EXHIBIT D

February 24, 2020

TO: Michael R. Muelrath, PE, Civil #67435
Applied Civil Engineering
2074 West Lincoln Avenue
Napa, CA 94558

FROM: _____
Michael Sherwood, B.S., PG #8839 (Exp. June. 2021)
Geologist Hydrologist, O'Connor Environmental, Inc.

Subject: Landslide Hazard Evaluation, Chappellet Vineyard
APN's 032-010-076 and 032-010-094

Introduction

This Landslide Hazard Evaluation considers the potential effect on slope stability of proposed vineyard development on the above referenced parcels (APN 032-010-076 and 032-010-094) as described in the Vineyard Development Erosion Control Plan (ECP) prepared by Applied Civil Engineering, Inc. (June 2019). O'Connor Environmental, Inc. (OEI) was engaged by the applicant (Chappellet Vineyard LLC), to conduct this evaluation. This evaluation is intended for use by County of Napa Planning, Building and Environmental Services Department (PBES) in its permitting process for the above referenced project; the scope of the evaluation is consistent with "Guidelines for Preparing Landslide Hazard Evaluation".

O'Connor Environmental has conducted several similar slope stability assessments in Napa County and Sonoma County in addition to several years of experience mapping landslides and evaluating slope stability in Washington and northern California. I am a Professional Geologist in California.

The two subject parcels together comprise approximately 238 acres; the northern parcel (APN 032-010-076) has 120+/- acres and the southern parcel (APN 032-010-094) has 118 +/- acres. The northern parcel contains approximately 12.8 acres of existing vineyard. The southern parcel has no existing vineyard; existing improvements include a road and the Vineyard Well (Figure 1) as shown in the ECP. The proposed vineyard development sites total 34.2 acres with 11.2 net acres (13.7 goss) proposed on the northern parcel and 23 net acres (28.2 gross acres) proposed on the southern parcel.

The subject parcels are owned and managed by the Chappellet Vineyard LLC and Chappellet Winery along with six other parcels in the area (032-010-022, 032-010-075, 032-010-090, 032-010-092, 032-010-098, 032-010-099, Figure 1). Including the two parcels with proposed vineyard areas, all eight parcels cover approximately 605 acres (Figure 1). It is assumed that this assessment accompanies all relevant documents submitted to the County of Napa, and that detailed descriptions of the project and the project site need not be repeated here.

Methods

To evaluate existing and potential slope stability hazards at the proposed vineyard site, the following tasks were undertaken: reviewed available geologic maps, reviewed available historic aerial photographs, reviewed soil survey data, performed field reconnaissance June 20, 2019, and synthesized available information regarding existing and likely future stability of the site.

Regional & Site Geology

The project is located within the California Coast Ranges geomorphic province. Numerous faults oriented northwest-southeast occur in this region, and extensive tectonic activity has created a landscape of northwest-southeast trending ridges and valleys. The tectonic activity is associated with the collision between the Farallon and North American plates occurring particularly in the late Mesozoic (about 100 million years before present), and with movement along the San Andreas Fault which formed in the mid-Cenozoic (about 30 million years before present) at the boundary between the Pacific and North American plates.

The project parcels are located on Pritchard Hill east of Lake Hennessey on a topographic bench oriented northwest to southeast in the mountains east of the Napa Valley. The bedrock geology mapped in the area of the project parcels is typical of the uplands east of the southern half of Napa Valley. The main geologic unit mapped at the project site and intersected by the project well (Well 1) is andesitic and basaltic lava flows of the Tertiary-aged Sonoma Volcanics (Map unit Tsa, see Figure 1). This portion of the Tsa unit is part of an approximately 32 square-mile northwest to southeast oriented block bound to the north and east by a contact with the older Mesozoic-aged rocks of the Coast Range Ophiolite which is a portion of the Great Valley Complex, the Franciscan Complex and a relatively large Quaternary landslide and to the west by overlying alluvium of the Napa Valley. The Tsa unit is part of the lower member of the Sonoma Volcanics which was described by Weaver (1949) as individual lava flows displaying great variability in thickness and texture over short distances. Reconnaissance confirmed the mapped bedrock geology. The site has numerous outcroppings of volcanic rocks of varied colors, weathering, and textures. Soils at the site are relatively thin and rocky with boulders and cobbles present across large portions of the property.

A series of northwest by southeast-tending Quaternary faults are mapped near the project parcels within about 0.5 miles to the northeast and southwest of the project site (Figure 2). The site is 18 miles northwest of the nearest active fault, the Green Valley Fault.

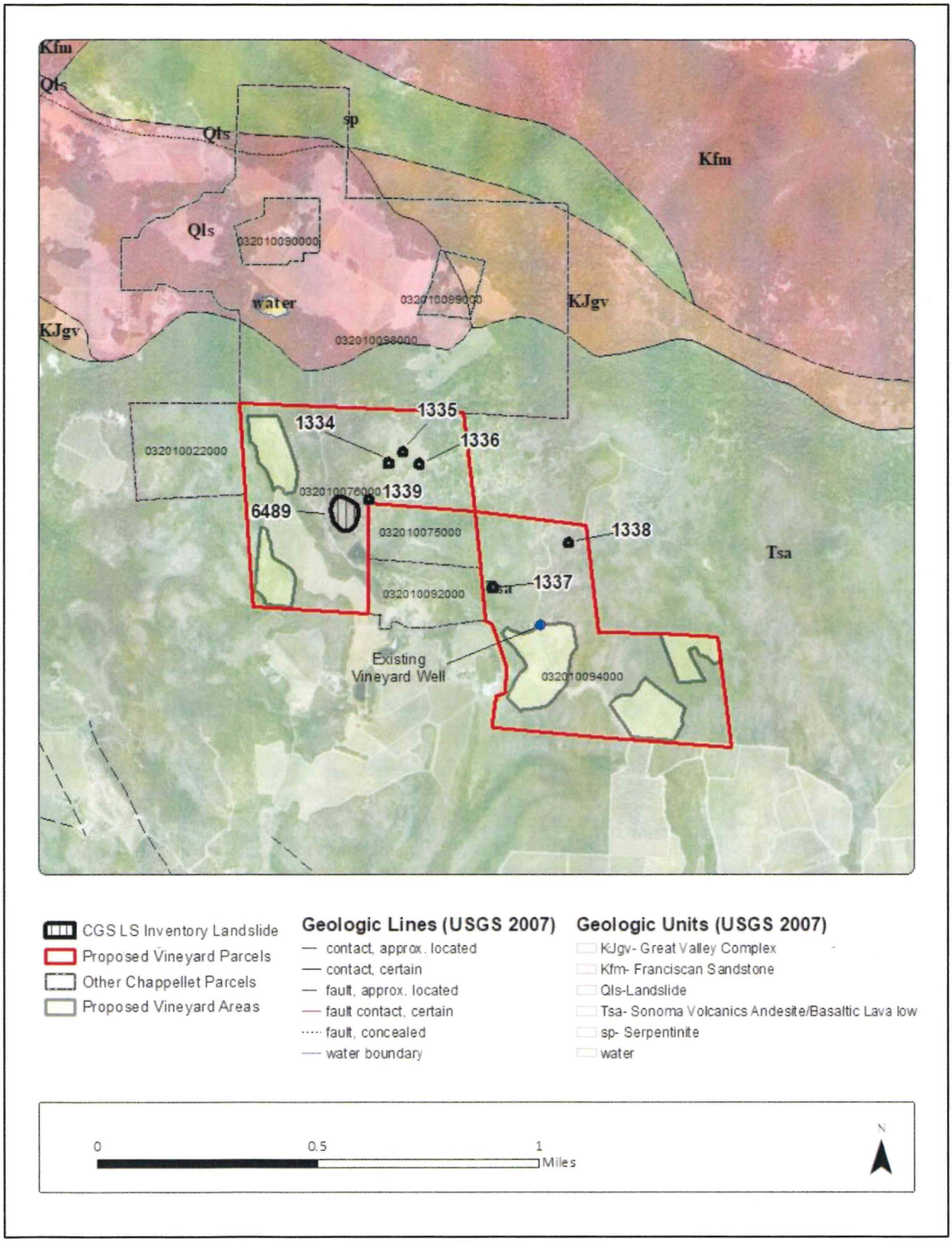


Figure 1. Surficial geology of the project parcel (Graymer et al., 2007).

