

GEOTECHNICAL ENGINEERING
 CONSTRUCTION MATERIALS
 ENGINEERING & TESTING
 SOILS • ASPHALT • CONCRETE

October 21, 2015

HDR Engineering, Inc. 555 North Carancahua Street, Suite 1600 Corpus Christi, Texas 78401

Attention: Mr. Philip Blackmar, Coastal Engineer

SUBJECT: SUBSURFACE INVESTIGATION, LABORATORY TESTING PROGRAM AND GEOTECHNICAL RECOMMENDATIONS FOR THE PROPOSED MOSES LAKE: WETLANDS RESTORATION PROJECTS Moses Lake/Dollar Bay Galveston, Texas RETL Job No.: G115189

Dear Mr. Blackmar,

In accordance with our agreement, we have conducted a subsurface exploration and soils evaluation for the above referenced project. The results of this investigation, together with our recommendations, are to be found in the accompanying report, an electronic copy of which is being transmitted herewith for distribution to the design team.

Often, because of design and construction details that occur on a project, questions arise concerning soil conditions, and Rock Engineering and Testing Laboratory, Inc. (RETL), a Texas Professional Engineering Firm (No. -2101), would be pleased to continue its role as Geotechnical Engineer during the project implementation.

RETL also has great interest in providing materials testing and observation services during the construction phase of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience.

Sincerely,

Mark C. Rock, P.E. Vice President of Operations

ROCK ENGINEERING & TESTING LABORATORY, INC.

www.rocktesting.com

6817 LEOPARD STREET • CORPUS CHRISTI, TEXAS 78409-1703 OFFICE: (361) 883-4555 • FAX: (361) 883-4711 10856 VANDALE ST. SAN ANTONIO, TEXAS 78216-3625 OFFICE: (210) 495-8000 • FAX: (210) 495-8015 SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM AND GEOTECHNICAL RECOMMENDATIONS FOR THE PROPOSED MOSES LAKE: WETLANDS RESTORATION PROJECTS MOSES LAKE/DOLLAR BAY GALVESTON, TEXAS

RETL JOB NUMBER: G115189

PREPARED FOR:

HDR ENGINEERING, INC. 555 NORTH CARANCAHUA STREET, SUITE 1600 CORPUS CHRISTI, TEXAS 78401

OCTOBER 21, 2015

PREPARED BY:

ROCK ENGINEERING AND TESTING LABORATORY, INC. 6817 LEOPARD STREET CORPUS CHRISTI, TEXAS 78409 PHONE: (361) 883-4555; FAX: (361) 883-4711



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INTRODUCTION

This report presents the results of a soils exploration and geotechnical analysis for the proposed Moses Lake: Wetlands Restoration Projects located near Galveston, Texas. This study was conducted for HDR Engineering, Inc.

Authorization

The work for this project was performed in accordance with Rock Engineering and Testing Laboratory, Inc. (RETL) Proposal No. P070615D (Revision 1) dated July 21, 2015. The proposal was approved and incorporated into HDR Engineering, Inc. "Geotech Subconsultant Agreement" executed on August 13, 2014.

Purpose and Scope

Based on information provided to RETL, the project will include construction of marsh areas and a shoreline protection system within Moses Lake.

Three options are being considered for construction of the proposed marsh areas. The first option is to construct mounds by pumping dredge slurry and allowing it to free flow to create the mound. Mounds created using this technique are anticipated to have a crest elevation of approximately +2½-feet, a crest diameter of approximately 40-feet, side slopes ranging from 30H:1V to 50H:1V, and a base elevation of approximately -2-feet. The second option is to construct terraces using mechanical excavation and placement. The proposed terraces are anticipated to have a crest elevation of approximately +3-feet, a crest width of approximately 10-feet, side slopes of approximately 4H:1V, and a base elevation of approximately 2-feet. The third option is to construct a containment berm with dimensions similar to the terraces and pump dredge material inside of the berm with fill thicknesses similar to the mounds. The soils to construction the proposed marsh areas may be obtained from a borrow source within Dollar Bay or from upland areas.

Shoreline protection is planned to be accomplished by using a rock breakwater system. The proposed breakwater is planned to have a crest elevation of approximately +3-feet, a crest width of approximately 5-feet, and side slopes of approximately 3H:1V. The base elevation of the breakwater is anticipated to be between -2 and -3-feet.

The scope of the exploration and analysis included the sampling and in-situ strength testing, field and laboratory testing, and engineering analysis. The geotechnical recommendations will include:

- Estimated allowable ground contact pressures,
- Estimated settlements associated with any potential elastic soil displacement or mudwaving during construction and
- Estimated differential and long term settlements.

The scope of services did not include an environmental assessment. Any statements in this report, or on the boring logs, regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

<u>General</u>

The exploration and analysis of the subsurface conditions reported herein are considered sufficient in detail and scope to assist the designers in preliminary design of this project. The recommendations submitted for the proposed project are based on the available soil information and the preliminary design details provided to RETL by HDR Engineering, Inc.

The Geotechnical Engineer states that the findings, recommendations, specifications or professional advice contained herein, have been presented after being prepared in a manner consistent with that level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project. No other representations are expressed or implied, and no warranty or guarantee is included or intended.

This report has been prepared for the exclusive use of HDR Engineering, Inc. for the specific application to the proposed Moses Lake: Wetlands Restoration Projects located near Galveston, Texas. Specifically the site is located in Moses Lake in the vicinity of Dollar Bay and near the southwest portion of Moses Lake.

FIELD EXPLORATION

<u>Scope</u>

The field exploration, to identify and evaluate the engineering characteristics of the subsurface conditions encountered included reconnaissance of the project site, performing strength testing, and recovering disturbed soil samples.

Twenty-one borings were performed at the site to a maximum depth of 10-feet below the bay bottom. The number of borings, boring locations and termination depths were determined with collaboration from HDR Engineering, Inc.

The boring identification, location, depth, and GPS coordinates are provided in the Summary of Boring Information table provided below.

MOSES LAKE: WETLANDS RESTORATION PROJECTS Moses Lake/Dollar Bay Galveston, Texas

October 21, 2015 Attn.: Mr. Philip Blackmar RETL Job No.: G115189

	SUMMARY OF BORING INFORMATION													
Boring I.D.	Boring Location	Boring Depth (ft)	GPS Coordinates											
B-1	Moses Lake: Site B, Marsh Area	10	N 29.421342° W 94.912535°											
B-2	Moses Lake: Site B, Marsh Area	71⁄2	N 29.419007° W 94.909785°											
B-3	Moses Lake: Site B, Marsh Area	10	N 29.421602° W 94.910181°											
B-4	Moses Lake: Site B, Marsh Area	10	N 29.420176° W 94.910554°											
B-5	Moses Lake: Site B, Marsh Area	9	N 29.421681° W 94.914693°											
B-6	Moses Lake: Site B, Marsh Area	10	N 29.419021° W 94.911743°											
B-7	Moses Lake: Site B, Marsh Area	5	N 29.420419° W 94.914561°											
B-8	Moses Lake: Site B, Marsh Area	10	N 29.420145° W 94.913042°											
B-9	Moses Lake: Site B, Marsh Area	5	N 29.418483° W 94.913578°											
B-10	Moses Lake: Site B, Marsh Area	5	N 29.419755° W 94.915731°											
B-11	Moses Lake: Site B, Marsh Area	71⁄2	N 29.418250° W 94.915859°											
B-12	Moses Lake: Site B, Marsh Area	71⁄2	N 29.418021° W 94.910185°											
B-13	Moses Lake: Site D, Marsh Area	5	N 29.419797° W 94.951053°											
B-14	Moses Lake: Site D, Marsh Area	41⁄2	N 29.418929° W 94.950279°											
B-15	Moses Lake: Site D, Marsh Area	21/2	N 29.418965° W 94.951697°											
B-16	Moses Lake: Site D, Marsh Area	41⁄2	N 29.418049° W 94.951083°											
B-17	Dollar Bay, Potential Borrow Area	10	N 29.429551° W 94.920912°											
B-18	Dollar Bay, Potential Borrow Area	10	N 29.425659° W 94.918583°											
B-19	Dollar Bay, Potential Borrow Area	10	N 29.427925° W 94.913016°											
B-20	Dollar Bay, Potential Borrow Area	10	N 29.429619° W 94.904736°											
B-21	Dollar Bay, Potential Borrow Area	10	N 29.425608° W 94.903854°											

The boring depths referred to in the tables above are measured from the bay bottom at the test locations during the time of our field investigation. RETL performed the boring operations. Boring Location Plans are included in the Appendix of this report.

Drilling and Sampling Procedures

The soils samples were obtained using a sediment sampler. All the samples were identified according to boring number and depth, encased in polyethylene plastic wrapping to protect against moisture loss and transported to the laboratory in special containers.

Field Tests and Measurements

Static Cone Tests - Portable static cone penetrometer tests were performed at select boring locations. The portable static cone penetrometer is a device used for measuring soil consistency. This test was performed on areas with apparent fine grained, soft soils. The device is equipped with dual rods enabling the cone stress to be measured directly. Soil friction on the outer rod does not influence the reading. The cone is forced into the soil in increments and retracted slightly after each increment to zero the gauge, then the cone is advanced to obtain the cone index (Qc). The cone index is always read directly from the gauge. It has units of kg/cm² that is essentially equal to tons/ft². The results of the portable static cone penetrometer tests are provided on the boring logs using the notation Qc.

Estimates of unconfined compressive strengths, cohesion, standard penetration test values "N" and CBR values can be derived from the cone index. The correlation between the cone index and soil constants is not absolute. The following empirical formulas were provided by the portable static cone penetrometer manufacturer, Boart Longyear Company, and have been determined through extensive field use of the unit:

- Standard Penetration Test Value "N" N = Qc/4
- Unconfined Compressive Strength "Qu" (tsf) Uniform clay and silty clays: Qu = Qc/5 Clayey silts: Qu = Qc/(10 to 20)
- Cohesion "C" or Undrained Shear Strength (tsf) Uniform clay and silty clays: C = Qc/10 Clayey silts: C = Qc/(20 to 40)

Vane Shear Testing – A GEONOR Inspection Vane Tester Model H-60 was used to measure the in-situ undrained shear strength of the soils. The test is performed by forcing a vane into the soil and twisting the vane to shear or fail a wedge of soil. The measuring part of the instrument is a spiral spring. When the handle is turned, the spring deforms and the upper and lower parts of the instrument receive a mutual angular displacement. The size of the displacement is dependent on the torque applied. A graduated scale is used to measure the displacement. The scale ring follows the upper part of the instrument and when shear failure in the soil occurs, the scale ring will remain in its position while the upper handle part of the instrument will return to the zero position. The distance the scale ring traveled is measured. This measurement has been correlated to a known torque force and converted to an undrained soil shear strength value: Undrained Shear Strength (tsf): C = Tv*2.

