CHRISTIAN WHEELER
ENGINEERING

February 25, 2021

Pfister Family Trust
c/o Luce et Studio Architects
5070-A Santa Fe Street
San Diego, California 92109

CWE 2200339.02

Subject: **Report of Preliminary Findings and Recommendations**
Proposed Pfister Residence, 6031 and 6051 Folsom Drive, La Jolla, California

Ladies and Gentlemen:

In accordance with your request, we have prepared this report to present preliminary geotechnical findings and recommendations for the subject project. This report is based on our subsurface explorations and our knowledge and experience with the general geotechnical conditions of the site vicinity.

PRELIMINARY SITE INFORMATION AND PROJECT DESCRIPTION

The subject site consists of two, adjacent residential lots located at 6031 and 6051 Folsom Drive, La Jolla, California. The lots, which are located adjacent to and north of Folsom Drive, are identified as Assessor's Parcel Numbers 357-182-06 and -07. The lot at 6051 Folsom Drive (APN 357-182-07) currently supports a one-story, single-family residence with an attached garage and other normally associated appurtenances. The lot at 6031 Folsom Drive (APN 357-182-06) is currently vacant.

Topographically, the central portions of the site are characterized by two relatively level building pads (one on each lot) that are about 20 to 25 feet above the adjacent portions of Folsom Drive. A moderate slope (APN 357-182-06) and a series of segmental block retaining walls (APN 357-182-07) rise approximately 15 feet to 20 feet from the level pad areas to the northern perimeter of the site. On-site elevations range from about 206 feet along the northern edge of the site to 154 feet at the southwest corner of the site. To the north of the site, a relatively natural slope ascends approximately 140 feet at an inclination of about 2.5:1 (horizontal to vertical) to the adjacent residential lots along Havenhurst Point.

We understand that the existing residence and improvements are to be demolished and that a new two-story, single-family residence with a basement garage, a swimming pool, site retaining walls, and other normally

associated improvements will be constructed. The subterranean portions of the home are expected to be of concrete/masonry construction and the above grade portions of the home are expected to be of conventional, wood-frame construction. The basement will include an on-grade concrete floor slab and retaining walls of about 10 feet in height. It is anticipated that the proposed structure and swimming pool will be supported by drilled cast-in-place concrete piers connected with grade beams. Miscellaneous light exterior improvements will be supported be supported by conventional shallow foundations. Grading to accommodate the proposed construction will consist of cuts and fills up to about 10 feet deep.

To assist in the preparation of this report, we were provided with a set of miscellaneous architectural drawings prepared by LUCE et studio, dated December 18, 2020, and a topographic plat prepared by Sowards & Brown Engineering, dated June 22, 2020. Copies of the topographic map and architectural site plan were used as a base map for our Site Plan and Existing Conditions and our Site Plan and Proposed Improvements, included herein as Plate Nos. 1A and 1B, respectively. We reviewed our report titled "Report of Geologic Reconnaissance, Proposed Single-Family Residence, 6031 and 6051 Folsom Drive, La Jolla, California", dated June 29, 2020 (CWE 2200339.01). In addition, we reviewed our report titled "Report of Preliminary Geotechnical Investigation, Proposed Single-Family Residence, Folsom Drive, La Jolla, California" dated July 21, 2005 (CWE 2010296.02). That previous report addresses the western portion of the subject site.

FINDINGS

SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Coastal Plains Physiographic Province of San Diego County. Based on our review of the referenced geotechnical literature and our experience within the vicinity of the site, we anticipate that the subject sites are underlain by artificial fill and slopewash materials that are in turn underlain by Cretaceous-age sedimentary deposits locally referred to as the Cabrillo Formation. These units are described below in order of increasing age.

ARTIFICIAL FILL (Qaf): The findings of our investigation indicate that most of the property is underlain by man-placed fill soils. The artificial fill extends to a maximum depth of about 17 feet below existing grade (boring B-3). However, it may be deeper in areas of the site not investigated. As encountered in our subsurface explorations, the fill soils consisted of brown, greyish-brown, dark brown, and reddish-brown, dry damp and damp to moist, sandy clayey gravel with cobble and boulders (GC). Maximum boulder size observed was about 12 inches. The fill soils were generally

loose and loose to medium dense in consistency. The artificial fill was judged to have a low expansive potential (EI between 21 and 50).

SLOPEWASH (Qsw): Quaternary-age slopewash was encountered underlying the fill soils in most of the site and to crop out near the surface in the northwestern portions of the site. As encountered in our subsurface explorations, the slopewash layer extended to a maximum thickness of about 15½ feet (boring B-2). However, the slopewash may be thicker in areas of the site not investigated. As encountered in our subsurface explorations, the slopewash consisted of brown to orangish-brown and reddish-brown, damp and moist, loose, loose to medium dense and medium dense, clayey gravel with cobble and boulders (GC). Maximum boulder size observed was about 12 inches. The slopewash was judged to have a low to medium expansive potential (EI between 21 and 90).

CABRILLO FORMATION (Kcc): Cretaceous-age, sedimentary deposits of the Cabrillo Formation crop out along the northernmost edge of the site and underlie the artificial fill and slopewash across the site. As encountered in our borings these materials generally consisted of light grayish-brown, reddish-brown, and light brown, moist, dense to very dense and very dense, silty sand (SM) and silty sandy gravel (GM). The formational soils were judged to have a low expansive potential (EI between 21 and 50).

GROUNDWATER: No free groundwater or seepage was encountered in our subsurface explorations.

PRELIMINARY CONCLUSIONS

In general, it is our professional opinion and judgment that the subject property is suitable for the construction of the subject project provided the recommendations presented herein are implemented. The main geotechnical conditions affecting the proposed project consist of potentially compressible artificial fill and slopewash, cut-fill transition and temporary cut slopes.

The subject site was found to be underlain by potentially compressible fill soils and slopewash extending to a maximum combined depth of about 22½ feet below existing grade (Boring B-2). Deeper potentially compressible fill soils may exist in areas of the site not investigated. These materials are considered unsuitable, in their present condition, for the support of settlement sensitive improvements. In order to mitigate this condition, it is recommended that the proposed structure and swimming pool be supported by drilled cast-in-place concrete piers extending into the underlying Cretaceous-age sedimentary deposits of the Cabrillo Formation.

It is anticipated that supporting light exterior improvements on deep foundations or removal and replacement as compacted fill of all potentially compressible materials is not cost effective. Therefore, it is recommended that potentially compressible soils underlying exterior settlement sensitive improvements be partially removed and replaced as compacted fill as described hereinafter. It should be recognized that this approach involves a certain risk of future settlement detrimental to these improvements. It is our opinion that this risk is very minor and cosmetic in nature. However, repairs and/or replacement of exterior improvements may be necessary in the future.

Materials of the Cabrillo Formation may be encountered at or near proposed basement finish pad grade. This condition would result in a cut-fill transition under the basement slab. This configuration may result in differential settlement detrimental to the slab due to the different compression potential of fill soil and slopewash and formational soils. In order to mitigate this potential condition, as well as the existing compressible soils, it is recommended that on-grade slabs for the proposed structure be designed as structural slabs.

Temporary cut slopes up to about 12 feet deep (including footing excavation) are anticipated for prosed basement construction. Existing fill soils and slopewash exposed in some of our trenches experienced severe caving. Due to this condition, it is recommended that temporary cut slopes be constructed at a 2:1 (horizontal to vertical) or flatter inclination.

Site preparation and grading recommendations will be included in our forthcoming geotechnical report. The following foundation recommendations should be considered preliminary and may require revisions after the results of our forthcoming field investigation and laboratory tests are analyzed.

PRELIMINARY RECOMMENDATIONS

FOUNDATIONS

GENERAL: Based on our findings and engineering judgment, the proposed structure and swimming pool may be supported by drilled cast-in-place concrete piers connected with grade beams. Light exterior miscellaneous improvements may be supported by conventional shallow continuous and isolated spread footings. The following recommendations are considered the minimum based on the anticipated soil conditions after site preparation as recommended in our geotechnical report is performed, and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified professional.

CONCRETE CAST-IN-PLACE PIERS

MINIMUM PIER DIMENSIONS: Cast-in-place concrete pier foundations should have a minimum diameter of 24 inches. The piers should extend to a minimum depth of 10 feet below the existing grade and 8 feet into Cabrillo Formation deposits, whichever is more. At this depth, a bearing capacity of 10,000 pounds per square foot (psf) may be assumed for said piers. This bearing pressure may be increased by 900 psf for each additional foot of depth, and 700 psf for each additional foot of width, up to a maximum bearing pressure of 20,000 psf. This value may be increased by one-third when considering wind and/or seismic loads. All piers should be connected with grade beams as specified by the project's structural designer.

PIER REINFORCING: The reinforcing steel for the piers should be specified by the project structural designer. As a minimum, we recommend that the pier reinforcing extend the full depth of the pier excavation.

LATERAL BEARING CAPACITY: The allowable lateral bearing resistance to lateral loads for the portion of the piers extending into fill soils and/or slopewash may be assumed to be 150 pounds per square foot per foot of depth up to a maximum of 1,500 pounds per square foot. The allowable lateral bearing resistance to lateral loads for the portion of the extending into Cabrillo Formation deposits piers may be assumed to be 30 pounds per square foot per foot of depth up to a maximum of 3,500 pounds per square foot. These values may be assumed to act below the setback line and on an area equal to twice the pier diameter.

PIER EXCAVATION OBSERVATION AND CLEANING: The pier excavations should be observed by a member of our staff to determine that the minimum embedment recommend in this report is achieved. Prior to placing the steel reinforcing cages, all loose or disturbed soils at the bottom of the pier excavations should be removed. The cleanout of the pier excavations should be approved by the geotechnical engineer.

DRILLING CHARACTERISTICS: It is anticipated that the proposed piers may be drilled utilizing conventional heavy-duty drilling equipment in good working condition; however, the on-site soils were found to be contain gravels, cobbles and boulders, the Cabrillo Formation was found to be very dense. These conditions may result in difficult drilling. Furthermore, although no caving was encountered in our brings, the artificial fill and slopewash is in a loose to medium dense condition.

SHALLOW FOUNDATIONS

DIMENSIONS: Spread footings supporting the proposed light exterior miscellaneous improvements should be embedded at least 18 inches below lowest adjacent finish pad grade. Continuous and isolated footings should have a minimum width of 12 inches and 24 inches, respectively. Retaining wall footings should be at least 18 inches deep and 24 inches wide. Footings located near descending slopes should be extended to a depth such that a minimum horizontal distance of 10 feet exists between the face of slope and the lower outside footing edge.

