Weber, Hayes & Associates
Hydrogeology and Environmental Engineering
120 Westgate Drive, Watsonville, CA 95076
(831) 722-3580 // www.weber-hayes.com

March 19, 2015

Ms. Mary Gourlay
Mr. Corbett W. Wright
Green Valley Corporation
777 North First Street, 5th Floor
San Jose, CA 95112

Subject: Initial Infiltration Testing, Dunslee Way at Scotts Valley Drive, Scotts Valley

Dear Ms. Gourlay and Mr. Wright:

This report describes initial infiltration testing and results conducted by Weber, Hayes and Associates (WHA) for the proposed development at Dunslee Way and Scotts Valley Drive in Scotts Valley, California (the site). The site location is shown on Figure 1. Initial infiltration testing was conducted at your request as the first step to determine if infiltration of stormwater is feasible at the site.

1. Summary of Infiltration Test Results

Infiltration test holes were installed to 8, 13, and 18 feet below the ground surface (bgs) at the locations shown on Figure 2. The infiltration rate at each of these depths was:

a. 8 feet bgs: 0.24 inches per hour
b. 13 feet bgs: 3.6 inches per hour
c. 18 feet bgs: 192.1 inches per hour

This data indicates it is likely that there is little to no natural infiltration at the site due to predominantly fine grained nature of the near surface soils. These predominantly fine grained soils were observed uniformly across the sloping site to a depth of approximately 15 to 25 feet. The data also suggest that infiltration is possible in the deep sandy zone observed from approximately 15 to 25 feet bgs at the sloping site (the site slopes uphill to the west and the sandy zone was observed at an approximately uniform elevation).

2. Scope of Services

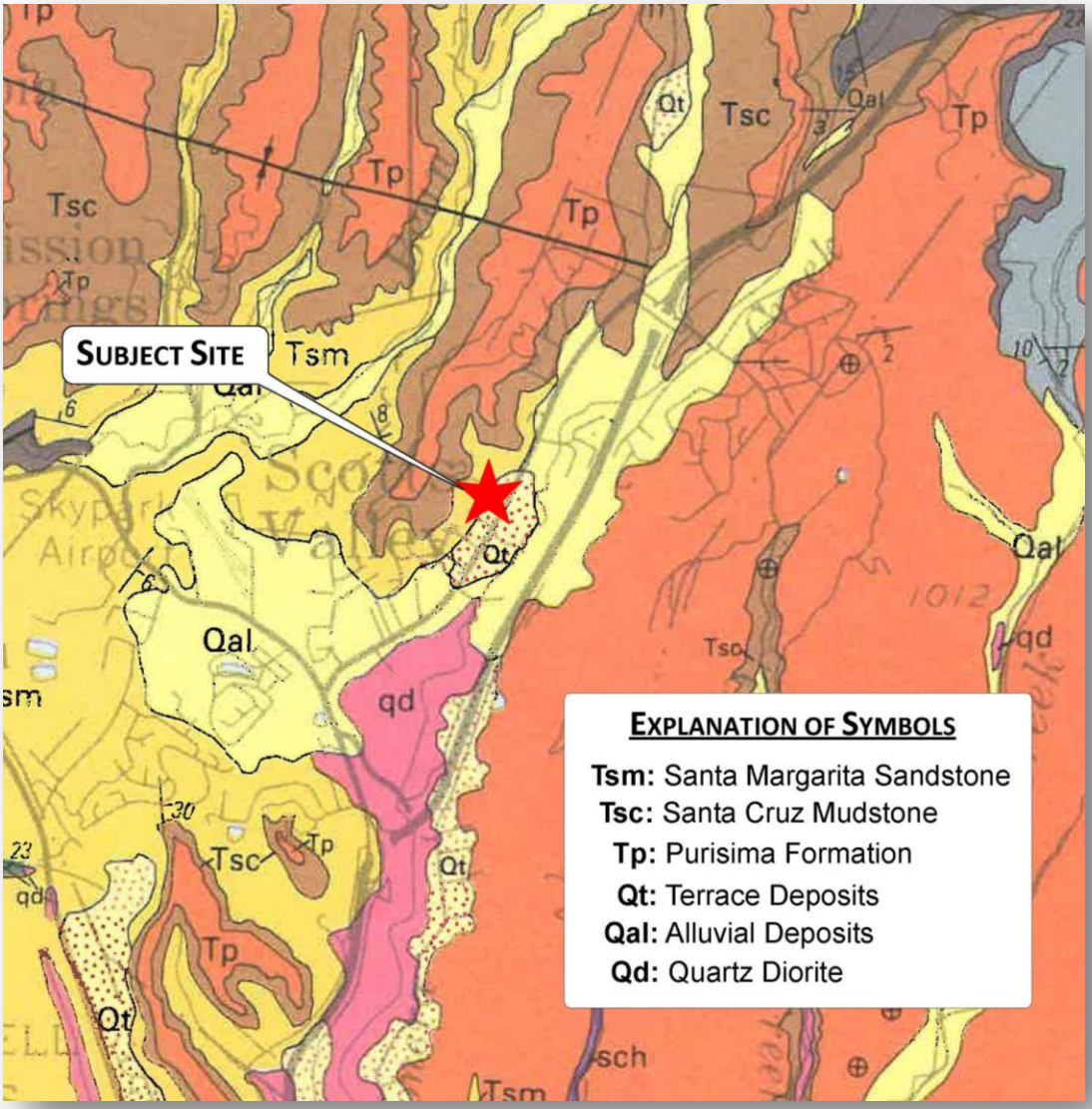
Our scope of professional services were developed in response to your December 1, 2014 electronic mail request and presented in our December 2, 2014 proposal. We were authorized to proceed with this work on January 27, 2015. Our scope of services entailed:

1) Reviewing available geologic and hydrogeologic data for the site and surrounding area
2) Reviewing the boring logs for the site prepared during the concurrent geotechnical investigation by the Geotechnical Consultant, Haro Kasunich and Associates (HKA).
3) Providing specifications for three on-site infiltration test holes which were installed by HKA and their subcontractor in conjunction with their geotechnical investigation at the site. The test holes were properly destroyed by HKA after our field work was completed. The locations of the test holes are shown on Figure 2. The depth of the test holes and the perforated intervals were:
    a. 8-feet deep, perforated 5-8 feet bgs
    b. 13-feet deep, perforated 10-13 feet bgs
    c. 18-feet deep, perforated 15-18 feet bgs
4) Observing the construction of the test holes.
5) Conducting infiltration tests in the three holes, including:
    a. Providing a water storage tank and arranging for potable water to be delivered to the site for infiltration testing
    b. Conducting infiltration tests to determine the infiltration rate in minutes per inch of water level drop at each of the three infiltration test holes/depths
6) Preparing this summary letter report describing the test methods and results (infiltration rates)

3. Geologic and Hydrogeologic Setting

The site is situated along the western flank of the tectonically uplifted Santa Cruz Mountains at an elevation of approximately 570 to 600 feet above mean sea level. The site is underlain by older, marine deposits consisting of Santa Margarita Sandstone (Tsm) which is comprised of

very thick bedded to massive thickly crossbedded yellowish-gray to white medium to fine grained arkosic sandstone with a thickness of approximately 430 feet along the Scotts Valley syncline[1]. A relatively thin layer of alluvial fill and localized terrace deposits set just above the Santa Margarita formation at the valley floor (approximately 15-30 feet thick), see the geologic map exert (below) for reference.



