November 28, 2016

RSCCD Facility Planning, District
Construction and Support Services
2323 N. Broadway, Suite 112, Santa Ana, CA 92706

Attn: Ms. Allison Coburn
Facilities Project Manager
P: (714) 480-7530
E: Coburn_allison@rsccd.edu

Re: Addendum to Geotechnical Engineering Report
Proposed Science Center - Santa Ana College
1530 West 17th Street
Santa Ana, California
Terracon Project No. 60145101

Dear Ms. Coburn,

Terracon Consultants, Inc. (Terracon) has completed the percolation testing services for the above referenced project. These services were performed in general accordance with our Supplemental Agreement for Services dated November 3, 2016. Terracon previously prepared a Geotechnical Report for this project on August 24, 2016. This percolation test report presents the results of the subsurface exploration and provides additional geotechnical recommendations concerning earthwork and the design and construction of an infiltration system for the proposed project.

Three (3) percolation tests were conducted at the site on November 14, 2016. The general test locations are shown in Exhibit A-1 and were requested by the design team. Soil samples were collected to determine visual soil classification. Logs of the percolation borings are shown in the attached Exhibits A-2 through A-4.

Typical Subsurface Profile

Specific conditions encountered at the boring locations are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil type in-situ, the transition between materials may be gradual. Details for the borings can be found on the boring logs attached to this report. General Notes along with the Unified Soil Classification System are provided in Exhibits A-5 and A-6. The surface materials encountered at the test locations generally consisted of 3 to 4 inch thick layer of asphalt concrete overlying a base layer with an approximate thickness of 3 to 4 inches. An asphalt binding fabric material, such as Petromat, was noted at location P-1. The subsurface materials generally consist sand with variable amounts of silt and clay.

Groundwater was not encountered in the test borings at the time of drilling. Based on previous explorations performed on-site, groundwater was encountered approximately 24 feet below the ground surface.

Percolation Test Results

Three (3) in-situ percolation tests (using falling head borehole permeability) were performed to an approximate depth of 5 feet and 10 feet below the ground surface (bgs). A 2-inch thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring and gravel was used to backfill between the perforated pipes and the boring sidewall to the top depth of the zone of percolation. The borings were then filled with water for a pre-soak period. At the beginning of each test, the pipes were refilled with water and readings were taken at a standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS				
Test Location (percolation test depth range)	**Soil Classification**	**Percolation Rate, in./hr.**	**Infiltration Rate*, in/hr.**	**Average Water Head, in**
P-1 (0 - 5 ft.)	Silty Clayey Sand	144	4.8	44
P-2 (5 - 10 ft.)	Silty Sand	205	7.9	38
P-3 (3 - 7 ft.)	Clayey Sand	132	5.7	33

*If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The correlated infiltration rates were calculated using the Porchet method.

Based on our test results, the correlated infiltration rates were found be greater than 0.3 in/hr. Therefore infiltration onsite appears to be feasible from a geotechnical standpoint.

The field test results are not intended to be design rates. They represent the result of our tests, at the depths and locations indicated, as described above. The design rate should be determined by the designer by applying an appropriate factor of safety. With time, the bottoms of infiltration systems tend to plug with organics, sediments, and other debris. Long term maintenance will likely be required to remove these deleterious materials to help reduce decreases in actual percolation rates.

The percolation test was performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 10 feet from any existing or proposed foundation system.

If you have any inquiries or comments on this report, please do not hesitate to contact the undersigned at (949) 261-0051.

