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June 28, 2019
Project No. SL10793-2

Spanish Vineyards
285 Bridge Street
San Luis Obispo, California 93401

Subject: **Engineering Geology Evaluation of Roadway Alignment**
Driveway to Proposed Residence, APN: 079-251-005
Pismo Beach Area, San Luis Obispo County, California

1.0 INTRODUCTION

As requested, certified engineering geologist Richard A. Pfost of GeoSolutions, Inc. completed an evaluation for the driveway alignment to the proposed single family residence to be located off Vetter Lane, APN: 079-251-005, in the Pismo Beach area of San Luis Obispo County, California. Figure 1 is a Site Location Map depicting the location of the property. Figure 2 is an Engineering Geologic Map that depicts the proposed roadway alignment and Plate 1B depicts cross sections through the site. Plate 2A, Regional Geologic Map (Hall and Prior, 1975), depict geologic conditions in the vicinity of the property.

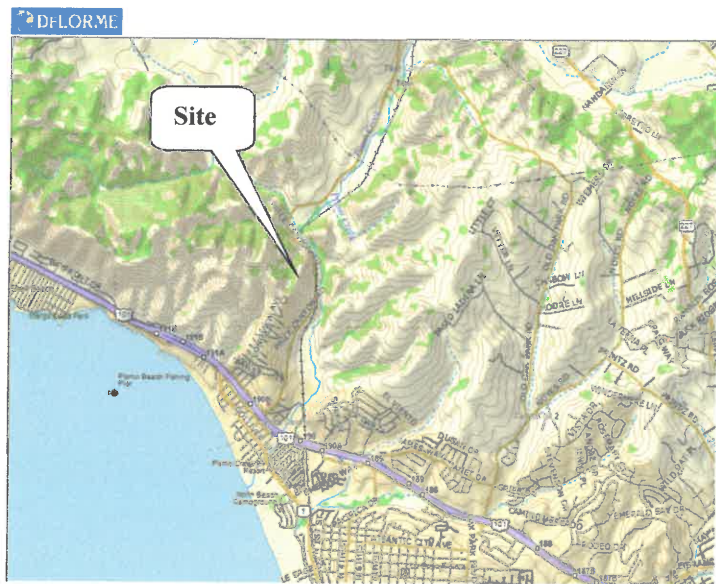


Figure 1: Site Location Map

The purpose of this evaluation is to discuss the geologic conditions along the proposed 8,971 foot long driveway alignment and provide recommendations for proposed improvements with respect to observed geologic conditions and the California Building Code. Presently, the alignment consists of unsurfaced ranch roadway with associated cut and fill slopes providing access through pasture land. It is understood that the completed roadway is not to be paved, with a gravel road section.

The existing cut slopes along the existing ranch road, are at an approximately 1:1 (horizontal:vertical) configuration and fill slopes along the roadway are approximately 2:1 (horizontal:vertical). The evaluation included a review of available geologic publications and maps pertinent to the Site. Field reconnaissance mapping was conducted along the roadway alignment on June 25, 2019.