[1] Brabb, E.E., 1989, Geologic map of Santa Cruz County, California, and the U.S. Geological Survey Miscellaneous Investigations Series Map I-1905.

The site is located within the Scotts Valley Groundwater Basin. The Santa Margarita Sandstone is considered to be the principal regional water-bearing formation and its aquifer exists under water table conditions (unconfined). Groundwater recharge occurs from the percolation of precipitation, seepage from streams, and subsurface flow from adjacent areas and formations. Percolation of precipitation is the most significant source of recharge[2].

On-Site Field Exploration

On February 12 and 27, 2015 Haro, Kasunich and Associates Inc (HKA) field personnel directed the drilling of seven (7) test boreholes (B-1 through B-7) ranging in depth from 4.5 to 31.5 feet below ground surface (bgs) across the site. These borings were installed as part of HKA's geotechnical investigation of the site. A test borehole location map and geologic logs prepared by HKA are included as Appendix A for reference. Subsurface lithology at the site generally consists of the following:

- Moderate to low permeability Silty Sand to Sandy Clay from ground surface to approximately 6 feet bgs underlain by,
- Relatively low permeability Sandy Silt to Sandy Clay to depths up to approximately 12 feet bgs at the lower elevation eastern portion of the site (B-1 through B-4) and up to 25 feet at the higher elevation western portion of the site (B-5 through B-7) underlain by,
- Relatively high permeability Poorly Graded Sand below a laterally continuous gravel layer encountered at depths of 14 to 18 feet bgs at the lower elevation eastern portion of the site (B-1, 3, and -4) and depths up to 27 feet bgs in the higher elevation western portion of the site (B-6). **The Sand is interpreted to be the Santa Margarita Sandstone.**

The observed lithology matches the regional geology described by Brabb.

4. Infiltration Testing Fieldwork

On February 12, 2014, Weber, Hayes and Associates observed the drilling and installation of three infiltration test holes at the site (Test Holes #1 through #3; see Figure 2). The test holes

[2] Department of Water Resources Groundwater Bulletin 118, Scotts Valley Groundwater Basin
http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-27.pdf

were installed by HKA and their drilling subcontractor as part of their geotechnical drilling program at the site. A soil boring permit was obtained by HKA through the Scotts Valley Water District (SVWD). The test holes were installed by a C-57 licensed driller (Exploration Geoservices, Inc., C-57 License 484-288) via a truck-mounted hollow-stem auger drill rig equipped with 8-inch diameter hollow stem augers. Infiltration test holes #1, #2, and #3 were advanced to depths of 8, 13 and 18 feet bgs, respectively. The generalized construction for each test hole was as follows:

- A few inches of clean, crushed ¾-inch rock was placed at the base of the test hole before the casing was installed
- 2-inch diameter 0.010-inch factory slotted PVC with machined threads for connecting the casing was set in the bottom 3-feet of the borehole (open at base in the clean crushed rock)
- 2-inch diameter PVC riser casing was threaded together to the ground surface
- 4 feet of ¾-inch clean crushed rock surrounding the casing from the base of the borehole to approximately 1 foot above the slotted screen interval

The cased infiltration test holes were constructed through the hollow stem augers in order to avoid potential sloughing of material into the borehole during construction. Following the infiltration tests, HKA and the driller returned to the site and properly destroyed each test hole in accordance with Scotts Valley Water District requirements and State standards.

Field Observations – Lithology of Infiltration Test Intervals

Grab samples of subsurface material were collected from the bottom 3-feet of the augers for each of the three test holes and logged by an experienced field geologist in order to provide lithologic information at the tested locations. The following lithology was observed:

Test Hole #1 (infiltration test depth of 8 feet bgs)

- **Sandy Clay,** brown with approximately 75-85% clay and 15-25% fine to medium sand

Test Hole #2 (infiltration test depth of 13 feet bgs)

- **Clayey Sand**, yellowish brown with approximately 60-70% fine to medium sand and 30-40% clay

Test Hole #3 (infiltration test depth of 18 feet bgs)

- **Poorly Graded Sand w/ Silt,** pale brown to light yellowish brown with approximately 90-95% fine to medium sand (dominantly fine) and 5-10% silt/clay fines

As noted in Section 3, the sand encountered in test hole #3 is interpreted to the Santa Margarita Sandstone.

Note: an Initial test hole advanced in the northern portion of the site encountered a thin (less than 6-inches thick) saturated gravelly zone (perched groundwater) at approximately 6 feet bgs (see HKA boring log for B-2, Appendix A). This shallow gravelly zone was not encountered elsewhere on the site. The 7.5 foot borehole infilled with groundwater to approximately 7 feet bgs and the plan to install an infiltration test hole at this location was abandoned. Infiltration test holes were instead installed on the southern portion of the property at the locations shown on Figure 2.

Infiltration Testing

In preparation for infiltration testing, each test hole was pre-soaked after construction with clean potable water on February 12, 2015. The test holes were pre-soaked for approximately 20 hours in advance of infiltration testing.

Infiltration testing was conducted by WHA field personnel on February 13, 2015. The infiltration tests were conducted by adding water to each of the three test holes to a level approximately 1 to 3 feet above the slotted interval (i.e., 4 to 6 feet above the base of the test hole) and periodically measuring the water level drop as referenced from the top of test hole casing with an electronic water level meter for a period of 60 minutes. Three consecutive 60 minute tests were conducted at each test hole location. Infiltration test data was recorded on field data sheets which are presented as Appendix B.

We note that the water level in Test Holes #1 and #2 following the approximate 20 hour pre-soak period was still several feet above the perforated interval so little to no water was added to these test holes during the tests.

5. Infiltration Test Results

The infiltration rate measured at each of the test holes was:

a. Test Hole #1, 8 feet bgs: 0.24 inches per hour
b. Test Hole #2, 13 feet bgs: 3.6 inches per hour
c. Test Hole #3, 18 feet bgs: 192.1 inches per hour

This data indicates there is a very low infiltration rate at 8 feet bgs where we observed a brown sandy clay.

The data indicate a somewhat higher infiltration rate in the clayey sand observed at 13 feet bgs.

Water infiltrates very rapidly into the Santa Margarita Sandstone observed in test hole #3 at 15-18 feet bgs.

It is likely that there is little to no natural infiltration at the site due to the predominantly fine grained nature of the near surface soils. These predominantly fine grained soils were observed uniformly across the site. The data also suggest that infiltration is possible in the deep sandy zone observed from approximately 15 to 25 feet bgs at the sloping site (the site slopes uphill to the west and the sandy zone is likely found at a uniform elevation).

6. Limitations

Our service consists of professional opinions and recommendations made in accordance with generally accepted geologic and engineering principles and practices. This warranty is in lieu of all others, either expressed or implied. The analysis and conclusions in this report are based on sampling and testing which are necessarily limited. Additional data from future work may lead to modifications of the opinions expressed herein.

