APPENDIX 3.1.8-3

Septic Feasibility Study

HUNSAKER & ASSOCIATES
SAN DIEGO, INC.

PLANNING
ENGINEERING
SURVEYING

IRVINE
SAN DIEGO
RIVERSIDE
PALM DESERT
LOS ANGELES

September 13, 2017

County of San Diego
Department of Environmental Health
Land and Water Quality Division
5510 Overland Avenue
San Diego, CA 92123

Attn: Scott Rosecrans, EHS III, REHS

Ref: Review of "Feasibility Study for Onsite Wastewater Treatment Systems, Otay Ranch Village 14 and Planning Areas 16 and 19, County of San Diego, California"

Dear Scott:

Based on my review of the above referenced feasibility study, and the results of the field investigation contained therein, which indicated areas of high groundwater, shallow soils and steep slopes, it is my opinion that the site is not suitable for the use of onsite wastewater treatment systems (conventional or alternative).

Please feel free to call me if you would like to discuss this matter further.

Respectfully Submitted,

Hunsaker & Associates
San Diego, Inc.

Thomas H. Koerner

Thomas H. Koerner, RCE

REGISTERED PROFESSIONAL ENGINEER
THOMAS H. KOERNER
No. C-65317
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Jackson Pendo Development Company
2245 San Diego Avenue, Suite 223
San Diego CA 92110

March 28, 2017 (Revised December 18, 2017)
P/W 1312-02
Report No. 1312-02-B-8R

Attention: **Ms. Liz Jackson**

Subject: ***Feasibility Study for Onsite Wastewater Treatment Systems, Otay Ranch Village 14 and Planning Areas 16 and 19, County of San Diego, California***

Pursuant to your request, Advanced Geotechnical Solutions, Inc. (AGS) has prepared this feasibility study for onsite wastewater treatment systems (OWTS) within portions of the proposed Otay Ranch Village 14 and Planning Areas 16/19, San Diego County, California. The recommendations presented in the following report are based on the results of our subsurface investigation and percolation testing conducted in the northeasterly portion of the overall site (Planning Area 16, Neighborhood R-16).

It is AGS's opinion that the use of onsite wastewater treatment systems for the proposed residential development is not feasible as studied herein. It was determined that additional testing outside the study area in Planning Area 16 was not necessary at this time for two principle reasons. First, determination that onsite wastewater treatment is infeasible for the residential lots within the study area would require that sewer be installed for those lots and County of San Diego policy requires that sewer be provided to any residential lot abutting a public sewer. Because the majority of the remaining lots within Planning Area 16 will abut the public sewer line serving the study area, sewer service will be required. Second, the geotechnical study conducted for Planning Area 16, which included lots outside the study area, concluded that the majority of Planning Area 16 is underlain by the same geologic units as those encountered in the study area and will have similar soil/bedrock profiles and permeability that are not generally conducive to onsite wastewater treatment systems.

1.0 SITE LOCATION AND DESCRIPTION

The Proposed Project is located within Township 17 South, Range 1 East, Sections 8, 16, 17, 18, 19, 20, and 30 on the USGS 7.5' Jamul Mountains quadrangle, generally along Proctor Valley Road, between the more urbanized City of Chula Vista and the rural community of Jamul, California. The project area is more specifically located within Otay Ranch Village 14 and Planning Areas 16/19 as depicted in Figure 1.

The total Project Area covers approximately 1,370 acres, of which approximately 724 acres are within Otay Ranch Village 14, 560 acres are within Planning Areas 16/19, and 86 acres are for offsite circulation. The Proposed Project area is in a natural state and is covered with a light to dense growth of annuals and some chaparral. A network of improved and unimproved roads provides access throughout the site. The existing elevations within the proposed development ranges from a high of approximately 1,345 feet above mean sea level (AMSL) in the northeastern portion of the site (R-16) to a low of approximately 550 feet AMSL within an active drainage near the southern limit of the proposed development. Topography on site ranges from gently sloping terraces to steep existing natural slopes approaching 1:1 (horizontal to vertical) slope

inclinations. Two southerly flowing primary drainages transect the site ultimately converging into a broad drainage adjacent to the existing Proctor Valley Road which drains into Upper Otay Reservoir.

The topography of the study area (Figure 2) is more specifically characterized by steep sided ridges with associated tributary drainages that flow to the south and east. Hard rock outcrops are common along ridgetops and descending slopes. The more prominent outcrops are noted on Plates 1 and 2. A broad southerly flowing drainage occupies the lower, northeasterly portion of the area. At the confluence of this drainage and a northeasterly flowing tributary drainage, a minor earthen dam was constructed creating a seasonal 'farmer's pond'.

