Geosphere Consultants, Inc.
Geotechnical Engineering • Engineering Geology
Environmental Management • Water Resources
— AN ATLAS COMPANY —

GEOTECHNICAL REPORT UPDATE

Proposed Residential Development
634 Palomar Drive
Redwood City, California

Prepared for:
Anusha Thalapaneni
David Jackson
c/o M Designs Architects
4131 West El Camino Real, Suite200
Palo Alto, California 94036
Attn: Chip Jessup, Architect

July 29, 2020
GEO Project No. 91-55905-A
3067.01.00

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Anusha Thalapaneni
David Jackson
c/o M Designs Architects
4131 West El Camino Real, Suite200
Palo Alto, California 94036
Attn: Chip Jessup, Architect

RE: GEOTECHNICAL REPORT UPDATE
Proposed Residential Development
634 Palomar Drive
Redwood City, California
GEO #91-55905-A (3067)

Dear Anusha and David:

INTRODUCTION

Purpose and Scope

This letter report has been prepared to update an October 17, 2013 geotechnical report prepared by Earth Investigations Consultants (EIC) for a single family residential development in the Palomar Park residential area, Redwood City, California, in approximately the same location as the currently proposed project (Appendix A). EIC has merged with **Geosphere Consultants, Inc.** (**Geosphere**) who has accepted responsibility as the project Geotechnical Consultant of Record (GCR). Accordingly, we have reviewed the EIC report and generally accept their findings, conclusions, and recommendations on the basis of the following tasks:

- Review of the EIC reports and other pertinent in-house geologic and geotechnical information. Appendix A contains the 2013 and 2014 geotechnical reports prepared for development proposed by two previous owners of this property. Locations of the borings from those investigations are plotted on Plate 1 (Engineering Geologic Map, Cross Section A-A', Photo 1) ;
- Site observations, and ground and aerial drone photographic documentation on July 24, 2020;
- Supplemental subsurface exploration at four locations within the proposed development area to augment geotechnical properties of soil profile characterized by EIC (Appendix B);
- Analysis and preparation of this report.

Proposed Project

The proposed project is to construct a three-story wood-frame residence with attached garage in the southwest part of the property (Plate 1). A lap swimming pool is planned to adjoin the northwest side of the residence. The southern perimeter of the development area will feature hardscape and planting areas. Site and foundation retaining walls are planned with respective heights ranging from up to

approximately 6 to 10 feet. An on-site sewage disposal system, to be located uphill of the proposed residence is required for this project to be designed and constructed pursuant to the County of San Mateo County Environmental Health Department guidelines. An easement across neighboring 636 Palomar Drive will provide the proposed gravel driveway access off Palomar Drive to the development area.

Southeasterly view of proposed driveway across house development area, toward Palomar Drive (07/24/2020).

GEOTECHNICAL REPORT UPDATE

Existing Surface Conditions

Recent reconnaissance observations for this geotechnical update confirmed the proposed development area surface conditions at the top of the slope described in the EIC reports have remained generally the same.

In 2017, a landslide to an approximate depth of 10 feet and involving sheared Franciscan bedrock occurred on the native slope between the proposed development area and Los Cerros Road (Plate 1; Earth Investigations Consultants, Inc., 2017). Geotechnical course-of-construction grading, and drainage of the slope repair approximately delineated on Plate 1 was under the direction of **Geosphere**. The

project was approved by **Geosphere** and finaled by the County of San Mateo Planning and Engineering Department in 2019.

Supplemental Subsurface Exploration and Testing

Two borings and two supplemental soil probes were continuously sampled to practical refusal 3 to 9 feet below the ground surface as augmentation for geotechnical characterization of the soil profile from the previous EIC investigations (Plate 1; Appendix B). Relatively undisturbed samples at the boring locations were retrieved by driving California, modified California, and Standard Penetration (SPT) split-spoon samplers with a 140-pound hammer lifted to a free-fall height of 30 inches to impact a steel anvil connected by pipe to the top of the respective samplers. The number drops (blows) was documented for each 18-inch drive segment at 6-inch depth intervals. The depth and number of blows for the lower 12 inches of each drive segment is tabulated on the Boring Log in terms of SPT values representing the relative strength of the samples soil. Blow counts from driving the modified California and California sampler were converted to Standard Penetration Test values using a multiplier of 0.76 and 0.93, respectively.