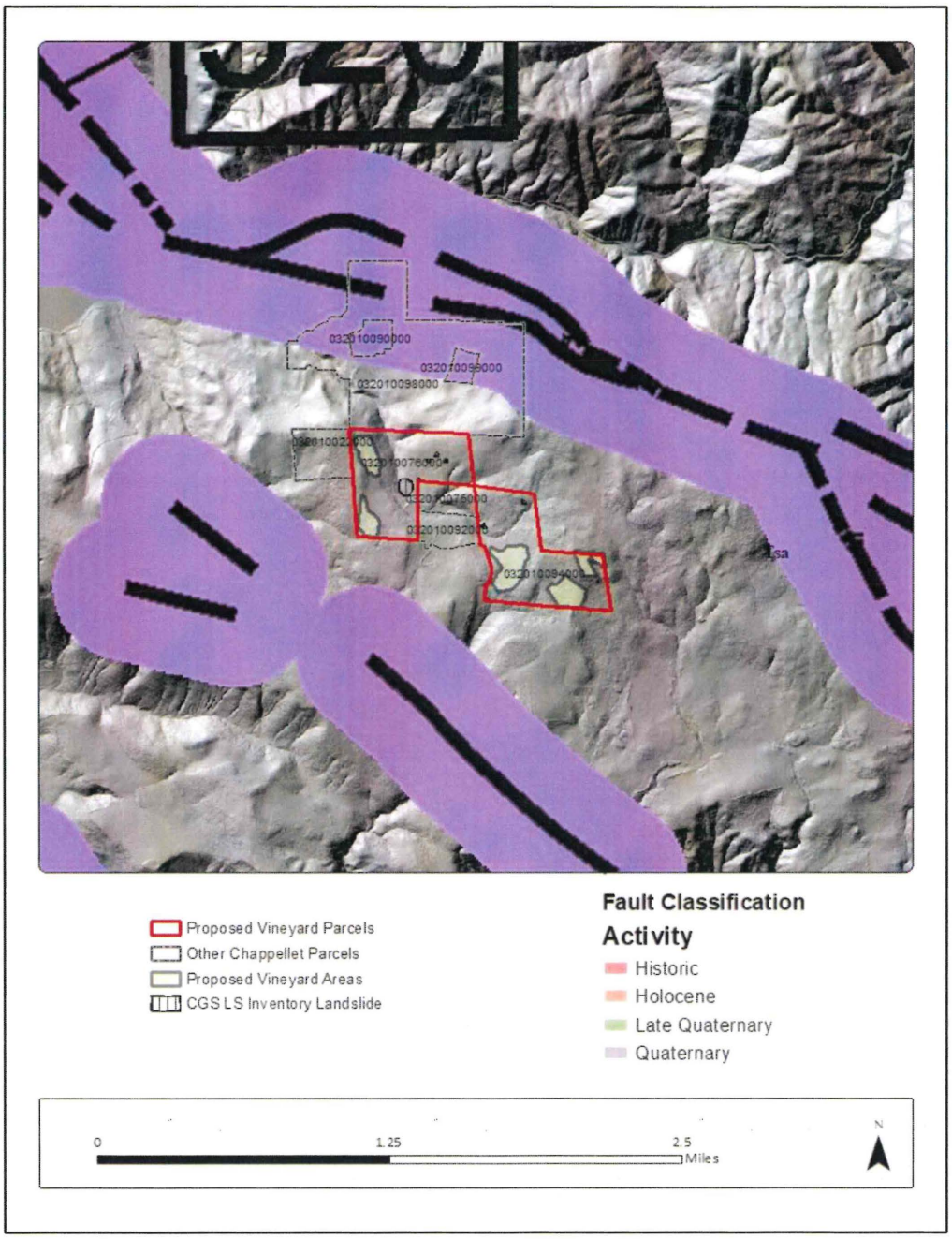


Figure 2. Faults near the project parcels from California Geological Survey Fault Activity Map of California (2010).