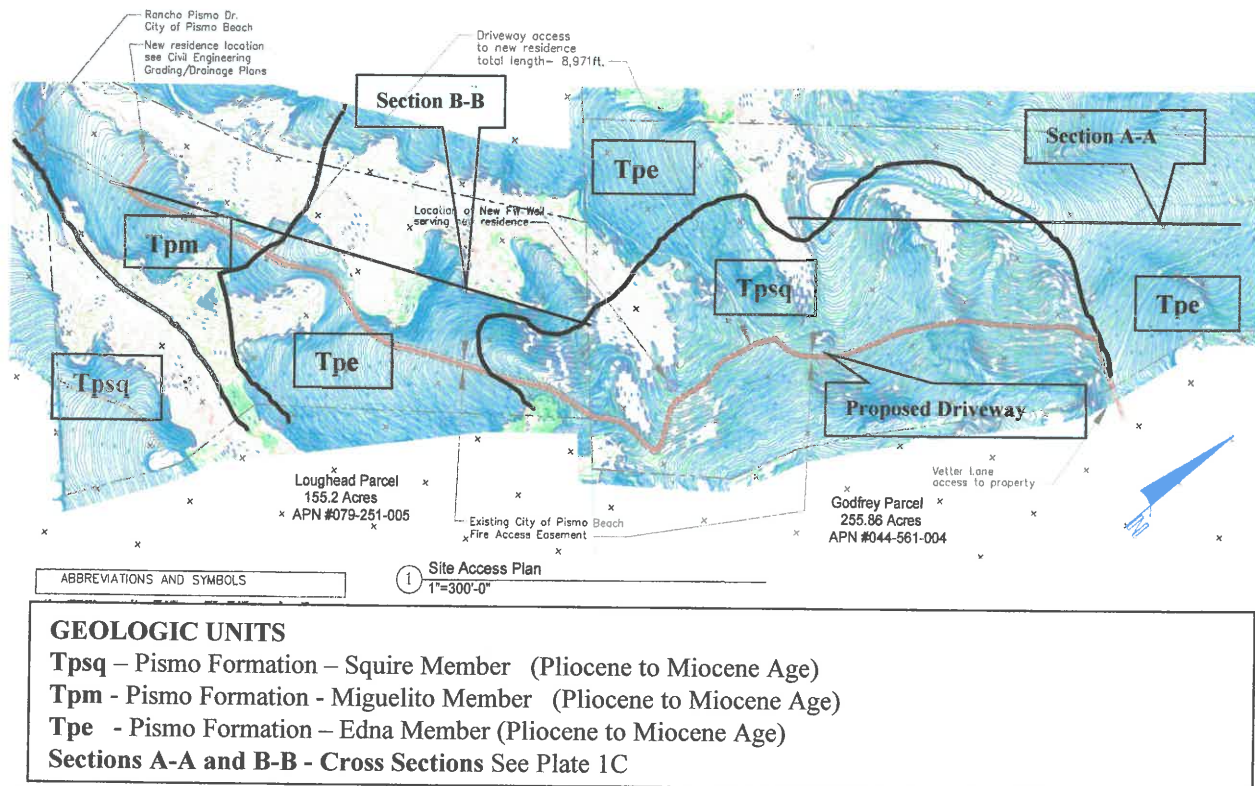


Figure 2 Site Engineering Geology Map

2.0 CONCLUSIONS

Geological conditions are suitable for the proposed roadway improvements provided that the recommendations provided herein are implemented.

2.1 Geologic Conditions

Formational units exposed along the roadway alignment is Pismo formation sedimentary rocks as observed in surface exposures within cut slopes. Locally, approximately 0.0 to 2.0 feet of colluvium was exposed within the cut slopes. Where exposed, this surface material consists of light brown, silty fine SAND and is termed colluvium. It is normally voided, very loose, and slightly damp to dry. In addition, minor fills (less than 3') was observed along reaches of the existing ranch roadway. The fill consisted of light brown, silty fine SAND derived from the underlying Pismo formation materials. No evidence of springs were observed upslope of the roadway alignment within the drainage channels, but it is assumed that surface soil saturation would occur during the wet winter months.

2.2 Landslides and Liquefaction

No landslide or other evidence of gross instability was mapped or observed along the proposed alignment. General Site liquefaction hazard along the roadway is considered very low due to the competent nature of the Pismo formation units (i.e. the massive sandstone and siltstone type rocks).

2.3 Seismic

The closest known active portion of a Holocene age fault is an active portion of the Los Osos fault that is located approximately 9.0 miles northwest of the Site (Jennings, 2010). Plate 3 is a Regional Fault Map for the area. The San Andreas Fault is the most likely active fault to produce ground shaking at the Site although it is not expected to generate the highest ground accelerations because of its distance from the Site

2.4 Seismically Induced Hazards

The driveway is at an elevation of approximately 200 to 400 feet in Elevation, and approximately is approximately 1.3 to 2.5 miles northeast of the ocean. Therefore, due to the height of the driveway and the distance from the ocean, the potential for a 100-year and 500-year seismic water wave event to affect the proposed driveway is considered low. Flooding associated with a seismic event is considered low due to the absence of a body of water upslope of the property. There is a low potential for seismically induced settlement at the Site based upon the lack of unconsolidated materials underlying the driveway along its proposed alignment. A low to moderate potential for localized differential settlement to occur where the alignment of the existing ranch road trends across cut and fill portions of the pre-existing ranch roadways. Generally, there appears to be a low potential for slope failure at the proposed development site also based upon the depth and character (massive indurated sandstone and siltstone) of the Pismo formation units.

2.5 Flooding and Erosion

The site is not located within or near the 100-year or 500-year flood zone based on Federal Emergency Management Agency flood zone maps (FEMA, 2012/2017).

The surficial and formational deposits are subject to erosion where not covered with vegetation or hardscape. The potential for severe erosion is considered low provided that vegetation and erosion control measures are implemented immediately after the completion of grading.

3.0 RECOMMENDATIONS

The following are recommended for implementation at the Site.

1. Based upon a visual review of nearby cut and fill slopes in similar materials and associated construction methods, cut slopes constructed into sandstone and siltstone rocks (Tpsq, Tpm, & Tpe) can be excavated at 1:1 (horizontal:vertical). The section of the cut slope exposing top soil and/or alluvium as well as all proposed fill slopes, can be 2:1 (horizontal:vertical). These recommendations reflected gross stability of existing cut slopes, however, localized areas of raveling and/or surficial instability may occur. Maintenance should be conducted regularly to control debris accumulation as the result of surface raveling accumulation.
2. Surface drainage gradients should be planned to prevent ponding along the driveway alignment. Surface drainage should be controlled to prevent concentrated water-flow onto either natural or constructed slopes. Rip-rap should be placed to armor upstream and downstream culvert openings. Exact drainage control structure placement may be considered during final road grading since field conditions may dictate location. All concentrated drainage needs to be in conformance with drainage facilities as per the general civil engineer.