Based on our review of available data from California State Water Resources Control Board GeoTracker GAMA Online Database, no wells are known to exist on or within 150 feet of the property. The closest known water supply well is located on Echo Valley Road approximately 1000 feet north of the Proposed Project. It is anticipated that the Proposed Project will be serviced by Otay Water District.

2.0 PROPOSED DEVELOPMENT

The Proposed Project is part of the overall Otay Ranch, an approximately 23,000-acre master-planned community in southern San Diego County designed as a series of villages and planning areas. The Proposed Project is located within Otay Ranch Village 14 and Planning Areas 16 and 19 in the Proctor Valley area of Otay Ranch.

Approximately 994 homes will be located in Village 14, set in three distinct areas (referred to herein as the South, Central and North). 878 of these homes will be single-family homes located in gated enclaves and 116 will be detached courtyard homes. 12 neighborhoods are planned with approximate densities ranging from 0.2 to 10.0 dwelling units per acre. The homes in Village 14 will be provided with sewer.

In addition to the homes in Village 14, there are 13 one-acre estate lots proposed in Planning Area 19 and 112 ranchettes averaging 3 acres in size located in Planning Area 16. Planning Area 16/19 homes will not be gated. These planning areas are being evaluated for OWTS feasibility. This study is focuses on the easterly portion of Planning Area 16 (R-16) as infeasibility for OWTS in this area of proposed development will necessitate sewerage to which the remaining portions of Planning Areas 16/19 will be connected.

The majority of the proposed development evaluated for this study is situated along a roughly north-south trending ridge in the northwesterly portion of the area with steep slopes descending to the east and west. Slope gradients within the study are predominantly in excess of 25 percent with several areas in excess of 40 percent. Based upon our review of the current plans, AGS understands that this portion of the project will be developed to support single-family residences along with associated improvements. The residential lots will be approximately 2 to 5 acres in size and are anticipated to have a net useable land area suitable for support of OWTS.

It was originally proposed to utilize conventional OWTS consisting of a septic tank connected to leach lines, as existing residences north of the Proposed Project utilize conventional OWTS. It should be noted that the existing residences north of the Proposed Project are underlain by a different geologic regime (alluvial soils and weathered grantic bedrock) and have a much more subdued topography compared to the study area. Due to the steep topography, presence of shallow hard bedrock (Santiago Peak Volcanics), and localized shallow groundwater, conventional OWTS were determined to be infeasible. Accordingly, the site was evaluated for use of alternative OWTS with supplemental treatment. Based upon the tentative site

development plan it is our understanding that each residential lot will have its own onsite wastewater treatment system. The potable water source is anticipated to be provided by Otay Water District.

3.0 FIELD INVESTIGATION

As part of the current study, AGS hand excavated and logged 30 test pits (HA-1 through HA-30). The purpose of the test pits was to determine the thickness and engineering characteristics of the soil and rock units onsite. The test pit depths ranged from 1.2 to 4.0 feet below ground surface. Logs of these test pits are presented in Appendix B. The approximate locations of the test pits are shown on Plates 1 and 2.

AGS also excavated 6 percolation test borings with a 6-inch diameter hand auger. Percolation testing was conducted in accordance with the Local Agency Management Program (LAMP) for Onsite Wastewater Treatment Systems. The approximate locations of the percolation test holes are shown on Plates 1 and 2. Test holes were approximately 6 inches in diameter and 10 to 12 inches deep. The sides and bottoms of the holes were cleaned and the holes were pre-soaked by successively filling the holes with approximately 8 to 10 inches of water for 4 hours then allowed to soak overnight. 4 of the 6 test holes (P-1, P-3, P-4 and P-6) had water remaining the following day. Percolation testing for these test holes was conducted in accordance with the Case 1 procedure. For the test holes that did not have water remaining overnight (P-2 and P-5), the holes were cleaned of sediment and approximately 2 inches of pea gravel was placed in the bottom. Testing was performed in accordance with the Case 3 procedure. The holes were filled with approximately 6 inches of water over the gravel and allowed to drop for 30 minutes. Testing continued with readings every 30 minutes for approximately 4 to 5 hours until sufficiently stabilized rates were recorded. Percolation test results and calculations are presented in Appendix B.

4.0 SITE GEOLOGY

4.1. Regional Geologic and Geomorphic Setting

The Proposed Project is located in the lower Peninsular Range Region of San Diego County, a subset of the greater Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges Geomorphic province is approximately bounded to the east by Elsinore Fault Zone, to the north by the Transverse Ranges, the south by Baja California, and to the west by the Pacific Ocean. This portion of the Peninsular Ranges is underlain by Jurassic and Cretaceous plutonic rocks of the Peninsular Ranges Batholith, which contains screens of variably metamorphosed Mesozoic supracrustal rocks. Late Jurassic and Early Cretaceous volcanic and volcaniclastic rocks exposed southwest of the Elsinore Fault Zone represent an older superjacent part of the Peninsular Ranges magmatic arc. These basement rocks are non-conformably overlain by a thick sequence of relatively undisturbed sedimentary rocks ranging from upper Cretaceous to Pleistocene in age.

