GENERAL SUPPLEMENTAL GEOTECHNICAL SUBSURFACE EXPLORATION BORING REPORT

FOR

EL PASO WATER – GRISSOM AND HUNT STORM SEWER IMPROVEMENTS PROJECT

GRISSOM LANE (MCAFFEE PLACE)
EL PASO, EL PASO COUNTY, TEXAS
CQC PROJECT NO. AGCQC17-046-01

el paso WATER

cea group

PREPARED FOR

CEA GROUP
813 N KANSAS STREET, SUITE 300
EL PASO, TEXAS 79902

construction quality control testing and engineering

CQC TESTING AND ENGINEERING, L.L.C.
TBPE FIRM REGISTRATION NO. F-10632
4606 TITANIC AVE.
EL PASO, TEXAS 79904
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PROJECT GENERAL GEOTECHNICAL REPORT

DATE: December 1, 2020 (Final Report Date May 7, 2021)

TO: **Mr. Abel Garcia, P.E.**
CEA Group
813 N. Kansas Street, Suite 300
El Paso, Texas 79902
E-Mail: agarcia@ceagroup.net

SUBJECT: **General Supplemental Geotechnical Subsurface Exploration Boring Report**
El Paso Water- Proposed Grissom Lane Storm Sewer Improvements Project
Grissom Lane (McAfee Place)
El Paso, El Paso County, Texas
CQC Project No.: AGCQC17-046-01

In accordance with our approved additional services scope of work, **CQC Testing and Engineering, L.L.C.** is pleased to provide **CEA Group** (Client) with this supplemental exploration boring report for the above referenced project. This report presents the results of our soil exploration boring, laboratory engineering soil classification test results and our general geotechnical soils information to support the design of the proposed storm sewer improvements. The information presented within this report is considered supplemental to our issued geotechnical engineering report No. AGCQC17-046, dated January 15, 2018.

1. General Project Information

Based on general information and a site plan provided by our Client, we understand that the supplemental scope of work for this El Paso Water project consists of an additional 400 linear foot storm sewer line segment along Grissom Lane (McAffee Pl.). The storm sewer line shall be extended from Hunt Court to Montana Avenue along Grissom Lane (McAfee Place). It is our understanding that the invert of the pipeline will be approximately 7 to 8 feet.

The following sections of this report present the results our supplemental subsurface exploration boring and limited laboratory engineering soil classification test results for consideration in the design of the new storm sewer line system.

2. Subsurface Exploration Evaluation & Laboratory Engineering Soil Classification Testing

As requested, the subsurface soils within the additional storm sewer line segment area were evaluated by completing a single (1) vertical exploration boring with a truck mounted drill rig. In general, the boring was advanced to a depth of approximately 11 ½ feet below the existing pavement surface elevation. Soil samples were collected during our drilling operations at discrete depth intervals. The general exploration boring location is presented in attached sheet A1-1 and our subsurface exploration boring log is presented in sheet A2. The boring was logged by our geotechnical engineering technical staff.

At the time of our drilling activities, ground water or water seepage was not observed in our boring.

3. Laboratory Engineering Soil Classification Tests

Collected soil samples during our field activities were transported to our laboratory for further visual observation and soil classification testing. In general, selected soil samples were subjected to limited soil moisture content tests, soil particle size analysis tests and plasticity index testing. All tests were performed in general accordance with ASTM test methods. Particle size analysis test results are reported in sheet A3, a summary of laboratory engineering soil classification tests are reported in sheet A4, a soil moisture-density relationship test result is reported in sheet A5 and a soil California Bearing Ratio test result is reported in sheet A6.

4. Encountered Subsurface Soils

Based on our soil classifications and laboratory tests, the subsurface soils encountered in our supplemental exploration boring may be described as a generalized soil stratum presented in the following table. The logged depth of the sandy soil formation types is approximately delineated in our boring log.

Table 1 – Summary of Subsurface Soil Classification & Strength

Stratum	General Description	Consistency (SPT Blow Counts)	Moisture Content (%)	Atterberg Limits		% Passing No. 200	USCS Classification
				Liquid Limit	Plasticity Index		
I	Clayey and Silty Sands, Fine to Coarse Grained with calcareous material and fine gravel.	Loose to Dense (9 to 35)	3 to 6	26	13	14 to 36	SC and SM
	Remarks: [1] The encountered sandy soils shall be susceptible to soil sloughing and collapse when unconfined during pipeline excavation. Particular very loose soil zones were encountered at approximately 2 ½ to 5 and 10 to 11 ½ feet below the existing pavement surface. [2] In general, encountered soils in our borings may be primarily considered Class III Backfill soil materials, provided that soil plasticity index values are less than 12. The encountered soils are **not** considered suitable pipe bedding soil material. Verification engineering soil classification testing (i.e., sieve analysis, plasticity index and soil moisture density relationship tests) shall be performed at the time of construction. [3] Encountered caliche and/or calcareous soil formations are not considered suitable backfill soil materials. Calcareous soils shall be replaced and/or blended with other on-site or imported suitable Select Fill soil material.						