3. It is recommended that the Engineering Geologist review the project plans prior to construction.
4. Excavation, fill, and construction activities should be in accordance with appropriate codes and ordinances of the County of San Luis Obispo. In addition, should unusual subsurface conditions be encountered during grading such as springs or fill material, these should be brought to the attention of the Engineering Geologist.
5. There is no serpentinite nor other ultra-mafic rocks along the proposed alignment, therefore, the potential for naturally occurring asbestos along the proposed driveway is considered very low.

4.0 SITE DESCRIPTION

The property is situated along the east side of Price Canyon, north of US Highway 101, in the Pismo Beach area of San Luis Obispo County, California. The 256 acre Godfrey Parcel and adjacent 155 acre Camino Cielo property are currently vacant and are utilized as cattle ranch and agricultural uses. Vegetation consists mainly of grasses with oak and trees in valleys. The gradient ranges from low-angle slopes along the principal ridgeline to locally steeper gradients in incised drainages extending up from Pismo Creek located immediately to the west. Existing unpaved ranch roads leads from the west end of Vetter Lane, then turning southwest along the northwest side of the eastern most principal ridgeline on the Godfrey parcel. It then extends down the center of the principal ridgeline as it trends down to the southwest to the proposed house site. In general, the existing ranch roads were graded near existing grade, with natural slopes along the roadway are approximately 2:1 to 4:1 (horizontal:vertical). For the northerly approximately 4500 Feet, the proposed alignment will traverse undulating topography, from the end of Vetter Lane at approximately Elevation 510.0 Feet down to below 460.0 Feet, and back up to approximately 540.0 Feet. The next approximately 4500 feet of alignment traverses down the center of the ridge from Elevation 540.0 Feet to a wide uniform slope at approximately Elevation 200.0 Feet. The proposed alignment is approximately 8971 feet long, following existing established ranch roads. The driveway alignment will hereafter be referred to as the "Site." General Site coordinates are 35.161612 degrees north latitude and -120.612738 degrees west longitude.

5.0 ENGINEERING GEOLOGY

5.1 Regional Geology

The Site is located in the vicinity of the San Luis Range of the Coast Range Geomorphic Province of California. The Coast Ranges lie between the Pacific Ocean and the Sacramento-San Joaquin Valley and trend northwesterly along the California Coast for approximately 600 miles between Santa Maria and the Oregon border. The Site lies within geologic terrain known as the Edna Sub-block of the San Luis/Pismo Structural Block (Lettis and Hall, 1994). The block is bordered on the north by the Los Osos Fault Zone and to the south by the Wilmar Avenue Fault. Past tectonic activity along these and other faults in the vicinity have created complex structural and stratigraphic relationships between the various rock units.

5.2 Local Geology

Generally, geologic conditions along the roadway appear to be relatively uniform. The proposed driveway is located within the Squire, Miguelito and Edna Members of the Pismo Formation as depicted on Plate 1, Site Engineering Geology Map. Hall, 1973, Dibblee, 2006 and Wiegers, 2011/2013 mapped the development as underlain by lower Pliocene to upper Miocene age Pismo Formation units. Information derived from surface mapping was used to classify subsurface soil and formational units.

5.2.1 Squire Member

Wiegiers, 2011/2013 maps the southeast portion of the Godfrey Parcel and the south end of the Rancho Cielo Parcel as within Squire Member of the Pismo Formation (Tpsq). Wiegiers, 2013 describes the Squire Member as "Massive, white, calcareous, fine- to medium-grained, quartzose to arkosic, silty sandstone. Sand grains subrounded to subangular; 75-80% quartz, 15-20% feldspar, less than 15% mafic minerals (Hall, 1973). Locally contains lenses of white, well rounded pebbles and cobbles of Monterey and Obispo Formation in the Edna Valley. Generally poorly bedded due to pervasive bioturbation" the Squire Member of the Pismo Formation (Tpsq) at the site consisted of white sandstone, coarse grained, slightly to moderately weathered and soft to very soft.

5.2.2 Miguelito Member

Wiegiers, 2011/2013 maps the southern portion of the Rancho Cielo Parcel as within Miguelito Member of the Pismo Formation (Tpm). Wiegiers, 2013 describes the Miguelito Member as "Brown to buff interbedded siltstone and claystone, moderately resistant, well-bedded, beds generally 2 to 4 inches thick. Locally includes beds and lenses of siliceous and dolomitic siltstone and friable, locally bituminous sandstone (Hall, 1973). Opaline and pocalaneous shale is present in the western part of the map area. The Miguelito Member consists of basinal mudstones that interfinger with coeval inner self sandstones of the Edna formation." The Miguelito Member of the Pismo Formation (Tpm) at the site consisted of brown siltstone, thinly bedded, slightly to moderately weathered, and soft to very soft.

