



1500 Abbott Road, Suite 210
 East Lansing, MI 48823
 Telephone: (517) 337-0111
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BORING NO. **MW-106D** SHEET **2 OF 5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **GF/PO**

COORDINATES **N 229,936.2 E 19,442,633.1**

SURFACE ELEVATION **1183.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	30-27	100	sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SW			
45		SSS	7-9 12-15	100	Light brown, fine to medium SAND, trace to some coarse Sand, trace fine Gravel, trace Silt, loose, well graded, massive, DRY. Fine to medium Sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SW			1141.25
50		SSS	8-9 10-15	100	Light brown, fine SAND, trace medium Sand, trace fine Gravel, trace Silt, loose, well graded, massive, DRY. Fine sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SW			1136.25
55		SSS	3-5 7-7	100	Light brown, medium SAND, trace to some fine Sand, trace Silt, trace coarse Sand, loose, well graded, DRY. Fine to medium sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity, ~10% quartz, and occurs as occasional 1" thick seams.	SW		Elevation of change in lithology indicated by drillers.	1131.25
60		SSS	2-3 3-2	100	Light brown, fine SAND and, SILT, trace medium Sand, loose, WET.	SM		Elevation of change in lithology indicated by drillers. Wet at ~58' bgl.	1125.75
65		SSS	2-2 2-3	100	Brown, fine to medium SAND, trace to some coarse Sand, trace Silt, well to poorly graded, WET. Fine to medium sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SW-SP			1123.75
70		SSS	1-1 1-1	100	Brown, fine SAND and, SILT, trace medium Sand, WET.	SM		When augers pulled to replace basket-collapsed to 58'; elevation of change in lithology indicated by drillers..	1118.75
75		SSS	1-1 1-1	75	Brown, fine to medium SAND, trace to some coarse Sand, trace Silt, loose, well to poorly graded, massive, WET. Fine to medium sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SW-SP		Elevation of change in lithology indicated by drillers.	1115.75
80		SSS	1-1 1-1	100	Brown SILT and fine SAND, trace medium Sand, trace organic matter, trace coarse Sand, loose, massive, WET. Fine sand is well rounded with moderate sphericity and ~70-80% quartz.	SM			1111.75
85		SSS	1-1 1-1	100	Brown SILT and fine SAND, trace medium Sand, loose, massive, WET. Fine sand is sub-angular with moderate sphericity and ~60-70% quartz.	SM			1106.25
90		SSS	1-2 2-3	100	Brown, fine to medium SAND, trace coarse Sand, trace Silt, loose, poorly graded, massive, WET. Fine to medium sand is sub-angular to with moderate sphericity and ~60-70% quartz.	SP			1101.25
					Brown Silty, CLAY, trace fine Sand, soft, moderate plasticity, MOIST.	CL-ML		Elevation of change in lithology indicated by drillers.	1097.95
					Brown to red, fine to medium SAND, trace coarse Sand, trace Silt, loose, poorly graded, massive, WET. Fine to medium sand is sub-angular with low sphericity and ~60-70% quartz.	SP		Elevation of change in lithology indicated by drillers.	1097.25
						SM		Elevation of change in	1091.25



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BORING NO. **MW-106D** SHEET **3 OF 5**
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COORDINATES **N 229,936.2 E 19,442,633.1**

SURFACE ELEVATION **1183.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	2-3 4-4	100	Brown to gray, fine SAND and, SILT, trace medium Sand, loose, massive, WET. (continued)	SM		lithology indicated by drillers.	
100		SSS	1-2 3-5	100	Brown, fine to coarse SAND, trace to some fine Gravel, trace Silt, trace coarse Sand, loose, well graded, WET. Fine to coarse sand is rounded with moderate sphericity and ~60-70% quartz. Coarse sand occurs in lenses.	SW			1086.25
105		SSS	2-1 2-4	100	Brown, fine to coarse SAND, trace to some fine Gravel, trace Silt, trace coarse Sand, loose, well graded, WET. Fine to coarse sand is sub-rounded with moderate sphericity and ~50-60% quartz. Coarse Sand occurs as occasional lenses.	SW			1081.25
110		SSS	2-1 2-4	50	Brown, fine to coarse SAND, trace fine Gravel, trace Silt, occasional lenses of coarse Sand, loose, well graded. Fine to Coarse Sand is sub-rounded with moderate sphericity and ~50-60% quartz. Coarse sand occurs as occasional lenses.	SW			1076.25
115		SSS	3-3 4-5	100	Brown, Silty, CLAY, trace to some fine Sand, medium stiff, moderately plastic, MOIST.	CL-ML		Elevation of change in lithology indicated by drillers.	1073.75
120		SSS	4-14 27-35	75	Brown, medium to coarse SAND, trace to some fine to medium Gravel, trace to some fine Sand, trace Silt, poorly graded, massive, WET. Fine to coarse sand is sub-angular and ~50% quartz. Coarse component is 10% quartz.	SP		Last Sample of 11/2/00.	1071.75
125		SSS	8-38 87-50 for 3"	100	Light brown, medium to coarse SAND, trace fine Gravel, trace fine Sand, poorly graded, wet. Fine to medium sand is well rounded with high sphericity and ~80-90% quartz. Coarse fraction is well rounded with low to moderate sphericity and composed almost entirely of rock fragments.	SP		Larry Jordan takes over logging from 119' on.	1066.25
130		SSS	5-14 44-40	100	Light brown, fine to medium SAND, trace coarse Sand, trace Silt, poorly graded, wet. All material is well rounded with high sphericity and ~90% quartz.	SP		Last sample of 11/3/00. Drillers Augered to 124'.	1063.75
135		SSS	53-30 95--	100	Brown, fine to very coarse SAND and fine to medium GRAVEL, trace coarse Sand and fine Gravel, well graded, and WET. Fine to medium sand is well rounded, highly spherical, and 70-80% quartz. Coarse component is 5-10% quartz. Coarse sand and fine gravel occurs as seams of less than 0.1 feet.	SW-GW		New driller (Dennis); water level at 0755 11/3/00 is 68.4'; begin at 124' on 11/6/00.	1061.25
140		SSS	4-3 4-8	25	Brown, medium SAND, trace to some fine and coarse Sand, trace very coarse Sand, poorly graded, massive, WET. Fine to medium sand is well rounded, highly spherical, and 60-70% quartz. Coarse component is rounded with low sphericity, and 10-20% quartz.	SP		Elevation of change in lithology indicated by drillers.	1057.25
145		SSS	7-14 20-23	100	Brown, fine to very coarse SAND, trace Silt, poorly graded, WET. Fine to medium sand is well rounded, highly spherical, and 70-80% quartz. Coarse component is angular, spherical, and ~10-20% quartz.	SP			1051.25
					Brown SILT and fine SAND, trace medium Sand, non-plastic, massive, WET. Fine to medium sand is well rounded, spherical, and 50-70% quartz.	SM			1048.25
					Brown, fine to coarse SAND and fine GRAVEL, trace Silt, well graded, massive, WET. Fine to medium sand is well rounded, highly spherical, and 70-80% quartz.	SW-GW			1046.25
					Brown, fine to medium SAND, trace Silt, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP		Elevation of change in lithology indicated by drillers (layers of fine and coarse material).	1041.25
					Brown SILT and very fine SAND, trace medium Sand, trace Clay, WET. Occasional oblique partings laminated at	SM			1039.25



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 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **GF/PO**

COORDINATES **N 229,936.2 E 19,442,633.1**

SURFACE ELEVATION **1183.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	3-4 13-21		40 degrees. Brown, fine to medium SAND, trace Gravel, poorly graded. Sand is well rounded and highly spherical, and ~70-80% quartz.	SM SP			1036.25
155		SSS	---		Brown, fine to very coarse SAND and fine GRAVEL, trace Silt, well graded, WET.	SW-GW		Elevation of change in lithology indicated by drillers.	1031.25
160		SSS	0-1 4-7	75	Brown SILT and CLAY, trace fine to coarse Sand, trace very coarse Sand, stiff, low plasticity, MOIST. Upper contact at oblique(40 degree) angle.	CL-ML		Elevation of change in lithology indicated by drillers.	1029.25
165		SSS	3-7 13-19	66	Grayish brown, fine to coarse SAND, little to some Clay, trace fine Gravel, very loose, massive, WET. Fine to coarse sands are rounded, spherical, 80-90% quartz. Fine gravel is sub-rounded, sub-spherical, and 60-70% quartz.	SC			1025.75
170		SSS	4-17 40-44	66	Brown, fine to coarse SAND, little Clay, medium dense, poorly graded, massive, WET. Fine to medium sands are well rounded, spherical, and 80-90% quartz. Coarse sand is rounded, sub-spherical, and 60-70% quartz.	SP			1021.25
175		SSS	3-8 26-35	17	Light brown, fine to coarse SAND, trace Silt and Gravel, very dense, poorly graded, massive, WET. Fine to medium sands are well rounded, highly spherical, and 80-90% quartz. Coarse sand is well rounded, sub-spherical, and 70-80% quartz.	SP		Color change from light brown to light gray and brown at 170'.	1016.25
180		SSS	3-8 26-35	50	Brown to light gray, fine to coarse SAND, trace Silt and Gravel, very dense, poorly graded, massive, wet. Fine to medium sands are well rounded, highly spherical, and 80-90% quartz. Coarse sand is well rounded, subspherical, and 70-80% quartz.	SP		Fine sands are likely only slough; driller says it is likely that we hit large gravels and thus low recovery.	1011.25
185		SSS	2-3 10-13	50	Multicolored to brown, very coarse SAND, trace fine Sand and Gravel, very dense, poorly graded, massive, WET. Coarse sand is rounded to sub-rounded, low sphericity, and 60-70% quartz. Fine sand is well rounded, highly spherical, and 80-90% quartz.	SP		179-181' first sample attempt, no recovery. Likely due to Gravel.	1006.25
190		SSS	0-3 7-12	50	Light brown, fine to medium SAND, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded and highly spherical, and ~80-90% quartz.	SP			1001.25
195		SSS	3-4 14-16		Light brown, fine to medium SAND, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded and highly spherical, and ~80-90% quartz.	SP			996.25
			3-6			SP		199-201' first sampling attempt, no recovery.	991.25
						SP			986.25