Based on our general review of boring B-2 completed on the north end of Grissom Lane it appears that the soil profile along the street shall consist primarily sandy soils in a loose to medium dense condition.

In general, the clearing, grubbing, screening to some degree and blending of excavated soils along the pipeline shall be required to meet the specified backfill material requirements presented Section 9.0 of our original referenced Limited General Subsurface Soils Evaluation Report.

5. Pavement Replacement

Based on our general observations of the existing pavement conditions, soil exploration boring soil samples and laboratory engineering soil classification test results, we recommend that the specified replacement pavement section consist of at least 3 inches of Type C – asphaltic-concrete (AC) material underlie by a minimum of 12 inches of approved controlled low strength soil cement material (CLSM). The AC material shall conform to a TXDOT - Item 340, Type C material with a minimum of 1,500 pounds of Marshall Stability (75 blows, ASTM D 1559), a flow

between 0.08 inches and 0.16 inches, air voids between 3 to 5 percent, and should be placed at a target of 98 percent of laboratory Marshall value. The asphalt content for the mix should be determined based on the Marshall Mix Design method. The bitumen material should be a performance grade material, PG70-22. The CLSM shall exhibit a minimum compressive strength of 150 psi at 7 days. The CLSM should be allowed to cure appropriately and equipment should not be allowed on the CLSM if the material exhibits a permanent deformation greater than ¼ inch. The proposed CLSM should be submitted to the engineer of record for review and approval through a submittal process. The proposed CLSM submittal should also contain compressive strength data for review and consideration by the engineer of record.

The Hot-Mixed Asphaltic-Concrete (HMAC) paving materials should be tested during construction production for mix design verification. The plant produced HMAC should be sampled for each day's production or every 20 tons of material produced and tested for compliance with the approved Marshall Mix Design or in accordance with current TXDOT or City of El Paso construction standards per TXDOT Item 340 and to determine the laboratory density of the material. The placed HMAC mat should be tested by conducting a minimum of one field density test every 50 to 150 linear feet (l.ft.) or as directed by the project engineer or project specifications.

6. Storm Sewer Pipe Backfilled Considerations

In general our storm sewer pipeline backfill recommendation remain unchanged from our original referenced report. Below is an updated summary of soil backfill and compaction requirements.

Table 2 - Pipeline Backfill Material Guidelines

BACKFILL ZONE	BACKFILL MATERIAL TYPE	ASTM COMPACTION REQUIREMENTS
Below Pipe Embedment Zone	Class III or Select Fill	90% per ASTM D-1557
Embedment Pipe Zone	Class I, II or as specified	90% per ASTM D-1557
Trench Backfill Above Pipe Zone	Class III or Select Fill	90% per ASTM D-1557
Backfill Material from Finished Surface to 36-inches	Class III or Select Fill	95% per ASTM D-1557

Additional Requirements:

1) The moisture content of the backfill materials shall be maintained within ±3% of optimum moisture content or as specified. Pipe zone backfill material shall be maintained within +/- 2 % optimum moisture content.

2) The supporting subgrade soils at the cut excavation that shall support embedment backfill material and the pipes should be stripped of all vegetation, organic matter, clay soil lumps, topsoil, construction/pavement debris and/or any foreign matter.

3) In general, embedment soil materials and pipes should not be directly supported by soils classified as CH, CL, MH, ML, OH, OL and PT under the USCS in all cases.

4) Please note that the pipe zone is typically defined as the area extending from the bottom of the trench to 12 inches above the top of the pipe and extending to the undisturbed trench walls on both sides of the pipe.

In the event that the new storm sewer system shall include the construction of drop inlets, we recommend that drop inlets be supported on a minimum of 8 inches of compacted flexible base course material, TXDOT Item 247,

Type A, Grade 3. The approved base course shall be placed in loose lifts not to exceed 6 inches to allow proper consolidation of the backfill material. The Structural Fill should be compacted to at least 95 percent of the maximum dry density as per ASTM D 1557.

The suitable subgrade soils that shall support the base coarse material should be compacted to at least 95 percent of maximum dry density per ASTM D 1557. The moisture content of the subgrade soils shall be maintained within ± 3 percent of optimum moisture content until permanently covered.

As requested, the analysis and recommendations in this supplemental exploration boring report are based on the data obtained from a single (1) boring performed at the approximate location indicated on the attached General Supplemental Geotechnical Subsurface Exploration Boring Location Aerial Plan, Sheet A 1- 1. This report may not reflect all the variations that may occur at the time of the storm sewer construction. The nature and extent of the variations may not become evident until during the course of earthwork excavations. This is specifically true of the comments presented within our original report with respect to the to the specified storm sewer line installation adjacent to existing residential structures and excavation/structure shoring requirements. All other recommendations within our original report remain unchanged.