5.2.3 Edna Member

Wiegiers, 2011/2013 maps the western portion of the Godfrey Parcel and northern portion of the Rancho Cielo Parcel as within Edna Member of the Pismo Formation (Tpe). Wiegiers, 2013 describes the Edna Member as "Buff, massive arkosic to quartzose sandstone, fine- to coarse-grained; quartz 80-95%, feldspar less than 5-15% (Hall, 1973)." The Edna Member of the Pismo Formation (Tpe) at the site consisted of tan sandstone, coarse grained, slightly to moderately weathered, and soft to very soft.

5.3 Surface and Ground Water Conditions

Surface drainage follows the topography southwest toward existing drainage channels. Drainage channels direct surface water southwest toward the Pismo Creek located off-site. Surface drainage should be directed away from proposed structures and slopes. A spring was observed in the northern portion of the Godfrey Parcel (see Plate 1) but outside of the area of the proposed driveway. Groundwater was not observed within any drainage courses along the proposed driveway.

5.4 Active Faulting and Coseismic Deformation

Many faults are mapped in the vicinity of the Site of varying types, lengths, and age. An active fault is one that shows evidence of displacement within the last 11,000 years (Recent epoch). A fault which displaces deposits of late Pleistocene age (500,000 to 11,000 years) but with no evidence of Recent movement is termed potentially active. Inactive fault is one that displace rocks of early Pleistocene or older (500,000 years or older).

Similar to the surrounding areas, the Site may be affected by moderate to major earthquakes centered on one of the known large, active faults listed in Table 1 below. Moment magnitudes are expressed, although any significant event on these faults could result in moderate to severe ground shaking at the subject site. The potential for ground failure of any portion of the Site during ground shaking is

considered low.

Table 1: Distance and Moment Magnitude of Closest Faults

Closest Active Faults to Site	Approximate Distance (miles)	Moment Magnitude (Mw)
Los Osos	9.0	6.8
Hosgri	13.0	7.3
San Andreas	40.0	6.9

The closest known active portion of a Holocene age fault is an active portion of the Los Osos fault that is located approximately 9.0 miles northwest of the Site (Jennings, 2010). Plate 3 is a Regional Fault Map for the area. The San Andreas Fault is the most likely active fault to produce ground shaking at the Site although it is not expected to generate the highest ground accelerations because of its distance from the Site.

5.5 Landslides

Hall, 1973, Dibblee, 2006 and Weigers, 2011/2013 did not map landslides in the vicinity of the property. During site mapping and review of aerial photography, landslides were not observed at the Site. There appears to be a low potential for landslides to affect the proposed development. There is a low rockfall potential to affect the proposed driveway based on the lack of boulders upslope of the proposed development.

5.6 Flooding and Severe Erosion

The site is not located within or near the 100-year or 500-year flood zone based on Federal Emergency Management Agency flood zone maps (FEMA, 2012/2017).

The surficial and formational deposits are subject to erosion where not covered with vegetation or hardscape. The potential for severe erosion is considered low provided that vegetation and erosion control measures are implemented immediately after the completion of grading.

5.7 Structural

The local structural trend in the site area is west-northwest south-southeast generally being near the eastern terminus of the major Pismo Syncline located to the north of the proposed driveway. Structural attitudes were not readily observed due to the massive, fractured, and weathered composition of the formational units. A review of Weigers, 2011/2013, indicated nearby attitudes of the underlying formational units to be striking northwest-southeast and dipping to the northeast at approximately 15°. No bedding attitudes could be obtained at the site. See Plate 1C – Site Cross Sections.

6.0 RECONNAISSANCE MAPPING

The driveway evaluation begins at the northwest end of Vetter Lane, it extends along existing ranch roads in a southwesterly direction. For approximately 5000 feet, it generally trends along the northwest flank of the northeast-southwest trending ridge. For the last approximately 4000 feet, it then descends down the center of a wide slope ridge, to the proposed house site. This evaluation was conducted along the driveway alignment from Vetter Lane to where it would intersect the existing ranch road along the east of the creek. Generally observations are depicted on Figure 2.

7.0 DRIVEWAY AREA

The proposed driveway would vary in width depending upon location and use but would be generally 16 feet wide minimum and extends for approximately 8,971 feet. The basis for driveway design is the Spanish Vineyards Residence plans prepared by Design Haus Architectural Design, Inc., dated June 18, 2019. Within the alignment are associated cut and fill slopes and drainage features. Based upon a review of the subject plans, minor grading is anticipated to establish necessary surface drainage control features as presented on the project plans. To facilitate the discussion portion of this study, the proposed ranch road is subdivided into two sections A and B.