The disturbed samples at the soil probe locations were retrieved by driving a 1½-inch O.D., split-spoon sampler to practical refusal with a Wacker BHF 30S, percussion hammer that imparts 35 ft. lb. axial force at a rate of 1270 blows per minute.

The supplemental borings reaffirmed the proposed development area is underlain by Franciscan sandstone and shale beneath up to 8 feet of surficial soil composed of undocumented fill from 2012 grading mantling high plasticity (PI=25) colluvium.

CONCLUSION

It is our opinion the area residential development as planned is feasible from a geotechnical standpoint. It appears undocumented fill in the proposed house development area will be mitigated by grading and/or retaining walls. Fill along the proposed driveway should be treated in accordance with the recommendations grading and/or retaining wall recommendations presented in Appendix A.

Supplemental recommendations in the following section are to accommodate design and construction of the proposed swimming pool.

SUPPLEMENTAL GEOTECHNICAL RECOMMENDATIONS

Seismic Design Parameters

Project structures should be evaluated/designed in accordance with local design practice and the 2019 California Building Code (CBC) to resist the seismic forces generated by severe earthquake shaking.

Given the soil profile characterized by the subsurface exploration, it is our opinion that a Site Class C classification (very dense soil and soft rock) is appropriate for characterizing potential earthquake ground shaking conditions and seismic design considerations for the Site, per ASCE/SEI 7-16 (Chapter 20).

Code-based spectral acceleration parameters were developed following the procedures of the 2019 CBC (Section 1613.3). The values of S_S, S_1, and F_V used to identify the Site-adjusted maximum considered earthquake (MCE) parameters are listed below. The values were obtained from the SEOC/OSHPD seismic hazard mapping web site based on the ASCE/SEI 7-16 Standard as required by the 2019 CBC.

- Site Location: Latitude 37.4812; Longitude –122.2700
- Site Soil Class: C
- Spectral Response Acceleration Values (g):
  $F_V = 1.4$; $S_S = 2.096$; $S_1 = 0.869$; $S_{DS} = 1.677$; $S_{D1} = 0.811$

Swimming Pool

The proposed pool shell (and vanishing edge trough, if applicable) should be supported by drilled piers in accordance with the foundation recommendations in Appendix A, and designed to resist an equivalent fluid pressure of 65 pounds per cubic foot to account for the highly expansive colluvium and undocumented fill that may be encountered. The bottom of the pool excavation should be prepared for subdrainage by placement of at least 6 inches of crushed rock that is drained to an approved discharge location downhill from the building site. A hydrostatic relief valve should be constructed in the shell at the deep end.

SUPPLEMENTAL SERVICES

We recommend that we review the geotechnical aspects of project design, including but not limited to grading and drainage, foundations, retaining wall, and pavements plans for conformance with the intent of the recommendations presented in Appendix A and supplemental recommendations presented in this report. During construction, we should observe the rough and finished grading operations, foundation excavations prior to steel placement, and the installation of all drainage facilities, including retaining wall backdrainage prior to burial to ascertain that our recommendations are followed. Upon completion of the project, we should perform a site observation and report the results of our work in a final report.

A representative from our office should be present to provide construction observation services, to observe the exposed geotechnical conditions, to modify recommendations, if necessary, and to confirm the project is constructed in accordance with the recommendations.
These services are outside the present scope and will be billed on a time and expense basis, in accordance with the fee schedule current at that time, and a supplemental agreement will be prepared. These services will be performed only if we are provided with sufficient notice to perform the work. We do not accept responsibility for items that we are not notified to observe. We recommend that the Owner be responsible for notification, no less than 48 hours before the requested site visit.

This geotechnical update report has been prepared in accordance with generally accepted geotechnical engineering practices for the exclusive use of you and your consultants for specific application to the proposed development. No warranty, either express or implied, is made.

In the event the nature, design, or location of the proposed construction differs significantly from what has been noted above, or if any future additions are proposed, the conclusions and recommendations presented in the adopted project geotechnical report should not be considered valid unless the project modification(s) are reviewed by our office relative to the project geotechnical report and verified in writing as valid.

