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GEOTECHNICAL STUDY REPORT

CAPRA SAGE CANYON EAST MONEY HOLE
2460 SAGE CANYON ROAD
ST. HELENA, CALIFORNIA

Project Number:

7068.07.06.20

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January 8, 2024

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INTRODUCTION

This report presents the results of our geotechnical study for the synthetically lined reservoir to be constructed at 2460 Sage Canyon Road in St. Helena, California. The site location is shown below.

During a previous replanting effort, a slope failure occurred in the planned reservoir area and we prepared an evaluation of that landslide in letter dated February 10, 2020 (attached in Appendix A). During the repair of the landslide, RGH personnel were on site to observe the excavation of landslide deposits, the installation of the installed drainage, and to perform compaction testing of the fill as it was placed to restore the hillside. Because of our familiarity with the site and our observation and testing performed during the grading required to install the compacted fill, we did not perform additional subsurface exploration.

SITE CONDITIONS

General

Napa County is located within the California Coast Range geomorphic province. This province is a geologically complex and seismically active region characterized by sub-parallel northwest-trending faults, mountain ranges and valleys. The oldest bedrock units are the Jurassic-Cretaceous Franciscan Complex and Great Valley sequence sediments originally deposited in a marine environment. Subsequently, younger rocks such as the Tertiary-age Sonoma Volcanics group, the Plio-Pleistocene-age Clear Lake Volcanics and sedimentary rocks such as the Guinda, Domengine, Petaluma, Wilson Grove, Cache, Huichica and Glen Ellen formations were deposited throughout the province. Extensive folding and thrust faulting during late Cretaceous through early Tertiary geologic time created complex geologic conditions that underlie the highly varied topography of today. In valleys, the bedrock is covered by thick alluvial soil.

Subsurface

The subsurface conditions primarily consist of varying thickness of compacted fill over sandstone bedrock. As described and shown in our attached letter, there were minor windows of landslide debris that was left in place under the compacted fill. We anticipate that the surface soil has developed some porosity as some vegetation has developed.

DISCUSSION AND CONCLUSIONS

Geotechnical Issues

General

Based on our study, we judge the proposed reservoir can be built as planned, provided the recommendations presented in this report are incorporated into their design and construction. The primary geotechnical concerns during design and construction of the project are:

1. The presence of weak surface soil; and

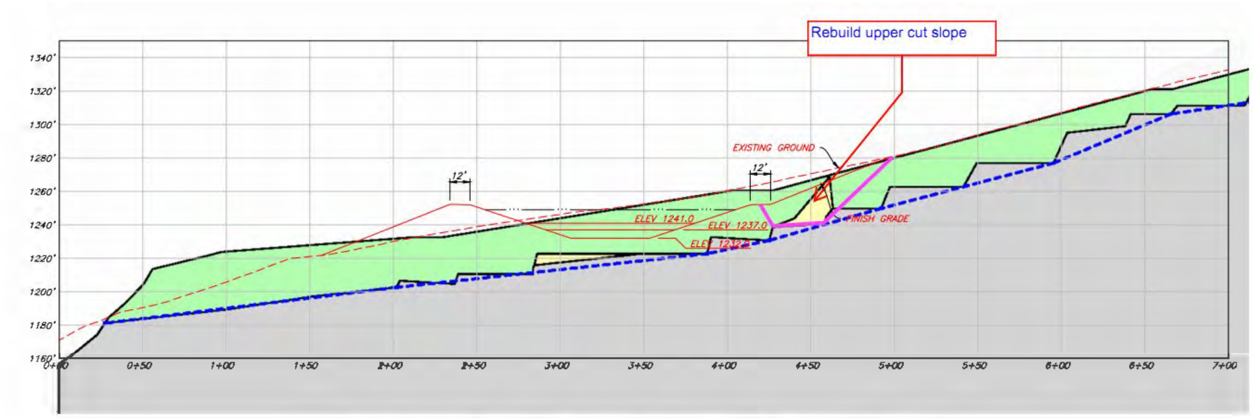
2. The presence of landslide debris remaining in the cut slope area of the reservoir.

Weak, Porous Surface Soil

Weak surface soil, such as that found at the site, appears hard and strong when dry but will lose strength rapidly and settle under the load of new fills or mechanical slabs as its moisture content increases and approaches saturation. The moisture content of this soil can increase as the result of rainfall, periodic irrigation or when the natural upward migration of water vapor through the soil is impeded by, and condenses under fills, slabs, or liners. The detrimental effects of such movements can be reduced by strengthening the soil during grading. This can be achieved by excavating the weak soil and replacing it as properly compacted (engineered) fill.

Remaining Landslide Deposits

As described and shown in the attached letter, a portion of the landslide deposits remain in the cut slope area of the planned reservoir. This material should be removed and replaced as engineered fill. This will likely require rebuilding the cut slope as an engineered compacted fill slope. The landslide debris remaining under the planned reservoir can remain, as it is buttressed by the fill below. A diagram showing the profile of the current condition with the remaining landslide deposits (shown in yellow) and a sketch of a concept of the planned reservoir is shown below. The green indicates engineered fill material.



SECTION OF EAST MONEY HOLE RESERVOIR – V2

On-Site Soil Quality

All fill materials must be approved by the geotechnical engineer. We anticipate that, with the exception of organic matter and of rocks larger than 6 inches in diameter, the excavated material will be suitable for re-use as engineered fill.

Engineered Fill

Engineered fill can consist of approved on-site soil or import materials with a low expansion potential. The geotechnical engineer must approve the use of on-site or import soil as engineered fill during grading.

Settlement

Since the embankment fill will bear on engineered fill or undisturbed bedrock, we estimate that post-construction differential settlement across the embankment should be about ½ inch.

Surface Drainage

Surface runoff typically sheet flows over the ground surface but can be concentrated by the planned site grading, landscaping, and drainage. The surface runoff can be quickened by long slopes, causing rilling and erosion. Benches can be utilized to reduce the surface lengths and reduce the drainage velocities.

RECOMMENDATIONS

Grading

Site Preparation

Areas to be developed should be cleared of vegetation and debris, including that left by the removal of obsolete structures. Trees and shrubs that will not be part of the proposed development should be removed and their primary root systems grubbed. Cleared and grubbed material should be removed from the site and disposed of in accordance with jurisdictional guidelines. Voids created during clearing should be backfilled with engineered fill as recommended herein.