BEARING CAPACITY: Spread footings supporting the proposed structure with a minimum depth of 18 inches and a minimum width of 12 inches may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf). This value may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural designer. However, based on the expected soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least 2 No. 5 bars positioned near the bottom of the footing and 2 No. 5 bars positioned near the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.30. The passive resistance may be considered to be equal to an equivalent fluid weight of 300 pounds per cubic foot. These values are based on the assumption that the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

FOUNDATION EXCAVATION OBSERVATION: All footing excavations should be observed by Christian Wheeler Engineering prior to placing of forms and reinforcing steel to determine whether the foundation recommendations presented herein are followed and that the foundation soils are as anticipated in the preparation of this report. All footing excavations should be excavated neat, level, and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential settlement for the proposed structure and swimming pool is expected to be less than about ¼ inch and ¼ inch over 40 feet, respectively,

provided the recommendations presented in this report are followed. The anticipated total and differential settlement for the proposed exterior improvements is expected to be less than about 1 inch and 1 inch over 40 feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: The prevailing foundation soils are assumed to have a low expansive potential (EI between 21 and 50). The recommendations within this report reflect these conditions.

SEISMIC DESIGN FACTORS

The seismic design factors applicable to the subject site are provided below. The seismic design factors were determined in accordance with the 2019 California Building Code. The site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters are presented in the following Table I.

TABLE I: SEISMIC DESIGN FACTORS

Site Coordinates: Latitude Longitude	32.822° -117.270°
Site Class	C
Site Coefficient F_a	1.2
Site Coefficient F_v	1.5
Spectral Response Acceleration at Short Periods S_s	1.309 g
Spectral Response Acceleration at 1 Second Period S_1	0.458 g
$S_{MS}=F_aS_s$	1.571 g
$S_{M1}=F_vS_1$	0.687 g
$S_{DS}=2/3*S_{MS}$	1.047 g
$S_{D1}=2/3*S_{M1}$	0.458 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed improvements.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor system of the proposed structure will consist of a concrete slab-on-grade. It is recommended that the slab be designed as a structural slab. A modulus of subgrade reaction of 150 pounds/cubic inch may be assumed for slab design.

INTERIOR FLOOR SLABS: The minimum main structure slab thickness should be 6 inches (actual) and the slab should be reinforced with at least No. 4 bars spaced at 12 inches on center each way. This recommendation may have to be revised depending on the extent of site preparation achieved. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend down into the perimeter footings at least 12 inches.

UNDER-SLAB VAPOR RETARDERS: Steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. Local industry standards typically include the placement of a vapor retarder, such as plastic, in a layer of coarse sand placed directly beneath the concrete slab. Two inches of sand are suggested above and below the plastic. The vapor retarder should be at least 15-mil Stegowrap® or similar material with sealed seams and should extend at least 12 inches down the sides of the interior and perimeter footings. The sand should have a sand equivalent of at least 30, and contain less than 10% passing the Number 100 sieve and less than 5% passing the Number 200 sieve. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs." It is the flooring contractor's responsibility to place floor coverings in accordance with the flooring manufacturer specifications.

EXTERIOR CONCRETE FLATWORK: Exterior concrete slabs on grade should have a minimum thickness of 5 inches and be reinforced with at least No. 4 bars placed at 18 inches on center each way (ocew). Driveway slabs should have a minimum thickness of 5 inches and be reinforced with at least No. 4 bars placed at 12 inches ocew. Driveway slabs should be provided with a thickened edge a least 12 inches deep and 6 inches wide. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

EARTH RETAINING WALLS

FOUNDATIONS: Foundations for any proposed retaining walls should be constructed in accordance with the foundation recommendations presented previously in this report.

PASSIVE PRESSURE: The passive pressure for the anticipated foundation soils may be considered to be 300 pounds per square foot per foot of depth. The upper foot of embedment should be neglected when calculating passive pressures, unless the foundation abuts a hard surface such as a concrete slab. The passive pressure may be increased by one-third for seismic loading. The coefficient of friction for concrete to soil may be assumed to be 0.30 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third.

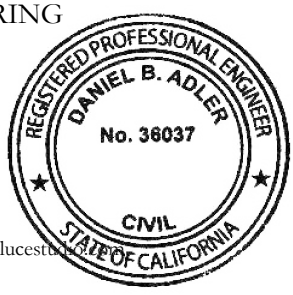
ACTIVE PRESSURE: The active soil pressure for the design of "unrestrained" and "restrained" earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 40 and 60 pounds per cubic foot, respectively. These pressures do not consider any other surcharge. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values are based on a drained backfill condition.

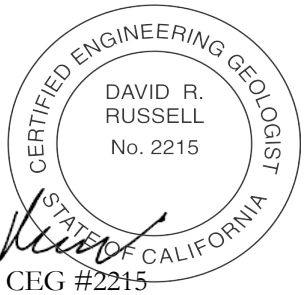
Seismic lateral earth pressures may be assumed to equal an inverted triangle starting at the bottom of the wall with the maximum pressure equal to 16.5H pounds per square foot (where H = wall height in feet) occurring at the top of the wall.

CLOSURE

If you have any questions after reviewing this letter, please do not hesitate to contact this office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING





Daniel B. Adler, RCE #36037 David R. Russell, CEG #2215

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JOB NO. 20-029 6/22/20
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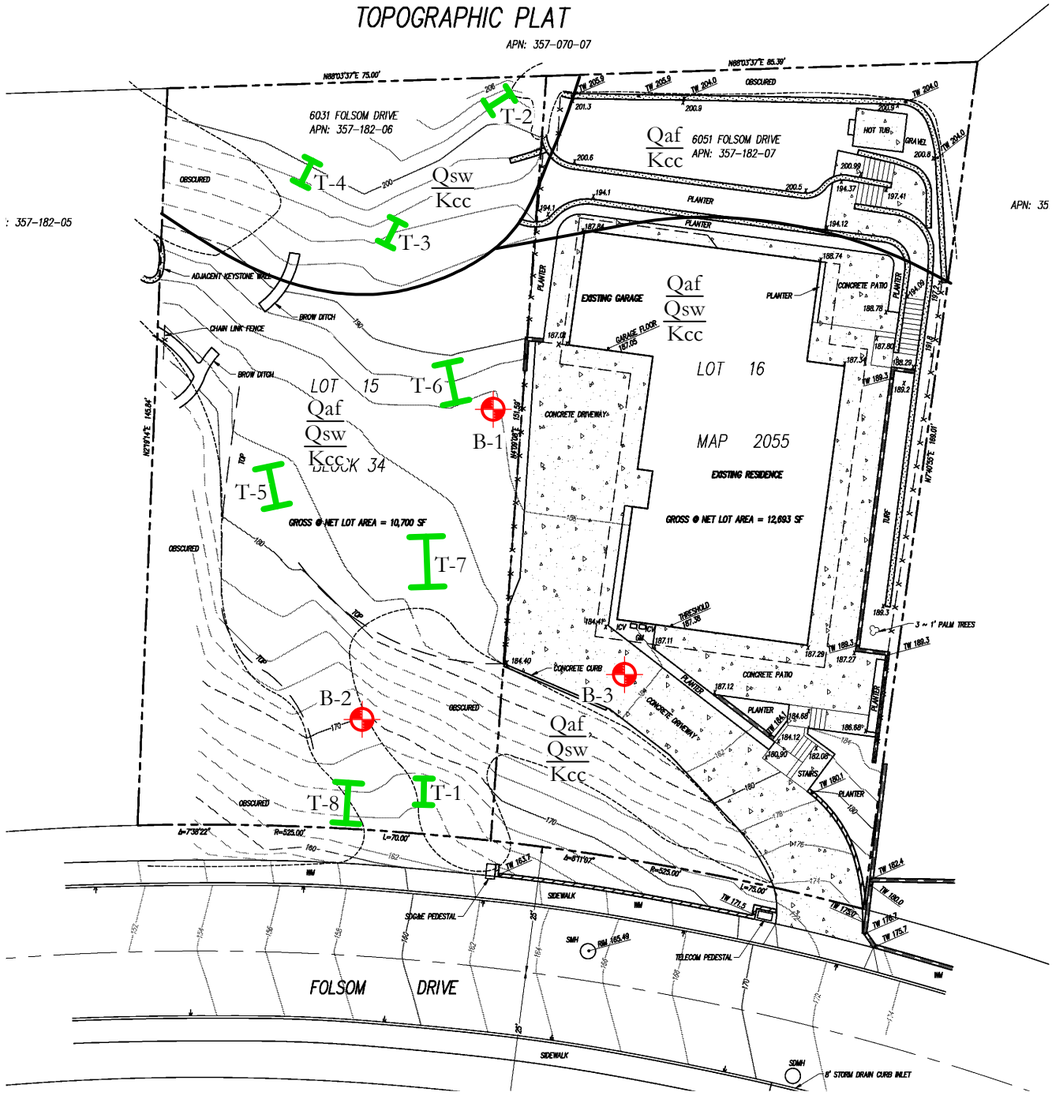
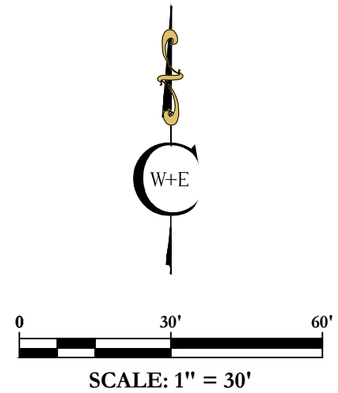
TOPOGRAPHIC PLAT





SCALE: 1" = 30'

