WATER QUALITY STUDY
6195 MONTEZUMA ROAD
SAN DIEGO, CA 92115

Lots 186 &
7247 Fairway Road
La Jolla, California 92037

Prepared for:
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October 12, 2017

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ATTACHMENTS

1.0 PROJECT DESCRIPTION

This project involves the construction of a new single-family residence on an existing vacant lot. The site has been previously graded. Additional improvements include a driveway, pool, retaining walls, curb outlet and a companion unit. The project is located on Lot 7 of La Jolla Country Club Knolls, Map No. 4039, 7247 Fairway Road,
La Jolla, California 92037.

2.0 Anticipated and Potential Pollutants - Post-Construction

There is no sampling data available for the existing site condition. In addition, the project is not expected to generate significant amounts of non-visible pollutants. However, the following constituents are commonly found on similar developments and could affect water quality:

Sediment discharge due to construction activities and post-construction areas left bare. (Anticipated)

Nutrients from fertilizers (Anticipated)

Pesticides from landscaping (Anticipated)

Trash and debris (Anticipated)

Oxygen demanding substances (Potential)

Oil and Grease (Anticipated)

Bacteria and Viruses (Anticipated)

3.0 MITIGATION MEASURES TO PROTECT WATER QUALITY

To address water quality for the project, BMPs will be implemented post-construction using Low-Impact Development Design Practice as outlined below.

LOW-IMPACT DEVELOPMENT DESIGN PRACTICES

Required Permanent Best Management Practices for Standard Development Projects

<u>Source Control (SC) BMP Requirements:</u>

SC-1: Prevent illicit discharges into the MS4

An illicit discharge is any discharge to the MS4 that is not composed entirely of storm water except discharges pursuant to a National Pollutant Discharge Elimination System permit and discharges resulting from firefighting activities. Projects must effectively eliminate discharges of non-storm water into the MS4. This may involve a suite of housekeeping BMPs which could include effective irrigation, dispersion of non-storm water discharges into landscaping for infiltration, and controlling wash water from vehicle washing.

Non-storm water discharges are not expected to be generated onsite. The site will be constructed using the following landscape precautions:

Rain shutoff devices will be used in all landscaped areas that use irrigation located onsite. They will prevent irrigation during and after precipitation events.

Irrigation contribution to dry-weather runoff will by not allowing irrigation spray patterns to fall on paved surfaces or drain inlets.

The landscaped areas will include separate irrigation systems, as appropriate, to address specific water requirements.

Flow reducers and shutoff valves will be used, as appropriate to control water loss in the event of a break in the irrigation system.

Rain shutoff devices will be used in all landscaped areas that use irrigation located onsite.

Inlets within lawn areas will be minimized and/or will include a non-turf buffer around the inlet to minimize or eliminate the transport of lawn care products.

Vehicle washing, should it take place, will occur to allow it to be conveyed to a landscaped area for treatment before being discharged from the site.

SC-2: Identify the storm drain system using stenciling or signage

Storm drain signs and stencils are visible source controls typically placed adjacent to the inlets. There are no storm drain inlets associated with this project that would require posting of notices or stenciling.

SC-3: Protect outdoor material storage areas from rainfall, run-on, runoff, and wind dispersal

Materials with the potential to pollute storm water runoff shall be stored in a manner that prevents contact with rainfall and storm water runoff. Contaminated runoff shall be managed for treatment shall incorporate structural or pollutant control BMPs for outdoor material storage areas, as applicable and feasible.

If outdoor storage areas were proposed for this project materials with the potential to contaminate storm water would be:

- Placed in an enclosure such as, but not limited to, a cabinet, or similar structure, or under a roof or awning that prevents contact with rainfall runoff or spillage to the storm water conveyance system; or

- Protected by secondary containment structures such as berms, dikes, or curbs.

- The storage areas would be paved and sufficiently impervious to contain leaks and spills, where necessary.

- The storage area would be sloped towards a sump or another equivalent measure that is effective to contain spills.

- Runoff from downspouts/roofs would be directed away from storage areas.

- The storage area would have a roof or awning that extends beyond the storage area to minimize collection of storm water within the secondary containment area. A manufactured storage shed may be used for small containers.

No outdoor material storage areas are proposed for this project

SC-4: Protect materials stored in outdoor work areas from rainfall, run-on, runoff, and wind dispersal

Outdoor work areas have an elevated potential for pollutant loading and spills. All development projects proposing outdoor work areas shall include the following structural or pollutant control BMPs for areas with potential for pollutant generation, as applicable and feasible:

- Create an impermeable surface such as concrete or asphalt, or a prefabricated metal drip pan, depending on the size needed to protect the materials.

- Cover the area with a roof or other acceptable cover.

- Berm the perimeter of the area to prevent water from adjacent areas from flowing on to the surface of the work area.

- Directly connect runoff to sanitary sewer or other specialized containment system(s), as needed and where feasible. This allows the more highly concentrated pollutants from these areas to receive special treatment that removes particular constituents. Approval for this connection must be obtained from the appropriate sanitary sewer agency.

- Locate the work area away from storm drains or catch basins.

No outdoor material storage in outdoor work areas are proposed for this project

SC-5: Protect trash storage areas from rainfall, run-on, runoff, and wind dispersal

Storm water runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. All development projects shall include the following structural or pollutant control BMPs, as applicable:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This can include berming or grading the waste handling area to prevent run-on of storm water.

- Ensure trash container areas are screened or walled to prevent offsite transport of trash.

- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.

- Locate storm drains away from immediate vicinity of the trash storage area and vice versa.

- Post signs on all dumpsters informing users that hazardous material are not to be disposed.

This project proposes the use of trash and recycle containers to be stored inside the garage.

SC-6: Use any additional BMPs determined to be necessary by the Co-permittee to minimize pollutant generation at each project site

- **SC-6A: Large Trash Generating Facilities:**

This project is not such a facility.

- **SC-6B: Animal Facilities:**

This project is not such a facility.

- **SC-6C: Plant Nurseries and Garden Centers**:

This project is not such a facility.

- **SC-6D: Automotive-related Uses:**

This project is not such a facility.

Site Design (SD) BMP Requirements:

SD-1: Maintain natural drainage pathways and hydrologic features

There are no natural storage reservoirs or drainage corridors onsite. There are no natural waterbodies onsite. The project does not propose to dredge or place fill materials in Waters of the U.S. and so need not obtain Clean Water Act Section 401 Water Quality Certification. The project does not propose to dredge or fill waters of the State and so does not need to fulfill waste discharge requirements.

SD-2: Conserve natural areas, soils and vegetation

- Conserve natural areas within the project footprint including existing trees, other vegetation, and soils

Entire project site area has been previously disturbed. Existing trees, other vegetation, and soils shall be conserved as feasible.

SD-3: Minimize impervious area

The site will include landscaped areas that will allow precipitation to fall on vegetated surfaces.

SD-4: Minimize soil compaction

Landscaped areas will be minimally compacted, consistent with geotechnical recommendations.

SD-5: Disperse impervious areas

Impervious areas will convey their runoff to landscaped areas before being conveyed offsite. Impervious areas are interspersed with pervious surfaces. Roof downspouts will convey runoff to landscaped areas.

SD-6: Collect runoff

Runoff is collected in numerous planting areas and is not conveyed to one large collection area permitting a greater opportunity for retaining some site runoff.

SD-7: Landscape with native or drought tolerant species

This project's landscape design and plant palette minimizes required resources (irrigation, fertilizers and pesticides) and pollutants generated from landscape areas. An effort will be made to use plants that will be drought tolerant and not require watering after establishment (2 to 3 years). Watering is planned only to be required during prolonged dry period. Final selection of plant material will be made by a landscape architect experienced with LID techniques.

SD-8: Harvest and use precipitation

The use of cisterns is impractical due to the requirement to utilize detained runoff in 36 hours and the size of the proposed standard development project.

Other Source Control Requirements

Building plans / Grading plans shall require implementation of post-construction soil stabilization practices and construction shall be performed in conformance with those plans.

Pet Waste collection dispensers are not applicable to this project.

There are no high pedestrian traffic areas requiring trash receptacles for this project.

BMPs Applicable to Individual Priority Projects

This is not a Priority project and so not subject to review of additional BMPs applicable to such projects.

4.0 SUMMARY/CONCLUSIONS

This project is subject to Standard Development Storm Water BMP requirements. This Water Quality Study has been prepared to analyze and identify this project's anticipated pollutants or concern and has addressed how Low Impact Development (LID) and Source Control BMP will be incorporated into the project. The proposed LID and Source Control BMPs have been shown to address mitigation measures to protect water quality to the maximum extent practicable. This project is not subject to hydromodification requirements.

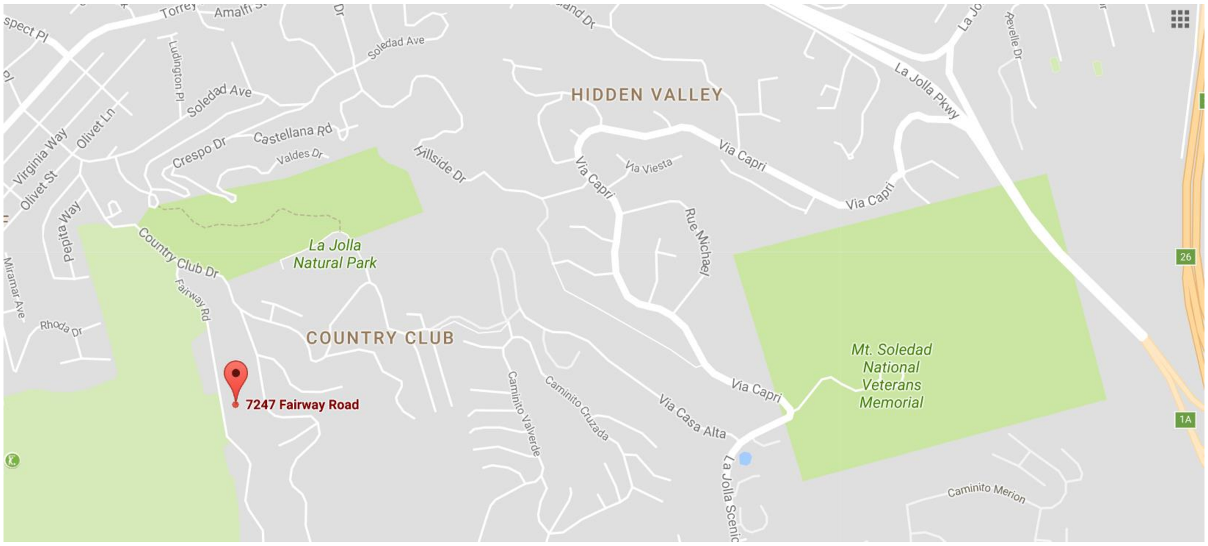
This Water Quality Study has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

ANTONY K. CHRISTENSEN, RCE 54021, EXP. 12-31-17	*DATE*

ATTACHMENT A

LOCATION MAP

7247 FAIRWAY ROAD

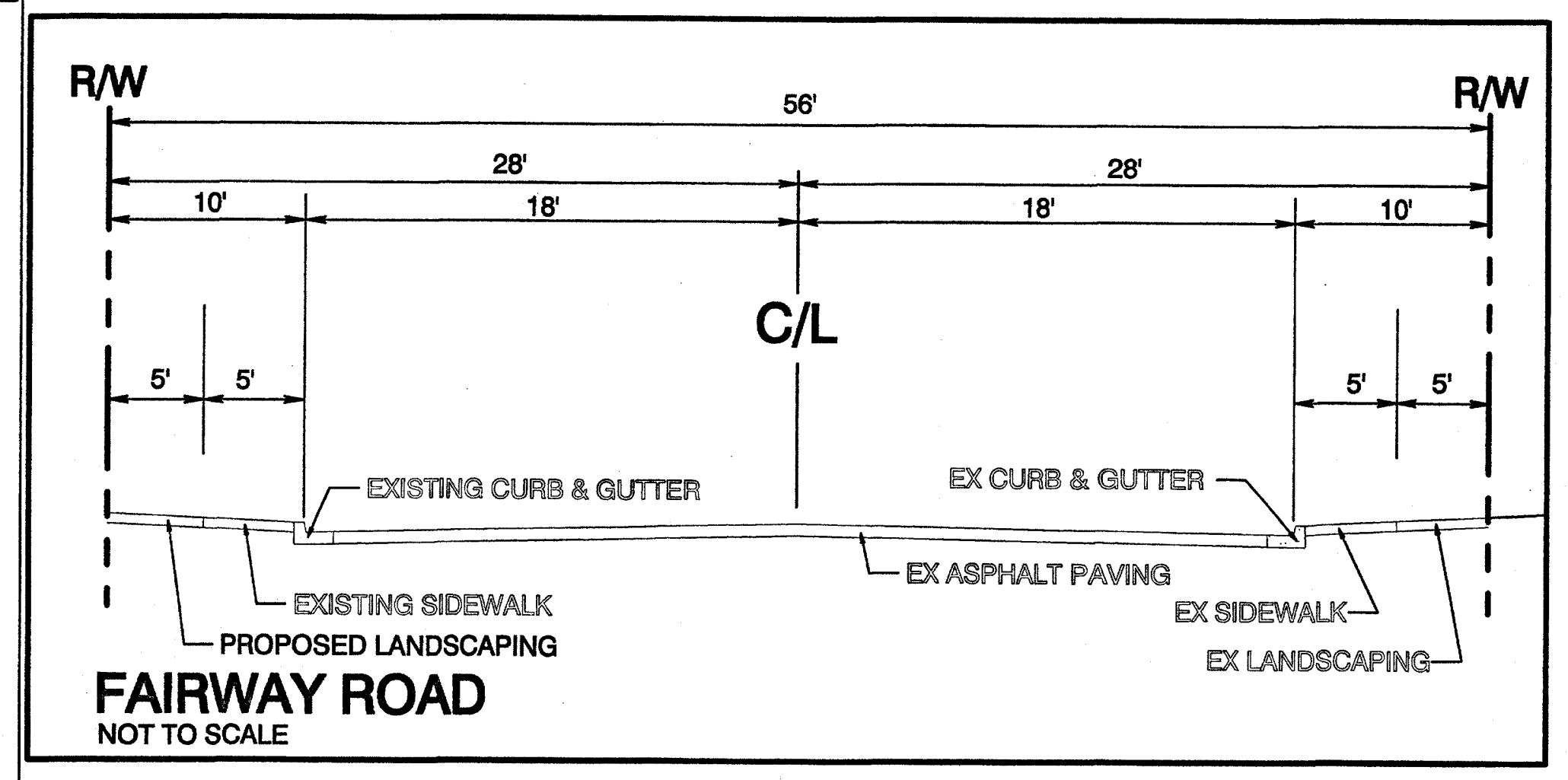


ATTACHMENT B

PROJECT MAP

LEGEND

PROPERTY/ RIGHT OF WAY LINE	P/L OR R/W ━━ ━ ━ ━━
EXISTING CONTOUR	— — — — — —
PROPOSED CATCH BASIN	▣
PROPOSED AREA DRAIN	○
PROPOSED PVC DRAIN	═ ═ ═ ═ ═ ═
PROPOSED CONCRETE SURFACE	▒
EXISTING CONCRETE SURFACE	▒
PROPOSED PLANTER	▤
PROPOSED LANDSCAPING	▤
EXISTING SEWER MAIN	—S——S—
EXISTING WATER MAIN	—W——W—
PROPOSED SITE WALL	▨
SETBACK LINE	— —— ——
PROPOSED CANTILEVERED DECK OVER MOTOR COURT	░
DOWNSPOUT LOCATION	DS
LIMIT OF WORK	—— ——
CURB OUTLET PER D-25 (MODIFIED) WITH 6" PVC DRAIN	▱ ═ ═



FAIRWAY ROAD
NOT TO SCALE

CONSTRUCTION NOTES

① 2424 CATCH BASIN TO COLLECT RUNOFF FROM UPPER AREA OF SITE AND SECOND LEVEL DECK AREA

② PORTION OF EXISTING DRIVEWAY TO BE REMOVED AND REPLACED WITH CURB GUTTER AND SIDEWALK PER SDG-156

③ C/L PROPOSED 20' DRIVEWAY PER SDG-159

④ EXISTING 3/4" WATER SERVICE TO BE KILLED AT MAIN

⑤ PROPOSED 1" COPPER WATER SERVICE

⑥ EXISTING 4" PVC SEWER LATERAL TO BE VIDEO CAMERA INSPECTED FOR ADEQUACY

⑦ EXISTING SEWER LATERAL CLEANOUT TO REMAIN PROTECT IN PLACE

⑧ DISCHARGE LOCATION FOR RUNOFF TO BE CONVEYED THROUGH LANDSCAPING FOR TREATMENT

⑨ PROPOSED SECOND FLOOR DECK ABOVE FIRST FLOOR MOTOR COURT

⑩ PROPOSED 10' SIDEWALK TRANSITION PER ADA REQUIREMENTS (TYP.)

⑪ VISIBILITY TRIANGLE - NO OBSTRUCTIONS INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3' IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT-OF-WAY THAT IS LOCATED WITHIN VISIBILITY AREAS SHALL NOT EXCEED 24" IN HEIGHT, MEASURED FROM THE TOP OF THE ADJACENT CURB.

⑫ 3636 CATCH BASIN

⑬ 2424 CATCH BASIN

⑭ CURB OUTLET PER D-25 (MODIFIED)
Q100=1.04 CFS V100= 2.8 FPS
EMRA REQUIRED

⑮ STEPPED GARDEN - DRAINAGE AND IRRIGATION BY SEPARATE LANDSCPAE PLAN (TYP.)

⑯ 1.5'X1.5'X1' LIGHT CLASS RIPRAP

⑰ CONNECTION POINT TO PLANTER DRAINAGE SYSTEM - CONVEYS TO RUNOFF TO STREET

⑱ 1212 CATCH BASIN

⑲ EXISTING LANDSCAPING/IRRIGATION IN RIGHT OF WAY EMRA REQUIRED IF EXCEEDS 24" IN HEIGHT

⑳ PERMEABLE WALKING PATH BY SEPARATE LANDSCAPE PLAN

㉑ PERMEABLE DECK/ VIEWING AREA BY SEPARATE LANDSCAPE PLAN

COASTAL DEVELOPMENT PERMIT NO. 579283

LEGAL DESCRIPTION

LOT 7 OF LA JOLLA COUNTRY CLUB KNOLLS, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 4039, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY ON DECEMBER 19, 1958

NOTES

1. THE SOURCE OF THE TOPOGRAPHIC INFORMATION SHOWN HEREON IS A SURVEY BY ALTA SURVEYING, INC, DATED JULY 27, 2017
2. THE PROPOSED USE OF THESE LOTS IS FOR A RESIDENTIAL SINGLE-FAMILY RESIDENCE
3. THE SUBJECT PROPERTY TO BE SERVED BY CITY OF SAN DIEGO SANITARY SEWER AND WATER MAINS.
4. DEVELOPER SHALL PROVIDE BUILDING ADDRESS NUMBERS, VISIBLE AND LEGIBLE FROM THE STREET FRONTING THE PROPERTY PER FHPS POLICY P-00-6 (UFC 901.4.4)
5. THE DEVELOPMENT PROPOSES TO PROVIDE 3 ADDITIONAL OFF STREET PARKING SPACES.
6. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
7. AN ENCROACHMENT MAINTENANCE AND REMOVAL AGREEMENT WILL BE REQUIRED FOR PRIVATE IMPROVEMENTS WITHIN EXISTING AND PROPOSED EASEMENTS, INCLUDING PRIVATE WALKWAYS AND LANDSCAPING CONNECTIONS (IF APPLICABLE)
8. THE ASSESOR PARCEL NUMBER IS: 352-201-10-00
9. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL SUBMIT A WATER POLLUTION CONTROL PLAN (WPCP). THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH THE GUIDELINES IN PART 2 CONSTRUCTION BMP STANDARDS CHAPTER 4 OF THE CITY'S STORM WATER STANDARDS.
10. PER SAN DIEGO MUNICIPAL CODE SECTION 144.0240(b)(3), THIS PROJECT IS A SINGLE-FAMILY SUBDIVISION OF FOUR LOTS OR LESS AND THEREFORE IS EXEMPT FROM THE REQUIREMENT TO UNDERGROUND THE OVERHEAD UTILITY FACILITIES IN THE ALLEY RIGHT-OF-WAY.
11. SITE RUNOFF SHALL BE TREATED BY RUNNING OVER LANDSCAPING BEFORE LEAVING THE SITE.
12. ALL ONSITE WALLS ARE SHOWN FOR INFORMATION ONLY AND BY SEPARATE PERMIT
13. THE BENCHMARK USED FOR THIS SURVEY IS THE BC MONUMENT AT THE CENTERLINE OF FAIRWAY ROAD 1000 FEET SOUTHERLY OF COUNTRY CLUB DRIVE BLVD. AS PUBLISHED IN THE CITY OF SAN DIEGO VERTICAL CONTROL BENCHBOOK, OCT 2011.
    ELEVATION: 384.96
    DATUM: MSL
14. AN ENCROACHMENT MAINTENANCE AND REMOVAL AGREEMENT SHALL BE REQUIRED FOR LANDSCAPING IN THE RIGHT OF WAY

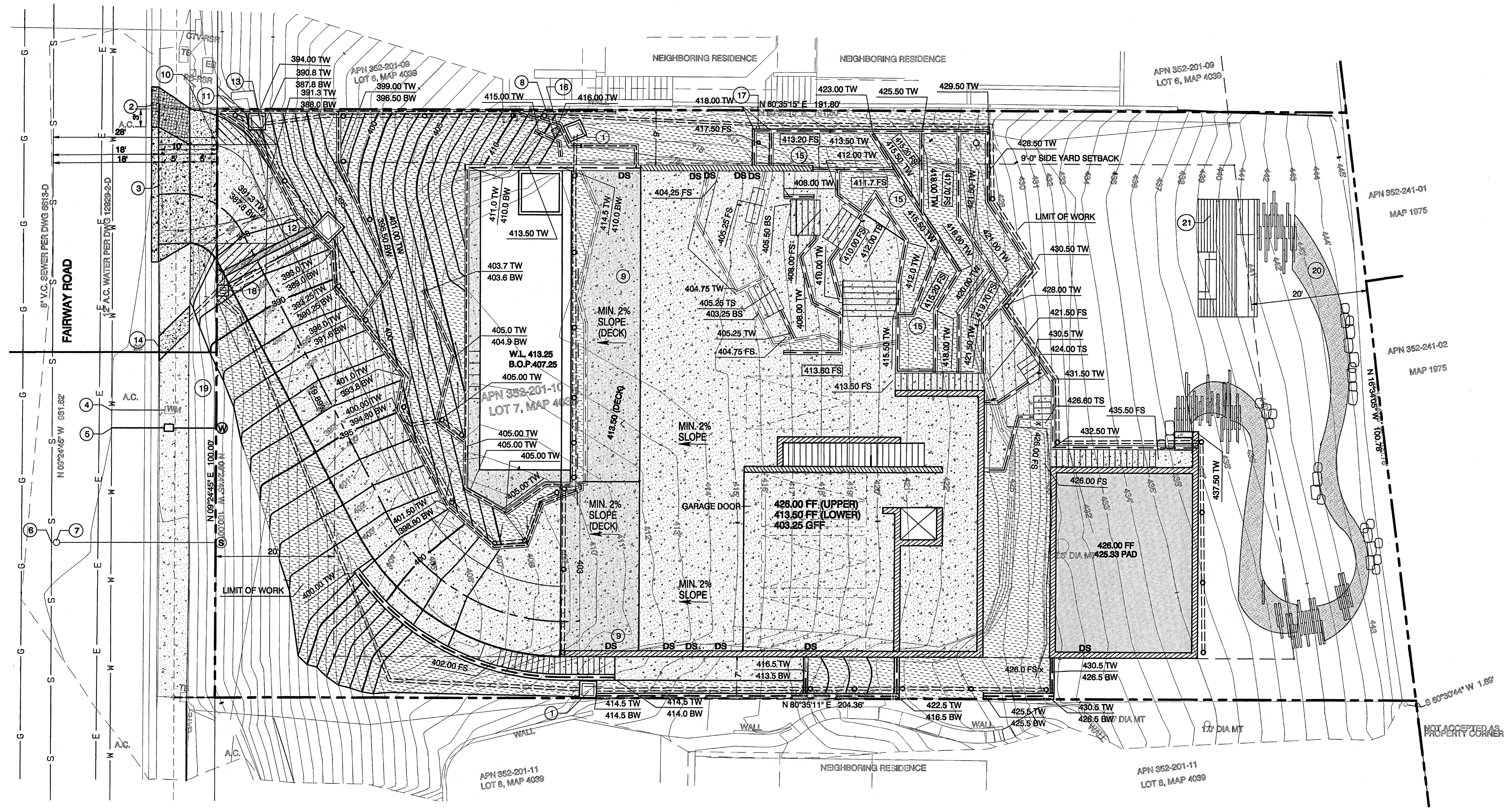
GRADING DATA

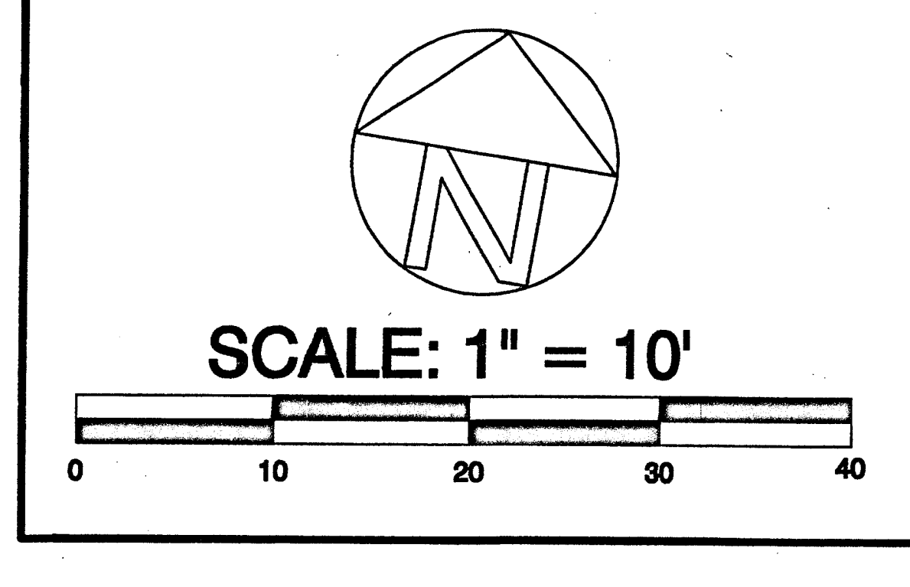
AREA OF SITE - 19,808 S.F.
AREA OF SITE TO BE GRADED - 14150 SF
PERCENT OF SITE TO BE GRADED - 71.4%
AREA OF SITE WITH NATURAL SLOPES GREATER THEN 25% - 0 SF
PERCENT OF SITE WITH NATURAL SLOPES GREATER THEN 25% - 0%
AMOUNT OF CUT - 3,630 CY
AMOUNT OF FILL - 20 CY
AMOUNT OF EXPORT - 3,610 CY
MAXIMUM HEIGHT OF FILL - 6' (WITHIN OR OUTSIDE BUILDING FOOTPRINT)
MAXIMUM DEPTH OF CUT - 22' (WITHIN BUILDING FOOTPRINT)
MAXIMUM DEPTH OF CUT - 11' (OUTSIDE BUILDING FOOTPRINT)

NOTE: EARTHWORK CALCULATIONS ARE APPROXIMATE

IMPERVIOUS AREA:
EXISTING IMPERVIOIUS AREA = 0 SF
TOTAL PROPOSED IMPERVIOUS AREA = 8756 SF

NOTE: FOR SECTION VIEWS SHOWING MAX CUTS, FILLS
& RETAINING WALL INSIDE SETBACK HEIGHTS
SEE SHEET C-4





SCALE: 1" = 10'

ANTONY K. CHRISTENSEN, RCE 54021

MARCH 22, 2018
Date

No. 54021
Exp. 12-31-19

Prepared By:

CHRISTENSEN ENGINEERING & SURVEYING
7888 SILVERTON AVENUE, SUITE "J"
SAN DIEGO, CA 92126
PHONE (858)271-9901 FAX (858)271-8912

Project Address:
7247 FAIRWAY ROAD
LA JOLLA, CA 92037

Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Project Name:
7247 FAIRWAY ROAD

Original Date: OCTOBER 10, 2017

Sheet Title:

Sheet

PRELIMINARY GRADING PLAN

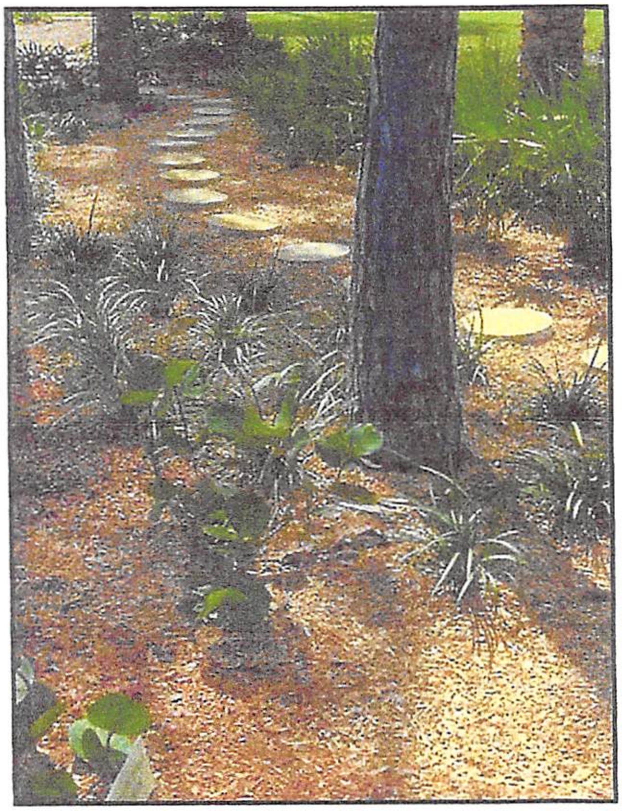
C-3

A2017-88

ATTACHMENT C

BMP DATA SHEETS

Site Design & Landscape Planning SD-10



Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

☑ Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation SD-12

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

ATTACHMENT D

STORM WATER REQUIREMENTS APPLICABILITY CHECKLIST

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
October 2016

Project Address: 7247 Fairway Road

Project Number *(for City Use Only)*: 579283

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

☐ Yes; SWPPP required, skip questions 2-4 ☒ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

☒ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

☐ Yes; WPCP required, skip 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☐ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

☒ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B **does not apply and no document is required. Continue to Section 2.**

---

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed.