LABORATORY TESTING PROGRAM

In addition to the field investigation, a laboratory testing program was conducted to determine additional pertinent engineering characteristics necessary in analyzing the behavior of the soils at the project location.

The laboratory testing included the following test procedures:

- Supplementary visual classification (ASTM D2487)
- Moisture content tests (ASTM D2216)
- Atterberg limits tests (ASTM D4318)
- Percent material finer than the #200 sieve tests (ASTM D1140)

All phases of the laboratory testing program were performed in general accordance with applicable ASTM Specifications. All field and laboratory tests results are included on the boring logs in the Appendix or in this report.

SUBSURFACE CONDITIONS

<u>General</u>

The types of subsurface soil materials encountered in the test borings have been visually classified and are described in detail on the boring logs. The soil classification, laboratory testing, estimated undrained shear strength for fine grained soils and the estimated angle of internal friction for course grained soils are provided in the following tables. More detailed results of the field investigation and laboratory tests are provided on the boring logs in the Appendix.

Representative samples of the soils were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of three months after issuance of this report.

The stratification of the soil, as shown on the boring logs, represents the soil conditions at the actual boring locations. Variations may occur between, or beyond, the boring locations. Lines of demarcation represent the approximate boundary between soil types, but the transition may be gradual, or not clearly defined.

It is to be noted that, whereas the test borings were drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean fill soil.

The soil profile tables below provide a summary of the average soil conditions encountered at the boring locations:

Soil Profile Table for Moses Lake: Site B (Borings B-1 through B-12)

D	GENERALIZED SOIL DESCRIPTION	LL	PI	С	ø	γe	-#200
0-4	Avg. Water Depth						
4-7	Fat/Lean CLAY & CLAYEY Sand	33-70	21-50	400	0	55	37-89
7-14	Fat/Lean CLAY & CLAYEY Sand	28-51	13-37	1,600	0	55	29-94

Soil Profile Table for Moses Lake: Site D (Borings B-13 through B-16)

D	GENERALIZED SOIL DESCRIPTION	LL	PI	С	ø	γe	-#200
0-3	Avg. Water Depth						
3-4	Fat/Lean CLAY & CLAYEY Sand			500	0	55	91
4-8	Fat CLAY	50-85	36-59	1,100	0	55	89-95

Soil Profile Table for Moses Lake: Dollar Bay (Borings B-17 through B-21)

D	GENERALIZED SOIL DESCRIPTION	LL	PI	С	ø	γe	-#200
0-6	Avg. Water Depth						
6-9	Fat CLAY			80	0	55	66-77
9-16	Fat CLAY & CLAYEY Sand	31	20	300	0	55	42-89

Where: D = Approximate Depth Below Bay Bottom

LL = Liquid limit (%)

PI = Plasticity index

C = Soil Cohesion, psf (undrained)

 ϕ = Angle of Internal Friction, deg. (undrained)

 γ_e = Effective soil unit weight, pcf

-#200 = Material passing #200 sieve, %

Exceptions to the stratigraphy provided in the soil profile tables above were observed. Of particular note, was the silty clayey sand and silty sand soils encountered at boring location B-3 between the mudline and the boring termination depth of 10-feet. A detailed description of the soils encountered are provided on the boring logs included in the Appendix.

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

Project Description

Based on information provided to RETL, the proposed project will include both wetland restoration and shoreline protection components. The project is planned to consist of the installation of a rock breakwater system to protect the marsh shoreline from erosion due to wave action and the construction of marsh mounds or terraces.

It is understood that specific locations for the wetland restoration and shoreline protection have not be determined within the areas of Site B and Site D in Moses Lake. Therefore, the recommendations provided within this report are general recommendations based on the soil conditions encountered at the boring locations throughout the Site B and Site D areas.

Three options are being considered for construction of the proposed marsh areas. The first option is to construct mounds by pumping dredge slurry and allowing it to free flow to create the mound. Mounds created using this technique are anticipated to have a crest elevation of approximately +2½-feet, a crest diameter of approximately 40-feet, side slopes ranging from 30H:1V to 50H:1V, and a base elevation of approximately -2-feet. The second option is to construct terraces using mechanical excavation and placement. The proposed terraces are anticipated to have a crest elevation of approximately +3-feet, a crest width of approximately 10-feet, side slopes of approximately 4H:1V, and a base elevation of approximately 2-feet. The third option is to construct a containment berm with dimensions similar to the terraces and pump dredge material inside of the berm with fill thicknesses similar to the mounds. The soils to construct the proposed marsh areas may be obtained from Dollar Bay or from upland areas.

Although it is understood the actual dimensions of the breakwater may vary, the assumptions stated in this report concerning assumed geometries of the breakwater are sufficient for this preliminary phase of the project.

Shoreline Protection

A stone breakwater will likely be utilized to stabilize the shoreline and protect the proposed wetlands by reducing erosion caused by dissipating wave action. The proposed breakwater is planned to have a crest elevation of approximately +3-feet, a crest width of approximately 5-feet, and side slopes of approximately 3H:1V. The base elevation of the breakwater is anticipated to be between -2 and -3-feet. It is anticipated that the material used to construct the breakwater will have a unit weight of approximately 165-pcf resulting in a maximum ground contact pressure on the order of 700 to 810 psf.

The geotechnical considerations for the rock breakwater, both during and after construction, are discussed below:

- Estimated ground contact pressures,
- Classification and bearing capacity of the supporting soils and
- Estimated immediate, differential and long-term settlements.

As depicted in the soil profile table provided above for borings B1 through B-16, the predominate soils encountered are plastic clay soils. The bearing capacity calculated for clay soils is dependent on the undrained shear strength of the clay soils. RETL estimates that the calculated ultimate bearing pressure at Site B (boring locations B-1 through B-12) is approximately 2,000 psf and at Site D (boring locations B-13 through B-16) on the order of 2,500 psf. The ultimate capacity of 2,000 to 2,500 psf is greater than the estimated ground contact pressure of 700 to 810 psf. Therefore, the in-situ soils encountered at the site should accommodate ground contact pressures of the magnitude exerted by the breakwater without the possibility of a classical bearing failure. RETL does not expect a classical bearing failure but initial settlement in areas with low soil strengths may create an associated mud wave. Estimated initial mudwave settlement in soft soil areas are estimated to be on the order of 1-foot.

Utilizing the information obtained within the scope of this project to a depth of 10feet, the estimated calculated long term consolidation settlement is on the order of 6 to 8-inches. Differential settlement is anticipated to be approximately one-half the total settlement. Soft soils at depths greater than 10-feet below the bay bottom, if present, will contribute to the settlement discussed above, but the magnitude of the settlement is impossible to predict given the lack of information on these deeper soils at depths greater than 10-feet below the bay bottom. If this information is desired, then it will be necessary for RETL to obtain additional soils data to a minimum depth of 70-feet below the bay bottom if the soils encountered exhibit normally consolidated or underconsolidated cohesive soil conditions or to a depth that preconsolidated clays are encountered to perform a more detailed settlement analysis.

Wetlands Restoration

Based on preliminary information provided to RETL by HDR Engineering, Inc., it is understood that the wetlands restoration work will include either a series of mounds or terraces using either material dredged from the borrow area or imported from an upland source. The borrow source materials encountered at borings B-17 through B-21 from the bay bottom and extending to a depth of approximately 10-feet consisted primarily of fine grained clay soils.. Due to the fines, clays and silts encountered at the boring locations, the discharge water velocity during dredging will have a significant impact on how quickly the soils will settle out of the discharge water. It is RETL's opinion that soils with a higher percentage of sand in a prospective borrow source will hasten construction of the proposed mounds.

Maximum ground contact pressure of a mound, given the proposed dimensions provided, is on the order of 420 psf. Maximum ground contact pressure of a terrace, given the proposed dimensions provided, is on the order of 480 psf. Utilizing generally accepted bearing capacity equations, RETL's analysis indicates that the in-situ soils have an ultimate bearing capacity of approximately 2,000 to 2,500 psf. The ultimate capacity of 2,000 to 2,500 psf is greater than the estimated ground contact pressure of 420 to 480 psf. Therefore, the in-situ soils encountered at the site should accommodate ground contact pressures of the magnitude exerted by the mounds and terraces without the possibility of a classical bearing failure.

Settlement of the supporting soils at the mound or terrace locations is a result of the ground contact pressure due to the placement fill soils used to construct the mounds or terraces and settlement of the soils making the mounds or terraces. Consolidation settlements of the soils supporting the mounds or terraces are estimated to be on the order of 4-inches to 7-inches and 90-percent of the total settlement can be expected to occur within 1 to 2-years of the load application. Consolidation settlement for soils supporting a containment berm and dredge soils are anticipated to be of a similar magnitude to that of the mounds or terraces.

Settlement of the soils within the mounds will be dependent upon what type of soils are selected for use to construct the mounds and the construction method. Sand soils, if used to construct the mounds, will experience relatively immediate settlements. Repeated tidal changes will result in a reduction if effective stress during high tides and and increase in the effective stress during low tide conditions which may delay the "loading" of the soils until extreme low tide events. Immediate settlements of sand soils within the mounds, which occur within approximately 7-days after the application of the load, are estimated to be on the order of 2-inches to 3-inches. Sands will only experience additional settlement if additional stress is applied above the previous maximum stress. Conversely, settlement of soils with significantly more fines, such as the clay soils encountered in most of the boring locations are more difficult to predict.

Due to the unpredictable nature of hydraulically placed clay soils, RETL recommends using sand soils to construct the mounds. Total settlement, taking into account the settlement of the supporting soils and settlement of the soils within the mounds constructed using sand soils is estimated to be on the order of 6 to 10-inches.

GENERAL COMMENTS

If significant changes are made in the character or location of the proposed project, a consultation should be arranged to review any changes with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

It is recommended that the services of RETL be engaged to test and evaluate the soils and to verify that the soils are consistent with those encountered by the boring operations. RETL cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the project if not engaged to also provide construction observation and testing for this project. If it is required for RETL to accept any liability, then RETL must agree with the plans and perform such observation during construction as we recommend.