CWE LEGEND

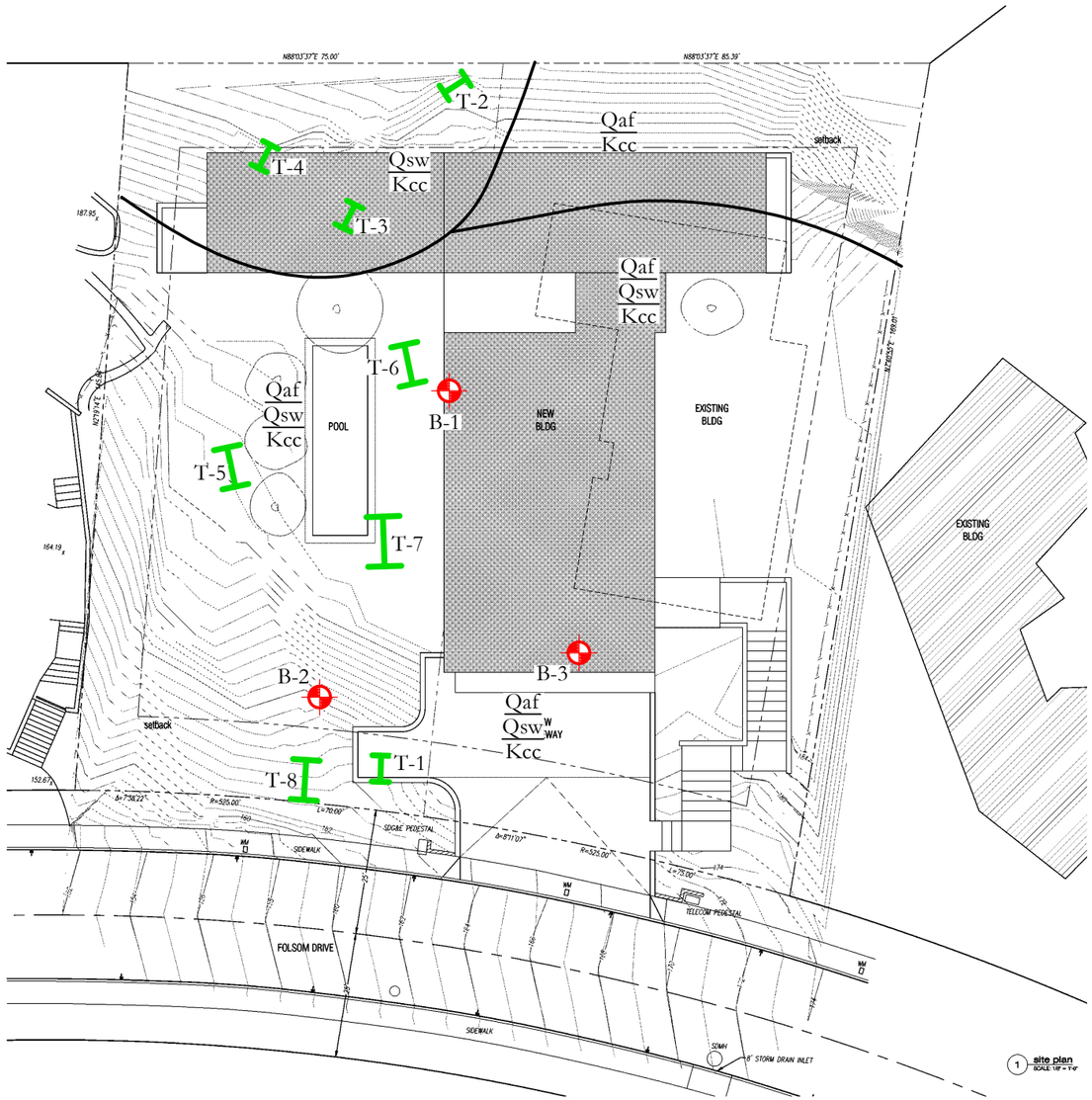
B-3	Approximate Boring Location (CWE, 2020)
T-8	Approximate Test Trench Location (CWE, 2005)
Qaf / Qsw / Kcc	Artificial Fill over Slopewash over Cabrillo Formation
Qaf / Qsw	Artificial Fill over Slopewash
Qsw / Kcc	Slopewash over Cabrillo Formation

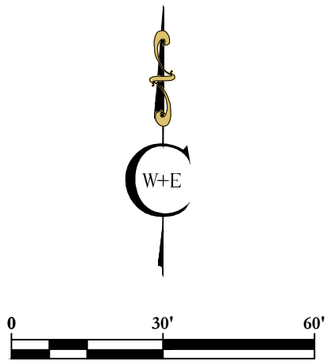
SITE PLAN AND EXISTING CONDITIONS

PROPOSED SINGLE-FAMILY RESIDENCE
6031 & 6051 FOLSOM DRIVE
LA JOLLA, CALIFORNIA

DATE:	FEBRUARY 2021	JOB NO.:	2200339.02
BY:	SRD	PLATE NO.:	1A

CHRISTIAN WHEELER ENGINEERING





SCALE: 1" = 30'

CWE LEGEND

B-3	Approximate Boring Location (CWE, 2020)
T-8	Approximate Test Trench Location (CWE, 2005)
Qaf / Qsw / Kcc	Artificial Fill over Slopewash over Cabrillo Formation
Qaf / Qsw	Artificial Fill over Slopewash
Qsw / Kcc	Slopewash over Cabrillo Formation

PFISTER FOLSOM RESIDENCE
6031-6051 FOLSOM DRIVE, LA JOLLA, CA 92037
LUCE et Studio 3076 santa fe street, san diego, ca 92109 +858.274.0223
T7 Architecture 946 Valley ave suite a, solana beach, ca 92057 +858.345.1295

KEYPLAN

STAMP:

PLAN NORTH

12.18.2020 plan review

ISSUANCE

SITE PLAN

A100

SITE PLAN AND PROPOSED IMPROVEMENTS

PROPOSED SINGLE-FAMILY RESIDENCE
6031 & 6051 FOLSOM DRIVE
LA JOLLA, CALIFORNIA

DATE:	FEBRUARY 2021	JOB NO.:	2200339.02
BY:	SRD	PLATE NO.:	1A

CHRISTIAN WHEELER ENGINEERING

Appendix A

Subsurface Explorations

LOG OF TEST BORING B-1

Date Logged:	7/10/20	Equipment:	Mait Baby Drill
Logged By:	DRR	Auger Type:	24" Bucket
Existing Elevation:	±146'	Drive Type:	N/A
Proposed Elevation:	Unknown	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			GM-GC	**Artificial Fill (Qaf):** Medium brown, dry, loose, SANDY, CLAYEY GRAVEL, cobbles and boulders up to 1' diameter. Damp to moist.							
5			GC	**Slopewash (Qsw):** Medium brown to orangish-brown, moist, loose to medium dense, SANDY, CLAYEY GRAVEL.		CK					
10			GM	**Cabrillo Foramtion (Kcc):** Light brown, moist, dense to very dense, SANDY CONGLOMERATE. Boring terminated at 11 feet. Backfilled with alternating lifts of bentonite and soil cuttings. No groundwater or seepage encountered.							
15											
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED SINGLE-FAMILY RESIDENCE
6031 & 6051 FOLSOM DRIVE
LA JOLLA, CALIFORNIA

DATE:	FEBRUARY 2021	JOB NO.:	2200339.02
BY:	SRD	APPENDIX:	A-1

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	7/10/20	Equipment:	Mait Baby Drill
Logged By:	DRR	Auger Type:	24" Bucket
Existing Elevation:	±146'	Drive Type:	N/A
Proposed Elevation:	Unknown	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	SAMPLE TYPE
0	GC	**Artificial Fill (Qaf):** Medium brown, dry to damp, loose, SANDY, CLAYEY GRAVEL with occasional cobbles and boulders up to 1'.	
		Becomes damp to moist.	
5			CK
	GC	**Slopewash (Qsw):** Orangish-brown, damp, loose, SANDY, CLAYEY GRAVEL, cobbles up to 8".	
10			
15			
20			
	GM	**Cabrillo Formation (Kcc):** Light brown, moist, very dense, SANDY CONGLOMERATE.	
25		Boring terminated at 23½ feet. Backfilled with alternating lifts of bentonite and soil cuttings. No groundwater or seepage encountered.	
30			

PENETRATION (blows per foot) | BULK | MOISTURE CONTENT (%) | DRY DENSITY (pcf) | RELATIVE COMPACTION (%) | LABORATORY TESTS

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁹⁹ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED SINGLE-FAMILY RESIDENCE
6031 & 6051 FOLSOM DRIVE
LA JOLLA, CALIFORNIA

DATE:	FEBRUARY 2021	JOB NO.:	2200339.02
BY:	SRD	APPENDIX:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-3

Date Logged:	7/10/20	Equipment:	Mait Baby Drill
Logged By:	DRR	Auger Type:	24" Bucket
Existing Elevation:	±146'	Drive Type:	N/A
Proposed Elevation:	Unknown	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				**6" Concrete**							
			GM	**Artificial Fill (Qaf):** Grayish-brown, damp, loose to medium dense, SILTY GRAVEL with sand. 3" asphalt at 2.5'.							
			GM	Dark brown, damp, loose to medium dense, SILTY GRAVEL with cobbles. Roots from 2.5' to 5'.							
5											
				Medium reddish-brown.							
10											
15											
			GC	**Slopewash (Qsw):** Reddish-brown, damp, medium dense, CLAYEY GRAVEL with cobble.							
20											
				Refusal at 23½ feet on boulder. Backfilled with alternating lifts of bentonite and soil cuttings. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED SINGLE-FAMILY RESIDENCE
6031 & 6051 FOLSOM DRIVE
LA JOLLA, CALIFORNIA

DATE:	FEBRUARY 2021	JOB NO.:	2200339.02
BY:	SRD	APPENDIX:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST TRENCH NUMBER T-1

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	166.0 feet	Depth to Water:	N/A
Finish Elevation:	158.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium to dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand and cobbles. Heavy caving from 0-14 feet.						
4								
6		**Slopewash/Coluvium (Qsw/Qcol):** Medium reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.						
8								
10								
12								
14		Test trench terminated at 14 feet.						
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	3

LOG OF TEST TRENCH NUMBER T-2

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	204.0 feet	Depth to Water:	N/A
Finish Elevation:	198.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Slopewash (Qsw):** Dark reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK					
4		**Cabrillo Formation (Kcc):** Light grayish-brown, moist, dense, SILTY SAND (SM).	CK					
6		Light reddish-brown and light gray, moist, dense to very dense, SILTY GRAVEL (GM), with sand.						
8		Test trench terminated at 8 feet.						
10								
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	4

LOG OF TEST TRENCH NUMBER T-3

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	196.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Slopewash (Qsw):** Medium reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			8.7	125.1	
4			CK			8.3	120.2	
6		**Cabrillo Formation (Kcc):** Medium reddish-brown, moist, medium dense, SILTY GRAVEL (GM), with sand. Highly weathered from 4-5 feet. At 5 feet becomes light reddish-brown and light gray, dense to very dense.	CK			23.1	98.5	
8								
10		Test trench terminated at 9 feet.						
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	5

LOG OF TEST TRENCH NUMBER T-4

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	196.0 feet	Depth to Water:	N/A
Finish Elevation:	196.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Slopewash (Qsw):** Dark reddish-brown, moist, loose to medium dense, CLAYEY SAND (SC), with sand.						
4		**Cabrillo Formation (Kcc):** Medium reddish-brown, moist, medium dense, SILTY GRAVEL (GM), with sand. Highly weathered from 2½ to 4½ feet. At 4½ feet becomes light reddish-brown and light gray, dense to very dense.						
6		Test trench terminated at 5 feet.						
8								
10								
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	6

LOG OF TEST TRENCH NUMBER T-5

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	181.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium reddish-brown and gray, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			8.6	116.0	
4		From 3 to 3½ feet becomes dark gray. At 4 feet becomes medium to dark reddish-brown.						
6			CK			7.6	131.1	MD
8		Moderate to heavy caving from 0-6 feet.						DS
10			CK			33.3	98.2	
12								
14		Test trench terminated at 13 feet.						
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	7

LOG OF TEST TRENCH NUMBER T-6

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	188.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			11.3	113.9	
4			CK			14.0	113.0	
6		**Slopewash (Qsw):** Medium to dark reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			15.5	110.1	MD, DS
8			CK			19.3	101.3	
10		**Cabrillo Formation (Kcc):** Light reddish-brown and light gray, moist, dense, CLAYEY GRAVEL (GC), with sand. At 11 feet becomes dense to very dense.	CK			9.7	138.2	
12		Test trench terminated at 12 feet.						
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	8

LOG OF TEST TRENCH NUMBER T-7

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	182.5 feet	Depth to Water:	N/A
Finish Elevation:	159.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium to dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand. Heavy caving from 0-12 feet.	CK			10.3	122.2	
4								
6		At 5 feet becomes dark grayish-brown.	CK			11.7	118.8	
8		At 7 feet becomes light to medium brown.						
10								
12			CK			11.4	121.4	
14								
16		**Highly Weathered Cabrillo Formation (Kcc):** Medium gray and dark red, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK					
18		**Cabrillo Formation (Kcc):** Light brown, moist, stiff to very stiff, SANDY GRAVELLY CLAY (CL).	CK					
20		Test trench terminated at 19 feet.						