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COORDINATES **N 229,936.2 E 19,442,633.1**
 SURFACE ELEVATION **1183.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	10-17	50	Light brown, fine to medium SAND, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded and highly spherical, and ~80-90% quartz. (continued)	SP			
205		SSS	3-5 9-10						
210		SSS	18-52 97--	25	Light brown, fine to medium SAND, trace Silt, dense, poorly graded, massive, WET. Fine sand is rounded to sub-rounded with high sphericity and 85-95% quartz. Medium sand is angular, sub-spherical, and 80-90% quartz.	SP			976.25
215		SSS	---		Light brown, fine to coarse SAND, trace Silt, dense, well graded, massive, WET. Fine sand is sub-angular to well rounded with high sphericity and 85-95% quartz. Medium and coarse sand is angular with low sphericity and 75-85% quartz. Silt occurs as one ~1/4" very soft gray clast.	SW			971.25
220		SSS	25-57 110--	42	Light gray to brown, fine to medium SAND, some Silt, dense, massive, WET. Sand is well rounded with high sphericity and 85-95% quartz. Silt occurs in ~3" thick lenses dispersed throughout the sample.	SM			966.25
225		SSS	6-21 44-65		Light brown, fine to medium SAND, trace to little Silt, dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 85-95% quartz.	SP			961.25
230		SSS	13-68 100 for 3"--		Light brown, fine to coarse SAND, trace Silt, dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is angular, sub-spherical, and 60-70% quartz.	SP			956.25
235		GRAB	---		Light brown, fine to medium SAND, trace Silt, dense, poorly graded, massive, WET. Fine sand is well rounded with high sphericity and 80-90% quartz. Medium sand is angular with low sphericity and 60-70% quartz.	SP		Sampled with sand bailer.	951.25
240		SSS	21-72 100 for 4"--	42	Light brown, fine to medium SAND, trace Silt and fine Gravel, very dense, well graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Gravel is angular to sub-rounded and 50-60% quartz.	SW			946.25
								End of boring - 241'.	942.75



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BORING NO. **MW-107D** SHEET **1 OF 6**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD **4 1/4" HSA** EQUIPMENT **CME 1050**
 DRILLING STARTED **11/2/00** ENDED **11/6/00**

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Dark brown, SAND, little Clay, trace Silt, slightly plastic, massive, and MOIST.	SP-SC			1180.68
5		SSS	1-1 1-1	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 90% quartz.	SP			1176.18
					Brown, fine to coarse SAND, little Clay, massive, and MOIST. Fine sand is well rounded, and 80-90% quartz. Coarse sand is angular, and 70-80% quartz.	SC			1175.48
10		SSS	10-25 50/6"--	75	Light brown, fine to coarse SAND, trace Silt, poorly graded, massive, and MOIST. Fine to medium sand is well rounded. Coarse sand is angular.	SP			1170.68
15		SSS	7-7 14-15	83	Light brown, fine to coarse SAND, poorly graded, somewhat stratified, and MOIST. Sand is rounded.	SP			1166.68
20		SSS	7-8 12-16	67	Brown, fine to coarse SAND, trace Silt, well graded, massive, and MOIST. Fine to medium sands are well rounded, spherical, and 70-80% quartz. Coarse sand is sub-rounded, sub-spherical, and 50-60% quartz.	SW			1162.68
25		SSS	8-16 25-28	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Fine to medium sand is well rounded and spherical with ~70-80% quartz.	SP			1158.18
			7-8			SP			1151.68



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 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	20-21	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz. <i>(continued)</i>	SP			
35		SSS	7-12 17-20	67	Light brown, fine to medium SAND, trace Silt, trace fine Gravel, poorly graded, and MOIST. Sands are well rounded, spherical, and 80-90% quartz. Gravel occurs as a 3" seam of fine Gravel at 35' bgl. Gravel is sub-rounded, 50-60% quartz.	SP		1146.68	
40		SSS	7-12 18-21	67	Light brown, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and MOIST. Fine to medium sand is sub-rounded, highly spherical, and 80-90% quartz, Gravel is angular, and 50-60% quartz.	SW		1143.18	
45		SSS	7-21 31-38	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is sub-rounded, spherical, and 80-90% quartz.	SP		1138.18	
50		SSS	7-16 22-24	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz.	SP		1133.18	
55		SSS	4-8 10-13	67	Brown, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and MOIST. Sand is sub-rounded with low sphericity and 80-90% quartz.	SW		1130.68	
60		SSS	7-12 10-14	67	Light brown, fine to coarse SAND, trace Gravel, trace Silt, poorly graded, massive, and WET. Fine to medium sand is sub-rounded, sub-spherical, and 60-80% quartz. Coarse sand is angular and 50-60% quartz. 1-1.25" Gravel is angular with low sphericity, and composed of white to gray chert.	SP		Water encountered at 55.5' bgl during drilling.	1126.68 1125.18
65		SSS	2-3 7-8	63	Light brown, fine to coarse SAND, trace Silt, poorly graded, massive, and WET. Sand is sub-angular to sub-rounded, sub-spherical, and 60-70% quartz.	SP		1118.18	
			12-23		Light brown, fine to coarse SAND, some medium Gravel, trace Silt, well graded, massive, and WET. Sand is sub-angular to sub-rounded, sub-spherical, and 60-70% quartz. Gravel is sub-angular to sub-rounded, and 20-30%	SW		1113.18	



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BORING NO. **MW-107D** SHEET **3** OF **6**
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 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	18-20	58	quartz.	SW			1108.18
75		SSS	8-9 23-30	33	Light brown, fine to coarse SAND, trace Silt, trace fine to medium Gravel, well graded, and WET. Sands are sub-rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and approximately 50% quartz.	SW			1103.18
80		SSS	8-16 21-27	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and WET. Sand is rounded, spherical, and 70-80% quartz.	SP			1098.18
85		SSS	3-8 21-22	83	Light brown, fine to medium SAND, trace Silt, trace fine Gravel, poorly graded, and WET. Sand is rounded, highly spherical, and 75-85% quartz. Fine Gravel occurs as 3" lens at 85.6' bgl, and is sub-rounded and 60-70% quartz.	SP			1093.18
90		SSS	5-11 20-25	75	Brown, fine to coarse SAND, some fine to medium Gravel, well graded, massive, and WET. Sand is angular to rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and 70-80% quartz.	SW			1088.18
95		SSS	10-25 27-30	42	Multicolored, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and WET. Sand is angular to rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and 70-80% quartz.	GP			1085.18
					Light brown, fine to medium GRAVEL, trace to some fine to coarse Sand, trace Silt, well graded, and WET. Sand and Gravel is sub- to well rounded with low to high sphericity. Sand is ~50% quartz and ~50% rock fragments. Gravel is entirely rock fragments. Contact between SP and GW is sharp at 99.5'.	GW			1083.18
100		SSS	20-25 31-35	67	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Sand is well rounded with moderate to high sphericity and ~95% quartz.	SP			1081.18
					Light brown, fine to medium SAND, trace coarse Sand, trace to some fine to coarse Sand, trace Silt, well graded, and WET. Sand and gravel are sub- to well rounded with low to high sphericity. Sand is ~50% quartz and ~50% rock fragments. Gravel is entirely rock fragments.	GW			1080.78
105		SSS	10-25 27-29	75	Light brown, fine to medium SAND, little to some fine to coarse Sand, poorly graded, occasional 1-2" thick lenses of fine to coarse Gravel, poorly graded, and WET. Sand is well rounded with moderate sphericity and is composed of ~80-90% quartz and 10-20% rock fragments.	SP			1078.18
			10-15		Light brown, fine to medium SAND, trace fines, massive, poorly graded, and WET. Sand is rounded with low	SP			1073.18