APPENDIX



- GEOTECHNICAL ENGINEERING
- CONSTRUCTION MATERIALS
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October 21, 2015 Attn.: Mr. Philip Blackmar RETL Job No.: G115189 BORING LOCATION PLAN MOSES LAKE: WETLANDS RESTORATION PROJECTS Moses Lake/Dollar Bay Galveston, Texas

ROCK ENGINEERING & TESTING LABORATORY, INC.

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October 21, 2015 Attn.: Mr. Philip Blackmar RETL Job No.: G115189

BORING LOCATION PLAN MOSES LAKE: WETLANDS RESTORATION PROJECTS Moses Lake/Dollar Bay Galveston, Texas

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so	DE	SA	\∾∕	Z L H Q	ž	LL	PL	PI	PO PO	ST CO	ΔIΝ	DESCRIPTION OF STRATUM			
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	- 3	1													
	- 4	1													
	- 5														
	Ū	AUGE S-1	R	Qc= 1	32						37	CLAYEY SAND, gray, moist, very soft.			
	- 6											Same as above, stiff.			
		AUGE	R	Qc= 10	31										
	- 7	_ S-2			51										
			┝┻┤												
	- 8	1													
	- 9											Same as above, very stiff.			
	5	AUGE S-3	ĸ	Qc= 12	30	28	15	13			29				
	- 10	-	L												
	- 11	-										Same as above.			
		AUGE	R	Qc= 14	31						36				
21/15	- 12	_ S-4													
10/	40														
	- 13	1													
	- 14	AUGE										Same as above.			
ROC		S-5	Т		39										
ър Ди	- 15	-										Boring was terminated at a depth of 10-feet below the mudline.			
AKE												boning was terminated at a depart of to reet below the madmine.			
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<u>e</u>	Qc - 8	STAT	IC	CONE PE	INET	ROM	1ETE	R TE	EST IN	NDEX	Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.421342° W 94.912535°.				
	IV - V	ANE	SI	HEAR TES								Boring Location: Site B, Proposed Marsh Areas			

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		ING &	>									CLIENT: HDR Engineering, Inc.
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							TERBI					
SOIL SYMBOL	(FT)	SAMPLE NUMBER	S	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
L S	ОЕРТН (FT)	MPLI	SAMPLES	10NS 10NS	ISTL	LIQ	PLA	PLA	Y DE	MPR RENG	ISUN	SURFACE ELEVATION:
so	DE	SA	\ <mark>&</mark> ∕	N N N N N N N N N N N N N N N N N N N	ž	LL	PL	PI	PO	STI CO	Ξ	DESCRIPTION OF STRATUM
	- 1 - 2 - 3	-										WATER DEPTH: 3.0'
		AUGE S-1	ĸ	Tv= 0.14	41							
	- 4	1			+		+		+	+		FAT CLAY, gray, moist, very soft.
	- 5	AUGE	R	Tv= 0.34	32	51	15	36			84	
	- 6	- AUGE S-3		Tv= 0.84	48						84	Same as above, soft.
	- 8 - 9 - 10	- AUGE _ S-4	R	Tv= 0.66								Same as above. Boring was terminated at a depth of 7½-feet below the mudline.
				RD PENE								REMARKS:
	Qc - S	STAT	IC	CONE PE	ENET	ROM	1ETE					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.419007° W 94.909785°. Boring Location: Site B, Proposed Marsh Areas

									LO	G OF	B	ORING B-3 SHEET 1 of 1
	6	NG &	>									CLIENT: HDR Engineering, Inc.
	NEINEEL		ES		ck Eng 7 Leo	gineeri pard S	ng & 1 Street	resting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	₹ ¦{	IIF	┫╎	Co	bus C	hristi, e: 36	TX 78	409-1	703			LOCATION: Galveston, Texas
	PAT		OBP	Fax Fax	c 361	-883-4	711	4000				NUMBER: G115189
			~									DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE	LD D	AT	A		LABC	ORAT	OR	/ DAT	A		DRILLING METHOD(S):
												Hand Auger
					MOISTURE CONTENT (%)						MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
L L		SAMPLE NUMBER			CONTE	IMIT	PLASTIC LIMIT	PLASTICITY INDEX	▶ 년	E VE	OO SIE	
SOIL SYMBOL	H (FT)	E NU	ĒS	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ F	URE (LIQUID LIMIT	ASTIC	ASTIC	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	NO. 2	
SIIC	DЕРТН (FT)	AMPI	SAMPLES	: TON: CON: C: TON: C: TON:	AOIST		PL	PI	NUNI	COMPI TREN TONS	INUS	SURFACE ELEVATION: DESCRIPTION OF STRATUM
S		0,	\%/ 	ZTHQ	2		PL	PI		0 0 0	2	DESCRIPTION OF STRATUM
	- 1 - 2 - 3 - 4	-										WATER DEPTH: 5.0'
	- 5											SILTY CLAYEY SAND, gray, moist, very loose.
		AUGE S-1	$\left[\right]$	Qc= 1	36							
	- 6	1							+	+		SILTY SAND, gray, moist, very loose. (SM)
	- 7	AUGE	R	Qc= 6	29	NP	NP	NP			24	
	, '											
	- 8	_										
												Same as above.
	- 9	AUGE	R	Qc= 15	29							Same as above.
		S-3		QC- 15	29							
	- 10	-										
	- 11	-	T									Same as above.
		AUGE	R	Qc= 15	26						19	
10/21/15	- 12											
	- 13											
D I												
Т. П	- 14	AUGE	Þ									Same as above.
ROC		S-5		Qc= 7	24							
GP.	- 15	-										Boring was terminated at a depth of 10-feet below the mudline.
LAKE												
SES												
0 MO												
11518												
LOG_OF_BORING G115189 MOSES LAKE.GPJ ROCK ETL.GDT												
ORIN	N - S)AF				TES		SIST			REMARKS:
OF_B	Qc - 5	STAT	IC	CONE PE	NET	RON	1ETE	RTE	IST IN	NDEX		Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.421602° W 94.910181°.
log	Tv - V	'ANE	SF	HEAR TES	ST IN	IDEX						Boring Location: Site B, Proposed Marsh Areas
												-

									LO	G OF	• B(ORING B-4 SHEET 1 of 1
		NG &	>									CLIENT: HDR Engineering, Inc.
	NGINEEL		E'S		ck Eng 17 Leo	gineeri pard S	ng & 1 Street	resting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
				Co	rpus C	hristi.	TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas
	ORAT		ORP	Fax Fax	c: 361	-883-4	4711	4000				NUMBER: G115189
		<u> </u>	<u> </u>									DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE	LD D)AT	A					Y DAT	A		DRILLING METHOD(S):
						AT	TERB LIMIT					Hand Auger
					Т (%)				1		(%) =	GROUNDWATER INFORMATION:
		R			TEN	.	⊨	PLASTICITY INDEX			SIEVI	Due to the location of the project site, groundwater readings were not obtained.
Ы	_	JMBE			CO			È	F	B∧i (F	200	
ΥMB((FT)	UL E NL	ES	NS/F S/SQ VS/SQ	URE	LIQUID LIMIT	PLASTIC LIMIT	ASTIC	ENSI	GTH SQ F	°.	
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	MOISTURE CONTENT (%)			-	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
sc	DE	Ś	\ð/	z i i o	ž	LL	PL	PI	E S	5 S E	Ξ	DESCRIPTION OF STRATUM
	- 1	-										
	- 2	-										WATER DEPTH: 4.0'
	- 3											
	- 3											
	- 4	_										
		AUGE	R.	Tv= 0.18	31	33	12	21			54	SANDY LEAN CLAY, gray, moist, very soft. (CL)
	- 5	-										Same as above, soft.
		AUGE S-2	R.	Tv= 0.56	30							
	- 6	_ 3-2										
	- 7	_										
												Same as shows (CL)
	- 8	AUGE S-3	R.	Tv= 0.70	30	44	16	28			69	Same as above. (CL)
		S-3		10-0.70	50	44	10	20			09	
	- 9	-										
	- 10											
	10	AUGE										Same as above.
	- 11	_ S-4			46							
1/15	- 12	-										
10/2	10		T						+	+	+	FAT CLAY, gray, moist.
-CDI	- 13	AUGE	R		61						72	
	- 14	_										
ROC												Boring was terminated at a depth of 10-feet below the mudline.
GPJ												
LAKE												
DSES												
89 MC												
BORING G115189 MOSES LAKE.GPJ ROCK												
9 DN												DEMARKO.
BORI										REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed		
벙				CONE PE				R TE	ST II	NDEX		by RETL at GPS Coord. N 29.420176" W 94.910554°. Boring Location: Site B, Proposed Marsh Areas
LOG	. v - v	/ \ \ 					<u> </u>					

									LO	<u>G OF</u>	BC	CRING B-5 SHEET 1 of 1
	6	NG &	\mathbf{i}									CLIENT: HDR Engineering, Inc.
	NEINEEL		ES	68 1	7 Leo	pard S	Street	-	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
				🕑 🔪 🔪 Coi	rpus C	hristi, e: 36	TX 78	409-1 4555	703			LOCATION: Galveston, Texas
	ORAT		ORP	Fax Fax	c 361	-883-4	1-005-	4000				NUMBER: G115189
			<u> </u>									DATE(S) DRILLED: 8/31/15 - 8/31/15
	FIE	LD D)AT	A		LABC	ORAT	ORY	′ DAT	A		DRILLING METHOD(S):
							TERBI					Hand Auger
		ABER		<u>F</u>	MOISTURE CONTENT (%)			PLASTICITY INDEX	, , E	E C	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	DISTURE 0	LIQUID LIMIT	PLASTIC LIMIT		DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	NUS NO. 2	SURFACE ELEVATION:
so	DE	SA	\ <u>v</u>	Z L F O	ĕ	LL	PL	PI	DR PO	ST CC	Σ	DESCRIPTION OF STRATUM
	- 1 - 2 - 3 - 4	-										WATER DEPTH: 4.8'
	- 5	AUGE S-1	R	Qc= 0	43							CLAYEY SAND, gray, moist, very soft.
		S-1										Same as above.
	- 6	AUGE	R	Qc= 0	36							Same as above.
	- 7 - 8 - 9 - 10	AUGE S-3		Qc= 5	29	29	13	16			36	Same as above, firm. (SC)
												Same as above, very stiff.
	- 11	- AUGE	R	Qc= 15	28							
10/21/15	- 12	S-4		QC- 15	20							Same as above. (SC)
GD	- 13	AUGE	ĸ	Qc= 18	28	32	14	18			39	
E												Boring was terminated at a depth of 9-feet below the mudline.
G G115189 MOSES LAKE.GPJ ROCK												bonng was terminated at a depth of 9-reet below the mudime.
ы Ы	Qc - 8	STAT	IC	rd Pene Cone Pe Hear Tes	NET	ROM	1ETE				REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.421681° W 94.914693°. Boring Location: Site B, Proposed Marsh Areas	