2. ☐ **High Priority**
   a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☒ **Low Priority**
   a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? ☐ Yes ☒ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? ☐ Yes ☒ No

3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). ☐ Yes ☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

- **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
- **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
- **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☒ No
5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ☐ Yes ☒ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ☐ Yes ☒ No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☒ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS.** ☐

2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☒

3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐

4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☐

Joy Christensen
Name of Owner or Agent *(Please Print)*

Assistant Engineer
Title

Joy D. Christensen
Signature

10/13/2017
Date

Preliminary Drainage Study

Lot 7 of La Jolla Country Club Knolls,
Map No. 4039,
7247 Fairway Road
La Jolla, California 92037

Prepared for:
Yang Wang
141 Des Voeus Road Central, Suite 705-706
Hong Kong, China

Prepared by:
Christensen Engineering & Surveying
7888 Silverton Avenue, Suite “J”
San Diego, CA 92126
(858) 271-9901

October 12, 2017

Introduction

This project involves the construction of a new single-family residence on an existing vacant lot. The site has been previously graded. Additional improvements include a driveway, pool, retaining walls, curb outlet and a companion unit.

The attached drainage area maps are from a topographic survey by ALTA Surveying, Inc. dated July 27, 2017. Prior to development all site runoff flows westerly onto Fairway Road then southerly into a public storm drain inlet located within Fairway Road. Following construction all onsite runoff will continue to be conveyed onto Fairway Road. Since there is an increase in total site imperviousness (0%) prior to construction and (45.2%) following construction, a slight increase in runoff (0.21 cfs) is expected to leave the site (1.09 cfs – 0.88 cfs). No runoff flows over neighboring properties following construction. There will be a slight but insignificant increase in runoff from the site. There will be no adverse effect on public storm drain system from this small increase in total runoff.

The runoff is conveyed to the City of San Diego storm drain system located in Fairway Road and then conveyed to the Pacific Ocean.

Section 404 of CWA regulates the discharge of dredged or fill material into waters of the United States. Section 404 is regulated by the Army Corps of Engineers. Section 401 of CWA requires that the State provide certification that any activity authorized under Section 404 is in compliance with effluent limits, the state’s water quality standards, and any other appropriate requirements of state law. Section 401 is administered by the State Regional Water Quality Control Board. The project does not require a Federal CWA Section 404 permit nor Section 401 Certification because it does not cause dredging or filling in waters of the United States and is in compliance with the State Water Quality Standards.
The Rational Method was used to calculate the anticipated flow for the 100-year storm return frequency event using the method outlined in the City of San Diego Drainage Design Manual.

______________________________	10-12-17
Antony K. Christensen	Date

RCE 54021
Exp. 12-31-17
JN A2015-24

Calculations

1. *Intensity Calculation*

(From the City of San Diego Drainage Design Manual)
Tc = Time of concentration

$$= \frac{1.8(1.1-C)\text{Dist.}^{1/2}}{(\quad S^{1/3} \quad)}$$

Since the slope over the area with the greatest elevation change (445’-390’) is (55’/216’) 25.5% over the area of the site to be developed and the distance traveled is 216 feet and the runoff coefficients are 0.45 (pre-construction) and 0.55 (post-construction).

Tc (pre-construction) = 5.8 minutes.

Tc (post-construction) = 4.9 minutes.

From the Intensity Duration Curve on page 83

I_{100} (pre-construction)= 4.3 inches

I_{100} (post-construction)= 4.4 inches

Since the design elevation is less then 1500’ there is no correction factor for elevation.

2. *Coefficient Determination*

From the City of San Diego Drainage Design Manual

Pre-Construction (Natural) C = 0.45

Post Construction (Single-Family Residential) C = 0.55

3. *Volume calculations*

Q = CIA

Areas of Drainage

The total area of the site to be developed is evaluated for pre-construction versus post-construction due to the Pre-Construction condition.

Pre-Construction

Area draining westerly to Fairway Road (C = 0.45)	A = 0.455 Acres

Post-Construction

Area draining curb outlet (C = 0.55)	X = 0.429 Acres
Area Fairway Road (C = 0.55)	Y = 0.006 Acres
Area unaffected by project (C=0.45)	Z = 0.020 Acres

Pre-Construction

Q_{100A} = (0.45) (4.3) (0.455)

Q_{100A} = 0.88 cfs

Post-Construction

Q_{100X} = (0.55) (4.4) (0.429)
Q_{100Y} = (0.55) (4.4) (0.006)
Q_{100Z} = (0.45) (4.4) (0.020)

Q_{100X} = 1.04 cfs
Q_{100Y} = 0.01 cfs
Q_{100Z} = 0.04 cfs

Total Runoff

Pre-construction: 0.88 cfs
Post-construction: 1.09 cfs (increase of 0.21 cfs)

4. Discussion

Prior to development all site runoff flows westerly to Fairway Road. Following construction all onsite runoff will continue to be conveyed onto Fairway Road then flow southerly to a public curb inlet located within Fairway Road. Since there is an increase in total site imperviousness, a slight increase in runoff (0.21 cfs) is expected to leave the site. No runoff flows over neighboring properties. There will be a slight but insignificant increase in runoff from the site. There will be no adverse effect on public storm drain system from this small increase in total runoff.

```
Type of conveyance is a: D-25 CURB OUTLET
Depth of channel equals .25 Feet
Bottom Width Equals 3
Side slope equals 1
Slope of conveyance equals 1.5 %
Roughness equals .015
Flow quantity equals 1.044424 CFS
Area equals .3711612 Square Feet
Velocity equals 2.802017 FPS
Depth of flow equals .1190001 Feet
```

APPENDIX

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi–Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:

(1) Type D soil to be used for all areas.

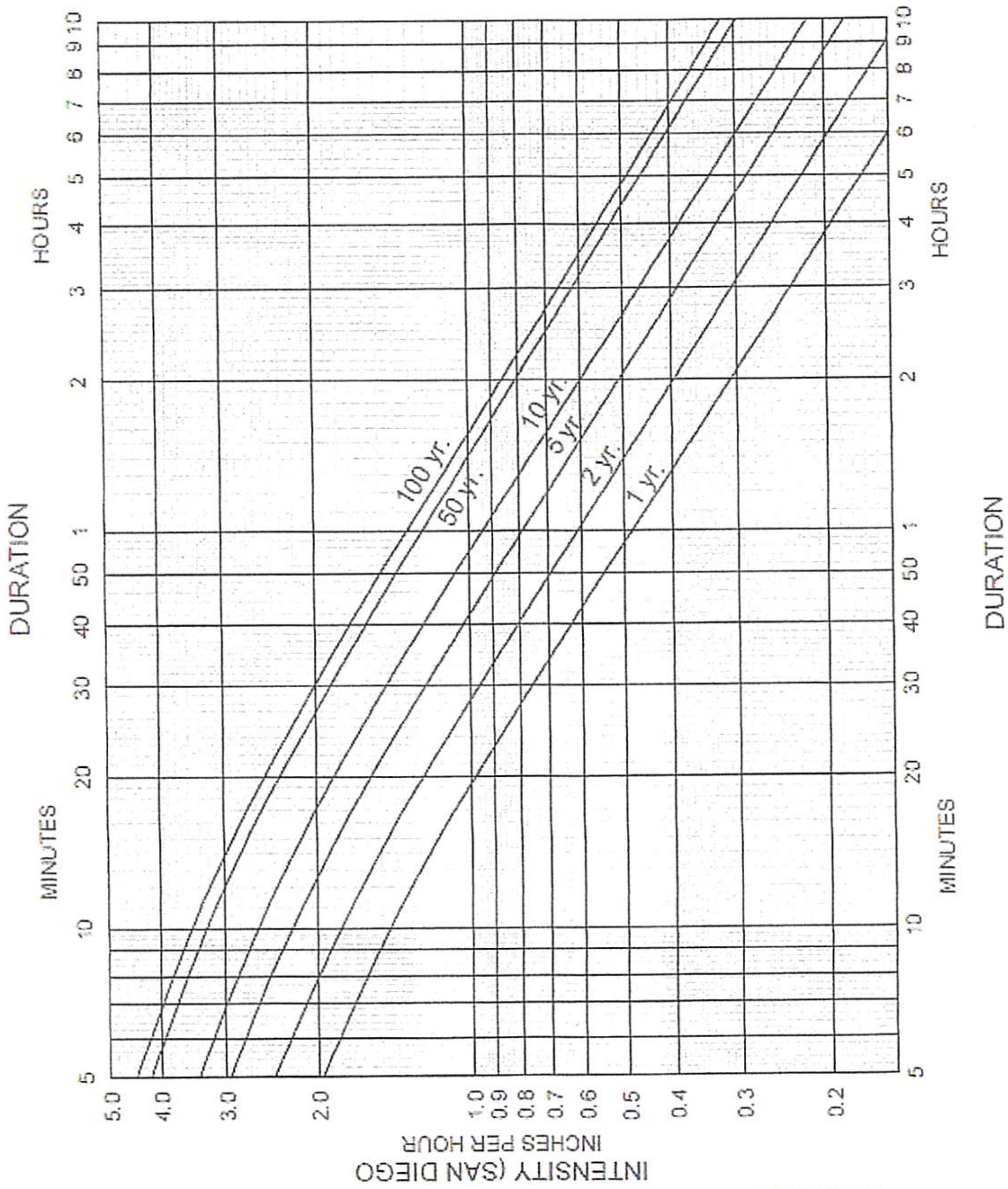
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_c for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_c calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



RAINFALL

INTENSITY - DURATION - FREQUENCY
CURVES

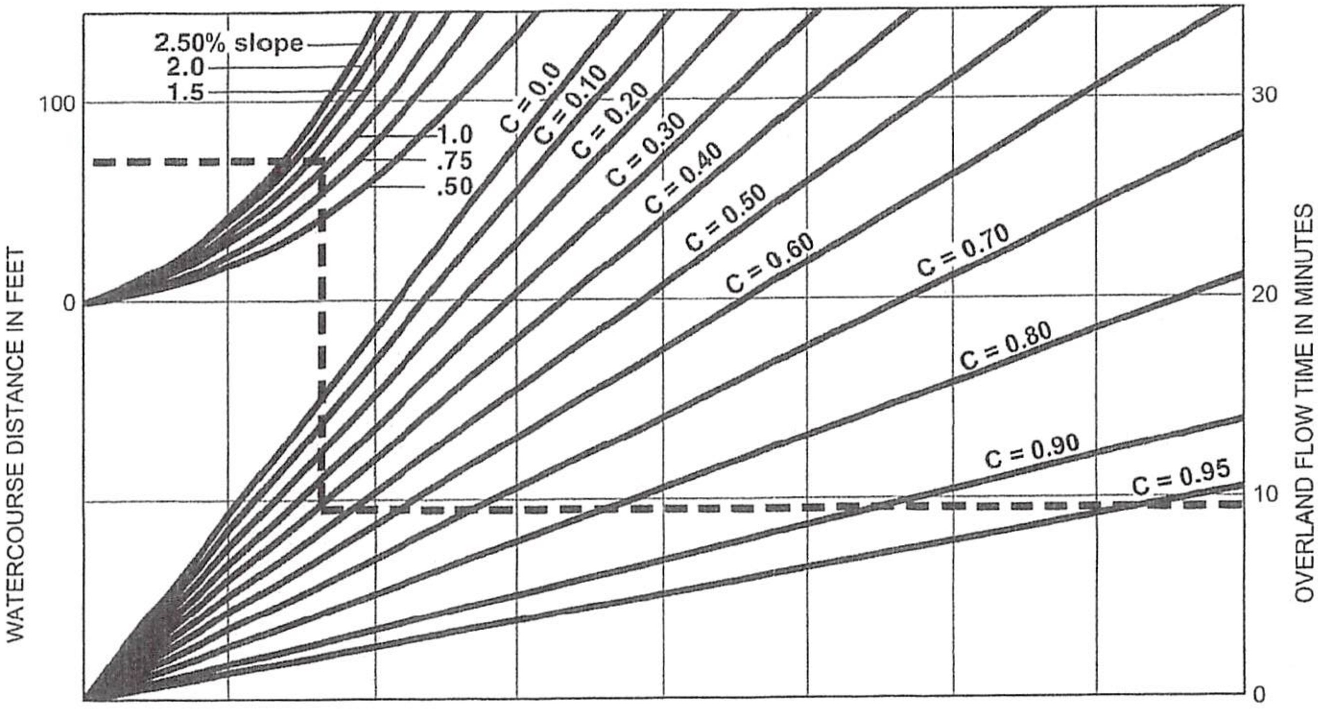
FOR

COUNTY OF SAN DIEGO

ELEV.	FACTOR
0-1500	1.00
1500-3000	1.25
3000-4000	1.42
4000-5000	1.60
5000-6000	1.7
DESERT	1.25

TO OBTAIN CORRECT INTENSITY, MULTIPLY INTENSITY ON CHART BY FACTOR FOR DESIGN ELEVATION.

Figure A-1. Intensity-Duration-Frequency Design Chart



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\,\sqrt{D}}{\sqrt[3]{s}}$$

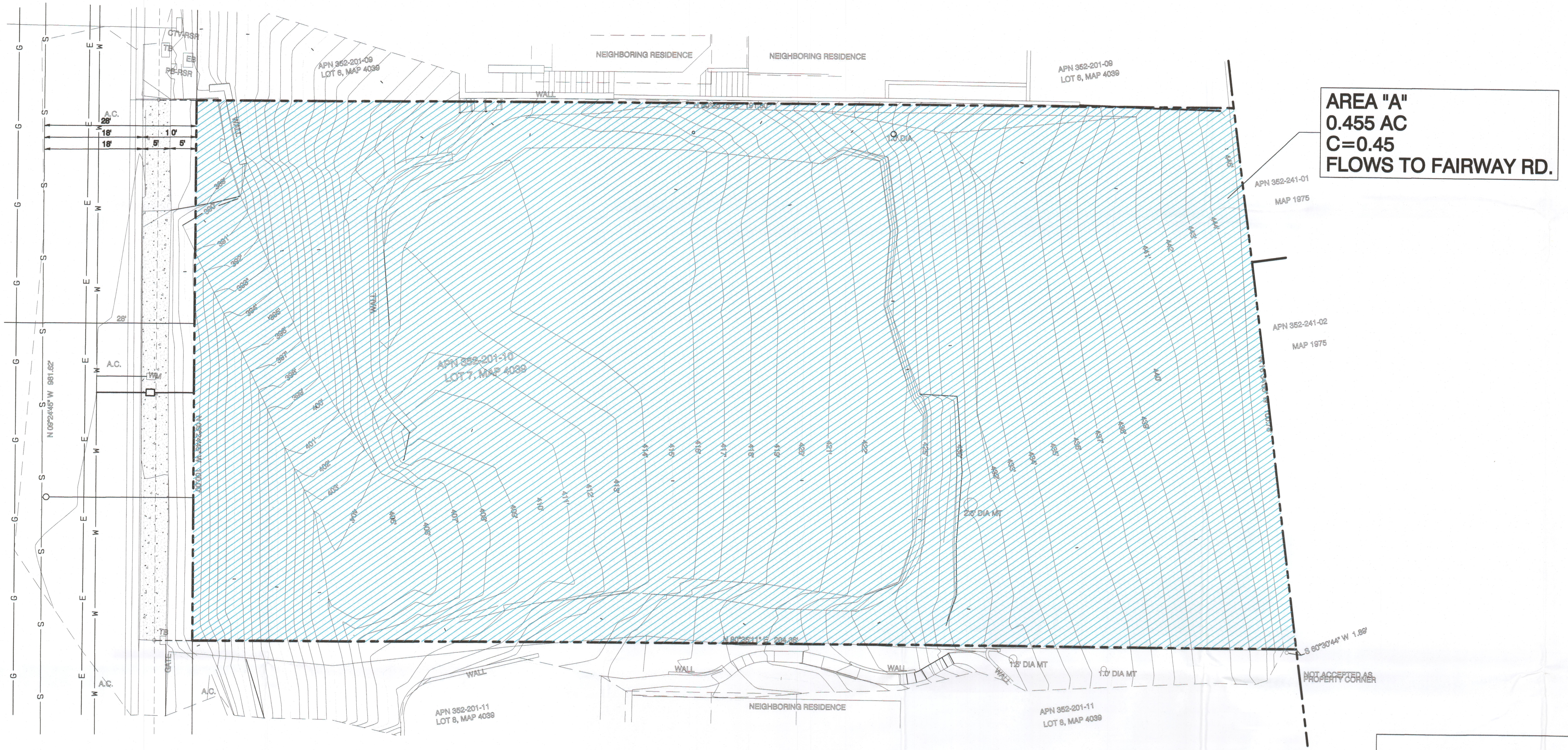
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Figure A-4. Rational Formula – Overland Time of Flow Nomograph

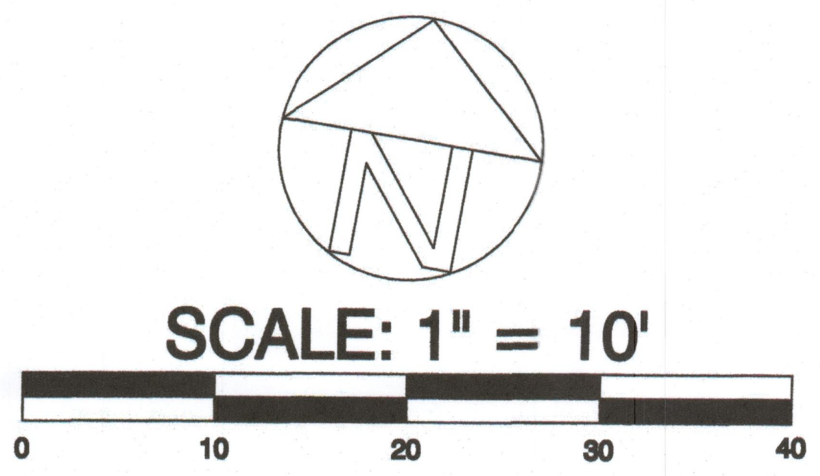
Note: Use formula for watercourse distances in excess of 100 feet.

DRAINAGE AREA MAPS

PRE-DEVELOPMENT DRAINAGE AREA MAP



AREA "A"
0.455 AC
C=0.45
FLOWS TO FAIRWAY RD.



OCTOBER 12, 2017

ANTONY K. CHRISTENSEN, RCE 54021

Date

No. 54021
Exp. 12-31-17

Prepared By:

CHRISTENSEN ENGINEERING & SURVEYING
7888 SILVERTON AVENUE, SUITE 'J'
SAN DIEGO, CA 92126
PHONE (858)271-9901

Project Address:

7247 FAIRWAY ROAD
LA JOLLA, CA 92037

Revision 5:

Revision 4:

Revision 3:

Revision 2:

Revision 1:

Project Name:

7247 FAIRWAY ROAD

Original Date: SEPTEMBER 10, 2017

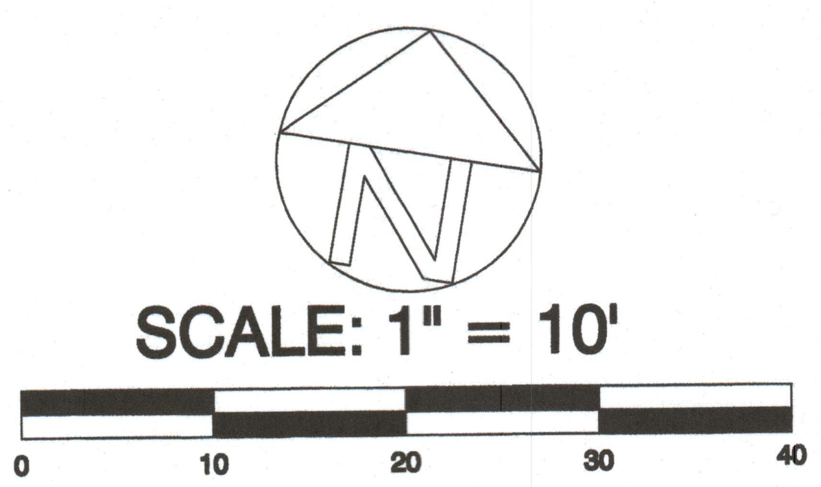
Sheet Title:

Sheet

PRE CONSTRUCTION DRAINAGE AREA MAP

JN A2017-88

POST-DEVELOPMENT DRAINAGE AREA MAP



REGISTERED PROFESSIONAL ENGINEER
Antony K. Christensen
No. 54021
Exp. 12-31-19
CIVIL
STATE OF CALIFORNIA

OCTOBER 12, 2017

ANTONY K. CHRISTENSEN, RCE 54021 Date

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LA JOLLA, CA 92037

Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Project Name:

7247 FAIRWAY ROAD

Original Date: SEPTEMBER 10, 2017

Sheet Title:

Sheet

POST CONSTRUCTION DRAINAGE AREA MAP

JN A2017-88

UPDATE REPORT OF GEOTECHNICAL INVESTIGATION

Wang Residential Project
7247 Fairway Road
La Jolla, California

JOB NO. 96-6938
04 October 2017

Prepared for:

Mr. Yang Wang

Geotechnical Exploration, Inc.
SOIL AND FOUNDATION ENGINEERING ● GROUNDWATER ● ENGINEERING GEOLOGY

04 October 2017

Mr. Yang Wang
C/o ESTUDIO FRISCH, INC.
3754 Ruette San Raphael
San Diego, CA 92130
Attn: Mr. Eduardo Frischwasser

Job No. 96-6938

Subject: **Update Report of Geotechnical Investigation and Geologic Reconnaissance**
Proposed Wang Residence
7247 Fairway Road
La Jolla, California

Dear Mr. Wang:

In accordance with your request and our proposal dated July 27, 2017, ***Geotechnical Exploration, Inc.*** has prepared this update report of geotechnical investigation of the soil and geologic conditions at the subject site. A geologic reconnaissance of the site was also performed per the requirements of the City of San Diego.

This report is an update of several reports prepared by this firm for the property located at 7247 Fairway Road including a "*Report of Geotechnical Investigation*," dated June 26, 1997, and three subsequent update reports dated February 21, 2001, May 28, 2003 and November 17, 2008.

In our opinion, if the conclusions and recommendations presented in this report are implemented during site preparation for the currently planned project, the site will be suited for the proposed residential structure and improvements. Recommendations presented in this report supersede all previously issued recommendations.

This opportunity to be of service is sincerely appreciated. Should you have any questions concerning the following report, please do not hesitate to contact us. Reference to our **Job No. 96-6938** will expedite a response to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

Jaime A. Cerros, P.E.
R.C.E. 34422/G.E. 2007
Senior Geotechnical Engineer

Leslie D. Reed, President
C.E.G. 999[exp. 3-31-19]/R.G. 3391

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REFERENCES

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UPDATE REPORT OF GEOTECHNICAL INVESTIGATION

Proposed Wang Residence
7247 Fairway Road
La Jolla, California

JOB NO. 96-6938

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

I. PROJECT DESCRIPTION

It is our understanding, based on communications with your architect, Mr. Eduardo Frischwasser of Estudio Frischwasser, Inc., as well as a review of preliminary plans and elevations provided by him, that it is planned to construct a new, two-story single-family residence over a basement garage, a two-story detached guest house, swimming pool and associated improvements. The structures will be of standard building materials utilizing conventional foundations with a concrete slab-on-grade garage floor. Construction plans have not been provided to us during the preparation of this report, however, when completed they should be made available for our review.

As part of this update report preparation, we reviewed our previously issued geotechnical report (dated June 26, 1997) for the property located at 7247 Fairway Road, as well as three subsequent update reports (dated February 21, 2001, May 28, 2003 and November 17, 2008). Where applicable, the figures and excavation logs from the original 1997 report have been included. In addition, we performed slope stability calculations as applicable to the new project.

The scope of work performed is briefly outlined as follows:

1. Review the identification and classification of the surface and subsurface soils in the area of the proposed construction, in conformance with the Unified Soil Classification System.

2. Make note of any landslides, faults or significant geologic features that may affect the development of the site.

3. Recommend site soil preparation procedures.

4. Recommend the allowable bearing pressures for the existing hard/dense natural soils and properly compacted fills.

5. Evaluate the settlement potential of the existing formational soils or proposed properly compacted fills under the new structural loads.

6. Recommend preliminary foundation design information, including active and passive earth pressures to be utilized in design of foundation and retaining structures.

II. EXECUTIVE SUMMARY

Our previous subsurface investigation revealed that the site (7247 Fairway Road, Lot 7) is underlain by firm to hard (medium dense to very dense) formational materials of the Tertiary-age Ardath Formation (Ta) overlain in some areas by loose to medium dense fill and topsoil to depths ranging from 1 to 13 feet. The upper few feet of the formational soils were noted to be weathered and highly fractured in the large diameter boring, B-5.

In their condition as revealed in the exploratory excavations, the fill soils, topsoils, residual soils and weathered formational soils will not provide a stable soil base for the proposed new structure and improvements. We do not expect the site soils to vary significantly in 2017 with respect to the variable density condition of the surficial fill, topsoils and weathered formational materials as described in 1996. Formational soils are anticipated to have remained in their primarily stiff to hard/medium dense to dense condition. Moisture content may have varied since original exploration.

It is our understanding that a basement garage is proposed under the footprint of the new residence. As such, most of the loose surficial soils and weathered formational materials should be removed during the excavation process, significantly reducing the quantity of soil removal and recompaction in the new building pad area. It is recommended that any loose or soft fill soils remaining after the below-grade excavation subgrade is achieved be removed and recompacted as part of site preparation prior to the addition of any new fill or structural improvements. Structure and property line retaining walls must be properly designed to accommodate the existing soil conditions.

All foundations for the proposed structure should be founded into the underlying dense (hard) formational materials or properly compacted fill soils. In proposed secondary improvement areas, all existing fill soils and topsoils will require removal and recompaction prior to placement of new fill or improvements.

III. DOCUMENT REVIEW

The following documents were reviewed for the preparation of this report:

7247 Fairway Road (Lot 7)

1. *Report of Soil Investigation and Geologic Reconnaissance, Proposed Residential Addition, 7247 Fairway Road, La Jolla, California*, prepared by Geotechnical Exploration, Inc., dated May 7, 1997 (GEI Job No. 96-6938).

2. *Report of Geotechnical Investigation, Proposed Residential Development, 7247 Fairway Road, La Jolla, California*, prepared by Geotechnical Exploration, Inc., dated June 26, 1997 (GEI Job No. 96-6938).

3. *Report of Geotechnical Investigation -- Update, Proposed Residential Development, 7247 Fairway Road, La Jolla, California*, prepared by Geotechnical Exploration, Inc., dated February 21, 2001 (GEI Job No. 96-6938).

4. *Response to City of San Diego Geotechnical Review, Proposed Fairway Residence, 7247 Fairway Road, La Jolla, California, W.O. #410168*, prepared by Geotechnical Exploration, Inc., dated September 18, 2001 (GEI Job No. 96-6938).

5. *Report of Geotechnical Investigation, Proposed Residential Development, 7247 Fairway Road, La Jolla, California*, prepared by Geotechnical Exploration, Inc., dated June 26, 1997 (GEI Job No. 96-6938).

6. *Report of Geotechnical Investigation -- Update, Proposed Residential Development, 7247 Fairway Road, La Jolla, California*, prepared by Geotechnical Exploration, Inc., dated May 28, 2003 (GEI Job No. 96-6938).

IV. SITE DESCRIPTION

The lot is addressed as 7247 Fairway Road and is known as Assessor's Parcel No. 352-201-10-00, Lot 7 of La Jolla Country Club Knolls, according to Map No. 4039, in the City and County of San Diego, State of California. Refer to Figure No. I.

The subject site, consisting of approximately 0.5 acre, is a generally rectangular-shaped lot located on the east side of Fairway Road, in the La Jolla area of the City of San Diego. It has previously been graded and supports a relatively level building pad accessed by an unpaved driveway from Fairway Road to the west. The site is bordered on the north and south by similar residential properties at similar elevations, to the east by an approximately 30-foot-high, ascending hillside with similar residential properties at the slope top, and to the west by an approximately 25- to 30-foot-high, descending fill-over-cut slope that abuts Fairway Road at its downslope terminus.

Structures currently existing on the property include concrete and masonry block remnants of a previously existing house foundation. Vegetation on the lot consists of some ground cover, some shrubs on the eastern slope and dry grass.

Approximate elevations across the site range from a high of 445 feet above mean sea level (MSL) at the southeast property corner to a low of 390 feet above MSL at the southwest property corner. The 20- to 25-foot-high, west-facing eastern slope ascends from the building pad and has a gradient ranging from 1.5:1.0 to 3.5:1.0 (horizontal to vertical). The front yard/western slope descends approximately 20 to 25 feet at a 1.5:1.0 (h:v) gradient down to Fairway Road from the building pad. The attached Figure No. IIa is a plan that reflects the existing undeveloped conditions and Figure No. IIb depicts the proposed project on the lot.

Information concerning elevations across the site was obtained from a preliminary grading plan with topographic information provided by Alta Land Surveying, dated June 27, 2017.

V. FIELD INVESTIGATION

A field investigation was conducted on the subject Lot 7 by this firm in 1996. (At that time a residential structure existed on the lot. That structure has been removed.) Four auger borings and four hand-excavated test pits were placed on the site in areas where the new structure and improvements were to be located and where access allowed. In addition, one 30-inch-diameter bucket-auger boring was placed in the driveway area to evaluate by direct observations whether an ancient landslide exists beneath the site. Downhole logging was performed in the large-diameter boring to a depth of 71 feet. The borings and hand-excavated pits were logged by our field representative, and samples were taken of the predominant soils throughout the field operation. Boring and pit logs were prepared on the basis of our observations and the results have been summarized on Figure No. III. The predominant soils have been classified in general conformance with the Unified Soil Classification System.

VI. FIELD AND LABORATORY TESTS AND SOIL INFORMATION

A. Field Tests

Relatively undisturbed samples were obtained by driving a 3-inch outside-diameter (O.D.) by 2-3/8-inch inside-diameter (I.D.) split-tube sampler a distance of 12 inches. Standard Penetration Tests were also performed by using a 140-pound weight falling 30 inches to drive a 2-inch O.D. by 1-3/8-inch I.D. sampler tube a distance of 18 inches. The number of blows required to drive the sampler the last 12 inches was recorded for use in evaluation of the soil consistency. The following chart provides an in-house correlation between the number of blows and the consistency of the soil for the Standard Penetration Test and the 3-inch sampler.