7.1 Section A

The proposed driveway alignment will extend along the existing ranch road, which traverses the northwest side of the northeast-southwest trending ridge for approximately 5000 feet from its start off Vetter Lane. Massive sandstone of the Squire Member of the Pismo formation (Tpsq) are exposed in the existing slopes along this section. See Figure 3. The existing ranch road is currently near existing ground elevation, with minor undulations for reflecting the natural topography. Minor cut slopes uphill of the existing ranch road alignment currently maintain established pasture growth, varying from approximately 1:1 to 3:1 (horizontal to vertical) in steepness, and appear to be stable with minor amounts of raveling where disturbed by cattle trails. The existing cut slopes are up a maximum height of 3 feet high and expose 0 to 2 feet of colluvium overlying sandstone. Should further excavation be necessary to improve the existing alignment cut slopes can be excavated at a 1:1 configuration, where massive sandstone is exposed, and 2:1 where colluvium or top soil is exposed. No substantial fill slopes exist along the alignment, however, should excavation be necessary to improve the existing alignment fill slopes can be constructed at a 2:1 configuration. All future excavation should be as per the attached grading recommendations.



Figure 3: Photograph looking south along existing ranch road and proposed alignment of driveway. Topographic high near boundary of Godfrey and Camino Cielo parcels in distance. Note typical terrain where underlain by massive sandstone of the Pismo formation type rocks.

Minor debris accumulation may occur along the base of cut and fill slopes pending establishment of permanent erosion control vegetation, therefore maintenance would be anticipated. As discussed with the owner, it is recommended that regular monitoring and maintenance be conducted to existing cut/fill slopes and erosion control features along the driveway alignment. All areas of fill or colluvium must be densified, and confined with aggregate base to minimize erosion potential. Any change in conditions, should be brought to the attention of the project Engineering Geologist.

7.2 Section B

This section of proposed driveway alignment will also extend along existing ranch road, which traverses the wide natural slope of the northeast-southwest trending ridge for approximately 4000 feet from near the boundary of the Camino Cielo and Godfrey parcels in the area of the topographic high. Massive sandstone and siltstone of the Squire, Edna, and Miguelito Members of the Pismo formation (Tpsq, Tpe, & Tpm) are exposed in the existing slopes along this section. The existing ranch road is currently near existing ground elevation, with minor undulations for reflecting the very resistant natural topography. Due to the concentration of water flow along the existing ranch road, erosion of the underlying sandstone and siltstone is occurring. See Figure 4. Minor cut slopes uphill of the existing ranch road alignment currently maintain established pasture growth, varying from approximately 1:1 to 3:1 (horizontal to vertical) in steepness, less than 2 feet in height, and appear to be stable with minor amounts of raveling where disturbed by cattle trails. The existing cut slopes are up a maximum height of 3 feet high and expose 0 to 1 foot of colluvium overlying sandstone. Should further excavation be necessary to improve the existing alignment cut slopes can be excavated at a 1:1 configuration, where massive sandstone is exposed, and 2:1 where colluvium or top soil is exposed. There are no fill slopes along the alignment, however, should excavation be necessary to improve the existing alignment, fill slopes can be constructed at a 2:1 configuration. All future excavation should be as per the attached grading recommendations.



Figure 4: Photograph looking southwest along existing ranch road and proposed alignment of driveway on Camino Cielo parcel. Note typical terrain where underlain by massive sandstone of the Pismo formation type rocks are exposed on the surface.

8.0 Plan Review

This report includes the results of our engineering geologic review of the project site plan for the driveway improvements for the Spanish Vineyard residence, APN: 079-251-005, in the Pismo Beach Area of the County of San Luis Obispo, California. The purpose of our review was to confirm the referenced plan was in compliance with the intent of the geologic recommendations provided in this Report and with known site conditions. Our review was conducted based upon Plan Sheets listed in Table 1.

Table 2: List of Sheets Reviewed

Title	Date	Sheet	Prepared By
Project Notes	June 18, 2019	Site 1	Design Haus Architectural Associates, Inc.
Site Access Plan	June 18, 2019	Site 2	Design Haus Architectural Associates, Inc.

It is our opinion that the proposed plans as listed in Table 1 is in general conformance with the intent of the recommendations presented in this Report.

9.0 ADDITIONAL SERVICES

The recommendations contained in this report are based on surface mapping, interpretation of subsurface investigation, and on the continuity of the sub-surface conditions encountered. It is assumed that GeoSolutions, Inc. will be retained to perform the following services:

1. Consultation during plan development.
2. Additionally, construction observation by the Project Engineering Geologist may be necessary to verify sub-surface conditions during excavation activities.

10.0 LIMITATIONS

1. The recommendations contained in this report are based on Site reconnaissance; review of sub-surface data, and partly on certain plans, information, and data provided to us. Any changes in those plans, information and data will render our recommendations invalid unless we are commissioned to review the changes and to make any necessary modifications and/or additions to recommendations.
2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information in this report be incorporated into the project plans and recommendations contained herein be brought to the attention of the architect. The owner or his/ her representative is responsible to ensure that the necessary steps are taken to verify that the contractor and subcontractors comply with recommendations in the field.
3. Our recommendations have been made in accordance with the principles and practices generally employed by the engineering professions. This is in lieu of all other warranties, expressed or implied. Reference is made to our Agreement for Professional Services, which contains additional limitations concerning this project.

