December 16, 2020
Job No. 528-006-20

Rockworth Companies
4655 South 2300 East, Suite 205
Holladay, Utah 84117

Attention: Mr. Tom Henriod

Ladies and Gentlemen:

Re: Response Letter No. 3-rev1
Review of Geotechnical Study and Slope Stability Analysis
Proposed Wasatch Rock Development
6695 Wasatch Boulevard
Cottonwood Heights, Utah

As part of Cottonwood Heights Sensitive Lands Evaluation and Development Standards (SLEDS) review, Mr. Daniel Brown of GeoStrata completed a review of the geotechnical study and slope stability analysis dated May 13, 2020[1], final slope stability analysis dated October 7, 2020[2], and the previously completed response letter dated July 9, 2020[3]. As a result of this review, several items of clarification or additional information were requested by Mr. Brown as outlined in the review letter dated November 3, 2020. The current items of clarification and our responses are provided below:

Current Comment 4

In the October 7, 2020 Gordon Geotechnical report, cross-section A-A' was updated based on additional subsurface data obtained from new boreholes. Section 6, Conclusions, of the October 7, 2020 Gordon Geotechnical report states:

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1 "Report, Geotechnical Study and Slope Stability Analysis, Proposed Wasatch Rock Development, 6695 Wasatch Boulevard, Cottonwood Heights, Utah," G² Job No. 528-005-20, Dated May 13, 2020.

2 "Report, Final Slope Stability Analysis, Proposed Wasatch Rock Development, 6695 Wasatch Boulevard, Cottonwood Heights, Utah," G² Job No. 528-006-20, Dated October 7, 2020.

3 "Response Letter, Review of Geotechnical Study and Slope Stability Analysis, Proposed Wasatch Rock Development, 6695 Wasatch Boulevard, Cottonwood Heights, Utah," G² Job No. 528 005 20, Dated July 9, 2020.

"The condominium structure at Section A-A' incorporates a deep cut for below-grade parking. A structural element must extend a minimum of 5 feet below the bottom of footings on the cut side to assure an adequate factor of safety. This may consist of deep foundations, soil improvement, or a permanent shoring solution such as soil nails. A depth of 5 feet is shallower than previously recommended in the May 13, 2020 report. This is due to the lack of groundwater encountered to depths of 81 feet at boring locations B-9 and B-10. The projected groundwater is deeper in the updated slope stability models resulting in more favorable slope stability conditions."

GeoStrata recommends that Cottonwood Heights City request that internal, external, and global stability of the permanent shoring and/or retaining wall to be constructed on the uphill side of the proposed condominium structure be evaluated prior to approval for construction. This evaluation will likely be completed during final design of this structure and should include and assessment of temporary cut and/or shoring during construction.

In addition, GeoStrata recommends that Cottonwood Heights City request that the constructability of the required cuts for this structure be investigated for feasibility. It is likely that additional geotechnical recommendations will be required for this portion of the project in order to decrease the potential for collapse of larger cuts within the unconsolidated granular sediments.

G² Response to Current Review Comment 4

Our slope stability analysis indicates that a shoring system will be required to maintain excavation sidewall stability and global stability of the large cuts associated with the condominium structure. There is most likely not sufficient space on the site to open cut this excavation. We recommend that the structural element requirement be considered as part of the shoring or footing design since it would likely be installed by drilling/shoring contractors.

Based on our understanding of the subsurface conditions and experience with deep below grade construction, a top-down cut with a shoring system such as soldier pile and lagging, tieback, or soil nail walls are feasible for this project. G² works with several shoring contractors in Salt Lake City with extensive experience installing permanent and temporary showing walls.

Temporary or permanent shoring systems are typically designed by the contractor performing the work. The shoring system design requires a significant amount of engineering and therefore is typically not performed until the building construction plans have been finalized. Minor changes to the building layout or footing elevations would require a complete re-design of the shoring/deep foundation system.

G² must review the shoring design to ensure that it conforms to the recommendations in our geotechnical study and slope stability analysis.

Current Comment 6

In both the July 9, 2020 Gordon Geotechnical response letter and in the October 7, 2020 Gordon Geotechnical report, strength parameters of the 'Concrete Washout' were updated to match the strength parameters of the 'Site Grading Fill' as requested in our June 17, 2020 review letter. This portion of the comment may be considered addressed.

However, in Section 6.0 "Conclusions" of the October 7, 2020 G^2 report, it states "Section B-B' indicates that concrete washout material may remain in place provided that any loose or raveling material is removed and the concrete washout is competent."

GeoStrata recommends that Cottonwood Heights City request clarification concerning how the competency of this material is to be assessed, and when such assessments would need to be completed or that the concrete washout material be considered undocumented fill which will require removal, replacement, and compaction to rebuild the slope to satisfactory conditions.

G^2 Response to Current Review Comment 6

The concrete washout material was found to be relatively competent and intact during G^2's field investigation and testing. Our updated slope stability analysis with reduced strength parameters indicated that the concrete washout material can be left in place and maintain global stability of proposed fill slopes. However, some loose blocks and raveling material was observed in the current gravel pit cut slope face near the location of Cross-Section B-B' and is anticipated to be encountered during site grading. The competency of this material will be assessed during initial earthwork site preparation for mass grading. Any loose or raveling material encountered on the slope face during preparation for placement of site grading fill slopes will be considered unsuitable and must be completely removed. G^2 can observe the site preparation and assess the competency of these materials as needed.

Current Review Comment 12

Section 5.1.3, Soil Strength, of the October 7, 2020 Gordon Geotechnical report states:

"The soil parameters were selected for analysis based upon direct shear test results performed on undisturbed and laboratory recompacted samples. Strength parameters for the more coarse- grained granular soils were selected based upon our experience with similar soils in the area. These coarse-grained sand and gravel soils are projected to exhibit relatively high strengths based on their performance history in gravel pit cut slopes which have been known to stand near- vertical for extended periods of time. The cohesive characteristic and friction angle of these granular soils may be explained by a slight cementation and interlocking of particles. Strength parameters of concrete washout are estimated as being equal to that of site grading fill.

The table on the following page summarizes the soil strength values utilized for static and seismic conditions."

Soil Type	Soil Parameter	Parameter Units
Lacustrine Sand and Gravel	Cohesion	200 (psf)
	Friction Angle	36
	Unit Weight	120 (pcf)
Laminated Silty Fine Sand Beds, Poorly Graded Sand Beds, Lacustrine Sand	Cohesion	0 (psf)
	Friction Angle	33
	Unit Weight	120 (pcf)
Lacustrine Fines	Cohesion	150 (psf)
	Friction Angle	27
	Unit Weight	120 (pcf)
Site Grading Fill (Compacted Washout Fines)	Cohesion	350 (psf)
	Friction Angle	33
	Unit Weight	120 (pcf)
Site Grading Fill (Compacted Sand and Gravel)	Cohesion	250 (psf)
	Friction Angle	38
	Unit Weight	120 (pcf)
Concrete Washout	Cohesion	350 (psf)
	Friction Angle	33
	Unit Weight	130 (pcf)
Pre-Lake Bonneville Landslide Deposits	Cohesion	0 (psf)
	Friction Angle	21
	Unit Weight	120 (pcf)
Pre-Lake Bonneville Alluvial Fan Deposits	Cohesion	200 (psf)
	Friction Angle	36
	Unit Weight	120 (pcf)

The table above lists soil strength parameters utilized in the slope stability assessment for the proposed development. GeoStrata recommends that Cottonwood Heights City request that the consultant add a column to this table to list the source of each of these soil strength parameters, i.e. sample location, depth, etc.

While responding to this comment, it is recommended that the Consultant note Section 3.0 (a) *Submittals* of Title 19.72 of the Cottonwood Heights City Code, which states; "*Submittals for*

review shall include boring logs; geologic cross sections; trench and test pit logs; laboratory data (particularly shear strength test results, including individual stress-deformation plots from direct shear tests); discussions pertaining to how idealized subsurface conditions and shear strength parameters used for analyses were developed; analytical results, and summaries of the slope stability and conclusions regarding slope stability. Section 6.0 (a) of the Cottonwood City Code states; *"Adequate evaluation of slope stability for a given site requires thorough and comprehensive geologic and geotechnical engineering studies. These studies are a crucial component in the evaluation of slope stability. Geologic mapping and subsurface exploration are normal parts of field investigation. Samples of earth materials are routinely obtained during subsurface exploration for geotechnical testing in the laboratory to determine the shear strength and other pertinent engineering properties.*

It should be noted that all soil strength parameters need to be based either on laboratory testing completed on representative samples of the soils being investigated, or on correlations between other laboratory or field investigation parameters (such as SPT blow counts). Soil strength parameters based on "experience with similar soils in the area" are not considered to represent appropriate sources of soil strength parameters.

G² Response to Current Review Comment 12

A column has been added to our strength parameters table indicating the source of the strength parameters for each material.

The table is presented below:

Soil Type	Soil Parameter	Parameter Units	Source of Strength Parameters
Lacustrine Sand and Gravel	Cohesion	200 (psf)	SPT blow count data (using Peck, Hansen, and Thornburn 1953 correlation), partial gradation tests, and direct shear on a representative remolded sample of lacustrine sand and gravel from adjacent gravel pit, "Sample C". The friction angle and cohesion were conservatively lowered from the test result on the laboratory compacted sample.
	Friction Angle	36	
	Unit Weight	120 (pcf)	
Laminated Silty Fine Sand Beds, Poorly Graded Sand Beds, Lacustrine Sand	Cohesion	0 (psf)	Minimum of: Direct Shear: B-3 at 75' Direct Shear: B-2 at 40' Direct Shear: B-4 at 5'
	Friction Angle	33	
	Unit Weight	120 (pcf)	

Soil Type	Soil Parameter	Parameter Units	Source of Strength Parameters
Lacustrine Fines	Cohesion	150 (psf)	Direct Shear: B-2 at 35'
	Friction Angle	27	
	Unit Weight	120 (pcf)	
Site Grading Fill (Compacted Washout Fines)	Cohesion	350 (psf)	Compaction and Direct Shear: representative sample of fill source from adjacent washout fines piles, TP-5
	Friction Angle	33	
	Unit Weight	120 (pcf)	
Site Grading Fill (Compacted Sand and Gravel)	Cohesion	250 (psf)	Compaction and Direct Shear: representative sample of granular fill source from adjacent gravel pit, "Sample C". Cohesion conservatively lowered.
	Friction Angle	38	
	Unit Weight	120 (pcf)	
Concrete Washout	Cohesion	350 (psf)	Field investigation and SPT testing (Boring B-1), strength of low-grade concrete, conservative comparison to compacted site grading fill from direct shear on TP-5 washout fines.
	Friction Angle	33	
	Unit Weight	130 (pcf)	
Pre-Lake Bonneville Landslide Deposits	Cohesion	0 (psf)	Residual Ring Shear: B-6 at 30' and Stark correlation with clay fraction and liquid limit of B-5 at 30' and B-5 at 32.5'. The laboratory test result was determined to be more representative due to interpreted age of the deposit and re-bonding of the clay minerals with time. Correlations were considered for comparison.
	Friction Angle	21	
	Unit Weight	120 (pcf)	
Pre-Lake Bonneville Alluvial Fan Deposits	Cohesion	200 (psf)	Blow count data (B-6 at 40') and conservative comparison to Lacustrine sand and gravel. Comparison is conservative because the interpreted age is much older than lacustrine sand and gravel
	Friction Angle	36	
	Unit Weight	120 (pcf)	

Job No. 528-006-20
Response Letter No. 3-rev1
December 16, 2020

GORDON GEOTECHNICAL ENGINEERING, INC.

If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

Gordon Geotechnical Engineering, Inc.

Jordan K. Culp, State of Utah No. 10975604
Professional Engineer

Reviewed By:

Patrick R. Emery, State of Utah No. 7941710
Professional Engineer

JKC/PRE:sn

Encl. Appendix A, Laboratory Strength Testing Data

Addressee (email only)

12-16-20

APPENDIX A

Laboratory Strength Testing Data

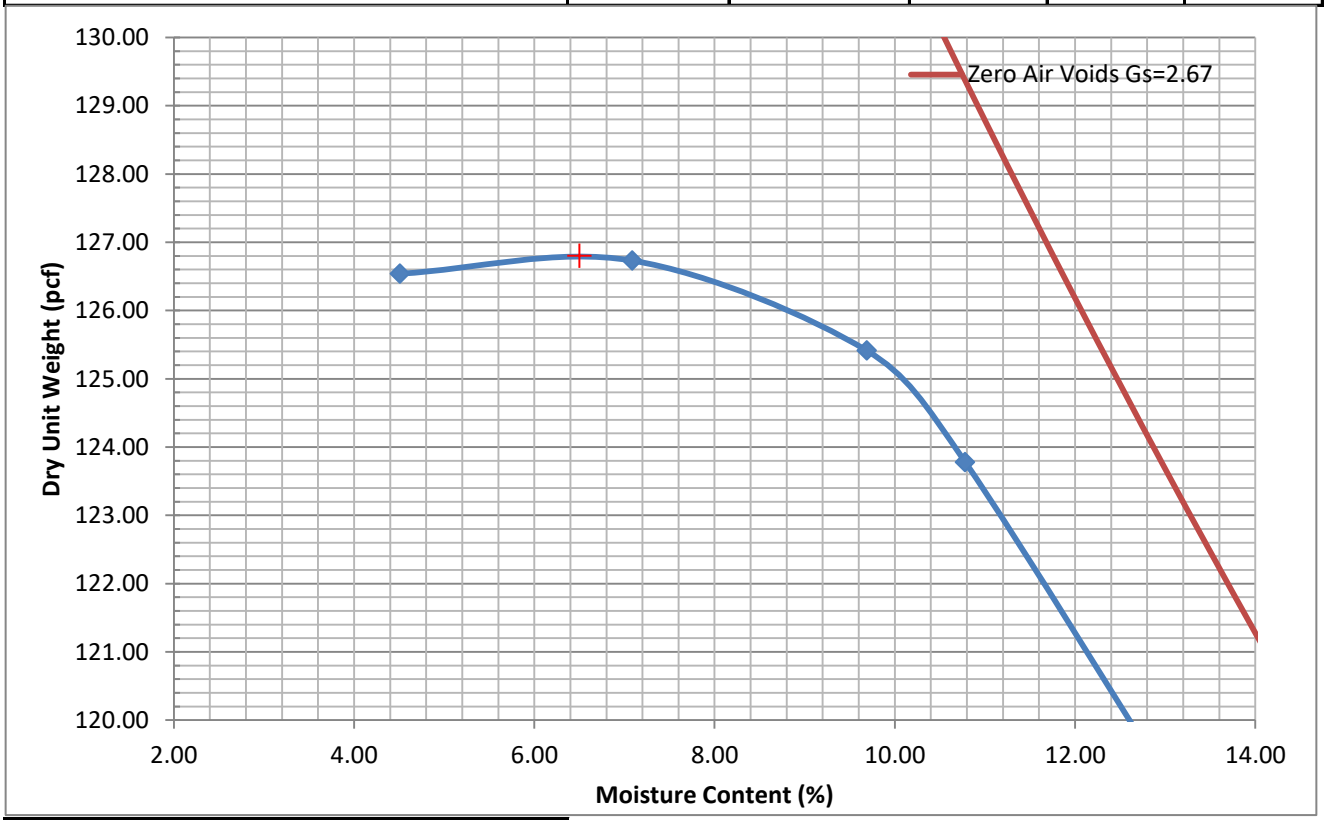
Proctor Compaction Test (ASTM 1557 Method C)

Project:	View 62		Job No.:	528-002-18		Date:	
Boring/TP:	Sample C	Sample No.:	Native Mix	Depth:	Borrow	Engineer:	WJG
Soil Description:	Test #1	Well Graded sand and gravel mixture					
Volume of Mold:	0.75	Weight of Hammer:		10	blows/layer: 56		Layers: 5

Test No.	Weight of Mold (g)	Weight of mold +moist soil (g)	Weight of Moist Soil (g)	Moist Unit Weight (pcf)	Moisture Content (%)	Dry unit weight (pcf)	Water Added
1	4235	8734	4499	132.24	4.51%	126.54	
2	4235	8852	4617	135.71	7.09%	126.73	
3	4235	8915	4680	137.56	9.69%	125.41	
4	4235	8900	4665	137.12	10.78%	123.78	
5	4235	8793	4558	133.98	13.56%	117.98	

Moisture Content Determination

Test No.	1	2	3	4	5
Pan No.	32	E	o	48	22
Weight of Pan (g)	40.88	43.18	43.11	40.87	40.4
weight of Pan + moist soil (g)	367.72	417.93	244.71	283.58	319.06
Weight of Pan + dry soil (g)	353.62	393.13	226.9	259.96	285.78
moisture Content	4.51%	7.09%	9.69%	10.78%	13.56%



Optimum Moisture Content:	6.5	%	(To be picked graphically)
Maximum Dry Unit Weight:	126.8	pcf	(To be picked graphically)