SOIL	***DENSITY DESIGNATION***	***2-INCH O.D. SAMPLER BLOWS/FOOT***	***3-INCH O.D. SAMPLER BLOWS/FOOT***
Sand and Non-plastic Silt	Very loose	0-4	0-7
	Loose	5-10	8-20
	Medium	11-30	21-53
	Dense	31-50	54-98
	Very Dense	Over 50	Over 98

Soil	***Density Designation***	***2-inch O.D. Sampler Blows/Foot***	***3-inch O.D. Sampler Blows/Foot***
Clay and Plastic Silt	Very soft	0-2	0-2
	Soft	3-4	3-4
	Firm	5-8	5-9
	Stiff	9-15	10-18
	Very Stiff	15-30	19-45
	Hard	31-60	46-90
	Very Hard	Over 60	Over 90

B. <u>Laboratory Tests</u>

Laboratory tests were performed in 1996 on soil samples retrieved during our initial subsurface investigation in order to evaluate their physical and mechanical properties and their ability to support the proposed structure and improvements. Test results are presented on Figure Nos. III and IV. The following tests were conducted in 1996 on the sampled soils:

1. Moisture Content (ASTM D2216-92)
2. Moisture/Density Relations (ASTM D1557-91, Method A)
3. Standard Penetration Test and Split Barrel Sampling (ASTM D1586-92 and D1587-84)
4. Expansion Test (UBC Test Method)
5. Atterberg Limits (ASTM D4318-84)
6. Direct Shear Test (ASTM D3080-72)

The moisture content (ASTM D2216) of a soil sample is a measure of the water content, expressed as a percentage of the dry weight of the sample.

Laboratory compaction values (ASTM D1557) establish the Optimum Moisture content and the laboratory Maximum Dry Density of the tested soils. The relationship between the moisture and density of remolded soil samples gives qualitative information regarding existing fill compaction and soil compaction conditions to be anticipated during any future grading operation.

The expansion potential of the on-site fill soils was determined utilizing the Uniform Building Code Test Method for Expansive Soils (UBC Standard No. 29-2). In accordance with the UBC test, potentially expansive soils are classified as follows:

Expansion Index	***Expansion Potential***
0 to 20	Very low
21 to 50	Low
51 to 90	Medium
91 to 130	High
Above 130	Very high

According to the UBC Test Method for Expansive Soils, the sampled fill soils on the site have a very high expansion potential, with a tested maximum Expansion Index of 149.

The Atterberg Limits test analysis (ASTM D4318) helps to more precisely classify the tested soils and to determine qualitative engineering characteristics such as expansion potential, permeability and shear strength.

Direct Shear Tests (ASTM D3080-72) were performed on relatively undisturbed remolded fill soil samples in order to evaluate their strength characteristics. The shear tests were performed with a constant strain rate direct shear machine. The specimens tested were saturated and then sheared under various normal loads under drained conditions at a rate of 0.024 mm/min. Direct shear test results of the formational soils were discussed in a cycle issue response letter for the site on September 18, 2001. The lowest peak strength values yielded friction angles of 28 and 22 degrees and cohesion values of 700 and 900 psf, respectively.

Based on the laboratory test data, our observations of the primary soil types, and our previous experience with laboratory testing of similar soils, our Geotechnical Engineer has assigned values for the angle of internal friction and cohesion to those soils that will provide significant lateral support or load bearing on the project. These values have been utilized in assigning the recommended bearing value as well as active and passive earth pressure design criteria for foundations and retaining walls. Encountered fill material in hand-dug pit HP-1 yielded an apparent friction angle of 13 degrees and cohesion of 1250 psf. Formational soil strength values of 13 degrees for friction angle and a cohesion 700 psf were used in our calculations. For the fill soil strength values a friction angle of 20 degrees and cohesion of 200 psf were used.

VII. REGIONAL GEOLOGIC DESCRIPTION

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

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

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

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

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

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

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

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

On Easter Sunday, April 4, 2010, a large earthquake occurred in Baja California, Mexico. It was widely felt throughout the U.S. southwest including Phoenix, Arizona and San Diego in California. It significantly affected Mexicali, Mexico. This M7.2 event, the Sierra El Mayor earthquake, occurred in northern Baja California, approximately 40 miles south of the Mexico-USA border at relatively shallow depth along the principal plate boundary between the North American and Pacific plates.

According to the U. S. Geological Survey this is an area with a high level of historical seismicity, and it has recently also been seismically active, though this is the largest event to strike in this area since 1892. The April 4, 2010, earthquake appears to have been larger than the M6.9 earthquake in 1940 or any of the early 20th century events (e.g., 1915 and 1934) in this region of northern Baja California. The event caused widespread damage to structures, closure of businesses, government offices and schools, power outages, displacement of people from their homes and injuries in the nearby major metropolitan areas of Mexicali in Mexico and Calexico in southern California. Estimates of the cost of the damage range to over $100 million.

This event's aftershock zone extended significantly to the northwest, overlapping with the portion of the fault system that is thought to have ruptured in 1892. Some structures in the San Diego area experienced minor damage and there were some injuries. Ground motions for the April 4, 2010, main event, recorded at stations in San Diego and reported by the California Strong Motion Instrumentation Program (CSMIP), ranged up to 0.058g. Aftershocks from this event continue to the date of this report along the trend northwest and southeast of the original event, including within San Diego County, closer to the San Diego metropolitan area. There have been hundreds of these earthquakes including events up to M5.7.

On July 7, 2010, a M5.4 earthquake occurred in Southern California at 4:53 pm (Pacific Time) about 30 miles south of Palm Springs, 25 miles southwest of Indio, and 13 miles north-northwest of Borrego Springs. The earthquake occurred near the Coyote Creek segment of the San Jacinto Fault. The earthquake exhibited sideways horizontal motion to the northwest, consistent with slip on the San Jacinto Fault. The earthquake was felt throughout Southern California, with strong shaking near the epicenter. It was followed by more than 60 aftershocks of M1.3 and greater during the first hour. Seismologists expect continued aftershock activity.

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

In California, major earthquakes can generally be correlated with movement on active faults. As defined by the California Division of Mines and Geology (Hart, E.W., 1980), an *"active"* fault is one that has had ground surface displacement within Holocene time (about the last 11,000 years). Additionally, faults along which major historical earthquakes have occurred (about the last 210 years in California) are also considered to be active (Association of Engineering Geologist, 1973). The California Division of Mines and Geology defines a *"potentially active"* fault as one that has had ground surface displacement during Quaternary time, that is, during the past 2.6 million years (Hart, E.W., 1980).

VIII. SITE-SPECIFIC GEOLOGIC DESCRIPTION

A. Stratigraphy

Our investigation and review of pertinent geologic maps and reports indicate that the site is underlain by firm to stiff/medium dense to very dense formational material of the Eocene-age Ardath Shale. The encountered soil profile generally consists of a veneer of fill and topsoil directly underlain by formational material. Some deeper fill and topsoils (up to 6 to 10 feet in depth) were encountered in the western (front yard) portion of the site near HP-1, B-4 and B-5 (see Figure Nos. II and III). The encountered fills were tested and found to have relatively low blowcounts based on the Standard Penetration Test during drill rig sampling and low relative compaction. The fill, topsoils and formational materials are all considered to have a high to very high expansion potentials. The encountered materials consist of the following:

Artificial Fill: The encountered fill consists of tan-gray brown, silty, fine to medium sand and sandy silt with some clay, roots and rock fragments. The encountered fill ranges from 1 to at least 10 feet in depth (see Figure Nos. II and III).

Topsoil/Slopewash: The encountered topsoil/slopewash consists of dark brown silty, fine to medium sand with some clay, and dark brown, sandy clay with some rock fragments and organic materials. This material is approximately 3 feet thick and is considered to be very highly expansive.

Ardath Shale (Ta): The Ardath Shale Formation underlies the entire site. The encountered formational materials generally consist of light gray-brown, tan-gray and orange-brown, well indurated, massive siltstone and sandstone. However, within the upper 15 to 20 feet, the material consists of fractured and weathered interbedded silts and sands. Below a depth of 20 feet, the material becomes very dense and displays several gypsum-healed features that are unbroken with no signs of recent disturbance.

Figure Nos. Va-b presents a portion of the geologic map of the area (Kennedy and Tan, 2005, La Jolla Quadrangle and Figure Nos. VIIa-c present cross-sectional views of the proposed building site.

B. Structure

Based on a review of the City of San Diego Seismic Safety Study for faults and geologic hazards, the site is located on a *"possible or conjectured"* ancient landslide within a high-risk geologic hazard area designated as geologic hazard Category 22; therefore, our 30-inch-diameter boring (B-5) was advanced to investigate possible ancient landslide activity at the site. Within exploratory boring B-5 we encountered massive siltstone and sandstone materials of the Ardath Shale Formation. Downhole logging revealed several concretions and gypsum-healed fractures to a depth of 71 feet. Bedding attitudes within the Ardath Shale were measured to strike typically N10°E, and dip 5 to 8 degrees to the southeast (into the hillside). No significant moisture or seeps were observed. The explored Ardath Shale Formation material consists of very dense, massive siltstones and sandstones with no significant open fracturing. Therefore, based on our geologic investigation, including downhole logging, as well as review of the geologic map (Kennedy and Tan, 2005) and USDA aerial photographs (AXN-8M-1 and 2, 4-11-53) there are no ancient landslides located on or beneath the site.

IX. GEOLOGIC HAZARDS

The City of San Diego Seismic Safety Study -- Geologic Hazards Map (Sheet No. 29) indicates that the site is located in a high-risk geologic hazard area, designated as Category 22, which is identified as *"a possible or conjectured ancient landslide."* (Refer to the previous section). An excerpted portion of the Geologic Hazards Map and legend are presented on Figure Nos. VIa and VIb, respectively.

The following is a discussion of the geologic conditions and hazards common to the La Jolla area of the City of San Diego, as well as project-specific geologic information relating to development of the subject property.

A. Local and Regional Faults

Reference to the geologic map for the area (Kennedy and Tan, 2005) and the City of San Diego Seismic Safety Study – Geologic Hazards Map No. 29 indicates that no faults have been mapped on the subject site.

Country Club Fault: The Country Club Fault is mapped approximately 1,000 feet northeast of the site. The Country Club Fault is considered potentially active. Risk of an earthquake occurring on this fault and ground rupture offset is considered to be low.

Rose Canyon Fault: The Rose Canyon Fault Zone---RCFZ---(Mount Soledad and Rose Canyon Faults), located approximately ½-mile northeast of the subject site, is mapped trending north-south from Oceanside to downtown San Diego, from where it appears to head southward into San Diego Bay, through Coronado and offshore. The Rose Canyon Fault Zone is considered to be a complex zone of onshore and offshore, en echelon strike slip, oblique reverse, and oblique normal faults. The Rose Canyon Fault is considered to be capable of causing a 7.2-magnitude earthquake and considered microseismically active, although no significant recent earthquake is known to have occurred on the fault.

Investigative work on faults that are part of the Rose Canyon Fault Zone at the Police Administration and Technical Center in downtown San Diego, at the SDG&E facility in Rose Canyon, and within San Diego Bay and elsewhere within downtown San Diego, has encountered offsets in Holocene (geologically recent) sediments. These findings confirm Holocene displacement on the Rose Canyon Fault, which was designated an "active" fault in November 1991 (California Division of Mines and Geology -- Fault Rupture Hazard Zones in California, 1999).

Coronado Bank Fault: The Coronado Bank Fault is located approximately 12 miles southwest of the site. Evidence for this fault is based upon geophysical data (acoustic profiles) and the general alignment of epicenters of recorded seismic activity (Greene, 1979). The Oceanside earthquake of 5.3 magnitude, recorded July 13, 1986, is known to have been centered on the fault or within the Coronado Bank

Fault Zone. Although this fault is considered active, due to the seismicity within the fault zone, it is significantly less active seismically than the Elsinore Fault (Hileman, 1973). It is postulated that the Coronado Bank Fault is capable of generating a 7.0-magnitude earthquake and is of great interest due to its close proximity to the greater San Diego metropolitan area.

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

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

Although the Elsinore Fault Zone belongs to the San Andreas set of active, northwest-trending, right-slip faults in the southern California area (Crowell, 1962), it has not been the site of a major earthquake in historic time, other than a 6.0-magnitude quake near the town of Elsinore in 1910 (Richter, 1958; Toppozada and

Parke, 1982). However, based on length and evidence of late-Pleistocene or Holocene displacement, Greensfelder (1974) has estimated that the Elsinore Fault Zone is reasonably capable of generating an earthquake with a magnitude as large as 7.5. Study and logging of exposures in trenches placed in Glen Ivy Marsh across the Glen Ivy North Fault (a strand of the Elsinore Fault Zone between Corona and Lake Elsinore), suggest a maximum earthquake recurrence interval of 300 years, and when combined with previous estimates of the long-term horizontal slip rate of 0.8 to 7.0 mm/year, suggest typical earthquake magnitudes of 6 to 7 (Rockwell, 1985). More recently, the California Geologic Survey (2002) considers the Elsinore Fault capable of producing an earthquake of 6.8 to 7.1 magnitude.

B. ***Other Geologic Hazards***

Ground Rupture: Ground rupture is characterized by bedrock slippage along an established fault and may result in displacement of the ground surface. For ground rupture to occur along a fault, an earthquake usually exceeds magnitude 5.0. If a 5.0-magnitude earthquake were to take place on a local fault, an estimated surface-rupture length 1 mile long could be expected (Greensfelder, 1974). Our investigation indicates that the subject site is not directly on a known fault trace and, therefore, the risk of ground rupture is remote.

Ground Shaking: Structural damage caused by seismically induced ground shaking is a detrimental effect directly related to faulting and earthquake activity. Ground shaking is considered to be the greatest seismic hazard in San Diego County. The intensity of ground shaking is dependent on the magnitude of the earthquake, the distance from the earthquake, and the seismic response characteristics of underlying soils and geologic units. Earthquakes of magnitude 5.0 Richter scale or greater are generally associated with notable to significant damage. It is our opinion that the most serious damage to the site would be caused by a large earthquake originating on a nearby strand of the Rose Canyon Fault Zone. Although the chance of such an event is remote, it could occur within the useful life of the structure. The greatest hazard at the site, in our opinion, will be ground shaking from earthquakes on active faults in Southern California and northwestern Mexico. The Modified Mercalli Index, a numerical scale of earthquake shaking intensity, is presented as Appendix B.

Landslides: Based upon our geologic investigation, review of the geologic map (Kennedy, 1975), and aerial photographs (AXN-8M-1 and 2, 4-11-53), there are no ancient landslides located on the site.

Based on the City of San Diego's Geologic Hazards Map that includes the subject site, the site is located on a possible ancient landslide within a high-risk geologic hazard area designated as Category 22.

Our 30-inch-diameter boring (B-5) was advanced to investigate possible recent or ancient landslide activity. Underlying approximately 8 feet of loose fill and topsoil/colluvium, we encountered approximately 15 to 20 feet of fractured and weathered Ardath Shale Formation. This material consists of interbedded silts and sands described as tan-gray, silty fine sand with some clay, and light orange-brown silty sand/sandy silt. At a depth of 15 feet, the material becomes denser with the first signs of planar gypsum features that appear unbroken and undisturbed. The very planar crystalline gypsum features commonly strike N70°E and dip 10°N. No significant moisture or soft, remolded clays (shear planes) were encountered. Other gypsum filling joint features were observed to be steeply dipping N20°E, 70°W. The material consists of very dense, massive siltstones and sandstones with no significant open fracturing within the Ardath.

A minor fault was encountered at 63.5 feet trending N20°E, dip 78°SW. This feature is considered to be intraformational breakage caused during the tectonic uplifting of Mt. Soledad. Iron staining within the bedding is offset ±2 inches, down on the southwest side. Other gypsum-healed features exist to the bottom of the hole. The boring was terminated at 71 feet due to practical drilling refusal and the drill rig equipment limited capabilities.

The observed boring features indicate no recent activity due to faulting or landsliding has occurred. The local features that appear disturbed are considered related to ancient movement that occurred in association with the uplift of Mt. Soledad. Since no clear evidence of recent or historic landsliding or deep seated slope instability was found, the risk of landsliding is considered very low. An evaluation of the possible deep-seated ancient landslide mass underlying the site, and surrounding region, is beyond the scope of this investigation.

Furthermore, any deeper ancient landsliding would most likely have occurred during the tectonic uplift and deformation of the underlying Tertiary and Cretaceous bedrock formations. The relatively low deformation uplift of the Quaternary Very Old Paralic Deposits (Lindavista Formation) on Mt. Soledad over the past 855,000 years ±75,000 years (Kern and Rockwell, 1992), the gypsum-filled joints at depth, and the deposition of Quaternary formation on the westerly sloping bench between the ocean and the western base of Mt. Soledad, suggest deeper sliding is a dormant condition with no potential for reactivation.

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

The risk of liquefaction of foundation materials at the project site due to seismic shaking is considered to be remote due to the dense nature of the natural-ground material and the lack of a shallow static groundwater surface under the site. The site does not have a potential for soil strength loss to occur due to a seismic event.

Tsunami: In general, the orientation of the southern California coastline and the bathymetry of the offshore southern California borderland have, during historical times, combined to protect the shoreline from any large magnitude tsunami height increases, as shown by records of tsunami occurrences that have been observed and/or recorded along the southern California shoreline since 1810 (Lander et al, 1993). For this segment of the California coastline (south of Santa Monica) there is no evidence of any high magnitude tsunamis generated during the last 200 years by large-scale regional sea floor movements (Gayman, 1998).

The risk of a tsunami affecting the site is considered negligible as the site is situated at an elevation of approximately 390 to 445 feet above mean sea level and approximately ½-mile from the Pacific Ocean.

Summary: It is our opinion, based upon a review of the available maps, and our investigation that the site is underlain by stable formational materials, and is suited for the proposed structure and associated improvements. It is our opinion that a known *"active"* fault presents the greatest seismic risk to the subject site during the lifetime of the proposed structure. To date, the nearest known *"active"* faults to the subject site are the northwest-trending Rose Canyon Fault, Coronado Bank Fault and the Elsinore Fault. No significant geologic hazards are known to exist on the site that would prevent the proposed construction. Refer to Section XII of this report for seismic design criteria.

X. SLOPE STABILITY ANALYSIS

The existing slopes and any proposed 2.0:1.0 slopes constructed should possess a factor of safety of 1.5 or higher against shallow or deep shear failure at the completion of the project. Slope stability was analyzed utilizing the *SLIDE 6* computer program (for slope stability analyses refer to Appendix D).

XI. GROUNDWATER

No groundwater was encountered during the course of our subsurface field investigation. We do not anticipate significant groundwater problems to develop in the future, *if the property is developed as proposed and proper drainage is maintained*.

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

On properties such as the subject site where dense, low permeability soils and/or formational materials exist at shallow depths, even normal landscape irrigation practices or periods of extended rainfall can result in shallow "perched" water conditions. The perching (shallow depth) accumulation of water on a low permeability surface can result in areas of persistent wetting and drowning of lawns, plants and trees. Resolution of such conditions, should they occur, may require site-specific design and construction of subdrain and shallow "wick" drain dewatering systems.

Subsurface drainage with a properly designed and constructed subdrain system will be required along with continuous back drainage behind any proposed lower-level garage/basement walls. Landscape areas and surrounding exterior areas should be provided with proper surface drainage to prevent water accumulation around the house.

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

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

XII. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based upon the practical field investigation conducted by our firm and resulting laboratory tests, in conjunction with our knowledge and experience with soil conditions in the La Jolla area of the City of San Diego.

The geotechnical investigation revealed that fill soils and topsoils (residual soils) of varying compaction underlie the property to depths ranging from 1 foot to approximately 10 feet. In their present condition, the existing fill soils, topsoils and localized soft/weathered formation will not provide a stable soil base for the proposed new structure and improvements. As such, we recommend these soils be removed and recompacted as part of site preparation prior to the addition of any new fill or structural improvements. Excavation for the proposed basement should result in the removal of most of these soils at the proposed basement location. The dense/hard formational materials have good bearing strength characteristics and are suitable for support of the proposed structural loads.

All foundations for the proposed structure should be founded either entirely into the underlying medium dense to dense formational materials or entirely in properly compacted fill soils. In proposed secondary improvement areas, all existing fill soils will require removal, moisture conditioning and recompaction prior to placement of new fill or improvements.

Final construction plans have not been provided to us for the preparation of this report, however, when completed they should be made available for our review. Additional or modified recommendations for foundation design and construction may be provided as warranted.

The opinions, conclusions and recommendations presented in this report are contingent upon ***Geotechnical Exploration, Inc.*** being retained to review the final plans and specifications as they are developed and to observe the site earthwork and installation of foundations.

A. Seismic Design Criteria

1. *CBC 2016 Seismic Design Criteria:* If the proposed structure will be designed in accordance with Section 1613 of the 2016 CBC, which incorporates by reference the ASCE 7-10 for seismic design, we recommend the following parameters be utilized. We have determined the mapped spectral acceleration values for the site based on a latitude of 32.8392 degrees and longitude of 117.2628 degrees, utilizing a program titled "Seismic Hazard Curves, Response Parameters and Design Parameters-v5.0.8," provided by the USGS, which provides a solution for ASCE 7-10 (Section 1613 of the 2016 CBC) utilizing digitized files for the Spectral Acceleration maps. In addition, we have assigned a Site Classification of C. The response parameters for design are presented in the following table. The design spectrum acceleration vs. Period T is shown on Appendix C. The Modified Mercalli Intensity Index is provided as Appendix B.

TABLE I

Mapped Spectral Acceleration Values and Design Parameters

S_s	S_1	F_a	F_v	S_{ms}	S_{m1}	S_{ds}	S_{d1}
1.266g	0.488g	1.0	1.512	1.266g	0.738g	0.844g	0.492g

B. Preparation of Soils for Site Development

3. *Clearing and Stripping:* The existing remnant structures, improvements and vegetation observed on the site should be removed prior to the preparation of the building pad and areas of associated improvements. This includes any roots from existing trees and shrubbery. Holes resulting from the removal of root systems or other buried obstructions that extend below the planned grades should be cleared and backfilled with properly compacted fill.

4. *Treatment of Existing Fill Soil or Loose Soils:* In order to provide suitable foundation support for the proposed residence and associated improvements, we recommend that all fill soils, topsoils and localized soft/weathered formation soils that remain after the necessary site excavations have been made be removed and recompacted. The recompaction work should consist of (a) removing these soils down to dense/hard formational materials; (b) scarifying, moisture conditioning, and compacting the exposed soils; and (c) cleaning and replacing the removed soils as compacted structural fill.

   The depth required to remove the fill soil and topsoils is anticipated to range from 1 foot to approximately 10 feet but should be determined by our representatives during the excavation work based on their examination of the soils being exposed. Excavation for the basement should result in the removal of most of these soils at that location. The lateral extent of the excavation should be at least 5 feet beyond the edge of the perimeter foundations, where feasible, and any areas to receive exterior improvements. Any unsuitable materials (such as oversize rubble and/or organic matter) should be selectively removed as directed by our representative and properly disposed of off-site.

Any rigid improvements founded on the existing variable density fill soils, topsoils and/or soft formational materials can be expected to undergo movement and possible damage. ***Geotechnical Exploration, Inc.*** takes no responsibility for the performance of any improvements built on loose natural soils or inadequately compacted fills. Any exterior area to receive concrete improvements should be verified for compaction and moisture within 48 hours prior to concrete placement or during the fill placement if the thickness of fill exceeds 1 foot.

5. *Subgrade Preparation:* After the site has been cleared, stripped, and the required excavations made, the exposed hard/dense subgrade soils in areas to receive fill and/or building improvements should be scarified to a depth of at least 12 inches, moisture conditioned, and compacted to the requirements for structural fill. The near-surface moisture content of clayey soils should be maintained by periodic sprinkling until 48 hours prior to concrete placement. The anticipated basement excavation into dense formational soils should not need scarification or recompaction unless moisture conditioning is required to reduce a high soil expansion potential. The moisture content of the formational soils at the time of excavation shall be at least 5 percent over Optimum Moisture.

6. *Expansive Soil Conditions:* Medium to very highly expansive soils encountered on the site should be moisture conditioned to at least 5 percent above Optimum Moisture content, compacted to between 88 to 92 percent of the Maximum Dry Density. Soils of medium or greater expansion potential should not be used as retaining wall backfill soils.

7. *Material for Fill:* Existing on-site soils with an organic content of less than 3 percent by volume are, in general, suitable for use as fill. Any required imported fill material should be a low-expansion potential (Expansion Index of 50 or less per ASTM D4829-07). In addition, both imported and existing on-site materials for use as fill should not contain rocks or lumps more than 6 inches in greatest dimension if the fill soils are compacted with heavy compaction equipment (or 3 inches in greatest dimension if compacted with lightweight equipment). All materials for use as fill should be approved by our firm prior to filling.

8. *Fill Compaction:* All structural fill should be compacted to a minimum degree of compaction of 90 percent based upon ASTM D1557-07 unless soils are medium to highly expansive, in which case, these soils may be compacted to between 88 and 92 percent of maximum dry density. Fill material should be spread and compacted in uniform horizontal lifts not exceeding 8 inches in uncompacted thickness. Before compaction begins, the fill should be brought to a water content that will permit proper compaction by either: (1) aerating and drying the fill if it is too wet, or (2) moistening the fill with water if it is too dry. Each lift should be thoroughly mixed before compaction to ensure a uniform distribution of moisture. As previously indicated, clayey on-site soils -- where allowed -- should have a moisture content at least 5 percent over optimum. No uncontrolled fill soils should remain on the site after completion of the site work. In the event that temporary ramps or pads are constructed of uncontrolled fill soils, the loose fill soils should be removed and/or recompacted prior to completion of the grading operation.

9. *Trench and Retaining Wall Backfill:* All backfill soils placed in utility trenches or behind retaining walls should be compacted to at least 90 percent of

Maximum Dry Density. Our experience has shown that even shallow, narrow trenches (such as for irrigation and electrical lines) that are not properly compacted, can result in problems, particularly with respect to shallow groundwater accumulation and migration. Backfill soils placed behind retaining walls should be installed as early as the retaining walls are capable of supporting lateral loads. Retaining wall backfill soils should be imported low expansive, with an Expansion Index equal to or lower than 50. Utility and drainage lines shall include a granular soil pipe bedding and on-site properly compacted soils.

C. Design Parameters for Proposed Foundations

10. *Footings:* We recommend that the proposed residence be supported on conventional, individual-spread and/or continuous footing foundations bearing on undisturbed formational materials and/or well-compacted fill material. All footings should be founded at least 24 inches below the lowest adjacent finished grade. All footings located on a slope face or closer than 8 feet inside the top of a slope should be deepened to 2 feet below a line beginning at a point 8 feet horizontally inside the slope and projected outward and downward, parallel to the face of the slope and into firm soils (see Figure No. VIII). Footings located adjacent to utility trenches should have their bearing surfaces situated below an imaginary 1.5:1.0 plane projected upward from the bottom edge of the adjacent utility trench. Otherwise, the trenches should be excavated farther from the footing locations.

11. *Bearing Values*: At the recommended depths, footings on properly compacted fill or formational soil may be designed for allowable bearing

pressures of 2,500 pounds per square foot (psf) for combined dead and live loads and 3,300 psf for all loads, including wind or seismic. However, the footings should have a minimum width of 12 inches. For retaining walls, an increase in soil bearing capacity of 500 psf is allowed for each additional foot in width beyond 1 foot. The maximum bearing capacity may not exceed 4,500 psf.

12. *Footing Reinforcement*: All continuous footings should contain top and bottom reinforcement to provide structural continuity and to permit spanning of local irregularities. We recommend that a minimum of two No. 5 top and two No. 5 bottom reinforcing bars be provided in the footings. A minimum clearance of 3 inches should be maintained between steel reinforcement and the bottom or sides of the footing. Isolated square footings should contain, as a minimum, a grid of three No. 4 steel bars on 12-inch centers, both ways. In order for us to offer an opinion as to whether the footings are founded on soils of sufficient load bearing capacity, it is essential that our representative inspect the footing excavations prior to the placement of reinforcing steel or forms, and also within 48 hours prior to concrete placement.

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

13. *Lateral Loads:* Lateral load resistance for the structure supported on footing foundations may be developed in friction between the foundation bottoms and the supporting subgrade. An allowable friction coefficient of 0.35 is

considered applicable. An additional allowable passive resistance equal to an equivalent fluid weight of 300 pounds per cubic foot acting against the foundations may be used in design provided the footings are poured neat against the adjacent undisturbed formational materials and/or properly compacted fill materials. These lateral resistance values assume a level surface in front of the footing for a minimum distance of three times the embedment depth of the footing.

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

15. *Swimming Pool Recommendations:* It is our understanding that a swimming pool is planned for the front/west yard area. The swimming pool should be founded entirely in cut formational soils. If this is not feasible, then the entire pool shell area should be founded in properly recompacted fill or the fill portion should be compacted to 95 percent relative compaction. The soils surrounding the swimming pool should be low-expansive or the swimming pool shell should be designed for a soil pressure of at least 70 pcf (for on-site expansive soils) if the pool wall is considered a cantilever wall free to rotate, or 85 pcf if considered a restrained wall. Seismic load increment, when applicable per City requirements, should be 15 pcf for unrestrained walls. The seismic pressure is applied in an inverted triangular distribution with the resultant pressure applied at 1/3H from the bottom of the retained soil height.

The pool deck subgrade should be properly moisture conditioned and compacted, and should be verified by our firm within 48 hours prior to steel and concrete placement. The pool deck should have dowels or continuous steel reinforcement at all joint locations to help reduce the potential for vertical differential damage. In addition, the control and isolation joints shall be sealed with elastomeric joint sealant. The sealant should be inspected and maintained periodically by the owner. The swimming pool deck area and adjacent areas should be provided with adequate surface drainage including positive surface drainage and/or functional area drains. The moisture content of on-site subgrade soils shall be at least 5 percent over Optimum Moisture content within 48 hours prior to concrete placement for the deck.

In addition, the pool should be provided with the minimum setback distance required by the CBC: 7 feet to daylight or the corresponding portion of the pool should be designed as a free-standing wall able to support the water pressure of 62.4 pcf.