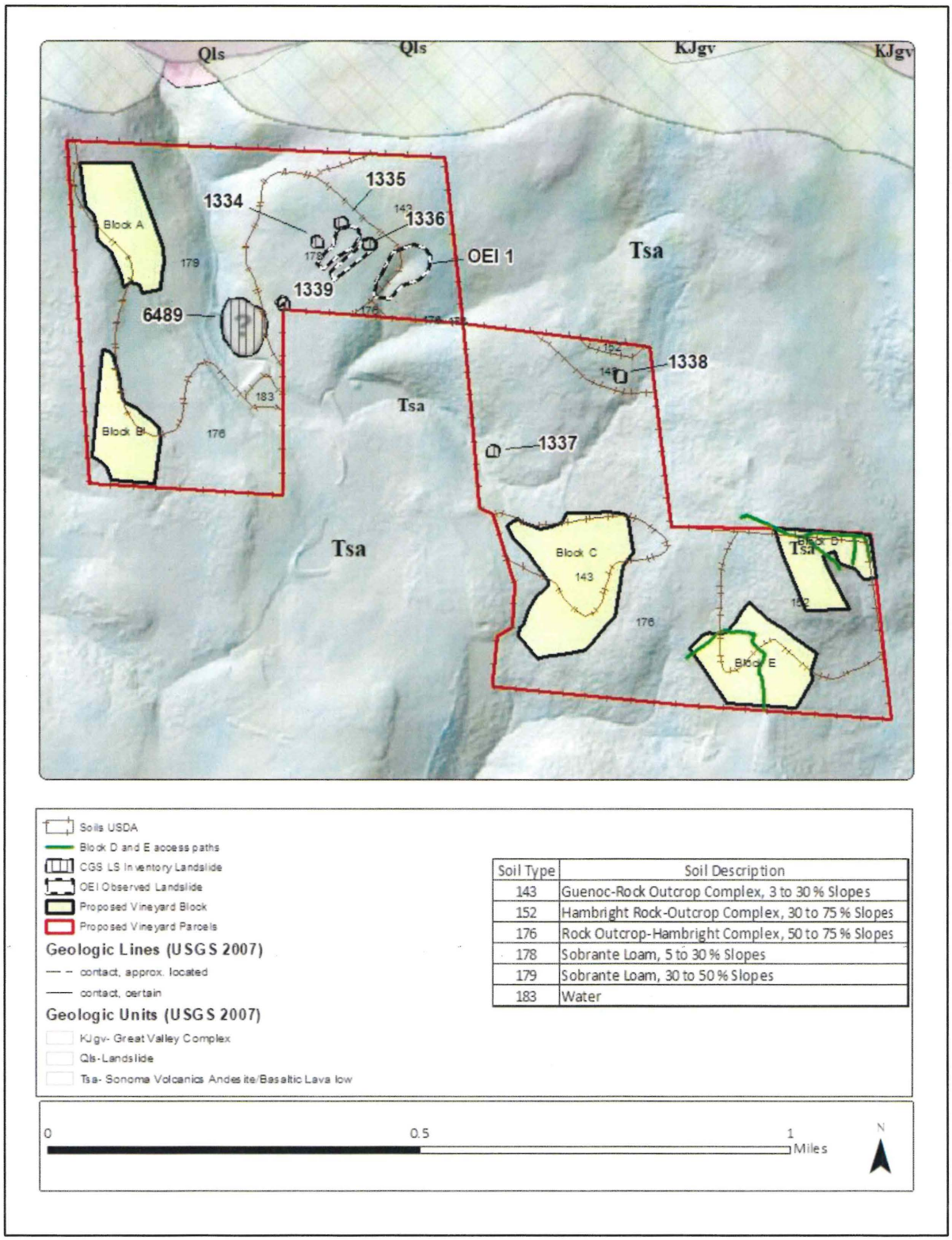
Potential Slope Instability

Napa County GIS Parcel Reports indicate that landslides are present on both of the project parcels. A regional landslide mapping effort by the California Geological Survey called the California Landslide Inventory (CGS, 2019) has compiled several mapping efforts across the state. In the vicinity of the project parcels landslides identified in the Yountville 7.5 Minute Quadrangle using aerial photos by Dwyer, Noguchi and O'Rourke of the US Geological Survey (USGS, 1976) show several landslides on the project parcels (Figure 3, Table 1). On the northern parcel four questionable debris flows (questionable is defined as "50% confident it is a landslide" by the USGS study) are mapped along with one feature identified as a questionable landslide of undefined type. On the southern parcel a questionable rockslide and a questionable debris flow are mapped (Figure 3). None of the mapped slides are located near the proposed vineyard areas or access roads.

Despite this generalized planning-level information about the site that indicates absence of landslide processes at the proposed vineyard sites, a site-specific assessment of slope stability (including a site visit to observe mapped features and slope conditions) at the project site was conducted. A discussion of the observations made during the site visit is provided later in this document.

Table 1. Landslides mapped by Dwyer, Noguchi and O'Rourke (USGS 1976) and OEI (2019).

Northern Parcel (APN 032-010-076)			
Source	**Landslide Number**	**Landslide Type**	**Field Review Note**
USGS 1976	6489	Questionable Undefined Landslide	Probable historic debris slide/slump, no scarp observed, convex hillside adjacent to small pond with subtle northern flank 15% slope.
USGS 1976	1339	Questionable Debris Flow	Slight depression, no evidence of a landslide, 15% slope, OEI field mapped smaller extent.
USGS 1976	1334	Questionable Debris Flow	See note below for 1335.
USGS 1976	1335	Questionable Debris Flow	Historic shallow earthflow, no evidence of any recent activity, 30% slopes and 22% down slope (see photo), OEI field mapped larger extent combining 1335 and 1334.
USGS 1976	1336	Questionable Debris Flow	Historic shallow earth flow/debris slide, no evidence of recent movement, 25% slope, OEI field mapped larger extent.
OEI observation	OEI 1	Probable Historic Debris Slide	No evidence of recent movement, 50% slope, newly mapped landslide by OEI.
Southern Parcel (APN 032-010-094)			
Source	**Landslide Number**	**Landslide Type**	**Field Review Note**
USGS 1976	1338	Questionable Debris Flow	Exposed bedrock, boulders and cobbles, no landslide observed.
USGS 1976	1337	Questionable Debris Flow	Exposed bedrock, boulders and cobbles, no landslide observed.



Soil Type	Soil Description
143	Guenoc-Rock Outcrop Complex, 3 to 30 % Slopes
152	Hambright Rock-Outcrop Complex, 30 to 75 % Slopes
176	Rock Outcrop-Hambright Complex, 50 to 75 % Slopes
178	Sobrante Loam, 5 to 30 % Slopes
179	Sobrante Loam, 30 to 50 % Slopes
183	Water

Figure 3: Distribution of USDA Soil types, Geology (Graymer, 2007) and Landslides on the project parcels, CGS California Landslide Inventory Landslides shown are from Dwyer, Noguchi and O'Rourke (USGS 1976)

A strong indicator of potential slope instability is slope gradient. Observations of slope gradient in the field did not suggest significant potential slope instability. Slope gradient on the proposed vineyard site is generally less than 30% with some small inclusions of > 30% slope. In most non-cohesive earth materials, potential instability is generally very low on slopes less than about 50% and may typically be found to be significant on slopes greater than 65%. On some landslide deposits and in some clay-rich materials under certain conditions, there may be higher potential instability on slopes in the 50% to 65% range.

Soils and Slopes

Soil types at the proposed vineyard sites were queried using the NRCS Web Soil Survey. The review of soils data is not particularly germane to site-specific determination of evidence of slope stability or instability but is sometimes helpful in identifying evidence of susceptibility to slope instability.

The soils mapped on the project parcels are listed in Table 2. The Guenoc and Hambright Rock outcrop soils are derived from weathering of Sonoma Volcanics bedrock. The Sobrante Loam is derived from a massive fine-grained sandstone, possibly the Franciscan Complex sandstone. The typical soil profiles extend to depths between 12 and 30 inches; soil depths at this site are generally substantially less. The Guenoc-Rock Outcrop Complex and Sobrante Loam soils are classified in Hydrologic Soil Group C which have a slow infiltration rate when thoroughly wet and have a slow rate of water transmission. Surface runoff is rated high. Hambright soil is classified in Hydrologic Soil Group D which has slow infiltration and a high runoff-potential when thoroughly wet. Per Web Soil Survey disclaimers, the soils data should not be considered accurate at the project scale.

Table 2. Soils located on the project parcels, properties from USDA Web Soil Survey.

Soil Type	Soil Description	Depth to Bedrock (inches)	Hydrologic Soil Group
143	Guenoc-Rock Outcrop Complex, 3 to 30 % Slopes	30	C
152	Hambright Rock-Outcrop Complex, 30 to 75 % Slopes	12	D
176	Rock Outcrop-Hambright Complex, 50 to 75 % Slopes	12	D
178	Sobrante Loam, 5 to 30 % Slopes	30	C
179	Sobrante Loam, 30 to 50 % Slopes	30	C

Aerial Photo Review

Historical aerial photography available on Google Earth was reviewed for evidence of active landslides at or near the project parcel. The available imagery was abundant for the period

covering the period for 2002 to present; the oldest image from this source was 1993. There is no evidence of landslides on or near the project site in any of the photos reviewed.

Observed Landslides and Slope Conditions

I conducted field reconnaissance of the proposed vineyard sites on both project parcels on June 20, 2019 over a six-hour period. Site photos are compiled in Appendix B. I measured the slope gradient of the ground surface at various locations in the proposed vineyard site using a clinometer. I found slopes consistent with those documented in the ECP and the Napa LiDAR-derived topographic data. In addition, I inspected the ground surface around the perimeter of the proposed vineyard sites where slopes are > 30% and where natural swales and ephemeral streams are found and where evidence of slope instability and landslide activity would likely exist if present. Finally, I visited all sites of landslides and suspected landslides or unstable areas identified by previous mapping efforts.

Although access to the entirety of proposed vineyard Blocks D and E was not possible due to very dense brush, access paths cut by the property owner traverse significant portions of both blocks (Figure 3). Walking these paths allowed me to observe ground conditions, measure local slopes, and visit some of the steepest sections of the Blocks (max slope observed was 30%). A maximum slope of 52% was observed 180 ft along the planar hillside northeast of proposed vineyard Block A. No evidence of instability or shallow landslides (debris slides or shallow rotational slumps) was observed within and around all of the proposed vineyard blocks on both parcels.