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	9

LOG OF TEST TRENCH NUMBER T-8

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	167.0 feet	Depth to Water:	N/A
Finish Elevation:	159.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.						
6		**Slopewash/Colluvium (Qsw/Qcol):** Medium reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.						
16		Moderate to heavy caving from 0-15 feet.						
18		**Colluvium/Highly Weathered Cabrillo Formation (Qcol/Kcc):** Medium to dark reddish-brown and light gray, moist, medium dense to dense, CLAYEY GRAVEL (GC), with sand.						
20								

Test trench continued on Plate No. 10.

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	10

LOG OF TEST TRENCH NUMBER T-8 (Continued)

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	167.0 feet	Depth to Water:	N/A
Finish Elevation:	159.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
22		**Colluvium/Highly Weathered Cabrillo Formation (Qcol/Kcc):** Medium to dark reddish-brown and light gray, moist, medium dense to dense, CLAYEY GRAVEL (GC), with sand.						
24		Test trench terminated at 23 feet.						
26								
28								
30								
32								
34								
36								
38								
40								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	11

CHRISTIAN WHEELER
ENGINEERING

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED SINGLE-FAMILY RESIDENCE
FOLSOM DRIVE
ASSESSOR'S PARCEL NUMBER 357-182-06
LA JOLLA, CALIFORNIA

SUBMITTED TO:

MR. KEVIN KLEINFELD
6777 VIA ESTRADA
LA JOLLA, CALIFORNIA 92037

SUBMITTED BY:

CHRISTIAN WHEELER ENGINEERING
4925 MERCURY STREET
SAN DIEGO, CALIFORNIA 92111

CHRISTIAN WHEELER
ENGINEERING

July 21, 2005

Mr. Kevin Kleinfeld
6777 Via Estrada
La Jolla, California 92037

CWE 2050296.02

SUBJECT: REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION,
PROPOSED SINGLE-FAMILY RESIDENCE,
FOLSOM DRIVE, LA JOLLA, CALIFORNIA

Dear Mr. Kleinfeld:

In accordance with your request, we have completed a preliminary geotechnical investigation for the subject single-family residence. We are presenting herewith a report of our findings and recommendations.

In general, we found that the subject site is suitable for the proposed residence, provided the recommendations provided herein are followed. We have determined that the site is generally underlain by artificial fill and slopewash material that are in turn underlain by Cretaceous-age sandstones of the Cabrillo Formation. The fill and slopewash are considered unsuitable in their present condition to support the fill and/or settlement-sensitive improvement. Based on this condition, coupled with the sharp difference in the thickness of the fill/slopewash between the eastern and western portions of the lot, it will be necessary to support the residence, garage, pool, and retaining walls west and north of the residence on pier and grade beam foundation systems, with the piers extending through the fill/slopewash and into the Cabrillo Formation. The retaining walls proposed east of the residence can likely be supported by conventional shallow foundations, since the proposed cuts in that area are expected to expose the Cabrillo Formation at the foundation level. In addition to using pier foundations, it will also be necessary to perform some remedial grading in the areas to support fill and/or light improvements, such as the proposed patio. Specific recommendations are presented in the attached report.

The site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed construction. A significant geologic hazard that could affect the site is ground shaking due to seismic activity along one of the regional active faults; however, construction in accordance with the

requirements of the most recent edition of the Uniform Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of construction proposed.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING

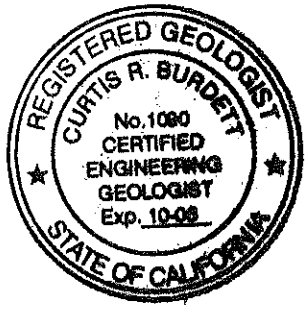
Shawn C. Caya, RCE #62983

Charles H. Christian, RGE # 00215

Curtis R. Burdett, CEG # 1090

CHC:CRB:scc

cc: (6) Submitted



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CHRISTIAN WHEELER
ENGINEERING

PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED SINGLE-FAMILY RESIDENCE

FOLSOM DRIVE, APN 357-182-06

LA JOLLA, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

This report presents the results of a preliminary geotechnical investigation for a proposed single-family residence to be constructed on a vacant lot located northerly of Folsom Drive, just east of Bellevue Avenue, in the La Jolla area of the city of San Diego, California. Figure Number 1 presented on the following page provides a vicinity map showing the location of the property.

We understand that it is proposed to construct a new two-story, single-family residence, a single-story garage, a pool, and other associated improvements. The garage will be constructed at the front of the lot and will have an approximate finished pad elevation of 162 feet, while the residence, patio and pool will be constructed above and behind the garage with an approximate finished pad elevation of 187 feet. This will require cuts and fills of up to approximately 22 feet and 10 feet, respectively, from existing grades and several interior and exterior retaining walls ranging in height from 2 feet to 25 feet. The retaining walls are expected to consist of masonry and/or cast-in-place concrete. Except where it is retaining, the residence will be of wood-frame construction and will have both raised wooden floors and an on-grade concrete floor slab.

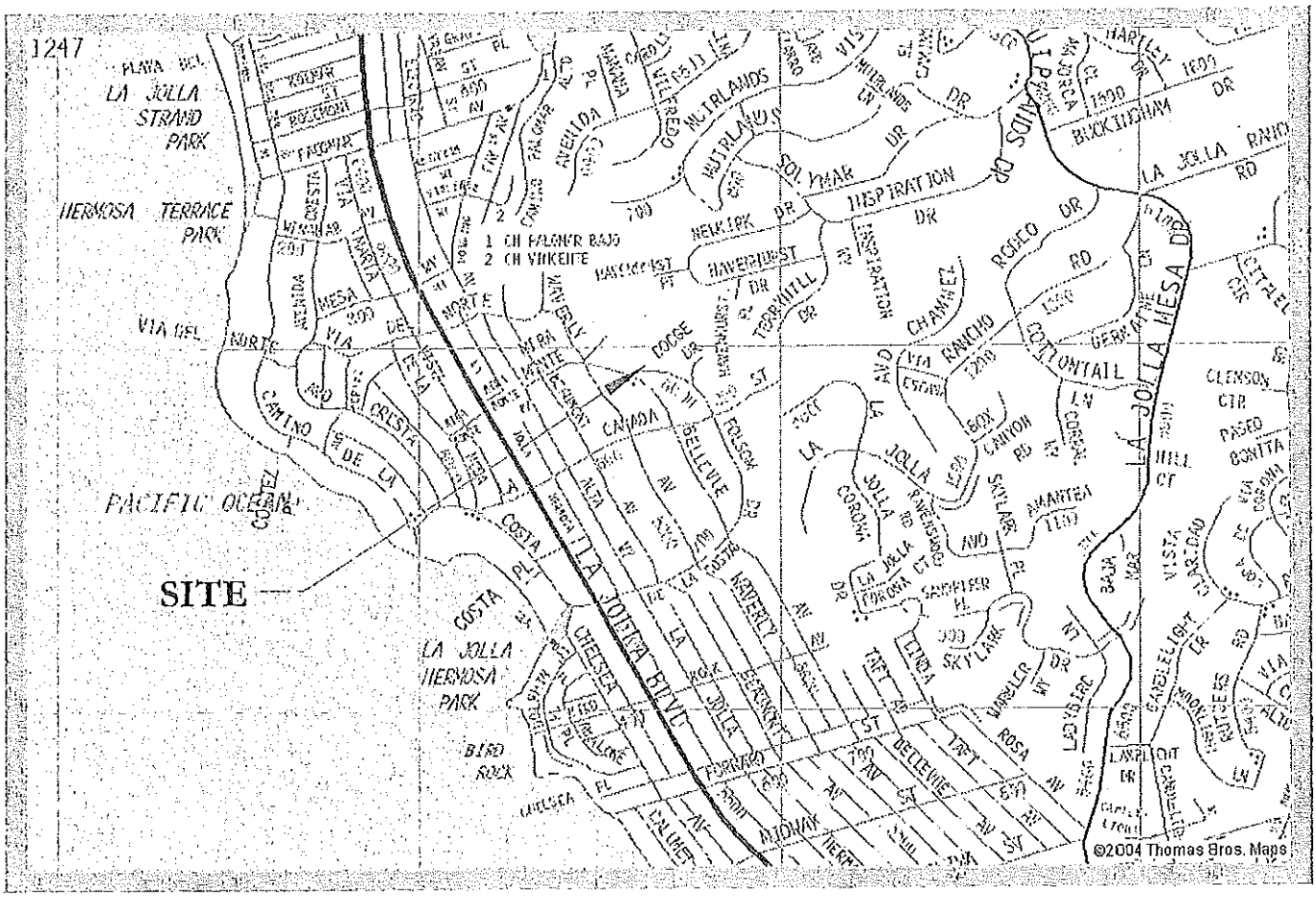
This report has been prepared for the exclusive use of Mr. Kevin Kleinfeld and his design consultants for specific application to the project described herein. Should the project be changed in any way, the modified plans should be submitted to Christian Wheeler Engineering for review to determine their conformance with our recommendations and to determine if any additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, express or implied.