4. Any person concerned with this project who observes conditions or features of the Site or surrounding area that are different from those described in this report should report them immediately to this office for evaluation as part of an additional scope of work. Should additional evidence become available in the future that would indicate the need for additional study, this firm should be contacted.
5. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of one (1) year without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 1 year.

Should you have any questions regarding content of this report or other concerns, please do not hesitate to contact us at (805) 543-8539.

Sincerely,
GeoSolutions, Inc.

Richard A. Pfost, C.E.C.
Senior Engineering Geologist



REFERENCES

- American Society of Civil Engineers (ASCE). *Minimum Design Loads for Buildings and Other Structures*, ASCE Standard 7-10, ASCE, Reston, VA, 2013.
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- United States Geological Survey. *MapView – Geologic Maps of the Nation*. Internet Application. USGS, accessed October 4, 2018. <<http://ngmdb.usgs.gov/maps/MapView/>>.

PLATES

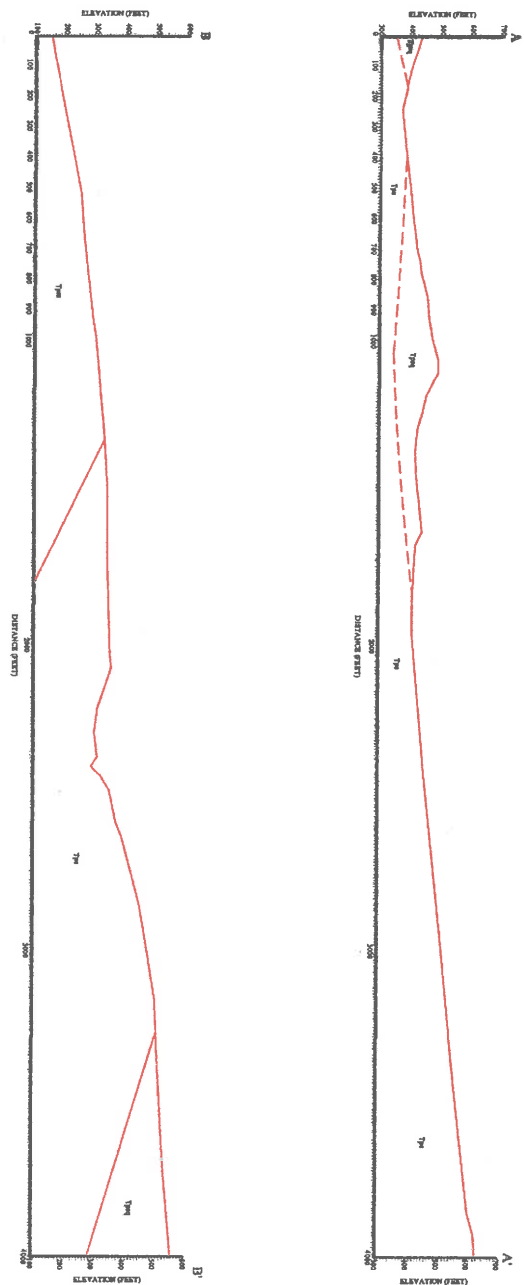
Plate 1C - Site Cross Section

Plate 2A – Regional Geologic Map, Wiegers, 2011/2013

Sheets Site 1 and Site 2 – Spanish Vineyard Residence

Preliminary Grading Specifications

LEGEND
 Tpsq PISMO FORMATION- SISQUOC MEMBER (PLIOCENE TO MIOCENE AGE)
 Tpm PISMO FORMATION- MIGUELITO MEMBER (PLIOCENE TO MIOCENE AGE)
 Tpe PISMO FORMATION- EDNA MEMBER (PLIOCENE TO MIOCENE AGE)
 --- CONTACT (DASHED WHERE APPROXIMATE)