Thank you for the opportunity to participate in the initial infiltration testing for this project. Please contact us at 831-722-3580 if you have any questions about this report.

Sincerely yours,

WEBER, HAYES AND ASSOCIATES

By: _____
Jered Chaney
Project Geologist

And: _____
Craig B. Drizin
Principal Engineer

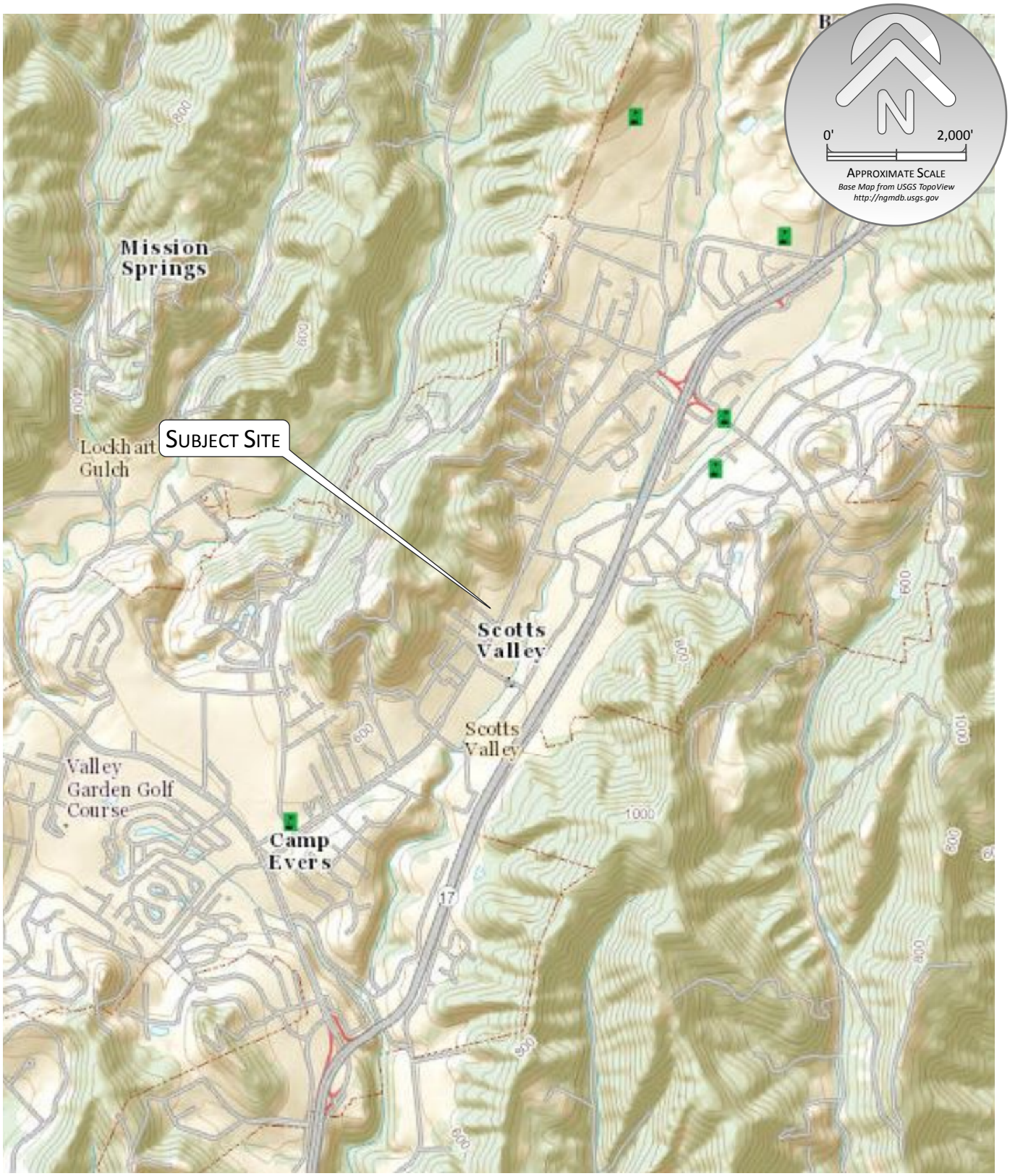
Attachments:

Figure 1: Location Map
Figure 2: Site Map

Appendix A: HKA Map and Logs of Test Boreholes
Appendix B: WHA Field Notes

Figures

Figure 1: Location Map
Figure 2: Site Map



Weber, Hayes & Associates
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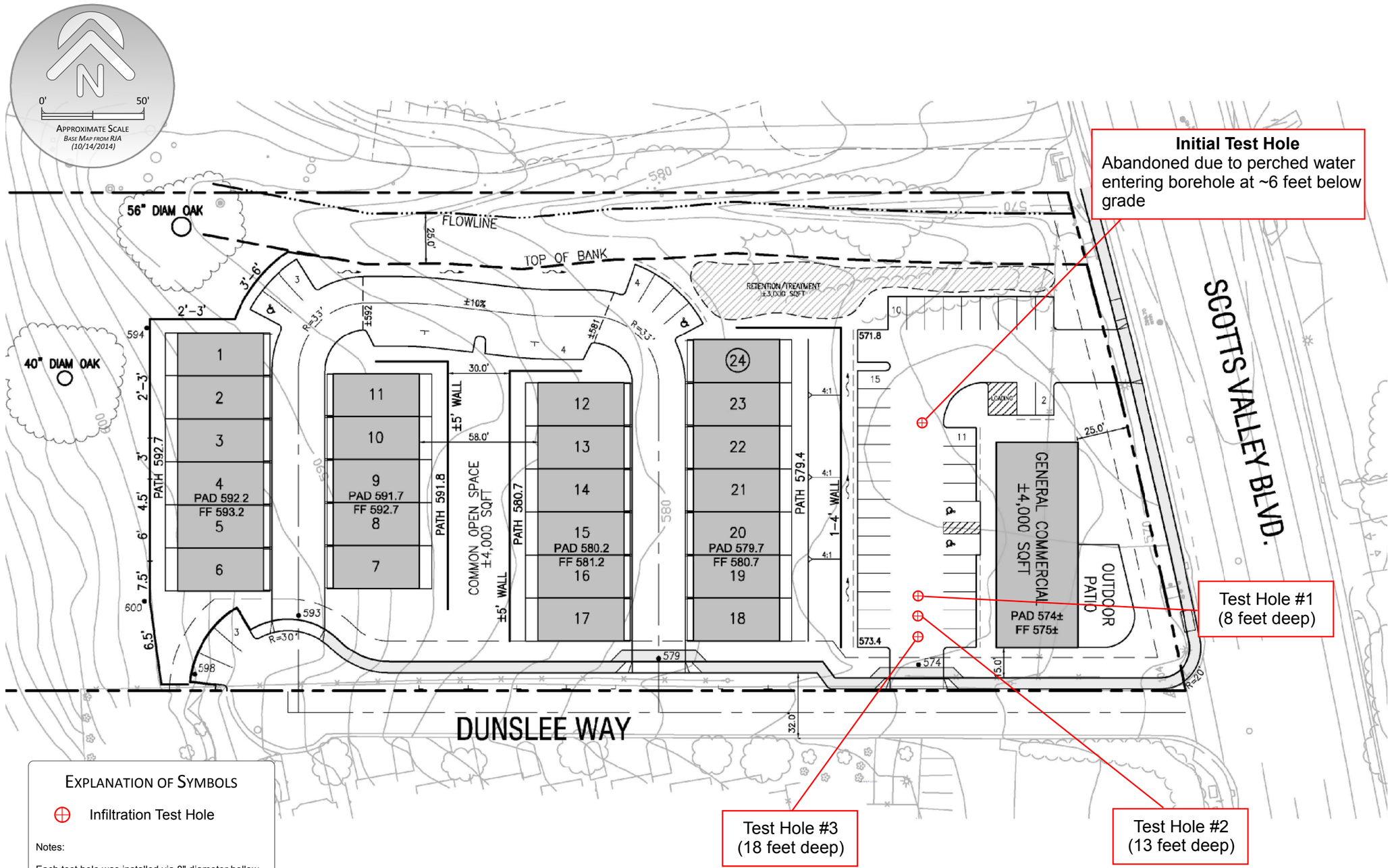
Location Map
Initial Infiltration Testing