If variations appear during construction, CQC should be contacted immediately, it may be necessary for a reevaluation of the information presented in this report to be made after performing on-site observations during the construction period and noting the characteristics of any variations. No other information relevant to the project site history or known conditions of concern were discussed or disclosed to CQC by our Client or owner.

We appreciate the opportunity to provide geotechnical consulting services on this project. Please call us if you have any questions with respect to the supplemental recommendations presented within this report.

Respectfully Submitted,
CQC Testing and Engineering, L.L.C.
TBPE Firm Registration No. F-10632

Jose Luis Arias
Project Engineer
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Jaime Rojas, P.E.
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5/7/2021
STATE OF TEXAS
JAIME ROJAS
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LICENSED
PROFESSIONAL ENGINEER

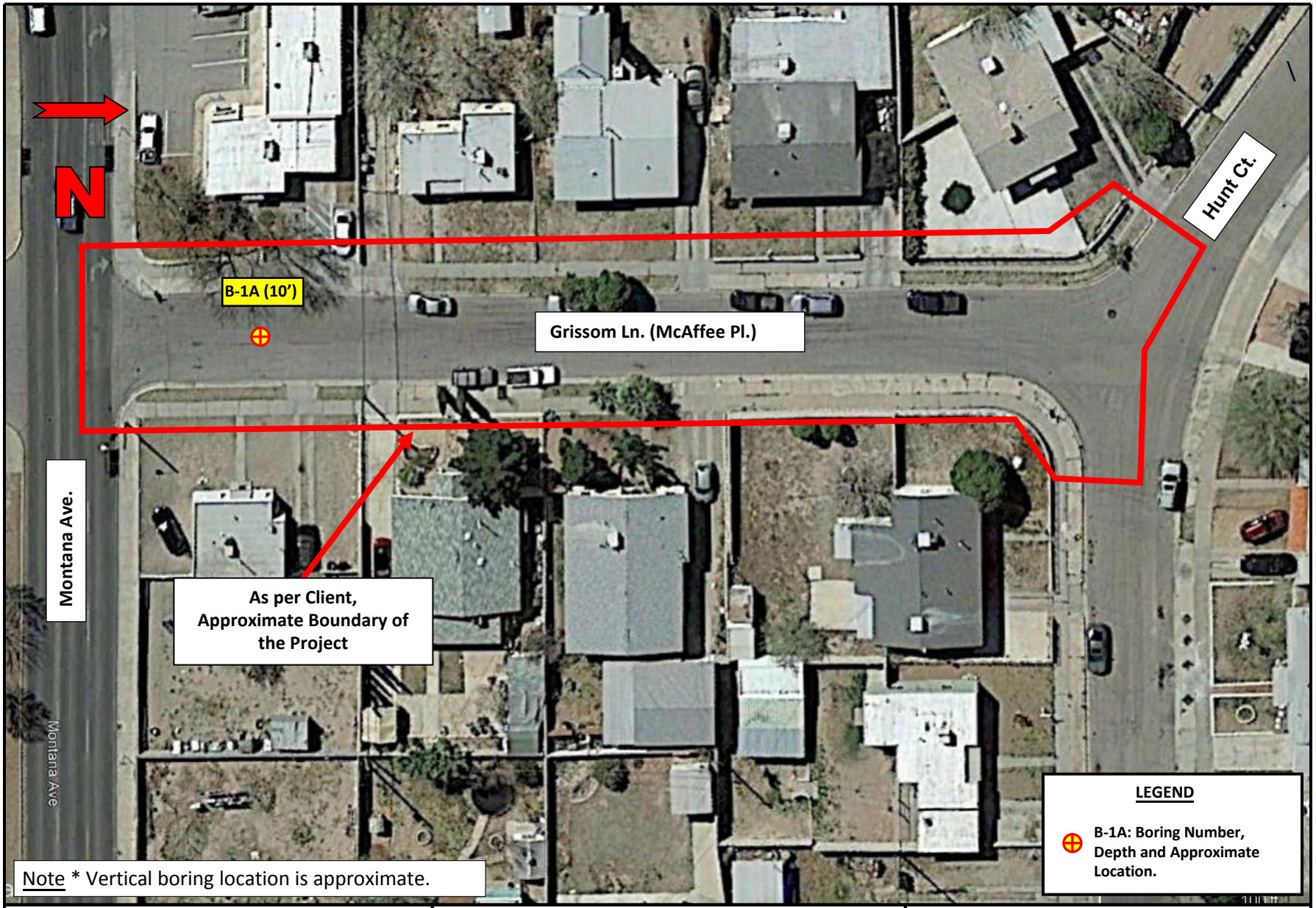
Appendix Section:

Appendix A.