On the northern parcel (APN 032-010-076) east of proposed vineyard Blocks A and B, five landslides were identified in the 1976 USGS study. In the southern parcel (APN 032-010-094) north of proposed vineyard Block C, two landslides were identified by the 1976 USGS study. I visited each site and assessed the slope stability of each. Table 1 summarizes each landslide and my assessment of stability.

In the northern project parcel I visited all five mapped landslides and assessed their classification, activity and stability. The extents of landslides 1334, 1335, 1336 and 1339 were adjusted as shown by the black and white dashed polygons in Figure 1. Landslides 1334 and 1335 appear to be offset to the northwest slightly and are part of a single feature; 1339 was smaller than the USGS mapped extent. The extent of landslide 6489 was not changed, and a previously unmapped probable historic debris slide landslide (OEI 1) was observed. None of the landslides observed were active or present a hazard to the project or project infrastructure. In the southern project parcel at the locations of the two mapped landslides both sites had exposed bedrock, boulders and cobbles; however, no evidence of active or historic slope movement was observed.

Numerous outcroppings of volcanic bedrock, boulders and cobbles are present throughout the proposed vineyard block areas. Grading of an emergency fire break across the southern parcel during the fire of 2017 exposed boulders and fragments of rock found at shallow depth below the soil. In the northern project parcel evidence of significant amounts of rock removed to

prepare the existing vineyard field indicates a very shallow depth to bedrock and rock. The presence of this volcanic rock lying at or near the surface throughout much or all of the proposed vineyard site indicates that the site is not generally susceptible to landslide processes in the absence of fractures or structural dip slopes parallel to surface slope. The volcanic rock has high strength, and overlying soils are thin and on slope gradients that are far below typical thresholds of instability.

Conclusions and Recommendations

Based on the foregoing assessment of site conditions, the proposed vineyard development is not expected to cause any significant decrease in slope stability nor any increase in erosion associated with landslide processes.

Limitations

This slope stability and erosion assessment has been prepared with generally accepted principles and practices of Professional Geology. The conclusions and recommendations presented are based on available data, site observations, and professional judgment.

References Cited

California Department of Conservation, 2013. Factors Affecting Landslides in Forested Terrain. Division of Mines and Geology Note 50, 6 p.

California Geological Survey, 2010. Fault Activity Map of California. Geologic Data Map No. 6. Compilation and Interpretation by: Charles W. Jennings and William A. Bryant. http://maps.conservation.ca.gov/cgs/fam/

Dwyer, M. J., Noguchi, N., and O'Rourke, J., 1976. Reconnaissance Photointerpretation Map Of Landslides In 24 Selected 7.5-Minute Quadrangles in Lake, Napa, Solano, and Sonoma Counties, California. United States Geological Survey, US Department of the Interior.

Graymer, R.W. et al. 2007. Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California. USGS Scientific Investigation Map 2956.

APPENDIX A-Site Photographs, June 2019

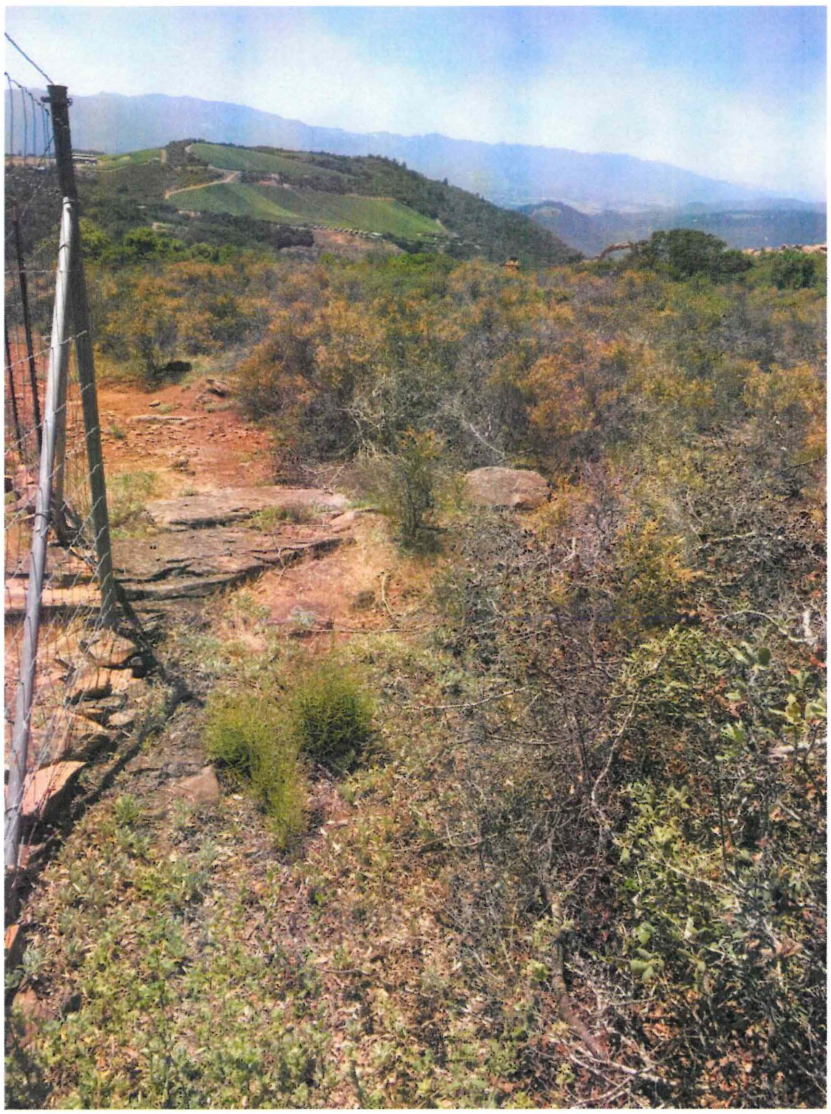


Photo 1 View of exposed bedrock in proposed vineyard Block B, view to the west.