									LO	<u>G OF</u>	- B	ORING B-6 SHEET 1 of 1
		ING &	>									CLIENT: HDR Engineering, Inc.
	NGINEEL		Es	1 / A 68	17 Lec	bard S	Street		g Labor	atory		PROJECT: Moses Lake/Dollar Bay
				(🌒 🔪 🗲 Co	rpus C	hristi.	TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas
	PRAT		ORP	Fa	x: 361	-883-4	4711	-000				NUMBER: G115189
		<u> </u>	<u> </u>									DATE(S) DRILLED: 9/14/15 - 9/14/15
	FIE	LD D)AT	A		LABC	ORAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	ES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/S0 FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
oll S'	PTH	MPL	SAMPLES		DIST				SUND	REN	NUS	SURFACE ELEVATION:
sc	DE	SA	\ <u>w</u>	/ ≍ĕ∺ő	Ĕ	LL	PL	PI	PC PC	S T S	Σ	DESCRIPTION OF STRATUM
	- 1 - 2 - 3	-										WATER DEPTH: 4.0'
	- 4	- AUGE	R	Tv= 0.20	58	70	20	50			89	FAT CLAY, gray, moist, very soft. (CH)
	- 5	S-1		1v= 0.20	50	/0	20	50			09	
	Ũ	AUGE	R									Same as above.
	- 6	AUGE _ S-2		Tv= 0.20	69							
	- 7 - 8 - 9	- AUGE S-3 -	R	Tv= 0.26	68						94	Same as above.
	10											
		AUGE	R	Tv= 0.20	74							Same as above.
0/21/1	- 12	1										
	- 13											Same as above.
TL.GI		AUGE S-5		Tv= 0.30								
LOG_OF_BORING G115189 MOSES LAKE.GPJ ROCK ET	- 14	_										Boring was terminated at a depth of 10-feet below the mudline.
LOG_OF_BORIN	Qc - 8	STAT	IC	RD PENE Cone Pe Hear te	ENET	RON	/IETE					REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.419021° W 94.911743°. Boring Location: Site B, Proposed Marsh Areas

									LO	g of	B	ORING B-7 SHEET 1 of 1
		INC P	$\overline{\times}$									CLIENT: HDR Engineering, Inc.
	NEINEE		ES	68 '	17 Led	pard S	Street		g Labor	atory		PROJECT: Moses Lake/Dollar Bay
K				Co Tel	rpus C ephon	hristi, ne: 36	TX 78 1-883-	409-1 4555	703			LOCATION: Galveston, Texas NUMBER: G115189
	RAI		cORP	Fax	x: 361	-883-4	1711					
					1							DATE(S) DRILLED: 8/31/15 - 8/31/15
	FIE			ΓA					/ DAT	A	1	DRILLING METHOD(S): Hand Auger
							TERB					
					NT (%			ШX			/E (%	GROUNDWATER INFORMATION:
		ER			NTE	⊢	МΙΤ				SIE	Due to the location of the project site, groundwater readings were not obtained.
30L	Ê	IUME							NITY SU.F	ET) H	. 200	
SYM	н Г	LE	LES	/S/NC/S/S/S/S/S/S/S/S/S/S/S/S/S/S/S/S/S/	TUR	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DEN9	NGT S/SQ	s NC	
SOIL SYMBOL	ОЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MOISTURE CONTENT (%)		 PL	_ <u>≂</u> PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION: DESCRIPTION OF STRATUM
				21170								
	- 1	1										
	- 2	-										WATER DEPTH: 3.0'
777	- 3											CLAYEY SAND, gray, moist, very soft.
		AUGE S-1		Tv= 0.16	33							
	- 4	1										Same as above, stiff. (SC)
	- 5	AUGE	ER	Tv= 1.04	36	36	11	25			48	
	Ū											
	- 6	-										
												SANDY LEAN CLAY, gray, moist, stiff. (CL)
	- 7	AUGE S-3	R	Tv= 1.04	34	42	13	29			59	
	- 8											
	Ũ											Boring was terminated at a depth of 5-feet below the mudline.
Ш												DEMARKO
												REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed
				CONE PE				R TE	ST IN	IDEX		by RETL at GPS Coord. N 29.420419° W 94.914561°. Boring Location: Site B, Proposed Marsh Areas
	· • - ١		- 01		5							

LOG_OF_BORING G115189 MOSES LAKE GPJ ROCK_ETL GDT 10/21/15

									LO	G OF	BC	ORING B-8 SHEET 1 of 1
		NG P	~									CLIENT: HDR Engineering, Inc.
	VEINEEL		E'S	68	7 Leo	pard S	Street		g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	K			Co	rpus C	hristi, e: 36	TX 78	409-1	703			LOCATION: Galveston, Texas
	PRATO		ORP	Fax Fax	c: 361	-883-4	4711	1000				NUMBER: G115189
					1							DATE(S) DRILLED: 9/14/15 - 9/14/15
	FIE	LD D)AT	A					/ DAT	A		DRILLING METHOD(S): Hand Auger
					_		TERB LIMIT					
		BER		. –	MOISTURE CONTENT (%)			PLASTICITY INDEX		ш	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
SOIL SYMBOL	Ē	SAMPLE NUMBER	6	S/FT SQ FT SQ FT /SQ F	SE C(LIQUID LIMIT	PLASTIC LIMIT	TICIT	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	0. 20	
SYA	DЕРТН (FT)	IPLE	SAMPLES	S/SNC	STUF	Ingl	PLAS	LAS	DEN	IPRE ENG	N Sr	SURFACE ELEVATION:
SOIL	DEP	SAN	SAM	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ F	MOM		PL	PI	POU	STR (TON	MIN	DESCRIPTION OF STRATUM
			ÌÍ									
	· 1											
	2	-										
												WATER DEPTH: 4.5'
	- 3	-										
	- 4											
	- 5	AUGE	R.	Tv= 0.80	47							CLAYEY SAND, gray, moist, firm.
	0	S-1		11 0.00								FAT CLAV grou moist your off
	6	AUGE	R.	Tu- 0.00	60						00	FAT CLAY, gray, moist, very soft.
		AUGE S-2		Tv= 0.02	60						82	
	- 7	1	₽									
	0											
	- 8											CLAYEY SAND, gray, moist, firm. (SC)
	- 9	S-3	K ·	Tv= 0.76	33	39	12	27			48	
	10	1										
	• 11	1										
12	12	4										
10/21/												
	- 13	-										FAT CLAY, gray, moist.
ETLO		AUGE	R		66						78	
ROCK	- 14	- 0-4										
PJ R												Boring was terminated at a depth of 10-feet below the mudline.
AKE.0												
SESL												
SOM @												
15185												
G G												
LOG_OF_BORING G115189 MOSES LAKE.GPJ	N - ST			RD PENE	TRAT		TES		SIST		•	REMARKS:
<u>в</u> (Qc - S	STAT	IC	CONE PE	INET	ROM	1ETE					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.420145° W 94.913042°.
LOG	ľv - V	ANE	SF	HEAR TES	ST IN	IDEX						Boring Location: Site B, Proposed Marsh Areas
-												

									LO	g of	BC	ORING B-9 SHEET 1 of 1
		NG &	>									CLIENT: HDR Engineering, Inc.
	GINEER		E.S.	Ro 68	ck Eng 17 Leo	gineeri	ng & T	Testing	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	ĨI	1TF		🔶 🔪 🔪 Co	rpus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	BORAN		ъP	RATE Tel Fax	ephon k: 361	ie: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
	~	Pr IN	<u>,</u>	-								DATE(S) DRILLED: 9/14/15 - 9/14/15
	FIE)AT	Ā			ORAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
					(%)			s I	-		(%)	GROUNDWATER INFORMATION:
					L			DEX			NE (Due to the location of the project site, groundwater readings were not obtained.
		BER			ILNC	Ŧ	TIMI	≚ ≻		ш	0 SIE	
1BOL	Æ	NUN	(0)	S O F T	С Ш		TIC L		SITY CU.F	SSIV TH 2 FT)	D. 20	
SYN	DEPTH (FT)	SAMPLE NUMBER	PLES	S/SNO S/SNO	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DEN	COMPRESSIV STRENGTH (TONS/SQ FT)	VIINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
SOIL SYMBOL	DEP.	SAM	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	MOI		PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
	- 1	1										
	- 2											
	2											WATER DEPTH: 4.0'
	- 3	-										
	- 4	-										LEAN CLAY, gray, moist, very soft. (CL)
		AUGE S-1	ĸ	Tv= 0.18	39	49	11	38			75	<u></u> , g.e., g.e.,, c., c., c.,
	- 5	1										Same as above.
	•	AUGE	R	Tv= 0.24	44							
	- 6] [[
	- 7	_										
	-											CLAVEY SAND grow maint year off
	- 8	AUGE	R	Tv= 0.48	29						30	CLAYEY SAND, gray, moist, very soft.
		S-3		1v= 0.46	29						30	
	- 9	-										Boring was terminated at a depth of 5-feet below the mudline.
12												
/1.2/0												
GTIDI89 MUSES LAKE.GFU KUCK_EIL.GUI 10/21/15												
80												
												REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed
				CONE PE				K IE	SIN	NDEX		by RETL at GPS Coord. N 29.418483° W 94.913578°. Boring Location: Site B, Proposed Marsh Areas
	. v - v	/ \ \ L			5							