The findings of this report are valid as of the present date. However, the passing of time will likely change the conditions of the existing property due to natural processes or the works of man. In addition, due to legislation or the broadening of knowledge, changes in applicable or appropriate standards may occur. Accordingly, the findings of this report may be invalidated, wholly or partly, by changes beyond our control. Therefore, this report should not be relied upon after a period of three years without being reviewed by this office.

We trust this update provides you with the information you require at this time.

GEOSPHERE CONSULTANTS, INC.

Alex Lim, P.E., Q.S.P
Project Engineer

Joel E. Baldwin, II, P.G., C.E.G.
Principal Engineering Geologist (Renewal date 2/28/21)

Distribution: efile and 2 bound copies to addressee

ILLUSTRATIONS

Plate 1- Engineering Geologic Map, Cross Section A-A', Photo 1

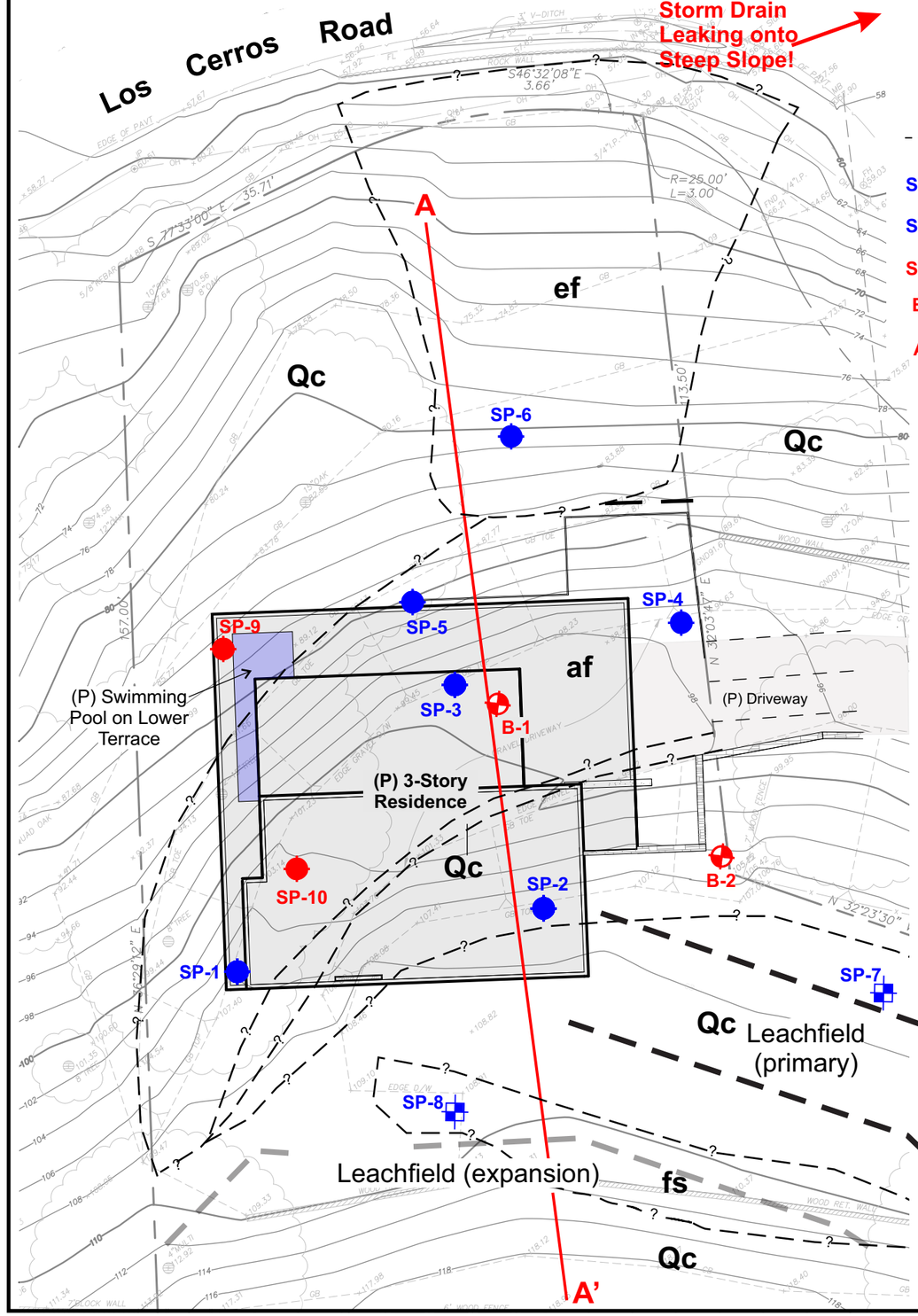
APPENDIX A

2013 and 2014 Project Geotechnical Reports prepared by Earth Investigations Consultants