Address: Dunslee Way at Scotts Valley Drive, Scotts Valley, CA

Date: March 18, 2015

Revisions/Notes:

Figure 1
Project 2X442



Explanation of Symbols

⊕ Infiltration Test Hole

Notes:

Each test hole was installed via 8" diameter hollow stem auger in an 8-inch diameter borehole, and cased with 2" diameter PVC with 3-feet of 0.010-inch factory slotted screen at the base of the casing. The casing was surrounded by clean 3/4-inch crush rock to 1-foot above slotted interval.

- Test Hole #1 slotted from 5-8 feet below grade
- Test Hole #2 slotted from 10-13 feet below grade
- Test Hole #3 slotted from 15-18 feet below grade

Figure 2
Project 2X442

Site Map
Initial Infiltration Testing

Address: Dunslee Way at Scotts Valley Drive, Scotts Valley, CA, CA

Date: March 18, 2015

Revisions/Notes:

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Hydrogeology and Environmental Engineering
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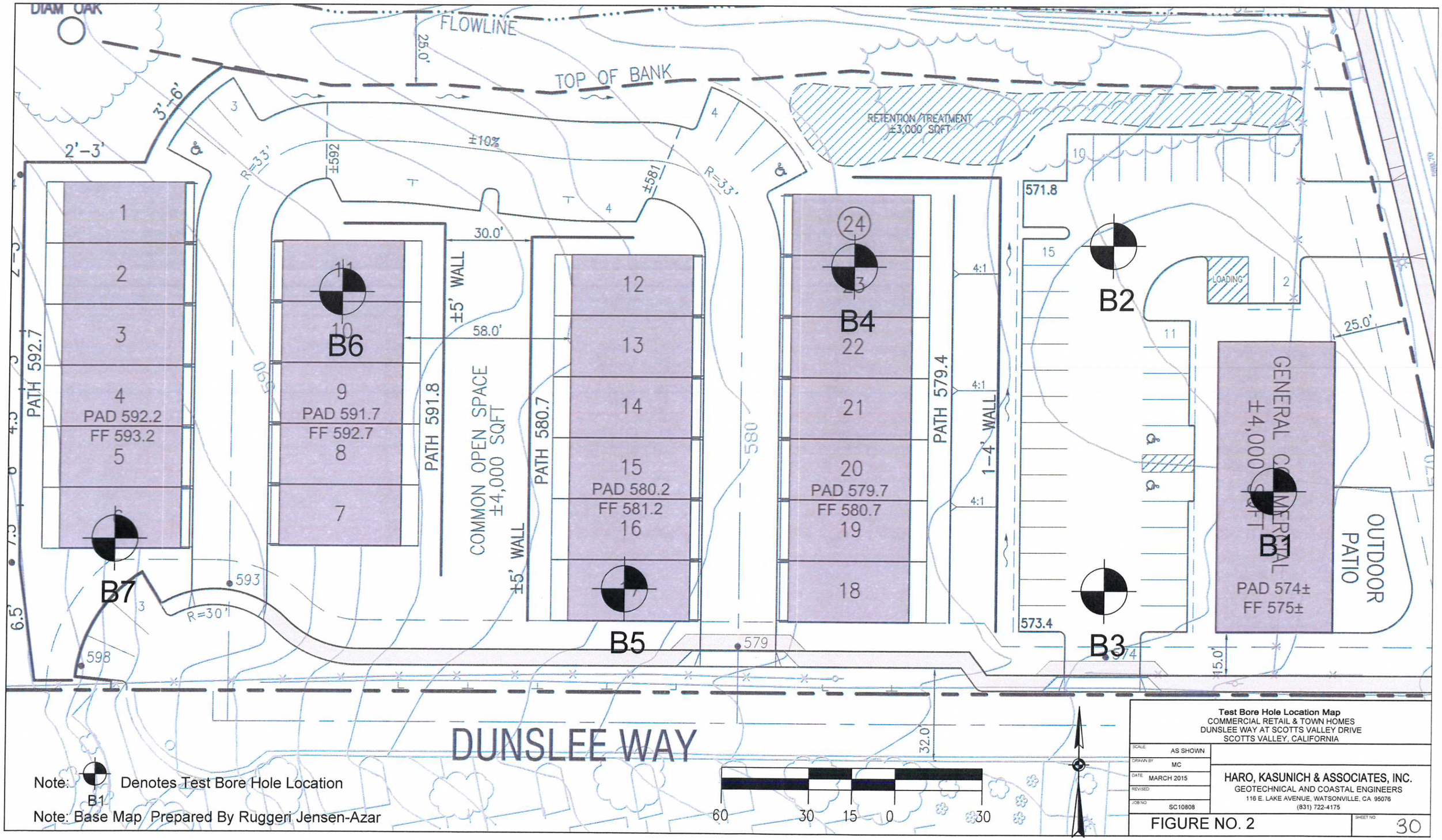
Appendix A

HKA Map and Logs of Test Boreholes



Note: B1 Denotes Test Bore Hole Location

Note: Base Map Prepared By Ruggeri Jensen-Azar

Test Bore Hole Location Map
COMMERCIAL RETAIL & TOWN HOMES
DUNSLEE WAY AT SCOTTS VALLEY DRIVE
SCOTTS VALLEY, CALIFORNIA

SCALE	AS SHOWN
DRAWN BY	MC
DATE	MARCH 2015
REVISED	
JOB NO	SC10808

HARO, KASUNICH & ASSOCIATES, INC.
GEOTECHNICAL AND COASTAL ENGINEERS
116 E. LAKE AVENUE, WATSONVILLE, CA 95076
(831) 722-4175

FIGURE NO. 2

SHEET NO 30

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE: 200, 40, 10, 4

CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS PER FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH (TSF)**	BLOWS PER FOOT*
VERY SOFT	0 - ¼	0 - 2
SOFT	¼ - ½	2 - 4
FIRM	½ - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