D. Concrete Slab-on-grade Criteria

16. *Minimum Floor Slab Reinforcement:* Based on our experience, we have found that, for various reasons, floor slabs occasionally crack, causing brittle surfaces such as ceramic tiles to become damaged. Therefore, we recommend that all slabs-on-grade contain at least a minimum amount of reinforcing steel to reduce the separation of cracks, should they occur.

    16.1 Interior floor slabs should be a minimum of 5 inches actual thickness and be reinforced with No. 4 bars on 18-inch centers, both ways, placed at midheight in the slab. *The slabs should be underlain by a 4-*

inch-thick layer of compacted crushed gravel (1/2 inch maximum diameter) underlying the moisture retardant membrane on properly compacted subgrade. Slab subgrade soil should be verified by a ***Geotechnical Exploration, Inc.*** representative to have the proper moisture content within 48 hours prior to placement of the vapor barrier and pouring of concrete.

16.2 Basement slabs should preferably be constructed on a waterproof membrane (such as Paraseal) on a 4-inch gravel base placed on properly compacted subgrade, per the manufacturer's instructions. The owner should be consulted as to the degree of slab moisture protection desired. If perched groundwater or seeps are observed after the basement excavation is complete, a subdrain drainage system may need to be installed beneath the slab.

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

17. Raised Wood Floors: If raised wood floors are to be constructed, they should be provided with either isolated piers embedded not less than 24 inches into the subgrade soils, or preferably, continuous footings similarly embedded into the compacted soils or firm formational soils. The continuous footings may be provided with windows for ducts or pipes. Surface bearing piers should not be used. Perimeter walls should be supported by continuous foundations, also embedded at least 24 inches into properly compacted soil.

18. *Concrete Isolation and Control Joints:* We recommend the project Civil/Structural Engineer incorporate isolation joints and sawcuts to at least one-fourth the thickness of the slab in any floor designs. The joints and cuts, if properly placed, should reduce the potential for and help control floor slab cracking. We recommend that concrete shrinkage joints be spaced no farther than approximately 20 feet apart, and also at re-entrant corners. However, due to a number of reasons (such as base preparation, construction techniques, curing procedures, and normal shrinkage of concrete), some cracking of slabs can be expected.

19. *Slab Moisture Emission:* Although it is not the responsibility of geotechnical engineering firms to provide moisture protection recommendations, as a service to our clients we provide the following discussion and suggested minimum protection criteria. Actual recommendations should be provided by the architect and waterproofing consultants.

    Soil moisture vapor can result in damage to moisture-sensitive floors, some floor sealers, or sensitive equipment in direct contact with the floor, in addition to mold and staining on slabs, walls and carpets.

    The common practice in Southern California is to place vapor retarders made of PVC, or of polyethylene. PVC retarders are made in thickness ranging from 10- to 60-mil. Polyethylene retarders, called visqueen, range from 5- to 10-mil in thickness. The thicker the plastic, the stronger the resistance will be against puncturing.

    Although polyethylene (visqueen) products are commonly used, products such as Stegowrap or Vaporshield possess higher tensile strength and are more specifically designed for and intended to retard moisture transmission into concrete slabs. The use of Stegowrap or Vaporshield or equivalent is highly recommended when a structure is intended for moisture-sensitive floor coverings or uses.

19.1 Vapor retarder joints must be lapped and sealed with mastic or the manufacturer's recommended tape. No heavy equipment, stakes or other puncturing instruments should be used on top of the liner before or during concrete placement. In actual practice, stakes are often driven through the retarder material, equipment is dragged or rolled across the retarder, overlapping or jointing is not properly implemented, etc. All these construction deficiencies reduce the retarder's effectiveness.

19.2 The vapor retarders are not waterproof. They are intended to help prevent or reduce vapor transmission and capillary migration through the soil into the pores of concrete slabs. Waterproofing systems must supplement vapor retarders if full waterproofing is desired. The owner should be consulted to determine the specific level of protection required.

20. *Exterior Slab Reinforcement:* As a minimum for protection of on-site improvements, we recommend that all nonstructural concrete slabs (such as patios, sidewalks, etc.) be at least 4 inches in actual thickness, founded on properly compacted, moisture conditioned, tested fill or dense native formation and underlain, if needed, by no more than 3 inches of clean leveling sand, with No. 3 bars at 18-inch centers, both ways, at the center of the slab, and contain adequate isolation and control joints. The performance

of on-site improvements can be greatly affected by soil base preparation and the quality of construction. It is therefore important that all improvements are properly designed and constructed for the existing soil conditions. The improvements should not be built on loose soils or fills placed without our observation and testing. Verification of soil adequacy should be provided by our firm within 48 hours prior to concrete placement.

For exterior slabs with the minimum shrinkage reinforcement, control joints should be placed at spaces no farther than 15 feet apart or the width of the slab, whichever is less, and also at re-entrant corners. Control joints in exterior slabs should be sealed with elastomeric joint sealant. The sealant should be inspected every 6 months and be properly maintained. To reduce vertical differential movement, all isolation joints should be provided with dowels or continuous steel reinforcement.

21. *Concrete Pavement:* Driveway pavement, consisting of Portland cement concrete at least 5½ inches in thickness, may be placed on properly compacted subgrade soils. The concrete should be at least 3,500 psi compressive strength, with control joints no farther than 12 feet apart. Pavement joints should be properly sealed with permanent joint sealant, as required in sections 201.3.6 through 201.3.8 of the Standard Specifications for Public Work Construction, 2015 Edition. Subgrade soil for the driveway should be compacted to at least 90 percent of Maximum Dry Density at a soil moisture content at least 5 percent above optimum (measured within 48 hours prior to concrete placement).

Control joints should be placed within 12 hours after concrete placement or as soon as the concrete allows sawcutting without aggregate raveling. The sawcuts should penetrate at least one-quarter the thickness of the slab.

E. ***Slopes***

22. *Permanent Slopes*: Any new cut or fill slopes up to 25 feet in height should be constructed at an inclination of 2.0:1.0 (horizontal to vertical). Existing slopes should continue to possess a factor of safety of 1.5 as long as proper pad and slope drainage is provided. Slope stability calculations (see Appendix D) indicate that the proposed slopes will have a factor of safety of 1.5 or higher against deep or shallow failures.

23. *Temporary Slopes*: Proposed temporary slopes for trenches should be stable for a maximum slope height of 6 feet in dense/hard formational soils at a ratio of 0.25:1.0 (horizontal to vertical) and at a slope ratio of 1.0:1.0 in the upper 5 feet for properly compacted fill or existing fill soils. The bottom 3 feet may be cut vertical in dense or hard formational soils. For retaining walls to be backfilled with low expansive soils the minimum slope ratio shall be 0.5 to 1.0, horizontal to vertical. No soil stockpiles, improvements or other surcharges may exist or be placed within a horizontal distance of 10 feet from the excavation. If these recommendations are not feasible due to space constraints, temporary shoring i.e., soldier pile and lagging, may be required for safety and to protect adjacent property improvements and construction personnel. If needed, temporary shoring (i.e., soldier pile and lagging) should be designed as recommended in the retaining wall section of this report. This office should be contacted for additional recommendations if additional shoring or steep temporary slopes are required. Steeper slopes

may be allowed after evaluation by our firm if observed cuts demonstrate higher strength values than those estimated.

24. *Slope Observations:* A representative of ***Geotechnical Exploration, Inc.*** must observe any steep temporary slopes *during construction*. In the event that soils and formational material comprising a slope are not as anticipated, any required slope design changes would be presented at that time.

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

26. *Slope Top/Face Performance:* The soils that occur in close proximity to the top or face of even properly compacted fill or dense natural ground cut slopes often possess poor lateral stability. The degree of lateral and vertical deformation depends on the inherent expansion and strength characteristics of the soil types comprising the slope, slope steepness and height, loosening of slope face soils by burrowing rodents, and irrigation and vegetation maintenance practices, as well as the quality of compaction of fill soils. Structures and other improvements could suffer damage due to these soil movement factors if not properly designed to accommodate or withstand such movement.

27. *Slope Top Structure Performance:* Rigid improvements such as top-of-slope walls, columns, decorative planters, concrete flatwork, swimming pools and other similar types of improvements can be expected to display varying degrees of separation typical of improvements constructed at the top of a

slope. The separations result primarily from slope top lateral and vertical soil deformation processes. These separations often occur regardless of being underlain by cut or fill slope material. Proximity to a slope top is often the primary factor affecting the degree of separations occurring.

Typical and to-be-expected separations can range from minimal to up to 1 inch or greater in width. In order to reduce the effect of slope-top lateral soil deformation, we recommend that the top-of-slope improvements be designed with flexible connections and joints in rigid structures so that the separations do not result in visually apparent cracking damage and/or can be cosmetically dressed as part of the ongoing property maintenance. These flexible connections may include *"slip joints"* in wrought iron fencing, evenly spaced vertical joints in block walls or fences, control joints with flexible caulking in exterior flatwork improvements, etc.

In addition, use of planters to provide separation between top-of-slope hardscape such as patio slabs and pool decking from top-of-slope walls can aid greatly in reducing cosmetic cracking and separations in exterior improvements. Actual materials and techniques would need to be determined by the project architect or the landscape architect for individual properties. Steel dowels placed in flatwork may prevent noticeable vertical differentials, but if provided with a slip-end they may still allow some lateral displacement.

F. ***Retaining Wall Design Criteria***

28. *Design Parameters – Unrestrained:* The active earth pressure (to be utilized in the design of any cantilever retaining walls, utilizing imported very low- to low-expansive soils [EI less than 50] as backfill) should be based on an

Equivalent Fluid Weight of 38 pounds per cubic foot (for level backfill only). In the event that a retaining wall is surcharged by sloping backfill, the design active earth pressure should be based on the appropriate Equivalent Fluid Weight presented in the following table. Where applicable, the soil seismic increment for unrestrained walls should be 15 pcf applied with a regular triangular distribution, with the apex of the triangle at the top of the wall and the at the bottom of soil retention.

	*Height of Slope/Height of Wall**			
Slope Ratio	**0.25**	**0.50**	**0.75**	**1.00(+)**
2.0:1.0 (existing slope)	42	48	50	52

*To determine design active earth pressures for ratios intermediate to those presented, interpolate between the stated values.

29. *Design Parameters – Restrained:* Retaining walls designed for a restrained condition should utilize a uniform pressure equal to 24xH (considered in pounds per square foot) considered as acting everywhere on the back of the wall. The soil pressure produced by any footings, improvements, or any other surcharge placed within a horizontal distance equal to the height of the retaining portion of the wall should be included in the wall design pressure. The recommended lateral soil pressures are based on the assumption that no loose soils or soil wedges will be retained by the retaining wall. Backfill soils should consist of low-expansive soils with EI less than 50, and should be placed from the heel of the foundation to the ground surface within the wedge formed by a plane at 30 degrees from vertical, and passing by the heel of the foundation and the back face of the retaining wall.

For temporary shoring walls supporting on-site clayey soils a soil at-rest pressure of 24xH psf may be used for a restrained shoring wall if level backfill soil is retained. If top-of-wall rotation is allowed, the soil equivalent fluid weight of 45 pcf may be used. Surcharge loads should be considered when applicable for the shoring design by using a 0.52 vertical-to-horizontal conversion coefficient. For long-term shoring walls a 48xH psf for braced shoring and 65 pcf for an unrestrained condition.

30. *Surcharge Loads:* Any loads placed on the active wedge behind a cantilever wall should be included in the design by multiplying the load weight by a factor of 0.32. For a restrained wall, the lateral factor should be 0.52 when retaining low expansive soils.

31. *Wall Drainage:* Proper subdrains and free-draining backwall material or board drains (such as J-drain or Miradrain) should be installed behind all retaining walls (in addition to proper waterproofing) on the subject project (see Figure No. IX, the Retaining Wall Drainage Schematic). ***Geotechnical Exploration, Inc.*** will assume no liability for damage to structures or improvements that is attributable to poor drainage. The architectural plans should clearly indicate that subdrains for any lower-level walls be placed at an elevation at least 1 foot below the bottom of the lower-level slabs. At least 0.5-percent gradient should be provided to the subdrain. The subdrain should be placed in an envelope of crushed rock gravel up to 1 inch in maximum diameter, and be wrapped with Mirafi 140N filter or equivalent. The subdrain may consist of Amerdrain or QuickDrain (rectangular section boards). If the slab is to be supported on top of basement wall footings, then the subdrain should be placed on the outer face of the footing, not on top of the footing.

32. *Quality Control*: It must be understood that it is not within the scope of our services to provide quality control oversight for surface or subsurface drainage construction or retaining wall sealing and base of wall drain construction. It is the responsibility of the contractor and/or their retained construction inspection service provider to verify proper wall sealing, geofabric installation, protection board (if needed), drain depth below interior floor or yard surface, pipe percent slope to the outlet, etc.

G. Site Drainage Considerations

33. *Surface Drainage:* Adequate measures should be taken to properly finish-grade the lot after the residence and other improvements are in place. Drainage waters from this site and adjacent properties should be directed away from the footings, floor slabs, and slopes, onto the natural drainage direction for this area or into properly designed and approved drainage facilities provided by the project civil engineer. Roof gutters and downspouts should be installed on the residence, with the runoff directed away from the foundations via closed drainage lines. Proper subsurface and surface drainage will help minimize the potential for waters to seek the level of the bearing soils under the footings and floor slabs. Failure to observe this recommendation could result in undermining and possible differential settlement of the structure or other improvements on the site or cause other moisture-related problems. Currently, the California Building Code requires a minimum 2-percent surface gradient for proper drainage of building pads unless waived by the building official. Concrete pavement may have a minimum gradient of 0.5-percent.

34. *Erosion Control*: In addition, appropriate erosion control measures should be taken at all times during and after construction to prevent surface runoff waters or mud from entering footing excavations or ponding on finished building pad areas.

35. *Planter Drainage:* Planter areas, flower beds and planter boxes should be sloped to drain away from the footings and floor slabs at a gradient of at least 5 percent within 5 feet from the perimeter walls. Any planter areas adjacent to the residence or surrounded by concrete improvements should be provided with sufficient area drains to help with rapid runoff disposal. No water should be allowed to pond adjacent to the residence or other improvements or anywhere on the site.

H. ***General Recommendations***

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

37. *Construction Best Management Practices (BMPs):* Construction BMPs must be implemented in accordance with the requirements of the controlling

jurisdiction. Sufficient BMPs must be installed to prevent silt, mud or other construction debris from being tracked into the adjacent street(s) or storm water conveyance systems due to construction vehicles or any other construction activity. The contractor is responsible for cleaning any such debris that may be in the street at the end of each work day or after a storm event that causes breach in the installed construction BMPs.

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

XIII. ***<u>GRADING NOTES</u>***

Geotechnical Exploration, Inc. recommends that we be retained to verify the actual soil conditions revealed during site grading work and footing excavation to be as anticipated in this *"Update Report of Geotechnical Investigation* " for the project. In addition, the compaction of any fill soils placed during site grading work must be observed and tested by the soil engineer. It is the responsibility of the grading contractor to comply with the requirements on the grading plans and the local grading ordinance. All retaining wall and trench backfill should be properly compacted.

Geotechnical Exploration, Inc. will assume no liability for damage occurring due to improperly compacted or uncompacted backfill placed without our observations and testing.

XIV. LIMITATIONS

Our conclusions and recommendations have been based on available data obtained from our field investigation and laboratory analysis, as well as our experience with similar soils and formational materials located in the La Jolla of San Diego. Of necessity, we must assume a certain degree of continuity between exploratory excavations and/or natural exposures. It is, therefore, necessary that all observations, conclusions, and recommendations be verified at the time grading operations begin or when footing excavations are placed. In the event discrepancies are noted, additional recommendations may be issued, if required.

The work performed and recommendations presented herein are the result of an investigation and analysis that meet the contemporary standard of care in our profession within the County of San Diego. No warranty is provided.

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

It is the responsibility of the owner and/or developer to ensure that the recommendations summarized in this report are carried out in the field operations and that our recommendations for design of this project are incorporated in the structural plans. We should be retained to review the project plans once they are available, to see that our recommendations are adequately incorporated in the plans.

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

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

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

Once again, should any questions arise concerning this report, please feel free to contact the undersigned. Reference to our **Job No. 96-6938** will expedite a reply to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

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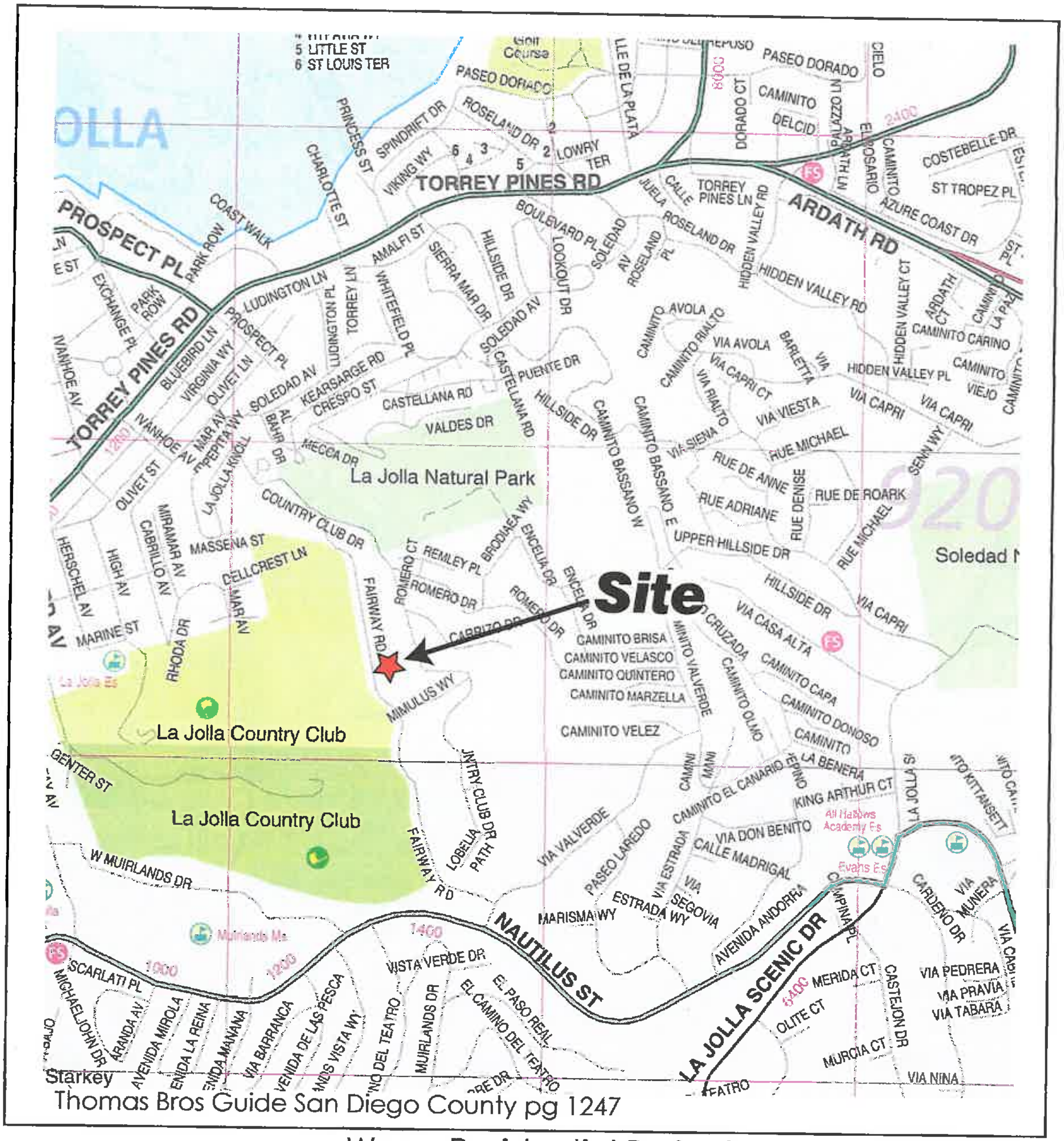
VICINITY MAP



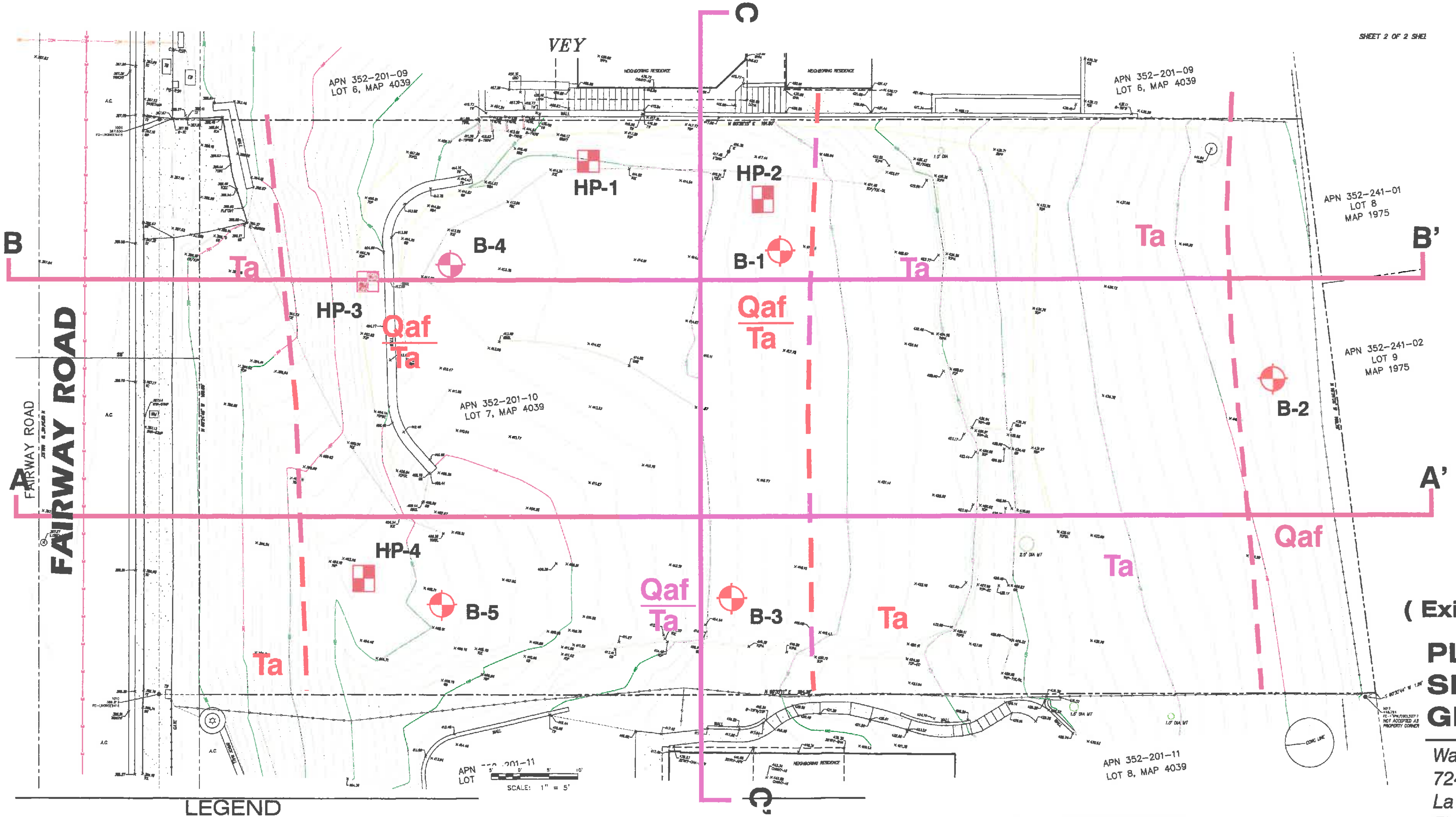
Thomas Bros Guide San Diego County pg 1247

Wang Residential Project
7247 Fairway Road
La Jolla, CA.

Figure No. I
Job No. 96-6938

REFERENCE: This Plot Plan was prepared from an existing TOPOGRAPHIC SURVEY MAP by ALTA LAND SURVEYING INC. dated 6/27/17 and from on-site field reconnaissance performed by GEI.

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



N

Scale: 1" = 20'
(approximate)

(Existing Conditions)

PLOT PLAN AND SITE SPECIFIC GEOLOGIC MAP

Wang Residential Project
7247 Fairway Road
La Jolla, CA.
Figure No. IIa
Job No. 96-6938

Geotechnical Exploration, Inc.

August 2017

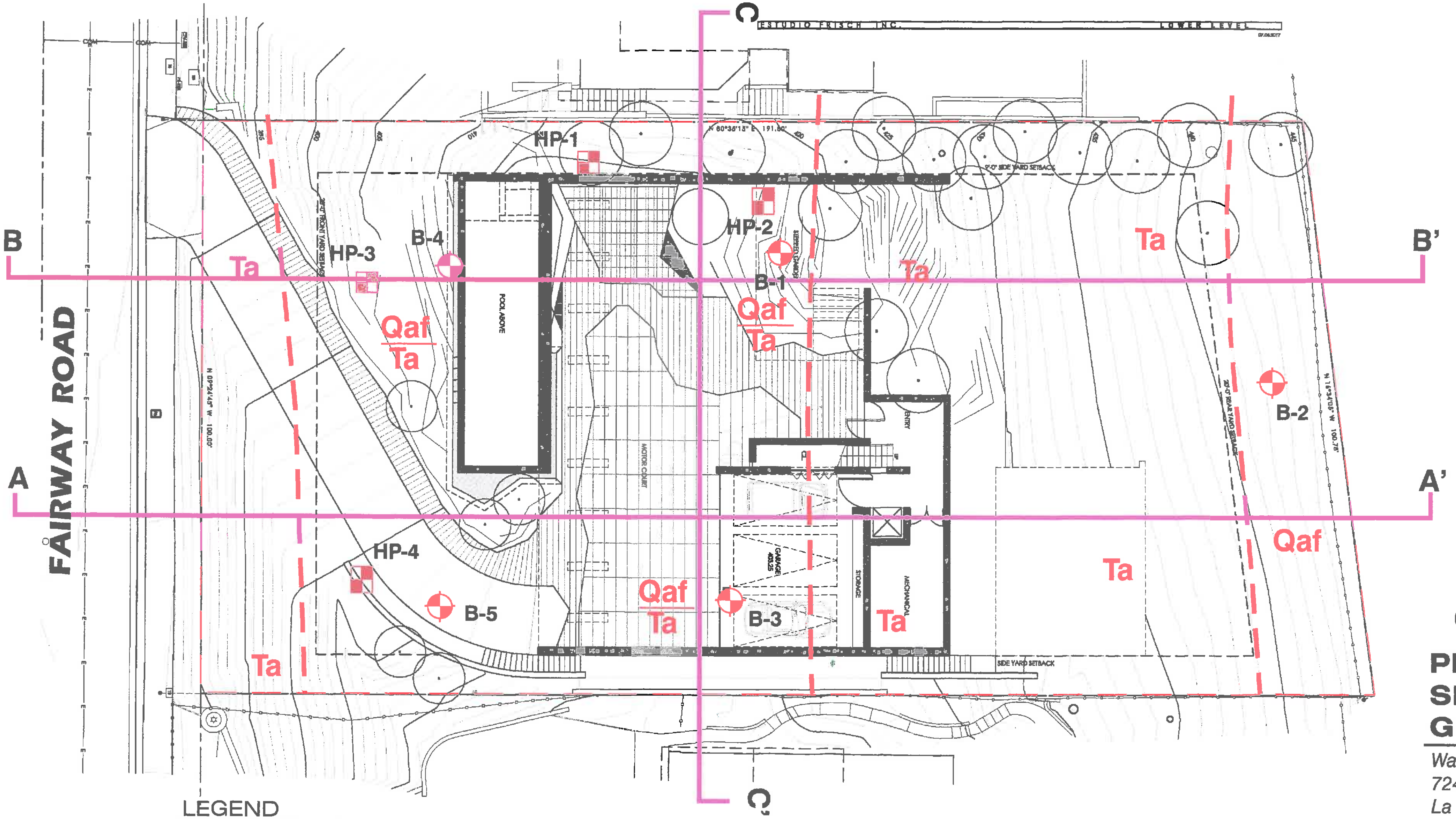
LEGEND

▨ **HP-4**	Approximate Location of Exploratory Handpit	**Qaf**	Quaternary Artificial Fill
⊕ **B-5**	Approximate Location of Exploratory Boring	**Ta**	Tertiary Ardath Shale
A ⊔ A'	Approximate Location of Cross Section	— —	Approximate Geologic Contact

96-6938-p5-IIa.ai

REFERENCE: This Plot Plan was prepared from an existing
LOWER LEVEL PLAN dated 07/06/2017 and from on-site
field reconnaissance performed by GEI.

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



N

Scale: 1" = 20'
(approximate)

LEGEND

🟥 **HP-4** Approximate Location of Exploratory Handpit

⊕ **B-5** Approximate Location of Exploratory Boring

Qaf Quaternary Artificial Fill

Ta Tertiary Ardath Shale

— — Approximate Geologic Contact

A ⌴ A' Approximate Location of Cross Section

(Proposed)

PLOT PLAN AND SITE SPECIFIC GEOLOGIC MAP

Wang Residential Project
7247 Fairway Road
La Jolla, CA.
Figure No. IIb
Job No. 96-6938

Geotechnical Exploration, Inc.