4.2. Site Geology

The Proposed Project is located near the eastern edge of the coastal plain at the contact with the metavolcanic rocks of the Jamul Mountains. Geologically, the site is underlain by two principle rock types, the Late Jurassic to early Cretaceous aged metavolcanic rocks of the Santiago Peak Volcanics and the Tertiary aged sedimentary rocks of the Otay Formation. The Otay Formation is informally subdivided into three subunits: an upper sandstone-claystone member; a middle gritstone member; and a basal angular-clast fanglomerate member. Minor exposures of upper

Pleistocene older alluvium exist locally as relatively flat lying river terraces and unconsolidated alluvium of Holocene age occupies the active drainages onsite. The study area is primarily underlain by Santiago Peak Volcanics. This unit is mantled by relatively thin veneers of colluvium/topsoil with localized veneers of residual soil.

The following section contains a summary of the soil and bedrock units encountered onsite. The approximate distribution of these units are shown on Plates 1 and 2. Description of these geologic units, as observed during our investigation, are presented below. Test pit logs are presented in Appendix B.

4.2.1. Topsoil/Colluvium - Undifferentiated (No Map Symbol)

Undifferentiated topsoil and colluvium exist throughout the Proposed Project site as a thin soil veneer. Thicker accumulations commonly occur near the base of slopes and natural topographic swales. As encountered, these materials ranged from less than one foot to four feet in thickness and are generally composed of silty to clayey sand and silty to sandy clay in a moist to wet and loose to moderately dense condition. Roots and minor to moderate porosity are common.

4.2.2. Alluvium (Qal)

Young alluvial deposits occupy the bottoms of the primary and tributary drainages onsite. These materials can generally be described as silty to clayey sand with gravel and small rock fragments in a moist to wet and loose condition and sandy clay in a moist to wet and soft condition.

4.2.3. Santiago Peak Volcanics (Jsp)

The site is underlain by Jurassic-aged Santiago Peak Volcanics at depth and commonly outcrops at the surface in the study area. The contact between the Santiago Peak Volcanics and the overlying younger geologic units represents a significant geologic hiatus. This contact is irregular and reflects a relatively high relief Mesozoic landscape. Subsequent erosion has exhumed portions of this ancient landscape, creating modern topographic highs including San Miguel Mountain to the north and the Jamul Mountains to the east.

The Santiago Peak Volcanics are generally dense and mildly metamorphosed volcanic rocks. Composition of the volcanic rocks varies from basalt to rhyolite but is predominantly dacite and andesite (Kennedy and Tan, 1977). Typically the meta-volcanics display crude to moderate bedding and foliation. Fracturing is poorly to moderately well developed. In general, outside of boulder areas, a thin weathered halo of residual soil exists. This soil veneer is generally comprised of silty to sandy clay or clayey sand. Below this, the rock is very dense and hard. Refusal to excavation was encountered within the upper one foot of the bedrock.

4.3. Groundwater

Surface water in the form of an ephemeral stream was observed in the area of Lots 6-8 near the northerly boundary of the proposed development. The ephemeral stream flowed beneath the surface near Lot 4 and collected in a broad drainage in the area of Lots 1 through 4. Excavations in the area

of Lots 1 through 4 encountered groundwater at a depth of less than one foot below ground surface. The shallow groundwater encountered is considered to be a transient condition related to recent prolonged rain events and the presence of an undocumented fill dam located at the confluence of this drainage and another tributary drainage. In consideration of the potential for shallow groundwater to develop in the area of Lots 1 through 4, OWTS is not considered feasible for these lots.

In addition, shallow perched groundwater was encountered at depths ranging between 1.5 and 3 feet below ground surface in four (4) of the exploratory test pits.

5.0 TESTING RESULTS

Due to the relatively steep site topography and presence of shallow bedrock and locally shallow groundwater, it was determined that the use of conventional OWTS consisting of a septic tank connected to a leach field for each lot was not considered feasible. In consideration of these limitations, the site was evaluated for the use of an alternative OWTS utilizing supplemental treatment.