Copies: 1.) Above Distribution
2.) File

\\CQCSERVERT620\CQC Working Files\GEO\Reports\2017\17-046-01 EPW-Grissom Lane Storm Sewer (CEA Group)\07-Final Report Documents\17-046-01_TechnicalReport_Final.docx

APPENDIX A



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General Supplemental Geotechnical Subsurface Exploration Boring Location Aerial Plan

El Paso Water – Grissom and Hunt
Storm Sewer Improvements Project
Grissom Lane (McAffee Place)
El Paso, El Paso County, Texas

Client: CEA Group

CQC Project No. AGCQC17-046-01

Scale: NTS

Check by: JR

Date: 12/01/2020

Sheet A1-1

CQC Testing and Engineering LLC - TBPE Firm No. F-10632
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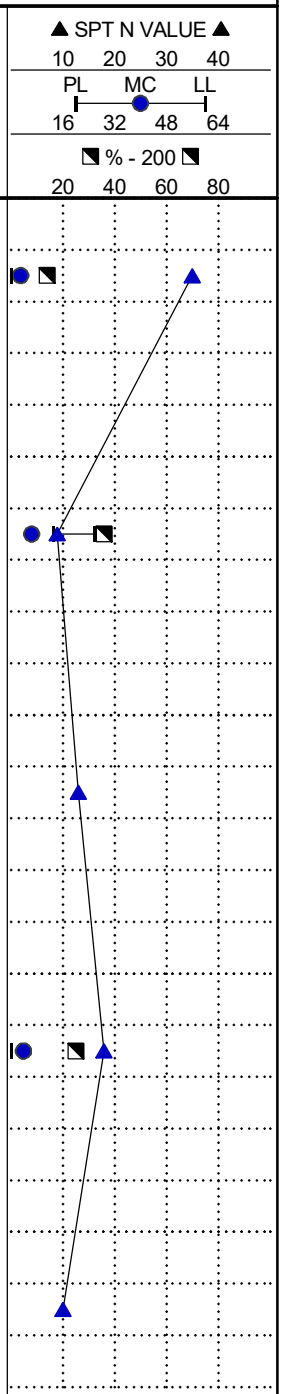
BORING NUMBER B-1A

CLIENT CEA Group
PROJECT NAME El Paso Water- Grissom and Hunt SS Improv. Project
PROJECT NUMBER AGCQC17-046-01
PROJECT LOCATION Grissom Lane(McAffee Place), El Paso, Texas
DATE STARTED 8/3/20 **COMPLETED** 8/3/20
GROUND ELEVATION Ext Grade **HOLE SIZE** 9 inches
DRILLING CONTRACTOR CQC **DRILLED BY** SC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 w/ 4-1/4" ID HSA
AT TIME OF DRILLING ---
LOGGED BY PG **CHECKED BY** JLA
AT END OF DRILLING ---
NOTES Boring Location: See Attached Boring Location Plan, Sheet A1-1
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	BLOW COUNTS (N VALUE)	% Moisture Content	% - 4	% - 200	PI (LL-PL)	Pocket Pen. (tsf)	Total Unit Weight (pcf)	USCS
0.0	SS 1		SAND, Fine Grained, Silty, Tannish Brown to Multicolored, Dense, Slightly Moist to Moist.	10-11-24 (35)	3.0	96	14	NP			SM
2.5	SS 2		SAND, Fine to Medium Grained, Clayey, Tannish Brown to Whittish Brown, Loose, Moist with calcareous material. - Encountered loose sandy soils shall be susceptible to soil sloughing and collapse when unconfined during excavation.	4-4-5 (9)	6.4	98	36	13			SC
5.0	SS 3		SAND, Fine to Medium Grained, Silty, Light Brown to Tannish Brown, Medium Dense, Slightly Moist.	6-6-7 (13)							
7.5	SS 4		- Fine to Coarse Grained, tannish brown to multicolored at approx. 7-1/2 feet. - Sands shall be suceptible to sloughing when unconfined during trench excavation.	4-5-13 (18)	3.9	92	25	NP			SM
10.0	SS 5		SAND, Fine to Medium Grained, Poorly Graded, Light Brown to Tannish Brown, Loose, Slightly Moist with silt.	9-3-7 (10)							
			NOTE: SS- Split Spoon Sample Bottom of borehole at 11.5 feet.								



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SOIL PARTICLE SIZE ANALYSIS TESTS

