NorCal Engineering
Soils and Geotechnical Consultants
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January 29, 2019 Project Number 12627-05

Proficiency Rubidoux LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, California 90049

Attn: Matt Englhard

RE: *SUPPLEMENTAL* **Soil Infiltration Study** - Proposed Office/Warehouse Development – Located Northwest of the Intersection of 26th Street and Avalon Street, in the City of Jurupa Valley, California

Dear Mr. Englhard:

Pursuant to your request, this firm has performed a *Supplemental* Soil Infiltration Study for the above referenced project. The information provided herein supplements that given in our previous report dated August 7, 2015. The purpose of this study is to further evaluate the feasibility of on-site drainage disposal systems on the subject property. The scope of current work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration; 3) double ring infiltration testing at three locations; 4) engineering analysis of field test data; and 5) preparation of this report.

It is proposed to install detention/infiltration basins/systems to dispose of on-site water runoff in conjunction with a new warehouse building development and associated parking. Locations and depths of supplemental tests were provided by Thienes Engineering on their map dated January 7, 2019.

Site Description

The property is located northwesterly of Avalon Street, as shown on the attached Figure 1. A railroad easement extends along the easterly property line.

The property is largely vacant with some low vegetation except for a church building and concrete parking lot at the corner of 26th Street and Avalon Street. A former mining operation is located on the northerly parcel. Drainage of the site sheetflows toward Avalon Street.

Field Exploration

The infiltration testing was completed on January 28, 2019 and consisted of using the double ring infiltrometer at four locations to determine the infiltration rate of the proposed retention/infiltration system(s). The locations of the tests are shown on the attached Figure 1. The test locations were excavated by backhoe to depths of 8.1 to 14.1 feet below existing ground surface (bgs). No significant caving occurred to the depths of these test excavations. Detailed descriptions of the subsurface soils are given on the attached test excavations logs in Appendix B. Test excavations ST-3 and ST-4 were performed at different elevations within the same test pit. This was performed because one of the test locations designated by Thienes was situated in the middle of the concrete parking lot of the church facility. Based upon findings in test pits during our previous testing and test pits placed pursuant to the completion of our *Geotechnical Engineering Investigation* report dated November 30, 2005, it is with reasonable certainty that we can conclude soil conditions are similar in our ST-3 and ST-4 test locations as 100 feet south beneath concrete pavement.

The test areas were found to be underlain by 12 inches of disturbed topsoils/fill soils overlying native soils. The soils at test locations consisted of native silty SAND with some clay and gravel to sandy SILT. These soils were noted to be medium dense/stiff to dense/stiff and damp.

Groundwater

Groundwater was not encountered in any of our recent excavations. Research of the *California Department of Water Resources website* http://www.water.ca.gov/waterdatalibrary/ showed a depth to groundwater of 80 feet or greater at a nearby monitoring well located one-half mile south of the site.

Infiltration Test Procedure and Results

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$Vir=\Delta Vir/(Air\Delta t)$

where:

Vir = inner ring incremental infiltration velocity, cm/hr

ΔVir = volume of water used during time interval to maintain constant head in the inner ring, cm^3

Air = internal area of the inner ting, cm^2

Δt = time interval, hr

The last reading obtained was used for design purposes in each of the basin. The testing data sheets are attached in Appendix B and summarized in the *Discussion of Results* section below.

Discussion of Results

The use of on-site disposal system by means of retention/infiltration basins appears to be geotechnically feasible for future development. The field infiltration rates given below may be utilized in the final basin design with a safety factor of 2.0 or greater.

Test No.	Depth (feet bgs)	Soil Type	Infiltration Rate (cm/hr)	(in/hr)
ST-1	8.1	sandy SILT	5.7	2.3
ST-2	9.9	sandy SILT w/clay	3.8	1.5
ST-3	10.7	sandy SILT w/clay	3.8	1.5
ST-4	14.1	slightly silty SAND	209	84

The use of stormwater infiltration is acceptable, provided the rates given above are used in design, without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated.