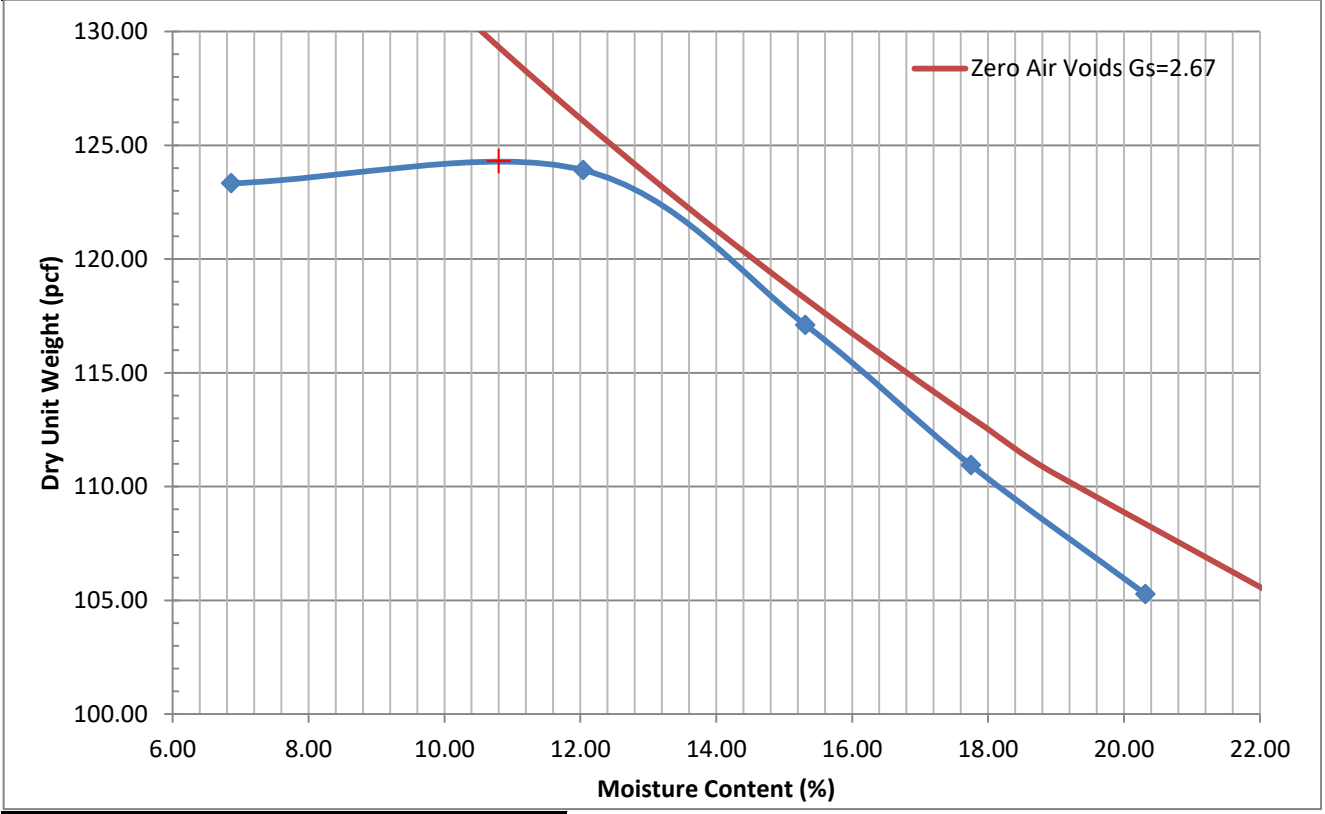
Proctor Compaction Test (ASTM D1557 Method C)

Project:	View 62		Job No.:	528-002-18		Date:	
Boring/TP:	TP-5	Sample No.:	BULK	Depth:	BULK	Engineer:	
Soil Description:	Washout Fine						
Volume of Mold:	1/13.33	Weight of Hammer:		5.5	blows/layer: 56		Layers: 3

Test No.	Weight of Mold (g)	Weight of mold +moist soil (g)	Weight of Moist Soil (g)	Moist Unit Weight (pcf)	Moisture Content (%)	Dry unit weight (pcf)	Water Added
1	4235	8718.5	4483.5	131.79	6.86%	123.32	
2	4235	8958	4723	138.83	12.04%	123.91	
3	4235	8829	4594	135.04	15.31%	117.10	
4	4235	8679	4444	130.63	17.75%	110.94	
5	4235	8544	4309	126.66	20.32%	105.27	

Moisture Content Determination

Test No.	1	2	3	4	5
Pan No.	P	51	B	19	7
Weight of Pan (g)	41.16	41.06	42.69	40.16	41.11
weight of Pan + moist soil (g)	452.32	409.77	448.41	382.71	390.55
Weight of Pan + dry soil (g)	425.91	370.14	394.53	331.07	331.54
moisture Content	6.86%	12.04%	15.31%	17.75%	20.32%



Optimum Moisture Content:	10.8	%	(To be picked graphically)
Maximum Dry Unit Weight:	124.3	pcf	(To be picked graphically)

2B

Chain of Custody

IGES
Intermountain GeoEnvironmental Services Inc.
2702 South 1030 West, Suite 10, South Salt Lake, UT 84119
Phone: 801.270.9400 Fax: 801.270.9401

Company Name:	Gordon Geotech Engineering
Project Number:	528-005-20
Address:	4426 Century Drive
Contact Name:	Jordan Culp
Phone Number:	801-327-9600 Fax:
Email:	Jordan@gordongeotech.com
Project Name:	Gravel Pit Development
Location:	
Client:	

☐ Required

Special Instructions:
☑ Standard
☐ Rush Service. Number of Days: _____ Approved: _____

* Sample Type:		** Container Type	
S - Soil	C - Concrete	B - Bag	T - Tube
G - Geosynthetic	O - Other	Bk - Bucket	O - Other
R - Rock		J - Jar	

Sample Identification	Depth	Sample Type*	Container Type**	Analysis: Direct Shear										Instructions/Comments
B-2	35'	S	Rin	X										2, 4, 8 KSF
B-2	40'	S	↓	X										2, 4, 8 KSF
B-3	75'	S	↓	X										2.5, 5, 10 KSF

Relinquished By: Jordan Culp	Date: 5-31-20 Time 13:43	Received By:	Date: 5/31/2020 Time 1343	Results Sent By:
☐ Hazardous Material ☐ Contaminated		IGES Project Number: M02106-015	☐ Existing Client ☐ New Client	Date: Time

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development
Date: 4/9/2020
By: EH

Boring No.: B-2
Sample: 8
Depth: 35'
Sample Description: Grey clay
Sample type: Undisturbed-trimmed from ring

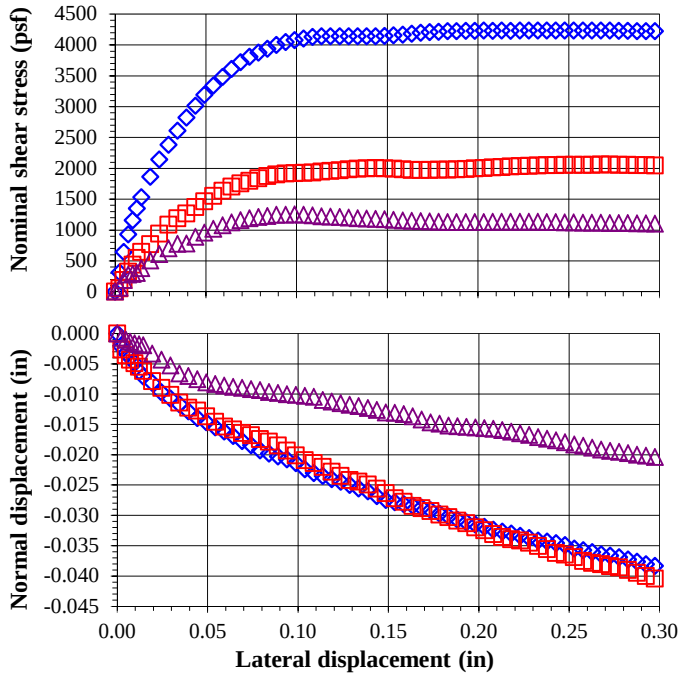
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0005
Specific gravity, Gs: 2.70 Assumed

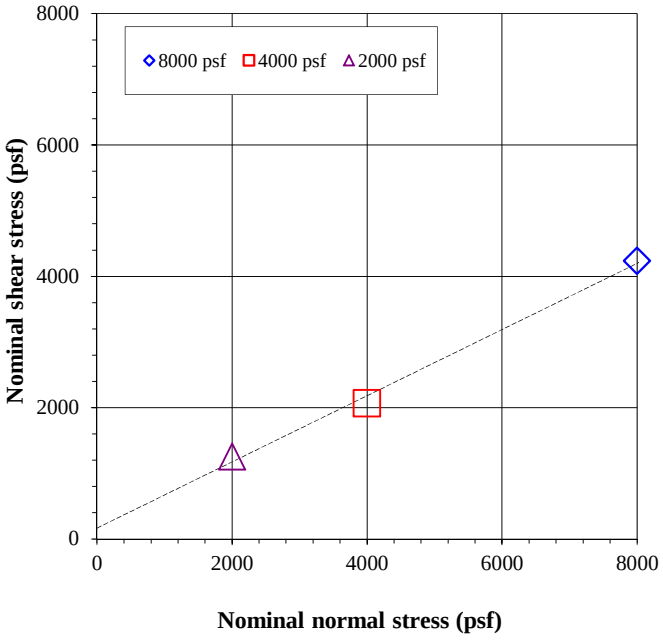
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	8000		4000		2000	
Peak shear stress (psf)	4237		2061		1254	
Lateral displacement at peak (in)	0.238		0.273		0.099	
Load Duration (min)	2512		2512		2512	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.994	0.918	0.997	0.950	0.994	0.951
Sample diameter (in)	2.416	2.416	2.413	2.413	2.417	2.417
Wt. rings + wet soil (g)	189.14	182.84	191.38	187.07	189.06	185.56
Wt. rings (g)	43.02	43.02	44.79	44.79	43.36	43.36
Wet soil + tare (g)	288.86		288.86		288.86	
Dry soil + tare (g)	250.46		250.46		250.46	
Tare (g)	121.68		121.68		121.68	
Water content (%)	29.8	24.2	29.8	26.0	29.8	26.7
Dry unit weight (pcf)	94.1	101.9	94.3	99.0	93.7	97.9
Void ratio, e, for assumed Gs	0.79	0.65	0.79	0.70	0.80	0.72
Saturation (%)*	101.7	100.0	102.4	100.0	100.9	100.0

ϕ' (deg)	27
c' (psf)	166

Average of 3 samples	Initial	Pre-shear
Water content (%)	29.8	25.6
Dry unit weight (pcf)	94.1	99.6

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens swelled at 100 psf load step.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:** B-2

No: M02106-015 (528-005-20) **Sample:** 8

Location: Gravel Pit Development **Depth:** 35'

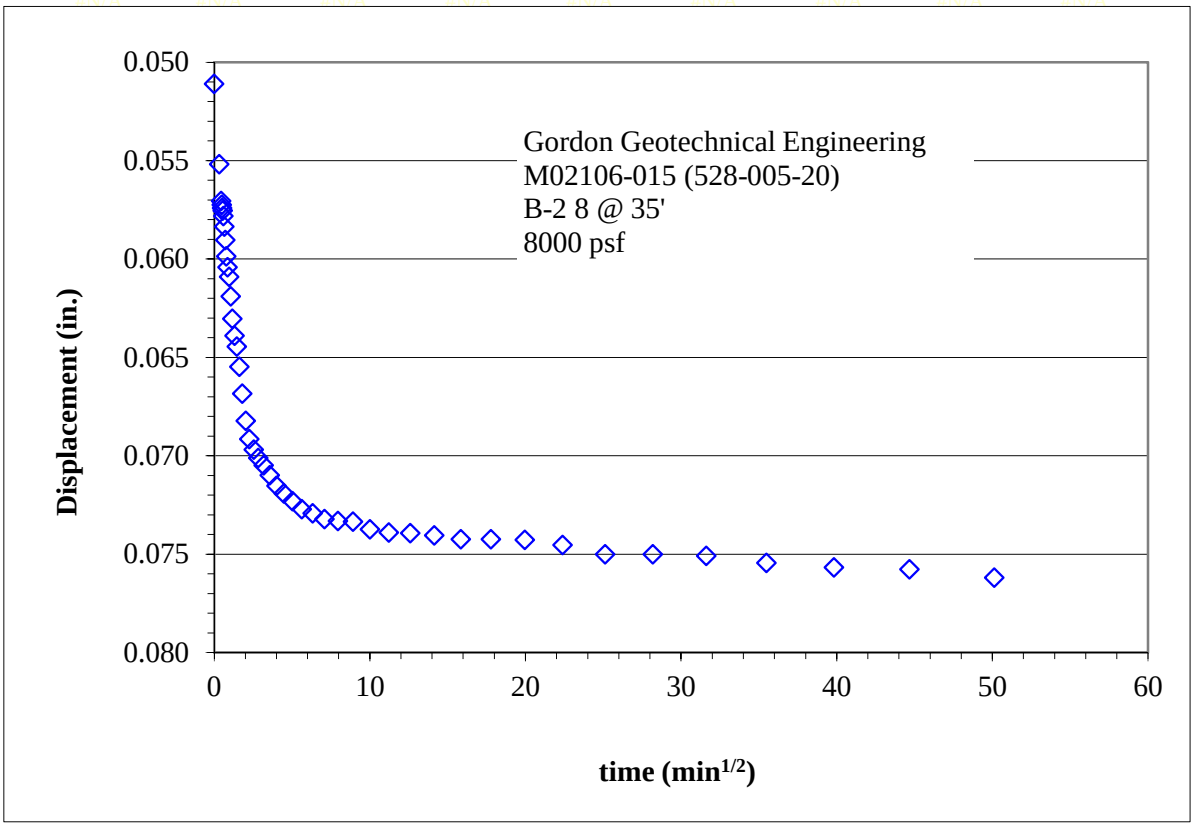
Nominal normal stress = 8000 psf			Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	312	-0.002	0.002	53	-0.003	0.002	65	-0.001
0.005	646	-0.003	0.005	187	-0.004	0.005	188	-0.001
0.007	928	-0.004	0.007	325	-0.004	0.007	277	-0.001
0.010	1161	-0.005	0.010	439	-0.005	0.010	286	-0.002
0.012	1351	-0.006	0.012	548	-0.006	0.012	304	-0.002
0.014	1530	-0.007	0.014	646	-0.006	0.014	379	-0.002
0.019	1863	-0.008	0.019	768	-0.008	0.019	507	-0.003
0.024	2142	-0.010	0.024	939	-0.009	0.024	609	-0.004
0.029	2380	-0.011	0.029	1085	-0.010	0.029	701	-0.005
0.034	2609	-0.012	0.034	1191	-0.011	0.034	773	-0.007
0.039	2824	-0.013	0.039	1269	-0.012	0.039	780	-0.007
0.044	3017	-0.014	0.044	1369	-0.013	0.044	889	-0.008
0.049	3191	-0.015	0.049	1466	-0.014	0.049	958	-0.008
0.054	3343	-0.015	0.054	1554	-0.015	0.054	1019	-0.008
0.059	3484	-0.016	0.059	1634	-0.015	0.059	1075	-0.009
0.064	3611	-0.017	0.064	1704	-0.016	0.064	1121	-0.009
0.069	3721	-0.018	0.069	1756	-0.016	0.069	1160	-0.009
0.074	3809	-0.018	0.074	1798	-0.017	0.074	1189	-0.009
0.079	3876	-0.019	0.079	1838	-0.017	0.079	1213	-0.009
0.084	3942	-0.020	0.084	1875	-0.018	0.084	1228	-0.010
0.089	4002	-0.020	0.089	1901	-0.018	0.089	1246	-0.010
0.094	4047	-0.021	0.094	1914	-0.019	0.094	1249	-0.010
0.099	4080	-0.021	0.099	1924	-0.020	0.099	1254	-0.010
0.104	4106	-0.022	0.104	1926	-0.021	0.104	1249	-0.010
0.109	4129	-0.023	0.109	1933	-0.021	0.109	1234	-0.010
0.114	4144	-0.023	0.114	1947	-0.022	0.114	1223	-0.011
0.119	4144	-0.024	0.119	1956	-0.023	0.119	1215	-0.011
0.124	4142	-0.024	0.124	1970	-0.024	0.124	1208	-0.012
0.129	4141	-0.025	0.129	1982	-0.024	0.129	1202	-0.012
0.134	4142	-0.026	0.134	1993	-0.024	0.134	1190	-0.012
0.139	4141	-0.026	0.139	1998	-0.025	0.139	1184	-0.012
0.144	4140	-0.027	0.144	2003	-0.026	0.144	1179	-0.013
0.148	4145	-0.027	0.148	1998	-0.026	0.148	1172	-0.013
0.153	4156	-0.028	0.153	1995	-0.027	0.153	1163	-0.013
0.158	4169	-0.028	0.158	1981	-0.028	0.158	1156	-0.013
0.163	4185	-0.028	0.163	1972	-0.028	0.163	1149	-0.014
0.168	4198	-0.029	0.168	1971	-0.029	0.168	1145	-0.014
0.173	4210	-0.029	0.173	1973	-0.029	0.173	1138	-0.015
0.178	4217	-0.030	0.178	1977	-0.030	0.178	1134	-0.015
0.183	4223	-0.030	0.183	1976	-0.030	0.183	1128	-0.015
0.188	4226	-0.031	0.188	1982	-0.031	0.188	1130	-0.015
0.193	4230	-0.031	0.193	1989	-0.031	0.193	1128	-0.015
0.198	4229	-0.032	0.198	1996	-0.032	0.198	1129	-0.016
0.203	4235	-0.032	0.203	2007	-0.032	0.203	1128	-0.016
0.208	4232	-0.032	0.208	2015	-0.033	0.208	1132	-0.016
0.213	4235	-0.033	0.213	2022	-0.034	0.213	1133	-0.016
0.218	4231	-0.033	0.218	2029	-0.034	0.218	1133	-0.016
0.223	4234	-0.033	0.223	2034	-0.034	0.223	1132	-0.016
0.228	4236	-0.034	0.228	2039	-0.035	0.228	1130	-0.017
0.233	4235	-0.034	0.233	2045	-0.035	0.233	1130	-0.017
0.238	4237	-0.034	0.238	2049	-0.036	0.238	1128	-0.017
0.243	4236	-0.035	0.243	2051	-0.036	0.243	1126	-0.018
0.248	4236	-0.035	0.248	2054	-0.036	0.248	1125	-0.018
0.253	4235	-0.035	0.253	2056	-0.037	0.253	1123	-0.018
0.258	4236	-0.036	0.258	2056	-0.038	0.258	1119	-0.019
0.263	4234	-0.036	0.263	2056	-0.038	0.263	1117	-0.019
0.268	4234	-0.036	0.268	2060	-0.038	0.268	1115	-0.019
0.273	4234	-0.037	0.273	2061	-0.038	0.273	1113	-0.019
0.278	4229	-0.037	0.278	2057	-0.039	0.278	1113	-0.020
0.282	4227	-0.037	0.282	2057	-0.039	0.282	1110	-0.020
0.287	4227	-0.038	0.287	2052	-0.039	0.287	1109	-0.020
0.292	4226	-0.038	0.292	2052	-0.040	0.292	1104	-0.020
0.297	4225	-0.038	0.297	2047	-0.040	0.297	1102	-0.020
0.300	4225	-0.038	0.300	2046	-0.041	0.300	1102	-0.020

