



# Earth Systems

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November 18, 2022

File No.: 304247-002

Mr. Loch Dreizler, General Manager  
Santa Ynez Community Services District  
1070 Faraday Street  
Mail: PO Box 667  
Santa Ynez, California 93460-0667

**PROJECT:** SANTA YNEZ COMMUNITY SERVICES DISTRICT  
WEST SEWER SYSTEM EXPANSION PHASE 1  
HORIZON DRIVE EASEMENT  
SANTA YNEZ AREA OF SANTA BARBARA COUNTY, CALIFORNIA

**SUBJECT:** Summary Report of Soil Moisture/Density and Relative Compaction  
Profile of the Sewer Trench Backfill

**REF:** Revised Proposal for a Soil Moisture / Density Profile and Relative Compaction of the Sewer Trench Backfill, Santa Ynez Community Services District West Sewer System Expansion Phase 1, Horizon Drive Easement, Santa Ynez Area of Santa Barbara County, California, by Earth Systems Pacific, dated October 14, 2022, Doc. No. 2210-014.REVPRP

Dear Mr. Dreizler:

In accordance with your authorization of the above-referenced proposal, this report presents a summary report of the test results providing a soil moisture/density and relative compaction profile of the sewer trench backfill along a portion of the Santa Ynez Community Services District (SYCSD) West Sewer System Expansion Phase 1 Horizon Drive Easement project. The portion of the sewer trench backfill covered by this report is along the western side of the Sanja Cota Motor Lodge property located at 3099 East Highway 246 in the Santa Ynez area of Santa Barbara County, California. It also includes a portion of the easement as it extends through a residential property to the north of the Sanja Cota Motor Lodge property. This part of the sewer alignment is referred to herein as "the site."



### **Field Investigation and Laboratory Analyses**

On November 7, 2022, five borings were drilled at the site to an approximate depth of 8.5 feet below the existing ground surface (bgs). The borings were drilled with a Simco EP200 truck-mounted drill rig equipped with 4-inch diameter solid stem auger and an automatic trip hammer for sampling. The approximate location of the borings are shown on the Exploration Location Map presented in Appendix A.

Soils encountered in the boring were categorized and logged in general accordance with the Unified Soil Classification System and ASTM D2488-17. Copies of the boring logs are presented in Appendix A along with a Boring Log Legend. In reviewing the boring logs and legend, the reader should recognize that the legend is intended as a guideline only, and there are a number of conditions that may influence the soil characteristics as observed during excavation. These include, but are not limited to, the presence of cobbles or boulders, cementation, variations in soil moisture, presence of groundwater, and other factors. Consequently, the logger must exercise judgment in interpreting the subsurface characteristics possibly resulting in soil descriptions that vary somewhat from the legend. The reader should also consider the sampler type used when reviewing the blow counts.

As the boring was drilled, soil samples were obtained using a 3-inch outside diameter ring-lined barrel sampler (ASTM D3550-17 with shoe similar to D2937-17). Bulk soil samples were obtained from the auger cuttings.

Ring samples were tested for unit weight and moisture (ASTM D2937-17 as modified for ring liners). As the bulk samples were relatively small and similar, they were combined and tested for maximum density and optimum moisture content [ASTM D1557-12 (2021)]. The laboratory test results are presented in Appendix B.



### Conclusions

The summary test results are presented in the following Table.

