

June 19, 2020

Ed Tolen
La Plata Archuleta Water District
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cc; Dave Henry, P.E., Harris Water Engineers

PN: 56047GE

Subject: Logs of Subsurface Conditions and OSHA Considerations
LAPLAWD, Phase 1H, Water Line
Gem Village, Southern Frontage Road Alignment
Gem Village, Colorado

Mr. Tolen,

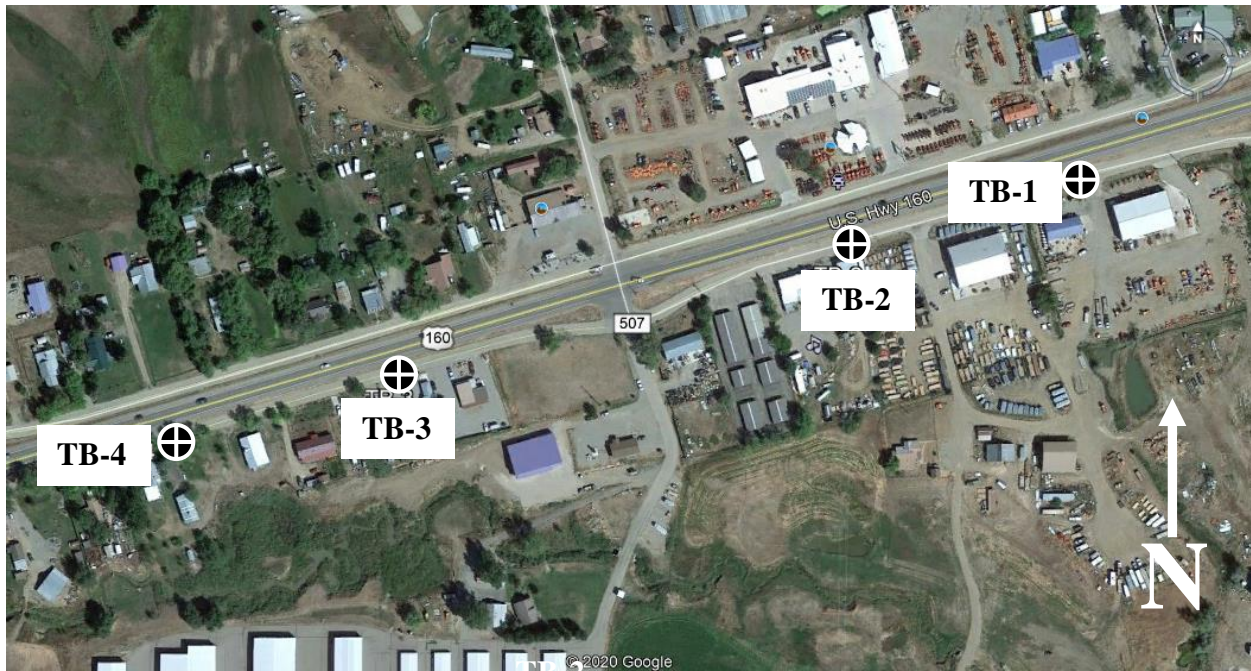
This letter presents the logs for subsurface conditions that were encountered on the subject project site within Gem Village, Colorado, as well as OSHA considerations for the project. Our services were performed in accordance with our proposal dated April 28, 2020 (PN: 20105P) for exploration services specific to the proposed project. We performed previous subsurface exploration for the LAPLAWD waterline project in the Gem Village area, which is provided in our letters dated July 11, 2016 and October 17, 2017, PN:54228GE.

We understand that the proposed project will consist of installation of a 12 -inch waterline along the southern frontage road (east bound lane) in Gem Village, as part of the larger LAPLAWD waterline project. Waterline installation will include either, or a combination of, horizontal directional boring/drilling (HDD) or open trenching techniques.

The information provided in this letter is not intended to dictate the feasibility or construction techniques for the proposed project, but rather to provide general subsurface soil information that Harris Water Engineers can utilize to help assess the feasibility for the proposed installation/construction.

Figures 1 presented below indicates the general location of the test borings that are presented/discussed in this letter. The imagery used for the Figures presented below were obtained from the Google Earth (imagery date 09-11-2019). The depths of the various subsurface strata indicated on our test boring logs and generally described below are based on the ground surface elevation at the test boring locations. The logs of the test borings are attached in Appendix A of this letter, and should be consulted for a more detailed description of the subsurface materials encountered in our borings.

Figure 1: Approximate Test Boring Locations



Subsurface Conditions Encountered in Test Borings TB-1 through TB-4

In test borings, we generally encountered previously placed roadway and embankment fill material from the asphalt surface to a depth that ranged from 2 to 6 feet. The fill material consisted of a pit run type mixture of dense gavels and cobbles with a sandy clay soil matrix and scattered large cobble or boulder sized particles. Below the fill material we encountered soft to medium stiff, sandy clay (CL) soil material to depths of 4 ½ to 14 feet. In both TB-1 and TB-4, sandy clay soil material was encountered from below the fill material to the total depth explored of 14 feet. In TB-2 and TB-3, we encountered formational claystone/shale material at depths of 9 feet in TB-2 and at 4 ½ feet in TB-3. The upper two to three feet of formational material was weathered, then became very hard to the bottom of test borings 11 and 14 ½ feet.