SITE VICINITY MAP

(Adapted from Thomas Brothers Maps)

PROPOSED SINGLE-FAMILY RESIDENCE
FOLSOM DRIVE
LA JOLLA, CALIFORNIA

North



PROJECT SCOPE

Our preliminary geotechnical investigation consisted of surface reconnaissance, subsurface exploration, obtaining representative soil samples, laboratory testing, analysis of the field and laboratory data and review of relevant geologic literature. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structures, or any other services not specifically described in the scope of services presented below. More specifically, the intent of this investigation was to:

a) Explore the subsurface conditions of the site to the depths influenced by the proposed construction;

b) Evaluate, by laboratory tests, the engineering properties of the various strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential;

c) Describe the general geology at the site including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters as required by the most recent edition of the Uniform Building Code;

d) Address potential construction difficulties that may be encountered due to soil conditions, groundwater or geologic hazards, and provide recommendations concerning these problems;

e) Develop soil engineering criteria for site preparation and grading, and address the stability of temporary construction slopes;

f) Provide design criteria for restrained and unrestrained retaining walls as well as temporary shoring;

g) Recommend an appropriate foundation system for the type of improvements anticipated and develop soil engineering design criteria for the recommended foundation design;

h) Present our professional opinions in this report, which includes in addition to our conclusions and recommendations, a plot plan, exploration logs and a summary of the laboratory test results.

It is not within the scope of our services to perform laboratory tests to evaluate the chemical characteristics of the on-site soils in regard to their potentially corrosive impact to on-grade concrete and below grade improvements. If desired, we can submit representative soil samples to a chemical laboratory for analysis. Further, it should be understood Christian Wheeler Engineering does not practice corrosion engineering. If such an analysis is necessary, we recommend that the developer retain an engineering firm that specializes in this field to consult with them on this matter.

FINDINGS

SITE DESCRIPTION

The subject site is an undeveloped lot identified as Assessor's Parcel Number 357-182-06, located adjacent to and north of Folsom Drive, just east of Bellevue Avenue, in the La Jolla area of the city of San Diego. The nearly rectangular shaped lot has approximately 70 feet of frontage along Folsom Drive and is approximately 145 to 150 feet deep. Based on our subsurface explorations and on the current topography of the site, it is evident that some previous grading has been performed, creating a gently-sloping pad in the central portion of the site. Along the southern and western sides of the pad, a slope descends relatively steeply to Folsom Drive and to the neighboring property, respectively, with a roadway cut into the slope to provide access to the pad from Folsom Drive. Above the pad, it appears that some relatively minor cuts have been performed on the property; however, the area generally consists of a moderately-inclined, natural hillside that ascends approximately 150 feet in elevation to the properties located on Havenhurst Point above. On-site elevations range from approximately 205 feet (MSL) near the northeastern corner of the property to approximately 155 feet (MSL) at the southwestern corner near Folsom Drive. The current pad elevation is approximately 183 feet (MSL). The only known improvement on the lot at this time is a concrete-lined drainage ditch that traverses the northwestern portion.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in Coastal Plains Physiographic Province of San Diego County. Based on the results of our subsurface explorations and review of

pertinent, readily available geologic literature, we have determined that the site is underlain by artificial fill and slopewash materials that are in turn underlain by Cretaceous-age sedimentary deposits locally referred to as the Cabrillo Formation. These units are described below in order of increasing age. In addition, geologic cross-sections are presented on the attached Plate Numbers 2A and 2B.

ARTIFICIAL FILL (Qaf): Man-placed fill soil was encountered within five of our eight subsurface explorations. The existing fill was generally encountered within the central and southern portions of the lot and had a thickness in excess of 13 feet near the edge of the existing graded pad. In general, the fill consisted of medium to dark reddish-brown, cobbley, clayey gravel (GC) that was moist and loose to medium dense in consistency. Based on our experience with similar soil types, the existing fill is expected to have a "very low" Expansion Index. Additionally, we expect that the fill generally has low to moderate strength characteristics and moderate settlement potential in its present state. Based on its settlement potential, the existing fill is considered unsuitable in its current state to support fill and/or settlement-sensitive improvements. Specific criteria to mitigate this condition are provided in the "Recommendations" section of this report.

SLOPEWASH (Qsw): A layer of Quaternary-age slopewash was encountered below the fill in the southern and central portions of the lot and near the surface in the northern portion. The slopewash ranged in thickness from approximately two feet in the northern portion of the lot to in excess of 17 feet in the southern portion, and typically consisted of medium to dark reddish-brown, cobbley, clayey gravel (GC) that was moist and loose to medium dense in consistency. Based on our experience with similar soil types, the slopewash is expected to have a "low" Expansion Index. Additionally, we expect that the slopewash generally has low to moderate strength characteristics and moderate settlement potential in its present state. Based on its settlement potential, the slopewash is considered unsuitable in its current state to support fill and/or settlement-sensitive improvements. Specific criteria to mitigate this condition are provided in the "Recommendations" section of this report.

CABRILLO FORMATION (Kcc): Cretaceous-age, sedimentary deposits locally referred to as the Cabrillo Formation were encountered below the slopewash within five of our eight subsurface explorations, and is expected to underlie the entire site at depth. Within our explorations, the formational materials generally consisted of light to medium reddish- and grayish-brown, silty gravel (GM) and silty sand (SM) that were moist and dense to very dense in consistency. Within trench T-2, the formational material was noted to strike N70°W with a dip of 7 degrees to the northeast. Based

on our experience with similar soil types, the Cabrillo Formation is expected to have a "low" Expansion Index, high strength parameters, and a low settlement potential. The formational material is considered suitable in its present condition to support fill and/or settlement-sensitive improvements.

GROUNDWATER: Groundwater was not encountered in any of our exploratory trenches and we do not anticipate that any groundwater-related problems will be encountered either during or after the proposed construction. However, it should be recognized that minor groundwater seepage problems might occur after construction and landscaping at a site even where none were present before construction. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the anticipated construction and landscaping, it is our opinion that any seepage problems that may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

TECTONIC SETTING: No faults are known to traverse the subject site. However, it should be noted that much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zone) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age (last 1.6 million years) faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act and identified all Quaternary-age faults as "potentially active" except for certain faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. Some faults considered to be "potentially active" would be considered to be "active" but lack specific criteria used by the State Geologist, such as *sufficiently active* and *well-defined.* Faults older than Quaternary-age are not specifically defined in Special Publication 42, Fault Rupture Hazard Zones in California, published by the California Division of Mines and Geology. However, it is generally accepted that faults showing no movement during the Quaternary period may be considered to be "inactive". The City of San Diego guidelines indicate that since the beginning of the Pleistocene Epoch marks the boundary between "potentially active" and "inactive" faults, unfaulted Pleistocene-age deposits are accepted as evidence that a fault may be considered to be "inactive".

A review of available geologic maps indicates that the active Rose Canyon Fault Zone is located approximately 2.2 kilometers northeast of the subject site. Other active fault zones in the region that could possibly affect the site include the Newport-Inglewood and Palos Verdes Fault Zones to the northwest, the Coronado Bank Fault Zone to the southwest, the Elsinore and Earthquake Valley Fault Zones to the northeast and east, respectively.

GEOLOGIC HAZARDS

GROUND SHAKING: A likely geologic hazard to affect the site is ground shaking as a result of movement along one of the major active fault zones mentioned above. Based on a Deterministic Seismic Hazard Analysis, the maximum ground accelerations that would be attributed to a maximum probable earthquake occurring along the nearest fault segments of selected fault zones that could affect the site are summarized in Table I presented below.

TABLE I: MAXIMUM GROUND ACCELERATIONS

Fault Zone	Distance	Max. Magnitude Earthquake	Maximum Ground Acceleration
Rose Canyon	2.2 km	6.9 Magnitude	0.32 g
Coronado Bank	18 km	7.4 Magnitude	0.23 g
Newport-Inglewood	39 km	6.9 Magnitude	0.10 g
Elsinore (Julian)	63 km	7.1 Magnitude	0.08 g
Earthquake Valley	75 km	6.5 Magnitude	0.05 g

LANDSLIDE POTENTIAL AND SLOPE STABILITY: The Relative Landslide Susceptibility and Landslide Distribution Map of the La Jolla Quadrangle, prepared by the California Division of Mines and Geology, indicates that the site is situated within Relative Landslide Susceptibility Area 3-1. Area 3-1 is considered to be "generally susceptible" to slope failures; Area 3-1 includes moderately to steeply sloping terrain, where slope failure and landsliding occurrences are rare though possible if it were adversely modified. Based on the results of our subsurface explorations, the subject site and adjacent hillside are underlain by dense to very dense, sandstone conglomerates of the Cabrillo Formation. This soil has relatively high strength parameters in its existing condition. Additionally, the formational material was noted to dip approximately seven degrees towards the northeast, which corresponds to an into-slope apparent dip, and as such, a favorable bedding orientation with regards to slope stability. Based on these conditions, it is our opinion that the potential for deep-seated landsliding within the subject site proper is low.

In addition to the naturally sloping areas, a relatively steep fill over cut slope exists at the front of the lot. However, based on the current development plan, this slope will generally be replaced by a retaining wall and/or the improvements will be supported by deep foundations. As such, the potential for slope failure will be low.

LIQUEFACTION: The native materials at the site are not subject to liquefaction due to such factors as soil density, grain-size distribution, and the absence of shallow groundwater conditions.

FLOODING: The site is located outside the boundaries of both the 100-year and the 500-year floodplains according to the maps prepared by the Federal Emergency Management Agency.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. Based upon the location of the site it will not be affected by tsunamis.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. Due to the site's location, it is considered to have a negligible risk potential for seiches.

CONCLUSIONS

In general, we found that the subject property is suitable for the proposed single-family residence, provided the recommendations provided herein are followed. Based on our investigation, we have identified the following geotechnical conditions that will have a significant impact on the proposed site development:

- The lot is underlain by artificial fill (in the western portion) and slopewash material that are in turn underlain by Cretaceous-age sedimentary deposits identified as the Cabrillo Formation. Although the Cabrillo Formation is typically dense to very dense in consistency, the artificial fill and slopewash are heterogeneous in consistency and are therefore considered unsuitable in their present condition to support fill and/or settlement-sensitive improvements.

- The slopewash/fill material ranges in thickness from a few feet in the eastern portion of the lot to over 23 feet in the western portion. This condition, combined with the planned grading, will result in the eastern portion of the residence being underlain by the dense to very dense formational soil while the remainder of the home, as well as the pool and retaining walls at the front of the home, will be underlain by the fill/slopewash.

- Due to the configuration of the site and the adjacent properties, it appeats that it will be unfeasible to remove all of the existing fill/slopewash and replace it as properly compacted fill. Based on this condition, combined with the differential bearing condition discussed above, the proposed structure, garage, pool, and retaining walls to the west and north of the structure will need to be supported by pier and grade beam foundation systems that extend through the fill/slopewash and are founded within the underlying sedimentary deposits. This may require that the pool location be moved from above the garage. In addition, remedial grading will be required in areas that will support new fill and/or light exterior improvements such as concrete flatwork. This remedial grading will generally consist of removing the upper portion of the on-site soil and replacing it as properly compacted fill.

- The proposed grading may require temporary shoring. Specific recommendations are presented in the "Temporary Shoring" section of this report.