Stripping

Areas to be graded should be stripped of the upper few inches of soil containing organic matter. Soil containing more than two percent by weight of organic matter should be considered organic. Actual stripping depth should be determined by a representative of the geotechnical engineer in the field at the time of stripping. The strippings should be removed from the site, or if suitable, stockpiled for re-use as topsoil in landscaping.

Excavations

Following initial site preparation, excavation should be performed as recommended herein. Excavations extending below the proposed finished grade should be backfilled with suitable materials compacted to the requirements given below. The embankment fill should be constructed on a level bench that exposes compacted engineering fill. The toe or downslope edge of the embankment should be founded on a keyway excavated at least 3 feet into engineering fill and at least 12 feet wide. The keyway should be drained as described in the geotechnical drainage section of this report. Level benches will be required to continue as fill is placed up the slope.

Weak Surface Soil - Within fill and mechanical slab areas, the weak surface soil should be excavated to within 6 inches of its entire depth. The excavated materials should be stockpiled for later use as compacted fill, or removed from the site, as applicable.

Excavation Safety - At all times, temporary construction excavations should conform to the regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety or other stricter governing regulations. The stability of temporary cut slopes, such as those constructed during the installation of underground utilities, should be the responsibility of the contractor. Depending on the time of year when grading is performed, and the surface conditions exposed, temporary cut slopes may need to be excavated to 1½:1, or flatter. The tops of the temporary cut slopes should be rounded back to 2:1 in weak soil zones.

Subsurface Drainage

A subdrain should be installed at the rear of the cut slope excavation made to remove the remaining landslide debris. Another subdrain should be placed about mid-height in the fill with another placed in the final 5 of fill. The subdrain should consist of a 4-inch diameter (minimum) perforated plastic pipe with SDR 35 or better embedded in permeable material. The permeable material should be at least 12 inches thick and extend at least 48 inches above the bottom of the pipe. Fabric should not be used at the soil and drain rock interface nor around the pipe.

In addition, subdrains should be installed at a minimum slope of 1 percent and should have cleanouts located at their ends and at turning points. "Sweep" type elbows and wyes should be used at all turning points and cleanouts, respectively. Subdrain outlets and riser cleanouts should be fabricated of the same material as the subdrain pipe as specified herein. Outlet and riser pipe fittings should not be perforated. A licensed land surveyor or civil engineer should provide "record drawings" depicting the locations of subdrains and cleanouts.

Fill Quality

All fill materials should be free of perishable matter and rocks or lumps over 6 inches in diameter and must be approved by the geotechnical engineer prior to use. We judge the on-site soil is generally suitable for use as fill but we should verify its suitability during grading.

Import Fill

Import fill should be free of organic matter, have a low expansion potential, and conform in general to the following requirements:

SIEVE SIZE	PERCENT PASSING (by dry weight)
6 inch	100
4 inch	90 – 100
No. 200	10 – 60

Liquid Limit – 40 Percent Maximum
Plasticity Index – 15 Percent Maximum

Material not conforming to these requirements may be suitable for use as import fill; however, it shall be the contractor's responsibility to demonstrate that the proposed material will perform in an equivalent manner. The geotechnical engineer should approve imported materials prior to use as compacted fill. The grading contractor is responsible for submitting, at least 3 business days in advance of its intended use, samples of the proposed import materials for laboratory testing and approval by the soils engineer.

Fill Placement

All fill placed as the embankment climbs the existing slope should be benched into engineered fill and placed in level lifts. The surface exposed by stripping and removal of weak surface soil should be scarified to a depth of at least 6 inches, uniformly moisture-conditioned to near optimum and compacted to at least 90 percent of the maximum dry density of the materials as determined by ASTM Test Method D-1557. Approved fill material should then be spread in thin lifts, uniformly moisture-conditioned to near optimum, and properly compacted on level benches or fill pads. All structural fills placed in the embankment, should be compacted to at least 92 percent relative compaction. All other fills, including the cut slope fill placed after removing the remaining landslide deposits, should be compacted to at least 90 percent relative compaction.

Permanent Cut and Fill Slopes

In general, reservoir interior cut and fill slopes should be designed and constructed at slope gradients of 3:1 (horizontal to vertical) or flatter, unless otherwise approved by the geotechnical engineer in specified areas. The downstream embankment face may be constructed at 2½:1 or flatter. Fill slopes should be constructed by overfilling and cutting the slope to final grade. "Track walking" of a slope to achieve slope compaction is not an acceptable procedure for slope construction. Permanent cut slopes should be observed in the field by the geotechnical engineer to verify that the exposed soil/bedrock conditions are as anticipated. The geotechnical engineer is not responsible for measuring the angles of these slopes.

Cut or fill slopes should be constructed with benches at least every 25 feet (vertically); the benches should be a minimum of 4 feet wide and should be sloped to drain to the rear and protected from erosion. Wider benches may be needed for vehicle access, if desired. The benches should be sloped longitudinally at a gradient of at least 1 percent. The discharge point of concentrated runoff should be either collected in a closed pipe that discharges onto erosion resistant natural drainages or other areas that are provided with energy dissipators.

Wet Weather Grading

Generally, grading is performed more economically during the summer months when on-site soil is usually dry of optimum moisture content. Delays should be anticipated in site grading performed during the rainy season or early spring due to excessive moisture in on-site soil. Special and relatively expensive construction procedures, including dewatering of excavations and importing granular soil, should be anticipated if grading must be completed during the winter and early spring or if localized areas of soft saturated soil are found during grading in the summer and fall.

Open excavations also tend to be more unstable during wet weather as groundwater seeps towards the exposed cut slope. Severe sloughing and occasional slope failures should be anticipated. The occurrence of these events will require extensive clean up and the installation of slope protection measures, thus delaying projects. The general contractor is responsible for the performance, maintenance and repair of temporary cut slopes.

Slab-On-Grade

Provided grading is performed in accordance with the recommendations presented herein, mechanical slabs should be underlain by firm soil, compacted fill. Slab-on-grade subgrade should be rolled to produce a dense, uniform surface. The future expansion potential of the subgrade soil should be reduced by thoroughly presoaking the slab subgrade prior to concrete placement. The moisture condition of the subgrade soil should be checked by the geotechnical engineer no more than 24 hours prior to placing the capillary moisture break.