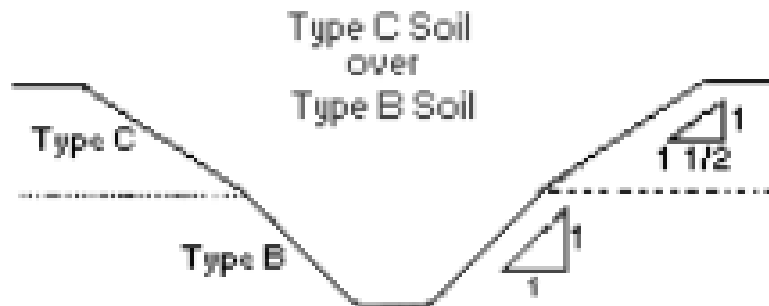
We encountered subsurface free water at 10 feet in TB-2 and at 12 feet in TB-4 at the time of our field study.

OSHA Soil Types and General Trench Excavation Stability Comments

We performed unconfined compressive strength of select in-situ liner samples of the soils and was performed in general accordance with ASTM D2166-06. The tests were performed on 1.94 inch diameter by approximate four (4) inch long “in-situ” extracted liner samples. We performed testing on two (2) “in-situ” liner samples obtained at depths ranging from about four (4) to five (5) feet below the ground surface elevation from TB-2 and TB-4. Due to the granular consistency of the upper fill soils, we were unable to obtain in-situ sample of this material. We obtained ultimate compressive strengths of about 17 pounds per square inch (1.2 tons per square foot) at a corresponding strain ranging from about 4 percent.

Based on our subsurface exploration and unconfined compressive strength test results, the upper fill soils, encountered in the upper 2 to 6 feet in our test borings, should be considered OSHA TYPE C Soils. The native clay soil encountered below the fill material, are consistent with OSHA Type B Soils. The formational material encountered should be considered OSHA Type A Soils. An exception is where water is encountered, then these materials should be considered OSHA Type C soils in any soil layer.

It is the responsibility of the Contractor to provide safe working conditions and to comply with the regulations in OSHA Standards, Excavations, 29CFR Part 1926. The diagram below obtained from the OSHA Technical Manual shows permissible unrestrained cut slopes for Type C soil over Type B soil. Temporary shoring will be required for any unrestrained cut slopes that exceed the maximum allowable sloping and/or benching.



The presence of water, seepage, fissuring, vibrations or surcharge loads may require temporary excavation to have flatter slopes. The Contractor's competent person should make decisions regarding cut slopes or contact a qualified geotechnical engineer.

The recommendations presented in this letter are based on our limited field exploration. We make no warranty either expressed or implied. Soil conditions may vary over relatively short distances. We should be notified to evaluate any questionable slopes or changes in soil types.

Please contact us if you have any questions, or if we may be of additional service.

Respectfully submitted,
TRAUTNER GEOTECH



Tom R. Harrison, P.E.
Geotechnical Engineer

APPENDIX A

Field Study Results

Field Engineer : T.Harrison
 Hole Diameter : 4" Solid
 Drilling Method : Continuous Flight Auger
 Sampling Method : Mod. California Sampler
 Date Drilled : 5/29/20
 Total Depth (approx.) : 14 feet
 Location : See TB Location Map

LOG OF BORING TB-1

LAPLAWD Gem Village Waterline
 Edward Tolen P.E.
 La Plata Archuleta Water District

Project Number: 56047GE













Depth in feet	Sample Type	Water Level	USCS	GRAPHIC	Samples	Blow Count	Water Level	REMARKS
	⊠ Mod. California Sampler ▨ Bag Sample ■ Standard Split Spoon	▼ Water Level During Drilling ▽ Water Level After Drilling						
0								
0 - 0.5				■				
0.5 - 1.0			GP	▨				
1.0 - 2.0			GP	▨				
2.0 - 6.0			CL	▨	⊠	10/6 9/6		
6.0 - 9.0				▨				
9.0 - 10.0			CL	▨	⊠	4/6 3/6		
10.0 - 14.0				▨				
14.0								Bottom of Test Boring at 14 feet

Field Engineer : T.Harrison
 Hole Diameter : 4" Solid
 Drilling Method : Continuous Flight Auger
 Sampling Method : Mod. California Sampler
 Date Drilled : 5/29/20
 Total Depth (approx.) : 14 feet
 Location : See TB Location Map

LOG OF BORING TB-2

LAPLAWD Gem Village Waterline
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Project Number: 56047GE
















Depth in feet	Sample Type	Water Level	USCS	GRAPHIC	Samples	Blow Count	Water Level	REMARKS
	 Mod. California Sampler  Bag Sample  Standard Split Spoon	 Water Level During Drilling  Water Level After Drilling						
0								
0 - 0.5								
0.5 - 1			GP					
1 - 4			GP					
4 - 9			CL			4/6 4/6		
9 - 11			SH			5/6 6/6		
11 - 14			SH					
14						50/4		
14.5								Bottom of Test Boring at 14.5 feet

Field Engineer : T.Harrison
 Hole Diameter : 4" Solid
 Drilling Method : Continuous Flight Auger
 Sampling Method : Mod. California Sampler
 Date Drilled : 5/29/20
 Total Depth (approx.) : 14 feet
 Location : See TB Location Map

LOG OF BORING TB-4

LAPLAWD Gem Village Waterline
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 La Plata Archuleta Water District

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Depth in feet	Sample Type	Water Level	USCS	GRAPHIC	Samples	Blow Count	Water Level	REMARKS
	 Mod. California Sampler  Bag Sample  Standard Split Spoon	 Water Level During Drilling  Water Level After Drilling						
DESCRIPTION								
0	Asphalt 0-4"							
	Base course material		GP					
1	Pit Run type fill material, 6 to 8 inch cobble, gravel, sand and clay, dense, moist, brown		GP					
2	Fill material, sandy Clay with shale fragments, stiff, moist, brown		CL					
4						4/6		
5	Sandy Clay, soft to medium stiff, moist to very moist to wet, dark brown					5/6		
9			CL			3/6		
10						4/6		
12								
14	Bottom of Test Boring at 14 feet							