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COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	16-16	50	sphericity and 70-80% quartz Multicolored, fine to medium GRAVEL, trace Sand, well graded. Gravel is rounded.	GW			1070.18
115		SSS	3-8 13-13	63	Light brown, fine to medium SAND, trace coarse Sand and fine Gravel, trace Silt, well graded, massive, and WET. Fine to medium sand is well rounded with medium to high sphericity and 80-90% quartz. Coarse sand and gravel is sub-angular to sub-rounded with low to medium sphericity and 70% rock fragments.	SW			1068.18
120		SSS	11-36 50 for 3"--	50	Light brown, fine to medium SAND, trace coarse Sand and Silt, poorly graded, and WET. Fine to medium sand is well rounded with medium to high sphericity and 85-95% quartz. Coarse sand is sub-angular to rounded with low to medium sphericity and is primarily rock fragments.	SP			1063.18
125		SSS	15-21 50/6"--	67	Light brown, fine SAND, little Silt, massive, and WET. Sand is well rounded with high sphericity and 80-90% quartz. Top 8" grades into fine Sand and Silt with occasional Clay seams (<1 cm thick) at bottom 8".	SM			1058.18
130		SSS	19-50/6' ---	75	Light brown, fine to medium SAND, trace coarse Sand and Gravel, trace Silt, poorly graded, and WET. Fine to medium Sand is well rounded with high sphericity and 80-90% quartz. Coarse sand and gravel is sub-rounded with low to medium sphericity and is composed of rock fragments, quartz, and occasional 1" diameter Clay clasts.	SP			1053.18
135		SSS	4-11 18-19	67	Light brown, fine to medium SAND, trace Silt, poorly graded, and WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP			1048.18
140		SSS	16-50/6' ---	67	Light brown, fine to medium SAND, trace coarse Sand and fine Gravel, trace Silt, poorly graded, massive, and WET. Sand and gravel are well rounded with high sphericity and 80-90% quartz.	SP			1043.18
145		SSS	15-16 19-21	67	Light brown, fine to medium SAND, trace Silt and coarse Sand, poorly graded, massive, and WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP		1240: Drillers stop drilling for weekend.	1038.18
			10-14		Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP		Larry Jordan logging (11/6/00).	1033.18



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 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	16-21	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Sand is well rounded with high sphericity and 80-90% quartz. (continued)				
155		SSS	3-7 10-14	100		SP			1023.18
160		SSS	4-4 8-11	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Fine to medium sand is well rounded with high sphericity and >90% quartz. Coarse fraction is sub- to well rounded with low to high sphericity and ~90% rock fragments.	SP			1018.18
165		SSS	10-25 ---	100	Light brown, medium to coarse SAND, trace fine Sand and fine Gravel, poorly graded, massive, and WET. Sand is well rounded with high sphericity and 70-80% quartz. Gravel is sub- to well rounded with medium sphericity and ~80% rock fragments.	SP		5' heave in augers. 164-166' sample, pushed through 12" heave.	1014.98
170		SSS	6-12 ---	75	Light brown, fine GRAVEL and medium to coarse SAND, well graded, and WET. Sand is well rounded with high sphericity and 60-70% quartz. Gravel is sub- to well rounded with medium to high sphericity and >90% rock fragments.	GW		5' heave in augers. 169-171' sample, pushed through 12" heave.	1013.18
175		SSS	12-28 ---	10	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is well rounded with high sphericity and ~70-80% quartz. Coarse fraction is sub- to well rounded with medium to high sphericity and ~80% rock fragments.	SP		5' heave in augers. 174-176' sample, pushed through 12" heave.	1008.18
180		SSS	16-50/6' ---	75	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Majority of fine to medium sand is well rounded and highly spherical. Fraction of fine and medium sand has low sphericity. High sphericity material is ~90% quartz; low sphericity material is >80% rock fragments. Coarse sand is sub- to well rounded with medium sphericity. Gravel has low to medium sphericity. Sand is predominantly quartz. Gravel is ~90% rock fragments.	SP			1003.18
						SP/GP			1000.68
						SP		Bailed 5' heave.	1000.38
185		SSS	11-50/6' ---	100	Light brown, medium to coarse SAND and GRAVEL. Sand is highly spherical and predominantly quartz. Gravel has low to medium sphericity and ~90% quartz. All material is well rounded.	SP			998.18
					Light brown, fine SAND, little medium Sand, poorly graded, and WET. Sand is well rounded, highly spherical, and ~90% quartz.				
					Light brown, fine to medium SAND, trace coarse Sand and fine Gravel, poorly graded, massive, and WET. Fine to medium sand is well rounded, highly spherical, and ~80% quartz. Coarse sand is ~80% rock fragments. Gravel is angular to sub-rounded with low sphericity and >90% rock	SP			993.18
			11-50/6'						



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BORING NO. **MW-107D** SHEET **6 OF 6**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.0 E 19,440,469.3**
 SURFACE ELEVATION **1180.68** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	---	50	fragments. Overall spoon coarsens downward. Light brown, fine to medium SAND, trace coarse Sand and fine Gravel, poorly graded, and WET. Fine to medium sand is well rounded, highly spherical, and 80-90% quartz. Coarse fraction is sub-angular to sub-rounded with medium sphericity and ~90% rock fragments. At 190' bgl, 2" lens of fine to medium Gravel. <i>(continued)</i>	SP		5' heave in augers. 189-191' sample, pushed through 12" heave.	988.18
195		SSS	16-21 ---	35	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is sub-rounded, highly spherical, and ~90-95% quartz. Coarse sand is sub-angular with low sphericity and ~80% rock fragments.	SP		5' heave	983.18
200		SSS	6-14 30--	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is well rounded, highly spherical, and ~80-90% quartz. Coarse sand is ~90% rock fragments. Gravel is sub-angular to sub-rounded with low sphericity.	SP		5' heave	978.18
205		SSS	16-50/5' ---	75	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium Sand is well rounded, highly spherical, and ~80-90% quartz. Coarse sand is ~90% rock fragments, sub-angular to sub-rounded with medium sphericity. ~2" thick lense of fine GRAVEL and fine to coarse SAND at 205.5'.	SP			973.18
210		SSS	12-16 ---	75	Light brown, fine to medium SAND, little to some coarse Sand, trace fine Gravel, poorly graded, massive, and WET. Fine to medium sand is sub- to well rounded and highly spherical, with ~70-80% quartz. Coarse fraction is angular to sub-rounded with low sphericity and >90% rock fragments.	SP			
								End of boring - 211'.	969.68



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BORING NO. **MW-1071** SHEET **1 OF 3**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.5 E 19,440,458.6**
 SURFACE ELEVATION **1180.75** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD EQUIPMENT
4 1/4" HSA CME 1050
 DRILLING STARTED ENDED
11/16/00 11/16/00

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

	SAND		SILT
	CLAY		CLAYEY SAND
	GRAVEL		SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Dark brown, SAND, little Clay, trace Silt, slightly plastic, massive, and MOIST.	SP-SC			1180.75
5		SSS	1-1 1-1	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 90% quartz.	SP			1176.25
					Brown, fine to coarse SAND, little Clay, massive, and MOIST. Fine sand is well rounded, and 80-90% quartz. Coarse sand is angular, and 70-80% quartz.	SC			1175.55
10		SSS	10-25 50/6"--	75	Light brown, fine to coarse SAND, trace Silt, poorly graded, massive, and MOIST. Fine to medium sand is well rounded. Coarse sand is angular.	SP			1170.75
15		SSS	7-7 14-15	83	Light brown, fine to coarse SAND, poorly graded, somewhat stratified, and MOIST. Sand is rounded.	SP			1166.75
20		SSS	7-8 12-16	67	Brown, fine to coarse SAND, trace Silt, well graded, massive, and MOIST. Fine to medium sands are well rounded, spherical, and 70-80% quartz. Coarse sand is sub-rounded, sub-spherical, and 50-60% quartz.	SW			1162.75
25		SSS	8-16 25-28	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Fine to medium sand is well rounded and spherical with ~70-80% quartz.	SP			1158.25
30		SSS	7-8 20-21	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz.	SP			1151.75
35		SSS	7-12 17-20	67	Light brown, fine to medium SAND, trace Silt, trace fine Gravel, poorly graded, and MOIST. Sands are well rounded, spherical, and 80-90% quartz. Gravel occurs as a 3" seam of fine Gravel at 35' bgl. Gravel is sub-rounded, 50-60% quartz.	SP			1146.75
			7-12		Light brown, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and MOIST. Fine	SW			1143.25