APPENDIX B

Appendix B – Subsurface Exploration and Laboratory Test Results

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



EXPLANATION

- **af** Artificial Fill
- **Qc** Colluvium
- **fs** Sandstone
- **ef** Engineered Fill

- Inferred Geologic Contact
- **SP-1** Approx. location of Soil Probe 1 (EIC 2013)
- **SP-7** Approx. location of Soil Probe 8 (EIC 2014)
- **SP-9** Approx. location of Soil Probe 9 (Geosphere 2020)
- **B-1** Approx. location of Boring 1 (Geosphere 2020)
- **A A'** Line of Cross Section A-A'

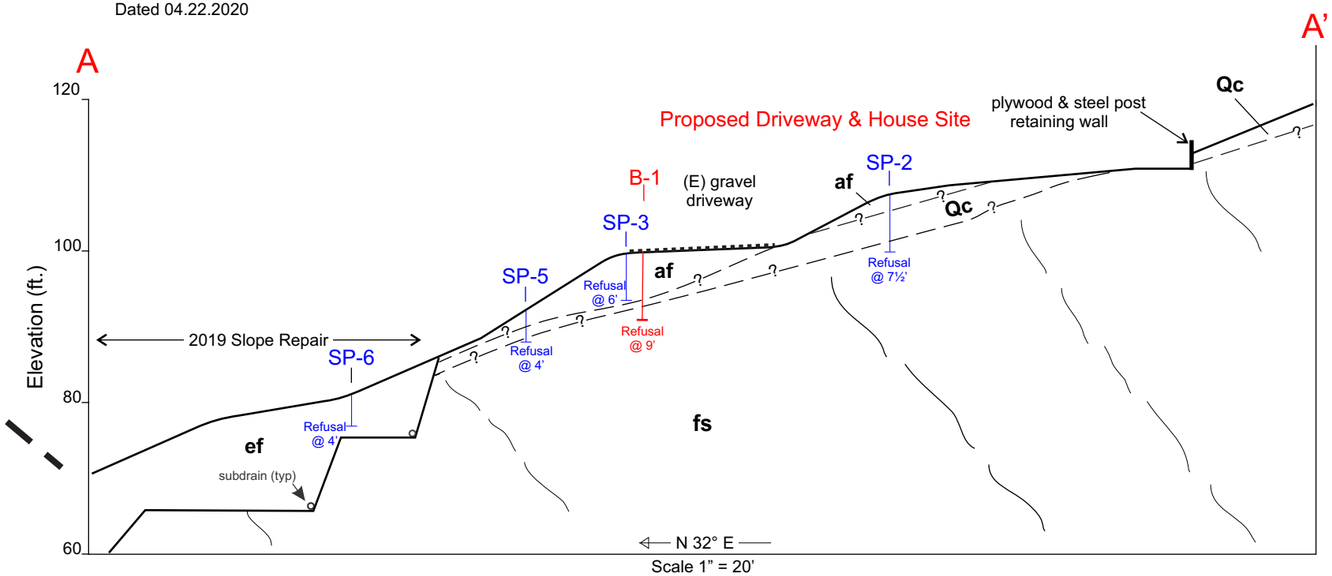
N

20 ft.
Scale

Sources: Giuliani & Kull, Inc.
Topographic Survey
Sheet 1, dated 05.07.2015

M Design Architects
Sheet A1.2 (P) Site Plan
Dated 04.22.2020

Photo 1. Aerial drone image of site. (2020)