									LOC	G OF	BC	CRING B-10 SHEET 1 of 1
		ING &	>									CLIENT: HDR Engineering, Inc.
	IGINEEE		ES	Ro 68	ck Eng 17 Leo	gineeri	ng & T Street	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	X : {	III		🔶 🔪 🔪 Co	rpus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	ABORAT		AP	Fax Fax	lephon x: 361	e: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
		P IN			T							DATE(S) DRILLED: 8/31/15 - 8/31/15
	FIE	LD D)AT	Ā					′ DAT	A		DRILLING METHOD(S): Hand Auger
							TERBI					
		L C			MOISTURE CONTENT (%)						MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
SOIL SYMBOL	FT)	SAMPLE NUMBER	s	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	RE CON	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	IO. 200 S	
L SYI	DЕРТН (FT)	APLE	SAMPLES	NONS/	ISTU	LIQU	PLAS	PLAS	NDS	APRE KENG NS/S	US N	SURFACE ELEVATION:
soll	DEP	SAN	SAN/	N H H H H H H H H H H H H H H H H H H H	MOI	LL	PL	PI	POL	STR TOI	MIN	DESCRIPTION OF STRATUM
	- 1	-										WATER DEPTH: 2.2' SANDY FAT CLAY, gray, moist, firm.
	- 3	AUGE	ĸ	Tv= 0.62	51							<u></u> , g ,
			t									CLAYEY SAND, gray, moist, very soft.
	- 4	AUGE	R	Tv= 0.12	27						47	
	- 5	-										
												CANDY FAT OLAY grove moint firm (CLI)
	- 6	- AUGE	R	T. 0.00	00			07				SANDY FAT CLAY, gray, moist, firm. (CH)
	_	AUGE S-3		Tv= 0.90	36	51	14	37			61	
]										Boring was terminated at a depth of 5-feet below the mudline.
/21/15												
G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
GPJ ROCK												
S LAKE												
MOSE												
5189 A												
BORING	J											REMARKS:
LOG_OF_BOF	Qc - \$	STAT	ΊC	RD PENE CONE PE HEAR TES	ENET	ROM	1ETE					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.419755° W 94.915731°. Boring Location: Site B, Proposed Marsh Areas

									LOC	G OF	BC	RING B-11 SHEET 1 of 1
		NG @	>									CLIENT: HDR Engineering, Inc.
	IGINEER		ES	Roc 681	ck Eng	gineeri pard S	ng & 1 Street	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
		III	-	🖌 🍼 🔪 Cor	bus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	BORAT		AB	Printer Tel Fax	epnon (: 361	e: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
			<i></i>									DATE(S) DRILLED: 8/31/15 - 8/31/15
	FIE	LD D	Α	ΓA		LABC	ORAT	ORY	′ DAT	A		DRILLING METHOD(S):
							TERB LIMIT					Hand Auger
					MOISTURE CONTENT (%)						(%)	GROUNDWATER INFORMATION:
		2					<u>–</u>	NDE			IEVE	Due to the location of the project site, groundwater readings were not obtained.
		MBE			NO	MIT		È	ᠵᄪ		S 00	
MBC	Ē	NN	S	S/FT SQ F SQ F S/SQ F	RE (STIC	STIC	NSIT S/CU	ESSI 11 10 10	10.2	
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	LOW NONS/ NONS/	ISTU	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	NDS	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
sol	DEF	SAN	SAN/	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	ΟW	LL	PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
	- 1	-										
												WATER DEPTH: 2.0'
777	- 2	-										CLAYEY SAND, gray, moist, very soft.
		AUGE		Qc= 1, Tv= 0.56	41							, g = y, s = y = s = s
	- 3	1	t	0.50								Same as above, firm.
		AUGE	R	Qc= 3, Tv=	32							
	- 4]		0.46								
	- 5	_										
												Same as above, stiff.
	- 6	AUGE S-3	R	0 10	24						40	
		S-3		Qc= 10, Tv= 0.06	31						48	
	- 7	-										
	•											
	- 8	1	T									Same as above, hard. (SC)
	- 9	AUGE _ S-4	R	Qc= 28, Tv= 0.40	30	32	11	21			42	
	Ū			10-0.40								Dering was terminated at a depth of 71/ fact below the mudling
												Boring was terminated at a depth of 7½-feet below the mudline.
21/15												
T 10/												
L.GD												
ы Х												
RO												
E.GP,												
RIAK												
OSE												
189 M												
BORING G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
												REMARKS:
				RD PENE ⁻ CONE PE								Boring location and depth were determined by RETL. Drilling operations were performed
<u> </u>				HEAR TES				11 10	.01 IP			by RETL at GPS Coord. N 29.418250° W 94.915859°. Boring Location: Site B, Proposed Marsh Areas
LOG												

									LOC	g of	BO	RING B-12 SHEET 1 of 1
		ING &	~									CLIENT: HDR Engineering, Inc.
	GINEEP		ES	Ro	ck Eng	gineeri pard S	ng & T	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	₹:{	III		Co	rpus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	ABORAT		CIP.	Fax Fax	ephon k: 361	ie: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
	~	A IN										DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE	ELD D)AT	Ā		LABC	ORAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
					(%)				1		(%)	GROUNDWATER INFORMATION:
		~			ENT						EVE	Due to the location of the project site, groundwater readings were not obtained.
		1BEF			ONT	Ę	- WI	≥		ų o	1S 00	
1BOI	Ē	NUN	0	SQF SQF	SE C		TICI	TICI	ISIT)	SSIV TH 2 FT	0.20	
SYN	TH (F	SAMPLE NUMBER	PLES	S/SNO S/SNO	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DEN	PRE ENG'	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
SOIL SYMBOL	DЕРТН (FT)	SAM	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MOIS		PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
-												
	- 1	1										
	- 2											WATER DEPTH: 3.5'
	2											
	- 3	_										
<i></i>												CLAYEY SAND, gray, moist, very soft.
	- 4	AUGE	R	Tv= 0.24	33							CLATET SAND, gray, moist, very son.
												SANDY LEAN CLAY, gray, moist, soft. (CL)
	- 5	AUGE S-2	R	Tv= 0.60	35	39	11	28			58	<u></u>
		S-2										
	- 6	-										
	- 7											
	「 ′											CLAYEY SAND, gray, moist, soft.
	- 8	AUGE	:K	Tv= 0.60	35							
	-											
	- 9	-										
												Same as above, firm.
	- 10	AUGE	R	Tv= 1.34	31						48	
		S-4		1.01								
	- 11	1										Boring was terminated at a depth of 7½-feet below the mudline.
10												
/21/1												
л 10												
L.GD												
Е												
ROC												
.GPJ												
LAKE												
SES												
39 MC												
G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
9 9												
BORING	N - S	ΤΑΝΓ			TRA		TES		SIST			REMARKS:
н	Qc - 3	STAT	ΊC	CONE PE	ENET	ROM	1ETE					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.418021° W 94.910185°.
	Tv - \	/ANE	Sł	HEAR TES	ST IN	IDEX						Boring Location: Site B, Proposed Marsh Areas

									LOC	G OF	BO	RING B-13 SHEET 1 of 1
		NG &	~									CLIENT: HDR Engineering, Inc.
	IGINEER		ES	Ro 68	ck Eng	gineeri pard S	ng & T Street	Testing	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	X : {	III		Co	rous C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	BORAT		AP	Fax Fax	epnon c: 361	e: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Pr III			1							DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE		DAT	Ā					/ DAT	A		DRILLING METHOD(S): Hand Auger
					_		TERB					
BOL		SAMPLE NUMBER		FT D FT D FT S D FT	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
SOIL SYMBOL	DЕРТН (FT)	LE N	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	TURI	aun	-AST	-AST	DRY DENSITY POUNDS/CU.F	COMPRESSIV STRENGTH (TONS/SQ FT)	S NO	
OIL \$	EPT	AMP	AMP		10IS				RY I	OMF TRE	INU NI	SURFACE ELEVATION:
Ñ	Δ	Ś	\v\ \v\	ΖĹΗŎ	Z	LL	PL	PI		Owe	Σ	DESCRIPTION OF STRATUM
	- 1 - 2 - 3	-										WATER DEPTH: 3.5'
	- 4	AUGE S-1	R	Tv= 0.22	46							SANDY LEAN CLAY, gray moist, very soft.
	- 5		J									FAT CLAY, gray, moist, very soft.
	- 5	AUGE	R	Tv= 0.22	34						89	
	- 6											
	Ũ											
	- 7											
			R									Same as above, soft. (CH)
	- 8	AUGE S-3		Tv= 1.00	32	85	27	58			95	
												Boring was terminated at a depth of 5-feet below the mudline.
NG G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
ш Н	Qc - S	STAT	IC	RD PENE CONE PE HEAR TES	INET	ROM	<b>1ETE</b>					REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.419797° W 94.951053°. Boring Location: Site D, Proposed Marsh Areas

									LOC	G OF	BC	RING B-14 SHEET 1 of 1
		NG &	>									CLIENT: HDR Engineering, Inc.
	<b>IGINEER</b>		E's	Rot	ck Eng	gineeri pard S	ing & T Street	Testing	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	<b>X</b> : {	III		Col	rpus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas
	ABORAT		RP	Fax Fax	ephon <: 361	ie: 36 -883-4	1-883- 1711	4555				NUMBER: G115189
	~		<u> </u>									DATE(S) DRILLED: 9/16/15 - 9/16/15
	FIE	LD D	Α	Ā		LABO	DRAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
					(%)				-		(%)	GROUNDWATER INFORMATION:
					ENT						ШЛ	Due to the location of the project site, groundwater readings were not obtained.
		ABEF			ONT	⊥₩	IWI	≚  ≿		L ا	1S 00	
ABOI	(L-	NN	0 0	SQ F SQ F SQ F	SE C		TIC	TICI	JSIT /CU.	SSIN TH Q FT	0. 2(	
SOIL SYMBOL	ОЕРТН (FT)	SAMPLE NUMBER	SAMPLES	S/SNC	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DEN	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
SOIL	DEP	SAN	SAM	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MOI		PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
			ÌÍ									
	- 1											
	- 1											WATER DEPTH: 2.5'
	- 2	_										
<i></i>												CLAYEY SAND, gray, moist, very soft.
	- 3	AUGE	R	Tv= 0.24	46							CLATET SAND, gray, moist, very son.
			$\mathbf{H}$									FAT CLAY, gray, moist, very soft.
	- 4	AUGE S-2	R	Tv= 0.34	34						95	
		5-2										
	- 5	1										
	- 6	AUGE	R	Tv= 0.48	33	50	14	36			92	Same as above, very soft. (CH)
	U	S-3		10-0.40			14				52	
	- 7	-	$\left  \right $									Boring was terminated at a depth of 4 ¹ / ₂ -feet below the mudline.
/15												
10/21												
GDT												
ETL												
SOCK												
SPJ F												
AKE.G												
ES L/												
SOM												
G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
BORING			יאר יאר	RD PENE			 тго	ים ד			1	REMARKS:
OF BC	QC - S	STAT	IC	CONE PE	ENET	RON	/ETE	RTE	EST IN	ANCE NDEX		Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.418929° W 94.950279°.
				HEAR TES								Boring Location: Site D, Proposed Marsh Areas
												1

