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September 18, 2020
Project No. 20-1254C2

Subject: Geotechnical Investigation for Proposed Secret Hills Ranch (with Revisions)
Southeast End of Via Tesoro, Alpine Area
County of San Diego, CA 91901 APN 520-060-18

Dear Mr. Trevaskis:

In accordance with your request, we have performed a geotechnical investigation at the subject site to determine the geotechnical aspects of the project and provide recommendations for design and construction of the proposed residences.

SCOPE OF SERVICES

The following scope of work was performed for this investigation:

- Site reconnaissance and review of published geologic, seismologic and geotechnical reports and maps pertinent to the project area

- Subsurface exploration consisting of eight test pits excavated within the limits of the proposed construction. The test pits were logged by our project supervisor.

- Collection of representative soil samples at selected depths. The obtained samples were sealed in moisture-resistant containers and transported to the laboratory for subsequent analysis.

- Laboratory testing of soil samples obtained during the field investigation.

- Geotechnical analysis of the field and laboratory data, which provided the basis for our conclusions and recommendations.

- Preparation of this report, which summarizes the results of our analysis and presents our findings and recommendations for the proposed construction.

SITE DESCRIPTION AND PROPOSED CONSTRUCTION

The subject site is an irregular-shaped parcel located at the southeast end of Via Tesoro, in the Alpine area of the County of San Diego, California. The property is vacant with general drainage to the south. Vegetation consists of grass, shrub and a few trees. The parcel is bordered by other residential parcels in all directions.

A conceptual grading plan prepared by Coffey Engineering, Inc. of San Diego California indicates that the proposed construction will consist of a single-family residence and a separate employee residence, detached garages, as well as a swimming pool and cabana, horse arenas and stables. The residences will be one-story, wood framed structures supported on continuous and/or individual spread footings with slab-on-grade floors.

SUBSURFACE EXPLORATION AND LABORATORY TESTING

Eight test pits were excavated on January 23, 2020, to a maximum depth of approximately 5 feet below existing grade with a Bobcat loader attached with an 18-inch bucket. The approximate locations of the test pits are shown on the attached Figure 2. Logs of the subsurface soils and bedrock materials are presented on Figure 3.

Following the subsurface exploration, laboratory testing was performed to evaluate the pertinent engineering properties of the foundation materials. The laboratory tests included maximum density/optimum moisture content, in place moisture content and dry density, and expansion index tests. The tests were performed in accordance with ASTM standards. The test results are shown on the logs of the test pits, Figure 3 and on Figure 4.

SOIL CONDITIONS

The subsurface descriptions are interpreted from conditions encountered during the field investigation and/or inferred from the geologic literature. Detailed descriptions of the subsurface materials are presented on the logs of the test pits presented on Figure 3. The following are general descriptions of the encountered soil and bedrock types.

Topsoil

Topsoil was encountered in the test pits to a depth of about 6 inches and consisted of dark brown, silty sand that was moist, loose and porous with a minor amount of organics (roots and rootlets).

Colluvium

Colluvium was encountered beneath the topsoil to a depth of 1.5 feet to 5 feet. The colluvium consisted of reddish brown, silty sand with a trace of clay that was moist and loose.

Weathered Granite Rock

Weathered granite rock was encountered beneath the colluvium to the depth explored of 5 feet. The weathered granite consisted of gray brown, silty sand that was dry, dense and difficult to excavate.

SOIL PROPERTIES

a. Compressible Soils

Our field observations and testing indicate the underlying granite rock has a low compressibility. However, loose, compressible topsoil and colluvium were encountered to a maximum depth of approximately 5 feet below existing surface grades within the proposed building areas. The loose surface soils should be removed and recompacted to at least 90 percent relative compaction, as discussed later in the report.

b. Expansive Soils

An expansion index test was performed on a representative sample of the colluvial soils. An expansion index of 14 was obtained which indicates the soils have a very low expansion potential.

c. AASHTO Soil Classification

The topsoil, colluvium and weathered rock soils are classified as A-2 by the AASHTO soil classification system.

GROUNDWATER

No groundwater was encountered to the depths of the test pits.

GEOLOGY

From published geologic maps, the site is underlain at depth by very dense granite rock.

There are no known geologic hazards such as landslides, liquefaction-prone areas, or earthquake faults at the site. However, the proposed buildings are subject to ground shaking and possible damage from earthquakes on nearby, or more distant, active faults.

SEISMIC DESIGN VALUES

Seismic design values are presented on the attached Figure 5.

CONCLUSIONS

Construction of the proposed residences is feasible from a geotechnical standpoint, provided the recommendations presented in this report are properly implemented during construction.