SAMPLING METHOD

STANDARD PENETRATION TEST	T	
MODIFIED CALIFORNIA	L or M	
PITCHER BARREL	P	
SHELBY TUBE	S	
BULK	B	

H_2O

Final	▽
Initial	▼
Water level designation	

*Number of blows of 140 lb hammer falling 30 inches to drive a 2" O.D. (1⅜" I.D.) split spoon sampler (ASTM D-1586)

**Unconfined compressive strength in tons/ft² is determined by laboratory testing or approximated by the Standard Penetration Test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

Haro Kasunich & Associates	KEY TO LOGS Dunslee Way At Scotts Valley Dr. Scotts Valley, California	Project No. SC10808 March 2015	Figure No. 3

Haro, Kasunich & Associates, Inc.
Geotechnical Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2-12-15 | BORING DIAMETER 8" | BORING NO. B-1

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Brown Silty SAND fine to medium grain, 1/4 inch subangular gravel, moist, loose	SM					
	1-1-1 (L)		Dark brown Sandy CLAY, fine gravel, moist, very stiff	CL	31			17.6	Atterberg Limits PI = 31 LL = 45.4% Free Swell 1%
	1-2 (T)		Dark brown mottled orange Sandy CLAY, fine to coarse grain, clasts, moist, very stiff		27				
5									
	1-3-1 (L)		Brown sandy SILT, fine grain, moist, very stiff	ML	33		96	28.1	
10	1-4 (T)		Brown orange matrix of Silty CLAY, SAND, gravel, fine to coarse grain, 1/4 inch to 1 inch gravel, moist, dense	ML-SW	46				
			Cobbles and gravels, rough drilling	CL-GW					
			Tan white SAND, fine to medium grain, damp, dense	SW					
15									
	1-5-1 (L)		Same but very dense		50/5"				
20									
25									
	1-6 (T)		Same as above		50/5"				
			Boring terminated at 29 feet						
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 4

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Haro, Kasunich & Associates, Inc.
Geotechnical Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2-12-15 | BORING DIAMETER 8" | BORING NO. B-2

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND, fine grain, trace of binder, moist, loose	SM					
	2-1- 1 (L)				19				
	2-2 (T)		Interbedded with clasts and gravels, 1/4 inch diameter, moist, medium dense		12				
5			Gravel layer with perched water	GW	13				
	2-3 (T)							25.0	
			Brown Sandy CLAY, very moist, fine grain, stiff	CL					
			Boring terminated at 7.5 feet						
10									
15									
20									
25									
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 5

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Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2-12-15 | BORING DIAMETER 8" | BORING NO. B-3

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown, brown Sandy CLAY and Silty SAND	CL					
5			Brown Sandy CLAY and Silty SAND	CL-SM					
10			Gravel layer	GW					
15			SAND	SW					
			Gravel	GW					
	3-1 (T)		Grey white SAND, damp to moist, fine to medium grain, very dense	SW	50/5.5'				
			Boring terminated at 18 feet						
20									
25									
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 6

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Geotechnical and Environmental Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2-12-15 | BORING DIAMETER 8" | BORING NO. B-4

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Dark brown Silty SAND, damp-moist, fine to medum grain, loose	SM					
	4-1-1 (L)		Dark brown Sandy CLAY, fine grain, moist, very stiff becomes interbedded with clasts at 3 to 4 feet	CL	25				
	4-2 (T)				27				
5	4-3 (T)		Grey Clayey SAND, interbedded with 1 inch clasts, moist, medium dense	SC	26				
10	4-4 (T)		Grey brown matrix of Sandy CLAY and SILT, moist, very stiff to hard	CL-ML	32			18.8	
15	4-5 (T)		Brown grey orange matrix of clayey SAND, SILT, and mudstone gravels 1 inch diameter, damp-moist, very dense	SC-ML	55				
			Greyish white SAND with tan mottling SAND fine to medium grain, moist, very dense	SW					
20	4-6 (T)				50/6"				
			Boring terminated at 21.5 feet						
25									
30									
35									

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BY: sr | FIGURE NO. 7

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Haro, Kasunich & Associates, Inc.
Geotechnical Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2/27/15 | BORING DIAMETER 6" | BORING NO. B-5

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0	5-1-1 (L)		Dark brown Silty SAND trace of CLAY, fine to medium grain, wet, loose	SM	11				
	5-2 (T)		Brown Clayey SAND, fine grain, moist, medium dense	SC	18				
5	5-3 (T)		Brown sandy lean CLAY, fine to medium grain, moist, very stiff	CL	27				
10	5-4 (T)		Brown Silty SAND with CLAY, moist, fine to medium grain, medium dense	SM	11				
15	5-6 (T)		Brown Silty SAND, fine to medium, grain, medium dense	SM	13				
20	5-7 (T)		Interbedded tan orange brown Silty SAND, fine to medium grain and subrounded gravels, 1 inch, damp, dense		41				
			Boring terminated at 21.5 feet						
25									
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 8

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Haro, Kasunich & Associates, Inc.
Geotechnical and Environmental Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2/27/15 | BORING DIAMETER 6" | BORING NO. B-6

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0	6-1-1 (L)		Brown Silty SAND, wet, fine to medium grain, loose	SM	14				
	6-2 (T)		Brown sandy, lean CLAY, moist, very stiff	CL	20			19.6	Atterberg Limits PI = 25 LL = 37.1%
5									
10	6-3 (T)		Brown orange Silty SAND, trace of CLAY, fine grain, moist, medium dense Harder drilling	SM	21				
15			Brown Clayey SAND with gravels, fine to medium grain, moist	SC					
20									
25	6-4 (T)		Brown orange interbedded SAND, Clayey SAND and Silty SAND fine to medium grain, moist, dense	SC	34				
			Tan SAND, fine to medium grain damp, very dense	SW					
30	6- 5(T)				50/3"				
			Boring terminated at 31.5 feet						
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 9

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Haro, Kasunich & Associates, Inc.
Geotechnical Engineers

Dunslee Way at Scotts Valley Boulevard

PROJECT NO. SC10808

LOGGED BY MC | DATE DRILLED 2/27/15 | BORING DIAMETER 6" | BORING NO. B-7

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft - lbs.	Qu - t.s.f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
0			Light brown Silty SAND, fine to medium grain, damp, FILL	SM					
			Dark brown Silty SAND, fine to medium grain, moist, loose	SM	26				
	7-1-1 (L)			SC					
	7-2 (T)		Brown orange Clayey SAND, fine to medium grain, moist-wet, medium dense	SM	37				
5			Brown orange Silty SAND, fine to medium grain, clasts, 1/4 inch, damp, dense						
			Boring terminated at 4.5 feet						
10									
15									
20									
25									
30									
35									

HARO, KASUNICH AND ASSOCIATES, INC.