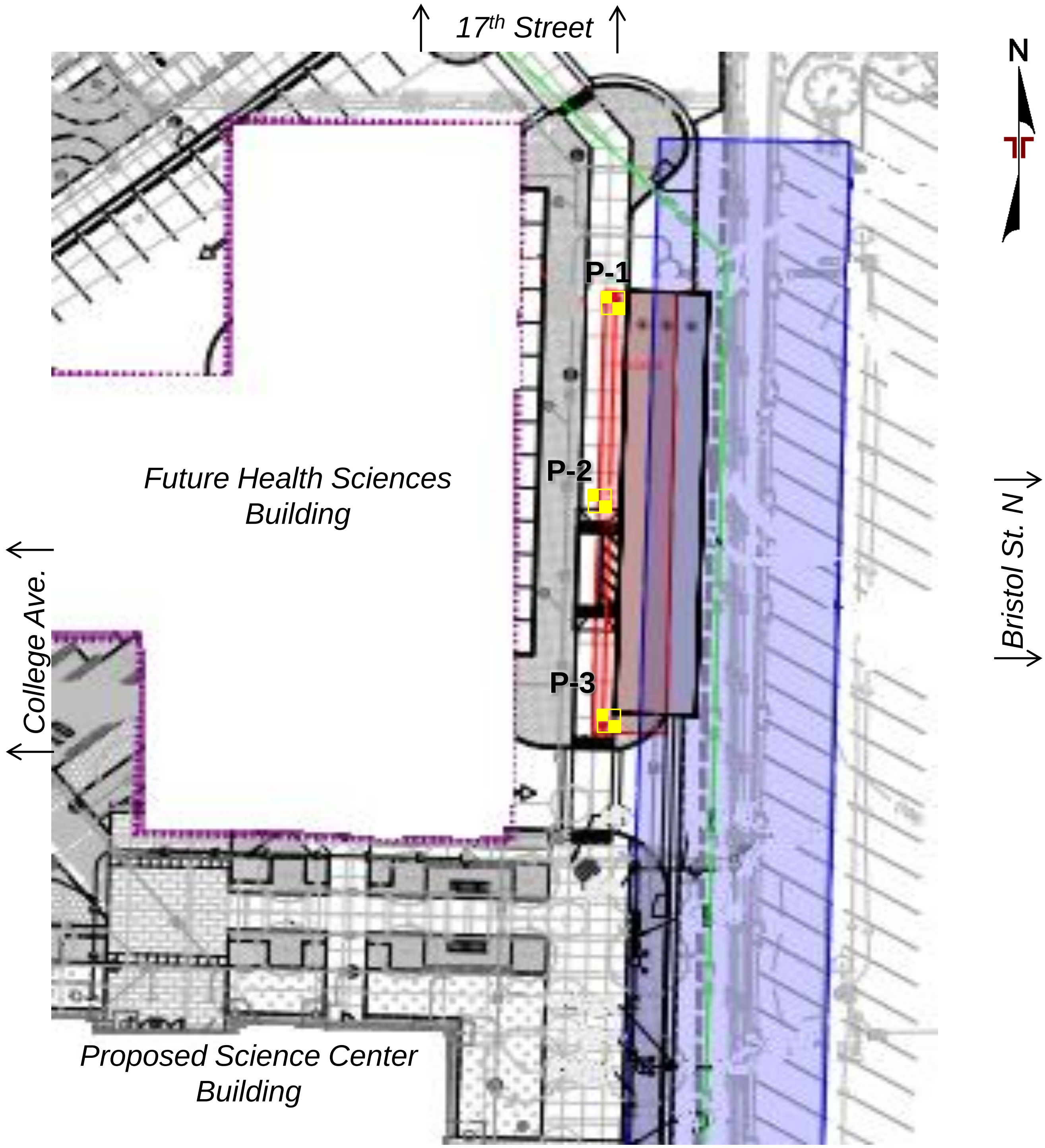
Sincerely,
Terracon Consultants, Inc.