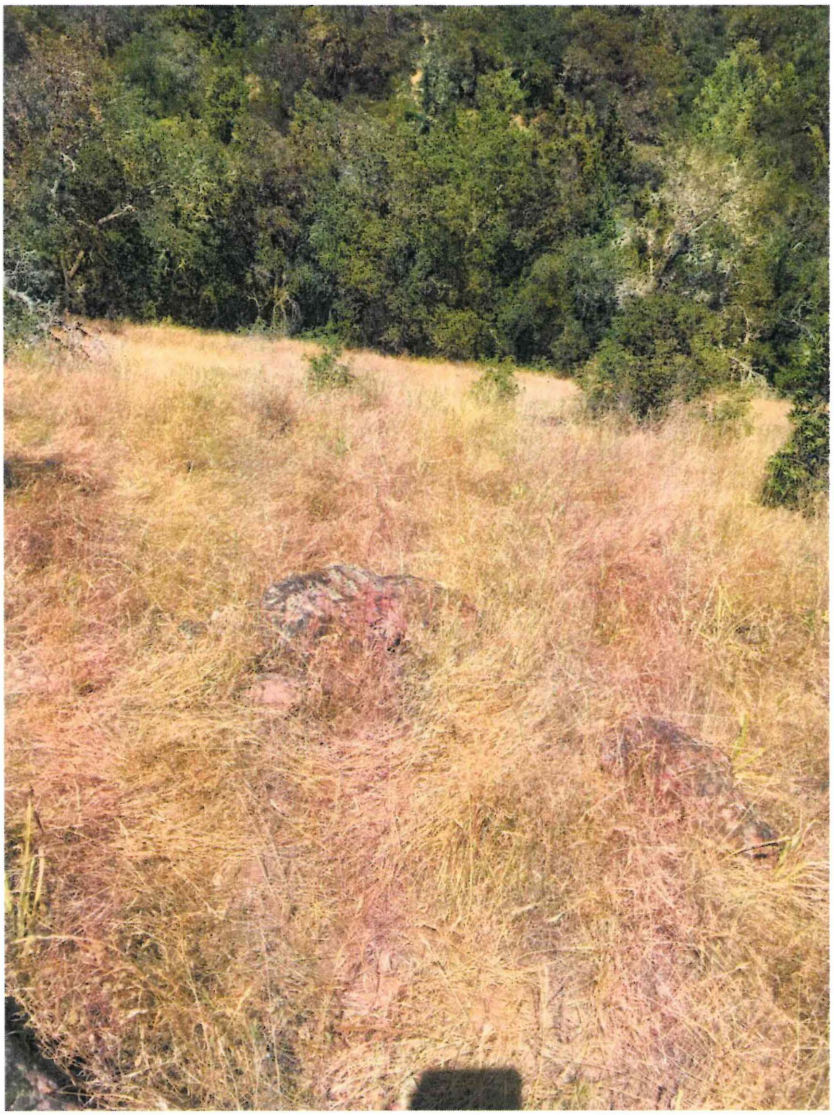


Photo 2. View of typical ground conditions with boulders and cobbles exposed on slope adjacent to Block A; view is to the east.

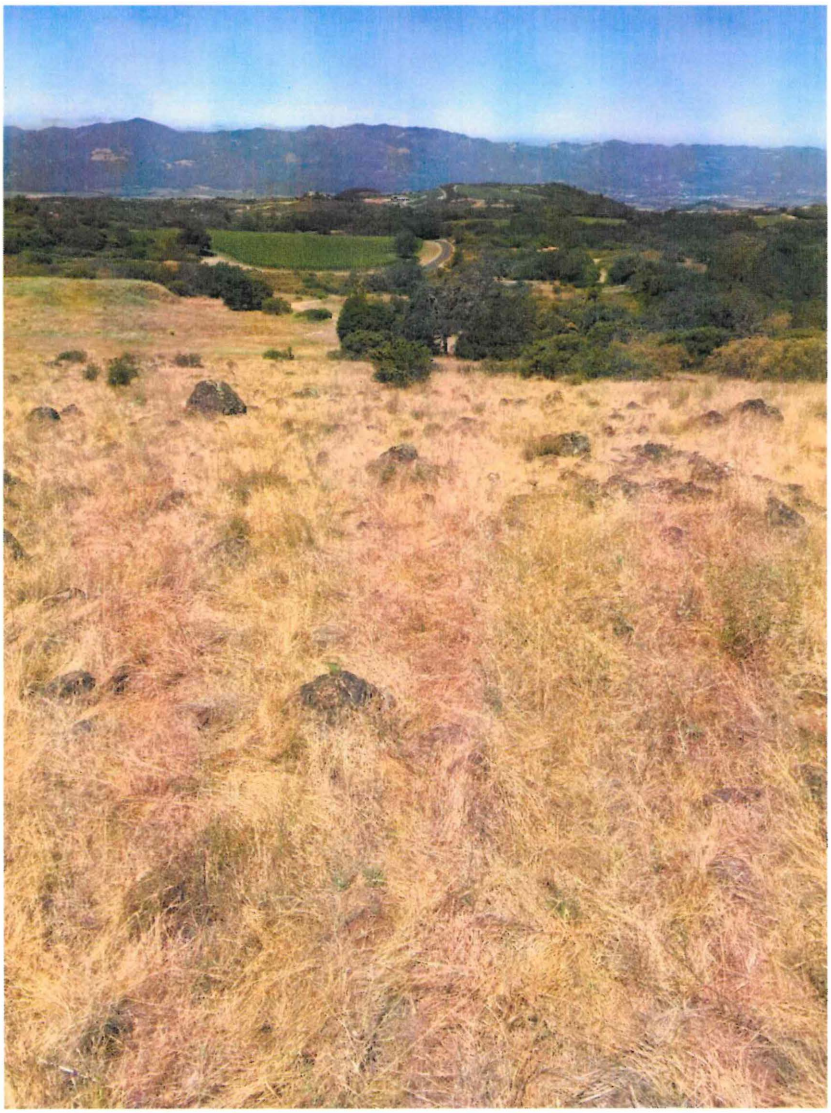


Photo 3 . View of typical ground conditions in proposed vineyard Block C, view to the west.

Photo 4. View of surface conditions in Block D

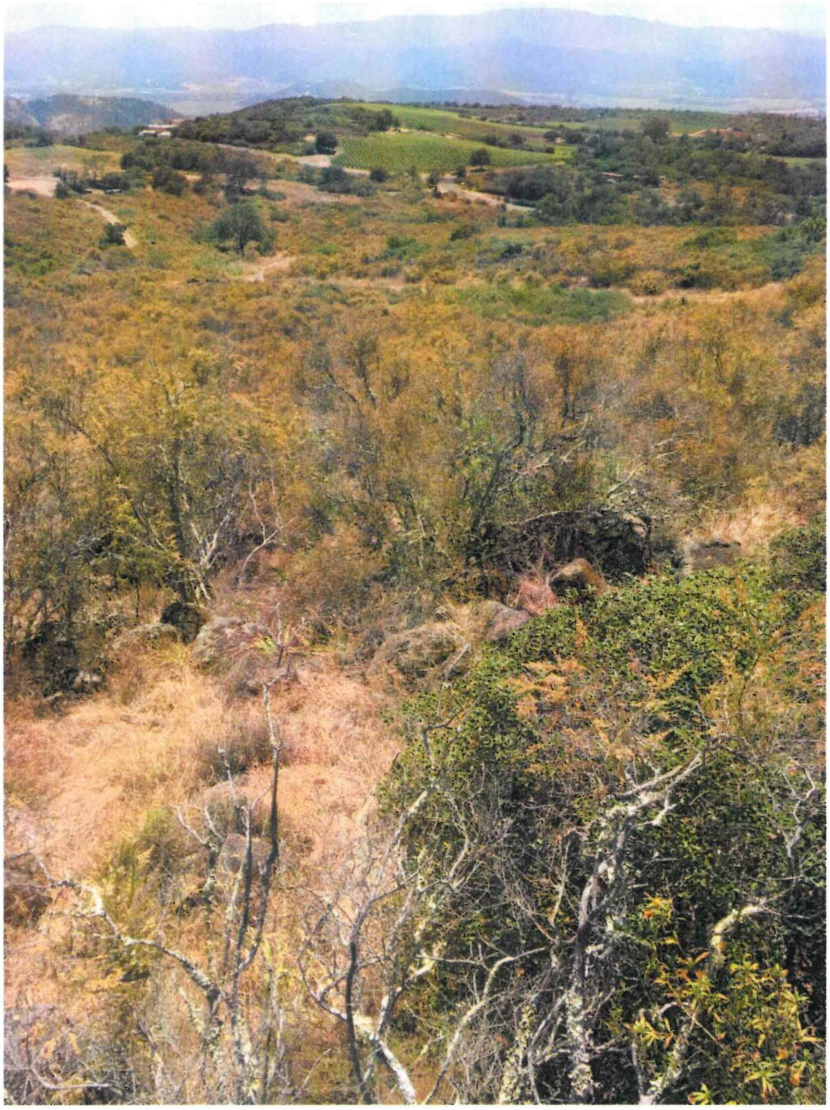


Photo 5. View of surface conditions in proposed vineyard Block E.