									LOC	G OF	BO	RING B-15 SHEET 1 of 1
		NG &	~									CLIENT: HDR Engineering, Inc.
	NEINEEL		Es		ck Eng 17 Leo	gineeri pard S	ng & 1 Street	resting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	<b>X</b> : {	III		Col	rpus C	hristi.	TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas
	RORAT.		AR	Fax Fax	epnon c: 361	-883-4	1-883- 1711	4555				NUMBER: G115189
			9									DATE(S) DRILLED: 9/16/15 - 9/16/15
	FIE	LD D	)AT	A		LABC	ORAT	OR	′ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
					(%)		LIMIT		-		(%)	GROUNDWATER INFORMATION:
					ENT		L	AD EX			EVE	Due to the location of the project site, groundwater readings were not obtained.
		MBEI			LNO	MIT	LIMI.	<u>⊢</u>	ᠵ╘		00 S	
MBO	ET)	NU NU	S	S/FT SQ F SQ F S/SQ	REO		STIC	STICI	NSIT S/CU	ESSI TH Q F1	IO. 2	
SOIL SYMBOL	ОЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
SOI	DEF	SAN	SAN/	а́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́́	MO	LL	PL	PI	POL	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
			Π									
	- 1											
	- 2	-										WATER DEPTH: 4.0'
												WATER DEPTH. 4.0
	- 3	-										
	- 4		R									FAT CLAY, gray, moist, very soft.
		AUGE S-1		Tv= 0.20	57							
	- 5	1										Same as above, soft. (CH)
	- 6	AUGE	:R	Tv= 0.68	40	72	13	59			95	
	Ū											Boring was terminated at a depth of 2½-feet below the mudline.
												boining was terminated at a depth of 2/2-reet below the mudnine.
15												
10/21/												
100												
ETL.C												
N N												
2J R(												
Æ.GF												
SLA												
AOSE												
G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
BORING			┙╹				<u>דר</u> ס		י כוכד		1	REMARKS:
OF BC				rd pene [.] Cone pe								Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.418965° W 94.951697°.
				HEAR TES				_	-			Boring Location: Site D, Proposed Marsh Areas
<u> ا</u> ر												

									LOC	G OF	BO	RING B-16 SHEET 1 of 1
		NG &	>									CLIENT: HDR Engineering, Inc.
	IGINEER		ES	Roc 681	ck Eng	gineeri	ing & 1 Street	Testing	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	<b>X</b> : {	IIH	┥	Col	rpus C	hristi,	Street TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas
	BORAT		OBP	Fax Fax	ephon k: 361	-883-4	1-003- 1711	4000				NUMBER: G115189
		S IN	~									DATE(S) DRILLED: 9/16/15 - 9/16/15
	FIE		A	ΓA		LABC	DRAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERB					Hand Auger
					(%)				-		(%)	GROUNDWATER INFORMATION:
					ENT		⊢	PLASTICITY INDEX			IEVE	Due to the location of the project site, groundwater readings were not obtained.
_		MBEI		卢卢턴		MIT	LIMI	<u>≻</u>	ר ד	E C	S 00	
MBO	Ē	IN	S	S/FT SQ F SQ F S/SQ F	REO		PLASTIC LIMIT	STIC	NSIT S/CU	ESSI 3TH 3CFI	10. 2	
SOIL SYMBOL	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ F	MOISTURE CONTENT (%)	LIQUID LIMIT	PLA	PLA(	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	SURFACE ELEVATION:
SOI	DEF	SAI	/SA/	ланс Зано	0 M	LL	PL	PI	POI	STF STF	MIN	DESCRIPTION OF STRATUM
			Π									
	- 1	1										
	- 2	-										WATER DEPTH: 3.0'
	- 3											FAT CLAY, gray, moist, very soft.
		AUGE S-1	ĸ	Tv= 0.36	48						91	
	- 4	1	t									Same as above, soft. (CH)
	F	AUGE	R	Tv= 0.64	30	67	12	55			94	
	- 5	] -										
	- 6	_										
		AUGE	R									Same as above.
	- 7	AUGE - S-3		Tv= 0.74								
			┦┛┼									Boring was terminated at a depth of 4 ¹ / ₂ -feet below the mudline.
/15												
10/21												
GDT												
Ε												
Ś												
P. R												
AKE.G												
ES L/												
MOS												
G115189 MOSES LAKE.GPJ ROCK_ETL.GDT 10/21/15												
			 ` • -								I	REMARKS:
				rd pene [:] Cone pe								Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.418049° W 94.951083°.
				HEAR TES								Boring Location: Site D, Proposed Marsh Areas
ЦШ												

									LOC	G OF	BO	RING B-17 SHEET 1 of 1
		ING &	~									CLIENT: HDR Engineering, Inc.
	NEINEEL		E'S		ck Eng 17 Leo	gineeri pard S	ng & T Street	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	<b>X</b> : {		┥╎	🖌 🏷 Col	rpus C	hristi.	TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas
	PRAT		ORP	Fax Fax	c: 361	-883-4	1-885- 1711	4000				NUMBER: G115189
			/									DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE	LD D	)AT	A		LABC	ORAT	ORY	′ DAT	A		DRILLING METHOD(S):
							TERBI					Hand Auger
					MOISTURE CONTENT (%)						MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION:
		2			TEN		<u>–</u>	PLASTICITY INDEX			IEVE	Due to the location of the project site, groundwater readings were not obtained.
5		MBE			NOC	LIQUID LIMIT	PLASTIC LIMIT	Σ	노 토	а Л	000	
,MBC	(FT)		ŝ	/S/F1 /SQ1 /SQ1 S/SG	JRE	ן מר	STIC	STIC	S/CL	ESS GTH SQ F	0 V	
SOIL SYMBOL	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	)IST(	LIQ	PLA	PLA	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	NUS	SURFACE ELEVATION:
so	DE	SA	\v v	Z L F O	ž	LL	PL	ΡI	DR PO	STI STI	Σ	DESCRIPTION OF STRATUM
	- 1	-										
	- 2	-										
	•											
	- 3	1									WATER DEPTH: 6.0'	
	- 4	_										
	•											
	- 5	-										
	- 6		R.									FAT CLAY, gray, moist, very soft.
	- 7	AUGE		Tv= 0.02	73							
	'											Same as above.
	- 8	AUGE		Tv= 0.04	67						74	
			₽									
	- 9	-										
			T									Same as above.
	- 10	AUGE	R.	Tv= 0.18	74							
	- 11											
	••											
112	- 12	-										Same as above.
10/21		AUGE	R.	Tv= 0.16	68						83	
GDT	- 13	_ S-4		10-0.10								
OCK	- 14	1										
PJ R	- 15											Same as above.
AKE.0		AUGE S-5		Tv= 0.24	59							
SES L	- 16	-										Boring was terminated at a depth of 10-feet below the mudline.
SOM 6												
G115189 MOSES												
BORING	N - S'		)AF		TRA	ΓΙΟΝ	TES	T RF	SIST	ANCE		REMARKS:
6	Qc - 8	STAT	ΊC	CONE PE	INET	RON	<b>1ETE</b>					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.429551° W 94.920912°.
TOG	IV - V	/ANE	SF	HEAR TES	SEIN	IDEX				_		Boring Location: Dollar Bay, Prospective Borrow Source Area

									LOC	G OF	BC	RING B-18 SHEET 1 of 1
		NG 0	~									CLIENT: HDR Engineering, Inc.
	ICINEEL		E'S		ck Eng	gineeri pard S	ng & T Street	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay
	<b>X</b> : {		•] {	🕑 🔪 🔪 Co	rpus C	hristi, e: 36	TX 78	409-1	703			LOCATION: Galveston, Texas
	CRAT		OBP	Fax Fax	c: 361	-883-4	1-003-	4000				NUMBER: G115189
		<u>Service</u>	/									DATE(S) DRILLED: 9/15/15 - 9/15/15
	FIE	LD D	)AT	A		LABC	ORAT	OR	/ DAT	A		DRILLING METHOD(S):
							TERBI					Hand Auger
SOIL SYMBOL	-T)	SAMPLE NUMBER	0	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	LIQUID LIMIT		PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/S0 FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.
SYA	ОЕРТН (FT)	IPLE	SAMPLES	S/SNC	STUF	Ingri	SAJ	PLAS	DEN	IPRE ENG	N SL	SURFACE ELEVATION:
SOIL	DEP	SAN	SAM	P: TO DC: T DC: T	MOM		PL	PI	POU	STR	MIN	DESCRIPTION OF STRATUM
-	- 1 - 2 - 3 - 4 - 5	-										WATER DEPTH: 6.0'
	- 6	AUGE	R	Tv= 0.02	88						77	FAT CLAY, gray, moist, very soft.
	- 7	S-1		10-0.02								
			R.									Same as above.
	- 8	AUGE		Tv= 0.02	77							
			₽									
	- 9	-										
			T									Same as above.
	- 10	AUGE S-3	R.	Tv= 0.16	77						89	
	- 11											
19	- 12	-										Same as above.
10/21		AUGE	R.	Tv= 0.16	84							Same as above.
	- 13	_ S-4		10-0.10	04							
			P									
ð	- 14	1										
	- 15											Same as above.
KE.G	15	AUGE S-5	R.	Tv= 0.24	70						86	
ESLA	- 16	-										Poring was terminated at a dopth of 10 feet helew the mudline
MOS												Boring was terminated at a depth of 10-feet below the mudline.
15189												
G G11												
	N _ 9'		╷┙┍						SIGT			REMARKS:
<u>ଞ୍</u> ଜ (	Qc - 8	STAT	IC	CONE PERE HEAR TES	INET	ROM	1ETE					Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.425659° W 94.918583°. Boring Location: Dollar Bay, Prospective Borrow Source Area
												•