BY: sr | FIGURE NO. 10

SuperLog CivilTech Software, USA www.civiltech.com File: C:\superlog4\HKALOGS\SC10808 Dunslee Way at Scotts Valley Boulevard.log Date: 3/17/2015

Appendix B

WHA Field Notes

WEBER, HAYES & ASSOCIATES
Hydrogeology and Environmental Engineering
120 Westgate Drive, Watsonville, CA 95076
831.722.3580 // www.weber-hayes.com

INDICATE ATTACHMENTS THAT APPLY
- ___ Site Map
- X Data Sheets
- ___ Geologic Logs
- ___ Photo Sheets
- ___ COC's
- ___ Chargeable Materials

Client: Green Valley Corporation		Date:	February 13, 2015
Site Location: Dunslee Way & Scotts Valley Drive, Scotts Valley, CA		Study #:	2X422
Field Tasks: [ ] Drilling [ ] Sampling [x] Other (see below): Perc Testing		Weather Conditions:	COOL, CLEAR
Personnel / Company On-Site:	Dan Kocher (Weber, Hayes & Associates; WHA)		

TIME:	
750	ARRIVE ON SITE FOR PERC TESTING
	(JERED CHANEY, WHA, ON-SITE). WATER ALREADY FILLED IN TANK.
	→ DISCUSS PLAN FOR DAY WITH JERED
8:21	BEGIN MEASUREMENTS OF DEPTH TO GROUNDWATER AT HOLE #1
	→ DRAWDOWN OVERNIGHT WAS MEASURED SO SLOW THAT NO WATER WAS ADDED TO HOLE
8:22	BEGIN MEASUREMENTS OF DEPTH TO GROUNDWATER AT HOLE #2
	→ DRAWDOWN OVERNIGHT WAS MEASURED SO SLOW THAT NO WATER WAS ADDED TO HOLE
8:59	WHILE HOLES #1 AND #2 DRAWDOWN FOR FINAL 30 MIN'S, ROUGHLY 8 GAL OF WATER IS ADDED TO HOLE #3, THEN WAITED UNTIL THERE WAS ROUGHLY 4 ft OF WATER HEIGHT IN COLUMN (ABOUT 1' ABOVE TOP OF SCREENED INTERVAL)
	→ BEGIN MEASUREMENTS
9:09	→ HOLE #3 DEWATERS, END OF FIRST TEST
9:21	TAKE FINAL MEASUREMENT AT HOLE #1, COMPLETING FIRST TEST
9:22	TAKE FINAL MEASUREMENT AT HOLE #2, COMPLETIN FIRST TEST
9:24	REPEATING STEPS DURING FIRST TEST, RUN SECOND TEST AT HOLE #3
9:38	HOLE #3 DEWATERS, COMPLETING SECOND TEST
9:47	REPEATING STEPS DURING FIRST TEST, RUN THIRD TEST AT HOLE #3
10:02	HOLE #3 DEWATERS, COMPLETING THIRD AND FINAL TEST
10:05	REPEATING STEPS DURING FIRST TEST, RUN SECOND TEST AT HOLE #2
10:07	REPEATING STEPS DURING FIRST TEST, RUN SECOND TEST AT HOLE #1
11:05	SECOND TEST AT HOLE #2 FINISHED
11:07	SECOND TEST AT HOLE #1 FINISHED
11:09	BEGIN THIRD AND FINAL TESTS AT HOLES # 2 & #1
12:09	THIRD AND FINAL TESTS AT HOLES # 2 & #1 FINISH
12:15	BEGIN CLEANUP AND DRAINING OF REMAING WATER IN TANK
12:30	LEAVE SITE

DAN 2/13/15
Signature of Field Personnel & Date

INFILTRATION HOLE # 1 Test # 1

ACTUAL INFILTRATION RATE							CALCULATED INFILTRATION RATE	
Start Time	8:21							
				multiplier				
1 Minutes	0.0	in	x	60	=		0	in/hr
2 Minutes	0.0	in	x	30	=		0	in/hr
4 Minutes	0.0	in	x	15	=		0	in/hr
5 Minutes	0.0	in	x	12	=		0	in/hr
10 Minutes	0.0	in	x	6	=		0	in/hr
15 Minutes	0.12	in	x	4	=		0.48	in/hr
30 Minutes	0.48	in	x	2	=		0.96	in/hr
60 Minutes	0.72	in	x	1	=		0.72	in/hr
Stop Time	9:21							
						Last Infiltration Rate:	0.72	in/hr

Comments: Screened Interval = 5' to 8' BTOC (all measurements in feet below top of casing (BTOC)
Initial Depth to Water: 2.18'

INFILTRATION HOLE # 1 Test # 2

ACTUAL INFILTRATION RATE							CALCULATED INFILTRATION RATE	
Start Time	10:07							
				multiplier				
1 Minutes	0.0	in	x	60	=		0	in/hr
2 Minutes	0.0	in	x	30	=		0	in/hr
4 Minutes	0.0	in	x	15	=		0	in/hr
5 Minutes	0.0	in	x	12	=		0	in/hr
10 Minutes	0.0	in	x	6	=		0	in/hr
15 Minutes	0.0	in	x	4	=		0	in/hr
30 Minutes	0.24	in	x	2	=		0.48	in/hr
60 Minutes	0.36	in	x	1	=		0.36	in/hr
Stop Time	11:07							
						Last Infiltration Rate:	0.36	in/hr

Comments: Initial Depth: 2.26'

INFILTRATION HOLE # 1 Test # 3

ACTUAL INFILTRATION RATE							CALCULATED INFILTRATION RATE	
Start Time	11:09							
				multiplier				
1 Minutes	0.0	in	x	60	=		0	in/hr
2 Minutes	0.0	in	x	30	=		0	in/hr
4 Minutes	0.0	in	x	15	=		0	in/hr
5 Minutes	0.0	in	x	12	=		0	in/hr
10 Minutes	0.0	in	x	6	=		0	in/hr
15 Minutes	0.0	in	x	4	=		0	in/hr
30 Minutes	0.12	in	x	2	=		0.24	in/hr
60 Minutes	0.24	in	x	1	=		0.24	in/hr
Stop Time	12:09							
						Last Infiltration Rate:	0.24	in/hr

Comments: Initial Depth: 2.29'

INFILTRATION HOLE # 2 Test # 1

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	8:22						
				multiplier			
1 Minutes	0.36	in	x	60	=	21.6	in/hr
2 Minutes	0.48	in	x	30	=	14.4	in/hr
4 Minutes	0.72	in	x	15	=	10.8	in/hr
5 Minutes	1.32	in	x	12	=	15.84	in/hr
10 Minutes	2.04	in	x	6	=	12.24	in/hr
15 Minutes	2.52	in	x	4	=	10.08	in/hr
30 Minutes	4.68	in	x	2	=	9.36	in/hr
60 Minutes	7.68	in	x	1	=	7.68	in/hr
Stop Time	9:22						
					Last Infiltration Rate:	7.68	in/hr

Comments: Screened Interval = 10' to 13' BTOC. All measurements in feet below top of casing (BTOC)
Initial Depth = 7.10'

INFILTRATION HOLE # 2 Test # 2

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	10:05						
				multiplier			
1 Minutes	0.12	in	x	60	=	7.2	in/hr
2 Minutes	0.36	in	x	30	=	10.8	in/hr
4 Minutes	0.48	in	x	15	=	7.2	in/hr
5 Minutes	0.60	in	x	12	=	7.2	in/hr
10 Minutes	0.96	in	x	6	=	5.76	in/hr
15 Minutes	1.32	in	x	4	=	5.28	in/hr
30 Minutes	2.4	in	x	2	=	4.8	in/hr
60 Minutes	4.32	in	x	1	=	4.32	in/hr
Stop Time	11:05						
					Last Infiltration Rate:	4.32	in/hr