August 2017

96-6938-p5-IIb.ai

EQUIPMENT Portable Auger Drill Rig	DIMENSION & TYPE OF EXCAVATION 6" diameter boring	DATE LOGGED 5-31-96
SURFACE ELEVATION ± 430' Mean Sea Level	GROUNDWATER DEPTH Not encountered	LOGGED BY JKH

FIELD DESCRIPTION AND CLASSIFICATION

DEPTH FT.	SYMBOL	SAMPLE	DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
		■	**SILTY FINE SAND/SANDY SILT** with roots and some rock fragments. Loose. Dry. Gray-brown. **FILL/TOPSOIL**	SM/ ML	16.6	111.3	16.5	115	96		50+	3"
5		▨	**SANDY SILTSTONE**, well indurated and slightly fractured. Very stiff. Damp. Tan-gray and orange. **FORMATION**	ML							50+	2"
			Bottom of hole @ 6.5'									
10												
15												
20												
25												

▽ WATER TABLE

☒ LOOSE BAG SAMPLE

[1] IN-PLACE SAMPLE

■ DRIVE SAMPLE

[S] SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION
7247 Fairway Road, La Jolla, California

JOB NUMBER
96-6938

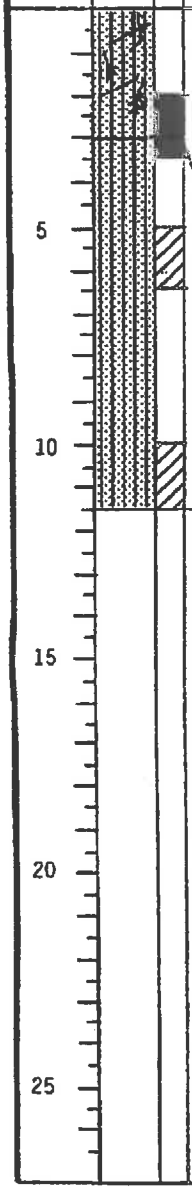
FIGURE NUMBER
IIIa

REVIEWED BY

LOG No.
B-1

EQUIPMENT Portable Auger Drill Rig	DIMENSION & TYPE OF EXCAVATION 6" diameter boring	DATE LOGGED 5-31-96
SURFACE ELEVATION ± 450' Mean Sea Level	GROUNDWATER DEPTH Not encountered	LOGGED BY JKH

FIELD DESCRIPTION AND CLASSIFICATION



DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
FINE SANDY SILT with some clay and roots, rock fragments. Loose to medium dense. Dry to damp. Gray-brown. FILL	ML	15.8	113.0	15.6	117	96		50+	3"
SANDY SILTSTONE, well indurated. Very stiff. Damp. Tan-gray and orange.	ML							30	2"
FORMATION								38	2"
Bottom of hole @ 11.5'									

∇ WATER TABLE

☒ LOOSE BAG SAMPLE

[1] IN-PLACE SAMPLE

▨ DRIVE SAMPLE

[s] SAND CONE/F.D.T.

JOB NAME Wang Residential Project		
SITE LOCATION 7247 Fairway Road, La Jolla, California		
JOB NUMBER 96-6938	REVIEWED BY	LOG No. **B-2**
FIGURE NUMBER IIIb		

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Portable Auger Drill Rig	6" diameter boring	5-31-96
SURFACE ELEVATION	GROUNDWATER DEPTH	LOGGED BY
± 430' Mean Sea Level	Not encountered	JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
		■	**SILTY FINE SAND/SANDY SILT** with roots and some rock fragments. Loose to medium dense. Dry to damp. Gray-brown. **FILL**	SM/ML	20.0	105.4	15.6	117	91		28	3"
5		▨	**SANDY SILTSTONE**, well indurated and slightly fractured. Firm. Damp to moist. Tan-gray and orange.	ML							28	2"
10		▨	**FORMATION**								40	2"
			Bottom of hole @ 11.5'									
15												
20												
25												

▽ WATER TABLE

☒ LOOSE BAG SAMPLE

[I] IN-PLACE SAMPLE

■ DRIVE SAMPLE

[S] SAND CONE/F.D.T.

JOB NAME	Wang Residential Project	
SITE LOCATION	7247 Fairway Road, La Jolla, California	
JOB NUMBER 96-6938	REVIEWED BY	LOG No. **B-3**
FIGURE NUMBER IIIc		

EQUIPMENT
Portable Auger Drill Rig

DIMENSION & TYPE OF EXCAVATION
6" diameter boring

DATE LOGGED
5-31-96

SURFACE ELEVATION
± 428' Mean Sea Level

GROUNDWATER DEPTH
Not encountered

LOGGED BY
JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
		■	**FINE SANDY SILT** with clay and chunks of siltstone and rock fragments. Soft to firm. Moist. Mottled tan-gray and orange-brown. **FILL**	ML	22.9	97.9	15.6	117	84		19	3"
5			**SANDY CLAY** with chunks of siltstone and rock fragments. Firm. Moist. Tan-dark brown.	CL							11	2"
		■	- some large rocks **FILL**		12.9	114.3			97			
10					1st	hole refused @ 10'					41	3"
			SANDY CLAY with some roots and cobbles. Firm to stiff. Damp. Dark red-brown. **TOPSOIL**	CL							13	2"
15			**SANDY SILTSTONE**, well indurated, slightly fractured. Stiff. Moist. Tan-gray and orange. **FORMATION**	ML							25/ 7"	2"
			Bottom of hole @ 13.5'									
20			B-5 refused @ 1' in 3 locations, concrete debris in wall backfill									
25												

∇ WATER TABLE
☒ LOOSE BAG SAMPLE
[1] IN-PLACE SAMPLE
■ DRIVE SAMPLE
[S] SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION
7247 Fairway Road, La Jolla, California

JOB NUMBER
96-6938

REVIEWED BY

LOG No.
B-4

FIGURE NUMBER
IIId

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Portable Auger Drill Rig	6" diameter boring	5-31-96
SURFACE ELEVATION	GROUNDWATER DEPTH	LOGGED BY
± 430' Mean Sea Level	Not encountered	JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
			SILTY FINE SAND/SANDY SILT with some clay, roots and rock fragments. Loose to medium dense. Dry. Tan-gray and dark brown (Very blocky).	SC/ MC								
1												
		1			25.9	99.1	15.6	117	85	*149		
2		☒	FILL									
3			**SANDY CLAY** with some roots, cobbles and some chunks of siltstone. Stiff. Damp. Dark red-brown. **SLOPEWASH/RESIDUUM**	CL								
4			Bottom of hole @ 4' Stem wall measured 43" from plate at bottom of crawlspace vent to top of footing.									
5												

*	UBC EXPANSION INDEX
∇	WATER TABLE
☒	LOOSE BAG SAMPLE
1	IN-PLACE SAMPLE
■	DRIVE SAMPLE
s	SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION
7247 Fairway Road, La Jolla, California

JOB NUMBER	REVIEWED BY	LOG No.
96-6938		**HP-1**
FIGURE NUMBER		
IIIe		

EQUIPMENT Portable Auger Drill Rig	DIMENSION & TYPE OF EXCAVATION 6" diameter boring	DATE LOGGED 5-31-96
SURFACE ELEVATION ± 430' Mean Sea Level	GROUNDWATER DEPTH Not encountered	LOGGED BY JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION		IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
			DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.								
1			**SILTY FINE SAND/SANDY SILT** with some clay, abundant roots and rock fragments. Loose to medium dense. Dry. Tan-gray and dark brown. **FILL**	SM/ ML								
2 3		☒	**SANDY SILTSTONE**, highly fractured but well indurated. Firm. Damp. Tan-gray and orange. **FORMATION**	ML			16.5	115				
4 5			Bottom of hole @ 3.5'									

∇ WATER TABLE
☒ LOOSE BAG SAMPLE
[1] IN-PLACE SAMPLE
▨ DRIVE SAMPLE
[S] SAND CONE/F.D.T.

JOB NAME Wang Residential Project		
SITE LOCATION 7247 Fairway Road, La Jolla, California		
JOB NUMBER 96-6938	REVIEWED BY	LOG No. **HP-2**
FIGURE NUMBER IIIf		

EQUIPMENT Portable Auger Drill Rig	DIMENSION & TYPE OF EXCAVATION 6" diameter boring	DATE LOGGED 5-31-96
SURFACE ELEVATION ±410' Above Mean Sea Level	GROUNDWATER DEPTH Not encountered	LOGGED BY JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
	▨		**SILTY FINE SAND/SANDY SILT** with some clay and abundant roots. Loose. Dry. Gray-brown. **FILL**	SM/MC								
1	▨		**SANDY CLAY** with abundant roots and rock fragments. Firm. Moist. Dark red-brown. **TOPSOIL**	CL								
2												
3			Bottom of hole @ 2' Retaining wall footing - City of San Diego Stan. Drawing. No reverse cantilever footing (±3' wide 12" - 18" deep).									
4												
5												

∇ WATER TABLE

☒ LOOSE BAG SAMPLE

[1] IN-PLACE SAMPLE

■ DRIVE SAMPLE

[s] SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION
7247 Fairway Road, La Jolla, California

JOB NUMBER
96-6938

FIGURE NUMBER
IIIg

REVIEWED BY

LOG No.
HP-3

EQUIPMENT
Portable Auger Drill Rig

DIMENSION & TYPE OF EXCAVATION
6" diameter boring

DATE LOGGED
5-31-96

SURFACE ELEVATION
± 416' Mean Sea Level

GROUNDWATER DEPTH
Not encountered

LOGGED BY
JKH

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLER O.D. (INCHES)
0–3 1 2	▨		**SILTY FINE SAND/SANDY SILT** with some clay and abundant chunks of siltstone and rock fragments. Loose to medium dense. Dry. Tan-gray and brown. FILL	SM/ ML								
3 4			3' fill on uphill side 1' on downhill side									

▽ WATER TABLE
☒ LOOSE BAG SAMPLE
[1] IN-PLACE SAMPLE
■ DRIVE SAMPLE
[s] SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION
7247 Fairway Road, La Jolla, California

JOB NUMBER
96-6938

REVIEWED BY

LOG No.
HP-4

FIGURE NUMBER
IIIh

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
E-120 Bucket Drill Rig	30" diameter boring	5-21-97
SURFACE ELEVATION	**GROUNDWATER DEPTH**	**LOGGED BY**
±416' Above Mean Sea Level	Not Encountered	JKH/LDR

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION		IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. − (%)	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
			DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.								
2			SILTY FINE SAND with roots, poor cohesion. Loose. Dry. Gray-brown	SM								
4			SILTY FINE SAND/ SANDY SILT with some roots to 1" diameter. Stiff. Damp. Medium brown. FILL	SM/ML								
6			SILTY FINE SAND. Loose to medium dense. Dry. Dark brown.	SM								
8			CLAYEY/SILTY SAND with some roots and organics. Medium dense. Damp. Dark brown. TOPSOIL	SC								
10			SILTY FINE SAND/SANDY SILT, highly weathered and fractured. Medium dense(firm). Damp. Light brown.	SM/ML								
12			-becomes light gray, orange & brown									
14			- still fractured, but less weathered. No open voids or joints.									
16												
18			- Planar gypsum features first occur. Material becomes more blocky and less fractured.									
20												
22			- N70°E 10°N Gypsum healed bedding feature. No soft, remolded clays or moisture. Thin gypsum sheets up to 1/8" unbroken.									
24			- 21'7" Material becomes very dense less fractured Ardath Shale. Interbedded siltstones and sandstones with no continuous planar features of weakness.									
26			ARDATH SHALE FORMATION									

∇ WATER TABLE

☒ LOOSE BAG SAMPLE

▢ IN-PLACE SAMPLE

▩ DRIVE SAMPLE

S SAND CONE/F.D.T.

JOB NAME Wang Residential Project

SITE LOCATION 7247 Fairway Road La Jolla, CA

JOB NUMBER 96-6938

FIGURE NUMBER IIIi

REVIEWED BY

LOG No. **B-5**

EQUIPMENT E-120 Bucket Drill Rig	DIMENSION & TYPE OF EXCAVATION 30" diameter boring	DATE LOGGED 5-21-97
SURFACE ELEVATION ±416' Above Mean Sea Level	GROUNDWATER DEPTH Not Encounterd	LOGGED BY JKH/LDR

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. - (%)	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
28			- 5/8" thick gypsum vien N22°W 64°W pinches out at 29.5'. All gypsum viens are steeply dipping to west.									
30			- N20°E 70°NW - Material becomes very dense with only minor degree of fracturing. Dips of healed joints and fractures role over to less than 15°.									
32												
34			- 1/2" thick, unbroken gypsum vien possibly following bedding N10°E Dip 8°E. Several near vertical gypsum viens cross cut bed, no offset.									
36												
38			- Material becomes massively bedded Minor color variation, light gray to gray with some orange.									
40			- N10°W 8°E bedding controlled gypsum vien.									
42												
44			- Moderate intensity gypsum- vien features every square foot.									
46			- N35°W 13°E 1" thick solid crystal gypsum bed.									
48												
50			- Horizontal 1/2" thick gypsum vien									
52			ARDATH SHALE FORMATION									
54												

∇ WATER TABLE

☒ LOOSE BAG SAMPLE

☐ IN-PLACE SAMPLE

■ DRIVE SAMPLE

[S] SAND CONE/F.D.T.

JOB NAME Wang Residential Project		
SITE LOCATION 7247 Fairway Road La Jolla, CA		
JOB NUMBER 96-6938	REVIEWED BY	LOG No. **B-5**
FIGURE NUMBER IIIj		

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
E-120 Bucket Drill Rig	30" diameter boring	5-21-97
SURFACE ELEVATION	**GROUNDWATER DEPTH**	**LOGGED BY**
±416' Above Mean Sea Level	Not Encountered	JKH/LDR

DEPTH FT.	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + CONSOL. − (%)	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
56			SILTSTONE/SANDSTONE, interbedded, massive. Very dense (hard). Damp. Light gray and orange.	SM/ML								
58												
60			-East/West 70° dipping gypsum vien									
62												
64			-N40°E 5°SE iron staining in bedding Minor fault trending N20°E 78°SE across bed. Offsets bed ±2" on SW side. Gypsum crystal healed.									
66												
68			-Gypsum healing 1/4" to 1/2" continues to bottom of hole.									
70			ARDATH SHALE FORMATION									
72			Bottom of hole @ 71'									
74												
76												
78												
80												

▽ WATER TABLE

☒ LOOSE BAG SAMPLE

[I] IN-PLACE SAMPLE

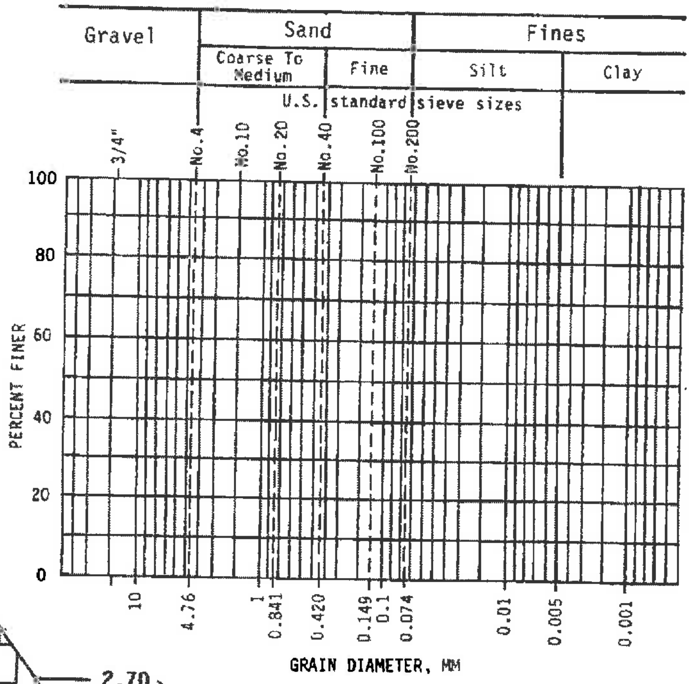
■ DRIVE SAMPLE

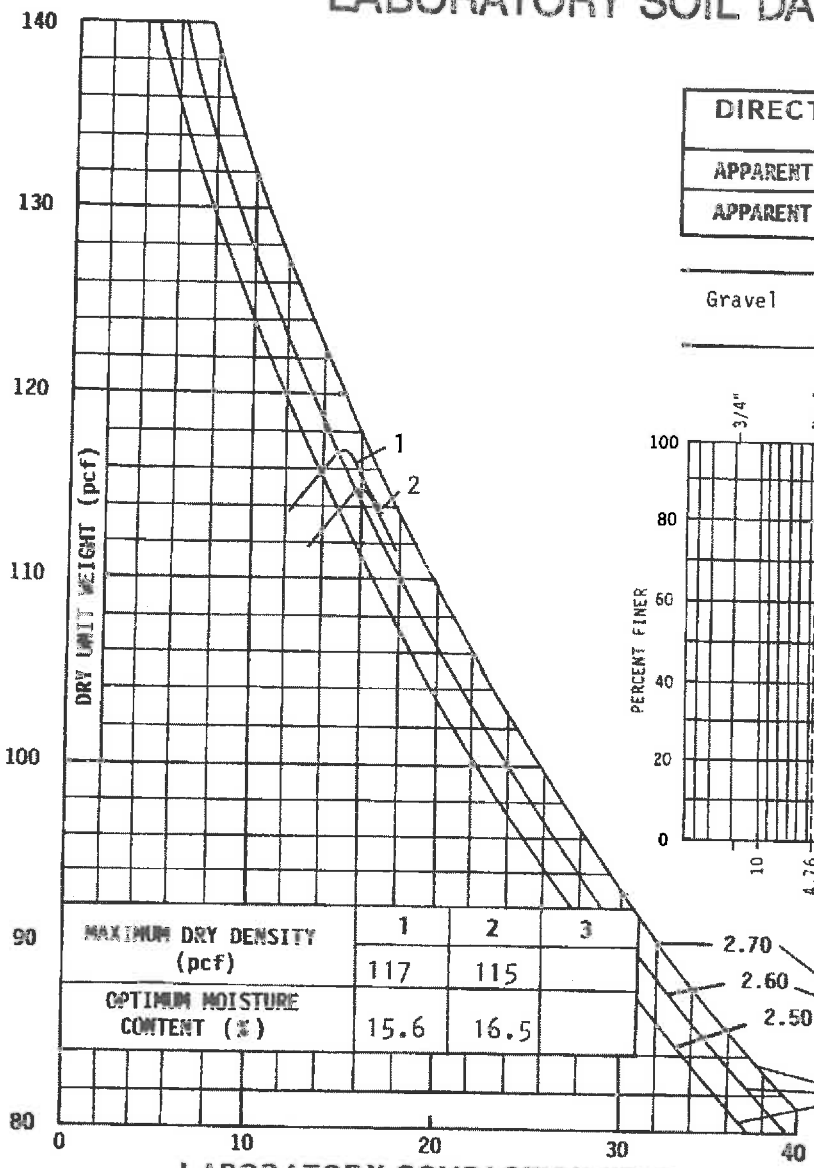
[S] SAND CONE/F.D.T.

JOB NAME Wang Residential Project		
SITE LOCATION 7247 Fairway Road La Jolla, CA		
JOB NUMBER 96-6938	REVIEWED BY	LOG No. **B-5**
FIGURE NUMBER IIIk		

LABORATORY SOIL DATA SUMMARY

DIRECT SHEAR TEST DATA	1	2	3
APPARENT COHESION (psf)	1250	-	
APPARENT FRICTION ANGLE	13°	-	





	1	2	3
MAXIMUM DRY DENSITY (pcf)	117	115	
OPTIMUM MOISTURE CONTENT (%)	15.6	16.5	

LABORATORY COMPACTION TEST

SOIL TYPE	SOIL CLASSIFICATION	BORING No.	TRENCH No.	DEPTH
1	SILTY FINE SAND/SANDY SILT with some clay. Tan-gray and dark brown.		HP-1	2'
2	SANDY SILTSTONE. Tan-gray and orange.		HP-2	2'
3				

SWELL TEST DATA	1	2	3
INITIAL DRY DENSITY (pcf)	105.4	-	
INITIAL WATER CONTENT (%)	13.0	-	
LOAD (psf)	144	-	
UBC EXPANSION INDEX	149	-	

FIGURE NUMBER IVa
JOB NUMBER 96-6938

ATTERBERG LIMIT DETERMINATIONS

(ASTM D423 AND D424)

No.	DESCRIPTION	Liquid Limit;LL	Plastic Limit;PL	Plastic Index;PI
1	SILTY FINE SAND/SANDY SILT with some clay. Tan-gray and dark brown.	44.0	24.2	19.8
2	SANDY SILTSTONE. Tan-gray and orange.	40.0	24.7	15.3

PLASTICITY INDEX; PI = LL − PL

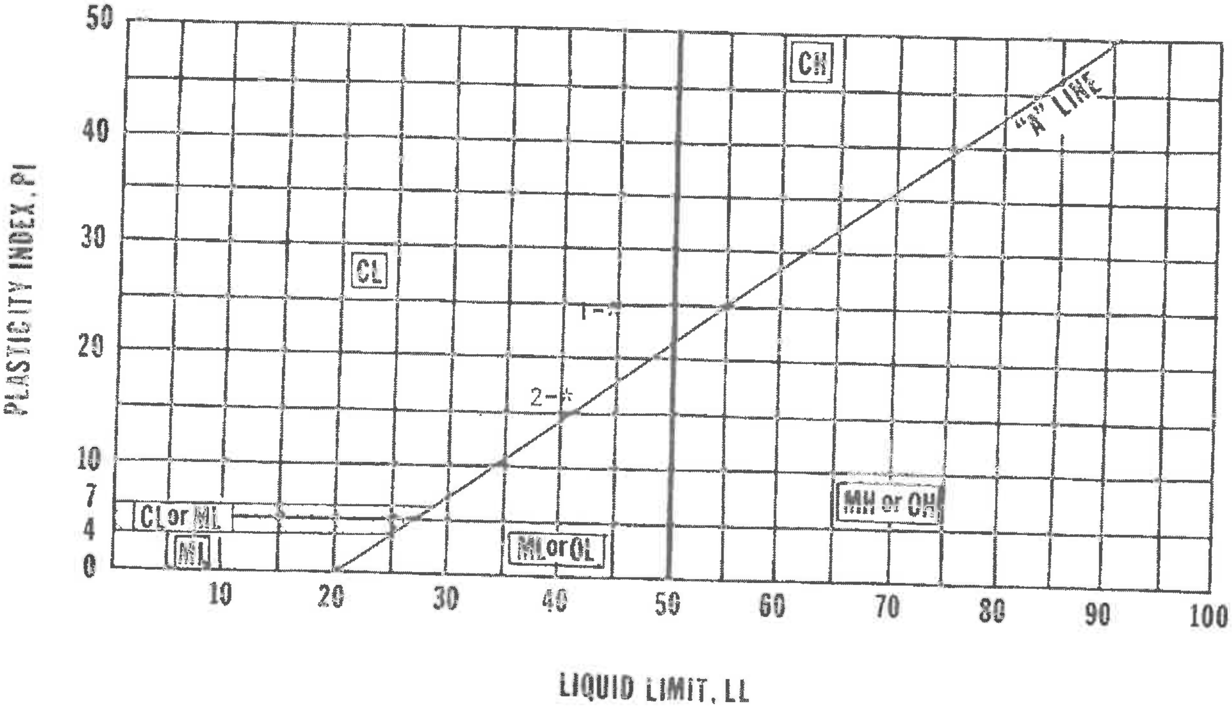
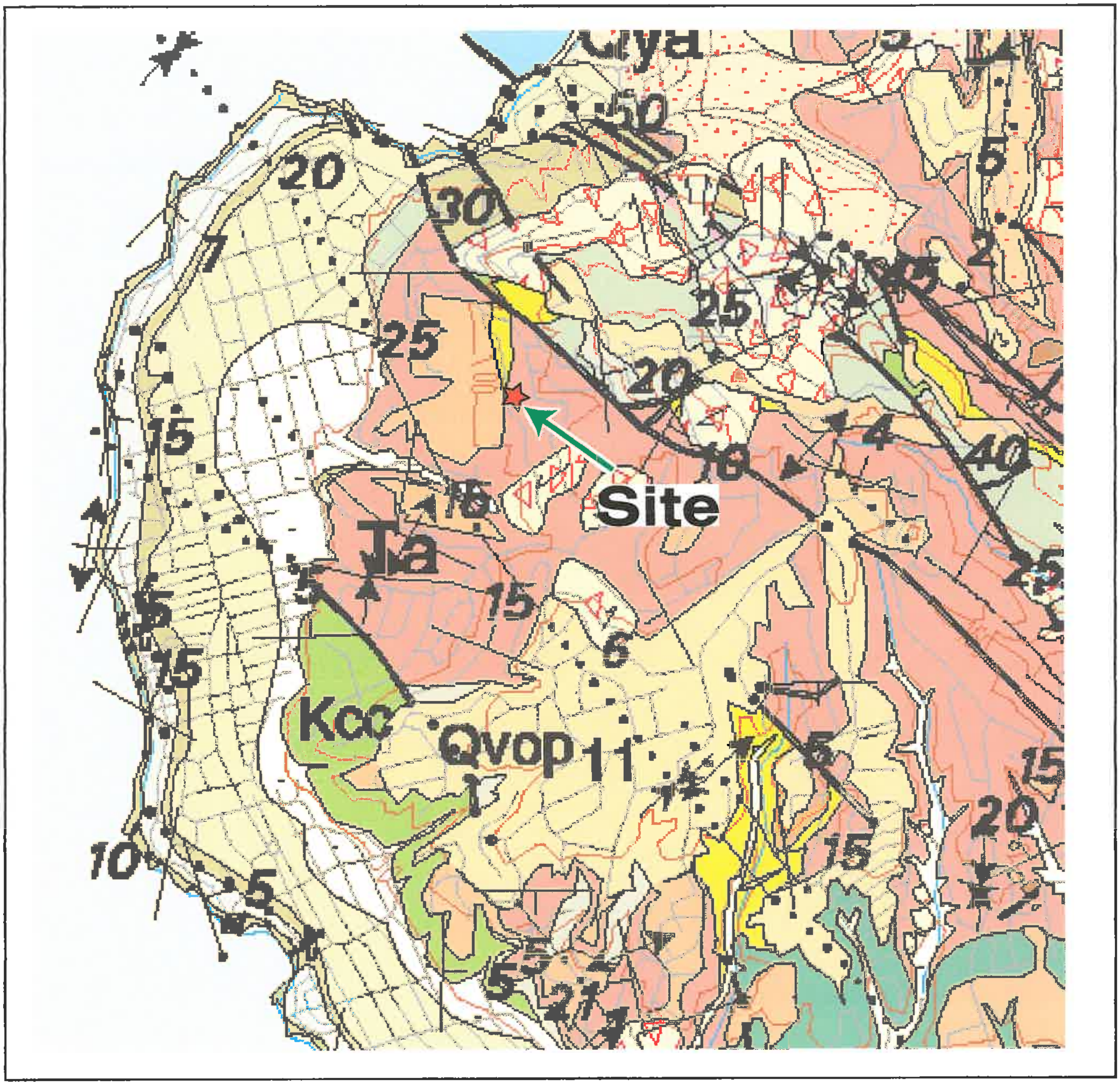


FIGURE NUMBER IVb
JOB NUMBER 96-6938

GEOLOGY MAP

2005

by Michael P. Kennedy and Siang S. Tan



Wang Residential Project
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La Jolla, CA.

Figure No. Va
Job No. 96-6938

CALIFORNIA GEOLOGICAL SURVEY
MICHAEL S. REICHLE, ACTING STATE GEOLOGIST

STATE OF CALIFORNIA - ARNOLD SCHWARZENEGGER, GOVERNOR
THE RESOURCES AGENCY - MICHAEL CHRISMAN, SECRETARY
DEPARTMENT OF CONSERVATION - DEBBIE SARBERAM, INTERIM DIRECTOR

DESCRIPTION OF MAP UNITS

Ta

Ardath Shale (middle Eocene)—Mostly uniform, weakly fissile olive-gray silty shale. The upper part contains thin beds of medium-grained sandstone, similar to thicker ones in the overlying Scripps Formation, and concretionary beds with molluscan fossils. The type section of the Ardath Shale is on the east side of Rose Canyon, 800 m south of the Ardath Road intersection with Interstate 5 (Kennedy and Moore, 1971)

Correlation of Map Units and Description of Map Units
for the

Geologic Map of the San Diego 30' X 60' Quadrangle, California

Compiled by
Michael P. Kennedy and Siang S. Tan

2005

Digital Preparation by
Kelly R. Bovard[1], Anne G. Garcia[1] and Diane Burns[1]

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

ONSHORE MAP SYMBOLS

Contact—Contact between geologic units; dotted where concealed.

Contact—Contact between paralic deposits and their associated marine abrasion platforms. This contact is approximate and generally buried by 1-5 m of marine and/or nonmarine sediment.

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

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

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

Landslide—Arrows indicate principal direction of movement.

Fault Zone—Area of extensively sheared rock within a zone defined by multiple faults.

Strike and dip of beds

Inclined

Strike and dip of igneous joints

Inclined

Vertical

Strike and dip of metamorphic foliation

Inclined

OFFSHORE MAP SYMBOLS

Contact

Contact—All contacts are extrapolated from a combination of seismic reflection data, samples and bathymetry, and are approximate in location.

Fault

Fault—Solid where well defined; dashed where inferred. Where fault offsets sea floor, age symbol is shown on bar on downthrown side. Where age was determined, age symbol is shown astride fault and relative offset if known is shown by "D" and "U" on downthrown and upthrown sides. Ages of faults are indicated as follows.

- ⊠ cuts strata of Holocene age
- ◪ cuts strata of Quaternary age
- Λ cuts strata of Miocene age or older
- ○ cuts strata of late Tertiary and Quaternary age

Fault Zone—Area of extensively sheared rock within a zone defined by multiple faults.

Folds

Anticline—Solid where well defined, dashed where inferred.

Syncline—Solid where well defined, dashed where inferred.

Landslides

Creep—Dashed where inferred.

Creep (noted on single survey line)—Arrow indicates apparent direction of sediment movement.

Slump—Dashed where inferred, queried where uncertain. Arrows indicate direction of movement.

Erosional scarp—Solid where well defined, dashed where inferred. Generally associated with active channels.

Channels and levees

Active Channel—Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport.

Levees—Dashed where inferred.