Exploratory excavations in the study area generally encountered metavolcanic bedrock at shallow depths (less than two feet below ground surface) and do not meet the minimum design criteria requiring a minimum unsaturated soil interval of two (2) feet below the bottom of proposed dispersal field/system. In areas where suitable separation to bedrock was observed, shallow percolation testing was performed. Preliminary percolation rates (rounded up to the nearest whole number) ranged from 40 minutes per inch to over 120 minutes per inch. Presented below in Table 5.0 are preliminary percolation rates and associated application rate for each test location.

TABLE 5.0
Preliminary Percolation Rates and Application Rates

Percolation Test Boring	Lot Number	Percolation Rate (minutes per inch)	Application Rate (Gal/Day/Ft.^{2})
P-1	5	160	N/A
P-2	8	40	0.422
P-3	9	120	0.100
P-4	10	160	N/A
P-5	16	60	0.200
P-6	30	240	N/A

6.0 CONCLUSIONS AND DESIGN RECOMMENDATIONS

Feasibility of onsite wastewater systems within the study area was evaluated using criteria from the County of San Diego Department of Environmental Health – Land and Water Quality Division's Local Agency Management Program (LAMP) for Onsite Wastewater Treatment Systems. Critical factors including topography, soil and bedrock conditions, and groundwater conditions were evaluated as part of this feasibility study.

The study area is characterized by moderately steep to steep, rocky terrain dissected by minor draws and tributary drainages. Slope inclinations generally exceed 25 percent and locally exceed 40 percent. Based on our subsurface exploration, the proposed treatment areas generally exhibit a shallow soil profile consisting of topsoil/colluvium over weathered metavolcanic bedrock which freshens quickly with depth. Where deeper weathering has occurred, a clayey residual soil horizon and clay lined fractures are commonly observed. The surficial soils and highly weathered, pervious bedrock are generally 1.5 to 2 feet in thickness and locally as thick as 4 feet. In general there is not adequate separation to highly consolidated/impermeable bedrock to support conventional or alternative OWTS on each proposed lot. Where adequate soil cover was observed, percolation test results indicate low soil permeability and 3 of the 6 test locations had percolation rates in excess of 120 minutes per inch precluding use of OWTS. In addition, shallow groundwater was encountered in lower portion of the study area precluding use of OWTS in the area of Lots 1 through 4.

Based on the results of our feasibility study, the study area does not possess suitable soil or groundwater conditions to support conventional or alternative onsite wastewater treatment systems on each proposed lot.

7.0 LIMITATIONS

The scope of work performed for this study was intended to evaluate the feasibility of onsite wastewater treatment systems based on the prevailing soil and geologic conditions for the proposed development as currently conceived. This report is based on the project as described and the information obtained from the excavations at the approximate locations indicated on the Plates 1 and 2.

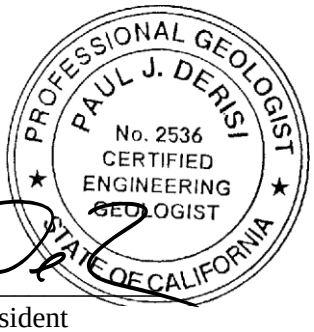
The findings are based on the results of the field, laboratory, and office investigations combined with an interpolation and extrapolation of conditions between and beyond the excavation locations. The results reflect an interpretation of the direct evidence obtained. Services performed by AGS have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS.

AGS has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

Advanced Geotechnical Solutions, Inc., appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 867-0487.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.



JEFFREY A. CHANEY, President
GE 2314, Reg. Exp. 6-30-19

PAUL DERISI, Vice President
CEG 2536, Reg. Exp. 5-31-19

Distribution: (3) Addressee
Attachments: Figure 1 – Site Location Map
Figure 2 – Topographic Map of Study Area
Plates 1 and 2 – Geologic Map and Exploration Location Plan;
Appendix A – References
Appendix B – Field Data and Calculations