Utility Trenches

The shoring and safety of trench excavations is solely the responsibility of the contractor. Attention is drawn to the State of California Safety Orders dealing with "Excavations and Trenches."

Unless otherwise specified, on-site, inorganic soil may be used as utility trench backfill. Where utility trenches support pavements and slabs, trench backfill should consist of aggregate baserock. The baserock should comply with the minimum requirements in Caltrans Standard Specifications, Section 26 for Class 2 Aggregate Base. Trench backfill should be moisture-conditioned as necessary, and placed in horizontal layers not exceeding 8 inches in thickness, before compaction. Each layer should be compacted to at least 90 percent relative compaction as determined by ASTM Test Method D-1557. Jetting or ponding of trench backfill to aid in achieving the recommended degree of compaction should not be attempted. Sloping trenches should be provided with trench dams.

Geotechnical Drainage

Reservoir Liner Underdrains

We recommend that the pond synthetic liner have underdrains installed. The liner underdrains can be constructed as a grid of four-inch diameter perforated pipe (SDR 35 or better) spaced at about 20 feet in each direction and sloped to drain to outlets by gravity. Alternatively, a series of circular rings of drains can be installed below the liner. Reservoir underdrains should be installed in trenches and backfilled to pond bottom grade with free draining rock.

Maintenance

Periodic land maintenance, especially on hillsides, will be required. Surface and subsurface drainage facilities should be checked frequently and cleaned and maintained as necessary or at least annually. Sloughing and erosion that occurs must be repaired promptly before it can enlarge.

Supplemental Services

Pre-Bid Meeting

It has been our experience that contractors bidding on the project often contact us to discuss the geotechnical aspects. Informal contacts between RGH Consultants (RGH) and an individual contractor could result in incomplete or misinterpreted information being provided to the contractor. Therefore, we recommend a pre-bid meeting be held to answer any questions about the report prior to submittal of bids. If this is not possible, questions or clarifications regarding this report should be directed to the project owner or their designated representative. After consultation with RGH, the project owner or their representative should provide clarifications or additional information to all contractors bidding the job.

Plan and Specifications Review

Coordination between the design team and the geotechnical engineer is recommended to assure that the design is compatible with the soil, geologic and groundwater conditions encountered during our study. RGH recommends that we be retained to review the project plans and specifications to determine if they are consistent with our recommendations. In the event we are not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations.

Construction Observation and Testing

Prior to construction, a meeting should be held at the site that includes, but is not limited to, the owner or owner’s representative, the general contractor, the grading contractor, the foundation contractor, the underground contractor, any specialty contractors, the project civil engineer, other members of the project design team and RGH. This meeting should serve as a time to discuss and answer questions regarding the recommendations presented herein and to establish the coordination procedure between the contractors and RGH.

In addition, we should be retained to monitor all soil related work during construction, including, but not limited to:

- Site stripping, over-excavation, grading, and compaction of near surface soil;
- Placement of all engineered fill and trench backfill with verification field and laboratory testing;
- Observation of all foundation excavations; and
- Observation of foundation and subdrain installations.

If, during construction, we observe subsurface conditions different from those encountered during the explorations, we should be allowed to amend our recommendations accordingly. If different conditions are observed by others, or appear to be present beneath excavations, RGH should be advised at once so that these conditions may be evaluated and our recommendations reviewed and updated, if warranted. The validity of recommendations made in this report is contingent upon our being notified and retained to review the changed conditions.

If more than 18 months have elapsed between the submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at, or adjacent to, the site, the recommendations made in this report may no longer be valid or appropriate. In such case, we recommend that we be retained to review this report and verify the applicability of the conclusions and recommendations or modify the same considering the time lapsed or changed conditions. The validity of recommendations made in this report is contingent upon such review.

These supplemental services are performed on an as-requested basis and are in addition to this geotechnical study. We cannot accept responsibility for items that we are not notified to observe or for changed conditions we are not allowed to review.

LIMITATIONS

This report has been prepared by RGH for the exclusive use of the property owner and their consultants as an aid in the design and construction of the proposed improvements described in this report.

The validity of the recommendations contained in this report depends upon an adequate testing and monitoring program during the construction phase. Unless the construction monitoring and testing program is provided by our firm, we will not be held responsible for compliance with design recommendations presented in this report and other addendum submitted as part of this report.

Our services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no warranty, either expressed or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed construction, the results of our field exploration, laboratory testing program, and professional judgment. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observation of construction.

The **Subsurface** section of this report represents the subsurface conditions at the locations and on the date indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. Site conditions and cultural features described in the text of this report are those existing at the time of our field exploration and may not necessarily be the same or comparable at other times.

It should be understood that slope failures including landslides, debris flows and erosion are on-going natural processes which gradually wear away the landscape. Residual soil and weathered bedrock can be susceptible to downslope movement, even on apparently stable sites. Such inherent hillside and slope risks are generally more prevalent during periods of intense and prolonged rainfall, which occasionally occur, in northern California and/or during earthquakes. Therefore, it must be accepted that occasional, unpredictable slope failure and erosion and deposition of the residual soil and weathered bedrock materials are irreducible risks and hazards of building upon or near the base of any hillside or any steeper slope area throughout northern California. By accepting this report, the client and other recipients acknowledge their understanding and acceptance of these risks and hazards, and the terms and conditions herein.

The scope of our services did not include an environmental assessment or a study of the presence or absence of toxic mold and/or hazardous, toxic or corrosive materials in the soil, surface water, groundwater or air (on, below or around this site), nor did it include an evaluation or study for the presence or absence of wetlands. These studies should be conducted under separate cover, scope and fee and should be provided by a qualified expert in those fields.