Figure No. Vb
Job No. 96-6938

City of San Diego
Seismic Safety Study
Geologic/Hazards and Faults
(1995)

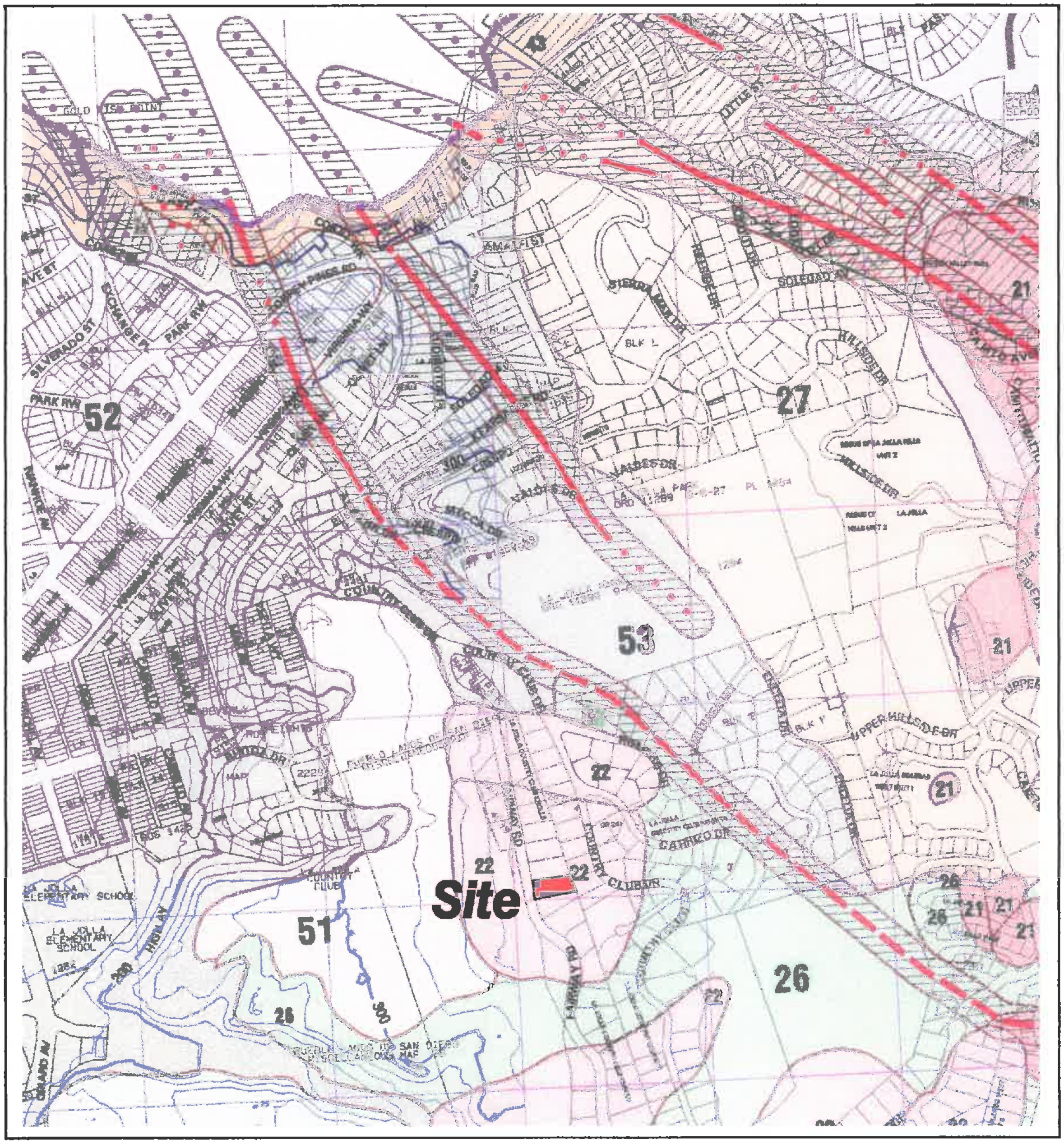

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Figure No. VIa
Job No. 96-6938

October 2008

LEGEND

Geologic Hazard Categories

(per City of San Diego Seismic Safety Study, 1995)

FAULT ZONES

- ▨ 11 Active
- ▤ 12 Potentially Active
  Inactive, presumed inactive or activity unknown
- ■ 13 Downtown special fault zone

LANDSLIDES

- ■ 21 Confirmed, known, or highly suspected
- ■ 22 Possible or conjectured

SLIDE-PRONE FORMATIONS

- ■ 23 Friars: neutral or favorable geologic structure
- ■ 24 Friars: unfavorable geologic structure
- ■ 25 Ardath: neutral or favorable geologic structure
- ■ 26 Ardath: unfavorable geologic structure
- ■ 27 Otay, Sweetwater and others

LIQUEFACTION

- ■ 31 High Potential - shallow groundwater
  major drainages, hydraulic fills
- □ 32 Low Potential - fluctuating groundwater
  minor drainages

COASTAL BLUFFS

- ■ 41 Generally unstable
  Numerous landslides, high steep bluffs,
  severe erosion, unfavorable geologic structure
- ■ 42 Generally unstable
  Unfavorable bedding planes, high erosion
- ■ 43 Generally unstable
  Unfavorable jointing, local high erosion
- ■ 44 Moderately stable
  Mostly stable formations, local high erosion
- ■ 45 Moderately stable
  Some minor landslides, minor erosion
- ■ 46 Moderately stable
  Some unfavorable geologic structure, minor or no erosion
- ■ 47 Generally stable
  Favorable geologic structure, minor or no erosion,
  no landslides
- ■ 48 Generally stable
  Broad beach areas, developed harbor

OTHER TERRAIN

- □ 51 Level mesas - underlain by terrace deposits and bedrock
  nominal risk
- □ 52 Other level areas, gently sloping to steep terrain,
  favorable geologic structure, low risk
- ■ 53 Sloping terrain, unfavorable geologic structure,
  Low to moderate risk
- ■ 54 Steeply sloping terrain, unfavorable or fault controlled
  geologic structure, Moderate risk
- ■ 55 Modified Terrain (graded sites)
  Nominal risk

- 🟦 Water (Bays and Lakes)

FAULTS

- 〰 Fault
- 〰 Inferred Fault
- • • • Concealed Fault
- ⩘ Shear Zone

Contour interval: 20 feet

Figure No. VIb
Job No. 96-6938

Geotechnical Exploration, Inc.

CROSS SECTION A-A'

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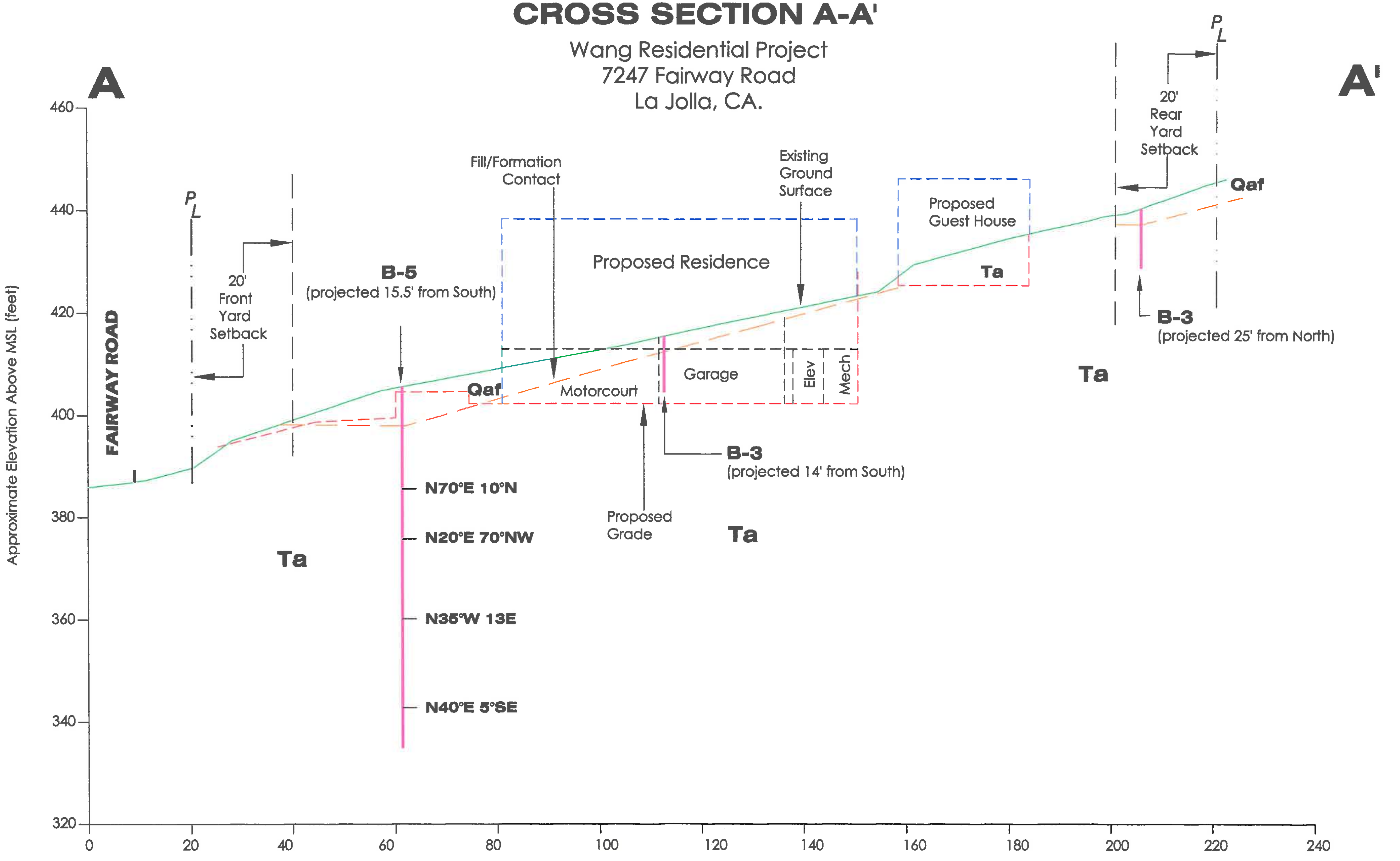
La Jolla, CA.



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

Relative Horizontal Distance (feet)
Scale:1" = 20'
(Horizontal and Vertical)

Figure No. VIIa

Job No. 96-6938

Geotechnical Exploration, Inc.

October 2017

96-6938-AA-3

CROSS SECTION B-B'

Wang Residential Project
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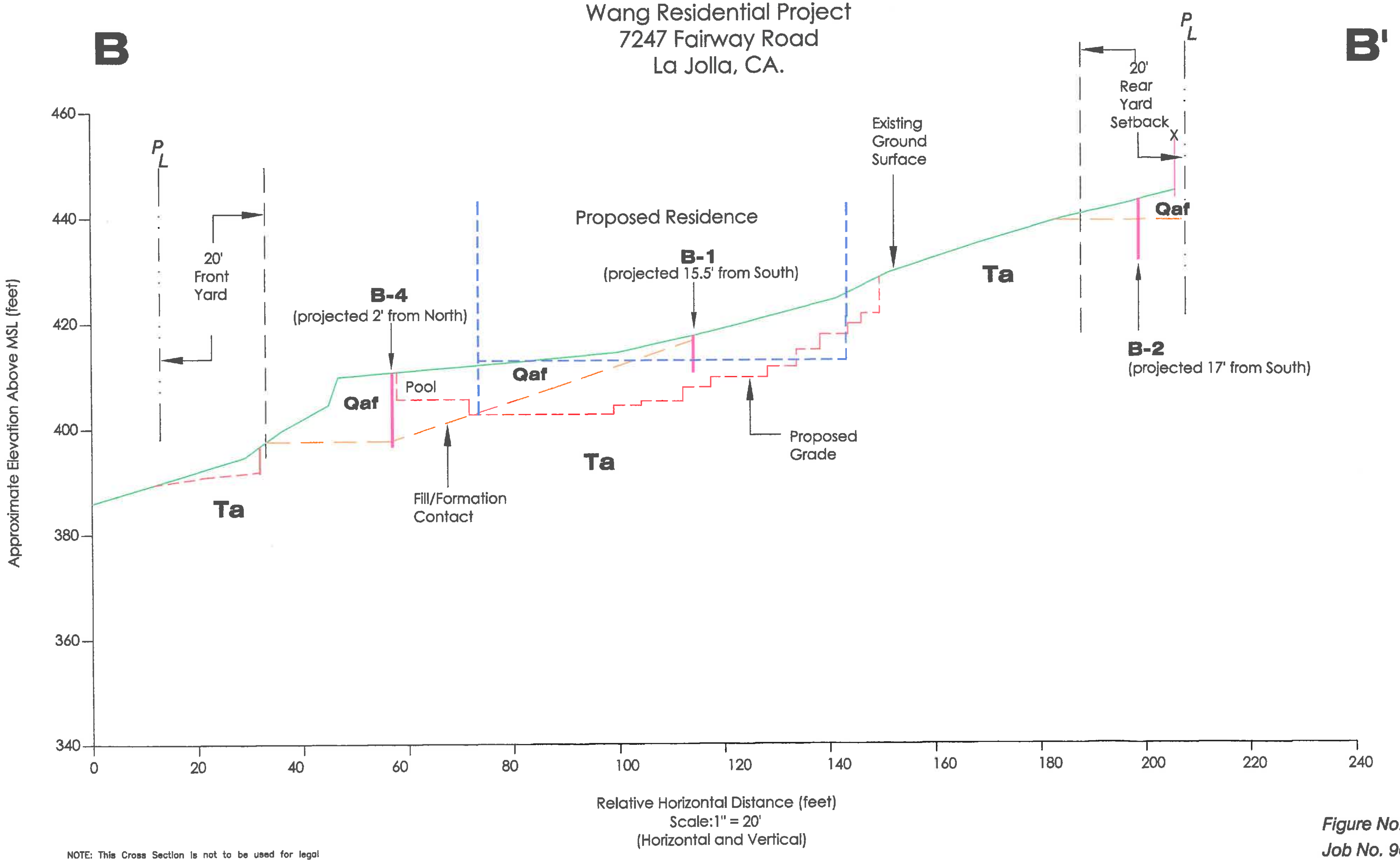
La Jolla, CA.



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

Figure No. VIIb
Job No. 96-6938

Geotechnical Exploration, Inc.

October 2017

96-6938-BB-3

CROSS SECTION C-C'

Wang Residential Project
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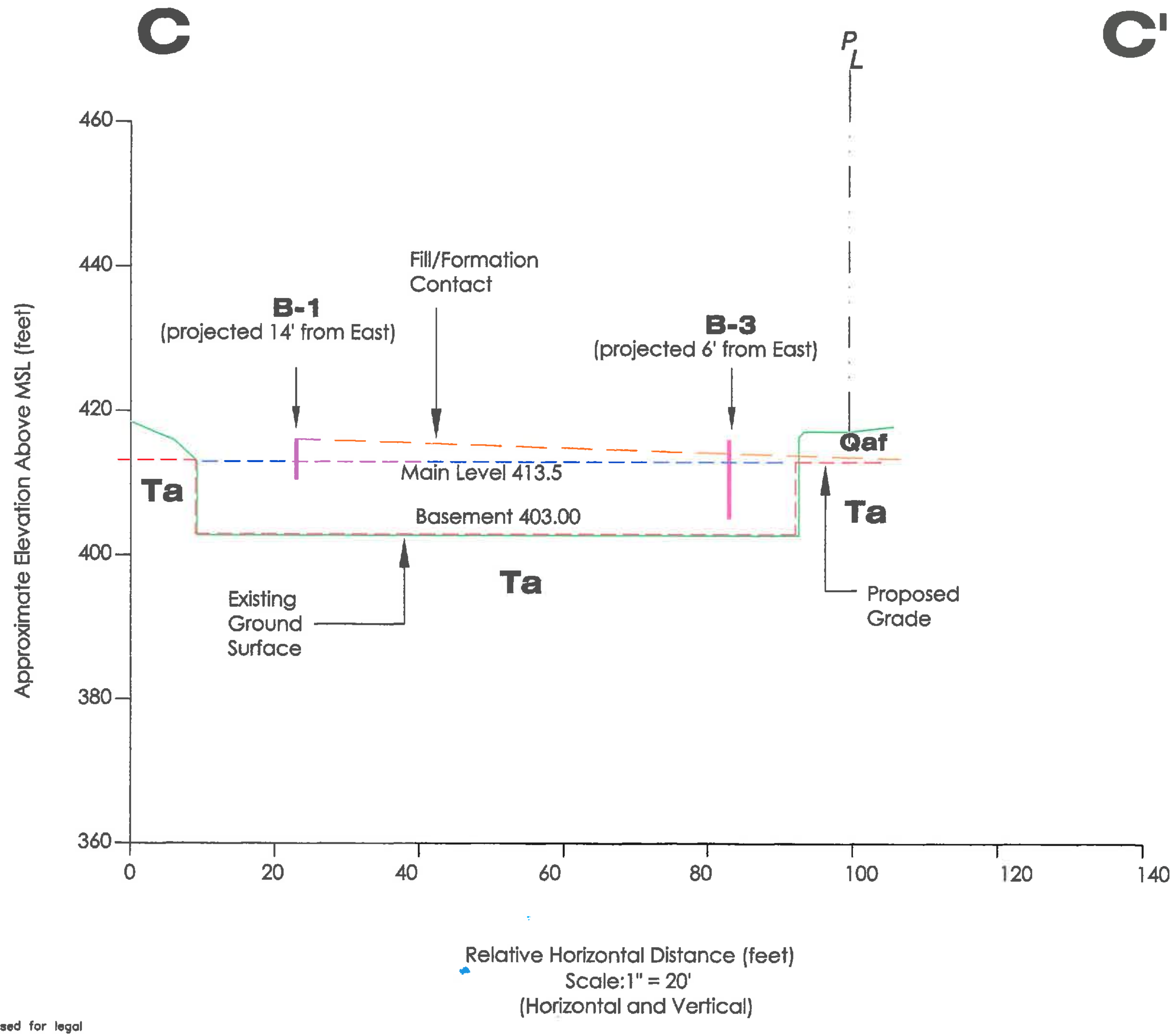
La Jolla, CA.



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

96-6938-CC-3

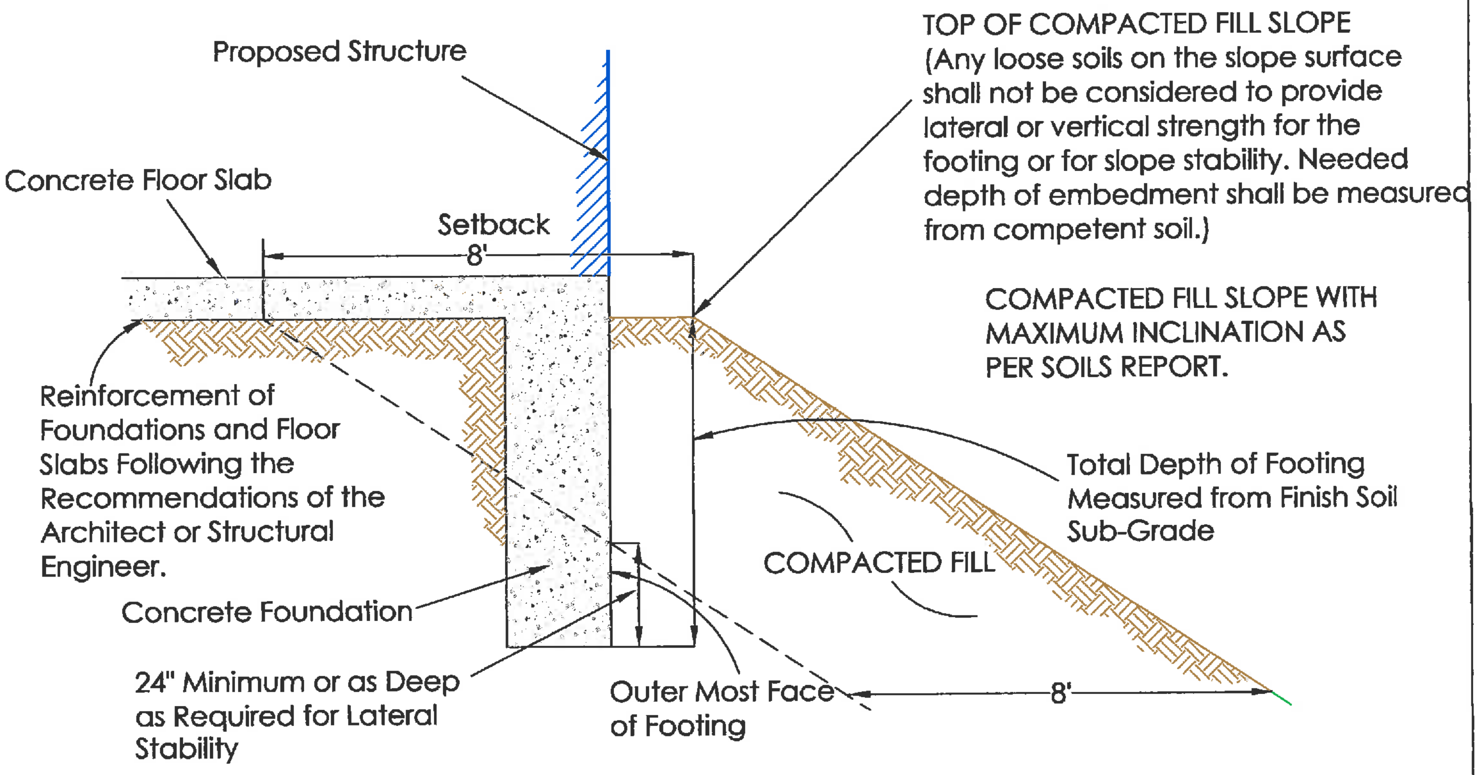
Figure No. VIIc

Job No. 96-6938

Geotechnical Exploration, Inc.

October 2017

FOUNDATION REQUIREMENTS NEAR SLOPES



TYPICAL SECTION

(Showing Proposed Foundation Located Within 8 Feet of Top of Slope)

24" FOOTING / 8' SETBACK

Total Depth of Footing

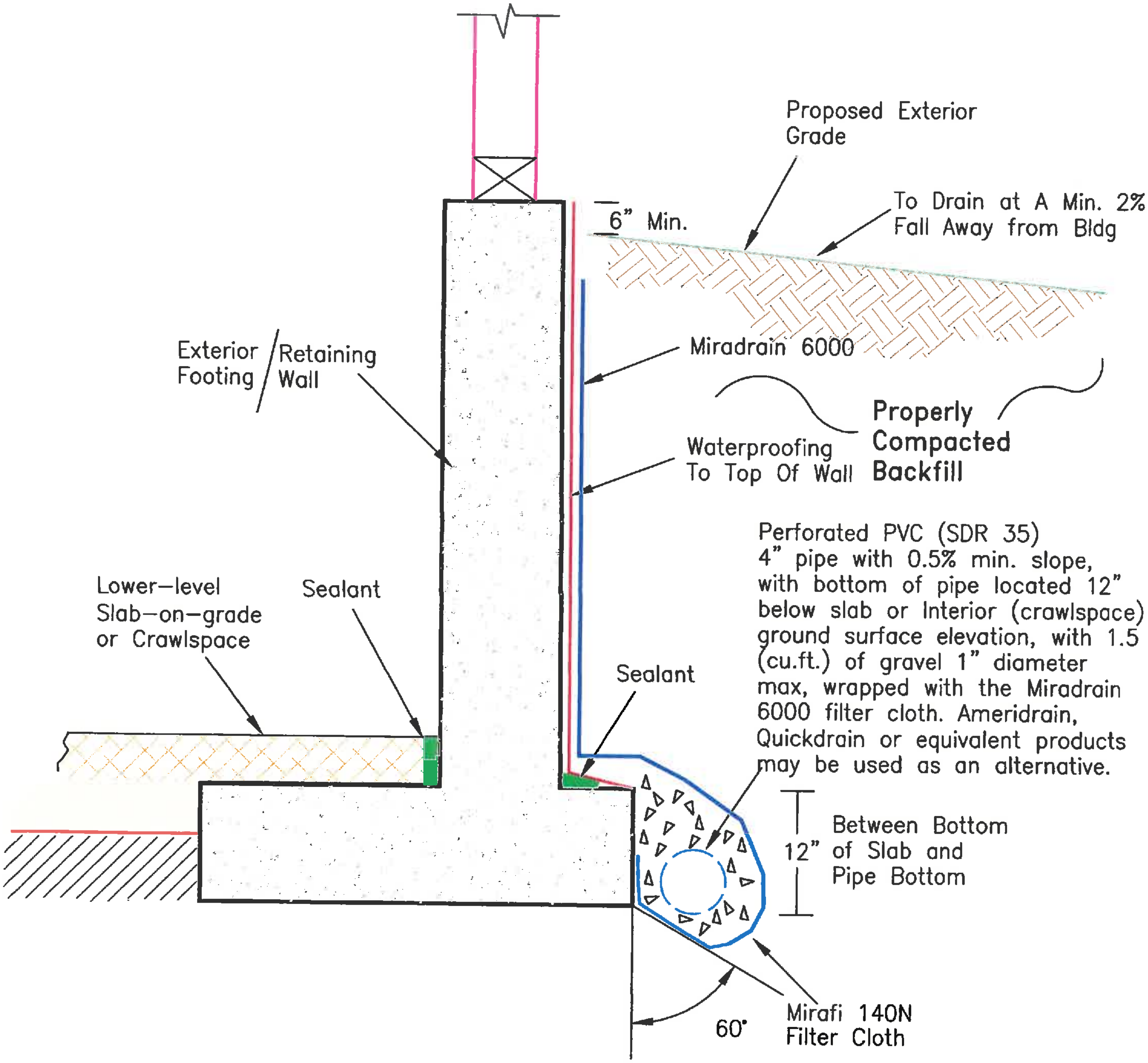
Distance From Top of Slope	1.5:1.0 SLOPE *	2.0:1.0 SLOPE
0	88"	72"
2'	72"	60"
4'	57"	48"
6'	40"	36"
8'	24"	24"

* when applicable

Figure No. VIII
Job No. 96-6938

Geotechnical Exploration, Inc.

RECOMMENDED SUBGRADE RETAINING WALL DRAINAGE SCHEMATIC



NOT TO SCALE

Figure No. IX

Job No. 96-6938

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

Geotechnical Exploration, Inc.

96–6938–IX

APPENDIX A
UNIFIED SOIL CLASSIFICATION CHART
SOIL DESCRIPTION

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

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

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

SILTS AND CLAYS

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

(rev. 6/05)

APPENDIX B
MODIFIED MERCALLI INTENSITY SCALE OF 1931
(Excerpted from the California Division of Conservation Division of Mines and Geology DMG Note 32)

The first scale to reflect earthquake intensities was developed by deRossi of Italy, and Forel of Switzerland, in the 1880s, and is known as the Rossi-Forel Scale. This scale, with values from I to X, was used for about two decades. A need for a more refined scale increased with the advancement of the science of seismology, and in 1902, the Italian seismologist Mercalli devised a new scale on a I to XII range. The Mercalli Scale was modified in 1931 by American seismologists Harry O. Wood and Frank Neumann to take into account modern structural features.

The Modified Mercalli Intensity Scale measures the intensity of an earthquake's effects in a given locality, and is perhaps much more meaningful to the layman because it is based on actual observations of earthquake effects at specific places. It should be noted that because the damage used for assigning intensities can be obtained only from direct firsthand reports, considerable time -- weeks or months -- is sometimes needed before an intensity map can be assembled for a particular earthquake.

On the Modified Mercalli Intensity Scale, values range from I to XII. The most commonly used adaptation covers the range of intensity from the conditions of *"I -- not felt except by very few, favorably situated,"* to *"XII -- damage total, lines of sight disturbed, objects thrown into the air."* While an earthquake has only one magnitude, it can have many intensities, which decrease with distance from the epicenter.

It is difficult to compare magnitude and intensity because intensity is linked with the particular ground and structural conditions of a given area, as well as distance from the earthquake epicenter, while magnitude depends on the energy released at the focus of the earthquake.

I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects thrown upward into the air.