REGIONAL LOCATION MAP
OTAY RANCH-VILLAGE 14 AND PA 16/19, SAN DIEGO COUNTY, CALIFORNIA

P/W 1312-02

FIGURE 1

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
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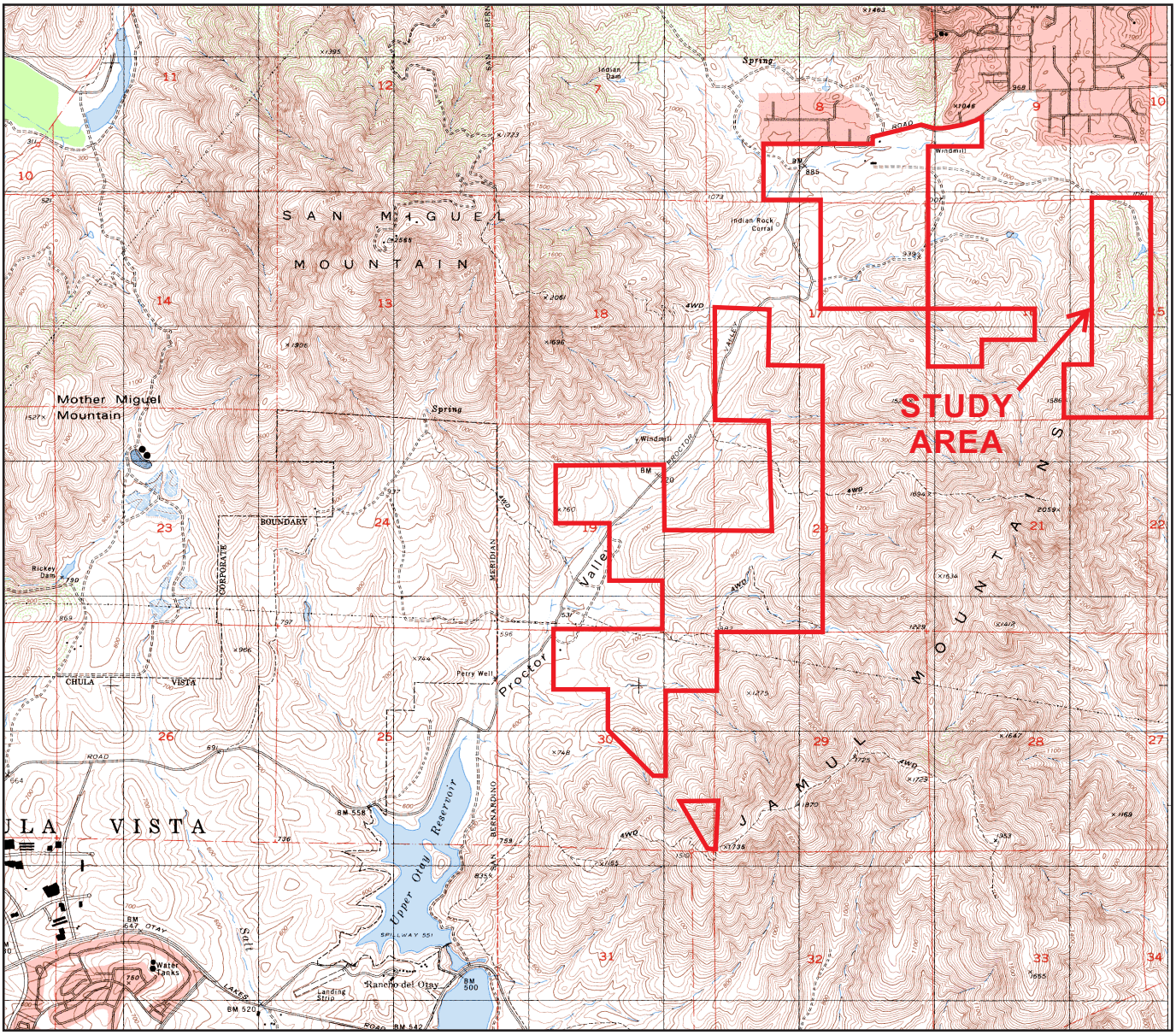

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1"=approx. 4000 ft.

SITE LOCATION MAP
OTAY RANCH-VILLAGE 14 AND PA 16/19, SAN DIEGO COUNTY, CALIFORNIA

P/W 1312-02

FIGURE 2

SOURCE MAP - TOPOGRAPHIC MAP OF THE JAMUL MOUNTAINS 7.5 MINUTE QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA

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APPENDIX A

REFERENCES

REFERENCES

Advanced Geotechnical Solutions, Inc., *Geotechnical Review of Preliminary Tentative Map and Grading Plan, Otay Ranch Village 14 and Planning Areas 16/19, County of San Diego, California*, Report No. 1312-02-B-6R, dated March 24, 2017 (Revised September 11, 2017).

County of San Diego, Department of Environmental Health, *Local Agency Management Program (LAMP) for Onsite Wastewater Treatment Systems*, dated February 24, 2015.

Hunsaker and Associates, *100-scale Preliminary Grading Plan, Otay Ranch Proctor Valley Village (Village 14) and Planning Areas 16 & 19, County of San Diego, California*, Sheets 17 and 18.