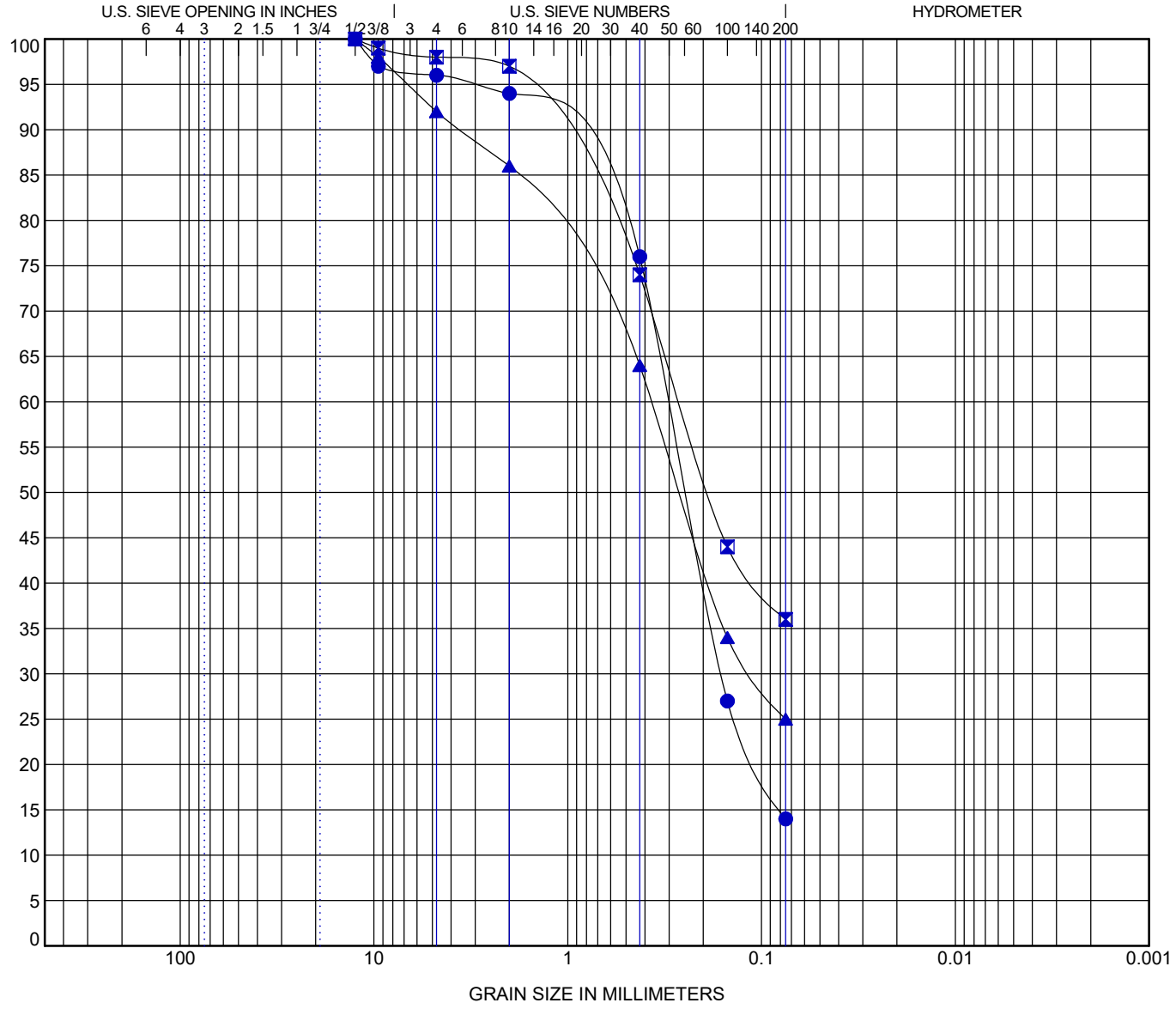
Test Method: ASTM D6913

CLIENT CEA Group

PROJECT NAME El Paso Water- Grissom and Hunt SS Improv. Project

PROJECT NUMBER AGCQC17-046-01

PROJECT LOCATION Grissom Lane(McAffee Place), El Paso, Texas



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-1A	0.0 - 1.5	SILTY SAND(SM)	NP	NP	NP		
⊠	B-1A	2.5 - 4.0	CLAYEY SAND(SC)	26	13	13		
▲	B-1A	7.5 - 9.0	SILTY SAND(SM)	NP	NP	NP		

BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1A	0.0 - 1.5	12.5	0.302	0.16		4.0	82.0	14.0	
⊠	B-1A	2.5 - 4.0	12.5	0.261			2.0	62.0	36.0	
▲	B-1A	7.5 - 9.0	12.5	0.37	0.11		8.0	67.0	25.0	

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SUMMARY OF LABORATORY ENGINEERING SOIL CLASSIFICATION TEST RESULTS

CLIENT CEA Group **PROJECT NAME** El Paso Water- Grissom and Hunt SS Improv. Project

PROJECT NUMBER AGCQC17-046-01 **PROJECT LOCATION** Grissom Lane(McAffee Place), El Paso, Texas

Borehole	Depth	N - Value	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 4	% Passing No. 200	Pocket Pen. (tsf)	Total Unit Weight (pcf)	Classification
B-1A	0.0- 1.5	35	3.0	NP	NP	NP	96	14			SM
	2.5- 4.0	9	6.4	26	13	13	98	36			SC
	5.0- 6.5	13									
	7.5- 9.0	18	3.9	NP	NP	NP	92	25			SM
	10.0- 11.5	10									

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Construction Materials Testing
Geotechnical Engineering
Environmental Site Assessments
Forensic Analysis/Testing