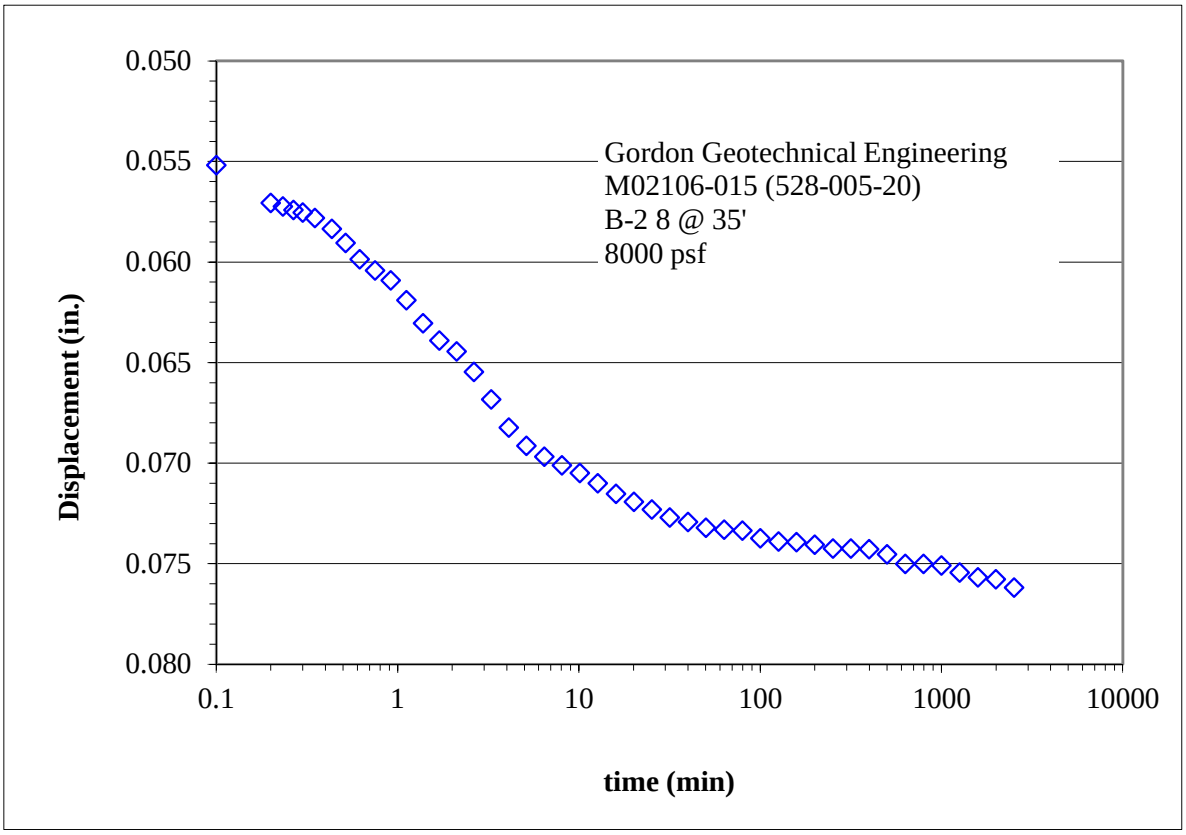
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development

Boring No.: B-2
Sample: 8
Depth: 35'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development
Date: 4/9/2020
By: EH

Boring No.: B-2
Sample: 9
Depth: 40'
Sample Description: Brown sand with clay
Sample type: Undisturbed-trimmed from ring

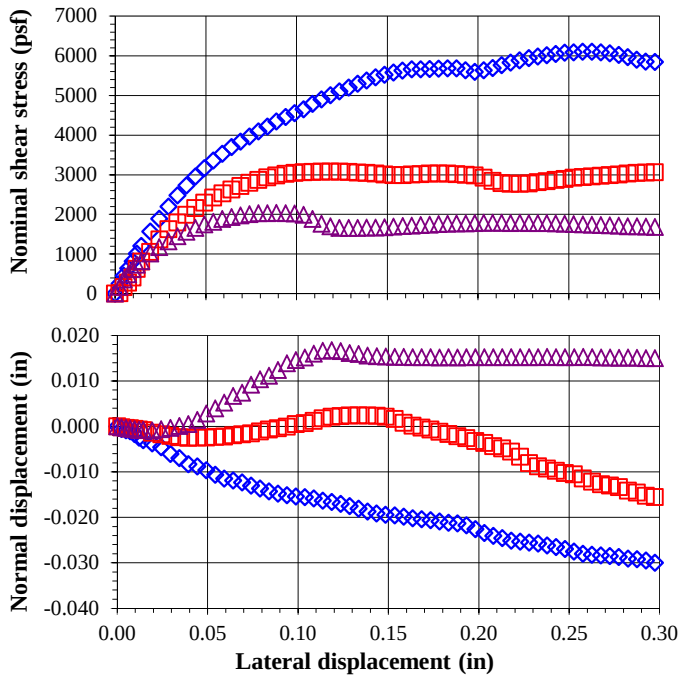
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0010
Specific gravity, Gs: 2.70 Assumed

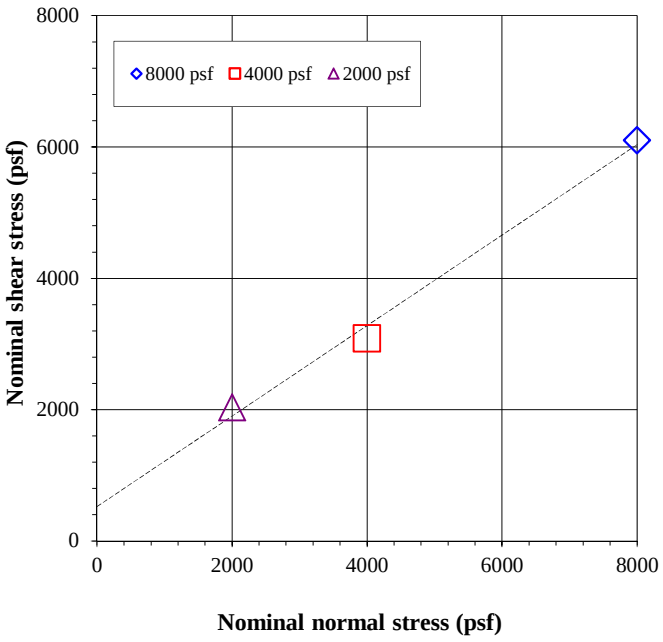
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	8000		4000		2000	
Peak shear stress (psf)	6103		3080		2035	
Lateral displacement at peak (in)	0.258		0.114		0.089	
Load Duration (min)	1000		1000		1000	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.992	0.944	0.994	0.966	0.997	0.974
Sample diameter (in)	2.422	2.422	2.414	2.414	2.417	2.417
Wt. rings + wet soil (g)	189.34	189.35	196.76	195.67	197.52	196.65
Wt. rings (g)	41.52	41.52	44.18	44.18	43.77	43.77
Wet soil + tare (g)	316.53		316.53		316.53	
Dry soil + tare (g)	282.93		282.93		282.93	
Tare (g)	127.31		127.31		127.31	
Water content (%)	21.6	21.6	21.6	20.7	21.6	20.9
Dry unit weight (pcf)	101.3	106.4	105.1	108.0	105.3	107.7
Void ratio, e, for assumed Gs	0.66	0.58	0.60	0.56	0.60	0.56
Saturation (%)*	87.9	100.0	96.5	100.0	97.1	100.0

ϕ' (deg)	35
c' (psf)	524

Average of 3 samples	Initial	Pre-shear
Water content (%)	21.6	21.1
Dry unit weight (pcf)	103.9	107.4

*Pre-shear saturation set to 100% for phase calculations





Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:** B-2

No: M02106-015 (528-005-20) **Sample:** 9

Location: Gravel Pit Development **Depth:** 40'

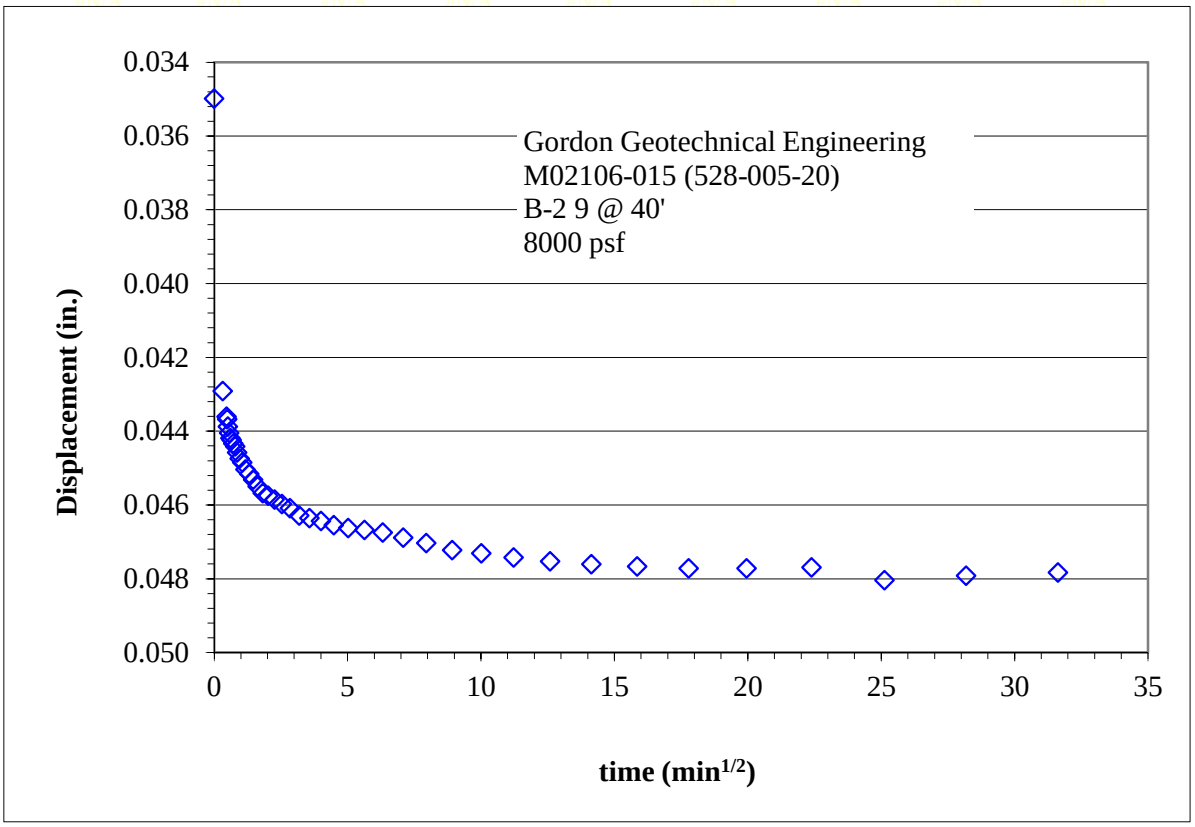
Nominal normal stress = 8000 psf			Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	253	-0.001	0.002	7	0.000	0.002	174	0.000
0.005	455	-0.001	0.005	164	0.000	0.005	356	0.000
0.007	639	-0.001	0.007	274	0.000	0.007	489	0.000
0.010	818	-0.002	0.010	408	-0.001	0.010	616	-0.001
0.012	1011	-0.002	0.012	620	-0.001	0.012	726	-0.001
0.014	1207	-0.003	0.014	806	-0.001	0.014	820	-0.001
0.019	1565	-0.004	0.019	1048	-0.001	0.019	1008	-0.001
0.024	1887	-0.005	0.024	1369	-0.002	0.024	1173	-0.001
0.029	2195	-0.006	0.029	1623	-0.002	0.029	1320	0.000
0.034	2477	-0.007	0.034	1793	-0.002	0.034	1449	0.000
0.039	2732	-0.008	0.039	1984	-0.003	0.039	1559	0.001
0.044	2960	-0.009	0.044	2154	-0.002	0.044	1657	0.001
0.049	3166	-0.010	0.049	2293	-0.002	0.049	1742	0.003
0.054	3359	-0.011	0.054	2423	-0.002	0.054	1814	0.004
0.059	3532	-0.011	0.059	2531	-0.002	0.059	1879	0.005
0.064	3698	-0.012	0.064	2625	-0.002	0.064	1931	0.007
0.069	3838	-0.012	0.069	2712	-0.002	0.069	1974	0.007
0.074	3967	-0.013	0.074	2798	-0.002	0.074	2001	0.009
0.079	4097	-0.014	0.079	2868	-0.001	0.079	2028	0.010
0.084	4219	-0.014	0.084	2932	-0.001	0.084	2027	0.011
0.089	4341	-0.015	0.089	2983	0.000	0.089	2035	0.012
0.094	4457	-0.015	0.094	3018	0.000	0.094	2030	0.014
0.099	4557	-0.015	0.099	3041	0.000	0.099	2018	0.015
0.104	4654	-0.016	0.104	3063	0.001	0.104	1986	0.015
0.109	4786	-0.016	0.109	3068	0.001	0.109	1883	0.016
0.114	4900	-0.016	0.114	3080	0.002	0.114	1765	0.017
0.119	5004	-0.017	0.119	3078	0.002	0.119	1698	0.017
0.124	5104	-0.017	0.124	3075	0.002	0.124	1659	0.017
0.129	5201	-0.017	0.129	3070	0.002	0.129	1655	0.016
0.134	5293	-0.018	0.134	3056	0.002	0.134	1655	0.016
0.139	5378	-0.019	0.139	3043	0.002	0.139	1662	0.016
0.144	5457	-0.019	0.144	3028	0.002	0.144	1668	0.015
0.148	5524	-0.019	0.148	3004	0.002	0.148	1677	0.015
0.153	5581	-0.020	0.153	2986	0.002	0.153	1688	0.015
0.158	5626	-0.020	0.158	2987	0.001	0.158	1703	0.015
0.163	5662	-0.020	0.163	3002	0.000	0.163	1715	0.015
0.168	5657	-0.020	0.168	3012	0.000	0.168	1730	0.015
0.173	5666	-0.021	0.173	3028	-0.001	0.173	1740	0.015
0.178	5675	-0.021	0.178	3032	-0.001	0.178	1753	0.015
0.183	5688	-0.021	0.183	3029	-0.002	0.183	1761	0.015
0.188	5684	-0.021	0.188	3016	-0.002	0.188	1767	0.015
0.193	5639	-0.022	0.193	2998	-0.003	0.193	1773	0.015
0.198	5593	-0.023	0.198	2978	-0.003	0.198	1779	0.015
0.203	5633	-0.023	0.203	2924	-0.004	0.203	1782	0.015
0.208	5689	-0.024	0.208	2846	-0.004	0.208	1783	0.015
0.213	5762	-0.025	0.213	2789	-0.005	0.213	1784	0.015
0.218	5827	-0.025	0.218	2767	-0.006	0.218	1782	0.015
0.223	5887	-0.025	0.223	2770	-0.007	0.223	1783	0.015
0.228	5941	-0.026	0.228	2782	-0.008	0.228	1780	0.015
0.233	5981	-0.026	0.233	2812	-0.009	0.233	1777	0.015
0.238	6019	-0.026	0.238	2839	-0.009	0.238	1775	0.015
0.243	6050	-0.027	0.243	2865	-0.010	0.243	1769	0.015
0.248	6076	-0.027	0.248	2892	-0.010	0.248	1763	0.015
0.253	6087	-0.028	0.253	2920	-0.011	0.253	1756	0.015
0.258	6103	-0.028	0.258	2938	-0.011	0.258	1747	0.015
0.263	6100	-0.028	0.263	2957	-0.012	0.263	1737	0.015
0.268	6091	-0.028	0.268	2971	-0.013	0.268	1730	0.015
0.273	6064	-0.029	0.273	2990	-0.013	0.273	1720	0.015
0.277	6026	-0.029	0.278	3008	-0.013	0.278	1710	0.015
0.282	5970	-0.029	0.282	3027	-0.014	0.283	1701	0.015
0.287	5905	-0.029	0.287	3041	-0.015	0.287	1697	0.015
0.292	5856	-0.029	0.292	3049	-0.015	0.292	1687	0.015
0.297	5849	-0.030	0.297	3063	-0.016	0.297	1679	0.015
0.300	5852	-0.030	0.300	3066	-0.016	0.300	1676	0.015