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BORING NO. **MW-1071** SHEET **2** OF **3**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.5 E 19,440,458.6**
 SURFACE ELEVATION **1180.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	18-21	67	to medium sand is sub-rounded, highly spherical, and 80-90% quartz, Gravel is angular, and 50-60% quartz. Light brown, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and MOIST. Fine to medium sand is sub-rounded, highly spherical, and 80-90% quartz, Gravel is angular, and 50-60% quartz. (continued)	SW		Water encountered at 55.5' bgl during drilling.	1138.25
45		SSS	7-21 31-38	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is sub-rounded, spherical, and 80-90% quartz.	SP			1133.25
50		SSS	7-16 22-24	67	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz.	SP			1130.75
55		SSS	4-8 10-13	67	Brown, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and MOIST. Sand is sub-rounded with low sphericity and 80-90% quartz.	SW			1126.75
60		SSS	7-12 10-14	67	Light brown, fine to coarse SAND, trace Gravel, trace Silt, poorly graded, massive, and WET. Fine to medium sand is sub-rounded, sub-spherical, and 60-80% quartz. Coarse sand is angular and 50-60% quartz. 1-1.25" Gravel is angular with low sphericity, and composed of white to gray chert.	SP			1125.25
65		SSS	2-3 7-8	63	Light brown, fine to coarse SAND, trace Silt, poorly graded, massive, and WET. Sand is sub-angular to sub-rounded, sub-spherical, and 60-70% quartz.	SW			1118.25
70		SSS	12-23 18-20	58	Light brown, fine to coarse SAND, trace Silt, trace fine to medium Gravel, well graded, and WET. Sand is sub-angular to sub-rounded, sub-spherical, and 60-70% quartz. Gravel is sub-angular to sub-rounded, and 20-30% quartz.	SP			1113.25
75		SSS	8-9 23-30	33	Light brown, fine to coarse SAND, trace Silt, trace fine to medium Gravel, well graded, and WET. Sands are sub-rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and approximately 50% quartz.	SW			1108.25
80		SSS	8-16 21-27	75	Light brown, fine to medium SAND, trace Silt, poorly graded, massive, and WET. Sand is rounded, spherical, and 70-80% quartz.	SW			1103.25
85		SSS	3-8 21-22	83	Light brown, fine to medium SAND, trace Silt, trace fine Gravel, poorly graded, and WET. Sand is rounded, highly spherical, and 75-85% quartz. Fine Gravel occurs as 3" lens at 85.6' bgl, and is sub-rounded and 60-70% quartz.	SP			1098.25
90		SSS	5-11 20-25	75	Brown, fine to coarse SAND, some fine to medium Gravel, well graded, massive, and WET. Sand is angular to rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and 70-80% quartz.	SW			1093.25
						SW			



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BORING NO. **MW-1071** SHEET **3 OF 3**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 230,060.5 E 19,440,458.6**
 SURFACE ELEVATION **1180.75** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	10-25 27-30	42	Multicolored, fine to coarse SAND, some fine to medium Gravel, trace Silt, well graded, massive, and WET. Sand is angular to rounded, sub-spherical, and 70-80% quartz. Gravel is rounded, sub-spherical, and 70-80% quartz. <i>(continued)</i>	SW			
					Multicolored, fine GRAVEL, little medium Gravel, poorly graded, massive, and WET. Gravel is well rounded with low sphericity and 60-70% quartz.	GP			1085.25
						GW			1083.25
100		SSS	20-25 31-35	67	Light brown, fine to medium GRAVEL, trace to some fine to coarse Sand, trace Silt, well graded, and WET. Sand and Gravel is sub- to well rounded with low to high sphericity. Sand is ~50% quartz and ~50% rock fragments. Gravel is entirely rock fragments. Contact between SP and GW is sharp at 99.5'.	SP			1081.25
						GW			1080.85
105		SSS	10-25 27-29	75	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Sand is well rounded with moderate to high sphericity and ~95% quartz.	SP			1078.25
					Light brown, fine to medium GRAVEL, trace to some fine to coarse Sand, trace Silt, well graded, and WET. Sand and gravel are sub- to well rounded with low to high sphericity. Sand is ~50% quartz and ~50% rock fragments. Gravel is entirely rock fragments.	SP			1073.25
110		SSS	10-15 16-16	50	Light brown, fine to medium SAND, little to some fine to coarse Sand, poorly graded, occasional 1-2" thick lenses of fine to coarse Gravel, poorly graded, and WET. Sand is well rounded with moderate sphericity and is composed of ~80-90% quartz and 10-20% rock fragments.	GW			1070.25
					Light brown, fine to medium SAND, trace fines, massive, poorly graded, and WET. Sand is rounded with low sphericity and 70-80% quartz	SW			1068.25
115		SSS	3-8 13-13	63	Multicolored, fine to medium GRAVEL, trace Sand, well graded. Gravel is rounded. Light brown, fine to medium SAND, trace coarse Sand and fine Gravel, trace Silt, well graded, massive, and WET. Fine to medium sand is well rounded with medium to high sphericity and 80-90% quartz. Coarse sand and gravel is sub-angular to sub-rounded with low to medium sphericity and 70% rock fragments.			End of boring - 116' bgl	1064.75



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BORING NO. **MW-108I** SHEET **1 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,525.6 E 19,439,573.3**
 SURFACE ELEVATION **1132.99** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD EQUIPMENT
4 1/4" HSA CME 95
 DRILLING STARTED ENDED
11/9/00 11/14/00

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5		SSS	3-4 7-9	75	Light brown SILT, some Clay, little fine Sand, low plasticity, massive, and MOIST. Sand is well rounded. Organic rich layer 4-4.25' bgl.	ML			1132.99
10		SSS	5-8 9-9	67	Light brown SILT, some fine Sand, trace Clay, trace coarse Sand, low plasticity, MOIST. Sand is well rounded and highly spherical. Sand is concentrated in 3" lense and also dispersed throughout rest of sample.	ML		8' bgl: Rig rythmically bouncing on fine gravels.	1125.49
15		SSS	7-9 12-14		Light brown SILT, some very fine Sand, trace Clay, trace coarse Sand, very stiff, massive, and MOIST. Sand is well rounded and highly spherical.	ML			1120.49
20		SSS	4-7 11-24		Brown CLAY, trace Silt, trace very fine Sand, moderately plastic, stiff, massive, and MOIST.	CL			1115.49
					Light brown, fine to medium SAND, poorly graded. Sand is well rounded, highly spherical, clean Sand.	SP			1112.39
					Medium GRAVEL.	GP			1110.49
25		SSS	5-7 7-9		Light brown CLAY, trace Silt, trace Gravel, trace Sand, low plasticity, stiff, and MOIST.	CL			1108.74
					Fine to medium SAND, poorly graded. Sand is well rounded, spherical, 80-90% quartz.	SP			1107.24
					Light brown SILT.	ML			1105.49
30		SSS	4-6 12-18	83	Grey, CLAY, low plasticity, massive.	CL		Silt grades into Clay in 29-31' split spoon sample.	1102.99
					Gray CLAY, some Silt, trace coarse Sand, moderately plastic, very stiff, massive, and MOIST. Sand is well rounded, sub-spherical, and matrix supported.	CL			1100.49
35		SSS	8-15 18-25	50	Light brown, fine to medium SAND, trace coarse Sand, trace Silt, loose, poorly graded, massive, and MOIST. Fine to medium sand is well rounded, spherical, and 80-90%	SP			1095.49
			1-3						



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BORING NO. **MW-1081** SHEET **2 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,525.6 E 19,439,573.3**
 SURFACE ELEVATION **1132.99** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	7-10	50	quartz. Coarse sand occurs as 2" seam @39', is well rounded, highly spherical, and 60-70% quartz.	SP			
45		SSS	1-2 8-19	33	Brown, fine to coarse SAND, trace fine Gravel, trace Silt, loose, well graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz. Gravel occurs in 2" seam and is well rounded, spherical, and 60-70% quartz.	SW			1090.49
50		SSS	1-2 5-8	42	Brown, fine to coarse SAND, little fine Gravel, trace Silt, loose, well graded, massive, and MOIST. Sand is well rounded, spherical, and 80-90% quartz. Gravel is well rounded, spherical, and 60-70% quartz.	SW			1085.49
55		SSS	2-2 3-4		Brown, SAND, trace Gravel, trace Silt, loose, well graded, massive, and MOIST. Sand is well rounded, spherical, 80-90% quartz. Gravel is well rounded, spherical, and 60-70% quartz.	SW			1080.49
60		SSS	2-2 3-4	58	Gray CLAY, little fine Sand, moderately plastic, massive, and MOIST to WET. Gray-brown CLAY, some fine to coarse Sand, trace fine Gravel, firm, moderately plastic, massive and WET. Fine to medium sand is well rounded, spherical, 80-90% quartz, coarse sand is well rounded, spherical, 60-70% quartz, all sand is clay matrix supported.	CL		Wet at 55' bgl.	1077.99
65		SSS	5-9 11-14	58	Gray CLAY, little fine to medium Sand, trace coarse Sand, very stiff, medium plastic, massive, and WET. Fine to medium sand is well rounded, spherical, and 80-90% quartz. Coarse sand is sub-spherical, rounded, and 60-70% quartz.	CL			1075.49
70		SSS	6-10 12-14	100	Gray CLAY, little fine to medium Sand, trace coarse Sand, very stiff, medium plastic, massive, and WET. Fine to medium sand is well rounded, spherical, and 80-90% quartz. Coarse sand is sub-spherical, rounded, and 60-70% quartz.	CL			1070.49
75		SSS	5-9 11-15	83	Brown, fine to medium SAND, trace Clay, medium dense, poorly graded, massive, and WET. Sand is well rounded, spherical, and 80-90% quartz.	SP			1062.99
80		SSS	3-5 9-11	100	Brown CLAY and SAND, trace fine Gravel, WET.	CL/SP			1060.49
85		SSS	5-6 8-13	75	Light brown, fine to coarse SAND, little Clay, medium dense, well graded, massive, and WET. Fine sand is well rounded, highly spherical, and 80-90% quartz. Medium to coarse sand is angular with low sphericity, and 60-70% quartz.	SW			1052.99
90		SSS	2-3 4-4	33	Brown, fine to coarse SAND, trace Silt, trace Clay clasts, medium dense, WET. Fine sand is well rounded, highly spherical, and ~80-90% quartz. Medium to coarse sand is sub-rounded to angular, sub-spherical, and 60-70% quartz. Clay clasts are ~1/8" diameter.	SW			1050.49
		SSS	2-3 4-4	33	Light brown, fine to medium SAND, trace coarse Sand, trace Clay clasts, loose, poorly graded, massive, WET. Fine to medium sand is well rounded, spherical, 80-90% quartz. Coarse sand is angular to sub-angular with low sphericity and 60-70% quartz. Clay clasts are 0.5-1" diameter.	SP			1045.49
						SP			1040.49