RECOMMENDATIONS

SITE GRADING

a. Site Clearing

The areas of the proposed residences and other construction should be cleared of vegetation and other deleterious materials. Vegetation and debris from the clearing operation should be properly disposed of off-site. The areas should be thoroughly inspected for any possible buried objects that need to be rerouted or removed prior to construction. All holes, trenches, or pockets left by the removal of these objects should be properly backfilled with compacted fill.

b. Surface Soil Removals

The existing, loose topsoil and colluvium within the proposed building areas and to a distance of at least 5 feet outside building limits should be removed down to dense granite rock or weathered granite, an estimated maximum depth of approximately 5 feet. Actual depths should be determined during grading and verified by our field representative.

c. Compaction and Method of Filling

Prior to fill placement, the bottom of the removal areas should be scarified to a depth of 6 to 8 inches, moisture conditioned to slightly above optimum moisture content and compacted to at least 90 percent relative compaction.

The on-site soils may be reused as compacted fill, provided they are free of organic materials and debris, and rocks or cobbles over 6 inches in dimension. Any imported fill soils should be predominantly granular and approved by our field representative.

All fill should be compacted to a minimum relative compaction of 90 percent as determined by ASTM D1557. Fill should be placed at a moisture content slightly above optimum moisture content, in lifts 6 to 8 inches thick, with each lift compacted by mechanical means.

Fill soils should be keyed and benched into sloping ground. Minimum key depths and bench heights should be 3 feet into dense, weathered granite rock.

Utility trench backfill should also be compacted to at least 90 percent relative compaction.

All grading, fill placement, and compaction should be performed in accordance with the grading requirements of the County of San Diego. Fill placement and compaction should be observed and tested as necessary by our field representative.

EROSION CONTROL

Due to the granular nature of the on-site soils, areas of recent grading or exposed ground may be subject to erosion. During construction, surface water should be controlled via berms, gravel/ sandbags, silt fences, straw wattles, siltation or bioretention basins, positive surface grades or other method to avoid damage to the finish work or adjoining properties. All site entrances and exits must have coarse gravel or steel shaker plates to minimize offsite sediment tracking. Best Management Practices (BMPs) must be used to protect storm drains and minimize pollution. The contractor should take measures to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed. After completion of grading, all excavated surfaces should exhibit positive drainage and eliminate areas where water might pond.

TEMPORARY SLOPES AND EXCAVATIONS

Temporary vertical slopes and excavations should not exceed 5 feet. Any temporary slopes or excavations greater than 5 feet in height should be shored or laid back at a 1:1 (horizontal to vertical) slope ratio. CAL-OSHA guidelines for temporary slopes and trench excavation safety should be implemented during construction.

FOUNDATIONS AND FLOOR SLABS

a. The proposed one-story residences may be supported on continuous and/or individual spread footings founded in properly compacted fill. Footings should have a minimum depth of 18 inches below building pad grade or lowest adjacent, finished grade, whichever is deeper. Continuous footings should be at least 12 inches wide and reinforced with a minimum of four #4 steel bars; two bars placed near the top of the footings and the other two bars placed near the bottom of the footings. Individual footings should be at least 18 inches square and reinforced with a grid of #4 bars spaced 12 inches on centers (each way) and placed on concrete blocks at the bottom of the footing.

b. Floor slabs should be at least 5 inches thick and reinforced with #4 bars placed at 18 inches on center in two directions in the middle of the slab. The reinforcing steel should be supported on steel chairs or concrete blocks. Floor slabs should be underlain by 2 inches of clean sand over a 10-mil visqueen moisture barrier over 2 inches of clean sand. To minimize the potential for shrinkage cracks, the maximum concrete slump should be 4 inches and the maximum water-cement ratio should be 50 percent. Some shrinkage cracks are still possible.

d. An allowable soil bearing value of 2,000 pounds per square foot may be used for the design of continuous and individual spread footings supported in properly compacted fill. This value may be increased by one-third for short term wind or seismic loads.

e. Lateral loads may be resisted by an equivalent fluid passive soil pressure of 300 pounds per cubic foot. A coefficient of friction of 0.4 may also be used. If passive and friction values are used together, the friction value should be reduced by one-third.

f. All footing excavations should be inspected and approved by our representative.

g. For design purposes, total and differential settlements of ½ inch may be utilized.

DRAINAGE

Adequate measures should be undertaken so that drainage water is directed away from the foundations, footings, floor slabs and the tops of slopes via rain gutters, downspouts, surface swales and subsurface drains towards the natural drainage for this area. As required in the current California Building Code, a minimum gradient of 2 percent is recommended in hardscape areas adjacent to the structure. In earth areas, a minimum gradient of 5 percent away from the structure for a distance of at least 10 feet should be provided. If this requirement cannot be met due to site limitations, drainage can be done through a swale in accordance with Section 1804.4 of the current California Building Code. Earth swales should have a minimum gradient of 2 percent. Drainage should be directed to approved drainage facilities. Proper surface and subsurface drainage will be required to minimize the potential of water seeking the level of the bearing soils under the foundations, footings and floor slabs, which may otherwise result in undermining and differential settlement of the structure and other improvements.