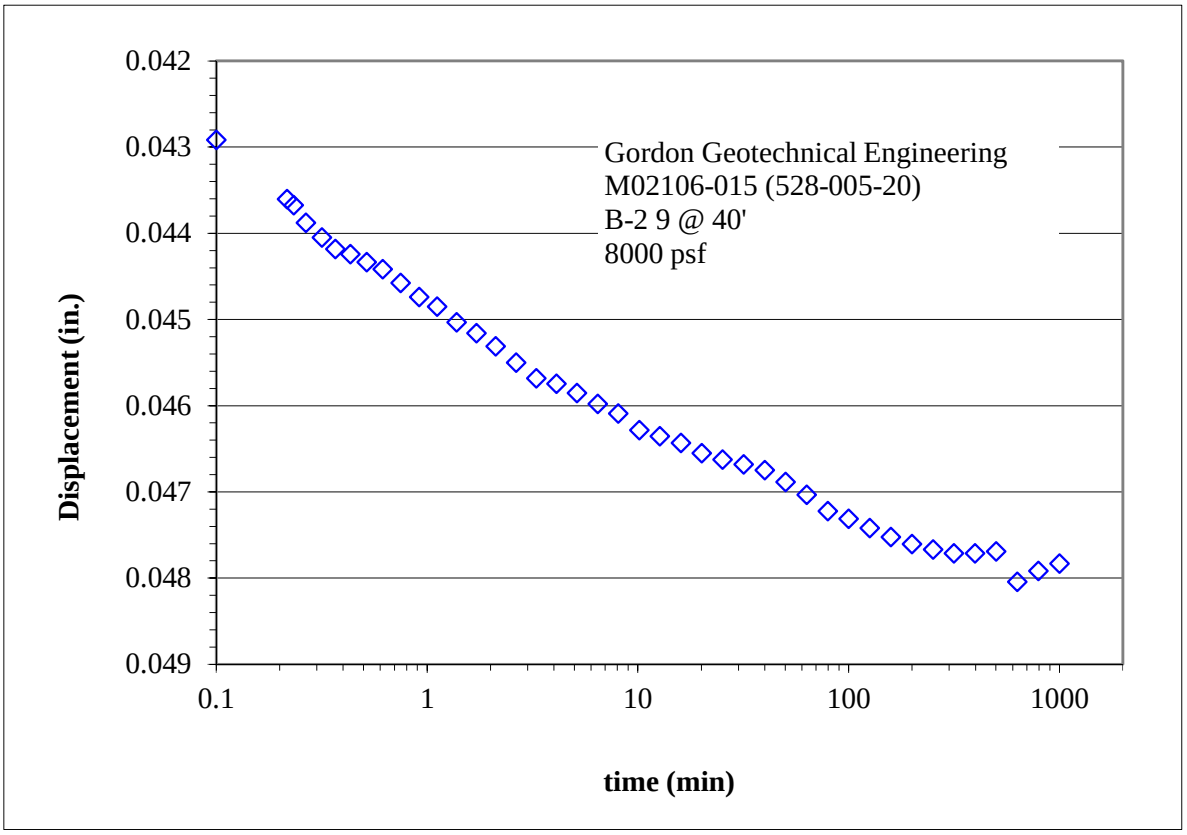
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development

Boring No.: B-2
Sample: 9
Depth: 40'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development
Date: 4/9/2020
By: EH

Boring No.: B-3
Sample:
Depth: 75'
Sample Description: Brown clayey sand
Sample type: Undisturbed-trimmed from ring

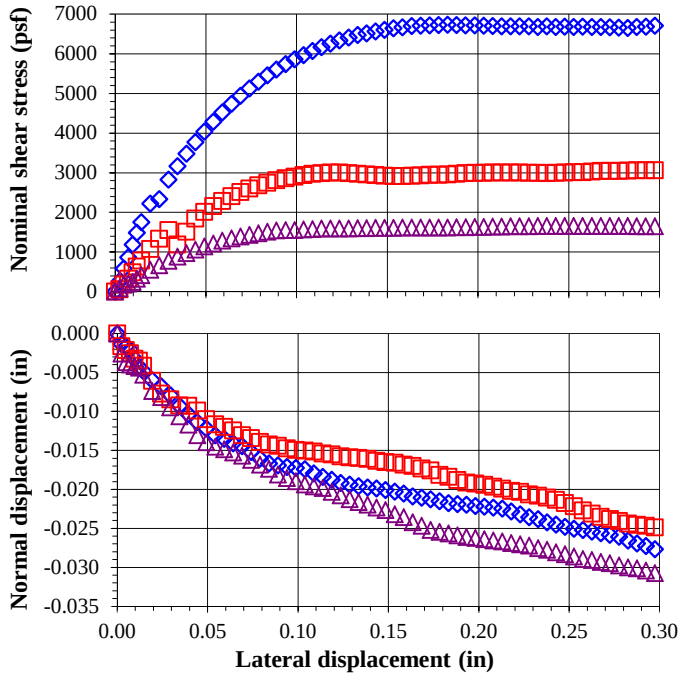
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0009
Specific gravity, Gs: 2.70 Assumed

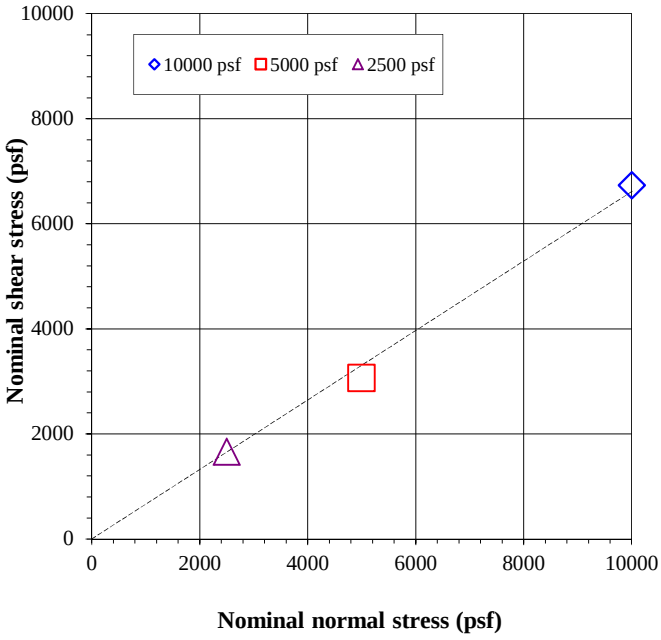
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	10000		5000		2500	
Peak shear stress (psf)	6735		3062		1659	
Lateral displacement at peak (in)	0.183		0.292		0.268	
Load Duration (min)	1995		1995		1995	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.995	0.935	0.996	0.938	0.986	0.938
Sample diameter (in)	2.413	2.413	2.414	2.414	2.417	2.417
Wt. rings + wet soil (g)	173.81	187.68	176.37	188.98	179.82	190.10
Wt. rings (g)	44.10	44.10	43.05	43.05	40.73	40.73
Wet soil + tare (g)	264.29		264.29		264.29	
Dry soil + tare (g)	250.55		250.55		250.55	
Tare (g)	127.02		127.02		127.02	
Water content (%)	11.1	23.0	11.1	21.6	11.1	19.3
Dry unit weight (pcf)	97.7	103.9	100.3	106.4	105.4	110.7
Void ratio, e, for assumed Gs	0.72	0.62	0.68	0.58	0.60	0.52
Saturation (%)*	41.4	100.0	44.1	100.0	50.1	100.0

ϕ' (deg)	33
c' (psf)	0

Average of 3 samples	Initial	Pre-shear
Water content (%)	11.1	21.3
Dry unit weight (pcf)	101.1	107.0

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens #1 and #2 contain vertical clay seam.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:** B-3

No: M02106-015 (528-005-20) **Sample:**

Location: Gravel Pit Development **Depth:** 75'

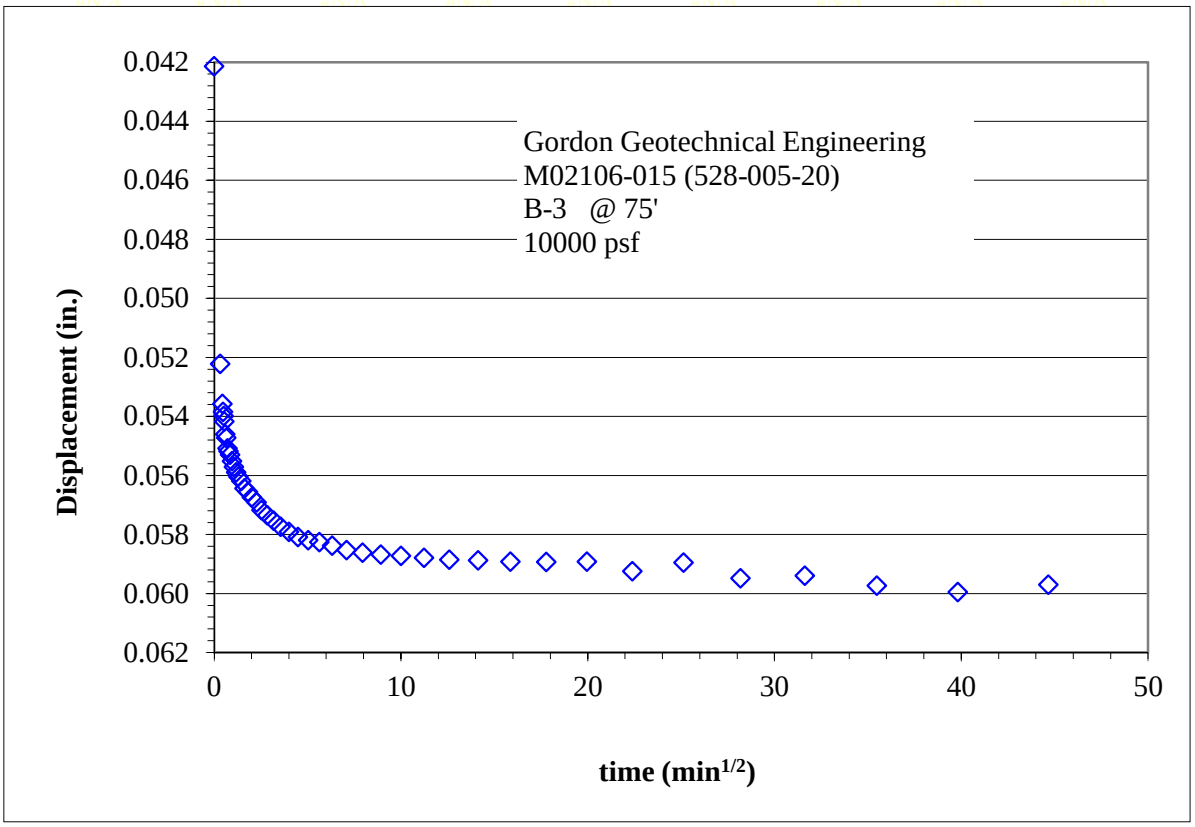
Nominal normal stress = 10000 psf			Nominal normal stress = 5000 psf			Nominal normal stress = 2500 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	257	-0.001	0.002	58	-0.002	0.002	84	-0.003
0.005	586	-0.002	0.005	180	-0.002	0.005	179	-0.004
0.007	863	-0.002	0.007	326	-0.003	0.007	207	-0.004
0.010	1188	-0.003	0.010	484	-0.003	0.010	246	-0.004
0.012	1484	-0.004	0.012	631	-0.004	0.012	321	-0.004
0.014	1755	-0.005	0.014	786	-0.004	0.014	410	-0.005
0.019	2223	-0.006	0.019	1076	-0.006	0.019	552	-0.007
0.024	2338	-0.007	0.024	1331	-0.008	0.024	667	-0.008
0.029	2824	-0.008	0.029	1551	-0.008	0.029	779	-0.009
0.034	3169	-0.009	0.034	1186	-0.009	0.034	882	-0.011
0.039	3482	-0.010	0.039	1513	-0.009	0.039	974	-0.012
0.044	3769	-0.011	0.044	1843	-0.010	0.044	1062	-0.013
0.049	4037	-0.012	0.049	2011	-0.011	0.049	1141	-0.014
0.054	4289	-0.013	0.054	2159	-0.012	0.054	1215	-0.015
0.059	4521	-0.014	0.059	2288	-0.012	0.059	1284	-0.015
0.064	4741	-0.014	0.064	2407	-0.012	0.064	1343	-0.015
0.069	4941	-0.014	0.069	2510	-0.013	0.069	1390	-0.016
0.074	5123	-0.015	0.074	2601	-0.013	0.074	1433	-0.016
0.079	5296	-0.016	0.079	2680	-0.014	0.079	1474	-0.017
0.084	5460	-0.017	0.084	2750	-0.014	0.084	1508	-0.017
0.089	5601	-0.017	0.089	2808	-0.014	0.089	1540	-0.018
0.094	5737	-0.017	0.094	2858	-0.015	0.094	1553	-0.019
0.099	5859	-0.017	0.099	2898	-0.015	0.099	1554	-0.019
0.104	5970	-0.017	0.104	2937	-0.015	0.104	1564	-0.019
0.109	6076	-0.018	0.109	2969	-0.015	0.109	1580	-0.020
0.114	6172	-0.018	0.114	2992	-0.015	0.114	1589	-0.020
0.119	6257	-0.019	0.119	3001	-0.016	0.119	1589	-0.020
0.124	6340	-0.019	0.124	3001	-0.016	0.124	1589	-0.021
0.129	6410	-0.019	0.129	2992	-0.016	0.129	1595	-0.021
0.134	6472	-0.020	0.134	2975	-0.016	0.134	1598	-0.022
0.139	6514	-0.020	0.139	2960	-0.016	0.139	1602	-0.022
0.144	6565	-0.020	0.144	2944	-0.016	0.144	1609	-0.022
0.148	6601	-0.020	0.148	2925	-0.017	0.148	1609	-0.023
0.153	6642	-0.020	0.153	2919	-0.017	0.153	1612	-0.023
0.158	6667	-0.021	0.158	2920	-0.017	0.158	1612	-0.024
0.163	6699	-0.021	0.163	2922	-0.017	0.163	1614	-0.024
0.168	6710	-0.021	0.168	2929	-0.017	0.168	1616	-0.025
0.173	6719	-0.021	0.173	2944	-0.018	0.173	1615	-0.025
0.178	6723	-0.022	0.178	2952	-0.018	0.178	1615	-0.025
0.183	6735	-0.022	0.183	2958	-0.018	0.183	1619	-0.026
0.188	6724	-0.022	0.188	2974	-0.019	0.188	1622	-0.026
0.193	6719	-0.022	0.193	2987	-0.019	0.193	1624	-0.026
0.198	6715	-0.022	0.198	2999	-0.019	0.198	1634	-0.026
0.203	6711	-0.022	0.203	2999	-0.019	0.203	1634	-0.026
0.208	6698	-0.022	0.208	3008	-0.020	0.208	1641	-0.027
0.213	6692	-0.022	0.213	3007	-0.020	0.213	1642	-0.027
0.218	6693	-0.023	0.218	3009	-0.020	0.218	1647	-0.027
0.223	6690	-0.023	0.223	3004	-0.020	0.223	1650	-0.027
0.228	6692	-0.024	0.228	2997	-0.021	0.228	1653	-0.027
0.233	6679	-0.024	0.233	2993	-0.021	0.233	1654	-0.028
0.238	6689	-0.024	0.238	2992	-0.021	0.238	1657	-0.028
0.243	6678	-0.025	0.243	2994	-0.021	0.243	1656	-0.028
0.248	6682	-0.025	0.248	3002	-0.022	0.248	1657	-0.028
0.253	6679	-0.025	0.253	3013	-0.022	0.253	1655	-0.029
0.258	6682	-0.025	0.258	3017	-0.023	0.258	1658	-0.029
0.263	6676	-0.025	0.263	3033	-0.023	0.263	1657	-0.029
0.268	6678	-0.026	0.268	3042	-0.024	0.268	1659	-0.029
0.273	6672	-0.026	0.273	3048	-0.024	0.273	1655	-0.029
0.278	6659	-0.026	0.278	3047	-0.024	0.278	1657	-0.030
0.282	6655	-0.027	0.282	3052	-0.024	0.282	1654	-0.030
0.287	6675	-0.027	0.287	3058	-0.025	0.287	1649	-0.030
0.292	6687	-0.027	0.292	3062	-0.025	0.292	1648	-0.030
0.297	6712	-0.028	0.297	3059	-0.025	0.297	1648	-0.031
0.300	6729	-0.028	0.300	3062	-0.025	0.300	1649	-0.031

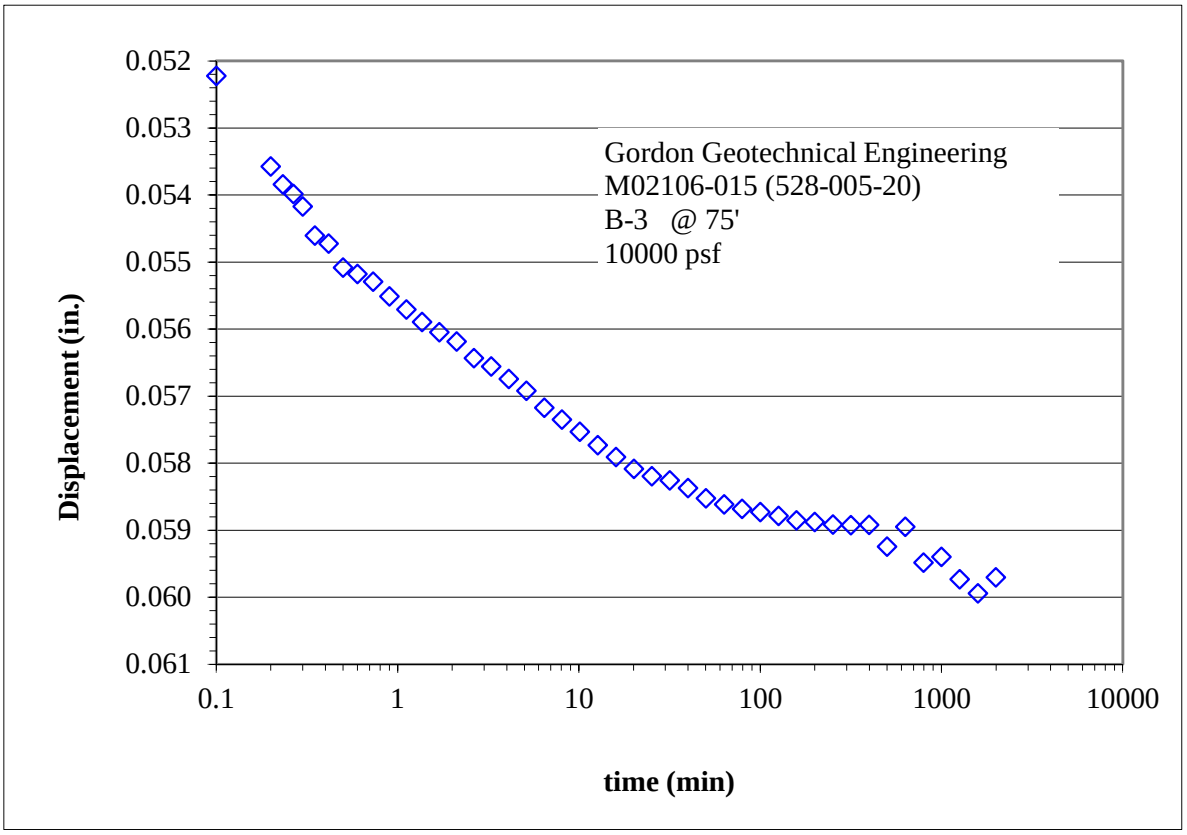
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-015 (528-005-20)
Location: Gravel Pit Development