APPENDIX A – LANDSLIDE EVALUATION AND REPAIR RECOMMENDATIONS

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February 10, 2020

Capra Vineyards
Attention: Krishna Hendrickson
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Santa Rosa, CA 95403

Landslide Evaluation and Repair Recommendations — Project Number: 7068.04.06.2
Capra Sage Canyon Vineyards Landslide
2460 Sage Canyon Road
St. Helena, California

Introduction

In April 2019, RGH observed a landslide that occurred within blocks 26C, 27C, and 28C at the Capra Sage Canyon Vineyards property in St. Helena, California. The site location is shown on the attached Plate 1. The vineyard blocks and outlined landslide are shown on Plate 2. Our engineering geologist logged ten test pits within the three vineyard blocks and, based on observations within the test pits, estimated the landslide to range in depth between approximately 3 and 15 feet. As observed within the test pits, the landslide occurred within both fill and native weathered mélange bedrock materials. Based on our observations, we recommended the landslide be stabilized through grading a keyway and removal of landslide debris within the toe area, placement of subdrains, and construction of a buttressed fill.

During excavation of the keyway, we observed that the active landslide plane within the lower portion of the landslide in fact varied in depth from approximately 15 to at least 35 feet. The landslide plane is sinuous in both the longitudinal and lateral directions. At these greater depths the landslide occurs as a block slide within weathered mélange and shale bedrock. The landslide continued to creep downslope faster than the keyway excavation could proceed. Thus, the approach to the stabilization efforts changed from focusing on stabilizing the toe to removing weight in the headscarp area, thus reducing driving forces and allowing work to continue in the toe area.

Following this new approach, a keyway was excavated within the upper portion of the landslide. The upper landslide was found to vary in depth from about 20 to 25 feet. The keyway was extended to below the active landslide plane and subdrains were placed. The landslide debris was removed and replaced as a buttressed fill to stabilize the upper portion. Material excavated from the lower portion of the landslide was used within the buttressed fill of the upper portion. Once the upper portion of the landslide was stabilized and drained as described, work resumed on the lower and also the middle portion. A keyway approximately 35 feet in depth was excavated for the lowermost portion and the middle keyway was approximately 25 feet in depth. Subdrains were placed where seepage was observed and the excavations were benched into the hillside to remove as much landslide debris as practical prior to placing engineered fill. In isolated areas, small lenses of landslide debris were left in place with drains placed above and below.

We were on site on an intermittent basis to observe the keyway excavations, drain installation and compaction effort. Compaction testing was also performed on an intermittent basis. We anticipate continuing to perform observation and testing as the work resumes.

Currently, the upper and lower portions are stabilized and the subdrains are actively draining. The central portion encompassing approximately vineyard block 27C remains in-place and has not had remedial grading. The smaller of the two ponds on the west side of vineyard block 27C has been filled. Below the lower keyway and engineered fill, a portion of the landslide debris remains.

Using the plan vineyard information, the pre-landslide topography, and topography of current conditions, we created cross sections and slope profiles for slope stability modeling. Samples were obtained from the excavated landslide material that was reworked and used as buttressed fill and submitted to an outside laboratory for remolded strength testing. Cohesion and internal friction angle values of the engineered fill obtained from the remolded strength results were used in conjunction with computer slope stability analyses to estimate the stability of the planned new slope configuration. Results and discussion of the slope stability analysis are provided in the following section.

Discussion

We performed slope stability analyses of the current as well as proposed slope conditions using the computer program Slope/W (GEO-SLOPE International, Ltd., 2019). In the model we used, the maximum finished slope gradient was approximately 4:1 (horizontal to vertical). Slope stability was evaluated under long-term static conditions. The groundwater level was estimated based on the elevations of subdrains placed at the base of the fill.

Static stability for long-term conditions was evaluated for a Factor of Safety against failure of 1.5. This Factor of Safety is generally accepted as the standard of practice for sloping conditions. Our analysis required strength parameters for the in-place soil, weathered bedrock, and engineered fill. For the evaluation of long-term static loading conditions, we used the effective strength parameters including internal friction angle (ϕ') and cohesion (c'). For our analysis we determined these parameters for the engineered fill by testing remolded samples. We estimated the parameters for the landslide debris using a sensitivity analysis, adjusting the known parameters until the Factor of Safety was approximately equal to 1, yielding the failed condition. The parameters used in our analysis are presented in the table below.

STATIC STRENGTH PARAMETERS			
Unit	**Unit Weight (pcf)**	**ϕ' (degrees)**	**c' (psf)**
Engineered Fill	120	36.6	30
Landslide Debris	120	15	30
Mélange Bedrock	120	45	2,000

Using assumed groundwater elevation and the parameters in the table above, our stability analysis yielded a

Factor of Safety greater than 1.5 for the current slope configuration (Plate 3) and the proposed finished grading configuration (Plate 4).

Recommendations

Based on our evaluation and observation and testing to date, we recommend that the repair continue and the slope be restored to a farmable configuration using the recommendations provided below. The landslide debris that remains below the lower buttress should be removed and replaced as engineered fill using the recommendations provided below.

Grading

Site Preparation

Areas to be developed should be cleared of vegetation and debris. Trees and shrubs that will not be part of the proposed development should be removed and their primary root systems grubbed. Cleared and grubbed material should be removed from the site and disposed of in accordance with County Health Department guidelines. We did not observe septic tanks, leach lines or underground fuel tanks during our study. Any such appurtenances found during grading should be capped and sealed and/or excavated and removed from the site, respectively, in accordance with established guidelines and requirements of the County Health Department. Voids created during clearing should be backfilled with engineered fill as recommended herein.

Stripping

Areas to be graded should be stripped of the upper few inches of soil containing organic matter. Soil containing more than two percent by weight of organic matter should be considered organic. Actual stripping depth should be determined by a representative of the geotechnical engineer in the field at the time of stripping. The strippings should be removed from the site, or if suitable, stockpiled for re-use as topsoil in landscaping.

Excavations

Following initial site preparation, excavation should be performed as recommended herein. Excavations extending below the proposed finished grade should be backfilled with suitable materials compacted to the requirements given below.

Within fill areas, remaining landslide debris should be removed for its full depth (except for areas referenced in this report that have been drained and left in place). Throughout the proposed fill buttress slope, fills should be constructed by excavating level keyways that expose undisturbed bedrock. The keyways should be at least 10 feet wide, extend at least 2 feet below the landslide plane and should be sloped to drain to the rear. Keyway excavations should extend laterally to at least a 1:1 imaginary line extending down from the toe of the fill. Keyway subdrains are discussed hereinafter in “Subsurface Drainage.”