Comments: Initial Depth: 7.95'

INFILTRATION HOLE # 2 Test # 3

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	11:09						
				multiplier			
1 Minutes	0.12	in	x	60	=	7.2	in/hr
2 Minutes	0.24	in	x	30	=	7.2	in/hr
4 Minutes	0.48	in	x	15	=	7.2	in/hr
5 Minutes	0.60	in	x	12	=	7.2	in/hr
10 Minutes	0.84	in	x	6	=	5.04	in/hr
15 Minutes	1.08	in	x	4	=	4.32	in/hr
30 Minutes	1.92	in	x	2	=	3.84	in/hr
60 Minutes	3.6	in	x	1	=	3.6	in/hr
Stop Time	12:09						
					Last Infiltration Rate:	3.6	in/hr

Comments: Initial Depth to water 8.32

INFILTRATION HOLE # 3 Test # 1

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	8:59						
				multiplier			
1 Minutes	5.28	in	x	60	=	316.8	in/hr
2 Minutes	11.04	in	x	30	=	331.2	in/hr
4 Minutes	17.76	in	x	15	=	266.4	in/hr
5 Minutes	20.76	in	x	12	=	249.12	in/hr
10 Minutes	DRY	in	x	6	=	–	in/hr
15 Minutes		in	x	4	=		in/hr
30 Minutes		in	x	2	=		in/hr
60 Minutes		in	x	1	=		in/hr
Stop Time	9:09						
					Last Infiltration Rate:	249.12	in/hr

Comments: Screen Interval = 15' to 18' BTOC. ALL DEPTHS WILL BE BELOW TOP OF CASING BTOC). well went dry at ~ 9 min.
Initial Depth to water = 15.44'

INFILTRATION HOLE # 3 Test # 2

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	9:24						
				multiplier			
1 Minutes	17.04	in	x	60	=	1,022.4	in/hr
2 Minutes	17.16	in	x	30	=	514.8	in/hr
3 ~~4~~ Minutes	19.68	in	x	20 ~~15~~	=	393.6	in/hr
4 ~~5~~ Minutes	23.76	in	x	15 ~~12~~	=	356.4	in/hr
5 ~~10~~ Minutes	27.6	in	x	12 ~~6~~	=	331.2	in/hr
6 ~~15~~ Minutes	30.72	in	x	10 ~~4~~	=	307.2	in/hr
8 ~~30~~ Minutes	36.48	in	x	7.5 ~~2~~	=	273.6	in/hr
10 ~~60~~ Minutes	40.68	in	x	6 ~~1~~	=	244.08	in/hr
Stop Time 9:38	12 min 45.84	in	x	5	=	229.2	in/hr
	14 min DRY				Last Infiltration Rate:	229.2	in/hr

Comments: Initial Depth to Water = 14'. well went dry at ~ 13 min

INFILTRATION HOLE # 3 Test # 3

ACTUAL INFILTRATION RATE					CALCULATED INFILTRATION RATE		
Start Time	9:47						
				multiplier			
1 Minutes	17.04	in	x	60	=	1,022.4	in/hr
2 Minutes	17.28	in	x	30	=	518.4	in/hr
3 ~~4~~ Minutes	17.52	in	x	20 ~~15~~	=	350.4	in/hr
4 ~~5~~ Minutes	17.64	in	x	15 ~~12~~	=	264.6	in/hr
5 ~~10~~ Minutes	21.12	in	x	12 ~~6~~	=	253.44	in/hr
7 ~~15~~ Minutes	27.72	in	x	8.6 ~~4~~	=	238.39	in/hr
9 ~~30~~ Minutes	34.56	in	x	6.7 ~~2~~	=	231.55	in/hr
11 ~~60~~ Minutes	37.92	in	x	5.5 ~~1~~	=	208.56	in/hr
Stop Time 10:02	13 min 41.76			4.6		192.10	in/hr
	15 min DRY			4	Last Infiltration Rate:	192.1	in/hr

Comments: Initial Depth to Water: 14'. well went dry at ~ 14 min.

Weber, Hayes & Associates
Hydrogeology and Environmental Engineering
120 Westgate Dr., Watsonville, CA 95076
PH: (831) 722-3580 FAX: (831) 722-1159
www.weber-hayes.com

INDICATE ATTACHMENTS THAT APPLY
- X Site Map
- ___ Data Sheets
- ___ Geologic Logs
- ___ Photo Sheets
- ___ COC's
- ___ Chargeable Materials

Client: **Green Valley Corporation**	Date: **February 12, 2015**
Site Location: **Dunsley Way & Scotts Valley Drive, Scotts Valley, CA**	Study #: **2X442**
Field Tasks: ☑ Drilling ☐ Sampling ☑ Other (see below): **Perc Test Hole Installations / Observations**	Weather Conditions: Sunny and Warming
Personnel / Company On-Site: **Jered Chaney (Weber, Hayes and Associates: WHA)**	

TIME:

0830 ⇒ Arrive onsite.
- Exploo Geo (Jason) onsite
- Moses (HKA) on site → leading drilling program.

0850 ⇒ Begin drilling geotech boring to 30' bgs
↳ will install test holes after.

⇒ Contact presumably w/ Santa Margarita Sand @ 14'; gravel bed above contact
↳ possibly old Carbonero creek deposits above sand.

0930 ⇒ Sand persists to base of borehole. @ 30'

1000 ⇒ Stage rig at "Test Hole 3" ⇒ Drill to 18' (8" HSA)
↳ encounter gravelly lens @ ~6' – Staturated
- Moist clayey Sand below → tag water in open hole @ 7' bgs
↳ Move test holes to Southern end of proposed parking lot
↳ See attached map.

1100 ⇒ At 18' in relocated Test Hole #3
→ Gravely Soils from ~12-15'
→ Poorly graded sand 15-18', very dense pale brown (10YR 6/3) to light yellowish brown (10YR 6/4) damp to moist, <5% fines
- Insert 2" Casing w/ 3' 0.010 slot screen at base of hole ~15-18'.
- ~2" 3/4-inch crush at base (open casing)
- 3/4" crush gravel from 14-18' bgs
- open annulus to ground surface.

1215 ⇒ Drill / install Test Hole 2 to 13' (3' screen at base)
1145 ↳ Test hole installed.
Lithology from ~10-13' ⇒ Clayey Sand, damp to moist 60-70% fine to medium Sand, ~30-40% clay, yellowish brown (10YR 5/4)

1150 ⇒ Drill / install Test hole #1 (screen 5-8' bgs)
1205 ⇒ Test hole installed

Jared Chaney 2/12/15
Signature of Field Personnel & Date

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INDICATE ATTACHMENTS THAT APPLY

- ___ Site Map
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- ___ Chargeable Materials

Client: **Green Valley Corporation**			Date: **February 12, 2015**
Site Location: **Dunsley Way & Scotts Valley Drive, Scotts Valley, CA**			Study #: **2X442**
Field Tasks: ☑ Drilling	☐ Sampling	☑ Other (see below):	Weather Conditions: Sunny & Warm
Perc Test Hole Installations / Observations			
Personnel / Company On-Site:	**Jered Chaney (Weber, Hayes and Associates: WHA)**		

TIME:

1205 Test Hole #1 lithology = Sandy Clay, damp, 75-85% Clay 15-25% Fine Sand

Pre-soak each test hole w/ ~10 gallons water
↳ = ~4' water in 8" hole.