Boring No.: B-3
Sample:
Depth: 75'





Chain of Custody

3A

IGES
Intermountain GeoEnvironmental Services Inc
2702 South 1030 West, Suite 10, South Salt Lake, UT 84119
Phone: 801.270.9400 Fax: 801.270.9401

Company Name:	Gordon Geotechnical
Project Number:	528-005-20
Address:	
Contact Name:	435-654-9281 Jordan Culp
Phone Number:	Fax:
Email:	
Project Name:	Gravel Pit
Location:	
Client:	

☐ **Required**

Special Instructions:
☐ Standard
☐ Rush Service. Number of Days: _____ Approved: _____

* Sample Type:		** Container Type	
S - Soil	C - Concrete	B - Bag	T - Tube
G - Geosynthetic	O - Other	Bk - Bucket	O - Other
R - Rock		J - Jar	

Sample Identification	Depth	Sample Type*	Container Type**	Analysis: Direct Shear	Residual/Ring Shear	Atterberg Limits							Instructions/Comments
B-4	5'	Ring		⊗									1, 2, 4 KSF
B-5	32.5'	Ring			⊗	⊗							2, 4, 8 KSF
B-6	30'	Ring			⊗	⊗							2, 4, 8 KSF
													* Please use our project No. on invoice

Relinquished By:	Date: 9-8-20 Time 14:48	Received By:	Date: 9/8/2020 Time 1448	Results Sent By:	Nick West
☐ Hazardous Material ☐ Contaminated		IGES Project Number: M02106-017	☒ Existing Client ☐ New Client	Date: Time	9-21-20

Z:\FORMS\[CHAIN_OF_CUSTODY.xls]CHAIN

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit
Date: 9/11/2020
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-5
Sample:
Depth: 32.5'
Description: Grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved
Approximate maximum grain size: No.4
Estimated percent retained on No.40: Not requested
As-received water content (%): Not requested

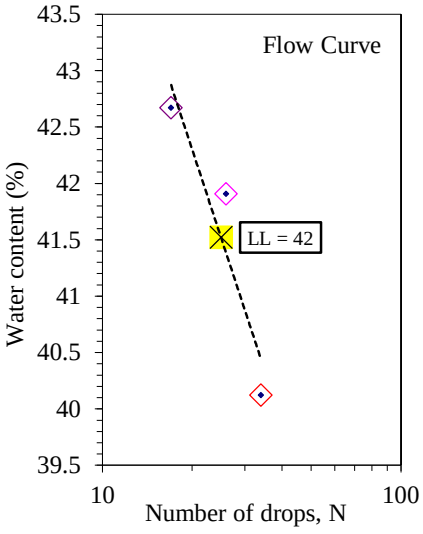
Plastic Limit

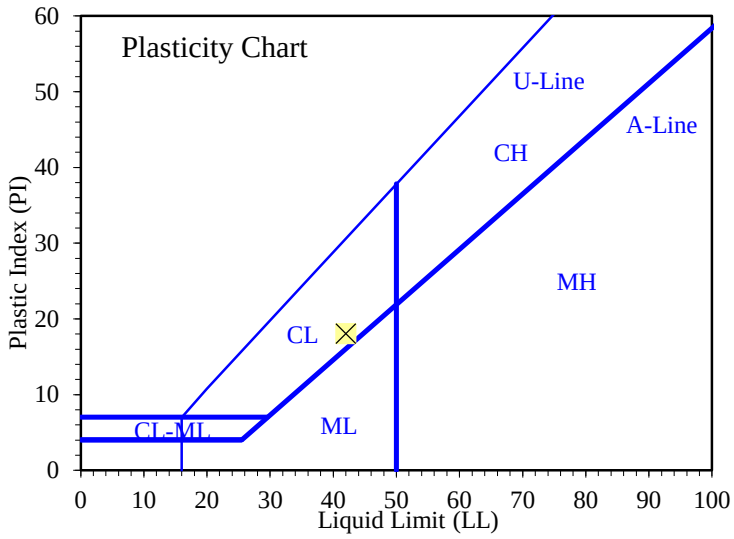
Determination No	1	2				
Wet Soil + Tare (g)	13.36	14.21				
Dry Soil + Tare (g)	12.13	12.82				
Water Loss (g)	1.23	1.39				
Tare (g)	7.05	7.07				
Dry Soil (g)	5.08	5.75				
Water Content, w (%)	24.21	24.17				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	26	17			
Wet Soil + Tare (g)	14.19	16.81	14.94			
Dry Soil + Tare (g)	12.18	14.10	12.67			
Water Loss (g)	2.01	2.71	2.27			
Tare (g)	7.17	7.65	7.35			
Dry Soil (g)	5.01	6.45	5.32			
Water Content, w (%)	40.12	41.91	42.67			
One-Point LL (%)		42				

Liquid Limit, LL (%)	**42**
Plastic Limit, PL (%)	**24**
Plasticity Index, PI (%)	**18**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit
Date: 9/11/2020
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-6
Sample:
Depth: 30'
Description: Grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved
Approximate maximum grain size: No.4
Estimated percent retained on No.40: Not requested
As-received water content (%): Not requested

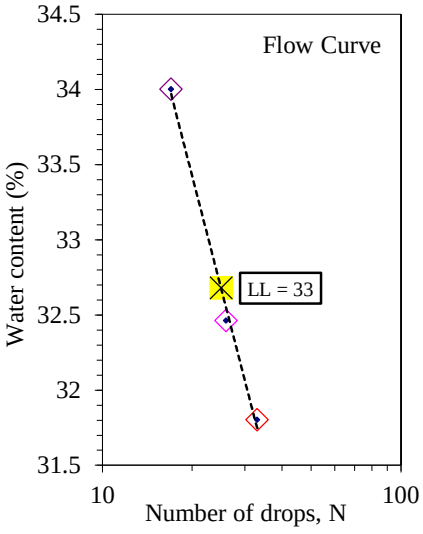
Plastic Limit

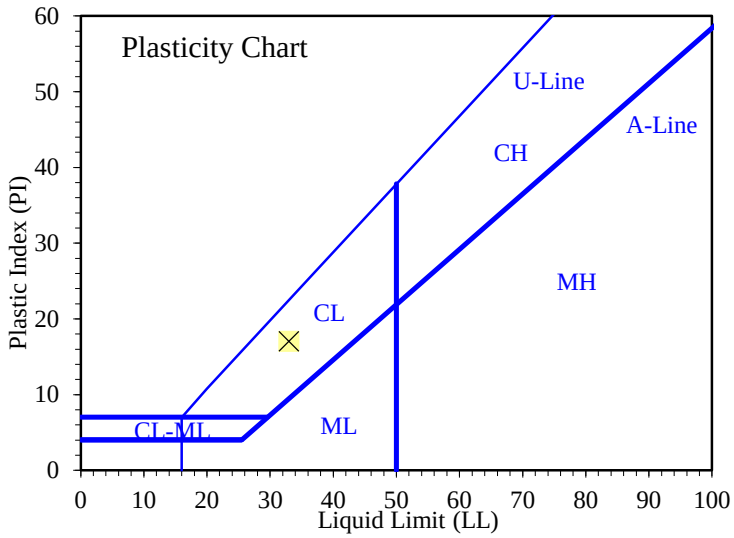
Determination No	1	2				
Wet Soil + Tare (g)	14.11	13.82				
Dry Soil + Tare (g)	13.12	12.86				
Water Loss (g)	0.99	0.96				
Tare (g)	7.05	7.08				
Dry Soil (g)	6.07	5.78				
Water Content, w (%)	16.31	16.61				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	26	17			
Wet Soil + Tare (g)	14.56	15.71	15.42			
Dry Soil + Tare (g)	12.76	13.60	13.38			
Water Loss (g)	1.80	2.11	2.04			
Tare (g)	7.10	7.10	7.38			
Dry Soil (g)	5.66	6.50	6.00			
Water Content, w (%)	31.80	32.46	34.00			
One-Point LL (%)		33				

Liquid Limit, LL (%)	**33**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**17**





Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit
Date: 9/10/2020
By: EH/DNB

Boring No.: B-4
Sample:
Depth: 5'
Sample Description: Brown sand
Sample type: Undisturbed-trimmed from ring

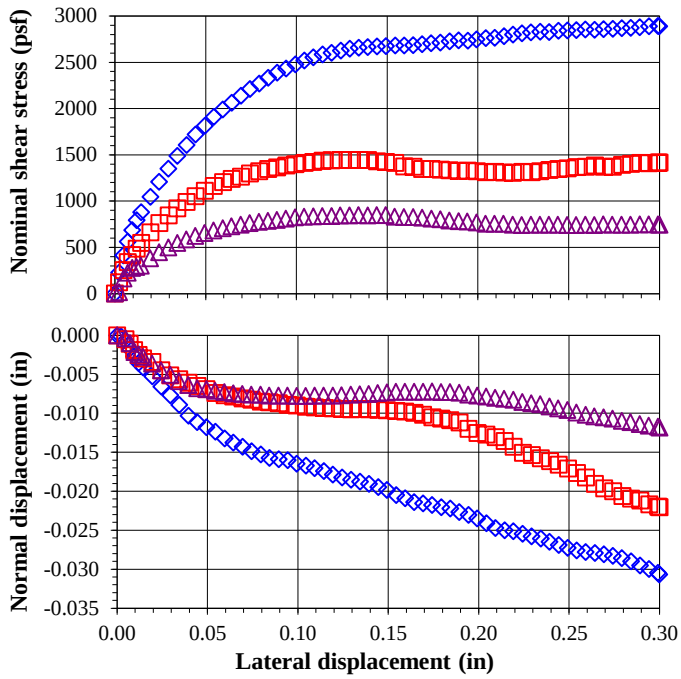
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0192
Specific gravity, Gs: 2.65 Assumed

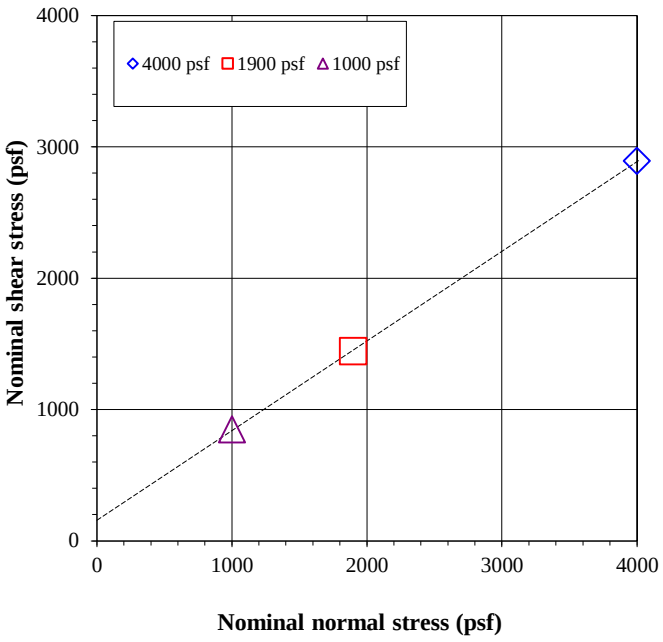
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	4000		1900		1000	
Peak shear stress (psf)	2892		1443		850	
Lateral displacement at peak (in)	0.299		0.129		0.149	
Load Duration (min)	1000		1000		1000	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.998	0.937	1.001	0.948	0.983	0.915
Sample diameter (in)	2.411	2.411	2.415	2.415	2.421	2.421
Wt. rings + wet soil (g)	169.87	190.99	169.49	191.70	160.42	182.19
Wt. rings (g)	44.51	44.51	44.31	44.31	39.43	39.43
Wet soil + tare (g)	368.42		368.42		368.42	
Dry soil + tare (g)	363.23		363.23		363.23	
Tare (g)	126.88		126.88		126.88	
Water content (%)	2.2	19.4	2.2	20.3	2.2	20.6
Dry unit weight (pcf)	102.6	109.2	101.8	107.5	99.7	107.0
Void ratio, e, for assumed Gs	0.61	0.51	0.63	0.54	0.66	0.55
Saturation (%)*	9.5	100.0	9.3	100.0	8.8	100.0

ϕ' (deg)	34
c' (psf)	159

Average of 3 samples	Initial	Pre-shear
Water content (%)	2.2	20.1
Dry unit weight (pcf)	101.3	107.9

*Pre-shear saturation set to 100% for phase calculations





Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:** B-4

No: M02106-017 (528-005-20) **Sample:**

Location: Gravel Pit **Depth:** 5'

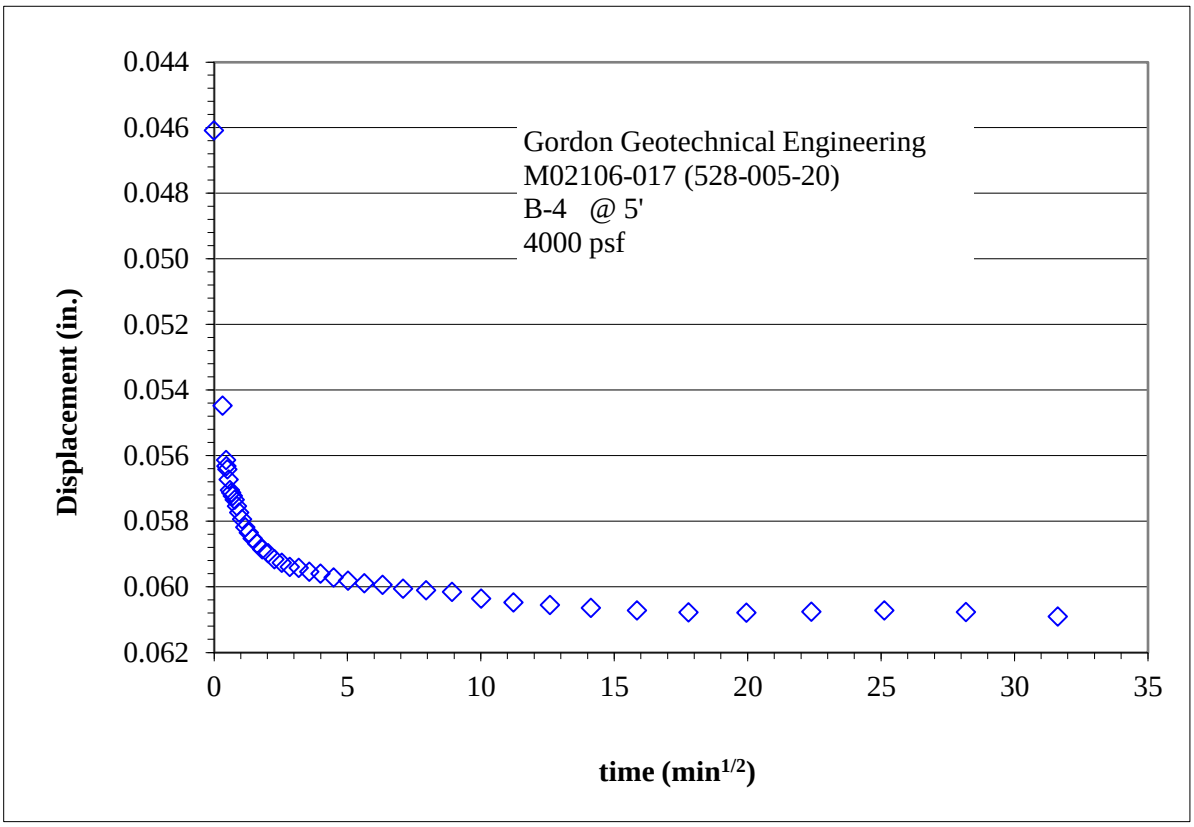
Nominal normal stress = 4000 psf			Nominal normal stress = 1900 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	226	0.000	0.002	121	0.000	0.002	15	0.000
0.005	412	-0.001	0.005	252	0.000	0.005	164	0.000
0.007	560	-0.002	0.007	339	-0.001	0.007	226	-0.001
0.010	686	-0.003	0.010	415	-0.002	0.010	276	-0.002
0.012	792	-0.004	0.012	485	-0.003	0.012	290	-0.002
0.014	880	-0.004	0.014	547	-0.003	0.014	303	-0.003
0.020	1047	-0.005	0.020	663	-0.003	0.019	380	-0.004
0.024	1209	-0.007	0.024	762	-0.004	0.024	446	-0.004
0.029	1351	-0.008	0.030	846	-0.005	0.029	500	-0.005
0.034	1488	-0.009	0.034	922	-0.006	0.034	547	-0.006
0.039	1604	-0.010	0.040	992	-0.006	0.039	585	-0.006
0.044	1719	-0.011	0.044	1051	-0.007	0.044	625	-0.007
0.049	1812	-0.012	0.049	1110	-0.007	0.049	656	-0.007
0.054	1910	-0.012	0.054	1162	-0.007	0.054	683	-0.007
0.059	1991	-0.013	0.060	1204	-0.008	0.059	707	-0.007
0.064	2064	-0.014	0.064	1238	-0.008	0.064	728	-0.007
0.069	2139	-0.014	0.069	1264	-0.008	0.069	745	-0.008
0.074	2210	-0.015	0.074	1297	-0.008	0.074	762	-0.008
0.079	2272	-0.015	0.079	1322	-0.009	0.079	775	-0.008
0.084	2332	-0.016	0.084	1345	-0.009	0.084	788	-0.008
0.089	2386	-0.016	0.089	1365	-0.009	0.089	798	-0.008
0.094	2434	-0.016	0.094	1383	-0.009	0.094	812	-0.008
0.099	2478	-0.016	0.099	1398	-0.009	0.099	824	-0.008
0.104	2519	-0.017	0.104	1413	-0.009	0.104	830	-0.008
0.109	2553	-0.017	0.109	1422	-0.009	0.109	833	-0.008
0.114	2584	-0.017	0.114	1436	-0.009	0.114	836	-0.008
0.119	2603	-0.018	0.119	1440	-0.009	0.119	837	-0.008
0.124	2627	-0.018	0.124	1442	-0.009	0.124	847	-0.008
0.129	2646	-0.019	0.129	1443	-0.009	0.129	846	-0.008
0.134	2657	-0.019	0.134	1443	-0.009	0.134	847	-0.008
0.139	2665	-0.019	0.139	1442	-0.009	0.139	846	-0.008
0.144	2672	-0.019	0.144	1429	-0.010	0.144	848	-0.007
0.149	2676	-0.020	0.149	1423	-0.010	0.149	850	-0.007
0.154	2681	-0.021	0.154	1411	-0.010	0.154	832	-0.007
0.159	2680	-0.021	0.159	1376	-0.010	0.159	827	-0.007
0.164	2687	-0.021	0.164	1371	-0.010	0.164	828	-0.007
0.169	2697	-0.022	0.169	1348	-0.010	0.169	821	-0.007
0.174	2706	-0.022	0.174	1346	-0.011	0.174	812	-0.007
0.179	2711	-0.022	0.179	1339	-0.011	0.179	804	-0.007
0.184	2726	-0.022	0.184	1333	-0.011	0.184	791	-0.007
0.189	2736	-0.023	0.189	1324	-0.011	0.189	783	-0.007
0.194	2733	-0.023	0.194	1329	-0.012	0.194	780	-0.008
0.199	2747	-0.024	0.199	1322	-0.013	0.199	768	-0.008
0.204	2762	-0.024	0.204	1313	-0.013	0.204	754	-0.008
0.209	2764	-0.025	0.209	1315	-0.013	0.209	755	-0.008
0.214	2782	-0.025	0.214	1308	-0.014	0.214	754	-0.008
0.219	2798	-0.025	0.219	1304	-0.014	0.219	745	-0.008
0.224	2815	-0.025	0.224	1315	-0.015	0.224	742	-0.009
0.229	2824	-0.026	0.229	1312	-0.015	0.229	744	-0.009
0.234	2830	-0.026	0.234	1323	-0.016	0.234	746	-0.009
0.239	2826	-0.026	0.239	1335	-0.016	0.239	746	-0.009
0.244	2839	-0.027	0.244	1346	-0.017	0.244	745	-0.009
0.249	2846	-0.027	0.249	1354	-0.017	0.249	743	-0.010
0.254	2847	-0.028	0.254	1366	-0.018	0.254	741	-0.010
0.259	2855	-0.028	0.259	1370	-0.018	0.259	744	-0.010
0.264	2850	-0.028	0.264	1385	-0.019	0.264	742	-0.010
0.269	2857	-0.028	0.269	1371	-0.020	0.269	747	-0.011
0.274	2863	-0.028	0.274	1371	-0.020	0.274	745	-0.011
0.279	2868	-0.029	0.279	1393	-0.021	0.279	745	-0.011
0.284	2871	-0.029	0.284	1404	-0.021	0.284	745	-0.011
0.289	2880	-0.030	0.289	1411	-0.021	0.289	748	-0.011
0.294	2890	-0.030	0.294	1410	-0.022	0.294	749	-0.012
0.299	2892	-0.030	0.299	1415	-0.022	0.299	748	-0.012
0.300	2889	-0.031	0.300	1415	-0.022	0.300	745	-0.012