At all times, temporary construction excavations should conform to the regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety or other stricter governing regulations. The stability of temporary cut slopes, such as those constructed during the installation of underground utilities, should be the responsibility of the contractor. Depending on the time of year when grading is performed, and the surface conditions exposed, temporary cut slopes may need to be excavated to 1½:1, or flatter. The tops of the temporary cut slopes should be rounded back to 2:1 in weak soil zones.

Fill Quality

All fill materials should be free of perishable matter and rocks or lumps over 6 inches in diameter and must be approved by the geotechnical engineer prior to use. Our slope stability analysis of the proposed fill slope was based on re-use of native and landslide debris, recompacted to 90 percent relative compaction at optimum moisture content. Thus, we judge the on-site soil is generally suitable for use as engineered fill for the purpose of this project.

In general, imported fill, if needed, should have comparable or better strength parameters as the soils we tested. Material not conforming to these requirements may be suitable for use as import fill; however, it shall be the contractor's responsibility to demonstrate that the proposed material will perform in an equivalent manner. The geotechnical engineer should approve imported materials prior to use as compacted fill. The grading contractor is responsible for submitting, at least 72 hours (3 days) in advance of its intended use, samples of the proposed import materials for laboratory testing and approval by the soils engineer.

Fill Placement

The surface exposed by stripping and removal of landslide debris should be scarified to a depth of at least 6 inches, uniformly moisture-conditioned to near optimum. Approved fill material should then be spread in thin lifts, uniformly moisture-conditioned to near optimum and properly compacted. All structural fills, including those placed to establish site surface drainage, should be compacted to at least 90 percent relative compaction. The entire fill buttress should be continually keyed and benched into firm, undisturbed bedrock.

Permanent Cut and Fill Slopes

Our stability analysis was based on finished slopes of approximately 4:1 with intervening vineyard roads. Thus, finished fill slopes should not be steeper than 4:1. If steeper slopes are required, we should be provided with proposed slope conditions prior to construction to ensure the proposed configuration yields a Factor of Safety greater than 1.5. Fill slopes should be constructed by overfilling and cutting the slope to final grade. "Track walking" of a slope to achieve slope compaction is not an acceptable procedure for slope construction. Permanent cut slopes should be observed in the field by the geotechnical engineer to verify that the exposed soil and bedrock conditions are as anticipated. Cuts that expose the landslide plane should be drained and buttressed as recommended herein. The geotechnical engineer is not responsible for measuring the angles of these slopes. Denuded slopes should be planted with fast-growing, deep-rooted groundcover to reduce sloughing or erosion. Following slope trimming, the finished slopes can be ripped for vineyard planting.

Wet Weather Grading

Generally, grading is performed more economically during the summer months when the on-site soil is usually dry of optimum moisture content. Delays should be anticipated in site grading performed during the rainy season or early spring due to excessive moisture in on-site soil. Special and relatively expensive construction procedures, including dewatering of excavations and importing granular soil, should be anticipated if grading must be completed during the winter and early spring or if localized areas of soft saturated soil are found during grading in the summer and fall.

Open excavations also tend to be more unstable during wet weather as groundwater seeps towards the exposed cut slope. Severe sloughing and occasional slope failures should be anticipated. The occurrence of these events will require extensive clean up and the installation of slope protection measures, thus delaying projects. The general contractor is responsible for the performance, maintenance and repair of temporary cut slopes.

Subsurface Drainage

A subdrain should be installed at the rear of the keyways, periodically on benches, and where evidence of seepage is observed. The subdrain should consist of a 4-inch diameter (minimum) perforated plastic pipe with SDR 35 or better embedded in drain rock. The permeable material should be at least 12 inches thick and extend at least 48 inches above the bottom of the keyway (see Plate 5) and/or 12 inches above and below the seepage zone.

In addition, subdrains should be installed at a minimum slope of 1 percent and should have cleanouts located at their ends and at turning points. “Sweep” type elbows and wyes should be used at all turning points and cleanouts, respectively. Subdrain outlets and riser cleanouts should be fabricated of the same material as the subdrain pipe as specified herein. Outlet and riser pipe fittings should not be perforated. A licensed land surveyor or civil engineer should provide “record drawings” depicting the locations of subdrains and cleanouts.

Vineyard subdrains should also be installed below the planned ripping depth. Vineyard subdrains should consist of 4-inch diameter (minimum) perforated plastic pipe with SDR 35 or better embedded in drain rock. These drains should be installed every 100 to 150 feet within the planned vineyard.

Our services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no warranty, either expressed or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed construction, the results of our field exploration, laboratory testing program, and professional judgment. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observation of construction.

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

Very truly yours,
RGH Consultants

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cc: Paul Bartelt
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SCL:JJP:TAW:sl:bw
Electronically submitted

Attachments:
Plate 1 - Site Location Map
Plate 2 - Site Plan
Plate 3 – Slope Stability – Existing Conditions
Plate 4 – Slope Stability – Proposed Conditions
Plate 5 – Hillside Grading Illustration