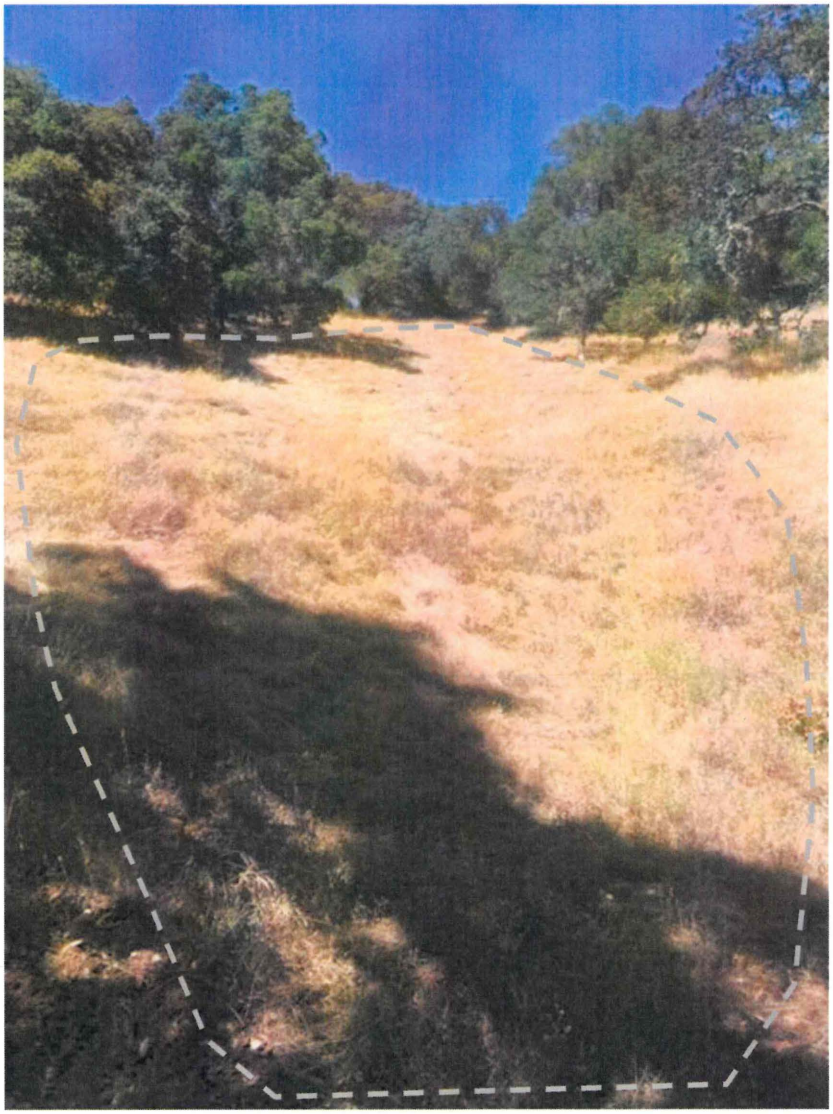


Photo 6. View up-hill to northeast of Probable Historic Debris slide OEI 1. Dashed line shows approximate extent.

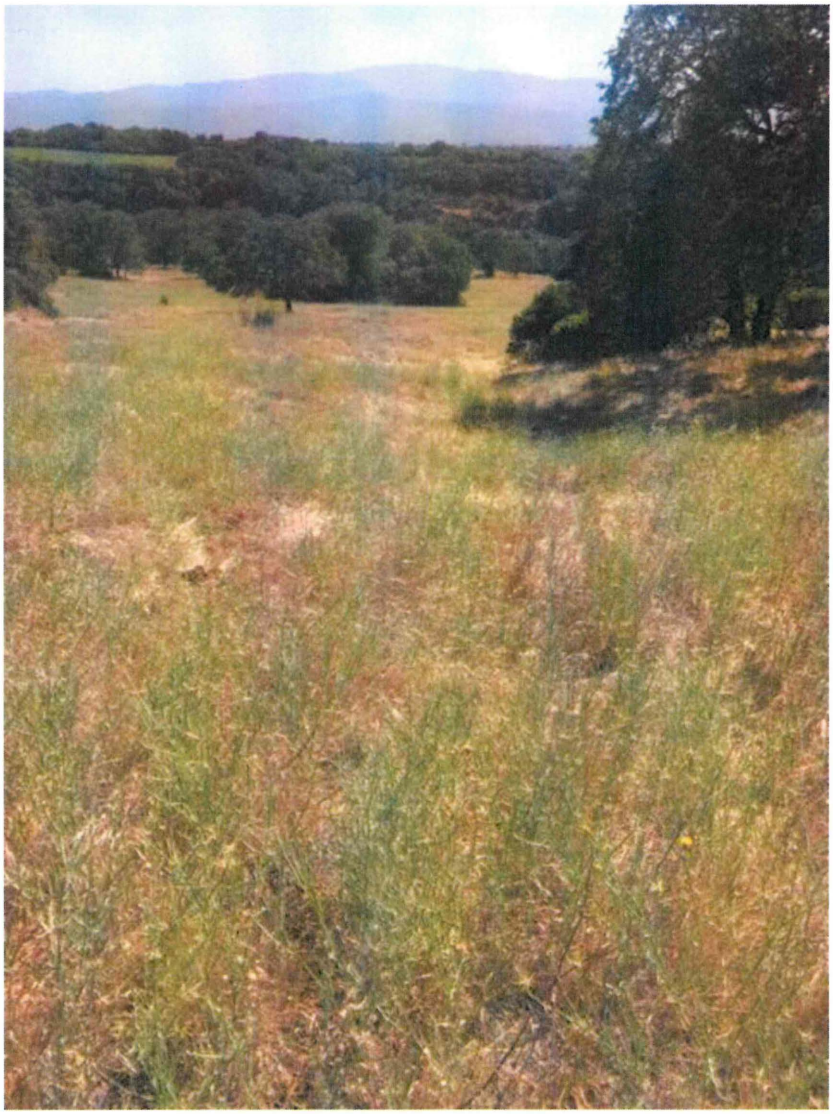


Photo 7. View from top to southwest of historic debris slide 1336. Subtle grassy swale extends down hill.