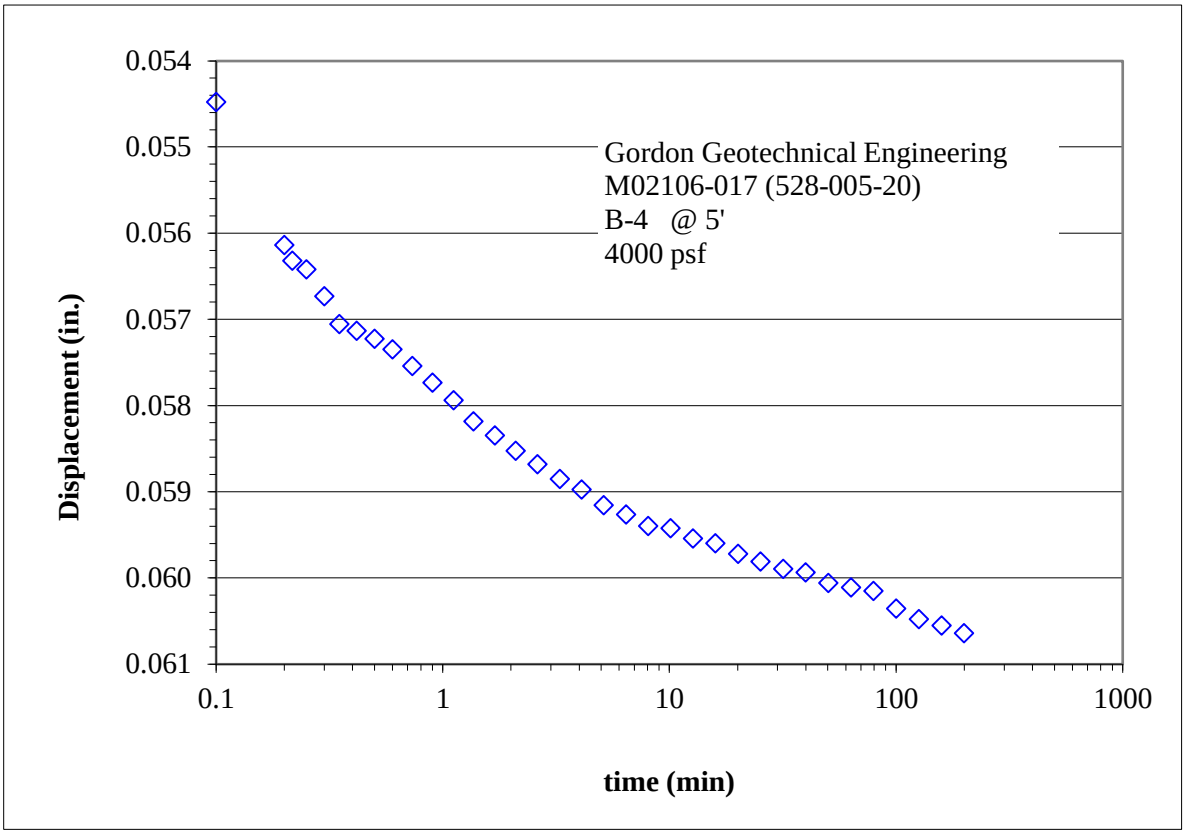
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit

Boring No.: B-4
Sample:
Depth: 5'





Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils (*ASTM 6467*)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit
Date: 9/18/2020
By: JDF

Boring No.: B-5
Sample:
Depth: 32.5'
Sample Description: Grey clay
Engineering Classification: Not requested

Sample preparation: Screened over No.40 / remolded near liquid limit
Test type: Residual with multi-staged sample
Ring friction remarks: Modified upper platen
Ring shear device: Bromhead type, WF 25850 #1
Sample presheared: Yes
Failure surface location: Near center

inner/outter/avg. dia. (mm)	70	100	85
inner/outter/avg. radii (mm)	35	50	42.5
Thickness (mm)/area (cm^2):	5	40.1	

LL (%):	42	CF [a] (%):	N/A
PL (%):	24	Gs assum.:	2.8
		% Finer No. 200 (tested sample):	89.9

LL, PL = liquid and plastic limits, respectively
[a]CF = %<0.002 mm and passing No. 10

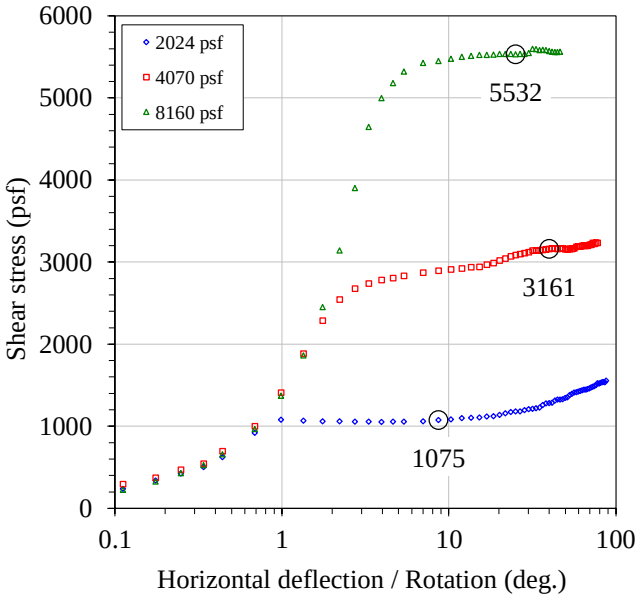
	τ stress	σ stress	Horz. def	Vert. def
Units:	(psf)	(psf)	(deg.)	(in)
Conversion:	20885.434	2048.2	1	3.94E-05

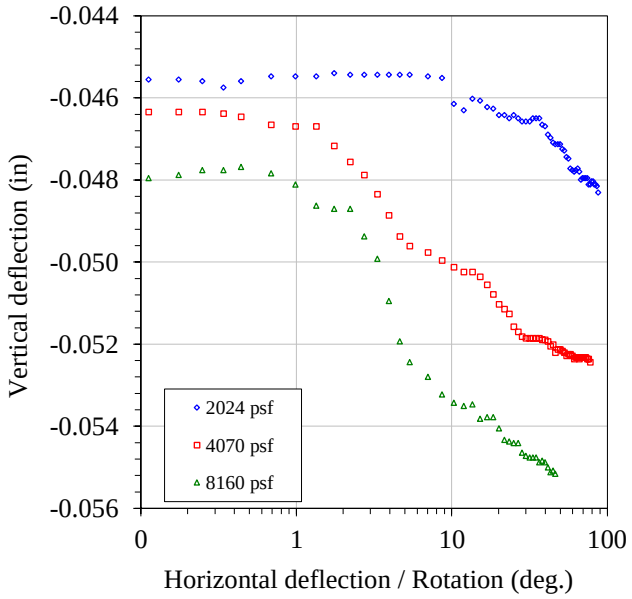
	Sample 1 Initial	Sample 1 Final	Sample 2 Initial	Sample 2 Final	Sample 3 Initial	Sample 3 Final
Sample thickness (mm)	4.61					
Wt. container + wet soil (g)	732.43					
Wt. container (g)	697.39					
Wet soil + tare (g)	75.55		Staged			51.23
Dry soil + tare (g)	60.46					45.39
Tare (g)	23.92					23.92
Water content (%)	41.3					27.2
Dry density (g/cm^3)	1.34					
Saturation (%)	100.0					

	Sample 1	Sample 2	Sample 3
Normal load on lever arm (kg)	3	7	15
Conversion factor (kg/cm^2) to (psf):	2048.1614	2048.1614	2048.1614
Residual deformation (deg.)	8.661	39.897	25.101
Normal stress (psf)	2024	4070	8160
Residual shear stress (psf)	1075	3161	5532
Peak shear stress (psf)	1555	3235	5597
Secant residual friction angle (deg)	28.0	37.8	34.1
Secant peak friction angle (deg)	37.5	38.5	34.4
Shear rate (deg/min)	0.0274	0.0274	0.0274
Peak friction angle (deg)	35.4		
Residual friction angle (deg)	34.6		

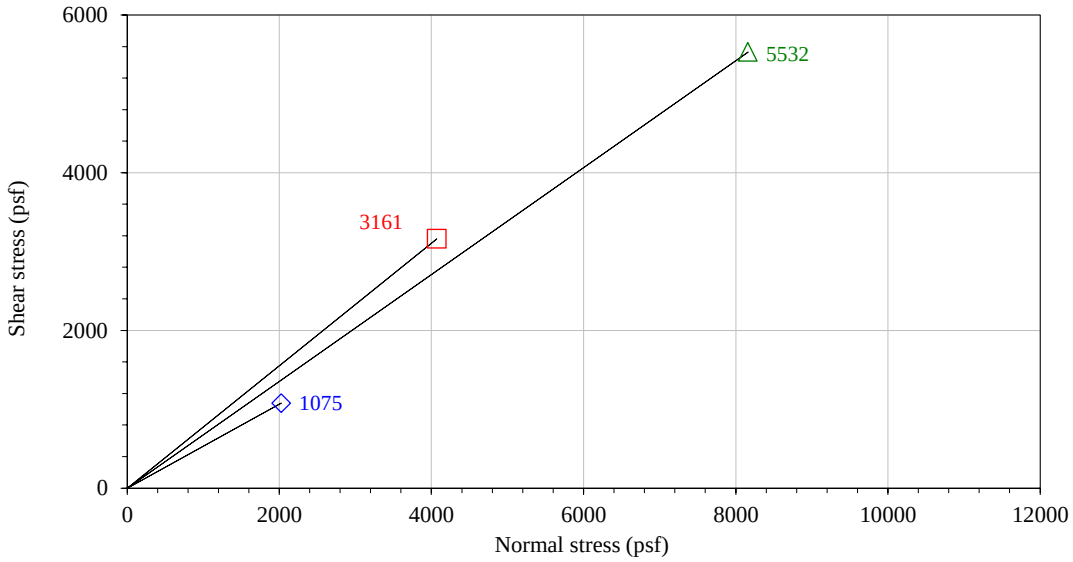
Entered by:_____
Reviewed:_____

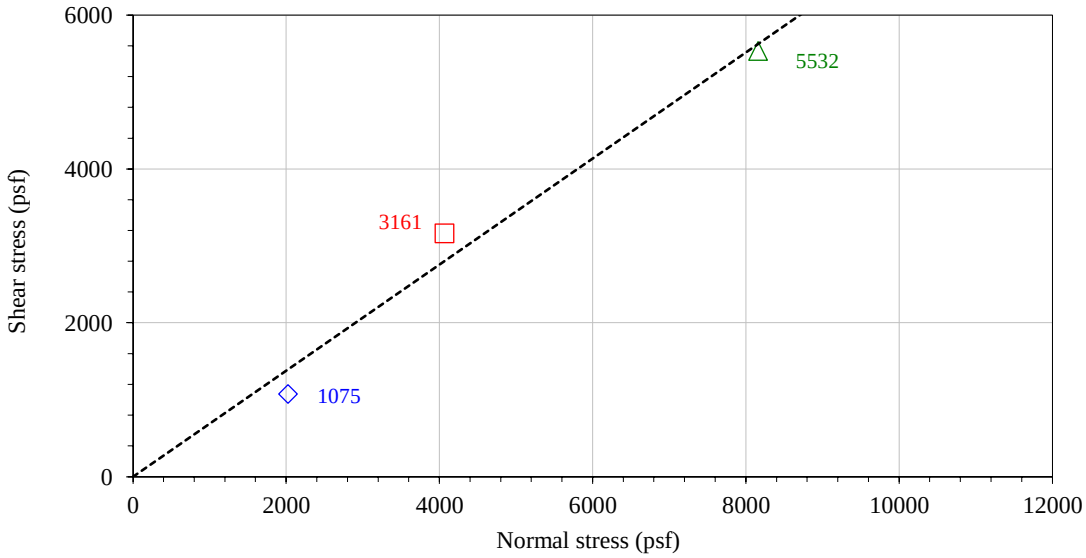
Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils (*ASTM 6467*)





*Horizontal deflection (in) = Degrees rotation * 0.0292*





Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils (*ASTM 6467*)

Project: Gordon Geotechnical Engineering
No: M02106-017 (528-005-20)
Location: Gravel Pit
Date: 9/18/2020
By: JDF

Boring No.: B-6
Sample:
Depth: 30'
Sample Description: Grey clay
Engineering Classification: Not requested

Sample preparation: Screened over No.40 / remolded near liquid limit
Test type: Residual with multi-staged sample
Ring friction remarks: Modified upper platen
Ring shear device: Bromhead type, WF 25850 #2
Sample presheared: Yes
Failure surface location: Near center

inner/outter/avg. dia. (mm)	70	100	85
inner/outter/avg. radii (mm)	35	50	42.5
Thickness (mm)/area (cm^2):	5	40.1	

LL (%):	33	CF [a] (%):	N/A
PL (%):	16	Gs assum.:	2.8
		% Finer No. 200 (tested sample):	90.7

LL, PL = liquid and plastic limits, respectively
[a]CF = %<0.002 mm and passing No. 10