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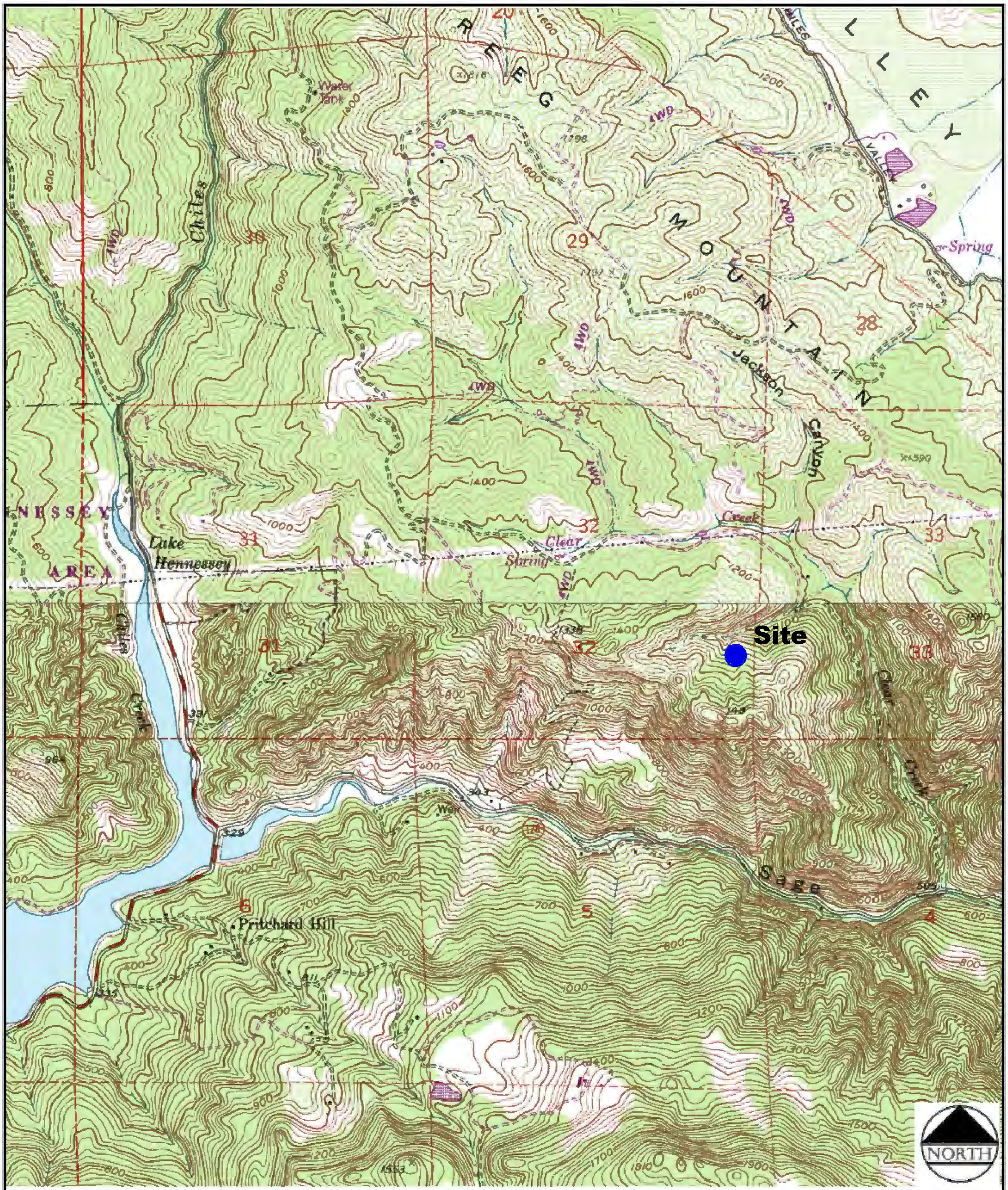

Reference: Maptech Topoquad, Yountville, Chiles Valley, California Quadrangles

Scale: 1" = 2000'

RGH CONSULTANTS	**SITE LOCATION MAP** Capra Sage Canyon Vineyards Landslide 2460 Sage Canyon Road St.Helena, California	PLATE **1**
Job No: 7068.04.06.2 — Date: FEB 2020		

EXPLANATION

Approximate limits of landslide that occurred prior to April 2019

A — A' Slope Stability Profile Location (Plates 3 & 4)

Approximate Locations of Subdrains within temporary repair

EDGE OF APPROVED VINEYARD AVENUE

EDGE OF APPROVED VINEYARD BLOCK

APPROXIMATE LIMITS OF LANDSLIDE REMEDIATION AREA

Approximate Scale

100 0 100 200 feet

Reference: Sheet C1, Landslide Remediation Exhibit, prepared by Bartelt Engineering, dated January 2020

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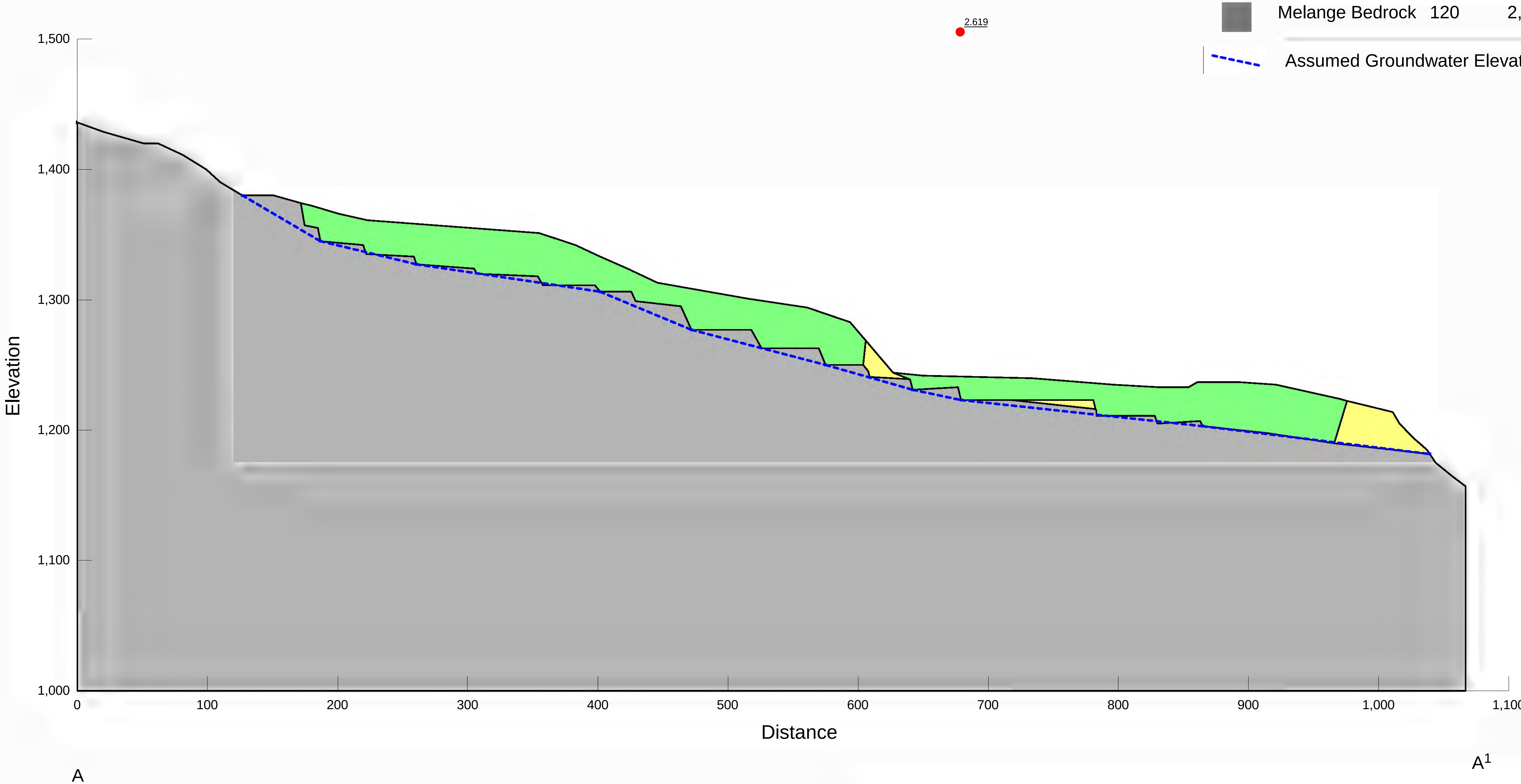
Job No: 7068.04.06.2 | Date: Feb 2020