SOIL MOISTURE - DENSITY RELATIONSHIP TEST RESULTS

PROJECT NO.: AGCQC17-046-01

PROJECT NAME: **General Supplemental Geotechnical Subsurface Exploration Boring**
EPW-Grissom and Hunt Storm Sewer Improvements Project
Grissom Lane (McAffee Place)
El Paso, El Paso County, Texas

SAMPLE INFORMATION

PROCTOR NO.: 1 **SAMPLED BY:** PG

SOIL SAMPLE LOCATION: B-1A **SAMPLE DATE:** 8/3/2020

SOIL SAMPLE APPROX. DEPTH: 1'-5'

SOIL TYPE/DESCRIPTION: On Site Subsurface Soils/ SAND, Fine to Coarse Grained, Silty, Tannish Brown to Multicolored with calcareous material and fine gravel.

SAMPLE TEST RESULTS

Sieve Analysis Test
Test Method: ASTM D 6913

Sieve Size/No.	Percent Retained	Percent Passing
3"	0	100
2-1/2"	0	100
1-1/2"	0	100
1"	0	100
3/4"	1	99
1/2"	5	95
3/8"	10	90
No. 4	12	88
No. 10	17	83
No. 40	36	64
No. 100	73	27
No. 200	83.8	16.2

Atterberg Limits Test
Test Method: ASTM D 4318

Limit Test	Index Test Result
LL	-
PL	-
PI	NP

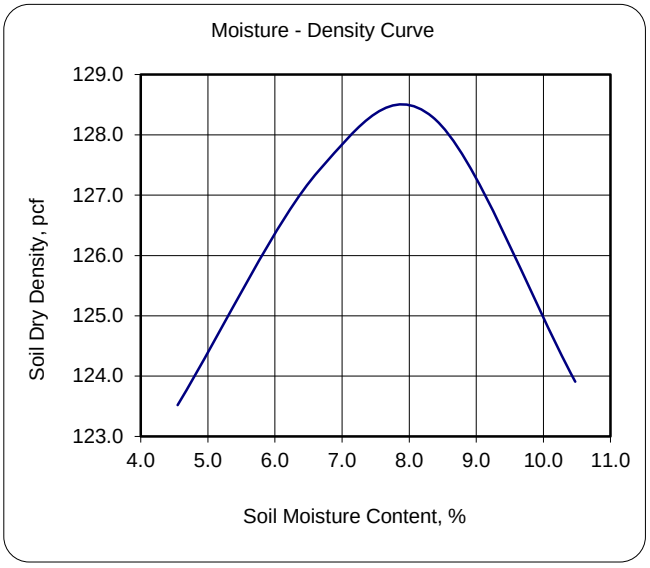
NP-Non Plastic

Soil Classification: **SM**
Test Method: ASTM D 2487

Moisture-Density Relationship Test
Test Method: ASTM D 1557, Method "B"

Test Sample No.	Moisture Content (%)	Sample Dry Density (pcf)
1	4.5	123.5
2	6.7	127.4
3	8.4	128.3
4	10.5	123.9

Maximum Dry Density, pcf: **128.5**
Optimum Moisture Content, %: **7.9**



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SOIL CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
ASTM D - 1883

PROJECT NO.: AGCQC17-046-01

PROJECT NAME: **General Supplemental Geotechnical Subsurface Exploration Boring**
EPW-Grissom and Hunt Storm Sewer Improvements Project
Grissom Lane (McAffee Place)
El Paso, El Paso County, Texas

SAMPLE INFORMATION

PROCTOR NO.: 1 **SAMPLED BY:** PG

SOIL SAMPLE LOCATION: B-1A **SAMPLE DATE:** 8/3/2020

SOIL SAMPLE APPROX. DEPTH: 1'-5'

SOIL TYPE/DESCRIPTION: On Site Subsurface Soils/ SAND, Fine to Coarse Grained, Silty, Tannish Brown to Multicolored with calcareous material and fine gravel.

TEST SPECIMEN INFORMATION:

Soil Sample Height, in.	4-1/2"
Soil Sample Approx. Diameter, in.	6"
Soil Optimum Dry Density, pcf	128.5
Soil Optimum Moisture Content, %	7.9

CBR Test Data:

Stress Contact Area, in^2	3.02
Sample Surcharge Load, lbs.	12.5
Soaking Period, hr's.	96

SPECIMEN SWELL TEST INFORMATION:

Intial Swell Reading:	0.0400
Final Swell Reading:	0.0400
Sample Vertical Swell, %	0.0