Boring Number	Depth (feet)	Dry Density (pcf)	Maximum Dry Density (pcf)	Relative Compaction (%)
1	2.0 – 2.5	100.7	116.0	87
1	4.0 – 4.5	100.6	116.0	87
1	6.0 – 6.5	103.1	116.0	89
1	8.0 – 8.5	112.2	116.0	97
2	2.0 – 2.5	99.6	116.0	86
2	4.0 – 4.5	92.6	116.0	80
2	6.0 – 6.5	94.4	116.0	81
2	8.0 – 8.5	98.1	116.0	85
3	2.0 – 2.5	94.8	116.0	82
3	4.0 – 4.5	97.8	116.0	84
3	6.0 – 6.5	93.5	116.0	81
3	8.0 – 8.5	88.7	116.0	76
4	2.0 – 2.5	102.2	116.0	88
4	4.0 – 4.5	90.8	116.0	78
4	6.0 – 6.5	103.2	116.0	89
4	8.0 – 8.5	100.6	116.0	87
5	2.0 – 2.5	88.5	116.0	76
5	4.0 – 4.5	95.0	116.0	82
5	6.0 – 6.5	94.3	116.0	81
5	8.0 – 8.5	96.4	116.0	83



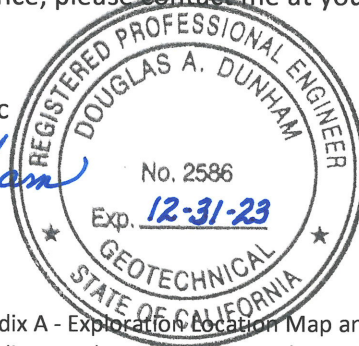
Santa Ynez Community Services District West Sewer  
System Expansion Phase 1 – Horizon Drive Easement  
Santa Ynez Area of Santa Barbara County, California

November 18, 2022

If there are any questions concerning the information presented within this report, or if we can be of further assistance, please contact me at your convenience.

Sincerely,  
Earth Systems Pacific

*Doug Dunham*  
Doug Dunham, GE  
Associate Engineer



Attachments: Appendix A - Exploration Location Map and Boring Logs  
Appendix B – Laboratory Test Results

Doc. No.: 2211-032.RPT/In



## **APPENDIX A**

Exploration Location Map

Boring Logs





LOGGED BY: L. Johnson  
 DRILL RIG: Simco EP-200 with Automatic Hammer  
 AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1  
 JOB NO.: 304247-002  
 DATE: 11/7/2022

DEPTH (feet)	USCS CLASS	SYMBOL	SANTA YNEZ COMMUNITY SERVICES DISTRICT HORIZON DRIVE SEWER EASEMENT Santa Ynez Area of Santa Barbara County, California		SAMPLE DATA					
			SOIL DESCRIPTION		INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	
0	SC		CLAYEY SAND: dark brown, loose, moist		0.0 - 7.0	○	100.7	14.8	3	
1					1.0 - 2.5					5
2					3.0 - 4.5					
3	CL		SANDY LEAN CLAY: dark brown, very stiff, moist light brown		5.0 - 6.5	■	103.1	15.6	5	
4					7.0 - 8.5				14	
5	SM		SILTY SAND: light brown, very dense, moist		112.2	14.1	16	11		
6								14		
7	SC		CLAYEY SAND: brown, very dense, moist, trace fine gravel		50/3"	34	50/5.5"	16		
8								34		
9	End of Boring @ 8.5'									
10	No subsurface water encountered									
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ Ring Sample ○ Grab Sample □ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.



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PAGE 1 OF 1  
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			SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: dark brown, loose, moist, trace fine gravel	1.0 - 2.5	■	99.6	19.9	3
1								3
2								5
3	CL		SANDY LEAN CLAY: dark brown, medium stiff, very moist	3.0 - 4.5	■	92.6	28.5	2
4								4
5			thin lens of fine gravel	5.0 - 6.5	■	94.4	26.6	10
6	SC		CLAYEY SAND: light brown, dense, very moist, trace fine gravel	7.0 - 8.5	■	98.1	18.1	24
7								45
8			very dense					12
9			End of Boring @ 8.5' No subsurface water encountered					30
10								50/6"
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

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			INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	
			SOIL DESCRIPTION					
0	SC		CLAYEY SAND: dark brown, loose, very moist, trace fine gravel					3
1				1.0 - 2.5		94.8	25.6	4
2								9
3								5
3	CL		SANDY LEAN CLAY: dark brown, stiff, moist	3.0 - 4.5		97.8	15.5	7
4								8
5			thin lens of fine gravel	5.0 - 6.5		93.5	26.6	6
6	SC		CLAYEY SAND: light brown, medium dense, very moist, trace fine gravel	7.0 - 8.5		88.7	25.0	9
7								12
8								12
9			End of Boring @ 8.5' No subsurface water encountered					15
10								19
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