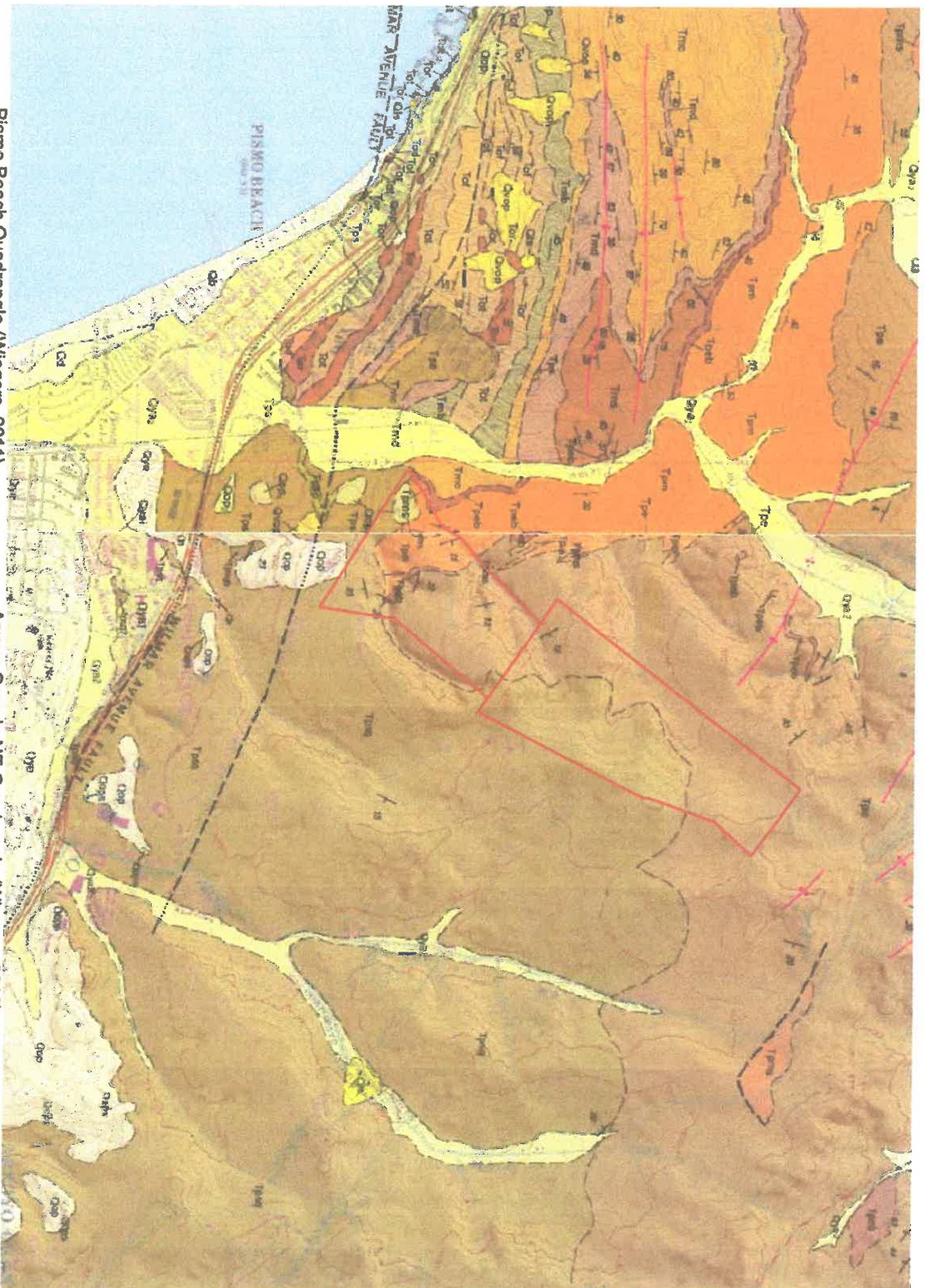


GeoSolutions, Inc.
 220 High Street
 San Luis Obispo, CA 93401
 (805) 543-8539

SITE CROSS SECTIONS

SPANISH VINEYARDS, GODFREY AND RANCHO CIELO PARCELS,
 PISMO BEACH AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
 1C
PROJECT
 SL10793-2



NO SCALE



Pismo Beach Quadrangle (Wiegert, 2011)

Arroyo Grande NE Quadrangle (Wiegert, 2013)

GeoSolutions, Inc.