APPENDIX B

FIELD DATA AND CALCULATIONS

March 28, 2017
P/W 1312-02

Report No. 1312-02-B-8

Project Otay Village 14
Date Excavated Feb. 9, 2017
Logged by SS/DL/PJD
Equipment Hand Auger

LOG OF TEST PITS

Test Pit No.	Depth (ft.)	USCS	Description
HA-1	0.0 – 1.5	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND with some clay, fine to medium grained, reddish brown, very moist, loose.
	1.5 – 1.75		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, reddish brown to gray, moderately hard, highly weathered, fractured. @1.75ft refusal.
			TOTAL DEPTH 1.75 FT. NO WATER, NO CAVING
HA-2	0.0 – 2.3	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND with clay, fine to medium grained, reddish brown to brown, very moist, loose; seepage at 2.3ft.
	2.3 – 2.5		**Santiago Peak Volcanics (Jsp):** SANDY CLAY (Residual Soil), red brown to yellow brown, soft, completely weathered @2.5ft. Meta-volcanic bedrock, yellow brown to gray brown, hard, weathered, fractured; refusal.
			TOTAL DEPTH 2.5 FT. PERCHED WATER AT 2.3 FT, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-3	0.0 – 1.25	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND with some clay, fine to medium grained, reddish brown, very moist, loose.
	1.25 – 1.5		**Santiago Peak Volcanics (Jsp):** SANDY CLAY (Residual Soil), yellow brown to gray brown, medium, completely to highly weathered @1.4 ft. Meta-volcanic bedrock, yellow brown to gray brown, moderately hard, highly weathered, fractured. @1.5ft. refusal. TOTAL DEPTH 1.5 FT. NO WATER, NO CAVING
HA-4	0.0 – 1.25	ML	**Topsoil/Colluvium - Undifferntiated:** SANDY SILT with some clay, fine to medium grained, reddish brown, moist, soft.
	1.25 – 2.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, gray brown, moderately hard, highly weathered, fractured. @1.75ft. breaks into silty sand, yellow brown to orange. @2.0ft. refusal. TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-5	0.0 – 1.75	ML	**Topsoil/Colluvium - Undifferntiated:** SANDY SILT, fine grained, reddish brown, wet, loose.
	1.75 – 2.25		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, yellow brown to gray brown, moderately hard, highly weathered, fractured. @1.75ft. breaks into silty sand, tan to gray, dense. @2.25ft. refusal TOTAL DEPTH 2.25 FT. NO WATER, NO CAVING
HA-6	0.0 – 3.75	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND, fine grained, reddish brown, wet, loose. @3ft groundwater seepage
	3.75 – 4.0		**Santiago Peak Volcanics (Jsp):** SANDY CLAY (Residual Soil), tan to orange, firm, completely to highly weathered @4.0ft. Meta-volcanic bedrock, tan to gray brown, hard to very hard, moderately weathered, fractured; refusal. TOTAL DEPTH 4.0 FT. PERCHED WATER @3.0ft, NO CAVING
HA-7	0.0 – 3.0	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND, fine to medium grained, reddish brown, wet, loose. @2.0ft. perched water
		CL/ML	@2.0ft. CLAYEY SILT to SILTY CLAY, fine grained, dark brown to gray, saturated, firm.
	3.0 – 3.2		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, tan to gray brown, hard, highly weathered, fractured. @3.2ft. refusal TOTAL DEPTH 3.2 FT. PERCHED WATER @ 2.0FT, NO CAVING