LIMITATIONS OF INVESTIGATION

Our investigation was performed using the skill and degree of care ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. This report provides no warranty, either expressed or implied, concerning future building performance. Future damage from geotechnical or other causes is a possibility.

This report is prepared for the sole use of our client and may not be assigned to others without the written consent of the client and ECSC&E, Inc.

The samples collected and used for testing, and the observations made, are believed representative of site conditions; however, soil and geologic conditions can vary significantly between exploration trenches, boreholes and surface exposures. As in most major projects, conditions revealed by construction excavations may vary with preliminary findings. If this occurs, the changed conditions must be evaluated by a representative of ECSC&E and designs adjusted as required or alternate designs recommended.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineer. Appropriate recommendations should be incorporated into the structural plans. The necessary steps should be taken to see that the contractor and subcontractors carry out such recommendations in the field.

The findings of this report are valid as of this present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and should be updated after a period of two years.

ADDITIONAL SERVICES

The review of plans and specifications, field observations and testing under our direction are integral parts of the recommendations made in this report. If East County Soil Consultation and Engineering, Inc. is not retained for these services, the client agrees to assume our responsibility for any potential claims that may arise during construction. Observation and testing are additional services, which are provided by our firm, and should be budgeted within the cost of development.

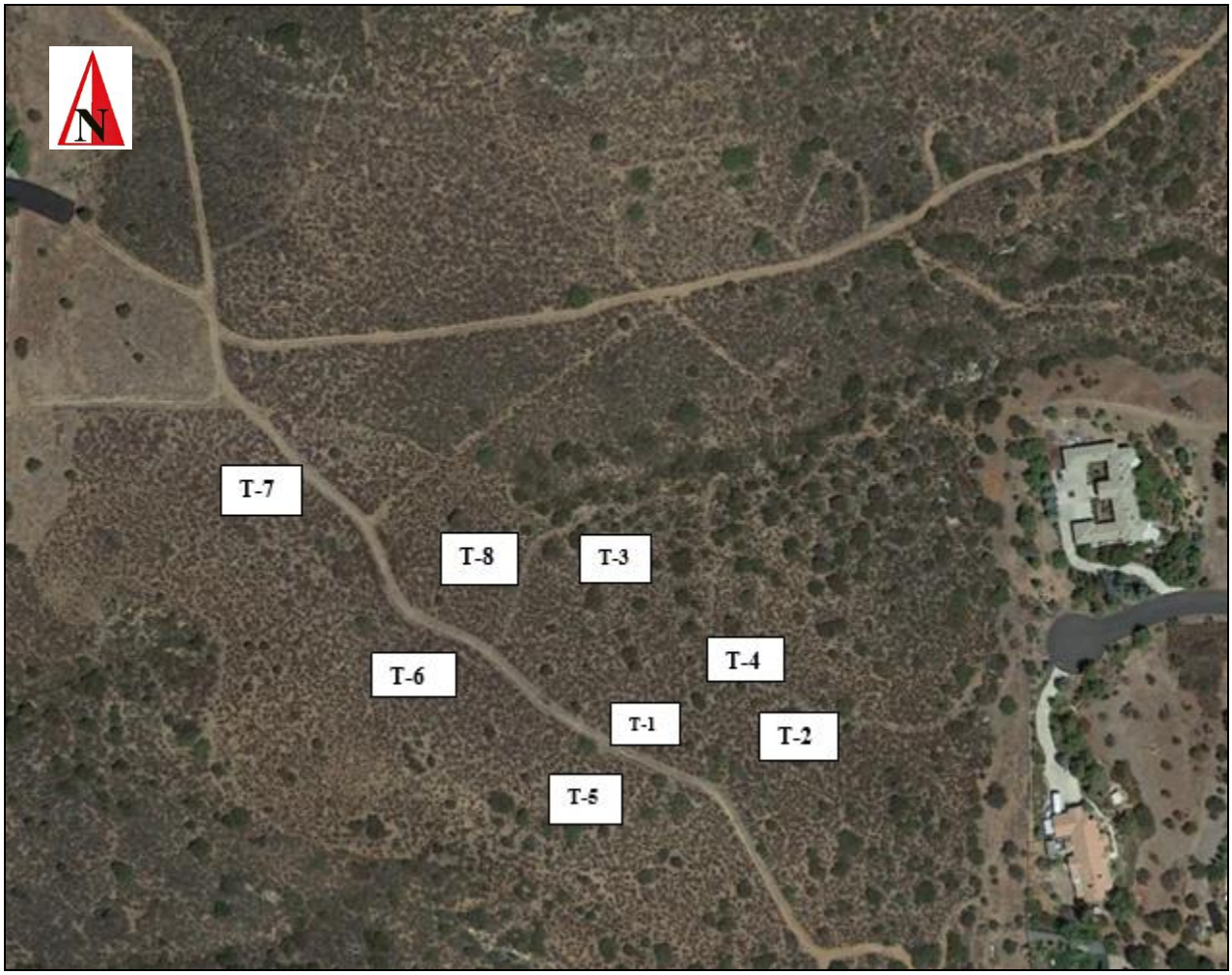
Respectfully Submitted,

Martin R. Owen, PE, GE
Geotechnical Engineer

Attachments: Figures 1 through 5

FIGURE 1
VICINITY MAP

FIGURE 2
LOCATIONS OF TEST PITS



LEGEND

T-8 APPROXIMATE LOCATION OF TEST PIT

FIGURE 3
LOGS OF TEST PITS

TEST PIT NO. 1

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM**		
	reddish brown, moist, loose, silty, fine-grained sand	95.7	12.8
1.5’	reddish brown, moist, dense, silty, fine-grained sand	123.7	11.2
2.5’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

TEST PIT NO. 2

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM**		
	reddish brown, moist, loose, silty, fine-grained sand	97.1	15.5
3.5’	reddish brown, moist, dense, silty, fine-grained sand		
4.5’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

Y = DRY DENSITY IN PCF
M = MOISTURE CONTENT IN %