This report and all conclusions are subject to the review of the controlling authorities for the project. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This infiltration study has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. All work was performed under the supervision of the Geotechnical Engineer. No other warranty, expressed or implied is made. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D Tucker

KEITH D. TUCKER
No. 841
Exp. 12/31/2020

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager

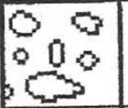
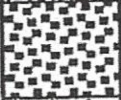
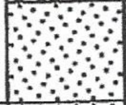
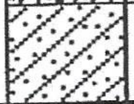
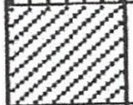
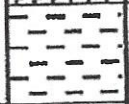
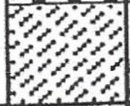
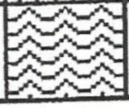
List of Appendices
(in order of appearance)

Appendix A

Logs of Test Pits ST-1 to ST-4

Field Test Data and Calculations

Appendix A

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT 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 GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

■	Indicates 2.5-inch Inside Diameter. Ring Sample.
☒	Indicates 2-inch OD Split Spoon Sample (SPT).
⧅	Indicates Shelby Tube Sample.
◫	Indicates No Recovery.
◧	Indicates SPT with 140# Hammer 30 in. Drop.
🖂	Indicates Bulk Sample.
◩	Indicates Small Bag Sample.
◨	Indicates Non-Standard
⧗	Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

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Log of Trench ST-1

Boring Location: 26th and Avalon, Jurupa Valley	
Date of Drilling: 1/28/19	**Groundwater Depth: None Encountered**
Drilling Method: Backhoe	
Hammer Weight:	**Drop:**
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology		Material Description	Samples Type	Samples Blow Counts	Laboratory Moisture	Laboratory Dry Density	Laboratory Fines Content %
0		GWT not encountered	FILL SOILS Sandy SILT to Silty SAND with occasional gravel and rootlets Brown, soft, moist					
			NATURAL SOILS Sandy SILT Brown, medium stiff, damp; with some clay 2 to 4 feet					
5								
			Boring completed at depth of 8'	☒		3.7		
10								
15								
20								
25								
30								
35								

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Log of Trench ST-2

Boring Location: 26th and Avalon, Jurupa Valley

Date of Drilling: 1/28/19

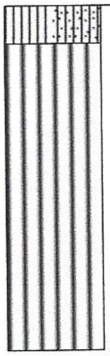
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lith- ology		Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		GWT not encountered	FILL SOILS Sandy SILT to Silty SAND with occasional gravel and rootlets Brown, soft, moist					
			NATURAL SOILS Sandy SILT with clay Brown, medium stiff, damp					
5								
			Boring completed at depth of 9'	☒		5.5		
10								
15								
20								
25								
30								
35								

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Log of Trench ST-3

Boring Location: 26th and Avalon, Jurupa Valley
Date of Drilling: 1/28/19
Groundwater Depth: None Encountered
Drilling Method: Backhoe
Hammer Weight:
Drop:
Surface Elevation: Not Measured

GWT not encountered

Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Sandy SILT to Silty SAND with occasional gravel and rootlets Brown, soft, moist					
		NATURAL SOILS Sandy SILT Brown, medium stiff, damp to moist					
5							
10		Boring completed at depth of 10'	☒		8.8		
15							
20							
25							
30							
35							

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Log of Trench ST-4

Boring Location: 26th and Avalon, Jurupa Valley

Date of Drilling: 1/28/19

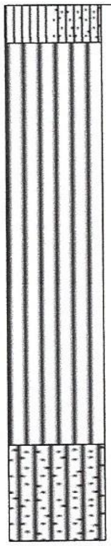
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lith-ology		Material Description	Samples Type	Samples Blow Counts	Laboratory Moisture	Laboratory Dry Density	Laboratory Fines Content %
0		GWT not encountered	FILL SOILS Sandy SILT to Silty SAND with occasional gravel and rootlets Brown, soft, moist					
			NATURAL SOILS Sandy SILT Brown, medium stiff, moist Increase in density with depth					
5								
10								
			Slightly silty SAND Brown, medium dense, damp					
			Boring completed at depth of 14'	☒		2.0		
15								
20								
25								
30								
35								

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1262705-2.log Date: 2/4/2019

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Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-1
Depth: 8'
Tested By: J.S.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
8:48			68.2			36.9					
8:58	10	10	70.4	2.2		39.5	2.6				
8:58			68.8			35.9					
9:08	10	20	70.2	1.4		37.8	1.9				
9:08			68.7			36.1					
9:18	10	30	70.0	1.3		38.0	1.9				
9:18			68.4			36.8					
9:28	10	40	69.5	1.1		38.6	1.8				
9:28			68.3			37.0					
9:38	10	50	69.5	1.2		38.6	1.6				
9:38			68.4			37.4					
9:48	10	60	69.3	0.9		38.9	1.5		5.4	9.0	
9:48			68.2			37.2					
9:58	10	70	69.3	1.1		38.8	1.6		6.6	9.6	
9:58			69.1			37.6					
10:08	10	80	70.0	0.9		39.0	1.4		5.4	8.4	
10:08			69.0			37.7					
10:18	10	90	69.9	0.9		39.0	1.3		5.4	7.8	
10:18			68.6			37.3					
10:28	10	100	69.6	1.0		38.7	1.4		6.0	8.4	
10:28			68.6			37.1					
10:38	10	110	69.5	0.9		38.5	1.4		5.4	8.4	
10:38			68.4			37.4					
10:48	10	120	69.3	0.9		38.8	1.4		5.4	8.4	