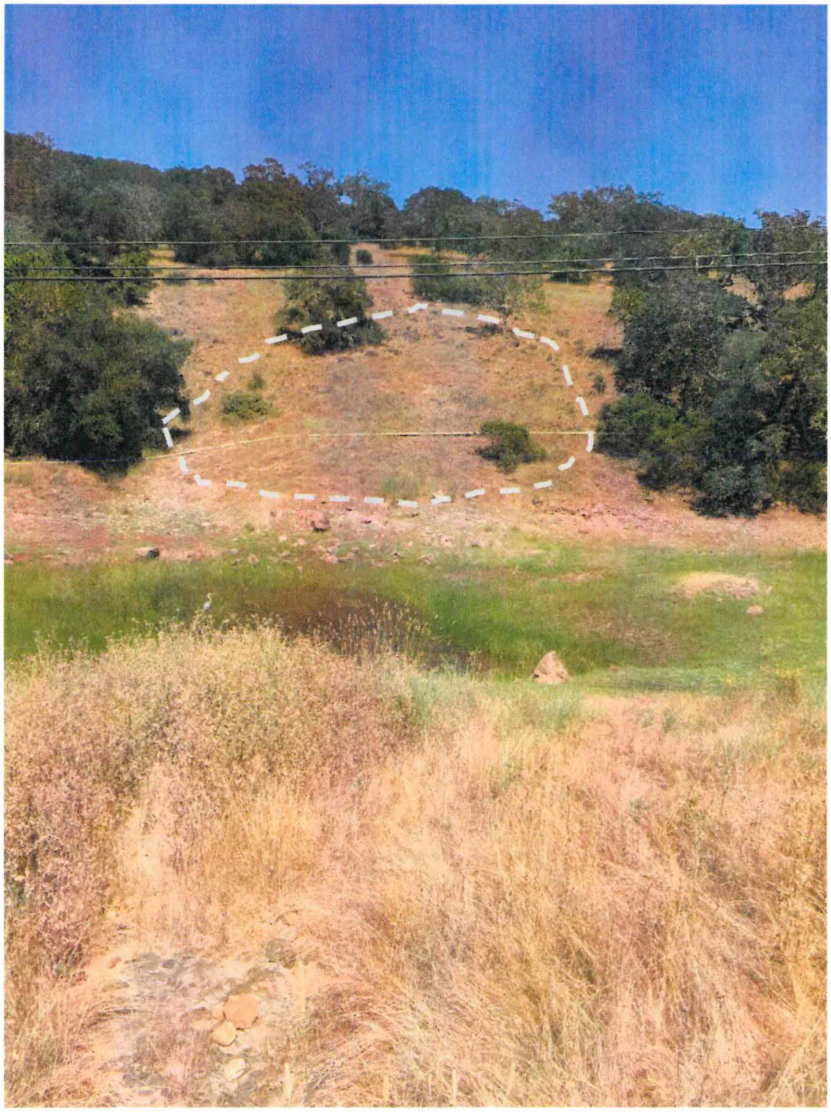


Photo 7. View of Probable historic debris slide/slump 6489 with small pond in foreground. Approximate extent indicated by dashed white line.

June 7, 2021

MEMORANDUM

To: Cyril Chappellet
Chappellet Vineyard LLC

From:

Michael Sherwood California PG #8839 (Exp. 6/30/2023)
Geologist, O'Connor Environmental, Inc.

Matthew O'Connor, PhD, CEG #2449 (Exp. 10-31-2021)
President, O'Connor Environmental, Inc.

Subject: Response to comments on Chappellet Vineyards Landslide Hazard Evaluation associated with #P20-00271-ECPA Sage Canyon Road: APNs 032-560-022 and -033

INTRODUCTION

This memorandum has been prepared in response to specific comments regarding the Chappellet Vineyards Landslide Hazard Evaluation presented in a memorandum to you from Don Barrella, Napa County PBES dated December 10, 2020. Excerpts from comments are provided in italics with our response below.

Item 2b (Pdf page 4) pertaining to the OEI Landslide Hazard Evaluation:
b. *Landslide Hazard Evaluation: Please provide an addendum or update to the Landslide Hazard Evaluation prepared by OEI Inc (February 2020) that includes the following information:*

i. The effects on slope stability due to the proposed ECPA related to increased infiltration due to proposed ripping depths. The report should also provide ground preparation recommendations to maintain slope stability.

VINEYARD FIELD PREPARATION BY RIPPING

Common site preparation practices in the shallow rocky volcanic soils found in the project area and across Napa County include the mechanical ripping of soils heavy bulldozers equipped with "rippers" extending into the soil along with the removal of larger boulders from future vineyard fields. All existing vineyard fields on the project parcel and neighboring parcels in the region have been so treated by ripping the soil

to varying depths. Large but variable volumes of rock have been removed and relocated to prepare for planting. Evidence of rock removal in neighboring vineyards is apparent in the field and in aerial imagery where all vineyard fields have adjacent rock storage and disposal areas.

PRIOR ASSESSMENT OF LANDSLIDE HAZARD

To reiterate the findings of the Chappellet Vineyards Landslide Hazard Evaluation prepared by OEI, the character of the proposed vineyard field with respect to slope gradient,, soils, local bedrock geology, and landform along with the absence of any observed unstable features or landslides on the project parcels has lead us to conclude that the proposed vineyard blocks are stable and that the proposed project will not cause significant slope instability nor any increase in erosion associated with landslide processes. OEI's Landslide Hazard Evaluation (February 2020) stated:

> Numerous outcroppings of volcanic bedrock, boulders and cobbles are present throughout the proposed vineyard block areas. Grading of an emergency fire break across the southern parcel during the fire of 2017 exposed boulders and fragments of rock found at shallow depth below the soil. In the northern project parcel evidence of significant amounts of rock removed to prepare the existing vineyard field indicates a very shallow depth to bedrock and rock. The presence of this volcanic rock lying at or near the surface throughout much or all of the proposed vineyard site indicates that the site is not generally susceptible to landslide processes in the absence of fractures or structural dip slopes parallel to surface slope. The volcanic rock has high strength, and overlying soils are thin and on slope gradients that are far below typical thresholds of instability.(pp. 8-9)

SUPPLEMENTAL ASSESSMENT

Additional evaluation of site conditions in relation to the concern raised regarding potential effects of ripping on slope stability includes:

- additional site reconnaissance on February 10, 2021, by Dr. Matthew O'Connor, CEG #2449, to observe conditions at the site to consider potential effects of ripping and rock removal on slope stability.
- Additional review and analysis of USDA soils data regarding hydrologic characteristics of soils in the area for indications regarding potential effects of soil ripping on infiltration and slope stability
- Additional review and analysis of aerial imagery and LiDAR DEM's for evidence regarding landslides or unstable slopes where vineyards are proposed or have been previously developed on similar terrain with similar bedrock

Site Reconnaissance. Dr. O'Connor visited existing vineyard fields on the project parcels to observe ground conditions in the post development state and traversed proposed Block C to evaluate representative conditions at proposed vineyard blocks. Dr. O'Connor's field observations confirmed the conclusions of M. Sherwood, PG #8839 (quoted above), regarding the character of the terrain. All areas in and around vineyard fields which had been prepped by ripping and rock removal were observed to be stable.

Soil Hydrology. USDA Web Soil Survey data indicate that the depth to restrictive layer for infiltrating water insoils located at the project site range from 0 feet to 2.5 feet (Table 1). The Web Soil Survey defines the restrictive layer as "...a nearly continuous layer that has one or more physical, chemical or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layer and frozen layers." In this area, the restrictive layers are bedrock. Typical depth of ripping for vineyard development in similar soil and bedrock conditions in Napa County would be expected to extend to the depth the soil restrictive layers comprised of volcanic bedrock.

Table 1. Soils located on the project parcels see Figure 1 for spatial distribution of soil types, properties from USDA Web Soil Survey.

Soil Type	Soil Description	Hydrologic Soil Group	Depth To restrictive layer (ft)
143	Guenoc-Rock Outcrop Complex, 3 to 30 % Slopes	C	2.5
152	Hambright Rock-Outcrop Complex, 30 to 75 % Slopes	D	1.0
176	Rock Outcrop-Hambright Complex, 50 to 75 % Slopes	D	0
178	Sobrante Loam, 5 to 30 % Slopes	C	2.5
179	Sobrante Loam, 30 to 50 % Slopes	C	2.5

Owing to the hydrogeologic characteristics of the volcanic rock on Pritchard Hill, ripping and removal of rock is unlikely to significantly affect subsurface hydrology and infiltration. on water The process of vineyard field preparation is likely to increase the relative proportion of soil to large rock in vineyard fields, but is not expected to affect the extent to which fractures and other void spaces present in underlying volcanic rock permit infiltration of water from the overlying residual soil. The changed proportions of soil and rock in prepared fields is not expected to significantly alter the water holding capacity of the soil. Hence we do not believe that the proposed field preparation process will significantly affect water infiltration processes.