CLENT: HDR Engineering A. Testing Laboratory Bit? Leopard Bit?         Field DATA         Laboratory Bit? Leopard Bit?         Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspan="2">Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colsp										LOC	g of	BO	RING B-19 SHEET 1 of 1			
With Leaded Bree, 1993         Market Street, 1993         Location: Calveston, Texas NUMBER: G115189           FIELD DATA         LABORATORY DATA         DATE(S) DRILED: g1/515 - 9/15/15           FIELD DATA         LABORATORY DATA         DATE(S) DRILED: g1/515 - 9/15/15           GROUNOWATER INFORMATION: Data (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DATE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRIE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRIE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRIE(S) DRILED: g1/51/5 - 9/15/15           USE State (S) g1/51 - 9/15/15         DRIE(S) DRIE(S) g1/51/5           USE State (S) g1/51 - 9/15/15         DRIE(S) g1/51/51		A CONTRACT OF A											CLIENT: HDR Engineering, Inc.			
Under the second of the sec		IGINEEL		ES	Ro	ck Eng	gineeri	ng & T Street	esting	g Labor	atory		-			
Fac: 381-883-4711         Nonclastic - Orlog         Nonclastic - Orlog         Nonclastic - Orlog           FIELD DATA         LABORATORY DATA         DATE(S) DRILLED: 91/51/5 - 91/51/5         DATE(S) DRILLED: 91/51/5 - 91/51/5           Image: Strate of the stra		<b>∛;</b> {	IIH	┫╎	🕑 🔪 🔪 Coi	pus C	hristi,	TX 78	409-1	703			, ,			
FIELD DATA       LABORATORY DATA       PAILLING METHOD(S): Hand Ager         000000000000000000000000000000000000		180RAT		RP	Fax Fax	epnon c: 361	-883-4	1-883- 1711	4555				NUMBER: G115189			
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Notes     The 0.02     To 0.02		FIE		AT	A		LABC	ORAT	OR	/ DAT	A					
Visual													Hand Auger			
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1       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	SYN	TH (I	PLE	PLE	S/SNO	STUF	Ingl	LAS	LAS	DEN	IPRE ENG	N SL	SURFACE ELEVATION:			
Image: Normal and the second	SOIL	DEP	SAM	SAM	N H H H H H H H H H H H H H H H H H H H	ŇOW				POU	COV STR	MIN				
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1       2       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -																
Year       Water Depth: 5.5         6       Auder S-1       Tv= 0.08       64         7       Auder S-2       Tv= 0.02       75         8       -       -       -         9       -       -         10       -       -         11       -       -         12       Auger S-2       Tv= 0.12       77         11       -       -         12       Auger S-4       Tv= 0.10       75         13       -       -         14       -       -         15       -       -         16       -       -         17       N- STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETRATION TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.		- 1	1													
Year       Water Depth: 5.5         6       Auder S-1       Tv= 0.08       64         7       Auder S-2       Tv= 0.02       75         8       -       -       -         9       -       -         10       -       -         11       -       -         12       Auger S-2       Tv= 0.12       77         11       -       -         12       Auger S-4       Tv= 0.10       75         13       -       -         14       -       -         15       -       -         16       -       -         17       N- STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETRATION TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.		- 2														
Visual Construction         Visual Construction         Visual Construction         FAT CLAY. gray, moist, very soft.           6         AUGER S-1         Tv= 0.08         64         7         Same as above.           7         AUGER S-2         Tv= 0.02         75         77         Same as above.           9         AUGER Tv= 0.12         Tv= 0.12         77         Same as above.         Same as above.           10         - S-33         Tv= 0.12         77         8         Same as above.         Same as above.           11         - UGER Tv= 0.10         75         85         Same as above.         Same as above.           12         AUGER S-4         Tv= 0.10         75         85         Same as above.         Same as above.           14         - S-5         Tv= 0.24         Same as above.         Same as above.         Same as above.           15         - S-5         Tv= 0.24         Same as above.         Same as above.         Same as above.           16         - S-5         Tv= 0.24         Same as above.         Same as above.         Same as above.           16         - S-5         Tv= 0.24         Same as above.         Same as above.         Same as above.																
Year         Solution         Fat CLAY, gray, moist, very soft.           6         AUGER S-1         Tv= 0.08         64         77           7         AUGER S-2         Tv= 0.02         75         77           9         -         -         -         -           9         -         -         -         -           10         -         -         -         -           11         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           12         AUGER S-4         Tv= 0.10         75         -         85           13         -         -         -         -         -         -           14         -         -         -         -         -         -         -           15         -         -         -         -         -         -         -           1		- 3	-										WATER DEPTH: 5.5'			
Year         Solution         Fat CLAY, gray, moist, very soft.           6         AUGER S-1         Tv= 0.08         64         77           7         AUGER S-2         Tv= 0.02         75         77           9         -         -         -         -           9         -         -         -         -           10         -         -         -         -           11         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           11         -         -         -         -         -           12         AUGER S-4         Tv= 0.10         75         -         85           13         -         -         -         -         -         -           14         -         -         -         -         -         -         -           15         -         -         -         -         -         -         -           1																
N.         STANDARD PENETRATION TEST RESISTANCE Q.C.STATIC CONE PENETROMETER TEST INDEX         REMARKS: Boring location and deph were determined by RETL. Drilling operations were performed by 100-400-400-400-400-400-400-400-400-400-		- 4	-													
N.         STANDARD PENETRATION TEST RESISTANCE Q.C.STATIC CONE PENETROMETER TEST INDEX         REMARKS: Boring location and deph were determined by RETL. Drilling operations were performed by 100-400-400-400-400-400-400-400-400-400-																
6       Normalized and the second secon		- 5	-													
7       AUGER S.2       Tv= 0.02       75       77       77       Same as above.         9       -       -       -       -       -       Same as above.         9       -       AUGER 10       Tv= 0.12       77       Tv= 0.12       77         11       -       -       Same as above.       Same as above.       Same as above.         12       AUGER S4       Tv= 0.10       75       85       Same as above.         14       -       -       Same as above.       Same as above.         15       -       S5       Tv= 0.24       Boring was terminated at a depth of 10-feet below the mudline.         0       N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETRATION TEST RESISTANCE PRETL at GPS Cont All 3242725' W 94.913016'.       Boring was terminated by RETL Drilling operations were performed by RETL at GPS Cont All 32427235' W 94.913016'.			AUGE	R.									FAT CLAY, gray, moist, very soft.			
7       AUGER S-2       Tv= 0.02       75       77         9       -       -       -       -         9       -       -       -       -         10       -       S-3       Tv= 0.12       77         11       -       -       S-3       Tv= 0.12       77         11       -       S-4       Tv= 0.10       75       85         12       AUGER S-4       Tv= 0.10       75       85       Same as above.         14       -       S-4       -       Same as above.       Same as above.         14       -       S-5       Tv= 0.24       Same as above.       Same as above.         0       -       S-5       Tv= 0.24       Same as above.       Same as above.         0       -       S-5       Tv= 0.24       Same as above.       Same as above.         0       -       S-5       Tv= 0.24       Same as above.       Same as above.         0       -       Same as above.       Same as above.       Same as above.         0       -       Same as above.       Same as above.       Same as above.         0       -       Same as above.       Same as above. <td< td=""><td></td><td>- 6</td><td>S-1</td><td></td><td>Tv= 0.08</td><td>64</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>		- 6	S-1		Tv= 0.08	64										
10       -       -       -       -       Same as above.         10       -       S3       Tv= 0.12       77       -       85         11       -       -       Same as above.       Same as above.         12       AUGER       Tv= 0.10       75       85         13       -       -       Same as above.       Same as above.         14       -       Same as above.       Same as above.         15       -       S.5       Tv= 0.24       Same as above.         N - STANDARD PENETRATION TEST RESISTANCE Cc - STATIC CONE PENETROMETER TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.		- 7											Same as above.			
9       -       AUGER       Tv= 0.12       77       Same as above.         11       -       Same as above.       Same as above.         11       -       Same as above.       Same as above.         11       -       Same as above.       Same as above.         12       AUGER       Tv= 0.10       75       85         13       -       Tv= 0.24       Same as above.         15       -       S.5       Tv= 0.24       Same as above.         N - STANDARD PENETRATION TEST RESISTANCE Cc - STATIC CONE PENETROMETER TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.		ŕ	S-2	K I	Tv= 0.02	75						77				
10       -       Same as above.         11       -       Same as above.         11       -       Same as above.         12       AUGER S-4       Tv= 0.10       75         13       -       -         14       -       Same as above.         15       -       Same as above.         N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.		- 8	-	Ш												
10       -       Same as above.         11       -       Same as above.         11       -       Same as above.         12       AUGER S-4       Tv= 0.10       75         13       -       -         14       -       Same as above.         15       -       Same as above.         N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       Boring was terminated at a depth of 10-feet below the mudline.																
900       -       Same as above.         11       -       Same as above.         12       AUGER S-4       Tv= 0.10       75         13       -       -         14       -       Same as above.         15       -       S-5         Tv= 0.24       -       Boring was terminated at a depth of 10-feet below the mudline.         N - STANDARD PENETRATION TEST RESISTANCE Co - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL af GPS Cord. N. 29.427925" W 94.913016".		- 9	-										Same as above.			
10       -       S3       -       S3       -       S3       -       S3       -       S3       S3 </td <td></td> <td></td> <td>AUGE</td> <td>R .</td> <td>Tv= 0 12</td> <td>77</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			AUGE	R .	Tv= 0 12	77										
12       AUGER       Tv= 0.10       75       85       Same as above.         13       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -		- 10	S-3													
12       AUGER       Tv= 0.10       75       85       Same as above.         13       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -																
12       AUGER       Tv= 0.10       75       85         13       -       -       -       -       -         14       -       -       -       -       -         15       -       S-5       Tv= 0.24       -       Boring was terminated at a depth of 10-feet below the mudline.         N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS:       Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925' W 94.913016''.		- 11	1													
13       -       13       -       14       -       Same as above.         14       -        Soft       Tv= 0.24        Boring was terminated at a depth of 10-feet below the mudline.         15       -          Boring was terminated at a depth of 10-feet below the mudline.         N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.	2	- 12											Same as above.			
14       -       AUGER       Tv= 0.24       Same as above.         15       -       S.5       Tv= 0.24       Boring was terminated at a depth of 10-feet below the mudline.         N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.	0/21/1	12	AUGE	K .	Tv= 0.10	75						85				
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.		- 13	-	I												
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.	JLI.G															
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.	З	- 14	-										Same as above.			
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°.			AUGE	R .	Tv= 0.24											
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX Tv - VANE SHEAR TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°. Boring Location: Dollar Bay, Prospective Borrow Source Area	E.GP	- 15	S-5													
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX Tv - VANE SHEAR TEST INDEX       REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°. Boring Location: Dollar Bay, Prospective Borrow Source Area	3 LAK								+				Boring was terminated at a depth of 10-feet below the mudline.			
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX Tv - VANE SHEAR TEST INDEX REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°. Boring Location: Dollar Bay, Prospective Borrow Source Area	OSE															
N - STANDARD PENETRATION TEST RESISTANCE         Qc - STATIC CONE PENETROMETER TEST INDEX         Tv - VANE SHEAR TEST INDEX	189 M															
N - STANDARD PENETRATION TEST RESISTANCE         Qc - STATIC CONE PENETROMETER TEST INDEX         Tv - VANE SHEAR TEST INDEX    REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.427925° W 94.913016°. Boring Location: Dollar Bay, Prospective Borrow Source Area	3115															
M - STANDARD PENETRATION TEST RESISTANCE       REMARKS:         Boring location and depth were determined by RETL. Drilling operations were performed       by RETL at GPS Coord. N 29.427925° W 94.913016°.         Boring Location: Dollar Bay, Prospective Borrow Source Area       Boring Location: Dollar Bay, Prospective Borrow Source Area		J														
Qc - SIATIC CONE PENETROMETER TEST INDEX     by RETL at GPS Coord. N 29.427925° W 94.913016°.       Boring Location: Dollar Bay, Prospective Borrow Source Area	BOR															
	Ъ,								R TE	STIN	NDEX		by RETL at GPS Coord. N 29.427925° W 94.913016°.			
	ΓΟ̈	IV - V		5									Soung Loodion, Bondi Buy, Froepoolito Borron Cource Alca			