Geologically, the site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed residence. A significant geologic hazard that could affect the site is ground shaking due to seismic activity along one of the regional active faults; however, construction in accordance with the requirements of the most recent edition of the Uniform Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of construction proposed.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in Appendix Chapter A33 of the Uniform Building Code, the minimum requirements of the City of San Diego, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report. Prior to grading, a representative of Christian Wheeler Engineering should be present at the pre-construction meeting to provide additional grading guidelines, if necessary, and to review the earthwork schedule.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the grading operation to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site preparation should begin with the complete removal of the existing vegetation, including all root balls from the trees to be removed and all significant root material. It should be noted that discing of the vegetation into the surficial soils is not an acceptable form of removal, and may result in the requirement that soils contaminated with vegetation be exported from the site.

SITE PREPARATION: After clearing and grubbing, the site preparation should consist of constructing a mat of properly compacted fill below the areas to support fill and/or light improvements such as concrete flatwork. The mat can be constructed by removing the existing on-site soils to a depth of five feet below the existing or proposed grade, whichever depth is greater, and replacing that material as properly compacted fill. All removal bottoms should be observed by the Geotechnical Consultant prior to placing fill or constructing improvements.

PROCESSING OF FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out and approved to receive fill, the exposed soils should be scarified to a depth of 12 inches, moisture conditioned, and compacted to at least 90 percent relative compaction. No other special ground preparation is anticipated at this time.

COMPACTION AND METHOD OF FILLING: All structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of maximum dry density as determined by ASTM Laboratory Test D1557. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by our soil technicians or project geologist. Fill material should be free of rocks or lumps of soil in excess of twelve inches in maximum dimension. However, in the upper two feet of pad grade, no rocks or lumps of soil in excess of six inches should be allowed.

Fills should be benched into all temporary slopes and into competent natural soils when the natural slope is steeper than an inclination of 5:1 (horizontal to vertical). Utility trench backfill within five feet of the proposed structure and the beneath exterior hardscapes should be compacted to a minimum of 90 percent of its maximum dry density.

TEMPORARY SLOPES: We anticipate that temporary excavation slopes, if any, will be less than 25 feet in height. For unconfined excavations, the temporary slopes may be cut at an inclination of 1:1. If deeper excavations are required, specific recommendations will be provided in the field when the soils and site conditions can be identified. Deep, temporary confined excavations should use sloping sides, shoring, or

"trench boxes" during construction, or any other approved construction technique to assure stability of the excavations.

The contractor is solely responsible for designing and constructing stable, temporary excavations and may need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides where the friable sands are exposed. The contractor's "responsible person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

SURFACE DRAINAGE: The ground around the proposed residence and garage should be graded so that surface water flows rapidly away from the buildings without ponding. In general, we recommend that the ground adjacent to buildings slope away at a gradient of at least two percent. Densely vegetated areas where runoff can be impaired should have a minimum gradient of five percent within the first five feet from the structure. Gutters and downspouts should discharge into controlled drainage devices.

TEMPORARY SHORING

GENERAL: The following information on the design parameters and installation of a shoring system is conceptual at this time. We can furnish any additional design recommendations to the designer as the project progresses and the plans are formalized. Also, we recommend that the Geotechnical Consultant review the final shoring plans and specifications prior to bidding or negotiating with a shoring contractor. The Geotechnical Consultant should review the final shoring plans before submission to reviewing agencies.

SHORING DESIGN AND LATERAL PRESSURES: For design of cantilevered shoring, a triangular distribution of lateral earth pressure may be used. It may be assumed that retained soils having a level surface behind the cantilevered shoring will exert a lateral pressure equal to that developed by a fluid with a density of 40 pounds per cubic foot. Cantilevered shoring is normally limited to excavations that do not exceed approximately 15 feet in depth in order to limit the deflection at the tops of the soldier piles.

DESIGN OF SOLDIER PILES: Soldier piles for temporary shoring systems should be spaced at least two diameters on center. The allowable lateral bearing value (passive value) of the fill soils below the level of excavation may be assumed to be 100 pounds per square foot per foot of depth from the excavated surface, up to a maximum of 1,500 pounds per square foot. The passive value for the formational soils may be assumed to

be 400 psf/ft, up to a maximum of 4,000 psf. The passive value may be assumed to act on an area equal to twice the pier diameter. To develop the full lateral value, provisions should be taken to assure firm contact between the soldier piles and the undisturbed soils. The concrete placed in the soldier pile excavations may be a lean mix concrete. However, the concrete used in that portion of the soldier pile which is below the planned excavation level should be of sufficient strength to adequately transfer the imposed loads to the surrounding soils.

LAGGING: Continuous lagging will be required between the soldier piles. The soldier piles and anchors should be designed for the full anticipated lateral pressure. However, the pressure on the lagging will likely be somewhat less due to arching in the soils. We recommend that the lagging be designed for a semi-circular distribution of earth pressure where the maximum pressure is 400 pounds per square foot at the mid-point between soldier piles, and 0 pounds per square foot at the soldier piles.

FOUNDATION SYSTEMS

GENERAL: As mentioned previously, due to the presence of the unsuitable fill/slopewash material and the anticipated differential bearing condition caused by this material, it will be necessary to support the proposed residence, garage, pool, and associated retaining walls on the western, southern and northern sides of the residence on pier and grade beam foundation systems, with the piers extending through the fill/slopewash and into dense sedimentary deposits. It will also be necessary to support the retaining wall foundations proposed east of the residence in the dense sedimentary deposits; however, we anticipate that the proposed cuts in that area will expose the formational soils at the foundation level and that it will be possible to support those retaining walls on conventional shallow foundations. Design criteria for each foundation type are presented in the following sections.

DEEP FOUNDATION SYSTEMS

GENERAL: Augured, cast-in-place concrete piers that are tied together with reinforced concrete grade beams are recommended for support of the structural loads of the proposed residence, garage, pool, and associated retaining walls to the west and north of the residence.

MINIMUM PIER DIMENSIONS: Concrete pier footings should extend through the unsuitable fill/slopewash material and be founded within the underlying competent formational material. We recommend that cast-in-place concrete piers be embedded at least 5 feet into competent formational

soils with a minimum overall embedment of at least 10 feet below pad grade. Piers should have a minimum diameter of 24 inches. The project structural engineer should design all pier locations, dimensions, and pier reinforcing using the recommendations and design parameters herein. However, as a minimum, the piers should be spaced no closer than three pier diameters.

PIER REINFORCING: Piers should be reinforced in accordance with the recommendations of the project structural engineer. The reinforcing cages should extend the full depth of the piers.

BEARING CAPACITY: Incorporating the minimum dimensions recommended, cast-in-place concrete piers may be designed for an allowable downward axial bearing capacity of 10 kips per square foot. This value may be increased by 800 psf for each additional foot of pier embedment into formational soil, up to a maximum allowable bearing capacity of 30 kips per square foot.

LATERAL PIER CAPACITY: The passive pressure for the fill/slopewash materials may be considered to be 100 pounds per square foot per foot of depth and the passive pressure for the competent formational materials may be considered to be 400 pounds per square foot per foot of depth. The maximum passive pressure value should be limited to 1,500 psf and 4,000 psf for the fill/slopewash and formational soil, respectively. In addition, the upper five feet of soil should be neglected in passive pressure calculations for piers constructed adjacent to descending slopes. The passive pressure value may be assumed to act on an area equal to twice the pier diameter.

SETTLEMENT CHARACTERISTICS: The anticipated total and/or differential settlements are expected to be less than about one-half inch, provided the recommendations presented in this report are followed.

CLEANING OF PIER EXCAVATIONS: Loose or unsuitable material should be removed from the foundation excavations prior to the placement of concrete. Cleaning of the bottom of the pier excavations may be performed by careful operations of the driller and back-spinning the drill auger under pressure or utilizing a clean-out plate. Hand cleaning may also be required.

FOUNDATION EXCAVATION OBSERVATION: All pier excavations should be observed by the Geotechnical Consultant prior to placing concrete to determine if the foundation recommendations presented herein are complied with.

FOUNDATION PLAN REVIEW: It is recommended that the foundation plans for piers be submitted to this office for review in order to verify that the recommendations presented in this report are incorporated in the structural plans.

SHALLOW FOUNDATIONS

GENERAL: Shallow spread footings may be used to support the retaining walls proposed to the east of the residence. Such foundations should have a minimum embedment of six inches into competent formational soil or 18 inches below the lowest adjacent grade, whichever depth is greater. In addition, provided the fill mat is constructed as recommended above, site retaining walls of three feet in height or less can be supported by shallow foundations with a minimum embedment of 24 inches below the adjacent grade. Retaining wall footings should have a minimum width of 24 inches.

BEARING CAPACITY: Conventional spread footings with the above minimum dimensions may be designed for an allowable soil bearing pressure of 2,500 pounds per square foot. For footing the footings in formational soil, this value may be increased by 800 psf and 350 psf for each additional foot of embedment and width, respectively, up to a maximum of 5,000 psf. No increase in bearing capacity should be made for the retaining wall footings in fill material. The bearing value may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

EXPANSIVE CHARACTERISTICS: Due to the generally "low" expansive potential of the soils to be found within the foundation zones, special foundation design for heaving soils are not considered necessary at this time.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential settlement is expected to be less than about one inch and one inch over forty feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

FOOTING REINFORCING: Reinforcement requirements for shallow foundations should be provided by a structural engineer. However, based on the existing soil conditions, we recommend that

the reinforcing for continuous footings consist of at least two No. 5 bars positioned three inches above the bottom of the footing and two No. 5 bars positioned approximately two inches below the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.35. The passive resistance may be considered to be equal to an equivalent fluid weight of 250 and 400 pounds per cubic foot for the compacted fill and formational soils, respectively. This assumes the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

FOUNDATION PLAN REVIEW: The foundation plans should be submitted to this office for review in order to ascertain that the recommendations of this report have been implemented, and that no additional recommendations are needed due to changes in the anticipated construction.

FOUNDATION EXCAVATION OBSERVATION: All shallow foundation excavations should be observed by the Geotechnical Consultant prior to placing concrete to determine if the foundation recommendations presented herein are complied with. All footing excavations should be excavated neat, level and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SEISMIC DESIGN PARAMETERS

Based on our Deterministic Seismic Hazard Analysis, the Maximum Ground Acceleration at the site is estimated to be approximately 0.32 g. For structural design purposes, a damping ratio not greater than 5 percent of critical dampening, and Soil Profile Type S_C are recommended (UBC Table 16-J). Based on the site's location at approximately 2.2 kilometers from the Rose Canyon Fault Zone (Type B Fault), Near Source Factors N_a equal to 1.28 and N_v equal to 1.57 are also applicable. These values, along with other seismically related design parameters from the Uniform Building Code (UBC) 1997 edition, Volume II, Chapter 16, utilizing a Seismic Zone 4 are presented in tabular form on the following page.