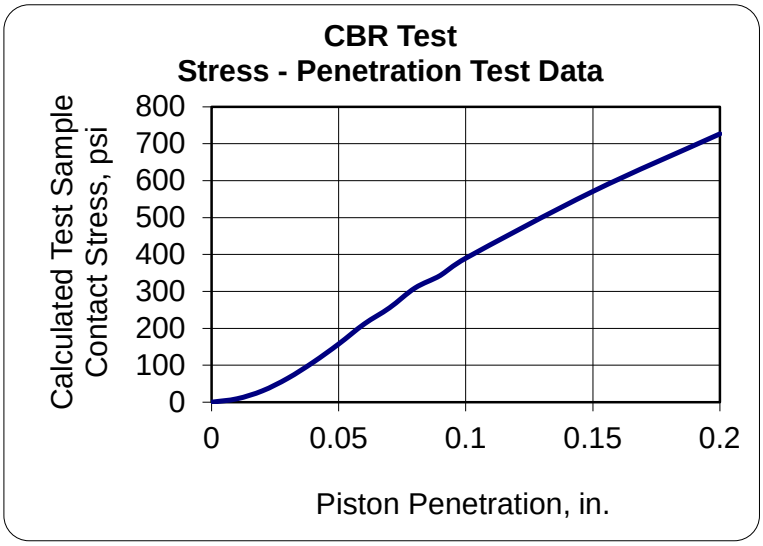
	Before Soaking	After Soaking
Dry Density, pcf	123.1	120.3
Moisture, %	8.1	10.6
% Compaction	95.8	93.6

UNCORRECTED CALCULATED SOAKED CBR VALUES:

CBR @ 0.1" Penetration	39
CBR @ 0.2" Penetration	48

Stress Versus Penetration Data

PEN.	Load, lbs.	Stress, psi
0	0	0
0.01	28	9
0.02	93	31
0.03	196	65
0.04	327	108
0.05	476	158
0.06	639	212
0.07	772	256
0.08	934	309
0.09	1037	343
0.1	1178	390
0.15	1724	571
0.2	2195	727



APPENDIX B

GEOTECHNICAL REPORT
TECHNICAL REFERENCE INFORMATION

DEFINITION OF DESCRIPTIVE TERMS

DENSITY OF GRANULAR SOILS

SPT N Value	Relative Density
< 4	Very Loose
4 – 10	Loose
11 – 30	Med. Dense
31 – 50	Dense
50 – 80	Very Dense
> 80	Hard

CONSISTENCY OF COHESIVE SOILS

SPT N Value	Consistency
< 2	Very Soft
2 – 4	Soft
5 – 8	Medium Stiff
9 – 15	Stiff
16 – 50	Very Stiff
> 80	Very Hard

DEGREE OF PLASTICITY

Nonplastic –	Has no cohesion; will not roll into a thread.
Trace of Plasticity –	Barely hold its shape when rolled into a thread.
Low Plasticity –	Has sufficient cohesion to form a thread but will quickly rupture when deformed.
Med. Plasticity –	Has considerable cohesion. Can be molded into a thread and will withstand considerable deformation without rupture.
High Plasticity –	Can be kneaded like dough without trace of rupture.

MOISTURE DESCRIPTIONS

	GRANULAR SOILS	COHESIVE SOILS
Dry	No Apparent Moisture	No Apparent Moisture
Slightly Moist	< Than 3% by Weight	< Less Than Plastic Limit
Moist	3% to 9% by Weight	Approximately Plastic Limit
Very Moist	> 9% by Weight	> than PL but < than LL
Wet	Submerged or Saturated	Submerged or Saturated

PLASTICITY

Cohesion TSF	Plasticity Index	Degree of Plasticity
0-0.125	0-5	None
0.125-0.25	5-10	Low
0.25-0.5	10-20	Moderate
0.5-1.0	20-40	Plastic
1.0-2.0	> 40	Highly Plastic
> 2.0		

ABBREVIATIONS

V. – Very	Fl. – Fairly	Sl. – Slightly	Med. – Medium
Tr. – Trace	< - Less Than	> - Greater Than	PL – Plastic Limit
Mod. – Moderately			