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BORING NO. **MW-1081** SHEET **3 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,525.6 E 19,439,573.3**
 SURFACE ELEVATION **1132.99** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	5-9 13-23	63	Light brown, fine to medium SAND, trace Silt, medium dense, poorly graded, massive, and WET. Fine sand is well rounded, highly spherical, and 80-90% quartz. Medium sand is angular with low sphericity and 60-70% quartz. (continued)	SP			
100		SSS	1-2 4-5	42	Brown, fine to coarse SAND, trace fine Gravel, trace Clay, loose, well graded, bedded, and WET. Clay occurs as 1" seam @ 99.3' bgl and is moderately plastic. Fine sand is well rounded, highly spherical, and 70-80% quartz. Medium to coarse sand and gravel is sub-angular with low sphericity, and 60-70% quartz.	SW			1035.49
105		SSS			Brown, fine to coarse SAND, trace fine Gravel, trace Silt, well graded, and WET. Fine sand is well rounded, highly spherical, and 80-90% quartz. Coarse sand and fine gravel are sub-rounded with low sphericity and 60-70% quartz. Coarse sand and gravel are concentrated in 3-4" thick lenses ~3-4" apart, with mostly fine to medium sand between the coarse layers.	SW			1030.49
110		SSS	3-6 8-19	67	Light brown, fine to coarse SAND, trace fine Gravel, trace Clay, medium dense, well graded, massive, and WET. Clay occurs as brown, moderately plastic 2" thick lenses @ 111'. Fine sand is well rounded, highly spherical, and 80-90% quartz. Coarse sand and gravel are rounded with low sphericity, and 60-70% quartz.	SW			1025.49
115		SSS	3-5 9-15	63	Light brown, fine to medium SAND, trace fine Gravel, trace Silt, medium dense, poorly graded, massive, and WET. Sand is well rounded, spherical, and 80-90% quartz.	SP			1020.49
120		SSS	2-3 6-9	83	Light brown, fine to medium SAND, trace Gravel, trace Clay, loose, poorly graded, massive, and WET. Sand is well rounded, spherical, and 80-90% quartz. Clay occurs as 2.5" lense @ 120.2' with 1.75" diameter Gravel directly above Clay. Gravel is well rounded, highly spherical, and quartz.	SP			1015.49
125		SSS	2-3 5-7		Light brown SAND, trace Clay, trace Gravel, loose, poorly graded, massive, and WET. Sand is well rounded, spherical, 80-90% quartz, Clay occurs as 2-1.5" lenses @ 125.6' bgl.	SP			1010.49
130		SSS	3-6 7-11	63	Brown, fine to coarse SAND, little Clay, trace fine Gravel, loose, well graded, massive, and WET. Sand is well rounded, spherical, 80-90% quartz. Clay is in 2" lenses.	SW			1005.49
135		SSS	2-4 5-7	63	Brown, fine to medium SAND, trace Silt, trace coarse Sand, loose, poorly graded, massive, and WET. Sand is sub-rounded to rounded, moderately spherical, and 80-90% quartz.	SP			1000.49
140		SSS	2-3 5-7	42	Gray CLAY, little fine Sand, moderately plastic, massive. Trace coarse Sand in a 3" lens.	CL			995.49
145		SSS	0-0 0-0	75	Gray CLAY, little fine Sand, trace coarse Sand, moderately plastic, massive. Sand is well rounded, spherical, and 80-90% quartz.	CL			990.49



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BORING NO. **MW-109D** SHEET **1** OF **5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 229,688.3 E 19,439,059.6**
 SURFACE ELEVATION **1118.77** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD EQUIPMENT
4 1/4" HSA CME 1050
 DRILLING STARTED ENDED
11/7/00 11/8/00

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Dark brown SILT and fine to coarse SAND, little Organic Matter, trace Clay, non-plastic, and WET.	ML			1118.77
5		SSS	3-4 5-2	75	Orange to brown, fine to medium SAND, little Silt, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is well rounded with high sphericity, and ~80% quartz. Coarse fraction is angular and ~80% rock fragments. @5.3 feet there is a 3" lens of fine to medium Gravel.	SP			1114.47
10		SSS	4-5 8-2	10	Brown, fine to medium GRAVEL, and fine to coarse SAND, well graded, and WET.	GW			1111.27
15		SSS	8-6 2-2	70	Gray SILT, and fine to medium SAND, little to some Clay, slightly plastic, laminated, and WET. Occasional Clay layers. Occasional laminations are at ~30 degrees with horizontal. Spoon coarsens downward overall.	ML		Very hard drilling at 12.5' bgl	1106.27
20		SSS	2/24"	100	Brown SILT, and fine to medium SAND, some Clay, trace coarse Sand, trace fine Gravel, slightly plastic, massive, and WET. Gravel and coarse sand are well rounded and primarily rock fragments.	ML			1101.27
25		SSS	2-2 2-3	100	Brown SILT, and CLAY, some fine to coarse SAND, trace fine Gravel, moderately plastic, and WET. Gravel is well rounded with low sphericity.	ML-CL			1096.27
30		SSS	2/24"	100	Brown SILT, and fine to medium Sand, trace to little Clay, trace coarse Sand, trace fine Gravel, slightly plastic, massive, and WET.	ML			1091.27
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium Sand is well rounded with high sphericity and >80% quartz. Coarse Sand is well rounded with low to high sphericity and >80% rock fragments.	SP			1089.37
35		SSS	2-6 6-6	25	Light brown, fine to medium SAND, poorly graded, massive, and WET. All components are well rounded with high sphericity and >85% quartz.	SP			1086.27
					Light brown, fine to coarse SAND, some Gravel, well graded, and WET. Sands are well rounded with high sphericity and ~70-80% quartz. Gravel is sub-angular to well rounded and >90% rock fragments.	SW			1083.77
						SP			1081.27
			1-1						



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BORING NO. **MW-109D** SHEET **2 OF 5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 229,688.3 E 19,439,059.6**
 SURFACE ELEVATION **1118.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	5-5	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium Sand is sub- to well rounded with high sphericity and >80% quartz. (continued)	SM		At 40.5' bgl, grades into Sand, some Silt.	1078.27 1076.27
45		SSS	5-5 7-10	70	Brown, fine to medium SAND, some Silt, little Clay, moderately plastic, and WET. Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, Silt content increases from trace to little from 44-45 feet bgs, well graded, graded bedding, and WET. @45 feet there is a 0.4 feet thick lens of Silty-Clay. Below the lens Clay and Silt content decrease to trace. Sand is well rounded with high sphericity and 70-80% quartz.	SM			1071.27
50		SSS	4-7 8-9	70	Light brown, fine to coarse SAND, trace fine Gravel, poorly graded, massive, and WET. Fine to medium Sand is well rounded with high sphericity and >80% quartz. Coarse sand is sub- to well rounded and primarily rock fragments.	SP			1066.27
55		SSS		90	Light brown, fine to medium SAND, trace to little Silt, trace coarse Sand, trace fine Gravel, well graded, massive, and WET. Fine to medium sand is sub-angular to sub-rounded with high sphericity and ~70-90% quartz. Coarse fraction is angular to well rounded and primarily rock fragments.	SP			1061.27
60		SSS	2-12 6-6	100	Light brown, fine to medium SAND, little coarse Sand, trace Gravel, poorly graded, massive, and WET. Fine to medium sand is sub- to well rounded with high sphericity and ~80-90% quartz. Coarse fraction is sub-angular to sub-rounded with high sphericity and ~70-80% rock fragments. Spoon coarsens downward.	SP			1056.27
65		SSS	4-4 6-9	50	Light brown, fine to medium SAND, little coarse Sand, little fine Gravel, well graded, graded bedding, and WET. Fine to medium sand is well rounded with high sphericity and ~80% quartz. Coarse fraction is sub-angular to well rounded with low to high sphericity and >80% rock fragments.	SW			1051.27
70		SSS	3-3 4-6	100	Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, massive, and WET. Fine to medium sand is sub-rounded with high sphericity and >90% quartz. Coarse fraction is sub-angular to well rounded with moderate to high sphericity and 70-90% rock fragments.	SP			1046.27
75		SSS	4-5 16-17	30	Gray SILT, some fine Sand, trace medium to coarse Sand, occasional 1mm thick fine to medium Sand laminations, WET.	ML			1041.27
80		SSS	4-7 8-8	100	Gray, fine to medium SAND, little coarse Sand, little Silt, trace fine Gravel, poorly graded, massive, and WET. Fine to medium Sand is sub-angular to well rounded with high sphericity and ~70-90% quartz. Coarse sand and fine gravel is sub-angular to sub-rounded with moderate sphericity and ~80% rock fragments.	SP			1036.27
85		SSS	2-2 2-4		Light gray, fine SAND, little medium Sand, little Silt, trace coarse Sand, trace Gravel, poorly graded, massive, and WET. Fine to medium Sand is primarily sub-angular to well rounded with a few angular grains. Coarser fraction is sub-angular. Sands are mostly quartz. Gravel is primarily rock fragments. @85.1' there is a 3" thick Gravel lense.	SP			1031.27
90		SSS	1-1 12-14	30	Gray SILT, little fine to medium Sand, trace to some Clay, slight to moderate plasticity, massive, and MOIST. Clay content increases with depth.	ML			1026.27