- Preliminary falling head info as measured by water level indicator and stop watch

Test Hole #1: No drop after 5 min

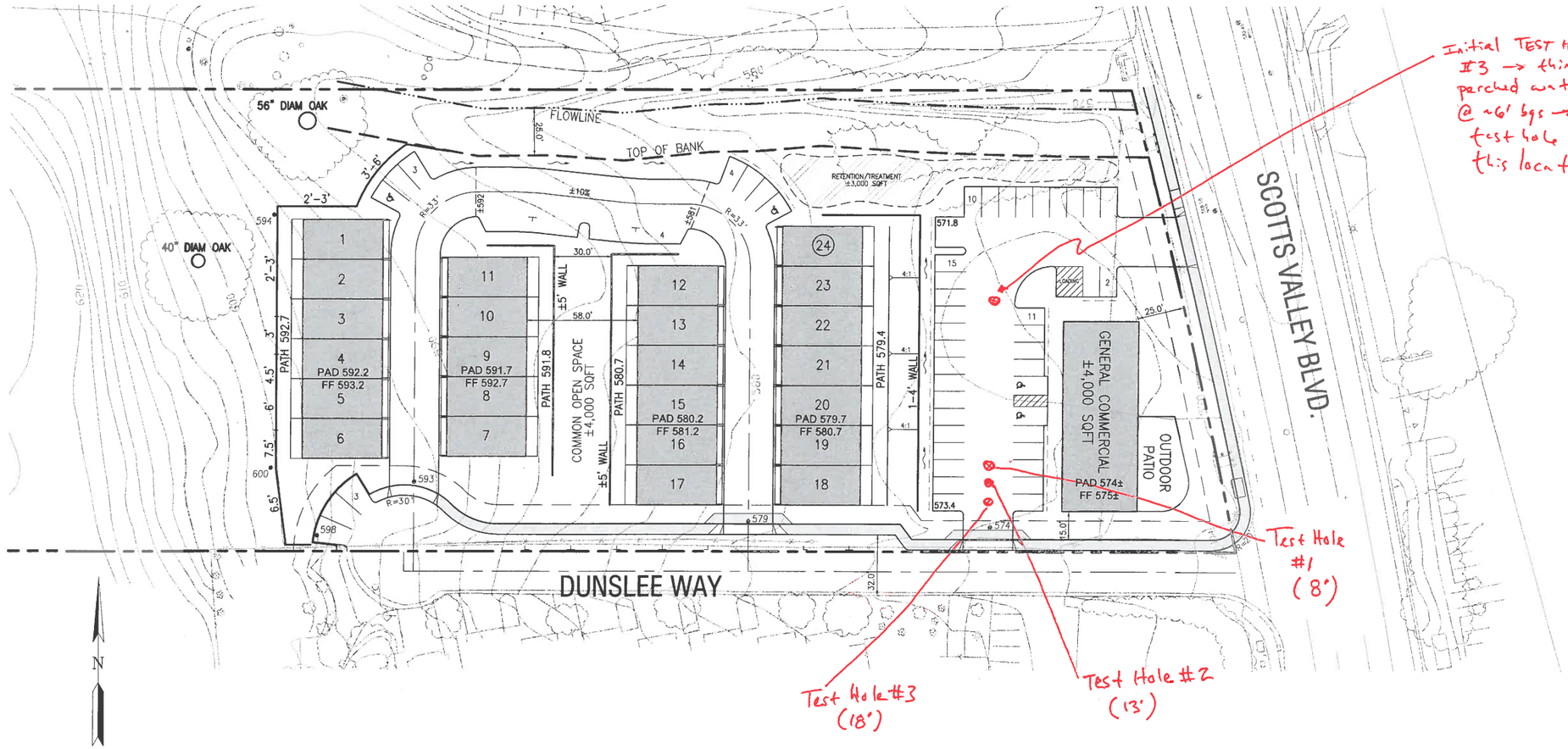
Test Hole #2: 0.002'/min

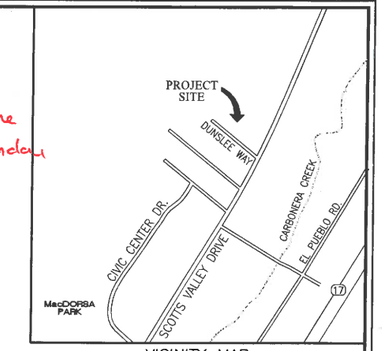
Test Hole #3: 0.7'/min

1230 ⇒ Demob.

JC 2/12/15

Dan Chaney 2/12/15
Signature of Field Personnel & Date

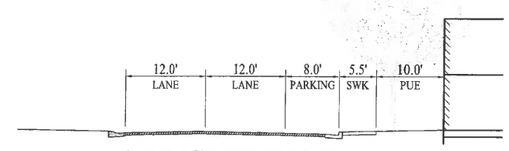




VICINITY MAP

SECTION AT COMMERCIAL/RESIDENTIAL

1"=10'



DUNSLEE WAY

NO SCALE

PROJECT INFORMATION

YIELD
- 4,000 SQFT COMMERCIAL RETAIL (RESTAURANT AND MICROBREWERY)
- 24 TOWN HOMES

COMMERCIAL PARKING PROVIDED
- 38 SPACES (9X16 W/2' OVERHANGS)

RESIDENTIAL PARKING PROVIDED
- 2 GARAGE SPACES/UNIT - 48
- 14 GUEST SPACES

RESIDENTIAL OPEN SPACE PROVIDED
- ±4,000 SQFT ACTIVE/PASSIVE OPEN SPACE, CENTRALLY LOCATED

GENERAL NOTES
1. TOPOGRAPHIC ELEMENTS DEPICTED HEREIN ARE CIRCA 2009 AND SHOULD NOT BE CONSIDERED CURRENT.
2. PROJECT BOUNDARY IS BASED ON RECORD INFORMATION AND IS SUBJECT TO FURTHER ANALYSIS
3. THIS CONCEPTUAL SITE PLAN HAS BEEN PREPARED UNDER THE ASSUMPTION THERE ARE NO GEOLOGIC AND/OR GEOTECHNICAL CONSTRAINTS. FURTHER STUDY IS NEEDED.
4. LOCATION OF THE ADJACENT SEASONAL SWALE IS BASED ON SURVEYED INFORMATION (SEPTEMBER 11, 2014).

CONCEPTUAL SITE PLAN

DUNSLEE WAY AT SCOTTS VALLEY BLVD.

SCOTTS VALLEY, CA

C.W. LAND CONSULTANTS, INC.
174 WEST CLIFF DRIVE
SANTA CRUZ, CA 95060

RJA
RUGGERI-JENSEN-AZAR
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PHONE: (408) 848-0300 FAX: (408) 848-0302

OCTOBER 24, 2014
092037-1001

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