Average = 5.7 / 8.6 cm/hr

Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-2
Depth: 9'
Tested By: J.S.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
9:02			98.7			39.5					
9:12	10	10	99.5	0.8		40.5	1.0				
9:12			99.5			40.5					
9:22	10	20	100.4	0.9		41.5	1.0				
9:22			100.4			41.5					
9:32	10	30	100.9	0.5		42.3	0.8				
9:32			100.9			42.3					
9:42	10	40	101.5	0.6		43.0	0.7				
9:42			101.5			43.0					
9:52	10	50	102.2	0.7		44.0	1.0				
9:52			102.2			44.0					
10:02	10	60	102.9	0.7		44.9	0.9		4.2	5.4	
10:02			102.9			44.9					
10:12	10	70	103.6	0.7		45.7	0.8		4.2	4.8	
10:12			103.6			45.7					
10:22	10	80	104.3	0.7		46.1	0.4		4.2	2.4	
10:22			104.3			46.1					
10:32	10	90	104.9	0.6		47.5	0.4		3.6	2.4	
10:32			102.1			43.0					
10:42	10	100	102.5	0.4		43.8	0.8		2.4	4.8	
10:42			102.5			43.8					
10:52	10	110	103.2	0.7		44.7	0.9		4.2	5.4	
10:52			103.2			44.7					
11:02	10	120	103.8	0.6		45.5	0.7		3.6	4.2	

Average = 3.8 / 4.2 cm/hr

Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-3
Depth: 10'
Tested By: J.S.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
11:15			71.0			39.9					
11:25	10	10	71.8	0.8		40.3	0.4				
11:25			71.8			40.3					
11:35	10	20	72.6	0.8		41.1	0.8				
11:35			72.6			41.1					
11:45	10	30	73.4	0.8		41.8	0.7				
11:45			73.4			41.8					
11:55	10	40	74.1	0.7		42.3	0.5				
11:55			74.1			42.3					
12:05	10	50	74.8	0.7		42.8	0.5				
12:05			74.8			42.8					
12:15	10	60	75.5	0.7		43.4	0.6		4.2	3.6	
12:15			75.5			43.4					
12:25	10	70	76.2	0.7		44.0	0.6		4.2	3.6	
12:25			76.2			44.0					
12:35	10	80	76.9	0.7		44.5	0.5		4.2	3.0	
12:35			76.9			44.5					
12:45	10	90	77.5	0.6		45.0	0.5		3.6	3.0	
12:45			77.5			45.0					
12:55	10	100	78.0	0.5		45.6	0.6		3.0	3.6	
12:55			78.0			45.6					
1:05	10	110	78.7	0.7		46.1	0.7		4.2	4.2	
1:05			78.7			46.1					
1:15	10	120	79.2	0.5		46.6	0.5		3.0	3.0	

Average = 3.8 / 3.4 cm/hr

Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-4
Depth: 14’
Tested By: J.S.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
11:37			98.5			39.2					
11:39	2	2	106.3	7.8		47.2	8.0				
11:39			99.4			38.4					
11:41	2	4	106.5	7.1		46.4	8.0				
11:41			98.6			37.6					
11:43	2	6	106.1	7.5		46.0	8.4				
11:43			97.5			37.7					
11:45	2	8	105.0	7.5		45.3	7.6				
11:45			99.0			37.4					
11:47	2	10	106.2	7.2		45.5	8.1				
11:47			97.9			37.8					
11:49	2	12	104.6	6.7		44.8	7.0		201	210	
11:49			98.2			37.6					
11:51	2	14	105.3	7.1		45.2	7.6		213	228	
11:51			97.8			37.7					
11:53	2	16	104.5	6.7		45.1	7.4		201	222	
11:53			99.0			37.9					
11:55	2	18	105.8	6.8		45.3	7.4		204	222	
11:55			99.0			38.9					
11:57	2	20	106.3	7.2		46.2	7.3		216	219	
11:57			99.1			39.2					
11:59	2	22	106.2	7.1		46.3	7.1		213	213	
11:59			99.6			38.8					
12:01	2	24	106.7	7.1		45.9	7.1		213	213	

Average = 209 / 218 cm/hr