South Shore Testing & Environmental

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February 8, 2018

Mr. Steve Galvez
Tierra Nova Consulting, Inc.
31938 Temecula Parkway, Ste A369
Temecula, California 9259

SUBJECT: **ONSITE STORMWATER INFILTRATION SYSTEM INVESTIGATION**
Proposed Multi-Family Residential Development - MHS-98, LLC
APN Nos.: 913-210-005 to -007, -010 to -013, & -033 to -035
Northeast of Rising Hill Drive and Bahama Way
City of Murrieta, Riverside County, California
Work Order No. 3721801.01

Dear Mr. Galvez:

In accordance with your authorization, we have conducted percolation testing for the infiltration system proposed for the proposed multi-family residential development. The purpose of our investigation was to provide infiltration rates for the proposed infiltration system.

Site Description

The proposed systems will be located on the westerly and easterly portions of the subject site (refer to **Plate 1**). The subject site is located north-northwest of Rising Hill Drive in the City of Murrieta, Riverside County, California.

At the time of our investigation, vegetation on the subject site consists of moderate low growth of chaparral type vegetation and a sparse dry growth of annual weeds and grasses. Man-made development at the subject site is generally limited to numerous undocumented soil stockpiles, several dirt access roads, and partial fencing along southeast portion of the site. Topographically, the subject site consists of low rolling terrain with natural gradients of approximately 8 to 20 percent to the north-northeast. Drainage is accomplished by sheetflow to the north-northeast toward Date Street. Overall relief on the subject site, in the vicinity of proposed development is approximately 50-ft, from above mean sea elevations 1,122 to 1,172.

Percolation Investigation

Percolation testing was conducted on January 3, 2018. Two tests were performed within the existing native soils in the area of the proposed systems as determined by the project civil engineer (please refer to **Plate 1**). Two separate exploratory trenches were excavated and two percolation tests were performed at depths corresponding to the depth of the proposed infiltration system. Soils were both visually classified according to the Unified Soil Classification System and by sieve analysis (South Shore, 2018) as a fine silty Sand (Unified Soil Classification - SM). That can be described as orange brown, fine to medium grained, minor coarse, moderately sorted, dry, and medium dense to dense.

A CAT No. 430 rubber-tired backhoe equipped with an 18-inch bucket was used to excavate the exploratory trenches. Our field personnel logged the exploratory trenches and copies of our Exploratory Trench Logs are presented in **Appendix B**.

GROUNDWATER

Groundwater was not encountered within our exploratory trenches, which were advanced to a maximum depth of 6.0-ft bgs on the lower elevations of the subject site. The subject site is located at the northerly end of the Santa Gertrudis Groundwater Unit (Rancho Water, 1984). Historic high groundwater in the vicinity of the subject site is anticipated to be at least 50-ft below the ground surface in the vicinity of the subject site (Rancho Water, 1984). Minor fluctuations can and will likely occur in moisture or free water content of the soil owing to rainfall and irrigation over time

SUMMARY OF TEST PROCEDURES

The testing procedure was performed in accordance with Riverside County Department of Environmental Health's "Local Management Program for Onsite Wastewater Treatment Systems", which became effective October 5, 2016 and the resulting perc rates were converted to infiltration rates utilizing the Porchet Method as outlined in the Riverside County Flood Control and Water Conservation District, "Design Handbook for Low Impact Development Best Management Practices" dated September 2011. The percolation tests were performed at depths within the underlying soils corresponding to the proposed system.

Conclusion

Testing indicated infiltration rates at test elevations of 1136 (I-1) and 1140 (I-2) within the native soils obtained fairly consistent infiltration rates of 2.5 and 3.2 minutes-per-inch. The percolation rate was converted to infiltration rate utilizing the Porchet Method. The slowest of the converted infiltration rates was Test No 1 at 2.5 minutes/inch. The rate provided does not include a safety factor. The test locations are presented on our Infiltration Test Location Map, **Plate 1**.