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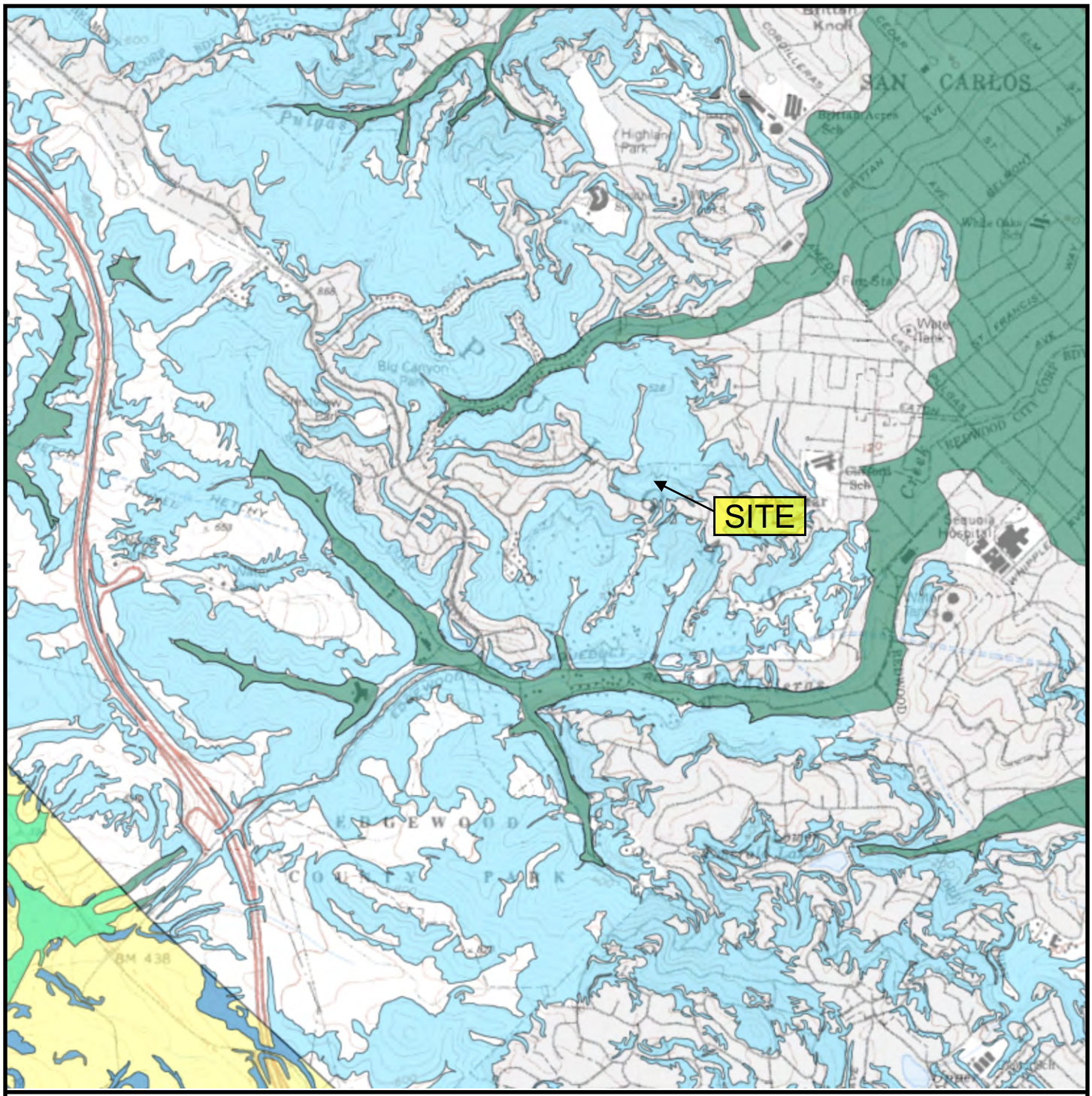
Date:	07.01.2020

ENGINEERING GEOLOGIC MAP, CROSS SECTION A-A', PHOTO 1
634 Palomar Drive
Redwood City, California

Plate 1



EXPLANATION

EARTHQUAKE-INDUCED LANDSLIDES
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Overlap of Earthquake Fault Zone (yellow) and Earthquake Induced Landslide Zone (blue)

N

2000 ft.
Scale

LIQUEFACTION
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation would be required.

Overlap of Earthquake Fault Zone (yellow) and Liquefaction Zone (green)

California Geological Survey (2018)

Geosphere Consultants, Inc.

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SEISMIC HAZARD MAP

634 Palomar Drive
Woodside, California

Plate 2