SITE PLAN
Capra Sage Canyon Vineyards Landslide
2460 Sage Canyon Road
St. Helena, California

PLATE 2

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(green)	Engineered Fill	120	30	36.6
(yellow)	Landslide Debris	120	30	15
(grey)	Melange Bedrock	120	2,000	45
(blue dashed line)	Assumed Groundwater Elevation			



Scale: NTS

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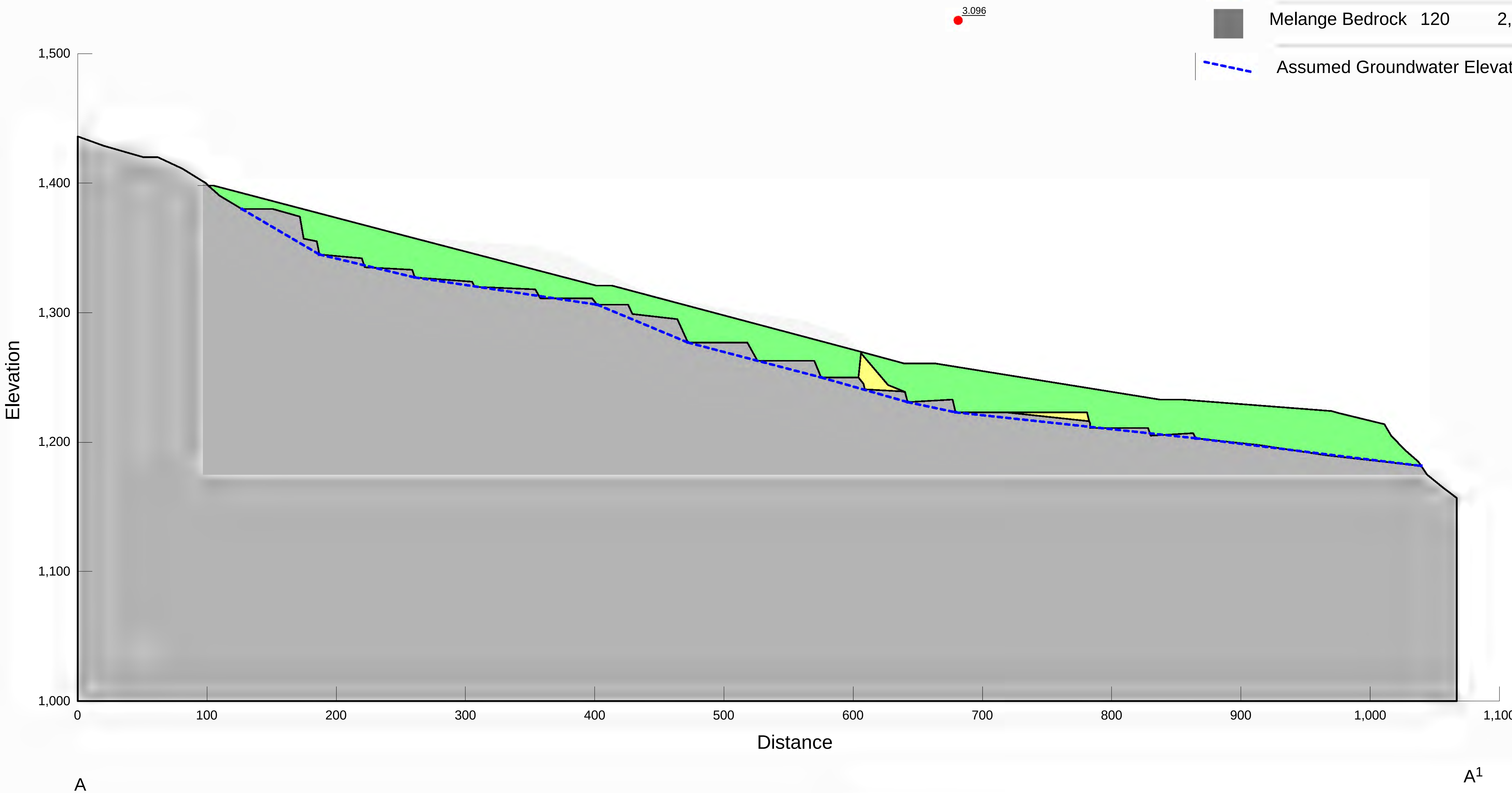
SLOPE STABILITY - EXISTING CONDITIONS
Capra Sage Canyon Vineyards Landslide
2460 Sage Canyon Road
St. Helena, California

PLATE 3

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Engineered Fill	120	30	36.6
	Landslide Debris	120	30	15
	Melange Bedrock	120	2,000	45