DELHAVEN AVENUE

DATE STREET

WINCHESTER ROAD

RISING HILL DRIVE

BAHAMA WAY

PRIMARY ACCESS

SECONDARY ACCESS

TEST AT ELEVATION 1140

I-2

TEST AT ELEVATION 1136

I-1

GROSS AREA = 8.37 ACRES
PAD AREA = 5.92 ACRES

50 RIDGE LINE

SOUTH SHORE TESTING & ENVIRONMENTAL

INFILTRATION TEST LOCATION MAP
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
APN #'S 913-210-005 to -007, -010 to -013, & -033 to -035
NORTHEAST OF RISING HILL DRIVE AND BAHAMA WAY
CITY OF MURRIETA, RIVERSIDE COUNTY, CALIFORNIA

WORK ORDER: 3721801.01 DATE: FEB. 2018 PLATE: 1 OF 1

I-2 - APPROXIMATE LOCATION OF INFILTRATION TESTS

GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

DEVELOPER:

EXHIBIT PREPARER:

VSL ENGINEERING
951-296-3930
31805 TEMECULA PARKWAY, #129
TEMECULA, CA 92592

DATE	INITIAL	ENGINEER OF WORK	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL	CITY APPROVAL

SHEET 1 | CITY OF MURRIETA ENGINEERING DEPARTMENT | OF SHEET 1

MASS GRADING PLAN FOR
PLOT PLAN NO.

APPROVED
ROBERT K. MOEHLING, CITY ENGINEER, CITY OF MURRIETA _____ DATE _____
RCE 63056 EXP. DATE 6/30/16

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

PROJECT NO. 99-063

DRAWING NO.

PERCOLATION TEST NO.	TEST ELEVATION (above mean sea level)	PERCOLATION RATE (Min/Inch	INFILTRATION RATE (In/Hr)
1	1136	2.30	6.4*
2	1140	2.12	7.0

*Slowest rate

CLOSURE

It should be noted that infiltration rates determined by testing are ultimate rates based on short-duration field test results utilizing clear water. Infiltration rates can be affected by silt build-up, debris, degree of soil saturation, and other factors. An appropriate safety factor should be applied prior to use in design to account for subsoil inconsistencies, possible compaction related to site grading, and potential silting of the percolating soils. The safety factor should also be determined with consideration to other factors in the system design, particularly storm water volume estimates and the safety factors associated with those design components.

LIMITATIONS

The tested rates are representative for the areas and soil types tested. Should the systems be moved or the exposed soil types are found to different within the proposed systems, the approved infiltration rates may not apply. Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers and Geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The report is issued with the understanding that it is used only by the owner and it is the sole responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the architect, engineer, and appropriate jurisdictional agency for the project and incorporated into the plans; and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations contained herein during construction and in the field.

The samples taken and used for testing and the observations made are believed representative; however, soil and geologic conditions can vary significantly between test locations. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by **South Shore Testing & Environmental**, or its assigns.

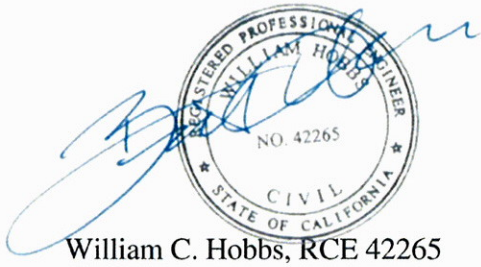
The findings of this report are valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified. The firm that performed the geotechnical investigation for this project should be retained to provide testing observation services during construction to maintain continuity of geotechnical interpretation and to check that the recommendations presented herein are implemented during construction of improvements.

If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. Selection of another firm to perform any of the recommended activities or failure to retain the undersigned to perform the recommended activities wholly absolves **South Shore Testing & Environmental**, the undersigned, and its assigns from any and all liability arising directly or indirectly from any aspects of this project.