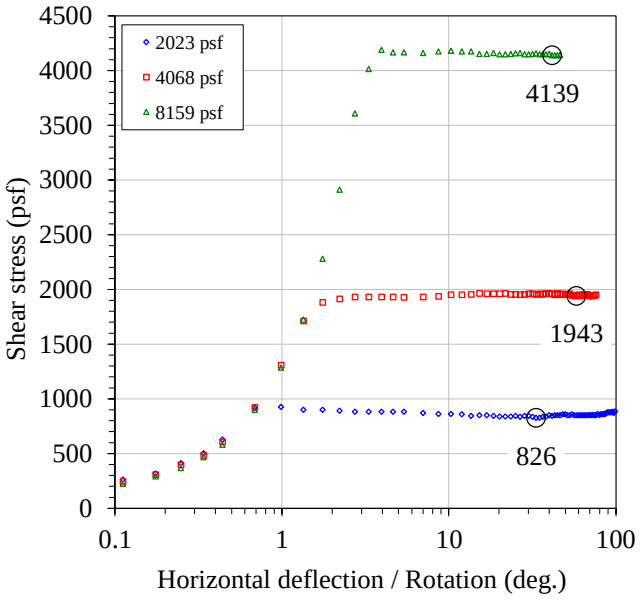
	τ stress	σ stress	Horz. def	Vert. def
Units:	(psf)	(psf)	(deg.)	(in)
Conversion:	20885.434	2048.2	1	3.94E-05

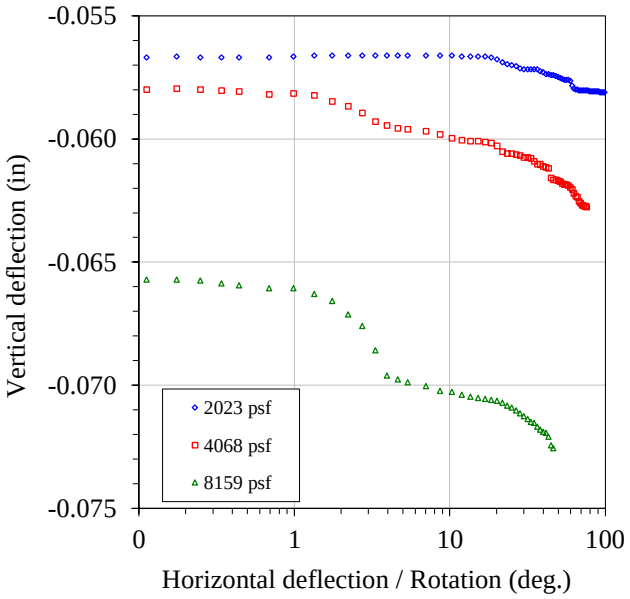
	Sample 1 Initial	Sample 1 Final	Sample 2 Initial	Sample 2 Final	Sample 3 Initial	Sample 3 Final
Sample thickness (mm)	4.46					
Wt. container + wet soil (g)	734.20					
Wt. container (g)	698.24					
Wet soil + tare (g)	62.18					62.79
Dry soil + tare (g)	50.31		Staged			58.65
Tare (g)	12.71					36.60
Water content (%)	31.6					18.8
Dry density (g/cm^3)	1.53					
Saturation (%)	100.0					

	Sample 1	Sample 2	Sample 3
Normal load on lever arm (kg)	3	7	15
Conversion factor (kg/cm^2) to (psf):	2048.1614	2048.1614	2048.1614
Residual deformation (deg.)	33.321	57.981	41.541
Normal stress (psf)	2023	4068	8159
Residual shear stress (psf)	826	1943	4139
Peak shear stress (psf)	927	1966	4190
Secant residual friction angle (deg)	22.2	25.5	26.9
Secant peak friction angle (deg)	24.6	25.8	27.2
Shear rate (deg/min)	0.0274	0.0274	0.0274
Peak friction angle (deg)	26.8		
Residual friction angle (deg)	26.4		

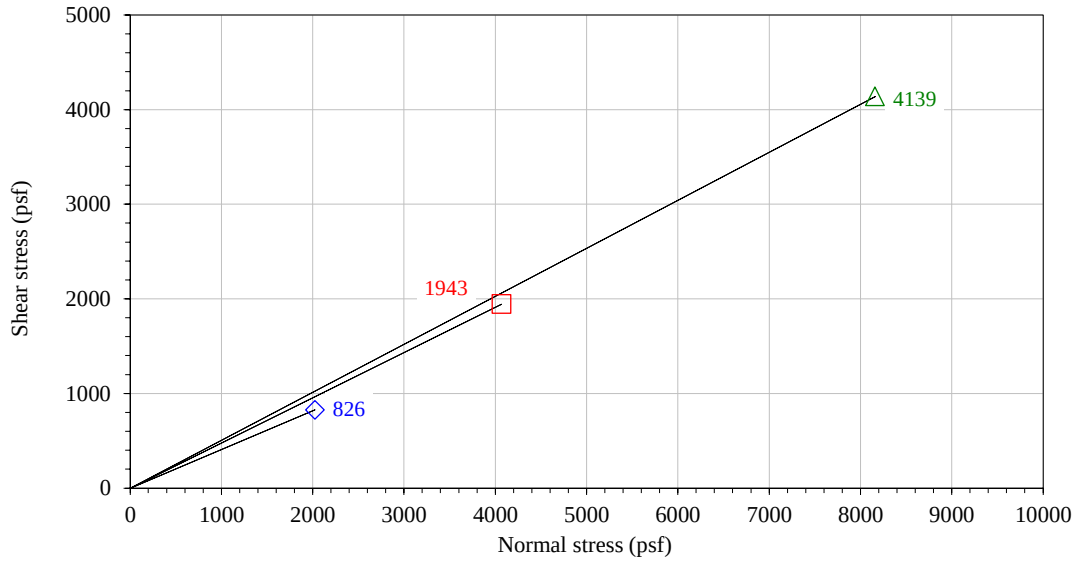
Entered by:_____
Reviewed:_____

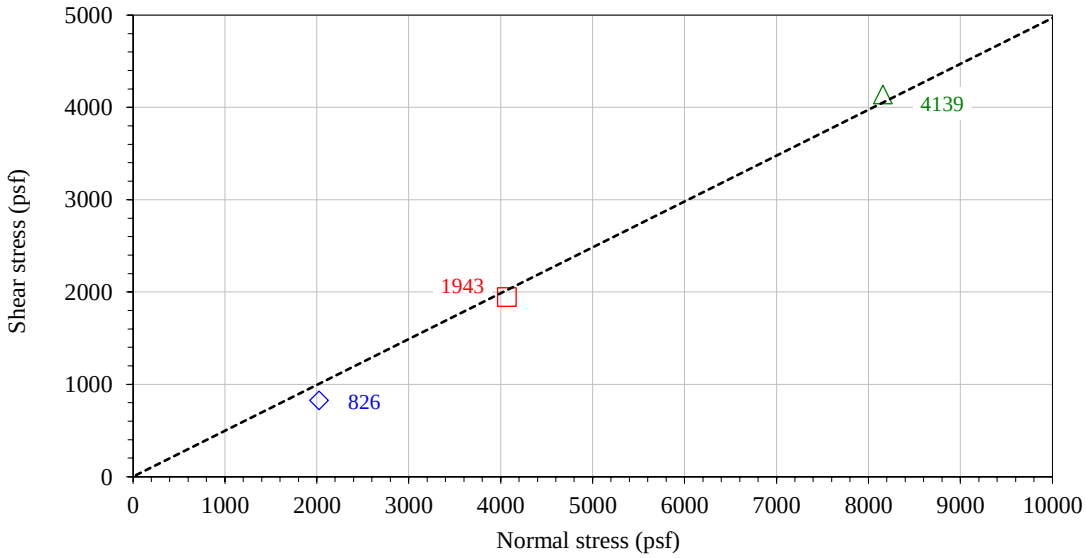
Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils (*ASTM 6467*)





*Horizontal deflection (in) = Degrees rotation * 0.0292*





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:**

No: M02106-006 (528-002-18) **Sample: Sample C**

Location: View 62 **Depth:**

Date: 4/2/2018 Sample Description: Brown sand

By: JDF Sample type: Laboratory compacted

Test type: Inundated Dry unit weight 120.5 pcf

Lateral displacement (in.): 0.3 at 6.5 (%) w

Shear rate (in./min): 0.0086 Compaction specifications: 95% of $\gamma_d$max

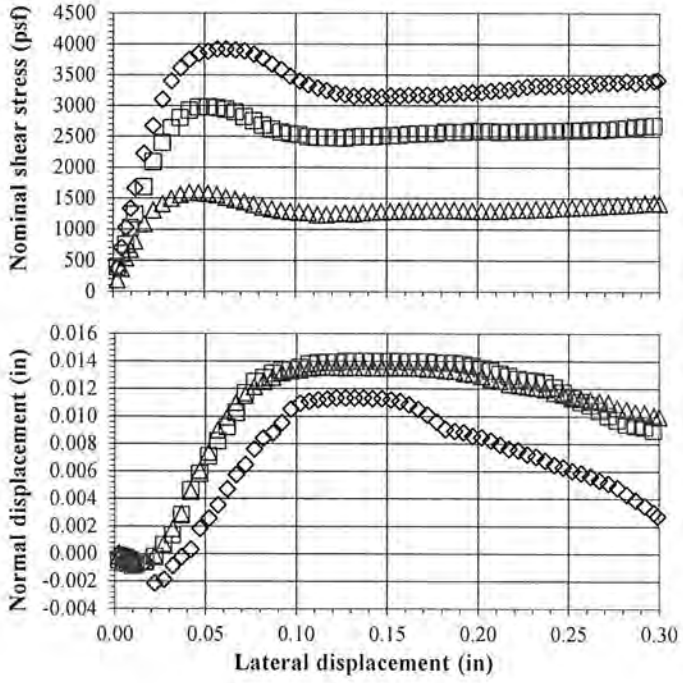
Specific gravity, Gs: 2.65 Assumed

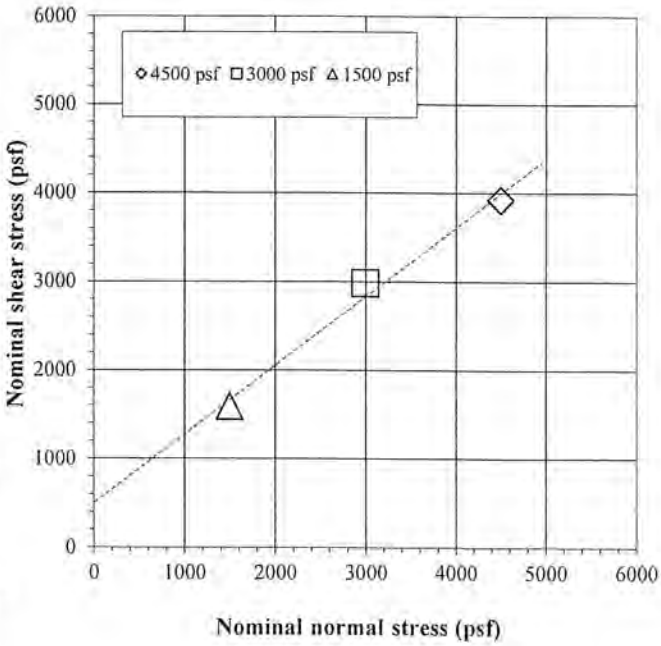
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	4500		3000		1500	
Peak shear stress (psf)	3919		2980		1589	
Lateral displacement at peak (in)	0.057		0.052		0.042	
Load Duration (min)	79		84		59	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.995	0.976	1.002	0.982	0.995	0.980
Sample diameter (in)	2.409	2.409	2.414	2.414	2.423	2.423
Wt. rings + wet soil (g)	197.49	207.07	199.36	209.02	195.44	205.97
Wt. rings (g)	44.63	44.63	44.79	44.79	41.95	41.95
Wet soil + tare (g)	313.38		313.38		313.38	
Dry soil + tare (g)	302.13		302.13		302.13	
Tare (g)	122.19		122.19		122.19	
Water content (%)	6.3	12.9	6.3	12.9	6.3	13.5
Dry unit weight (pcf)	120.8	123.2	120.8	123.2	119.9	121.7
Void ratio, e, for assumed Gs	0.37	0.34	0.37	0.34	0.38	0.36
Saturation (%)*	44.9	100.0	44.9	100.0	43.7	100.0

ϕ' (deg)	38
c' (psf)	499

Average of 3 samples	Initial	Pre-shear
Water content (%)	6.3	13.1
Dry unit weight (pcf)	120.5	122.7

*Pre-shear saturation set to 100% for phase calculations





Entered by: JDF

Reviewed: JP

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:**

No: M02106-006 (528-002-18) **Sample: Sample C**

Location: View 62 **Depth:**

Nominal normal stress = 4500 psf			Nominal normal stress = 3000 psf			Nominal normal stress = 1500 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.002	366	0.000	0.002	397	0.000	0.002	183	0.000
0.005	702	0.000	0.005	605	-0.001	0.005	364	0.000
0.007	1029	0.000	0.007	747	-0.001	0.007	538	0.000
0.010	1337	0.000	0.010	1018	-0.001	0.010	669	-0.001
0.012	1663	0.000	0.012	1237	-0.001	0.012	803	-0.001
0.017	2220	-0.001	0.017	1680	-0.001	0.017	1086	-0.001
0.022	2676	-0.002	0.022	2085	0.000	0.022	1306	0.000
0.027	3097	-0.002	0.027	2397	0.001	0.027	1407	0.001
0.032	3400	-0.001	0.032	2636	0.001	0.032	1496	0.002
0.037	3614	0.000	0.037	2803	0.003	0.037	1553	0.003
0.042	3752	0.000	0.042	2924	0.005	0.042	1589	0.005
0.047	3844	0.002	0.047	2973	0.006	0.047	1585	0.006
0.052	3883	0.003	0.052	2980	0.007	0.052	1572	0.007
0.057	3919	0.004	0.057	2964	0.008	0.057	1552	0.009
0.062	3917	0.005	0.062	2937	0.009	0.062	1513	0.010
0.067	3901	0.006	0.067	2897	0.010	0.067	1473	0.011
0.072	3888	0.006	0.072	2819	0.012	0.072	1438	0.011
0.077	3836	0.008	0.077	2752	0.013	0.077	1396	0.012
0.082	3776	0.008	0.082	2681	0.013	0.082	1355	0.013
0.087	3674	0.009	0.087	2617	0.013	0.087	1326	0.013
0.092	3585	0.010	0.092	2569	0.013	0.092	1299	0.013
0.097	3476	0.010	0.097	2546	0.013	0.097	1284	0.013
0.102	3400	0.011	0.102	2526	0.014	0.102	1273	0.013
0.107	3337	0.011	0.107	2490	0.014	0.107	1266	0.013
0.112	3288	0.011	0.112	2479	0.014	0.112	1230	0.014
0.117	3243	0.011	0.117	2480	0.014	0.117	1233	0.014
0.122	3196	0.011	0.122	2478	0.014	0.122	1254	0.014
0.127	3175	0.011	0.127	2472	0.014	0.127	1263	0.014
0.132	3152	0.011	0.132	2493	0.014	0.132	1248	0.014
0.137	3165	0.011	0.137	2496	0.014	0.137	1265	0.014
0.142	3152	0.011	0.142	2497	0.014	0.142	1279	0.014
0.147	3141	0.011	0.147	2508	0.014	0.147	1285	0.014
0.152	3160	0.011	0.152	2513	0.014	0.152	1288	0.014
0.157	3154	0.011	0.157	2517	0.014	0.157	1291	0.014
0.162	3173	0.011	0.162	2537	0.014	0.162	1303	0.014
0.167	3175	0.010	0.167	2543	0.014	0.167	1295	0.014
0.172	3175	0.010	0.172	2548	0.014	0.172	1303	0.013
0.177	3154	0.010	0.177	2550	0.014	0.177	1303	0.013
0.182	3188	0.009	0.182	2573	0.014	0.182	1304	0.013
0.187	3186	0.009	0.187	2569	0.014	0.187	1308	0.013
0.192	3214	0.009	0.192	2570	0.014	0.192	1298	0.013
0.197	3214	0.009	0.197	2589	0.014	0.197	1295	0.013
0.202	3220	0.008	0.202	2579	0.013	0.202	1295	0.013
0.207	3238	0.008	0.207	2583	0.013	0.207	1301	0.013
0.212	3256	0.008	0.212	2572	0.013	0.212	1300	0.013
0.217	3261	0.008	0.217	2578	0.013	0.217	1313	0.012
0.222	3288	0.008	0.222	2574	0.013	0.222	1314	0.012
0.227	3314	0.007	0.227	2583	0.013	0.227	1316	0.012
0.232	3321	0.007	0.232	2579	0.013	0.232	1322	0.012
0.237	3321	0.007	0.237	2591	0.012	0.237	1327	0.012
0.242	3324	0.006	0.242	2589	0.012	0.242	1338	0.012
0.247	3332	0.006	0.247	2592	0.012	0.247	1345	0.012
0.252	3335	0.006	0.252	2602	0.011	0.252	1351	0.011
0.257	3332	0.006	0.257	2596	0.011	0.257	1363	0.011
0.262	3345	0.006	0.262	2609	0.011	0.262	1368	0.011
0.267	3371	0.005	0.267	2608	0.010	0.267	1376	0.011
0.272	3376	0.005	0.272	2619	0.010	0.272	1386	0.011
0.277	3376	0.005	0.277	2631	0.010	0.277	1390	0.011
0.282	3402	0.004	0.282	2639	0.009	0.282	1398	0.010
0.287	3371	0.004	0.287	2659	0.009	0.287	1408	0.010
0.292	3389	0.003	0.292	2674	0.009	0.292	1421	0.010
0.297	3405	0.003	0.297	2680	0.009	0.297	1426	0.010
0.299	3418	0.003	0.300	2692	0.009	0.300	1420	0.010