Assumed Groundwater Elevation



Scale: NTS

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Date: Feb 2020

SLOPE STABILITY - PROPOSED CONDITIONS

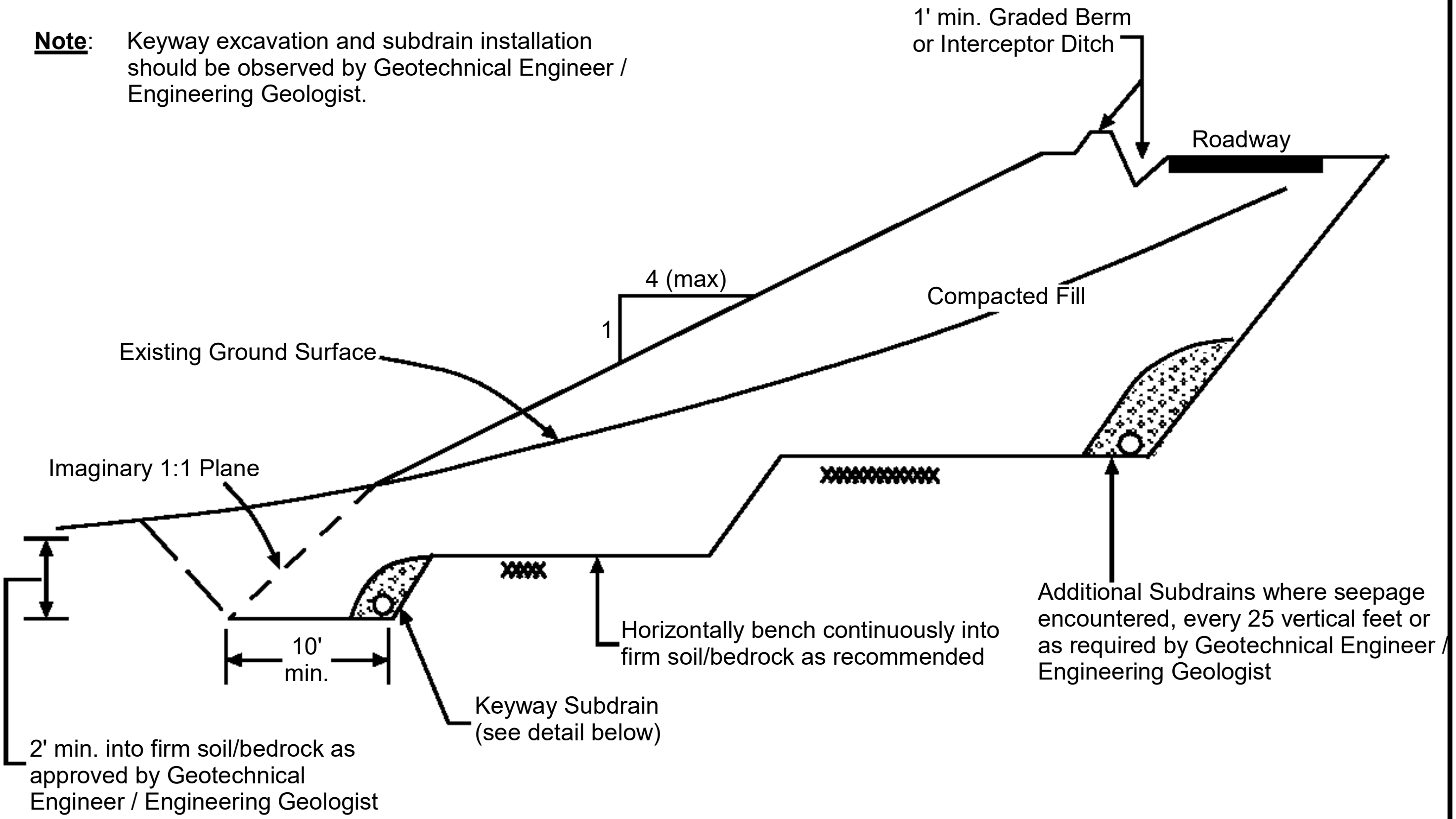
Capra Sage Canyon Vineyards Landslide
2460 Sage Canyon Road
St. Helena, California

PLATE

4

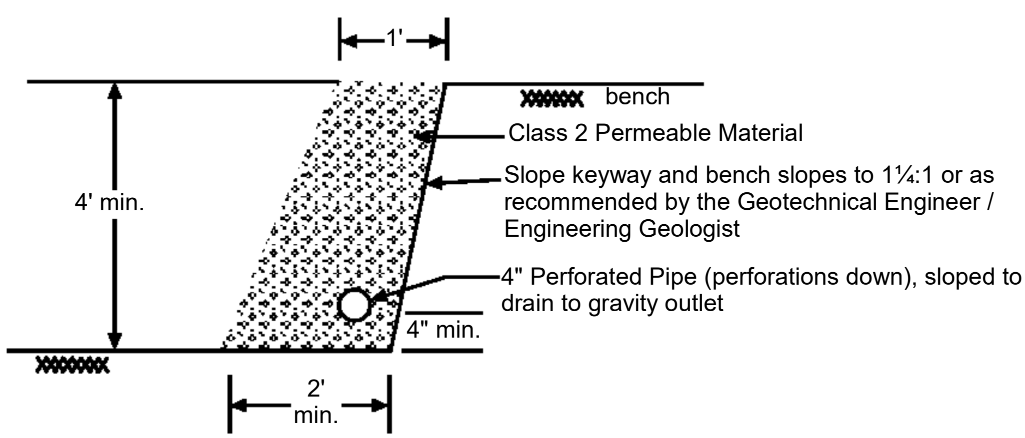
HILLSIDE GRADING ILLUSTRATION

(Not To Scale)



KEYWAY SUBDRAIN

(Not To Scale)



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Job No: 7068.04.06.2 | Date: FEB 2020

HILLSIDE GRADING ILLUSTRATION
Capra Sage Canyon Vineyards Landslide
2460 Sage Canyon Road
St.Helena, California

PLATE 5

APPENDIX B - DISTRIBUTION

Capra Company, LLC (e)
Attention: Scott Zapatocky
scott@capravineyards.com

Wagner & Bonsignore (e)
Attention: Dave Lounsbury
dlounsbury@wbecorp.com

JJP:TAW:jjp:brw

https://rghgeo.sharepoint.com/sites/shared/shared documents/project files/7001-7250/7068/7068.07.06.2 capra sage canyon east money hole/.01 - cons/7068.07.06.20 gs report.docx

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from alight industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ-sometimes significantly from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in-this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer For Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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