We appreciate the opportunity to be of service. Limitations and conditions contained in reference documents are considered in full force and applicable. If you have any questions, please do not hesitate to call our office.

Respectfully Submitted,

South Shore Testing & Environmental



John P. Frey
Project Manager

William C. Hobbs, RCE 42265
Civil Engineer

ATTACHMENTS
Plate 1 – Infiltration Test Location Map
Appendix A –References
Appendix B – Exploratory Trench Logs

APPENDIX A

References

REFERENCES

CDM Smith, Inc. 2013, "Technical Guidance Document For Water Quality Management Plans" dated June 7, 2013.

Department of Water Resources Website, 2018, "Groundwater Data Section".

Department of Water Resources, August 1971, "Water Wells and Springs in the Western Part of the Upper Santa Margarita River Watershed, Riverside and San Diego Counties, California", Bulletin No. 91-20.

Kennedy, M.P. and Morton, D.M., 2003, "Preliminary Geologic Map of the Murrieta 7.5' Quadrangle, Riverside County, California", U.S.G.S. Open-File Report 03-189, Scale: 1" = 2,000'.

Rancho California Water District, March 1984, "Water Resources Master Plan".

Riverside County Department of Environmental Health, 2016, "Local Management Program for Onsite Wastewater Treatment Systems", effective October 5, 2016.

Riverside County Flood Control and Water Conservation District, 2011, "Design Handbook for Low Impact Development Best Management Practices" dated 9, 2011.

South Shore Testing and Environmental, 2018, "Preliminary Geotechnical Investigation, Proposed Multi-Family Residential Development - MHS-98, LLC, APN Nos.: 913-210-005 to -007, -010 to -013, & -033 to -035, Northeast of Rising Hill Drive and Bahama Way, City of Murrieta, Riverside County, California", Work Order No. 3721801.00, Dated February 8, 2018.

VSL Engineering, 2017, "Mass Grading Plan", Sheet 1 of 1, Scale: 1 = 40-ft, Project No. 99-063.

APPENDIX B

Exploratory Trench Logs

LOGGED BY: JPF	METHOD OF EXCAVATION:CAT # 430 BACKHOE EQUIPPED W/ 18" BUCKET ELEVATION: + 1140	DATE OBSERVED: 1/3/18 LOCATION: SEE PLOT PLAN

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO.__1__ DESCRIPTION	SOIL TEST
				V			**PAUBA FORMATION**	
				I			SILTY SAND (SM): DARK YELLOW BROWN, FINE TO MEDIUM GRAINED, NUMEROUS PINPOINT PORES TOP 2-FT	
				I			SILTY SAND (SM): YELLOW BROWN, FINE TO CORSE GRAINED, TRACE GRAVEL,	
5				A			MODERATELYGRADED, DRY, DENSE	INFILTRATION TEST
							TOTAL DEPTH 5.0'	
							NO GROUNDWATER	
							NO CAVING	
10								
15								
20								
25								
30								
35								
40								

JOB NO: 3721801.01	LOG OF TEST PIT	FIGURE: T-1

LOGGED BY: JPF	METHOD OF EXCAVATION:CAT # 430 BACKHOE EQUIPPED W/ 18" BUCKET ELEVATION: ± 1146	DATE OBSERVED: 1/3/18 LOCATION: SEE PLOT PLAN

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO.__2__ DESCRIPTION	SOIL TEST
5							**PAUBA FORMATION** SILTY SAND (SM):MEDIUM GRAY, FINE TO COARSE GRAINED, MODERATELY GRADED, DRY, WEAKLY CEMENTED, MEDIUM DENSE, MINOR POROSITY	INFILTRATION TEST
10							**TOTAL DEPTH 6.0'**	
15								
20								
25								
30								
35								
40								

JOB NO: 3721801.01	LOG OF TEST PIT	FIGURE: T-2