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BORING NO. **MW-109D** SHEET **3 OF 5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 229,688.3 E 19,439,059.6**
 SURFACE ELEVATION **1118.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	1-5 7-12	100	Gray SILT, little fine to medium Sand, trace coarse Sand, massive, and MOIST. Fine to medium sand is sub-rounded with low sphericity. Coarse sand is sub-rounded and >80% rock fragments. (continued)	ML			1021.27
100		SSS	6-7 9-10	100	Gray SILT, some fine to coarse Sand, little Clay, trace Gravel, slightly plastic, massive, and MOIST.	ML			1016.27
105		SSS	7-8 13-13		Gray SILT, some fine to coarse Sand, trace to little Clay, trace Gravel, slightly plastic, massive, and MOIST.	ML			1011.27
110		SSS	4-4 7-16		Gray, fine to medium SAND, some Silt, little Clay, trace coarse Sand, trace Gravel, well graded, slightly plastic, massive, and WET. Sand is sub-angular to sub-rounded, highly spherical, and ~60-80% quartz.	SC			1006.27
115		SSS	2-2 3-5		Gray, fine to medium SAND, some Silt, little Clay, trace coarse Sand, trace fine Gravel, massive, well graded, slightly plastic, and WET. Sand is sub-angular to sub-rounded and predominantly quartz. Occasional 1" thick Gravel lenses. Gravel is angular to sub-rounded.	SC			1001.27
120		SSS	1/24"		Light gray, fine to medium SAND, little Clay, little Silt, trace coarse Sand, trace Gravel, massive, poorly graded, and WET. Fine to medium sand is sub-angular to sub-rounded with low to high sphericity and ~70-80% quartz. Coarse sand is angular to sub-rounded, has low sphericity, and is primarily rock fragments.	SP			996.27
125		SSS	1/24"		Light brown, fine SAND, trace medium Sand, poorly graded, massive, and WET. Sand is well rounded with high sphericity and ~80% quartz.	SP			991.27
130		SSS	1-1 1-1		Light brown, fine to medium SAND, trace coarse Sand, trace Gravel, poorly graded, massive, and WET. Sand is sub- to well rounded with high sphericity and ~80-90% quartz.	SP			986.27
135		SSS	1/24"		Brown, fine SAND, some Silt, little Clay, trace medium to coarse Sand, poorly graded, massive, and WET. Occasional sand layers.	SP			981.27
140		SSS	WH/24"		Brown, fine SAND, some Clay, little Silt, poorly graded, massive, and WET. Occasional <1" thick Sand and Gravel lenses.	SP		Did not drive sample, as it dropped 2' under weight of rods.	976.27
145						SP		Did not sample, due to problems with heave.	



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BORING NO. **MW-109D** SHEET **4 OF 5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 229,688.3 E 19,439,059.6**
 SURFACE ELEVATION **1118.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	2/24"		Brown, fine SAND, some Clay, little Silt, massive, and WET. Occasional Sand seams.	SP			971.27
155		SSS	2-2 2-2		Gray to brown, very fine to fine SAND, some Clay, trace coarse Sand, trace fine Gravel, and WET. Sand is well rounded with medium to high sphericity. Some thin (~1/8" thick), soft gray Clay layers, and moderately plastic.	SP			966.27
160		SSS	6-6 50/5"		Light brown SILT and very fine Sand, trace fine Sand, trace Clay, trace coarse Sand, trace fine Gravel, massive, stiff, and MOIST. Gravel is matrix supported.	ML			961.27
165		SSS	31-50/4'	55	Grayish brown SILT, some very fine Sand, laminated, and MOIST.	ML			956.27
170		SSS	6-6 18-29	75	Brown to gray CLAY, trace Silt, hard, and MOIST.	CL			953.07
175		SSS	6-17 29-39	75	Brown to gray SILT and very fine Sand, WET, interbedded with two to four inch layers of brown to gray CLAY and Silt, very stiff, and MOIST.	ML-CL			951.27
180		SSS	25-25 50/5"	85	Gray to brown SILT, some Clay, little very fine Sand, hard, massive, and WET. Sand is well rounded with high sphericity. Silty material is interbedded with more Clayey layers.	ML-CL			946.27
185		SSS	19-50/4'	75	Gray to brown, very fine SAND, some Silt, trace Clay, poorly graded, massive, and WET. Clay occurs as a 1" inch seam, three inches from the bottom of the spoon.	SM			941.27
190		SSS	15-30 50/4"	75	Gray to brown, very fine to fine SAND, little to some Silt, some Clay clasts, massive, and WET. Sand is rounded with high sphericity. Clay clasts are ~1/8" to 1/2" in diameter.	SM			936.27
195		SSS	19-22 50/6"		Gray to brown CLAY, trace to some Silt, hard, laminated, and MOIST.	CL			931.27
					Gray to brown, very fine to fine SAND, little Silt, poorly graded, and WET. Sand is well rounded with high sphericity.	SM			928.77
					Gray to brown CLAY, trace coarse Sand, hard, and MOIST.	CL			926.27
					Gray to brown CLAY, trace fine to coarse Sand, hard, and MOIST.	CL			921.27
						CL			



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BORING NO. **MW-109D** SHEET **5 OF 5**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 229,688.3 E 19,439,059.6**
 SURFACE ELEVATION **1118.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Rec- overy %					
		SSS	25-31	92		CL	----	End of boring - 201' bgs.	917.77



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BORING NO. **MW-110D** SHEET **1 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 227,779.8 E 19,440,962.8**
 SURFACE ELEVATION **1167.08** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD **4 1/4" HSA** EQUIPMENT **CME 1050**
 DRILLING STARTED **11/13/00** ENDED **11/14/00**

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5		SSS	2-2 2-2	75	Light brown fine to medium SAND, trace coarse Sand, poorly graded, interbedded, and MOIST. Sand is well rounded with high sphericity, >70% quartz and is interbedded with light brown fine to medium SAND, some Silt, little Clay, well graded, massive, slightly plastic, and MOIST.	SP			1167.08
10		SSS	3-4 6-7	75	Light brown CLAY and Silt, trace fine to coarse Sand, trace Gravel, moderately plastic, laminated, and WET. Clay layers alternate with Clayey Silt layers.	CL			1159.58
15		SSS	8-12 13-13	5	Light brown, fine to medium SAND and SILT, little Clay, slightly plastic, and WET.	SM			1154.58
20		SSS	5-7 9-14	100	Light brown CLAY and SILT, trace fine to coarse Sand, trace Gravel, moderately plastic, laminated, and WET. Clay is interbedded with Clayey Silt.	CL			1149.58
25		SSS		100	Light brown, CLAY and SILT, trace fine to coarse Sand, trace Gravel, plastic, laminated, and WET. Clay and Clayey Silt is interbedded.	CL			1144.58
30		SSS	6-9 18-18	90	Light brown fine to coarse SAND, some Gravel, well graded, and MOIST.	SW			1142.08
35		SSS	14-22 31-30	90	Light brown, fine SAND, trace coarse Sand, trace Silt, poorly graded, massive, and MOIST.	SP			1137.08
					Light brown, fine SAND, little Silt, trace medium to coarse Sand, trace Gravel, poorly graded, laminated, and MOIST. Sand is sub-angular to sub-rounded, highly spherical, >70% quartz, and is laminated with mm scale Silty partings.	SP			1134.58
			19-21		Light brown, fine to medium SAND, trace coarse Sand, trace to little Silt, poorly graded, laminated, and MOIST. Sand is sub- to well rounded with high sphericity and >80%	SP			1129.58