TABLE II: SEISMIC DESIGN PARAMETERS

UBC Chapter 16 Table No.	Seismic Design Parameter	Recommended Value
16-I	Seismic Zone Factor Z	0.40
16-J	Soil Profile Type	S_C
16-Q	Seismic Coefficient C_a	0.40 N_a
16-R	Seismic Coefficient C_v	0.56 N_v
16-S	Near Source Factor N_a	1.28
16-T	Near Source Factor N_v	1.57
16-U	Seismic Source Type	B

ON-GRADE SLABS

GENERAL: It is our understanding that the floor system of the proposed garage and, at least partially, the residence will consist of concrete slabs-on-grade. The following recommendations are considered the minimum slab requirements based on the soil conditions and are not intended in lieu of structural considerations.

INTERIOR FLOOR SLABS: The minimum slab thickness should be five inches (actual) and the slab should be reinforced with at least No. 3 bars spaced at 12 inches on center each way. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend into the perimeter footings at least six inches. The garage slab may be constructed independent of the garage perimeter footings, but a felt strip should be placed between the slab and the footing. If the garage slab is placed monolithically with the perimeter footings, the garage slab reinforcement should extend into the perimeter footings at least six inches.

MOISTURE PROTECTION FOR INTERIOR SLABS: Historically, it has been a construction standard to install a moisture/vapor retarder system below interior on-grade slabs where moisture-sensitive floor covering is anticipated. The purpose of the moisture/vapor retarder is to attempt to minimize the transmission of moisture up through the concrete slab from sources below the slab. It should be noted that there is no known construction method that will insure that no moisture will migrate up though on-grade floor slab, and that there will always be some amount of moisture migration into the air space above on-grade floor slabs.

The industry standard for a moisture/vapor retarder system is to place a four-inch layer of clean, coarse sand or crushed rock below on-grade concrete floor slabs. If sand is used, which is the most common subslab material, it should have less than ten percent and five percent passing the No. 100 and No. 200 sieves,

respectively, in order to provide a capillary break between the underlying soil and the concrete slab. In addition, a 15-mil polyethylene membrane, such as Stago-Wrap, should be placed directly over the sand or rock blanket and the slab concrete should be placed directly over the membrane. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs".

In addition, concrete mixes can be designed to reduce the permeability of the concrete, and thus, reduce the amount of moisture migration up into the air space above the on-grade concrete slab. If desired, we can provide mix design recommendations to help minimize the concrete permeability.

EXTERIOR CONCRETE FLATWORK: Exterior slabs should have a minimum thickness of four inches. Reinforcement should be placed in exterior concrete flatwork to reduce the potential for cracking and differential movement. Control joints should be placed in exterior concrete flatwork to help control the location of shrinkage cracks. Spacing of control joints should be in accordance with the American Concrete Institute specifications.

EARTH RETAINING WALLS

FOUNDATIONS: Foundations for proposed retaining walls should be constructed in accordance with the recommendations for shallow foundations presented previously in this report. It should be noted that those recommendations also provide design values for the calculation of sliding resistance.

ACTIVE PRESSURE: The active soil pressure for the design of "unrestrained" and "restrained" earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 40 and 60 pounds per cubic foot, respectively. An additional 15 pounds per cubic foot should be added to the above values for 2:1 (H:V) sloping backfill. These values assume a drained, non-detrimentally expansive (E.I less than 50) backfill condition and do not consider any surcharge pressures. If any are anticipated, this office should be contacted for the necessary increase in soil pressure.

WATERPROOFING AND SUBDRAINS: Waterproofing details should be provided by the project architect. A suggested wall subdrain detail is provided on the attached Plate Number 13. We recommend that the Geotechnical Consultant be requested to observe all retaining wall subdrains to verify proper construction.

BACKFILL: All backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the Geotechnical Engineer and Engineering Geologist so that they may review and verify their compliance with this report and with the Uniform Building Code. It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the Geotechnical Engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. It should be verified in writing if the recommendations are found to be appropriate for the proposed changes or our recommendations should be modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they are due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the client's responsibility, or his representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Eight subsurface explorations were made between April 14 and May 24, 2005 at the locations indicated on the attached Plate Number 1. These explorations consisted of trenches excavated with a Case 580L Backhoe with an 18-inch bucket. The fieldwork was conducted by an engineering geologist.

The explorations were carefully logged when made. The trench logs are presented on the following Plate Numbers 3 through 11. The soils are described in accordance with the Unified Soils Classification System. In addition, a verbal textural description, the wet color, the apparent moisture and the density or consistency are provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

Undisturbed chunk samples of typical and representative soils were obtained from the trenches and returned to the laboratory for testing. Bulk samples of disturbed soil were also collected in bags from the bucket of the backhoe.

LABORATORY TESTING

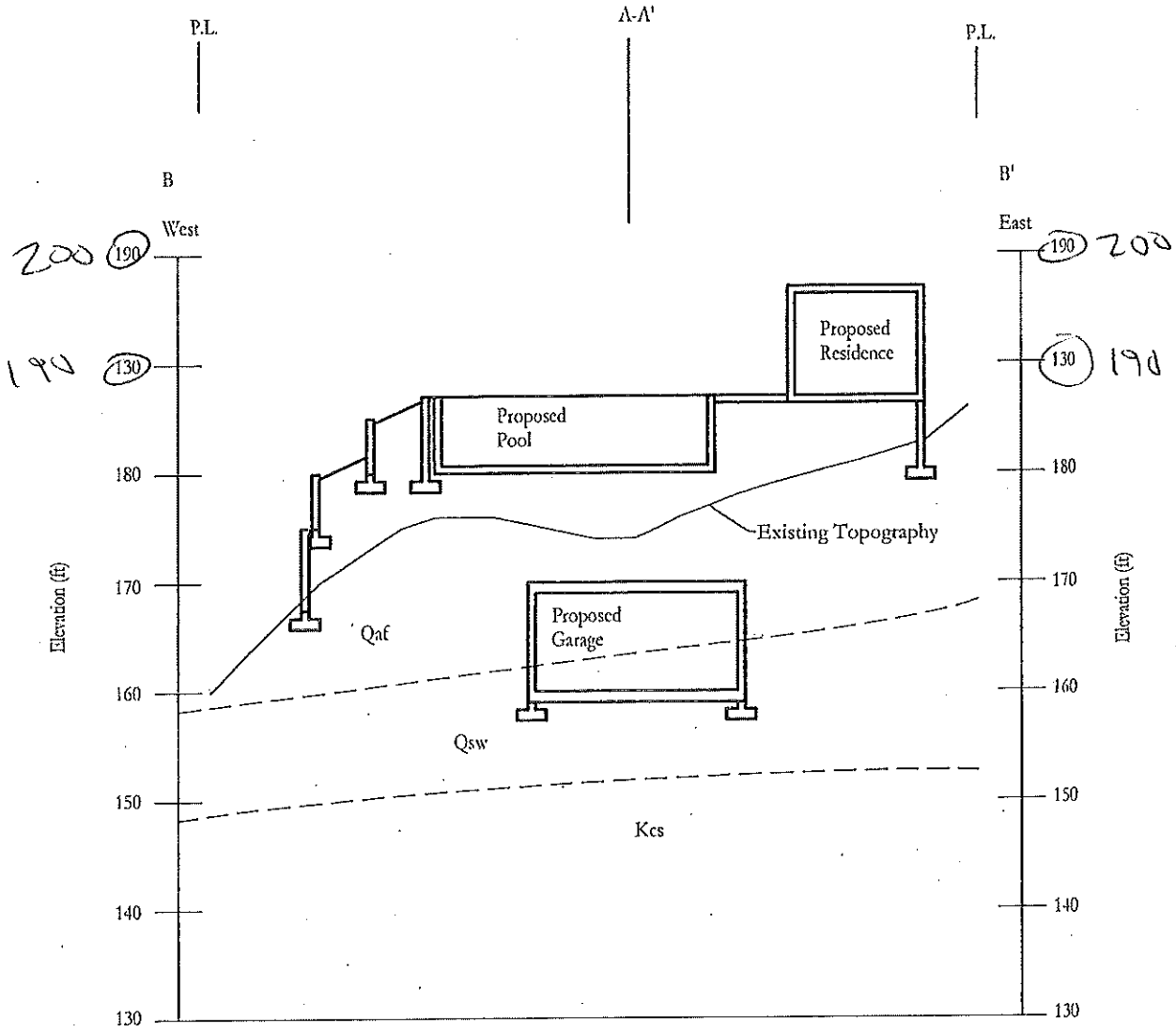
Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed is presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.

b) **MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the trench logs.

c) **COMPACTION TEST:** The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D-1557, Method A. The results of these tests are presented on Plate Number 12.

d) **DIRECT SHEAR TEST:** Direct shear tests were performed to determine the failure envelope based on yield shear strength. The shear box was designed to accommodate a sample having a diameter of 2.375 inches or 2.50 inches and a height of 1.0 inch. Samples were tested at different vertical loads and a saturated moisture content. The shear stress was applied at a constant rate of strain of approximately 0.05 inch per minute. The results of these tests are presented on Plate Number 12.



GEOLOGIC CROSS-SECTION B-B'

SCALE: $\frac{1}{16}$" = 1'

CHRISTIAN WHEELER
ENGINEERING
4925 Mercury Street • San Diego, CA 92111 • 858-496-9760 • FAX 858-496-9758

PROPOSED SFR	
BY: CHC/SCC/HC	DATE: JULY 2005
JOB NO.: 2050296	PLATE NO.: 2B

LOG OF TEST TRENCH NUMBER T-1

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	166.0 feet	Depth to Water:	N/A
Finish Elevation:	158.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium to dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand and cobbles. Heavy caving from 0-14 feet.						
4								
6		**Slopewash/Coluvium (Qsw/Qcol):** Medium reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.						
8								
10								
12								
14		Test trench terminated at 14 feet.						
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE
6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	2

LOG OF TEST TRENCH NUMBER T-2

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	204.0 feet	Depth to Water:	N/A
Finish Elevation:	198.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		Slopewash (Qsw): Dark reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK					
4		Cabrillo Formation (Kcc): Light grayish-brown, moist, dense, SILTY SAND (SM).	CK					
6		Light reddish-brown and light gray, moist, dense to very dense, SILTY GRAVEL (GM), with sand.						
8		Test trench terminated at 8 feet.						
10								
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO.:	2050296	PLATE NO.:	3

LOG OF TEST TRENCH NUMBER T-3

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	196.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Slopewash (Qsw):** Medium reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			8.7	125.1	
4			CK			8.3	120.2	
6		**Cabrillo Formation (Kcc):** Medium reddish-brown, moist, medium dense, SILTY GRAVEL (GM), with sand. Highly weathered from 4-5 feet. At 5 feet becomes light reddish-brown and light gray, dense to very dense.	CK			23.1	98.5	
8								
10		Test trench terminated at 9 feet.						
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE
6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	4