REGISTERED PROFESSIONAL ENGINEER
JOSHUA R. MORGAN
C 86032
CIVIL
STATE OF CALIFORNIA

Josh R. Morgan, P.E.
Senior Staff Engineer

F. Fred Buhamdan, P.E.
Department Manager

Attachments: Exhibit A-1: Percolation Test Location Plan
Exhibits A-2 through A-4: Boring Logs
Exhibit A-5: General Notes
Exhibit A-6: Unified Soil Classification System



LEGEND

P-1 BORING AND PERCOLATION TEST APPROXIMATE LOCATION

PERFORMED ON NOV 14, 2016

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: JM	Project No. 60145101	Terracon Consulting Engineers & Scientists 1421 Edinger Avenue, Tustin, California 92614 PH. (949) 261-0051 FAX. (949) 261-6110	BORING/PERCOLATION TEST LOCATION PLAN
Drawn by: GA	Scale: 1" ~ 40'		**Proposed Science Center** 1530 West 17th street Santa Ana, CA
Checked by: JM	File Name: A-1		
Approved by: FH	Date: 11/28/2016		

Exhibit

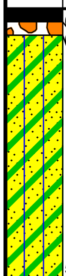
A-1

BORING LOG NO. P-1

PROJECT: Proposed Science Center

CLIENT: RSCCD Facility Planning, District Santa Ana, CA

SITE: 1530 West 17th Street Santa Ana, California

GRAPHIC LOG	LOCATION See Exhibit A-2 DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.3 **ASPHALT CONCRETE**, 3" Thickness, petromat encountered											
	0.5 **AGGREGATE BASE COURSE**, 3" Thickness											
	SILTY CLAYEY SAND (SC-SM), brown to reddish-brown											
	5.0	5										
	Boring Terminated at 5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic SPT Hammer

Advancement Method:
Hand Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix A-5 and A-6 for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave
Tustin, CA

Boring Started: 11/11/2016	Boring Completed: 11/11/2016
Drill Rig: Hand Auger	Driller: Cal Pac
Project No.: 60145101	Exhibit: A-2

BORING LOG NO. P-2

PROJECT: Proposed Science Center

CLIENT: RSCCD Facility Planning, District Santa Ana, CA

SITE: 1530 West 17th Street Santa Ana, California

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.3	**ASPHALT CONCRETE**, 4" Thickness											
	0.6	**AGGREGATE BASE COURSE**, 3" Thickness											
	5.0	**SILTY CLAYEY SAND (SC-SM)**, brown to reddish-brown	5										
	10.0	**SILTY SAND (SM)**, tan	10										
		Boring Terminated at 10 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic SPT Hammer

Advancement Method:
Hand Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix A-5 and A-6 for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave
Tustin, CA

Boring Started: 11/11/2016	Boring Completed: 11/11/2016
Drill Rig: Hand Auger	Driller: Cal Pac
Project No.: 60145101	Exhibit: A-3

BORING LOG NO. P-3

PROJECT: Proposed Science Center

CLIENT: RSCCD Facility Planning, District Santa Ana, CA

SITE: 1530 West 17th Street Santa Ana, California

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.3	**ASPHALT CONCRETE**, 4" Thickness											
	0.7	**AGGREGATE BASE COURSE**, 4" Thickness											
	7.0	**CLAYEY SAND (SC)**, dark brown	5										
		Boring Terminated at 7 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic SPT Hammer

Advancement Method:
Hand Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix A-5 and A-6 for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave
Tustin, CA

Boring Started: 11/11/2016	Boring Completed: 11/11/2016
Drill Rig: Hand Auger	Driller: Cal Pac
Project No.: 60145101	Exhibit: A-4

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

- Auger
- Shelby Tube
- Split Spoon
- Rock Core
- Macro Core
- Modified California Ring Sampler
- Grab Sample
- No Recovery
- Modified Dames & Moore Ring Sampler

WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
N	**N value**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**
(WOH)	Weight of Hammer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		Organic:	(Liquid limit - oven dried) / (Liquid limit - not dried) < 0.75	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic Silt [K,L,M]
		Organic:	(Liquid limit - oven dried) / (Liquid limit - not dried) < 0.75	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI $\geq$ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.