FIGURE 3 (Continued)
LOGS OF TEST PITS

TEST PIT NO. 3

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand		
1.5’	reddish brown, moist, dense, silty, fine-grained sand	119.7	10.7
2.5’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

TEST PIT NO. 4

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand		
3.0’	reddish brown, moist, dense, silty, fine-grained sand	107.6	16.3
4.5’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

Y = DRY DENSITY IN PCF
M = MOISTURE CONTENT IN %

FIGURE 3 (Continued)
LOGS OF TEST PITS

TEST PIT NO. 5

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand	98.3	14.6
2.5’	reddish brown, moist, dense, silty, fine-grained sand		
3.5’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

TEST PIT NO. 6

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand		
3.5’	reddish brown, moist, dense, silty, fine-grained sand		
5.0’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

Y = DRY DENSITY IN PCF
M = MOISTURE CONTENT IN %

FIGURE 3 (Continued)
LOGS OF TEST PITS

TEST PIT NO. 7

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand	97.1	15.5
3.0’	reddish brown, moist, dense, silty, fine-grained sand		
4.0’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

TEST PIT NO. 8

DEPTH	SOIL DESCRIPTION	Y	M
Surface	**TOPSOIL** dark brown, moist, loose, porous, silty, fine-grained sand w/ rootlets		
0.5’	**COLLUVIUM** reddish brown, moist, loose, silty, fine-grained sand		
2.5’	reddish brown, moist, dense, silty, fine-grained sand		
3.0’	**WEATHERED GRANITE ROCK** gray brown, dry, dense, silty, fine to coarse-grained sand refusal, bottom of test pit, no caving, no groundwater test pit backfilled 1/23/20		

Y = DRY DENSITY IN PCF
M = MOISTURE CONTENT IN %

FIGURE 4
RESULTS OF LABORATORY TESTS

EXPANSION INDEX TEST
(ASTM D 4829

TEST LOCATION	INITIAL MOISTURE CONTENT (%)	SATURATED MOISTURE CONTENT (%)	INITIAL DRY DENSITY (PCF)	EXPANSION INDEX	EXPANSION POTENTIAL
T-4 @ 1.5’	11.7	20.6	102.9	14	VERY LOW

MAXIMUM DENSITY TEST
(ASTM D 1557)

TEST LOCATION	SOIL TYPE	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
T-1 @ 1.0’	1	REDDISH BROWN SILTY SAND	127.0	9.5

FIGURE 5
SEISMIC DESIGN VALUES

2200 Via Tesoro, Alpine, CA 91901, USA
Latitude, Longitude: 32.8113025, -116.761591

Date	2/18/2020, 2:00:58 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	0.954	MCE_R ground motion. (for 0.2 second period)
S_1	0.355	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.972	Site-modified spectral acceleration value
S_{M1}	0.513	Site-modified spectral acceleration value
S_{DS}	0.648	Numeric seismic design value at 0.2 second SA
S_{D1}	0.342	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.018	Site amplification factor at 0.2 second
F_v	1.445	Site amplification factor at 1.0 second