220 High Street

San Luis Obispo, CA 93401

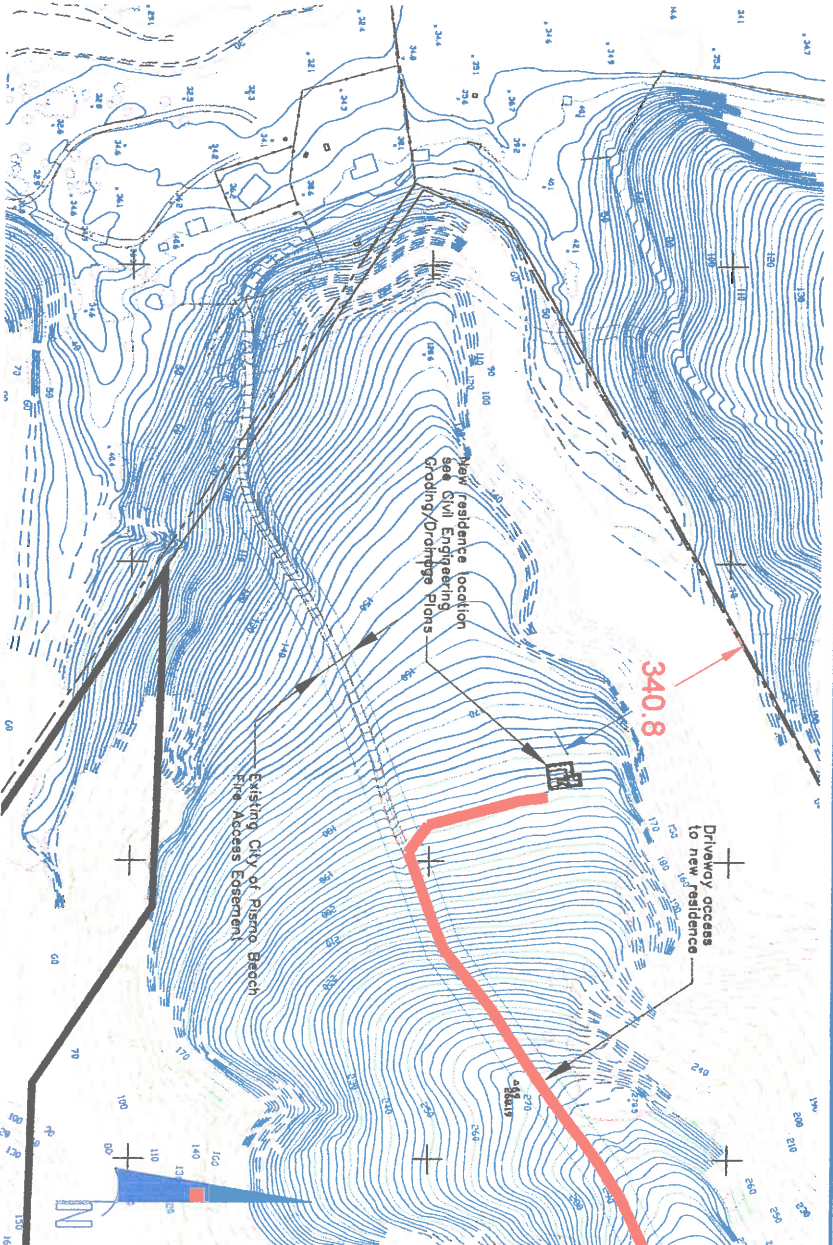
(805) 543-8539

REGIONAL GEOLOGIC MAP

GODFREY PARCEL AND RANCHO CIELO PARCEL, PISMO BEACH AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
2A

PROJECT
SL10793-2



SHEET INDEX	
site1	Site Plan/Vicinity Map/Project Info.
site2	Overall Site Plan/Site Access Plan/Abbrv's.
G-1	General Notes
A-1	Bldg. Floor Plan 1/4" Scale
A-2	Building Elevations
A-3	Structural Framing Plan/Notes/Details
A-4	Foundation Plan/Sections/Detail
D-1	Architectural Details
E-1	Electrical Plan

PROJECT NOTES

SCOPE OR WORK: Construction of New Residence and Fresh Water

well, septic system and access drive.

PROPERTY ADDRESS: adjacent - Rancho Plamo Dr. Price Canyon

ZONING: RL

ASSESSOR'S PARCEL NUMBER: 079-251-005

LOT AREA: 1 acre (155.2 Acre Parcel)

PROPERTY OWNER / APPLICANT: Spanish Vineyards, LLC - JG King

SAN LUIS OBISPO, CALIFORNIA 93401

OCCUPANCY GROUP: R-1

CONSTRUCTION TYPE: V-NR

BUILDING AREA: 1,020 S.F.

CONFIRMATION/ BUILDER: 1.B.D. 544-4444
(805)

ARCHITECTS:

Ronald E. Wylie
40373 Sandia Creek Dr.
Follbrook, CA 92028
(760) 728-6287

APPLICABLE CODES:

This project shall comply with the 2018 editions of the California Residential Code (CRC) and/or California Building Code (CBC), California Mechanical Code (CMC), California Plumbing Code (CPC), California Electrical Code (CEC), California Green Building Standards Code (CALGreen), all amendments to the CA codes adopted by the County of San Luis Obispo and all other codes, regulations and approvals established by the City of Pismo Beach. [R106.1.1 CRC] and approved by the Construction Committee. The Contractor shall schedule a preconstruction conference with all parties involved at the Project site to review special inspection requirements & procedures and individual special inspectors who will be assigned to the project as well as requirements for structural observation. Contractor shall contact County Building Division to confirm meeting time & place.

Approval of Plans and Specifications does not permit the violation of any section of the Building Code or other Ordinance or Law (CBC 105.4).

New Address Numbers shall be provided, permanently affixed to the Building and visible from the street fronting the Property. Numbers shall be at least 4" high with min. 1/2" stroke width on contrasting color background (CFC 505.1)



2 Site Vicinity Map
no scale

PRELIMINARY GRADING SPECIFICATIONS

A. General

1. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.
2. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.
3. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.
4. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

1. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.
2. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.
3. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

1. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours notice.
2. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

3. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

1. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.
2. The contractor should be responsible for the stability of all temporary excavations.
3. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

1. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.
2. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1804 of the 2013 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.
3. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

1. Structural fill should not contain rocks larger than 3 inches in greatest dimension, and should have no more than 15 percent larger than 2.5 inches in greatest dimension.
2. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

1. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative density of 90 percent based on ASTM D1557-07.

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2. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.
3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.
4. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required.

H. Drainage

1. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.
2. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.
3. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.
4. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.
5. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.
6. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.