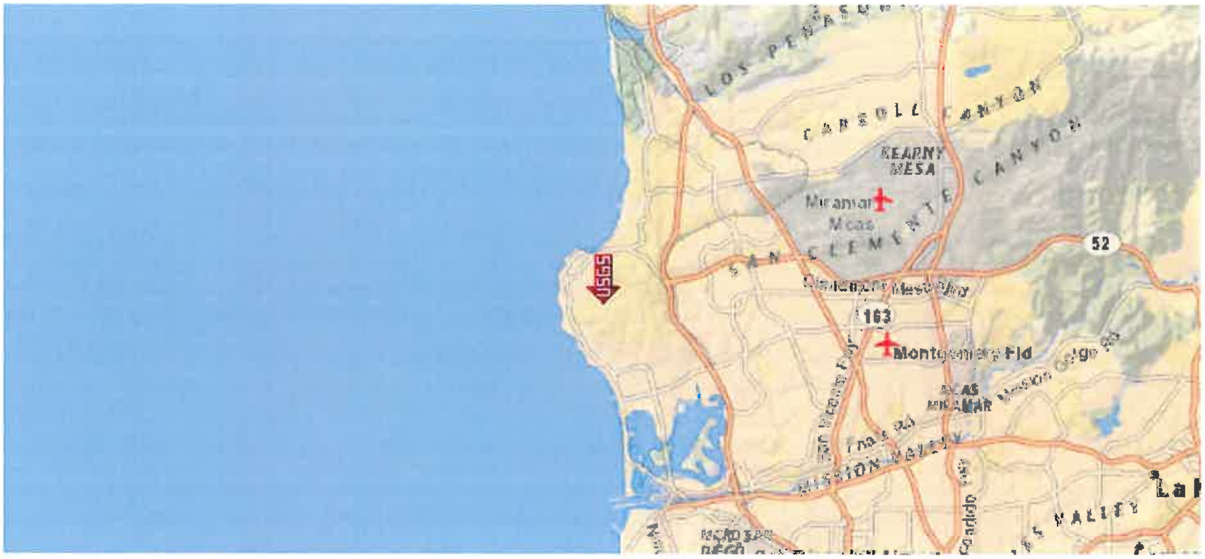
APPENDIX C

USGS Design Maps Summary Report

Design Maps Summary Report

User–Specified Input

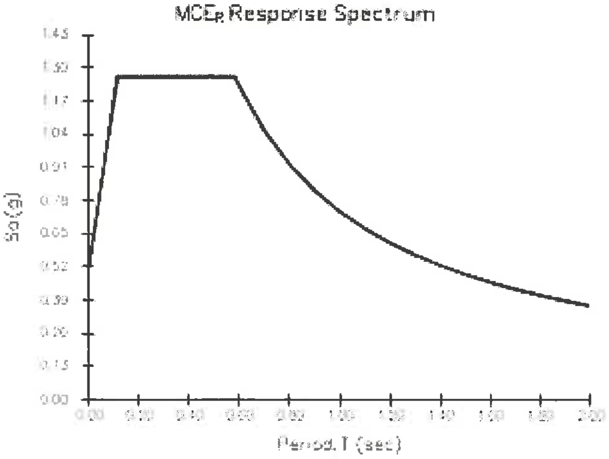
Report Title	7247 Fairway Road, La Jolla, CA Tue October 3, 2017 21:47:25 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	32.8392°N, 117.2628°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

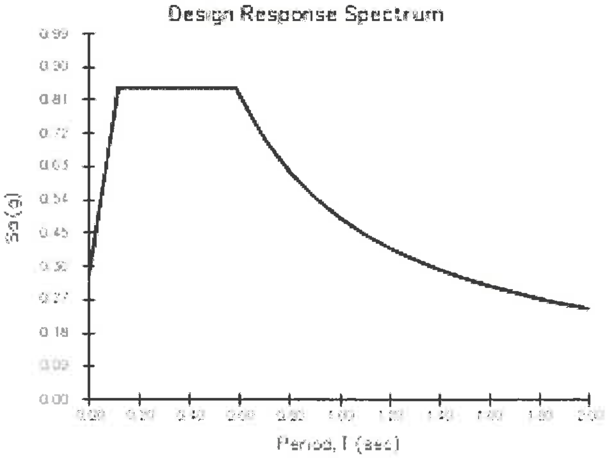


USGS–Provided Output

S_S = 1.266 g	S_{MS} = 1.266 g	S_{DS} = 0.844 g
S_1 = 0.488 g	S_{M1} = 0.738 g	S_{D1} = 0.492 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (32.8392°N, 117.2628°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	$S_S = 1.266$ g
From Figure 22-2 [2]	$S_1 = 0.488$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ **or** $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1		See Section 20.3.1	

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = D and S_S = 1.266 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.488 g, F_v = 1.512

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 1.266 = 1.266$ g

---

Equation (11.4-2): $S_{M1} = F_VS_1 = 1.512 \times 0.488 = 0.738$ g

---

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.266 = 0.844$ g

---

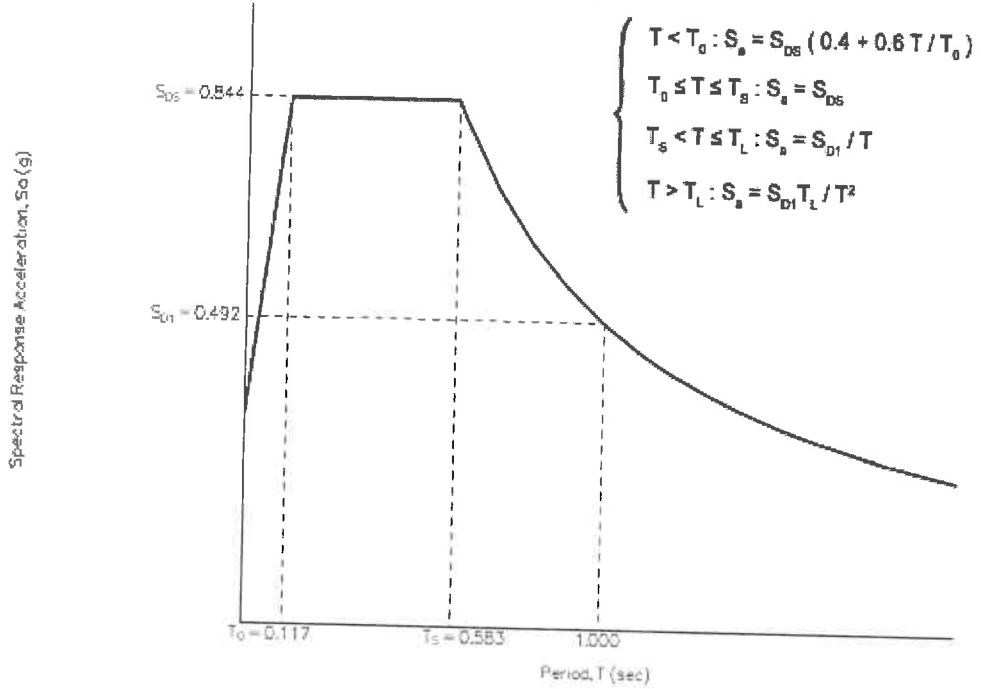
Equation (11.4-4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 0.738 = 0.492$ g

---

Section 11.4.5 — Design Response Spectrum

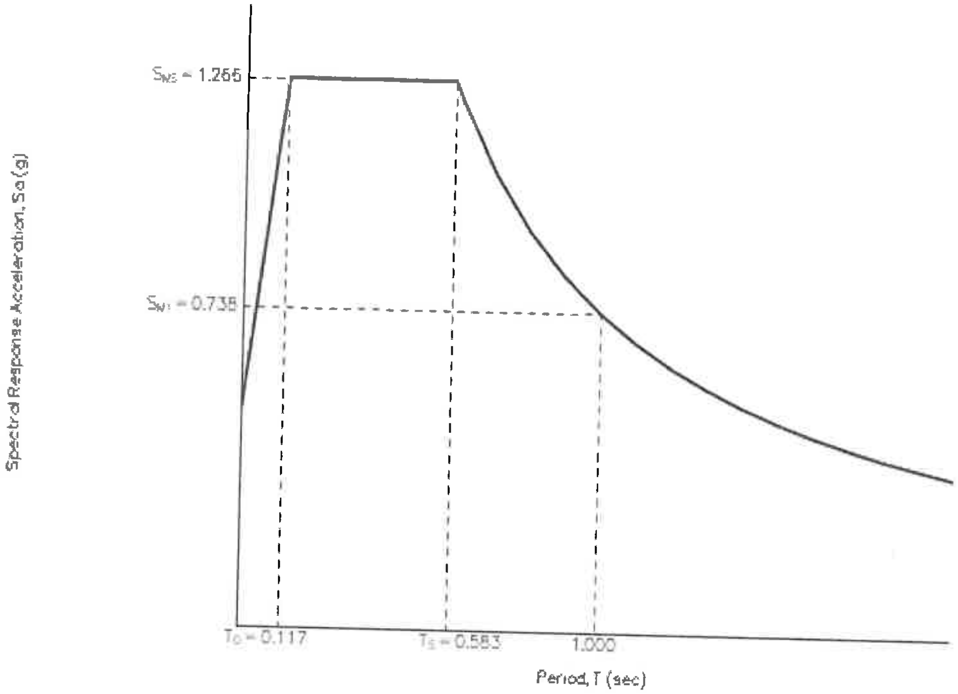
From <u>Figure 22-12</u> [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.567

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.567 = 0.567$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.567 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] $C_{RS} = 0.844$

From Figure 22-18 [6] $C_{R1} = 0.876$

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	**RISK CATEGORY**		
	I or II	**III**	**IV**
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.844 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	**RISK CATEGORY**		
	I or II	**III**	**IV**
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.492 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

APPENDIX D

SLOPE STABILITY ANALYSIS

SLOPE STABILITY CALCULATIONS WITH SLIDE 6 COMPUTER PROGRAM
Wang Residential Project
GEI Job No. 96-6938

We have performed gross slope stability calculations using the *SLIDE 6* program by Roc Science. The program is a limit equilibrium slope stability program that allows the use of several slope stability methods to calculate the factors of safety against shear failure. On this project, we used the Janbu Simplified method as a basis for calculations when using circular slide planes for analysis through the site geological cross sections.

The program calculates the factor of safety against soil shear failure of potential slide surfaces for selected locations. We select the range of slide surfaces where shear failure is likely to occur. The program output figure shows the factor of safety for the analyzed surface range. The printout displays a geologic cross-section with different colored layers, with each layer corresponding to their respective soil strength parameters. A block with contours of different colors and shades corresponds to different ranges of factors of safety within a calculated specified analyzed range of slide surfaces (see attached printouts for Section A-A', Section B-B', and Section C-C' in the attached report). The program displays numbers inside the contour box representing the factor of safety for that surface. The green circular number represents the lowest possible factor of safety that was calculated out of all possible calculated surfaces within the contour block. Soil strength values, geometry, and water conditions (no water encountered) used in the program were based on geological information at the site obtained by our project geologist. The soil strength values were obtained from shear strength tests performed by Geotechnical Exploration Inc. in remolded soil samples and values of other properties in the same vicinity. Since the soil cohesion of formational soils cannot be fully reproduced in remolded soils samples, we have adjusted those values based on our experience and observations at the site and slopes in the vicinity.

Once the static gross stability of different slide planes was calculated, we analyzed the same sections including a seismic lateral force of 0.15g to obtain the factor of safety for seismic conditions. The calculated factors of safety for both static and seismic analysis yielded values that are considered acceptable, i.e., 1.5 or higher for static load analysis, and 1.15 for seismic analysis.

The shallow slope stability calculations were performed on the different slope segments measured on the slope faces of sections along the different slopes by using geotechnically accepted equation for infinite slopes with saturated upper layer. The calculations were performed by assuming that the upper 3 feet of those soils were saturated and the slope segment analyzed had infinite length. Locations where calculations yielded the factor of safety against shear failure below 1.5 should be re-compacted and graded to a 2H:1V slope. The calculated factors of safety also yielded factors of safety that are equal or higher than the minimum acceptable of 1.5.

γ_{sat}	γ_{water}	γ'	H
pcf	pcf	pcf	ft
130	62.4	67.6	3

SHALLOW FAILURE

EQUATION 1

$$F.S. = \left(\frac{C}{\gamma_{sat} \times H \times \cos(\beta) \times \sin(\beta)}\right) + \left(\frac{\gamma'}{\gamma_{sat}} * \frac{\tan(\varphi)}{\tan(\beta)}\right)$$

SHALLOW SLOPE STABILITY ANALYSIS IS BASED ON EQUATION (1) FOR THE CALCULATED VALUES.

CROSS-SECTION A-A'				
SOIL TYPE	C (psf)	ϕ(°)	β(°)	F.S.
FILL (Qaf)	200	20	18	2.327
ARDATH (Ta)	700	13	12	9.391
ARDATH (Ta)	700	13	26	4.802

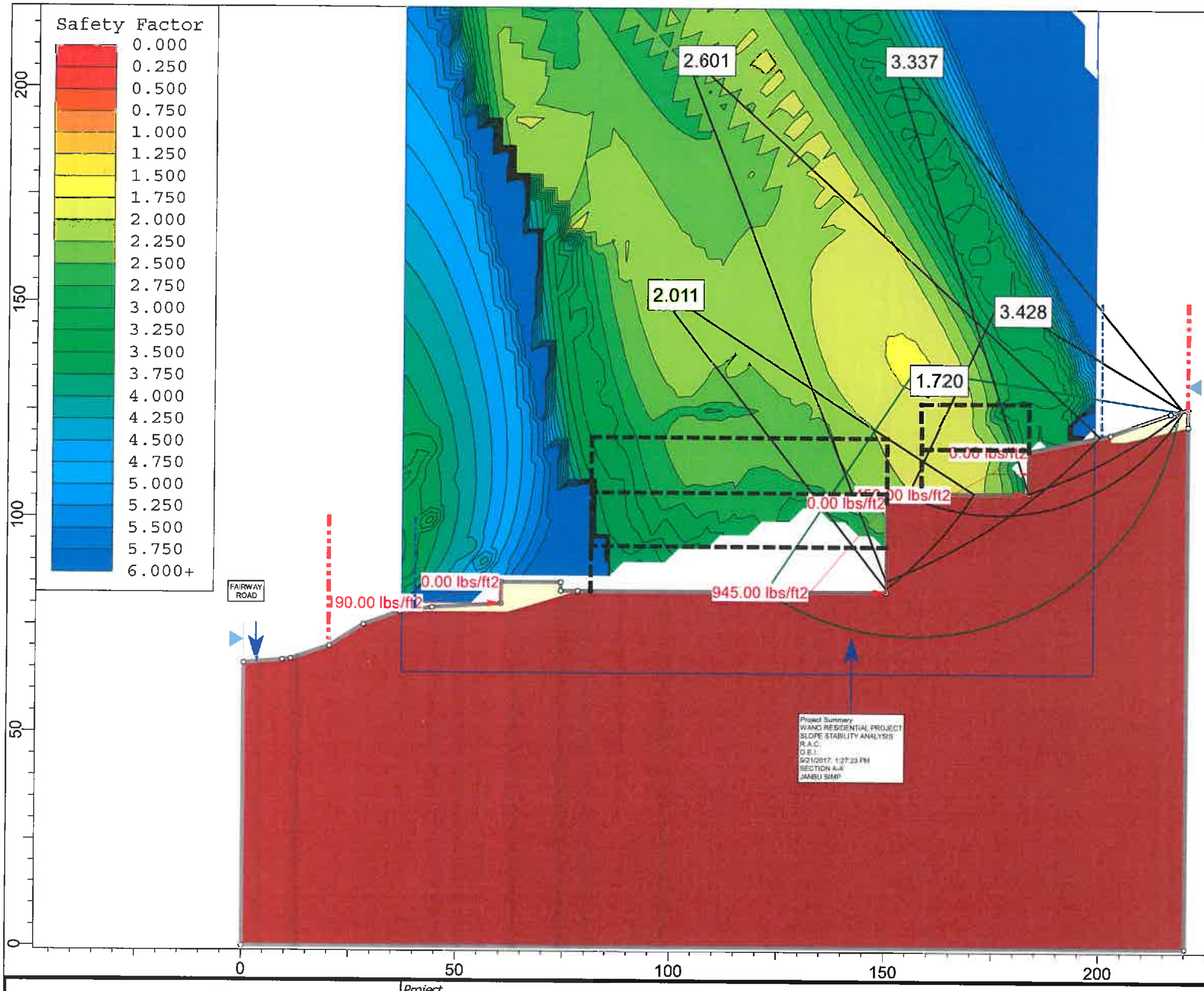
CROSS-SECTION B-B'				
SOIL TYPE	C (psf)	ϕ(°)	β(°)	F.S.
FILL (Qaf)	200	20	14	2.944
ARDATH (Ta)	700	13	17	6.812
FILL (Qaf)	200	20	20	2.116
FILL (Qaf)	200	20	32	1.444

FILL (Qaf)	200	20	27	1.639

2:1 SLOPE

β	Slope inclination with respect to the horizontal plane
ϕ	Friction angle of the soil
C	Cohesion of the soil
γ_{sat}	Saturated unit weight of the soil
γ'	Submerged unit weight of the soil
H	Thickness of the saturated soil layer

Factors of Safety **ABOVE** 1.5 are adequate. Factors of Safety **BELOW** 1.5 should be graded to a slope angle no greater than 27° (2H:1V slope).



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
EXISTING FILL (Qafe)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Static analysis of the proposed slope for the proposed residence and guest house. An equivalent lateral fluid pressure of 45 pcf was used for the main residence and upper level guest house. A pressure of 38 pcf was used for the retaining wall located adjacent to Fairway Road.

Geotechnical Exploration, Inc.

Project	WANG RESIDENTIAL PROJECT		
Analysis Description	SLOPE STABILITY ANALYSIS		
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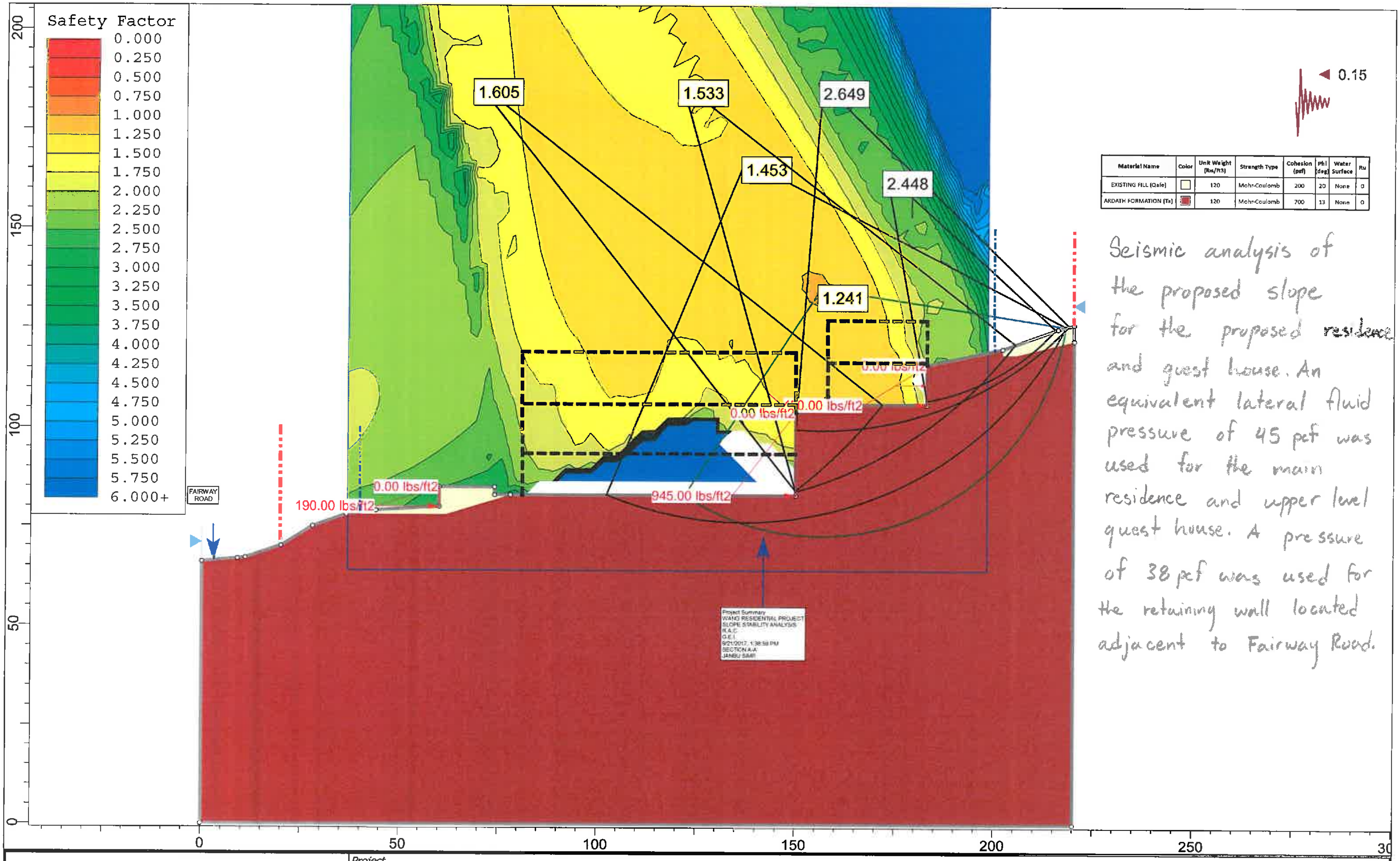
Company	G.E.I.		
Date	9/21/2017, 1:27:23 PM	File Name	JOB NO. 96-6938A01.slim

SLIDEINTERPRET 6.039



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
EXISTING FILL (Qafe)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Seismic analysis of the proposed slope for the proposed residence and guest house. An equivalent lateral fluid pressure of 45 pcf was used for the main residence and upper level guest house. A pressure of 38 pcf was used for the retaining wall located adjacent to Fairway Road.

Project Summary
WANG RESIDENTIAL PROJECT
SLOPE STABILITY ANALYSIS
R.A.C.
G.E.I.
9/21/2017, 1:38:59 PM
SECTION A-A
JANBU SIMP.

Geotechnical Exploration, Inc.

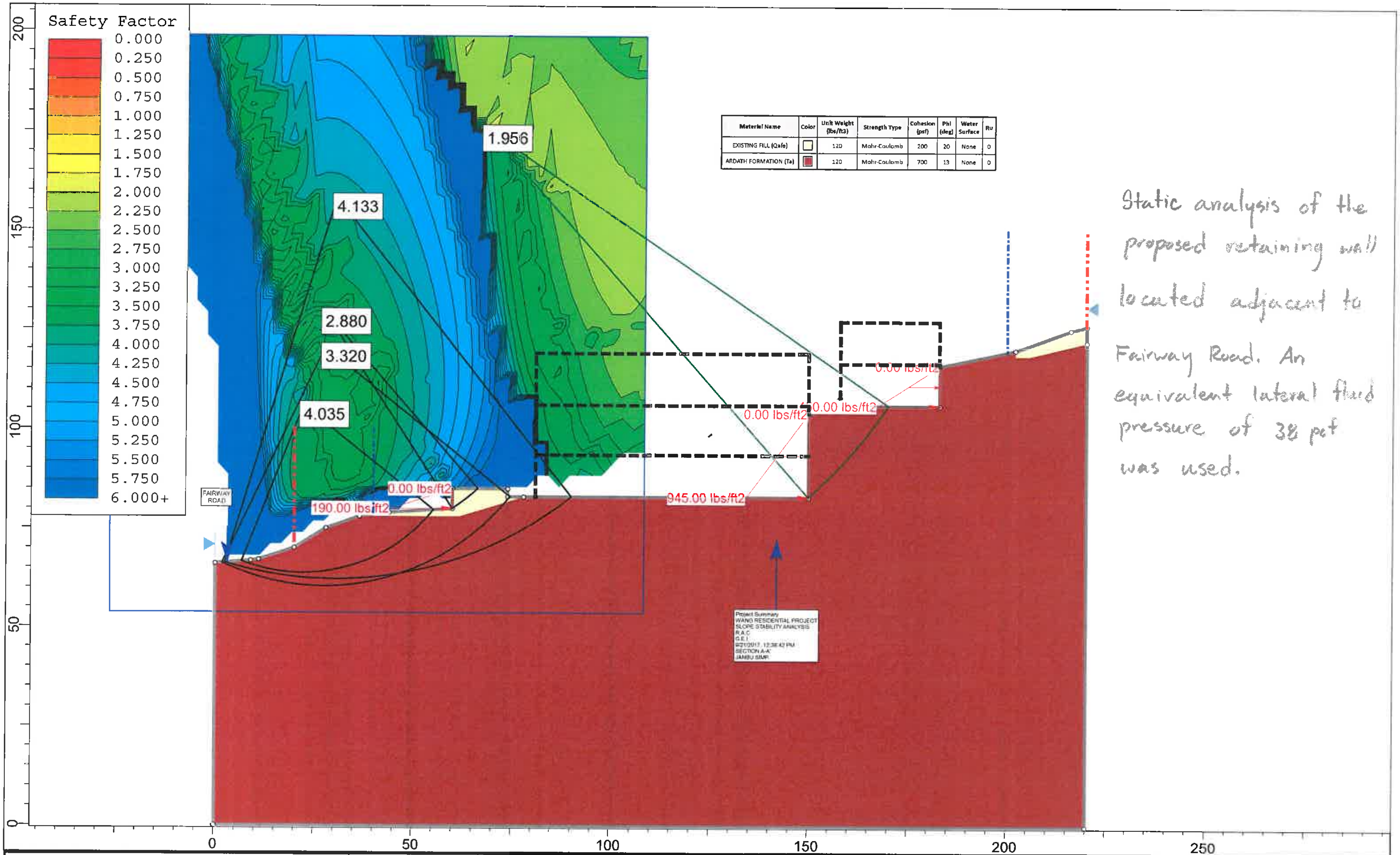
Project: WANG RESIDENTIAL PROJECT

Analysis Description: SLOPE STABILITY ANALYSIS

Drawn By: R.A.C.
Scale: 1:400
Company: G.E.I.

Date: 9/21/2017, 1:38:59 PM
File Name: JOB NO. 96-6938A01w_0.15gSHAKE.slim

SLIDEINTERPRET 6.039



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
EXISTING FILL (Qafe)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Project Summary
WANG RESIDENTIAL PROJECT
SLOPE STABILITY ANALYSIS
R.A.C
G.E.I
9/21/2017, 12:38:42 PM
SECTION A-A'
JANBU SIMP.

Static analysis of the proposed retaining wall located adjacent to Fairway Road. An equivalent lateral fluid pressure of 38 pcf was used.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SLOPE STABILITY ANALYSIS

Drawn By	R.A.C.	*Scale*	1:400	*Company*	G.E.I.
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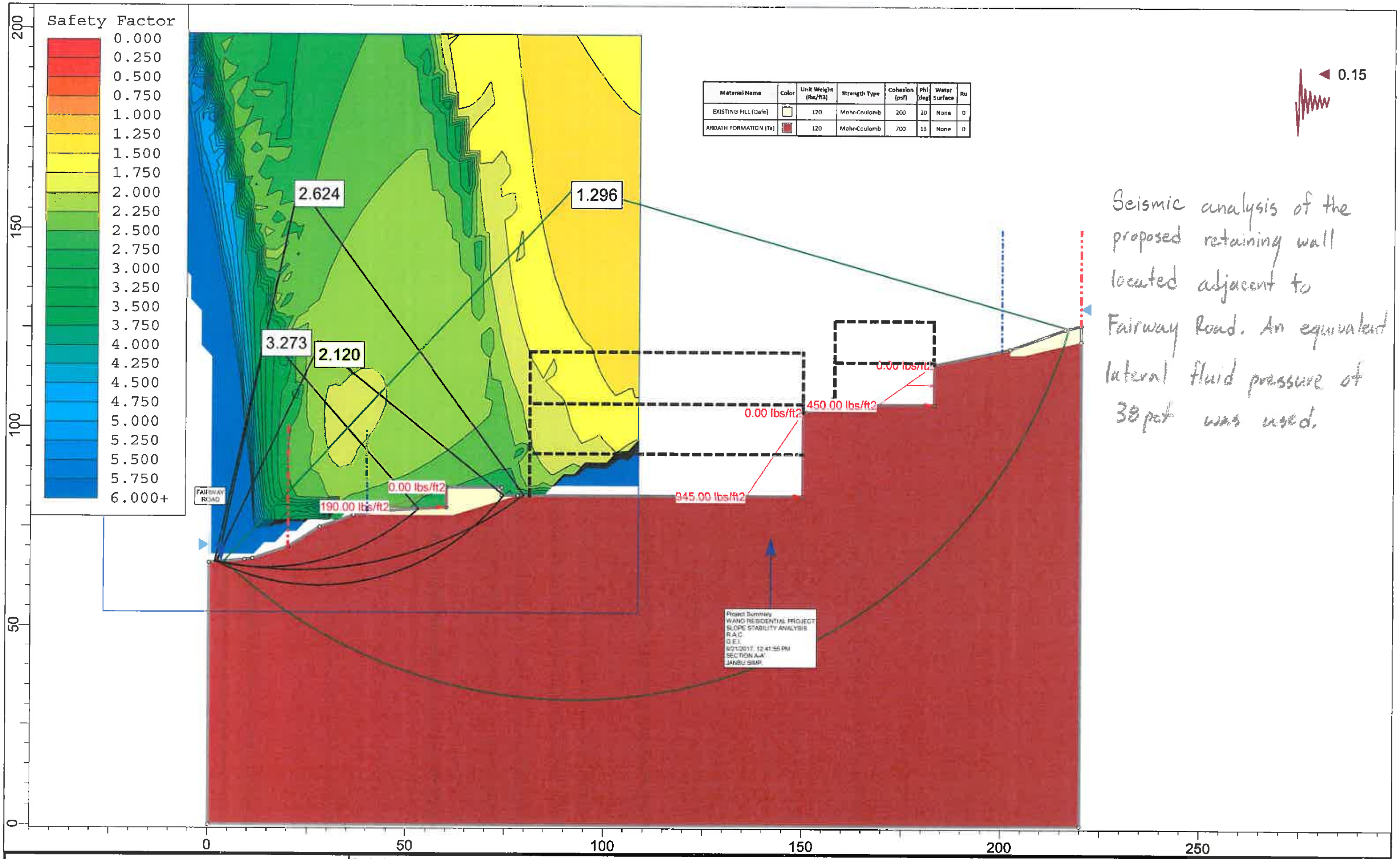

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
EXISTING FILL (Qafe)	🟨	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Seismic analysis of the proposed retaining wall located adjacent to Fairway Road. An equivalent lateral fluid pressure of 38 pcf was used.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project
WANG RESIDENTIAL PROJECT

Analysis Description
SLOPE STABILITY ANALYSIS

Drawn By
R.A.C.

Scale
1:400

Company
G.E.I.