Test

Pit No.	Depth (ft.)	USCS	Description
HA-8	0.0 – 3.5	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND, fine to medium grained, reddish brown, moist, loose.
	3.5 – 4.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, tan to gray brown, moderately hard to hard, highly weathered, fractured breaks into SILTY SAND @4.0ft. refusal TOTAL DEPTH 4.0 FT. NO WATER, NO CAVING
HA-9	0.0 – 1.75	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND, fine to medium grained, reddish brown, moist, loose.
	1.75 – 2.0		**Santiago Peak Volcanics (Jsp):** SANDY CLAY (Residual Soil), gray, wet, firm, completely to highly weathered. @2.0ft. Meta-volcanic bedrock, gray brown, hard, weathered, fractured; refusal. TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING
HA-10	0.0 – 1.75	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND, fine to medium grained reddish brown, moist, loose.
	1.75 – 2.0		**Santiago Peak Volcanics (Jsp):** SANDY CLAY (Residual Soil), gray, wet, firm, completely to highly weathered. @2.0ft. Meta-volcanic bedrock, reddish brown to dark gray brown, hard, fractured; refusal. TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-11	0.0 – 1.5	ML/SM	**Topsoil/Colluvium - Undifferntiated:** SANDY SILT to very fine SILTY SAND with some clay, reddish brown very moist, loose,
	1.5 – 2.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, olive grey, soft to moderately hard, highly weathered, fractured, breaks into very fine silty SAND @2.0ft. Very hard, slightly weathered, light gray; refusal TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING
HA-12	0.0 – 1.25	SM	**Topsoil/Colluvium - Undifferntiated:** SILTY SAND with some clay, fine grained, reddish brown to dark brown, very moist, loose; some small angular fragments up to 3inch.
	1.25 - 1.5		**Santiago Peak Volcanics (Jsp):** CLAYEY SILT (Residual Soil), gray with abundant FeO2 mottling, highly weathered, medium dense @ 1.25 ft. Meta-volcanic bedrock, slightly weathered, hard, light gray; fractured. @1.5ft. refusal TOTAL DEPTH 1.5 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-13	0.0 – 1.75	ML	**Topsoil/Colluvium - Undifferntiated:** CLAYEY SILT with Fine Sand, dark brown, moist to wet, soft. @0.5ft. SANDY SILT with Clay, fine, reddish brown, loose, wet to saturated with angular Jsp fragments up to 6 inch @1.25ft. CLAYEY SILT
	1.75- 2.25		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, slightly weathered, hard, dark olive gray, with iron oxide (FeO2). @2.25 ft. refusal TOTAL DEPTH 2.25 FT. SEEPAGE @ 0.5ft, NO CAVING
HA-14	0.0 – 1.75	CL	**Topsoil/Colluvium - Undifferntiated:** CLAYEY SAND with silt, fine grained, dark reddish brown, moist, loose @1.0ft. SILTY TO SAND CLAY, fine, dark brown, wet, soft to firm,
	1.75 – 2.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, slightly weathered, hard, dark olive gray, small fragments reduce to fine sandy silt @2.0 Hard with fracture/joints in bottom of excavation @2.0ft. refusal TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-15	0.0 – 2.0	CL	**Topsoil/Colluvium - Undifferntiated:** SANDY CLAY with silt, fine grained, dark reddish brown to dark brown, moist, loose, occasional fragments to 2 inch. @0.75ft CLAYEY SAND, fine grained, moist to wet, loose to medium dense, occasional fragments to 3 inch
	1.5 – 2.25		**Santiago Peak Volcanics (Jsp):** SILTY CLAY (Residual Soil), orange brown, moist to wet, soft, becomes clayey silt with fine sand @2ft Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @2.25ft. refusal
			TOTAL DEPTH 2.25 FT. NO WATER, NO CAVING
HA-16	0.0 – 1.5	ML	**Topsoil/Colluvium - Undifferntiated:** CLAYEY SILT with sand, fine grained, reddish brown, moist, soft. @0.5ft wet to saturated, with occasional Jsp fragments to 2 inches
	1.5 – 1.75		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.75ft. refusal
			TOTAL DEPTH 1.75 FT. NO WATER, NO CAVING
HA-17	0.0 – 1.25	SC	**Topsoil/Colluvium - Undifferntiated:** CLAYEY SAND with silt, fine grained, reddish brown to orange brown, moist, loose to medium dense.
	1.25 – 1.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.5ft. refusal
			TOTAL DEPTH 1.5 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-18	0.0 – 2.0	SM/SC	**Topsoil/Colluvium - Undifferntiated:** SILTY TO CLAYEY SAND, fine grained, brown, moist, loose. @1.0ft CLAYEY SAND, wet to saturated @1.5ft Jsp fragments to 6 inches
	2.0 – 2.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @2.25ft perched water @2.5ft. refusal
			TOTAL DEPTH 2.5 FT. MINOR SEEPAGE @1.0ft. PERCHED WATER @2.25ft, NO CAVING
HA-19	0.0 – 1.0	ML	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, reddish brown to brown, moist to wet, soft to medium.
	1.0 – 1.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.5ft refusal
			TOTAL DEPTH 1.5 FT. NO WATER, NO CAVING
HA-20	0.0 – 0.5	SC	**Topsoil/Colluvium - Undifferntiated:** CLAYEY SAND, fine grained, brown, very moist, loose. @0.5ft saturated; groundwater filling hole
			TOTAL DEPTH 0.5 FT. @0.5ft. WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-21	0.0 – 0.3	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	0.3 – 0.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @0.5ft. refusal
			TOTAL DEPTH 0.5 FT. NO WATER, NO CAVING
HA-22	0.0 – 0.5	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	0.5 – 1.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.0ft. refusal
			TOTAL DEPTH 1.0 FT. NO WATER, NO CAVING
HA-23	0.0 – 0.3	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	0.3 – 0.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @0.5ft. refusal
			TOTAL DEPTH 0.5 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-24	0.0 – 2.0	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	2.0		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, weathered, hard breaks into CLAYEY SANDY GRAVEL @2.0ft. refusal TOTAL DEPTH 2.0 FT. NO WATER, NO CAVING
HA-25	0.0 – 0.3	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	0.3 – 0.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @0.5ft. refusal TOTAL DEPTH 0.5 FT. NO WATER, NO CAVING
HA-26	0.0 – 0.5	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY, fine grained, brown to dark brown, moist to wet, stiff.
	0.5 – 0.6		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @0.6ft. refusal TOTAL DEPTH 0.6 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-27	0.0 – 1.0	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY with sand, fine to coarse grained, reddish brown to brown, moist to wet, stiff, trace coarse grained sand.
	1.0 - 1.2		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.2ft. refusal TOTAL DEPTH 1.2 FT. NO WATER, NO CAVING
HA-28	0.0 – 1.0	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY with sand, fine grained, reddish brown to brown, moist to wet, stiff, trace coarse grained sand.
	1.0 – 1.5		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @1.5ft. refusal TOTAL DEPTH 1.5 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
HA-29	0.0 – 0.5	CL	**Topsoil/Colluvium - Undifferntiated:** SILTY CLAY with sand, fine grained, reddish brown to brown, moist to wet, stiff, trace coarse grained sand.
	0.5 – 0.7		**Santiago Peak Volcanics (Jsp):** Meta-volcanic bedrock, dark olive gray, slightly weathered, hard @0.7ft. refusal TOTAL DEPTH 0.7 FT. NO WATER, NO CAVING
HA-30	0.0 – 1.0	ML	**Topsoil/Colluvium - Undifferntiated:** SANDY SILT, fine grained, brown to dark brown, wet to saturated, soft. @0.8ft ground water TOTAL DEPTH 1.0 FT. WATER @0.8ft, SOME CAVING