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			INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
			SOIL DESCRIPTION				
0	SC		CLAYEY SAND: dark brown, dense, moist				
1			1.0 - 2.5		102.2	10.7	12 25 33
2			1.0 - 3.5				
3			medium dense				
3			3.0 - 4.5		90.8	8.2	8 13 18
4			3.5 - 6.0				
5			5.0 - 6.5		103.2	18.3	12 21 33
6	CL		SANDY LEAN CLAY: brown, hard, moist				
7			7.0 - 8.5		100.6	30.0	11 25 32
8			light brown, very moist				
9			End of Boring @ 8.5' No subsurface water encountered				
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

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DEPTH (feet)	USCS CLASS	SYMBOL	SANTA YNEZ COMMUNITY SERVICES DISTRICT HORIZON DRIVE SEWER EASEMENT Santa Ynez Area of Santa Barbara County, California						
			SAMPLE DATA						
SOIL DESCRIPTION			INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.		
0	SC		CLAYEY SAND: dark brown, loose, moist, trace fine gravel	■	88.5	30.8	10		
1			medium dense, very moist				10		
2								14	
3					3.0 - 4.5	■	95.0	11.3	10
4									16
5			brown, slightly moist	■	94.3	9.1	8		
6							11		
7							16		
8							5		
9			End of Boring @ 8.5' No subsurface water encountered				11		
10							17		
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									

LEGEND: ■ Ring Sample ○ Grab Sample □ Shelby Tube Sample ● SPT

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## **APPENDIX B**

### Laboratory Test Results

**BULK DENSITY TEST RESULTS**

ASTM D 2937-17 (modified for ring liners)

November 18, 2022

<b>BORING NO.</b>	<b>DEPTH feet</b>	<b>MOISTURE CONTENT, %</b>	<b>WET DENSITY, pcf</b>	<b>DRY DENSITY, pcf</b>
1	2.0 - 2.5	14.8	115.5	100.7
1	4.0 - 4.5	21.5	122.2	100.6
1	6.0 - 6.5	15.6	119.1	103.1
1	8.0 - 8.5	14.1	128.1	112.2
2	2.0 - 2.5	19.9	119.3	99.6
2	4.0 - 4.5	28.5	119.0	92.6
2	6.0 - 6.5	26.6	119.6	94.4
2	8.0 - 8.5	18.1	115.8	98.1
3	2.0 - 2.5	25.6	119.0	94.8
3	4.0 - 4.5	15.5	112.9	97.8
3	6.0 - 6.5	26.6	118.4	93.5
3	8.0 - 8.5	25.0	111.0	88.7
4	2.0 - 2.5	10.7	113.1	102.2
4	4.0 - 4.5	8.2	98.3	90.8
4	6.0 - 6.5	18.3	122.1	103.2
4	8.0 - 8.5	30.0	130.8	100.6
5	2.0 - 2.5	30.8	115.8	88.5
5	4.0 - 4.5	11.3	105.8	95.0
5	6.0 - 6.5	9.1	102.9	94.3
5	8.0 - 8.5	10.4	106.4	96.4

**MOISTURE-DENSITY COMPACTION TEST**

ASTM D 1557-12 (Modified)

PROCEDURE USED: B

November 18, 2022

PREPARATION METHOD: Moist

Boring #4 @ 3.5 - 6.0'

RAMMER TYPE: Mechanical

Brown Clayey Sand (SC)

SPECIFIC GRAVITY: 2.65 (assumed)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	1
3/8"	4
#4	10

**MAXIMUM DRY DENSITY: 116.0 pcf**

**OPTIMUM MOISTURE: 14.8%**