Date
9/21/2017, 12:41:55 PM

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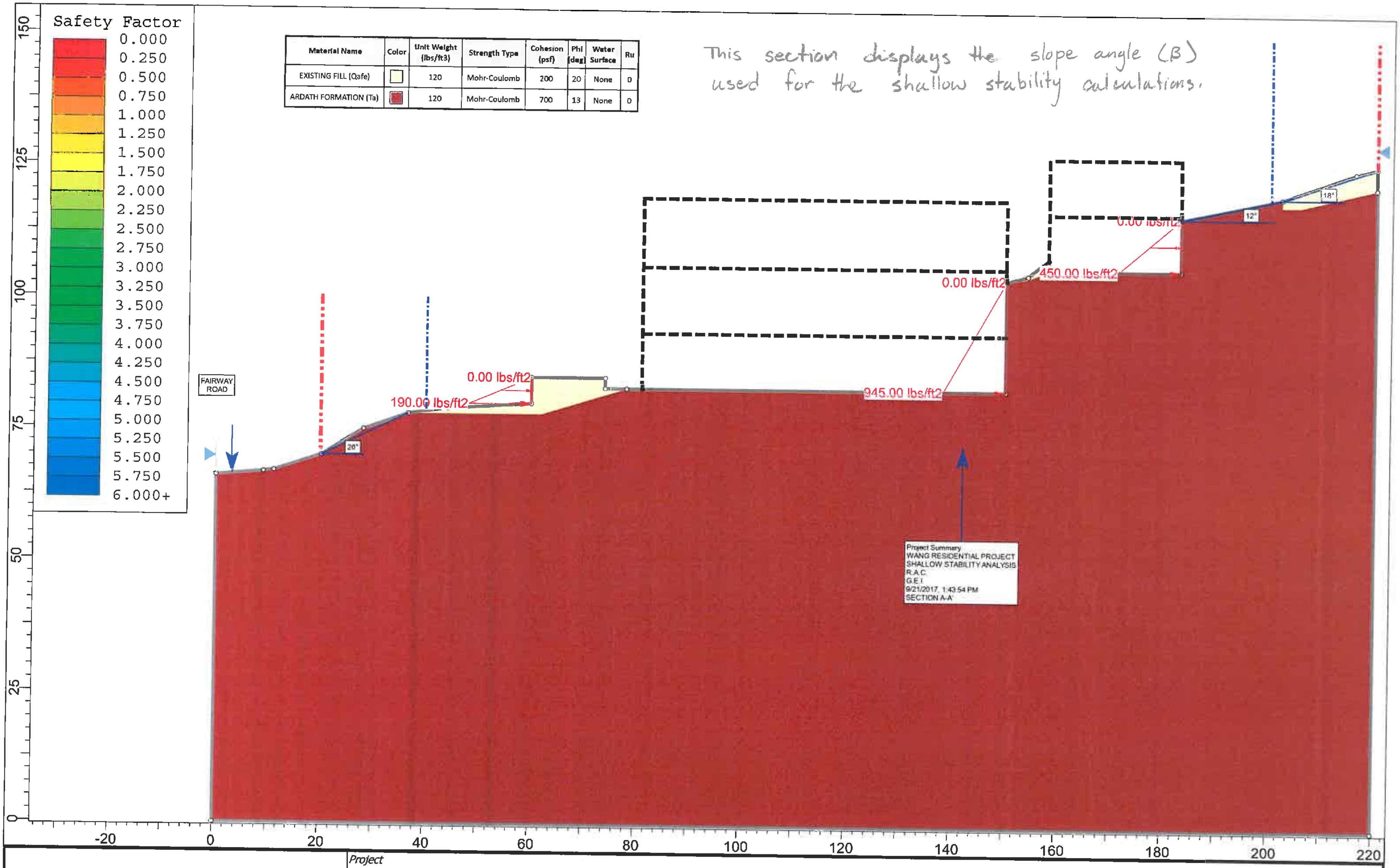

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
EXISTING FILL (Qafe)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

This section displays the slope angle (β) used for the shallow stability calculations.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SHALLOW STABILITY ANALYSIS
Drawn By	R.A.C.
Scale	1:300
Company	G.E.I.
Date	9/21/2017, 1:43:54 PM
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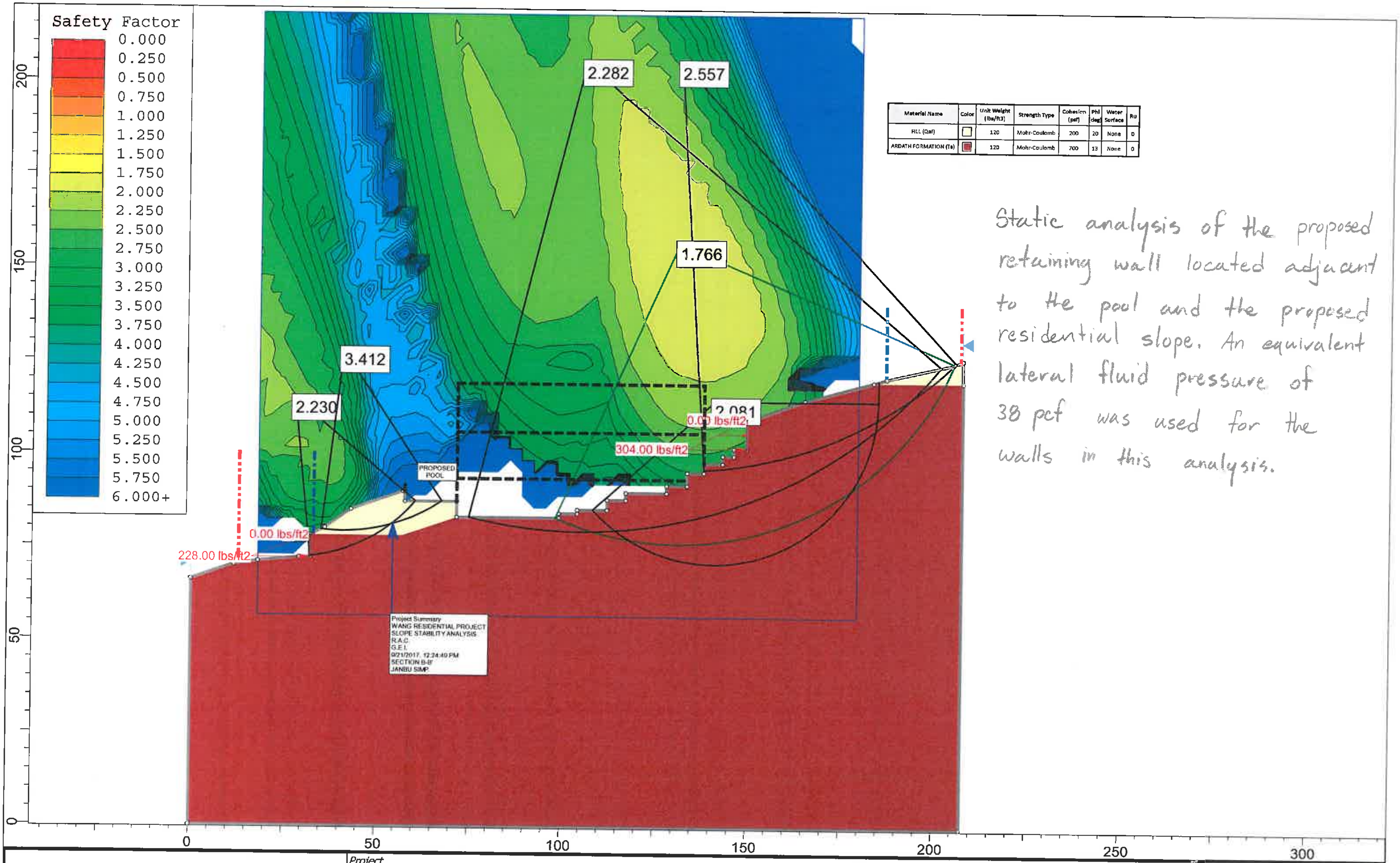

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
FILL (Qaf)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Static analysis of the proposed retaining wall located adjacent to the pool and the proposed residential slope. An equivalent lateral fluid pressure of 38 pcf was used for the walls in this analysis.

Geotechnical Exploration, Inc.

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SLOPE STABILITY ANALYSIS
Drawn By	R.A.C.
Scale	1:425
Company	G.E.I.
Date	9/21/2017, 12:24:49 PM
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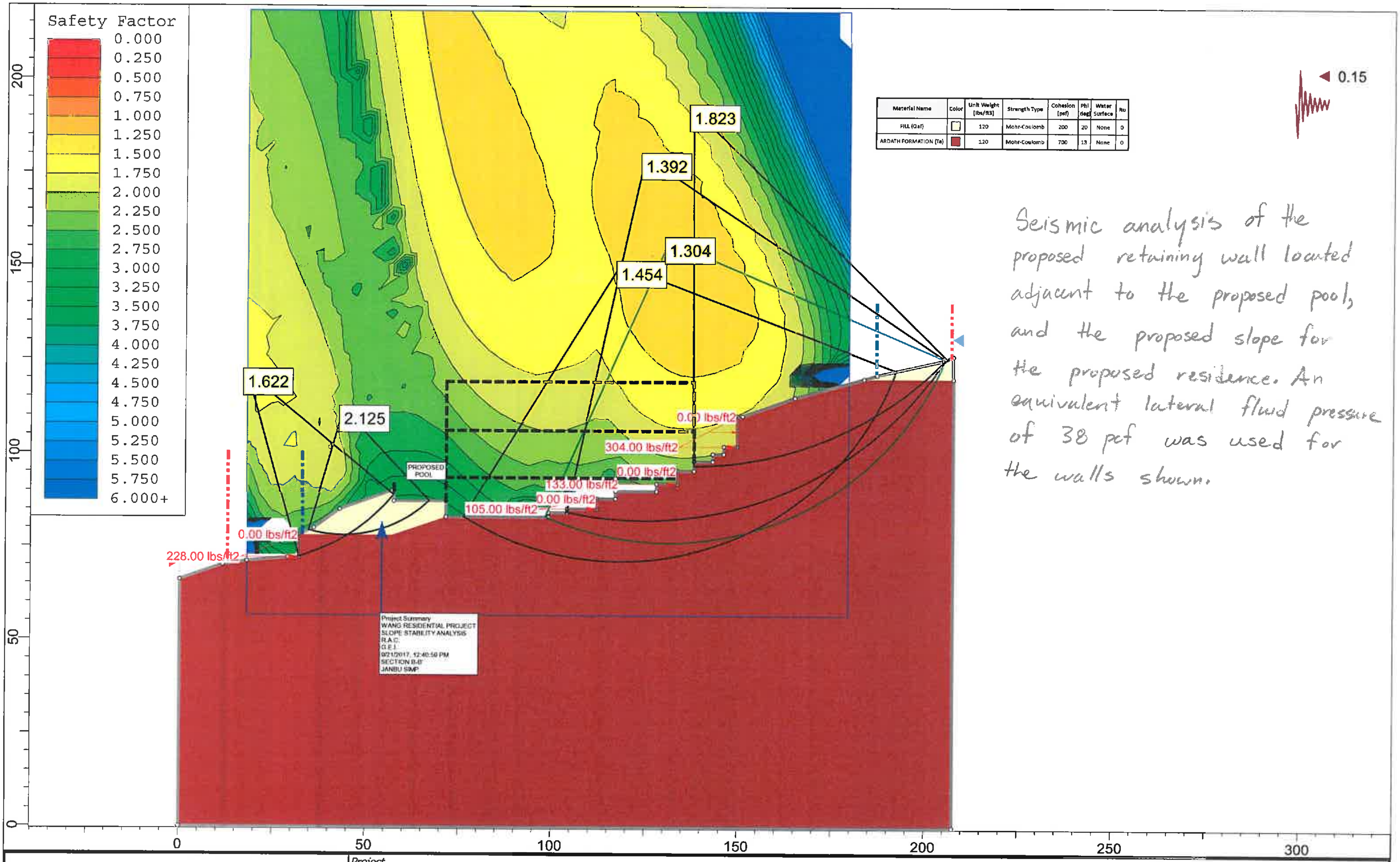
SLIDEINTERPRET 6.039



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
FILL (Qaf)	☐	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Seismic analysis of the proposed retaining wall located adjacent to the proposed pool, and the proposed slope for the proposed residence. An equivalent lateral fluid pressure of 38 pcf was used for the walls shown.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT		
Analysis Description	SLOPE STABILITY ANALYSIS		
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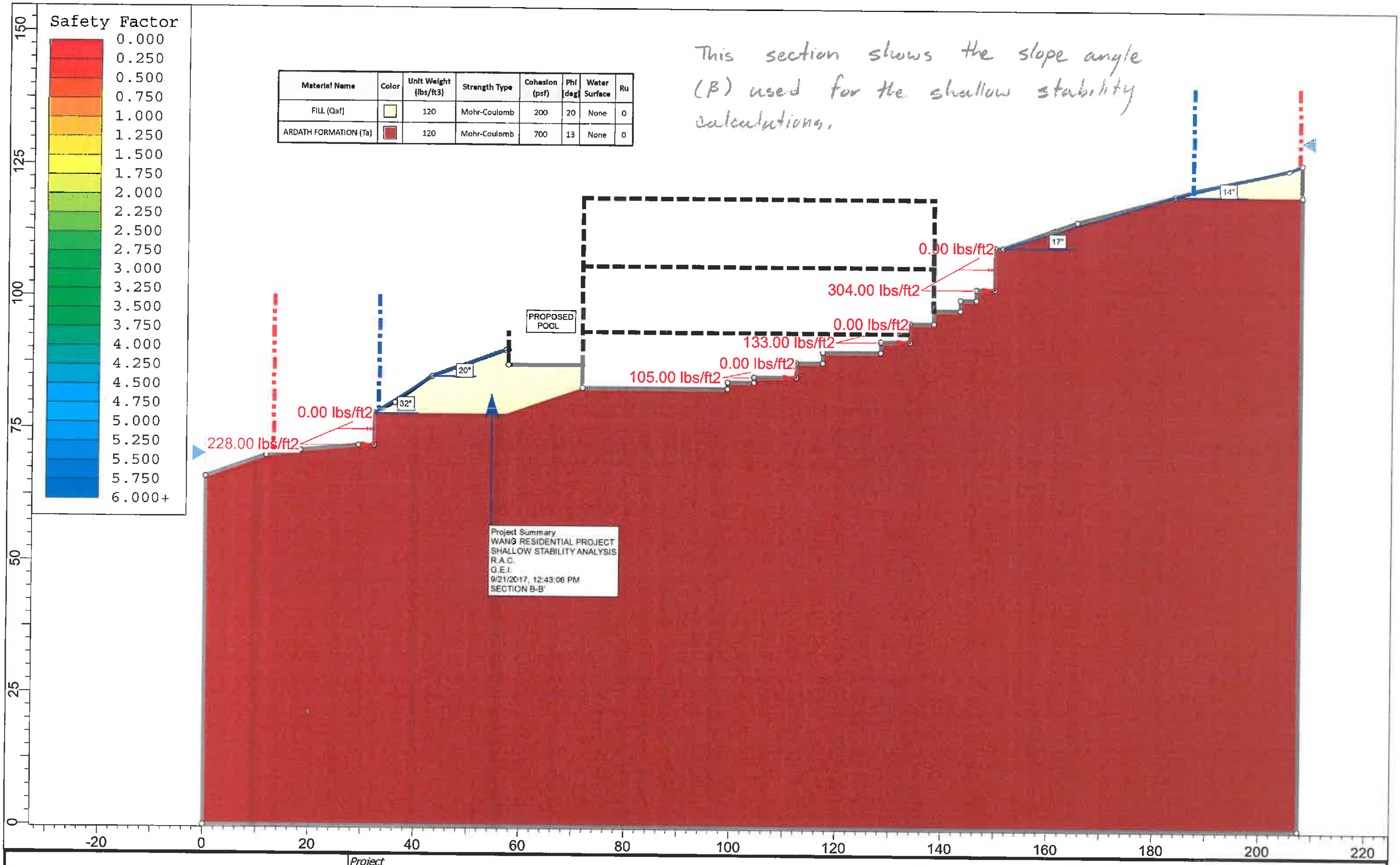
Date	9/21/2017, 12:40:59 PM	*File Name*	JOB NO. 96-6938B01w_0.15gSHAKE.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
FILL (Qaf)	🟨	120	Mohr-Coulomb	200	20	None	0
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

This section shows the slope angle (β) used for the shallow stability calculations,

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SHALLOW STABILITY ANALYSIS
Drawn By	R.A.C.
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Company	G.E.I.
Date	9/21/2017, 12:43:06 PM
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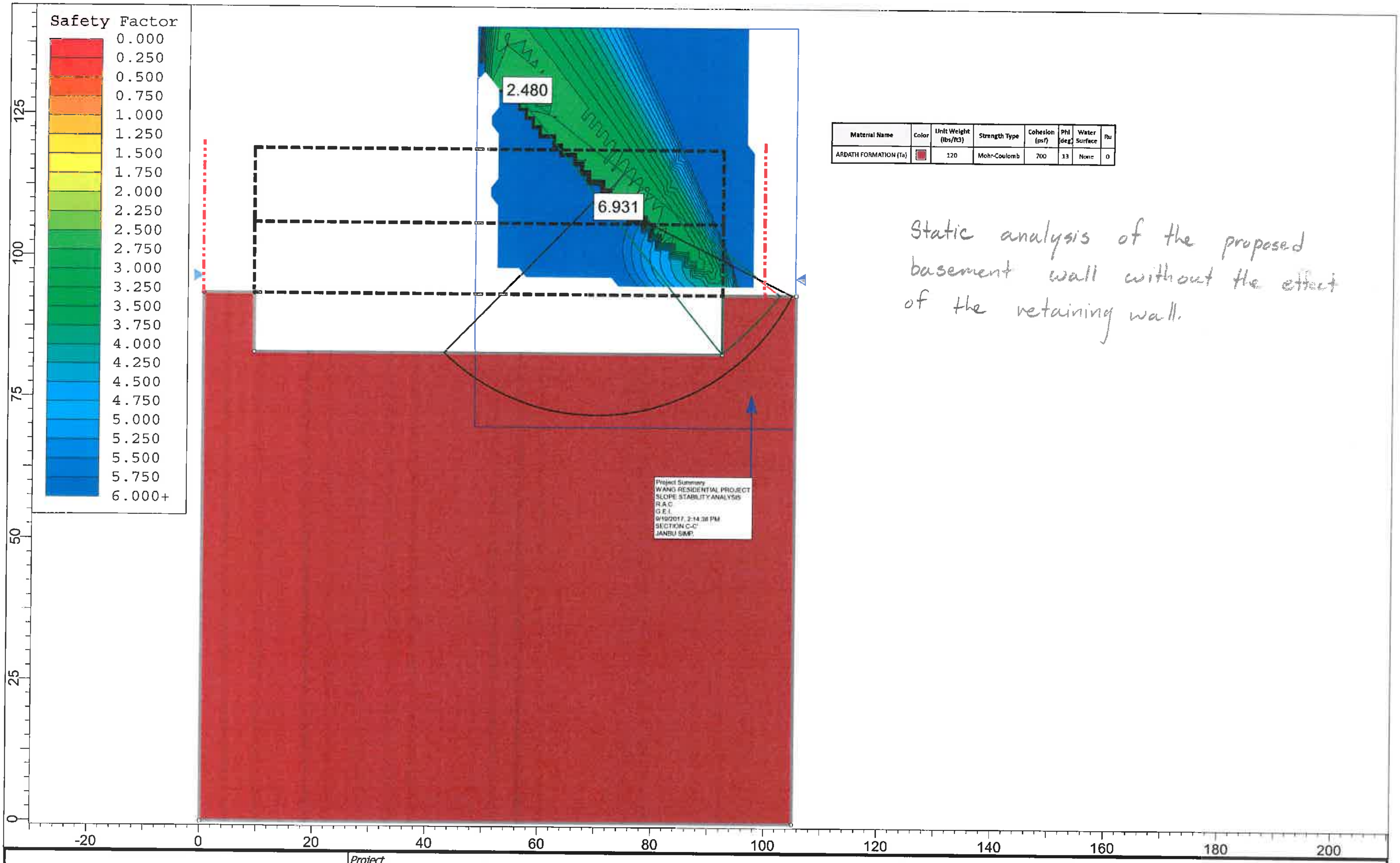

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Project Summary
WANG RESIDENTIAL PROJECT
SLOPE STABILITY ANALYSIS
R.A.C.
G.E.I.
9/19/2017, 2:14:38 PM
SECTION C-C'
JANBU SIMP.

Static analysis of the proposed basement wall without the effect of the retaining wall.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SLOPE STABILITY ANALYSIS

Drawn By	R.A.C.	*Scale*	1:280	*Company*	G.E.I.
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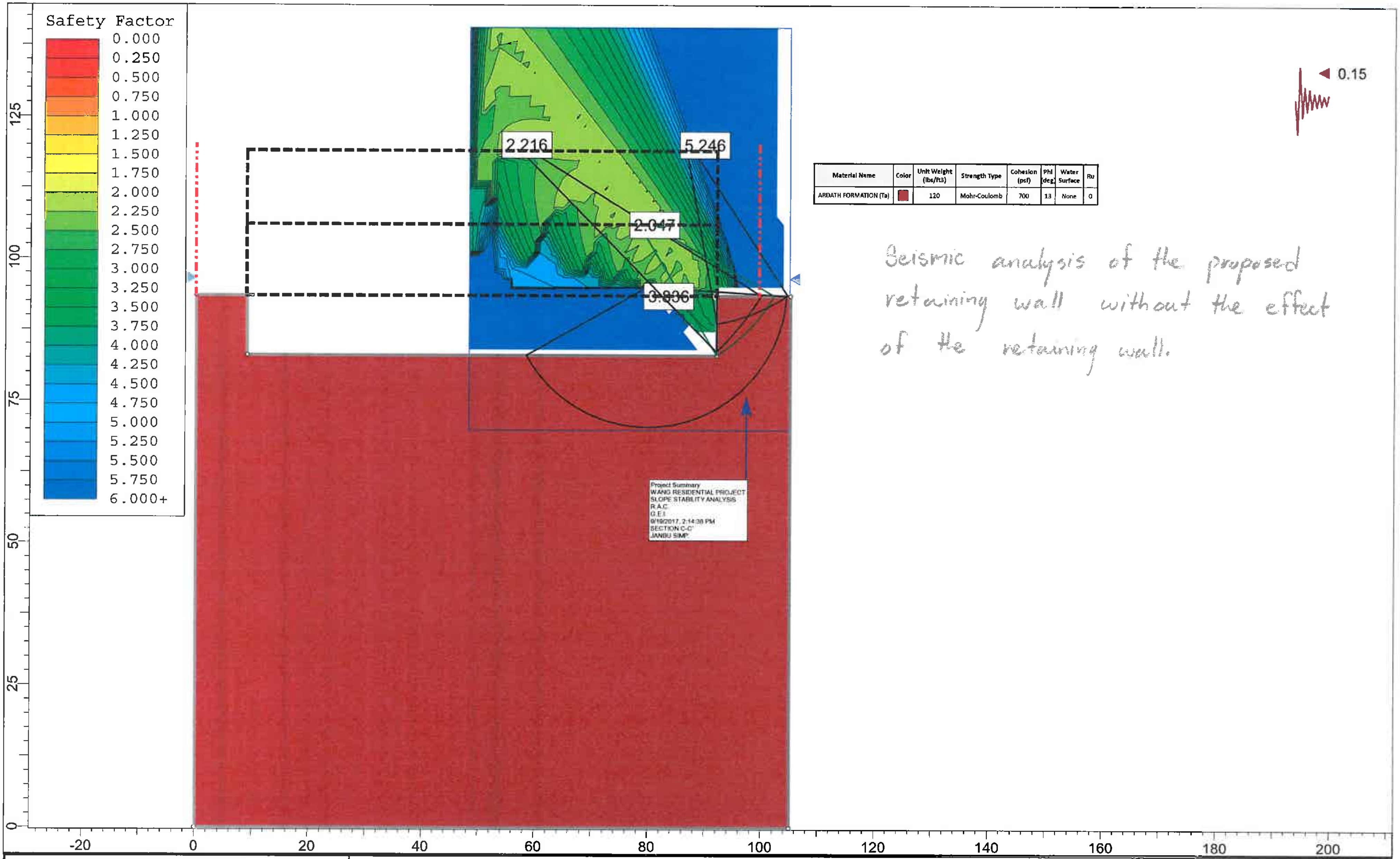

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Seismic analysis of the proposed retaining wall without the effect of the retaining wall.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SLOPE STABILITY ANALYSIS
Drawn By	R.A.C.
Scale	1:280
Company	G.E.I.
Date	9/19/2017, 2:14:38 PM
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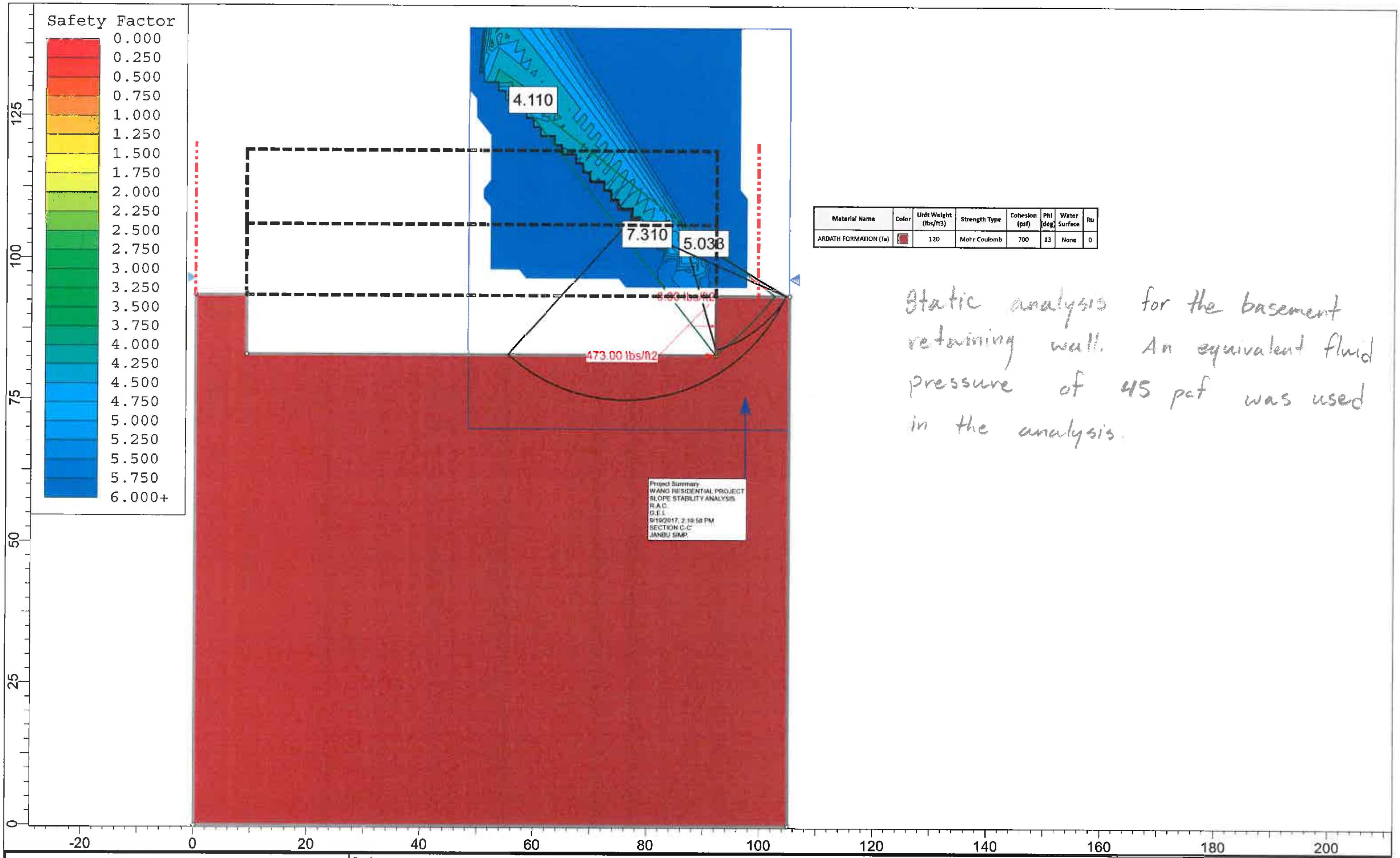

Project Summary
WANG RESIDENTIAL PROJECT
SLOPE STABILITY ANALYSIS
R.A.C.
G.E.I.
9/19/2017, 2:19:58 PM
SECTION C-C'
JANBU SIMP.

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Static analysis for the basement retaining wall. An equivalent fluid pressure of 45 pcf was used in the analysis.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project
WANG RESIDENTIAL PROJECT

Analysis Description
SLOPE STABILITY ANALYSIS

Drawn By
R.A.C.

Scale
1:280

Company
G.E.I.

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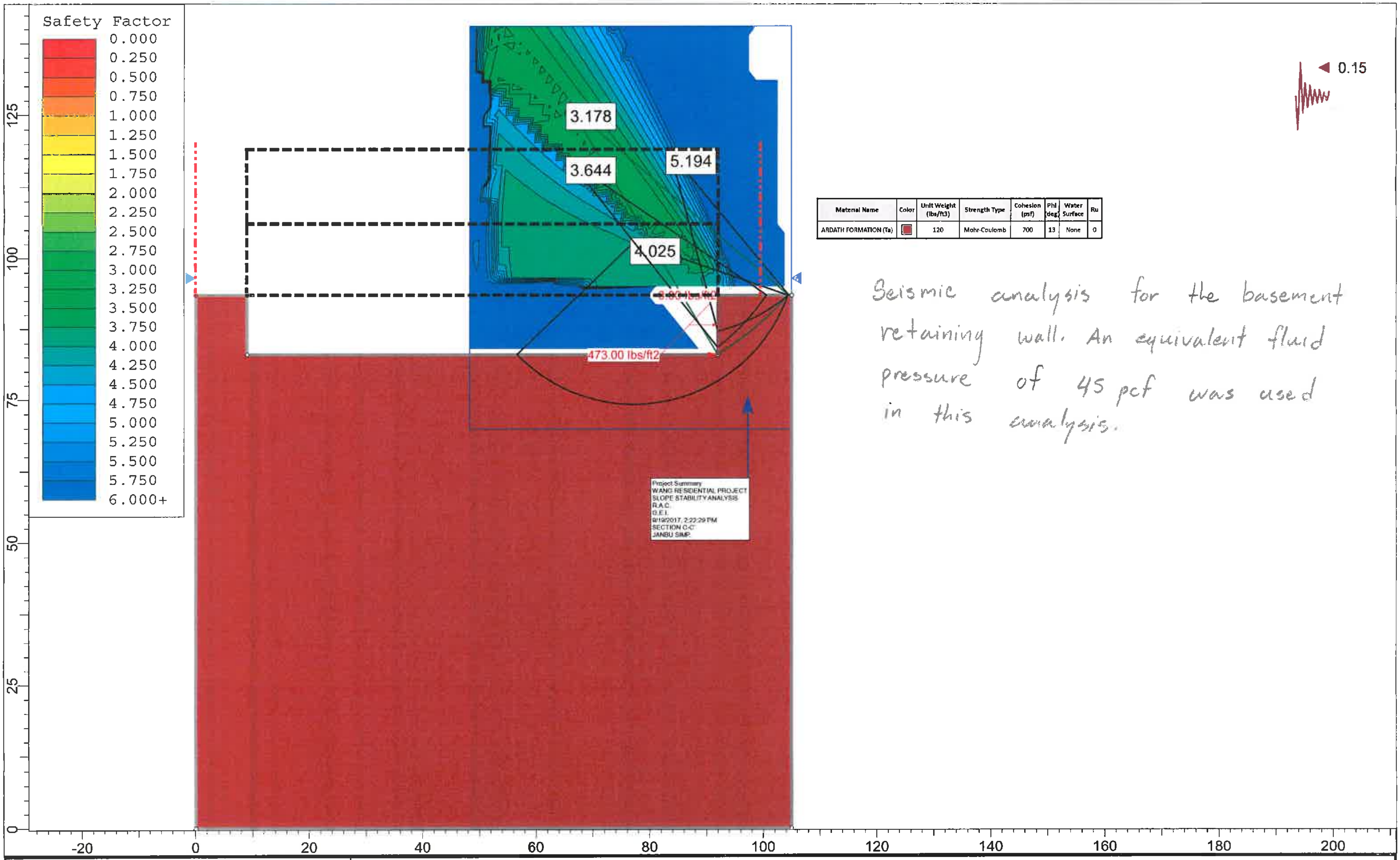

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
ARDATH FORMATION (Ta)	🟥	120	Mohr-Coulomb	700	13	None	0

Project Summary
WANG RESIDENTIAL PROJECT
SLOPE STABILITY ANALYSIS
R.A.C.
G.E.I.
9/19/2017, 2:22:29 PM
SECTION C-C'
JANBU SIMP.

Seismic analysis for the basement retaining wall. An equivalent fluid pressure of 45 pcf was used in this analysis.

Geotechnical Exploration, Inc.

SLIDEINTERPRET 6.039

Project	WANG RESIDENTIAL PROJECT
Analysis Description	SLOPE STABILITY ANALYSIS

Drawn By	R.A.C.	Scale	1:280	Company	G.E.I.
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