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-1 | Tested By: PJD | Water Temp.: 65

Depth of Test Hole: 11" | USCS : SC/CL | Air Temp.: 62

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	8:12	8:42	30	5 3/4	6	1/4	120	Water in test hole
2	8:42	9:12	30	6	6 3/16	3/16	160	Case I testing
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-2 | Tested By: PJD | Water Temp.: 65

Depth of Test Hole: 10.5" | USCS : SM/SC | Air Temp.: 64

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	9:26	9:56	30	5 1/4	6 1/8	7/8	34	Case III testing
2	9:56	10:26	30	6 1/8	6 7/8	3/4	40	
3	10:27	10:57	30	5 3/8	6 1/4	7/8	34	
4	10:58	11:28	30	5 3/16	6 1/8	15/16	32	
5	11:29	11:59	30	5 1/4	6 1/16	13/16	37	
6	12:01	12:31	30	5 1/4	6 1/8	7/8	34	
7	12:32	13:02	30	5 3/16	6	13/16	37	
8	13:04	13:34	30	5 1/4	6	3/4	40	
9								
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-3 | Tested By: PJD | Water Temp.: 65

Depth of Test Hole: 10" | USCS : SC/CL | Air Temp.: 64

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	9:49	10:19	30	4 1/2	4 7/8	3/8	80	Water in test hole
2	10:19	10:49	30	4 7/8	5 1/8	1/4	120	Case I testing
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-4 | Tested By: PJD | Water Temp.: 65

Depth of Test Hole: 10.5" | USCS : SC/CL | Air Temp.: 64

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	11:16	11:46	30	4 3/4	5 1/16	5/16	96	Water in test hole
2	11:46	12:16	30	5 1/16	5 1/4	3/16	160	Case I testing
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-5 | Tested By: DL | Water Temp.: 66

Depth of Test Hole: 12" | USCS : SC | Air Temp.: 64

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	10:39	11:09	30	5 7/8	6 3/4	7/8	34	Case III testing
2	11:10	11:40	30	5 5/8	6 3/8	3/4	40	
3	11:42	12:12	30	5 7/8	6 7/16	9/16	53	
4	12:14	12:44	30	5 3/4	6 1/4	1/2	60	
5	12:45	13:15	30	5 5/8	6 1/4	5/8	48	
6	13:17	13:47	30	5 3/4	6 5/16	9/16	53	
7	13:50	14:20	30	5 3/4	6 1/4	1/2	60	
8	14:22	14:52	30	5 5/8	6 3/16	9/16	53	
9	14:54	15:24	30	5 5/8	6 1/8	1/2	60	
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: Otay Village 14, 16 & 19 | Project No.: 1312-02 | Date: 2/10/2017

Test Hole No.: P-6 | Tested By: DL | Water Temp.: 66

Depth of Test Hole: 10" | USCS : CL | Air Temp.: 62

Test Hole Dimensions (Inches)

Length | Width | Diameter 6" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	8:46	9:16	30	4 3/8	4 5/8	1/4	120	Water in test hole
2	9:16	9:46	30	4 5/8	4 3/4	1/8	240	Case I testing
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								