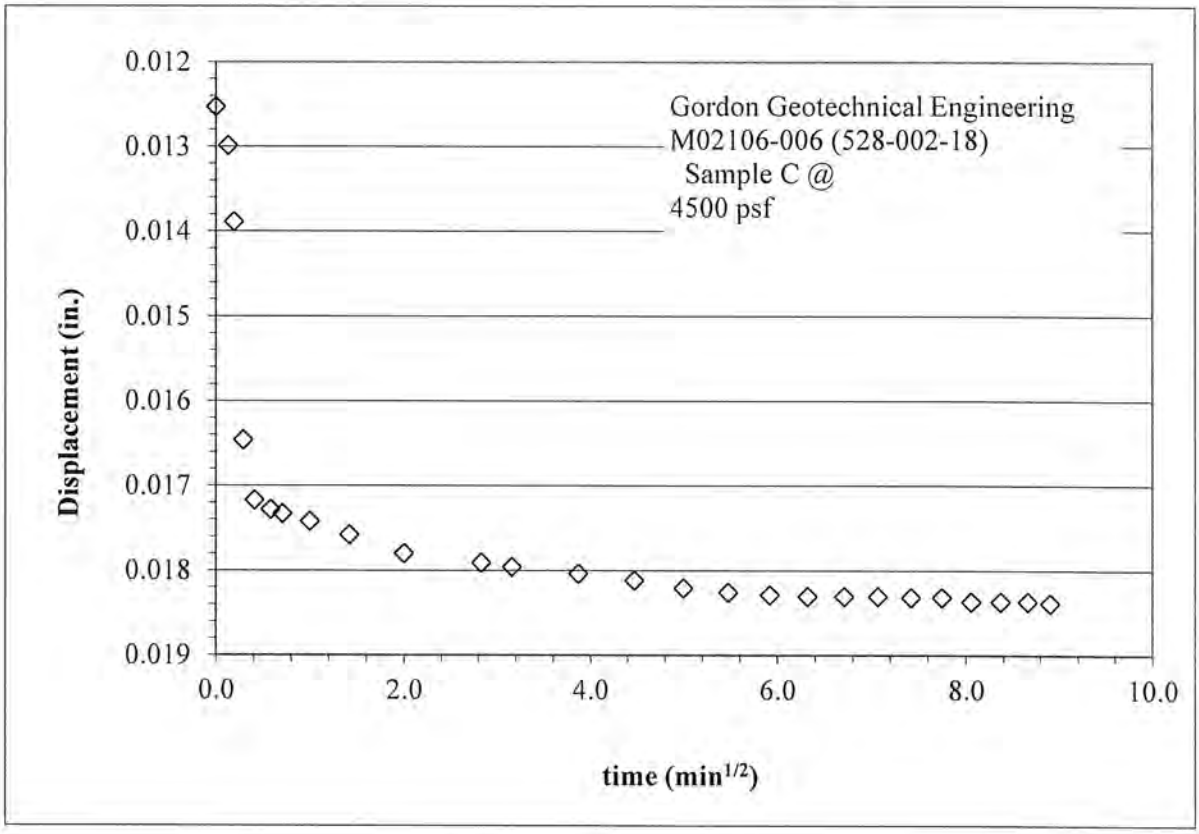
Direct Shear Test for Soils Under Drained Conditions

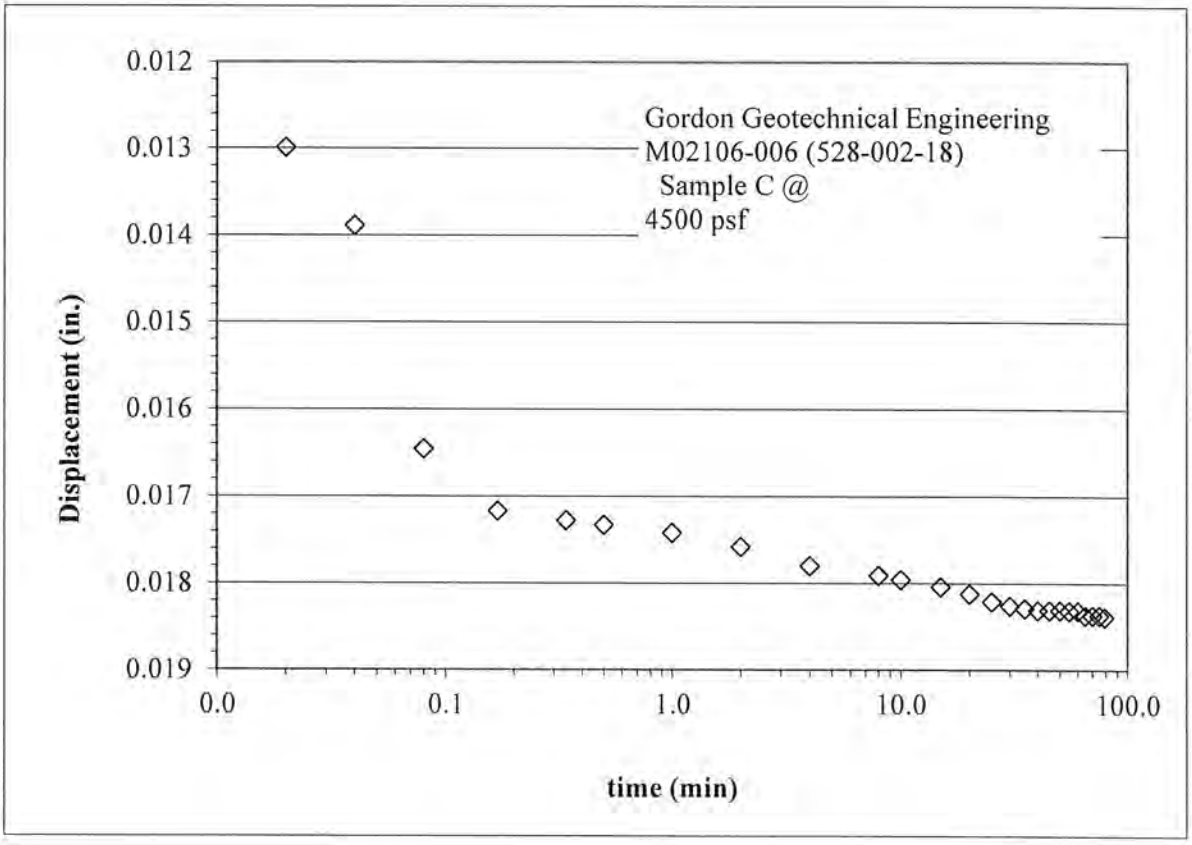
(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.:**

No: M02106-006 (528-002-18) **Sample: Sample C**

Location: View 62 **Depth:**





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.: TP-5**

No: M02106-006 (528-002-18) **Sample:**

Location: View 62 **Depth:**

Date: 4/5/2018 Sample Description: Brown clay

By: EH Sample type: Laboratory compacted

Test type: Inundated Dry unit weight 118.1 pcf

Lateral displacement (in.): 0.3 at 10.8 (%) w

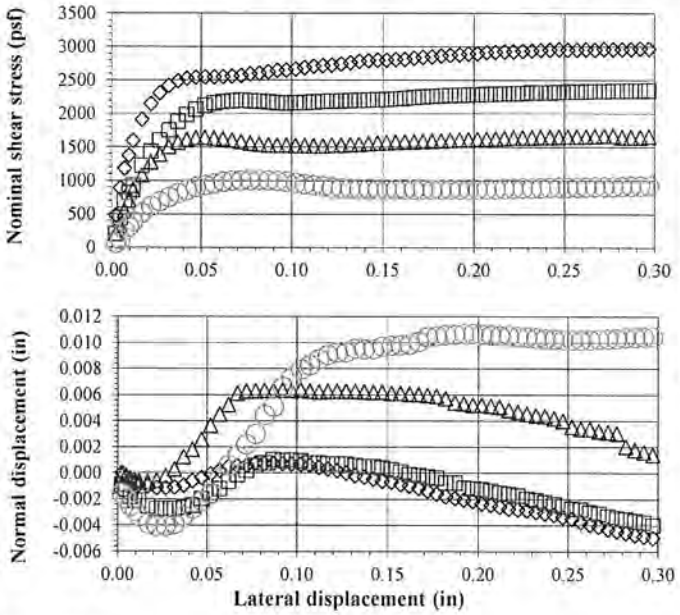
Shear rate (in./min): 0.0007 Compaction specifications: 95% of $\gamma_d$max

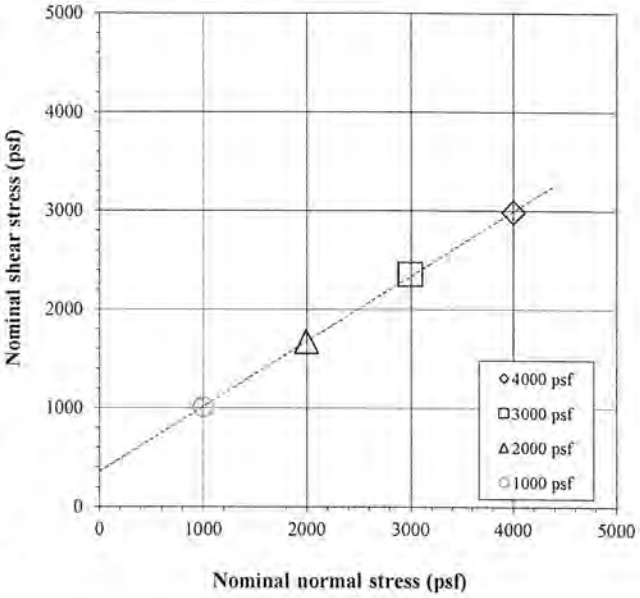
Specific gravity, Gs: 2.70 Assumed

	Sample 1		Sample 2		Sample 3		Sample 4	
Nominal normal stress (psf)	4000		3000		2000		1000	
Peak shear stress (psf)	2984		2355		1672		1012	
Lateral displacement at peak (in)	0.301		0.301		0.277		0.077	
Load Duration (min)	981		931		991		46	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	1.002	0.984	0.993	0.946	0.998	0.995	1.002	0.992
Sample diameter (in)	2.423	2.423	2.416	2.416	2.422	2.422	2.417	2.417
Wt. rings + wet soil (g)	201.88	207.81	201.98	205.62	200.49	207.51	203.84	210.44
Wt. rings (g)	43.21	43.21	45.58	45.58	42.54	42.54	46.11	46.11
Wet soil + tare (g)	277.93		277.93		277.93		277.93	
Dry soil + tare (g)	263.50		263.50		263.50		263.50	
Tare (g)	128.39		128.39		128.39		128.39	
Water content (%)	10.7	14.8	10.7	13.3	10.7	15.6	10.7	15.3
Dry unit weight (pcf)	118.2	120.3	118.3	124.1	118.2	118.6	118.1	119.2
Void ratio, e, for assumed Gs	0.43	0.40	0.43	0.36	0.43	0.42	0.43	0.41
Saturation (%)*	67.7	100.0	67.8	100.0	67.8	100.0	67.5	100.0

		Average of 4 samples	Initial	Pre-shear
ϕ' (deg)	33	Water content (%)	10.7	14.7
c' (psf)	356	Dry unit weight (pcf)	118.2	120.5

*Pre-shear saturation set to 100% for phase calculations





Comments:

Test specimens swelled upon inundation.

Entered by: EH

Reviewed: NB

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.: TP-5**

No: M02106-006 (528-002-18) **Sample:**

Location: View 62 **Depth:**

Nominal normal stress = 4000 psf			Nominal normal stress = 3000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.002	480	0.000	0.002	205	-0.001	0.002	203	0.000	0.002	67	-0.002
0.005	888	0.000	0.005	442	-0.001	0.005	327	0.000	0.005	120	-0.002
0.007	1182	-0.001	0.007	704	-0.002	0.007	545	0.000	0.007	254	-0.003
0.010	1373	-0.001	0.010	821	-0.002	0.010	704	-0.001	0.010	311	-0.003
0.012	1595	-0.001	0.012	926	-0.002	0.012	860	-0.001	0.012	391	-0.003
0.017	1913	-0.001	0.017	1223	-0.003	0.017	1083	-0.001	0.017	514	-0.004
0.022	2147	-0.001	0.022	1435	-0.003	0.022	1274	-0.001	0.022	617	-0.004
0.027	2310	-0.001	0.027	1606	-0.003	0.027	1392	0.000	0.027	689	-0.004
0.032	2419	-0.001	0.032	1754	-0.003	0.032	1505	0.000	0.032	755	-0.004
0.037	2488	-0.001	0.037	1884	-0.003	0.037	1572	0.001	0.037	812	-0.003
0.042	2527	-0.001	0.042	1984	-0.002	0.042	1614	0.002	0.042	857	-0.003
0.047	2542	0.000	0.047	2067	-0.002	0.047	1638	0.003	0.047	904	-0.002
0.052	2548	0.000	0.052	2124	-0.001	0.052	1643	0.004	0.052	933	-0.002
0.057	2550	0.000	0.057	2160	-0.001	0.057	1636	0.005	0.057	961	0.000
0.062	2553	0.001	0.062	2182	-0.001	0.062	1625	0.005	0.062	984	0.001
0.067	2560	0.001	0.067	2196	0.000	0.067	1604	0.006	0.067	1002	0.001
0.072	2568	0.001	0.072	2201	0.000	0.072	1582	0.006	0.072	1007	0.002
0.077	2594	0.001	0.077	2195	0.001	0.077	1558	0.006	0.077	1012	0.003
0.082	2602	0.001	0.082	2188	0.001	0.082	1543	0.006	0.082	1009	0.004
0.087	2625	0.001	0.087	2175	0.001	0.087	1532	0.006	0.087	1006	0.005
0.092	2646	0.001	0.092	2164	0.001	0.092	1527	0.006	0.092	998	0.007
0.097	2653	0.001	0.097	2160	0.001	0.097	1526	0.006	0.097	985	0.007
0.102	2669	0.001	0.102	2163	0.001	0.102	1525	0.006	0.102	967	0.008
0.107	2690	0.001	0.107	2167	0.001	0.107	1522	0.006	0.107	952	0.008
0.112	2710	0.000	0.112	2177	0.001	0.112	1519	0.006	0.112	934	0.009
0.117	2720	0.000	0.117	2184	0.001	0.117	1521	0.006	0.117	917	0.009
0.122	2728	0.000	0.122	2189	0.001	0.122	1526	0.006	0.122	900	0.009
0.127	2746	0.000	0.127	2195	0.001	0.127	1533	0.006	0.127	892	0.009
0.132	2764	0.000	0.132	2197	0.001	0.132	1540	0.006	0.132	883	0.010
0.137	2785	0.000	0.137	2203	0.001	0.137	1545	0.006	0.137	880	0.010
0.142	2793	0.000	0.142	2205	0.001	0.142	1553	0.006	0.142	878	0.010
0.147	2801	-0.001	0.147	2209	0.000	0.147	1560	0.006	0.147	872	0.010
0.152	2801	-0.001	0.152	2217	0.000	0.152	1566	0.006	0.152	874	0.010
0.157	2808	-0.001	0.157	2224	0.000	0.157	1573	0.006	0.157	874	0.010
0.162	2813	-0.001	0.162	2233	0.000	0.162	1578	0.006	0.162	874	0.010
0.167	2829	-0.001	0.167	2244	0.000	0.167	1585	0.006	0.167	872	0.010
0.172	2844	-0.001	0.172	2254	0.000	0.172	1586	0.006	0.172	874	0.010
0.177	2852	-0.002	0.177	2261	0.000	0.177	1592	0.006	0.177	867	0.011
0.182	2865	-0.002	0.182	2269	-0.001	0.182	1596	0.006	0.182	871	0.011
0.187	2873	-0.002	0.187	2274	-0.001	0.187	1606	0.005	0.187	872	0.011
0.192	2883	-0.002	0.192	2279	-0.001	0.192	1611	0.005	0.192	874	0.011
0.197	2893	-0.002	0.197	2282	-0.001	0.197	1614	0.005	0.197	876	0.011
0.202	2899	-0.002	0.202	2288	-0.001	0.202	1621	0.005	0.202	876	0.011
0.207	2914	-0.002	0.207	2292	-0.001	0.207	1626	0.005	0.207	878	0.011
0.212	2919	-0.003	0.212	2297	-0.002	0.212	1631	0.005	0.212	879	0.011
0.217	2927	-0.003	0.217	2300	-0.002	0.217	1636	0.005	0.217	883	0.011
0.222	2930	-0.003	0.222	2303	-0.002	0.222	1641	0.005	0.222	887	0.010
0.227	2935	-0.003	0.227	2308	-0.002	0.227	1643	0.005	0.227	889	0.010
0.232	2942	-0.003	0.232	2318	-0.002	0.232	1647	0.004	0.232	891	0.010
0.237	2948	-0.003	0.237	2318	-0.002	0.237	1651	0.004	0.237	897	0.010
0.242	2955	-0.003	0.242	2318	-0.002	0.242	1652	0.004	0.242	900	0.010
0.247	2961	-0.003	0.247	2325	-0.003	0.247	1656	0.004	0.247	902	0.010
0.252	2955	-0.004	0.252	2330	-0.003	0.252	1661	0.004	0.252	902	0.010
0.257	2955	-0.004	0.257	2329	-0.003	0.257	1661	0.003	0.257	905	0.010
0.262	2961	-0.004	0.262	2335	-0.003	0.262	1664	0.003	0.262	907	0.010
0.267	2955	-0.004	0.267	2338	-0.003	0.267	1667	0.003	0.267	911	0.010
0.272	2966	-0.004	0.272	2340	-0.003	0.272	1671	0.003	0.272	913	0.010
0.277	2963	-0.004	0.277	2343	-0.003	0.277	1672	0.003	0.277	914	0.010
0.282	2961	-0.005	0.282	2343	-0.004	0.282	1651	0.002	0.282	919	0.010
0.287	2966	-0.005	0.287	2346	-0.004	0.287	1652	0.002	0.287	920	0.010
0.292	2976	-0.005	0.292	2347	-0.004	0.292	1653	0.002	0.292	925	0.010
0.297	2973	-0.005	0.297	2353	-0.004	0.297	1663	0.001	0.297	930	0.010
0.301	2984	-0.005	0.301	2355	-0.004	0.300	1660	0.001	0.300	931	0.010

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: Gordon Geotechnical Engineering **Boring No.: TP-5**

No: M02106-006 (528-002-18) **Sample:**

Location: View 62 **Depth:**