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BORING NO. **MW-110D** SHEET **2 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 227,779.8 E 19,440,962.8**
 SURFACE ELEVATION **1167.08** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	26-28	100	quartz. Interbedded with 2" thick layers with trace to little Silt.	SP			
45		SSS	7-14 21-29	100	Light brown, fine to medium SAND, trace coarse Sand, trace to little Silt, poorly graded, interbedded, and MOIST. Sand is sub- to well rounded with high sphericity and ~80-90% quartz. Silt content varies from trace to little from layer to layer. Some layers show iron staining.	SP			1124.58
50		SSS	7-15 25-21	100	Light brown, fine to medium SAND, trace coarse Sand, trace to little Silt, poorly graded, interbedded, and MOIST. Sand is sub- to well rounded with high sphericity and 80-90% quartz. Silt content varies from layer to layer. Some laminations are at an angle with horizontal (cross-bedding).	SP			1119.58
55		SSS	5-16 28-29	100	Light brown, very fine SAND, trace to little Silt, trace medium Sand, cross bedded, poorly graded, and MOIST. Sand is well rounded with high sphericity.	SP			1114.58
60		SSS	8-12 23-40		Light brown, fine to medium SAND, poorly graded, cross bedded, and MOIST. Sand is sub- to well rounded with high sphericity and >80% quartz.	SP			1109.58
65		SSS	9-10 11-18		Light brown, fine to medium SAND, poorly graded, massive, and WET. Sand is sub- to well rounded with medium to high sphericity and >80% quartz.	SP		Water between 61 and 64'.	1104.58
70		SSS	5-6 10-16		Light brown, fine to medium SAND, trace coarse Sand, trace Gravel, poorly graded, massive, and WET. Fine to medium sand is well rounded with high sphericity and >80% quartz. Coarse fraction is well rounded with medium sphericity and is primarily rock fragments.	SP			1099.58
75		SSS	6-7 7-9	100	Light brown, fine to coarse SAND, little to some Gravel, well graded, and WET. Sand is well rounded with high sphericity and >50% quartz. Gravel is angular to sub-rounded with low to medium sphericity and is 90% rock fragments. Occassional Gravel lenses.	SW		Bailed heave.	1094.58
80		SSS	5-5 10-10	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Sand is well rounded with high sphericity and >80% quartz.	SP		Bailed heave.	1089.58
85		SSS	7-19 22-32	100	Light brown, fine to medium SAND, some Silt, trace coarse Sand, trace Gravel, trace Clay, well graded, interbedded, and WET. Fine to medium sand is sub- to well rounded with high sphericity and >70% quartz. Coarse fraction is sub-angular to sub-rounded. More Gravelly lens at 84.5' (4" thick).	SM		Bailed heave.	1084.58
90		SSS	8-11 22-25	75	Light brown, fine to medium SAND, trace to little Gravel, trace coarse Sand, well graded, massive, and WET. Fine to medium sand is well rounded with high sphericity and >80% quartz. Coarse fraction is sub-angular to well rounded with low sphericity and >80% rock fragments. Gravel lens at 89.8'.	SW		Bailed heave.	1079.58
						SW		Bailed heave.	1074.58



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BORING NO. **MW-110D** SHEET **3 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 227,779.8 E 19,440,962.8**

SURFACE ELEVATION **1167.08** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	2-4 7-10	40	Light brown, fine to coarse SAND, trace fine Gravel, well graded, massive, and WET. Fine to medium sand is well rounded with high sphericity and >80% quartz. Coarse fraction is sub-angular to sub-rounded with low to moderate sphericity and >90% rock fragments. <i>(continued)</i>	SW			
100		SSS	4-4 10-17	75	Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, interbedded, and WET, interbedded with fine to medium GRAVEL and medium to coarse Sand. Fine to medium Sand is well rounded with high sphericity and >80% quartz. Coarse fraction is sub-angular to sub-rounded with low to moderate sphericity and >90% rock fragments. Gravel lenses are ~2" thick.	SP		Bailed heave. Stop drilling for day 11/13/00 15:40.	1069.58
105		SSS	5-20 50/6"		Brown, coarse SAND, some fine to medium Sand, trace Gravel, poorly graded, graded bedding, and WET. Fine to medium Sand is well rounded with high sphericity and >70% quartz. Coarse fraction is sub-angular to sub-rounded with low to high sphericity and >80% rock fragments.	SP		Began drilling 11/14/00, 07:42. Drilled hole prior to pounding spoon.	1064.58
110		SSS	14-26 50/4"		Light brown, fine to medium SAND, little coarse Sand, trace fine to medium Gravel, well graded, massive, and WET. Fine to medium sand is sub- to well rounded with moderate to high sphericity and >80% quartz. Coarse fraction is sub-angular to well-rounded with low to moderate sphericity and >90% rock fragments.	SW		Bailed well.	1059.58
115		SSS	10-18 50/6"		Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, massive, and WET. Fine to medium Sand is well-rounded, with moderate to high sphericity and >80% quartz. Coarse fraction is sub-angular to sub-rounded with moderate sphericity and >70% rock fragments.	SP			1054.58
120		SSS	21-25 28-50/6"	75	Gray to brown, fine to medium SAND, little Silt, little coarse Sand, little Gravel, well graded, massive, and WET. Fine to medium sand is sub- to well rounded with high sphericity and >80% quartz. Coarse fraction is angular to well-rounded with low to moderate sphericity and predominantly rock fragments.	SM			1049.58
125		SSS	18-22 50/4"	50	Gray to brown, fine to medium SAND, little Silt, little coarse Sand, well graded, interbedded, and WET; interbedded with gray CLAY and SILT, moderately plastic, and WET. Sample is varved with Sandy layers varying from 1-3 cm and Clay from 0.5 to 1.5 cm in thickness.	SM			1044.58
130		SSS	15-26 50/6"		Gray to brown, fine to medium SAND, some Silt, little coarse Sand to Gravel, well graded, massive, and WET. Fine to medium sand is sub-angular to well rounded with moderate to high sphericity and >80% quartz. Coarse fraction is sub-angular to well-rounded with low to moderate sphericity and >80% rock fragments.	SM			1039.58
135		SSS	6-17 50/4"		Gray to brown, fine to medium SAND, some Silt, little coarse Sand, trace Gravel, well graded, Silty laminations, and WET. Fine to medium sand is sub-angular to well rounded with moderate to high sphericity and >80% quartz. Coarse fraction is sub-angular to well-rounded with low to moderate sphericity and >80% rock fragments. Occasional 1cm thick Clay layers.	SM			1034.58
140		SSS	7-16 50/6"	75	Gray to brown, fine to medium SAND, some Silt, trace coarse Sand, trace fine Gravel, well graded, laminated, and WET. Occasional mm-scale Clay layers. Fine to medium sand is sub-angular to sub-rounded with moderate to high sphericity and >70% quartz. Coarse fraction is sub-angular to sub-rounded with moderate to high sphericity and primarily rock fragments.	SM			1029.58
145		SSS	3-6 6-9	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is well-rounded with high sphericity and >80% quartz. Coarse	SP			1024.58



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BORING NO. **MW-110D** SHEET **4 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 227,779.8 E 19,440,962.8**
 SURFACE ELEVATION **1167.08** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	2-3 6-11	50	fraction is sub-angular to sub-rounded with moderate to high sphericity and >70% rock fragments. Light brown, fine to medium SAND, trace coarse Sand, trace fine to medium Gravel, poorly graded, and WET. Occasional Gravel size Silty Clay clasts. Also occasional cm-scale Clay layers toward 151'. Fine to medium sand is well-rounded with high sphericity and >90% quartz. Coarse fraction is sub-angular to well-rounded with low to moderate sphericity and >70% rock fragments.	SP			1019.58
						SP			1014.58
155		SSS	2-3 6-10	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Sand is well-rounded with high sphericity and >80% quartz.	SP			
160		SSS	4-4 5-10	90	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium sand is well-rounded with high sphericity and >80% quartz. Coarse fraction is sub-angular to sub-rounded with moderate sphericity and >70% rock fragments.	SP		Split spoon caught down hole. Drillers pump water down hole. Bailed augers.	1009.58
165		SSS	18-21 50/5"	10	Light brown, fine SAND, trace medium Sand, poorly graded, massive, and WET. Sand is well-rounded with low to moderate sphericity and >80% quartz.	SP		Bailed augers.	1004.58
170		SSS	2-9 25/6"	25	Light brown, fine to medium SAND, poorly graded, massive, and WET. Sand is sub- to well rounded with high sphericity and >80% quartz.	SP			999.58
175		SSS	8-27/6"	0	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Sand is well-rounded with high sphericity and >80% quartz. Coarse fraction is primarily rock fragments.	SP		Sampled heave from bailer.	994.58
180		SSS	7-18 50/6"	75	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and WET. Fine to medium Sand is well-rounded with high sphericity and >80% quartz. Coarse fraction is sub-angular and primarily rock fragments.	SP		No recovery on first spoon. Bailed and respooned.	989.58
185		SSS	8-23 38-44	90	Gray to brown, fine to medium SAND, some Silt, little coarse Sand, trace Gravel, trace Clay, non-plastic, massive, and WET. Sand is sub-angular to sub-rounded with high sphericity. Fine to medium Sand is >80% quartz. Coarse fraction is >80% rock fragments. Gravel is sub-angular to sub-rounded and 100% rock fragments.	SM			984.58
190		SSS	25-41 50/4"	100	Gray SILT, some fine to coarse Sand, little Clay, little Gravel, slight to moderate plasticity, and MOIST (Till).	ML			979.58
								End of Boring - 191' bgs.	976.08