LOG OF TEST TRENCH NUMBER T-4

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	196.0 feet	Depth to Water:	N/A
Finish Elevation:	196.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Slopewash (Qsw):** Dark reddish-brown, moist, loose to medium dense, CLAYEY SAND (SC), with sand.						
2		**Cabrillo Formation (Kcc):** Medium reddish-brown, moist, medium dense, SILTY GRAVEL (GM), with sand. Highly weathered from 2½ to 4½ feet. At 4½ feet becomes light reddish-brown and light gray, dense to very dense.						
4								
6		Test trench terminated at 5 feet.						
8								
10								
12								
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	5

LOG OF TEST TRENCH NUMBER T-5

Date Excavated:	4/14/2005	Logged by:	TSW
Equipment:	Case 580L Backhoe	Project Manager:	CHC
Existing Elevation:	181.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium reddish-brown and gray, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			8.6	116.0	
4		From 3 to 3½ feet becomes dark gray. At 4 feet becomes medium to dark reddish-brown.						
6			CK			7.6	131.1	MD
8		Moderate to heavy caving from 0-6 feet.						DS
10			CK			33.3	98.2	
12								
14		Test trench terminated at 13 feet.						
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE
6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO.:	2050296	PLATE NO.:	6

LOG OF TEST TRENCH NUMBER T-6

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	188.0 feet	Depth to Water:	N/A
Finish Elevation:	186.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		Artificial Fill (Qaf): Dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			11.3	113.9	
4			CK			14.0	113.0	
6		Slopewash (Qsw): Medium to dark reddish-brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK			15.5	110.1	MD, DS
8			CK			19.3	101.3	
10		Cabrillo Formation (Kcc): Light reddish-brown and light gray, moist, dense, CLAYEY GRAVEL (GC), with sand.	CK			9.7	138.2	
12		At 11 feet becomes dense to very dense.						
		Test trench terminated at 12 feet.						
14								
16								
18								
20								

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO.:	2050296	PLATE NO.:	7

LOG OF TEST TRENCH NUMBER T-7

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	182.5 feet	Depth to Water:	N/A
Finish Elevation:	159.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium to dark brown, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand. Heavy caving from 0-12 feet.	CK			10.3	122.2	
4								
6		At 5 feet becomes dark grayish-brown.	CK			11.7	118.8	
8		At 7 feet becomes light to medium brown.						
10								
12			CK			11.4	121.4	
14								
16		**Highly Weathered Cabrillo Formation (Kcc):** Medium gray and dark red, moist, loose to medium dense, CLAYEY GRAVEL (GC), with sand.	CK					
18		**Cabrillo Formation (Kcc):** Light brown, moist, stiff to very stiff, SANDY GRAVELLY CLAY (CL).	CK					
20		Test trench terminated at 19 feet.						

CHRISTIAN WHEELER ENGINEERING

PROPOSED SINGLE-FAMILY RESIDENCE

6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	8

LOG OF TEST TRENCH NUMBER T-8 (Continued)

Date Excavated:	5/24/2005	Logged by:	TSW
Equipment:	Cat 446 Backhoe	Project Manager:	CHC
Existing Elevation:	167.0 feet	Depth to Water:	N/A
Finish Elevation:	159.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
22		**Colluvium/Highly Weathered Cabrillo Formation (Qcol/Kcc):** Medium to dark reddish-brown and light gray, moist, medium dense to dense, CLAYEY GRAVEL (GC), with sand.						
24		Test trench terminated at 23 feet.						
26								
28								
30								
32								
34								
36								
38								
40								

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PROPOSED SINGLE-FAMILY RESIDENCE
6031 Folsom Drive, La Jolla, California

BY:	HF	DATE:	July 2005
JOB NO. :	2050296	PLATE NO.:	10

LABORATORY TEST RESULTS

PROPOSED SINGLE-FAMILY RESIDENCE

FOLSOM DRIVE

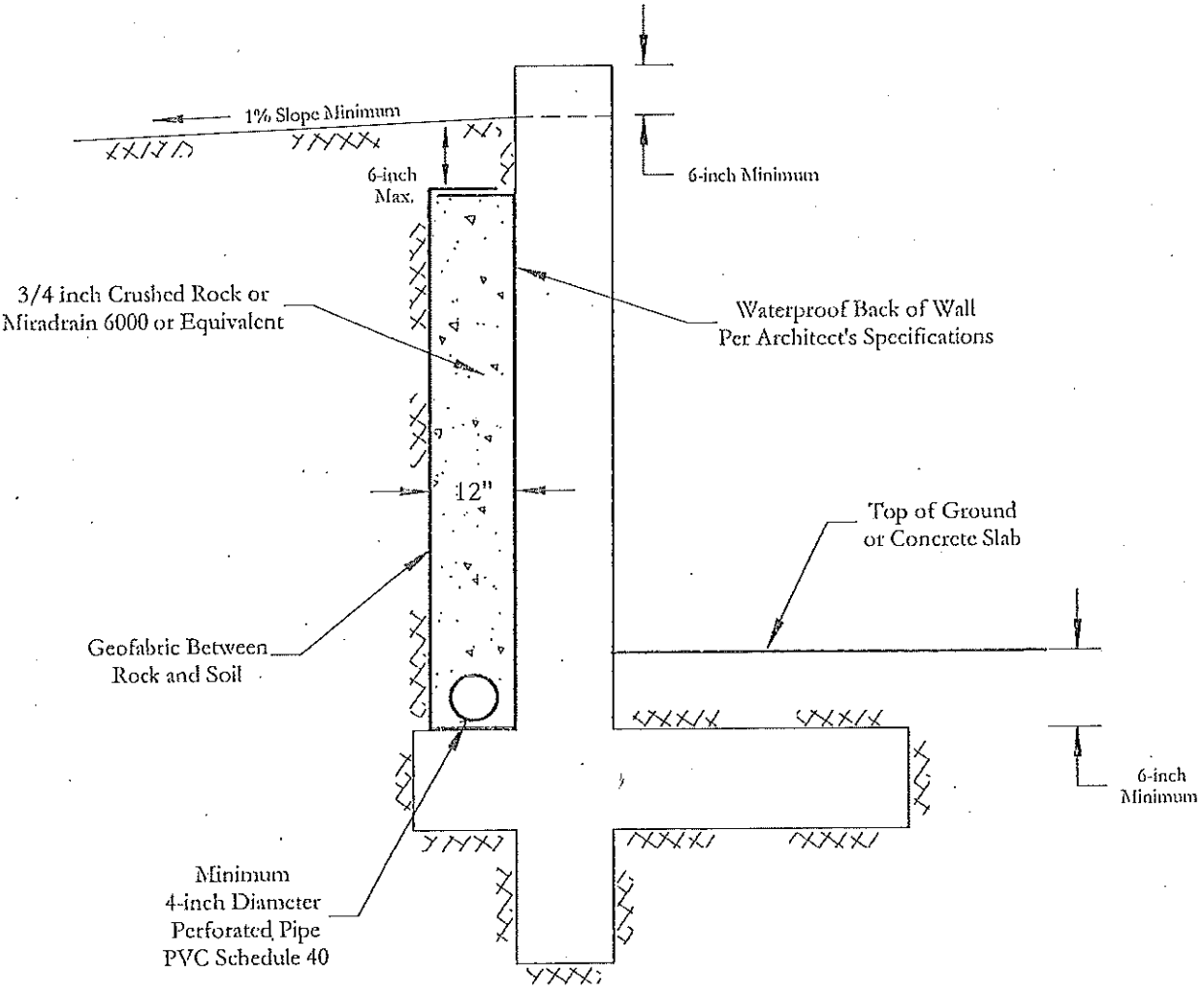
SAN DIEGO, CALIFORNIA

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)

Sample Location	Trench T-5 @ 5'-10'	Trench T-6 @ 9'-12'
Sample Description		
Maximum Density	124.4 pcf	117.6 pcf
Optimum Moisture	9.4 %	12.4 %

DIRECT SHEAR (ASTM D3080)

Sample Location	Trench T-5 @ 5'-10'	Trench T-6 @ 9'-12'
Sample Type	Remolded to 90 %	Remolded to 90 %
Friction Angle	29 °	34 °
Cohesion	325 psf	325 psf



RETAINING WALL SUBDRAIN DETAIL

No Scale

CHRISTIAN WHEELER ENGINEERING
4925 MERCURY STREET
SAN DIEGO, CALIFORNIA 92111
TEL. (858) 496-9760
FAX. (858) 469-9758

PROPOSED SINGLE-FAMILY RESIDENCE
Folsom Drive, La Jolla, California

BY: SCC	DATE: July 2005
JOB NO.: 2050296	PLATE NO.: 13

REFERENCES

Anderson, J.G.; Rockwell, R.K. and Agnew, D.C., 1989, Past and Possible Future Earthquakes of Significance to the San Diego Region, Earthquake Spectra, Volume 5, No. 2, 1989.

Blake, T.F., 2000, EQFAULT, A Computer Program for the Estimation of Peak Horizontal Acceleration from 3-D Fault Sources, Version 3.0, Thomas F. Blake Computer Services and Software, Thousand Oaks, California.

Boore, David M., Joyner, William B., and Fumal, Thomas E., 1997, "Empirical Near-Source Attenuation Relationships for Horizontal and Vertical Components of Peak Ground Acceleration, Peak Ground Velocity, and Pseudo-Absolute Acceleration Response Spectra", in Seismological Research Letters, Volume 68, Number 1, January/February 1997.

California Division of Mines and Geology, 1997, "Guidelines for Evaluating and Mitigating Seismic Hazards in California", CDMG Special Publication 117.

California Division of Mines and Geology, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada.

Jennings, C.W., 1975, Fault Map of California, California Division of Mines and Geology, Map No. 1; Scale 1:750,000.

Countywide Flood Insurance Rate Map, Map No. 06073C1584F (panel 1584 of 2375), prepared by the Federal Emergency Management Agency, effective date June 19, 1997.

Kennedy, M.P., 1975, Geology of the San Diego Metropolitan Area, California; California Division of Mines and Geology, Bulletin 200.

Kern, P., 1989, Earthquakes and Faults in San Diego County, Pickle Press, 73 pp.

Tan, S.S., 1995, Landslide Hazards in the Southern Part of the San Diego Metropolitan Area, San Diego County, California, California Division of Mines and Geology Open-File Report 95-03.

Wesnousky, S.G., 1986, "Earthquakes, Quaternary Faults, and Seismic Hazards in California", in Journal of Geophysical Research, Volume 91, No. B12, pp 12,587 to 12,631, November 1986.

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

PROPOSED SINGLE-FAMILY RESIDENCE

FOLSOM DRIVE

LA JOLLA, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D-1557-91
Density of Soil In-Place - ASTM D-1556-90 or ASTM D-2922

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3

feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report.

When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, shall be backrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density (degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified the day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or