Furthermore, all slopes within proposed vineyard areas have gradients less than 30% with some small areas of >30% slope. As stated in OEI (2020): "In most non-cohesive earth materials, potential instability is generally very low on slopes less than out 50% and may typically be found to be significant on slopes greater than 65%." (p. 7) Because of this fundamental characteristic of non-cohesive soils, we do not believe that porposed site preparation including ripping to an average depth of 3 feet within the proposed vineyard areas will cause a decrease in slope stability.

Aerial and LiDAR Imagery. Finally, aerial imagery and recent LiDAR topographic data were reviewed for the Pritchard Hill area, particularly those areas with developed vineyards with in soils and geology similar to the project area. Figure 1 shows existing vineyard areas where this additional review was made in and around vineyards where rock removal and soil ripping has occurred. Available aerial imagery on Google Earth covering the period between 2002 and the present did not reveal any evidence of landslides in these

areas. Further review of hillshade terrain maps and slope gradient maps derived from recent 2018 LiDAR data collected by USGS[1] did not reveal any landslides or unstable slopes in areas located on nearby upland plateaus and rounded ridgetops within the Tsa bedrock unit (Figure 1). Slopes across all vineyard areas are generally less than 30% per county requirements and therefore it is not surprising that no evidence of landslides or unstable slopes were remotely identified. Anomalous steeper slopes near vineyard areas were always associated with piles of rock removed from the adjacent fields.

The absence of landslides or unstable slope features associated with vineyard fields developed where rock removal and soil ripping in areas of similar slopes soils and geology is compelling evidence that these practices are not expected to reduce slope stability or cause erosion associated with landslides or other mass wasting processes.

CONCLUSION

Proposed ripping depths for the new Chappellet vineyard blocks will depend upon soil conditions but will range between 2 and 4 feet with typical expected depth of 3 feet as reported by the project applicant in discussions at the site with Dr. Matt O'Connor, CEG #2449 on February 10, 2021. These depths are based upon the applicant's experience preparing the existing Chappellet vineyard fields and their familiarity with proposed new vineyard site conditions in addition to the experience of neighboring vineyards constructed on similar terrain on Pritchard Hill. Our supplemental evaluation of site conditions and overall conditions in the Pritchard Hill area underlain by volcanic rock revealed no evidence of landslides or unstable slopes, regardless of whether vineyard development has occurred or not. We believe that the proposed depth of ripping and vineyard field preparation will not have adverse effects on slope stability or associated erosion. Potential erosion associated with rainfall-runoff processes is evaluated by means of a USLE analysis per PBES policies and procedures.

[1] U.S. Geological Survey, 20200318, USGS one meter x55y426 CA NoCAL Wildfires B5b 2018: U.S. Geological Survey.

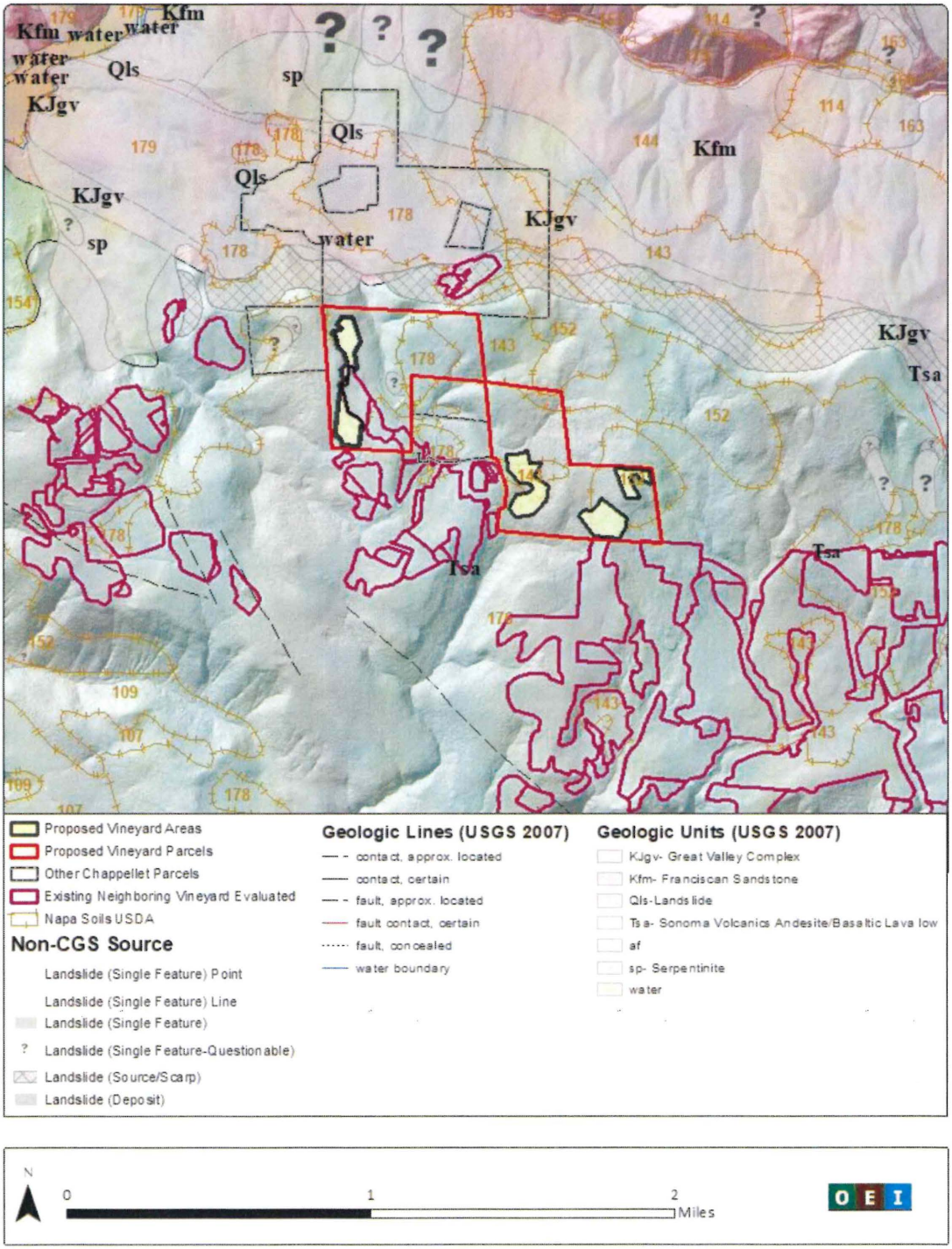


Figure 1. Project site with proposed vineyard areas, geology, soils and previously mapped landslides.

ii. The effects and any changes in sediment delivery amounts based on the project including changes in the amount of sediment delivered to drainageways as compared to existing conditions.

Impacts of proposed project upon sediment delivery have been addressed in the soil erosion analysis (USLE) which has been submitted as a part of the ECPA by Applied Civil Engineering. Please refer to this analysis for details on changes.

iii. The effects and any potential impacts and threats to both on and off-site resources (i.e. aquatic resources and streams) as a result of the project as compared to existing conditions.

Based upon our findings presented in the original Landslide Hazard Evaluation which determined that the project will not cause any significant decrease in slope stability nor any increase in erosion associated with landslides we do not anticipate any sediment delivery increases (compared to existing conditions) will occur.

Therefore, no impacts or threats to aquatic resources and streams will occur as a result of the project.