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BORING NO. **MW-1141** SHEET **1 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 231,929.8 E 19,442,648.2**
 SURFACE ELEVATION **1198.32** DATUM **USGS**

DRILLING CONTRACTOR
Stearns
 DRILLING METHOD EQUIPMENT
4 1/4" HSA CME 1050
 DRILLING STARTED ENDED
11/21/00 11/22/00

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5					Orange to brown, fine to medium SAND, trace coarse Sand, trace Gravel, poorly graded, MOIST. Fine to medium sand is sub-angular to sub-rounded with moderate to high sphericity and 70% quartz.	SP		Drillers augered to 29 feet before sampling. Drillers noted gravel from 0-1' bgs. 0-10' lithological description based on cutting.	1198.32
10					Orange to brown, fine to medium SAND, trace coarse Sand, trace Gravel, poorly graded, MOIST. Fine to medium sand is sub-angular to sub-rounded with moderate to high sphericity and 70% quartz.	SP		10-20' lithological description based on cuttings.	1188.32
15					Orange to brown, fine to medium SAND, trace coarse Sand, trace Gravel, poorly graded, MOIST. Fine to medium sand is sub-angular to sub-rounded with moderate to high sphericity and 70% quartz.	SP		20-29' lithological description based on cuttings.	1178.32
30		SSS	4-4 6-8	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-angular to sub-rounded with moderate to high sphericity and 60-80% quartz.	SP			1169.32
35		SSS	28-11 13-13	50	Light brown, fine to coarse SAND, some fine to medium Gravel, well graded, massive, and MOIST. All material is sub-angular to well rounded with moderate to high sphericity. Fine to medium sand is >70% quartz. Coarse fraction is primarily rock fragments.	SW			1165.82
			9-9		Light brown, fine to medium SAND, little coarse Sand, trace Gravel, well graded, bedded, and MOIST. All components are sub-angular to well rounded with moderate to high	SW			1160.82



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BORING NO. **MW-114I** SHEET **2 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 231,929.8 E 19,442,648.2**
 SURFACE ELEVATION **1198.32** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	10-13	75	sphericity. Fine to medium sand is >70% quartz. Coarse fraction is primarily rock fragments. 1" thick Silt seam at 40.0'. 3" Gravel lens at 40.2'. Light brown, fine SAND, trace medium Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz.	SW			1155.82
45		SSS	4-7 10-16	75	Light brown, fine SAND, trace medium Sand, poorly graded, bedded, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz.	SP			1150.82
50		SSS	7-8 9-9	75	Light brown, fine SAND, trace medium Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz. 1" thick Silty Sand lens at 49.8 feet bgs.	SP			1145.82
55		SSS	3-7 8-10	75	Light brown, fine SAND, trace medium Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz.	SP			1140.82
60		SSS	5-9 14-16	90	Light brown, fine SAND, trace medium Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz.	SP			1135.82
65		SSS	5-10 13-16	50	Light brown, fine SAND, trace medium Sand, poorly graded, massive, and MOIST. Fine to medium sand is sub-rounded with moderate to high sphericity and >80% quartz.	SP		Wet at 66' bgl during drilling.	1130.82
70		SSS	4-6 9-10	100	Brown, fine to medium SAND, little coarse SAND, poorly graded, massive, and WET. Fine to medium sand is sub-rounded with medium to high sphericity and 80% quartz. Coarse sand is angular to sub-rounded with low sphericity and is primarily rock fragments.	SP			1123.32
75					Brown, fine to medium SAND, little coarse SAND, poorly graded, massive, and WET. Fine to medium sand is sub-rounded with medium to high sphericity and 80% quartz. Coarse sand is angular to sub-rounded with low sphericity and is primarily rock fragments.				1123.32
80		SSS	2-6 9-10	25		SP			
85					Brown, fine to medium SAND, little coarse SAND, poorly graded, massive, and WET. Fine to medium sand is sub-rounded with medium to high sphericity and 80% quartz. Coarse sand is angular to sub-rounded with low sphericity and is primarily rock fragments.			Bailed heave before sampling from 80-181' bgl.	1113.32
90		SSS	10-12 16-28			SP			



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BORING NO. **MW-1141** SHEET **3 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 231,929.8 E 19,442,648.2**
 SURFACE ELEVATION **1198.32** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95					Brown, fine to medium SAND, trace coarse SAND, trace fine Gravel, poorly graded, massive, and WET. Fine to medium sand is sub-rounded with medium to high sphericity and 80% quartz. Coarse sand is angular to sub-rounded with low sphericity and is primarily rock fragments.	SP			1103.32
100		SSS	2-3 6-7			SP			
105					Brown, fine to medium SAND, little coarse SAND, trace fine Gravel, poorly graded, laminated, and WET.	SP			1093.32
110		SSS	1-2 5-8	100		SM			
115					Silty fine SAND Brown, fine to medium SAND, little coarse Sand, poorly graded, graded bedding, WET. Fine to medium sand is sub- to well rounded with moderate to high sphericity and >80% quartz. Coarse fraction is angular to sub-rounded with low to moderate sphericity and is primarily rock fragments. Brown, fine to medium SAND, some coarse Sand, trace Gravel, well graded, massive, and wet. Fine to medium sand is sub-rounded with moderate to low sphericity, and is >80% quartz. Coarse fraction is angular to sub-rounded with low to moderate sphericity and is primarily rock fragments.	SP		Stopped drilling for the day.	1088.32 1088.12
120		SSS	5-7 10-14	100		SW			
125					Light brown, fine to medium SAND, some coarse SAND, little fine Gravel, poorly graded, graded bedding, and WET. Fine to medium sand is well rounded with high sphericity and >70% quartz. Coarse fraction is sub-angular to sub-rounded with low to high sphericity and ~70-90% rock fragments.	SP			1073.32
130		SSS	8-10 10-16	75		SP			
135					Light brown, fine to medium SAND, little to some coarse Sand, trace fine Gravel, poorly graded, bedded, and wet. Fine to medium sand is well rounded with high sphericity and >70% quartz. Coarse fraction is sub-angular to sub-rounded with low to high sphericity and ~70-90% rock fragments. 4" thick lens of coarser material showing graded bedding at 139.8 feet bgs.	SP			1063.32
140		SSS	7-12 13-15	75		SP			
145						SP			1053.32



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BORING NO. **MW-114I** SHEET **4 OF 4**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Larry Jordan**

COORDINATES **N 231,929.8 E 19,442,648.2**
 SURFACE ELEVATION **1198.32** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	8-10 14-16	75	Light brown, fine to medium SAND, little to some coarse Sand, trace fine Gravel, poorly graded, massive, and WET. Fine to medium sand is well rounded with high sphericity and 70% quartz. Coarse fraction is sub-angular to sub-rounded with low to high sphericity and ~70-90% rock fragments. <i>(continued)</i>	SP			
160		SSS	16-50/6'	25	Light brown, fine to medium SAND, little Silt, interbedded with SILT, some Clay, slight to moderate plasticity, and WET.	SM		Drillers noted change in lithology at 158'	1040.32
165					Brown, fine to medium SAND, trace Silt clasts, poorly graded, massive, and WET. Silt clasts are gravel sized.	SP		Drillers noted change in lithology at 161'	1037.32
170		SSS	16-24 50/6"	10					
175					Brown, fine to medium SAND, trace Silt clasts, poorly graded, massive, and WET. Silt clasts are gravel sized.	SP			1023.32
180		SSS	4-27 30/3"	25				End of boring - 181' bgl	1017.32



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BORING NO. **Seep 1** SHEET **1 OF 1**
 PROJECT **GSWA: Spring Hill Camp Phase III**
 LOCATION **Osceola Township, MI**
 PROJECT NO. **4065-005**
 LOGGED BY **Jeff Groncki**

COORDINATES **N 226,960.6 E 19,440,873.6**
 SURFACE ELEVATION **1088.04** DATUM **USGS**

DRILLING CONTRACTOR
Malcolm Pirnie
 DRILLING METHOD **Hand Auger** EQUIPMENT **Hand Auger**
 DRILLING STARTED **6/27/00** ENDED **6/27/00**

LOCATION DESCRIPTION:

 See attached Site Diagram for location.

STRATA KEY

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					PEAT	PT			1088.04
		GRAB			Medium to fine SAND, with some coarse Sand and fine Gravel, trace medium to coarse Gravel.	SP			1087.04
5								End of boring - 5' bgl	1083.04