									LOC	RING B-20 SHEET 1 of 1				
		NG &	>							CLIENT: HDR Engineering, Inc.				
	IGINEER		ES	Rot	ck Eng	gineeri pard S	ng & T Street	esting	g Labor	atory		PROJECT: Moses Lake/Dollar Bay		
		IIH	-1 (	🖌 🏷 Col	rpus C	hristi.	TX 78	409-1	703			LOCATION: Galveston, Texas		
	BORAT		RP	Fax Fax	epnon c: 361	e: 36 -883-4	1-883- 1711	4555				NUMBER: G115189		
		P. IN	/									DATE(S) DRILLED: 9/15/15 - 9/15/15		
	FIE	LD D	AT	A		LABC	DRAT	ORY	/ DAT	A		DRILLING METHOD(S):		
							TERB					Hand Auger		
D.	<b>DEPTH (FT)</b>	SAMPLE NUMBER			MOISTURE CONTENT (%)			NDEX	DRY DENSITY POUNDS/CU.FT	T) VE	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Due to the location of the project site, groundwater readings were not obtained.		
SOIL SYMBOL		NU U	ES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ F	URE	ID	ASTIC	ASTIC	ENSI.	COMPRESSIVE STRENGTH (TONS/SQ FT)	0 Z			
OIL S'	EPTH	MPL	SAMPLES		OIST				SUNE	IREN ONS/	NUS	SURFACE ELEVATION:		
SC	DE	S (	\ଡ∕	z⊾⊢õ	ž	LL	PL	PI	E C	0 IS E	Σ	DESCRIPTION OF STRATUM		
-	· 1 · 2 · 3 · 4 · 5	-										WATER DEPTH: 6.0'		
	6	AUGE	R -	Tv= 0.02	72							FAT CLAY, gray, moist, very soft.		
	· 7	-										Same as above.		
		AUGE S-2	R -	Tv= 0.08	68									
	8													
	9	_	$\square$											
	Ū											CLAYEY SAND, gray, moist, soft.		
	10	AUGE	R.	Tv= 0.92	29	31	11	20			42	CLATET SAND, gray, moist, son.		
		S-3		10-0.92	25						42			
	11	-	₽											
	10													
121/16	12	]										Same as above.		
	13	AUGE _ S-4	К -	Tv= 0.54	29						42			
			Ш											
×	14	-												
No.							+	<u> </u>				FAT CLAY, gray, moist.		
d'	15	AUGE S-5	R		94									
	10	5-5												
OSE	16	1										Boring was terminated at a depth of 10-feet below the mudline.		
189 M														
G115														
<u>ଞ୍</u> ଚି (	N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX Tv - VANE SHEAR TEST INDEX											REMARKS: Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.429619° W 94.904736°. Boring Location: Dollar Bay, Prospective Borrow Source Area		
⊐L												1		

									LOC	G OF	BO	RING B-21 SHEET 1 of 1			
		ING &	~							CLIENT: HDR Engineering, Inc.					
	Rock Engineering & Testing Laboratory 6817 Leopard Street Corpus Christi, TX 78409-1703											PROJECT: Moses Lake/Dollar Bay			
			┥╎	🕑 🔪 🔪 Col	rpus C	hristi.	TX 78 1-883-	409-1	703			LOCATION: Galveston, Texas			
	RAT		ORP	Fax Fax	c: 361	-883-4	1-885- 1711	4000				NUMBER: G115189			
			/									DATE(S) DRILLED: 9/15/15 - 9/15/15			
	FIE	LD D	)AT	A		LABC	ORAT	ORY	′ DAT	A		DRILLING METHOD(S):			
							TERBI					Hand Auger			
					MOISTURE CONTENT (%)						MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION:			
		2			TEN		<u>–</u>	PLASTICITY INDEX			IEVE	Due to the location of the project site, groundwater readings were not obtained.			
2		SAMPLE NUMBER			NOC	TIMI	PLASTIC LIMIT	Σ	ᠵᄖ	T VE	500 S				
,MBC	(FT)		ŝ	/S/F1 /SQ I /SQ I /SQ F	JRE (	LIQUID LIMIT	STIC	STIC	NSI1	ESS GTH SQ F	Ő.				
SOIL SYMBOL	ОЕРТН (FT)	MPLI	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	JISTL	LIQI	PLA	PLA	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)		SURFACE ELEVATION:			
so	DE	SA	\&∕	Z L F O	ž	LL	PL	ΡI	DR PO	STI CO	ž	DESCRIPTION OF STRATUM			
	- 1	-													
	- 2	-													
	- 3	-										WATER DEPTH: 6.0'			
	- 4														
	4														
	- 5	_													
	- 6											SANDY FAT CLAY, gray, moist, very soft.			
	_	AUGE S-1		Tv= 0	64						66				
	- /	1	Ţ									Same as above.			
	- 8	AUGE	R	Tv= 0.12	52										
	Ũ														
	- 9	-													
												Same as above.			
	- 10	AUGE S-3	R.	Tv= 0.08	58						69				
		S-3													
	- 11	1													
<i>ی</i>	- 12														
0/21/1		AUGE	R									Same as above.			
	- 13	_ S-4		Tv= 0.08	58										
ETL.G			₽												
OCK.	- 14	-													
			T									Same as above.			
Œ.GF	- 15	AUGE	R.	Tv= 0.14											
IS LA	- 16														
G115189 MOSES												Boring was terminated at a depth of 10-feet below the mudline.			
51891															
BORING											REMARKS:				
				rd pene [:] Cone pe								Boring location and depth were determined by RETL. Drilling operations were performed by RETL at GPS Coord. N 29.425608° W 94.903854°.			
<u> </u>				HEAR TES								Boring Location: Dollar Bay, Prospective Borrow Source Area			
<b>۲</b>	o"     Iv - VANE SHEAR TEST INDEX     Boring Locatio											l			



Engineering & Testing Laboratory, Inc.

Rock Engineering & Testing Laboratory 6817 Leopard Street Corpus Christi, TX 78409-1703 Telephone: 361-883-4555 Fax: 361-883-4711

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KEY TO SOIL CLASSIFICATION AND SYMBOLS UNIFIED SOIL CLASSIFICATION SYSTEM TERMS CHARACTERIZING SOIL													
MAJOR D			-	FICATION SYST	NAME			ACTERIZING SOIL					
		GW		Well Graded Gra little or no fines	avels or Gravel-Sand mixtures,	, 5	SLICKENSIDED - having inclined planes of weakness that are slick and glossy in						
	GRAVEL AND			Poorly Graded C little or no fines	Gravels or Gravel-Sand mixture		<ul> <li>appearance</li> <li>FISSURED - containing shrinkage cracks,</li> <li>frequently filled with fine sand or silt; usually</li> </ul>						
	GRAVELLY SOILS	GM		Silty Gravels, G	ravel-Sand-Silt mixtures	1	more or less vertical	) - composed of thin layers					
COARSE GRAINED		GC		Clayey Gravels,	Gravel-Sand-Clay Mixtures		of varying color and to sand or silt at the bot	exture, usually grading from					
SOILS		SW		Well Graded Sa fines	nds or Gravelly Sands, little or	no C	CRUMBLY - cohesive s blocks or crumbs on	oils which break into small drying					
	SAND AND	SP		Poorly Graded S no fines	ands or Gravelly Sands, little c		of calcium carbonate						
	SANDY SOILS	SM		Silty Sands, Sar	nd-Silt Mixtures	V	WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes POORLY GRADED - predominantly of one grain size uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip						
		SC		Clayey Sands, S	Sand-Clay mixtures	F							
	SILTS	ML		Silty or Clayey fi	nd very fine Sands, Rock Flour ne Sands or Clayey Silts	r,	graded)						
	AND CLAYS LL < 50	CL		Inorganic Clays Gravelly Clays, S Clays	of low to medium plasticity, Sandy Clays, Silty Clays, Lean		SYMBOLS FOR TEST DATA         Image: Constraint of the symple         Image: Constraint of the symple						
FINE GRAINED		OL		Organic Silts an plasticity	d Organic Silt-Clays of low								
SOILS	SILTS	мн		Inorganic Silts, I Sandy or Silty so	Micaceous or Diatomaceous fin pils, Elastic Silts	ne							
	AND CLAYS LL > 50	сн		Inorganic Clays	of high plasticity, Fat Clays								
		он		Organic Clays o Organic Silts	f medium to high plasticity,								
HIGHLY ( SO	DRGANIC ILS	PT /	<u> </u>		Highly Organic soils		— Rock C	ore					
	<b></b>				DESCRIBING CONSISTENCY								
	COARSE G	RAINED					GRAINED SOILS						
	RIPTIVE ERM		STAN	LOWS/FT. DARD PEN. TEST	DESCRIPTIVE TERM		IO. BLOWS/FT. TANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.					
Very Loose Loose Medium Dense Very Dense			1 3	0 - 4 4 - 10 0 - 30 0 - 50 ver 50	Very Soft Soft Firm Stiff Very Stiff Hard		< 2 2 - 4 4 - 8 8 - 15 15 - 30 over 30	< 0.25 0.25 - 0.50 0.50 - 1.00 1.00 - 2.00 2.00 - 4.00 over 4.00					
					Field Classification for "Cons	sistency	" is determined with a (	0.25" diameter penetrometer					