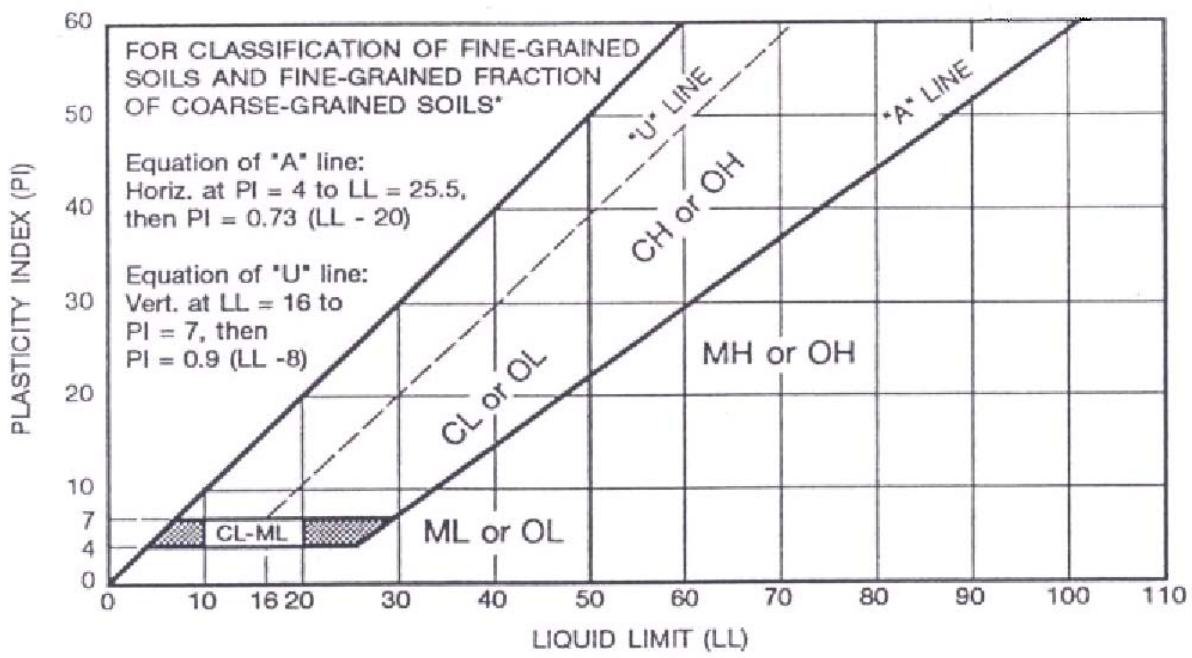
SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
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 SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (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
				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

GEOTECHNICAL REPORT
SOIL CLASSIFICATION REFERENCE INFORMATION

Cohesive Soil Classification Chart



U.S. STANDARD SIEVE

	12"	3"	¾"	4	10	40	200		
BOULDERS	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	FINE		COARSE	MEDIUM	FINE		
152	76.2	19.1	4.76	2.00	0.420	0.074	0.002		

SOIL GRAIN SIZE IN MILLIMETERS

Laboratory Test Methods:

Moisture Content Tests:

Moisture Contents are determined from representative portions of a soil sample. The samples initial weight is recorded and it is then dried to a constant weight. From this data the moisture content is calculated.

Atterberg Limit Tests:

Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL) tests are performed to aid in the classification of soils and to determine the plasticity and volume change characteristics of the materials. The Liquid Limit is the minimum moisture content at which a soil will flow as a heavy viscous fluid. The Plastic Limit is the minimum moisture content at which the soil behaves as a plastic material. The Shrinkage Limit is the moisture content below which no further volume change will take place with continued drying. The Plasticity Index (PI) is the numeric difference between the Liquid Limit and the Plastic Limit and indicates the range of moisture content over which a soil remains plastic.

Grain Size Distribution Test (Particle Size Analysis, Sieve Analysis):

The distribution of soils finer than the No. 200 sieve is determined by passing a representative soil sample through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage passing (or retained) is calculated. For determination of the percentage of material finer than the No. 200 sieve, the specimen is first washed through the sieve. The distribution of the materials finer than the No. 200 is determined by use of the different size particles while suspended in water.

APPENDIX C

CLIENT: **CEA Group**

PROJECT NAME: **El Paso Water – Grissom and Hunt Storm Sewer Improvements Project**
Grissom Lane at Montana Avenue
El Paso, El Paso County, Texas

PHOTO NO. 1: General view of drilling activities at exploration vertical boring B-1 location.

PHOTO NO. 2: General view of drilling activities at exploration vertical boring B-1 location.

PHOTO NO. 3: General view of utility markings within vertical boring B-1.

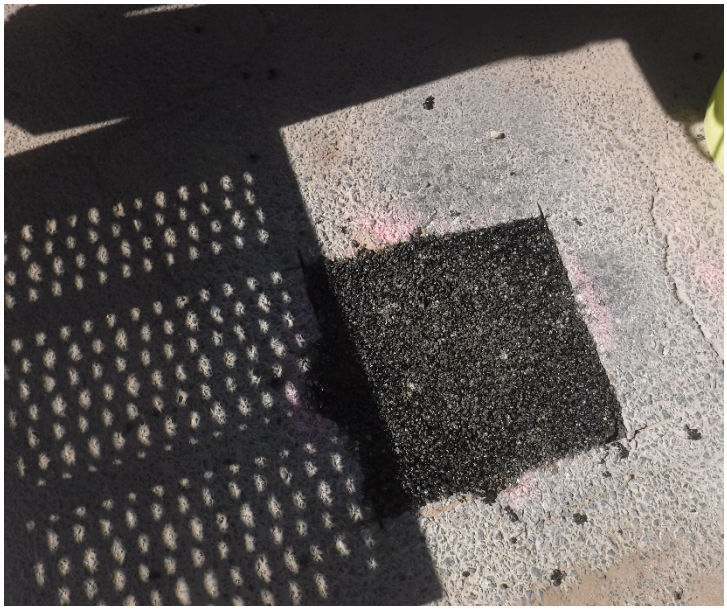


PHOTO NO. 4: General view of asphaltic concrete patch at boring location.

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