MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

INTEROFFICE COMMUNICATION

TO: Christiaan Bon, Project Manager, Gaylord District Office
Remediation and Redevelopment Division

FROM: Brian Eustice, Geologist, Hydrogeologic Unit, Geological Services Section
Remediation and Redevelopment Division Brian Eustice (KZ)

DATE: October 13, 2020

SUBJECT: Camp Grayling-Lake Margrethe, Crawford County, Site ID #20000100
GSS Job # 1057
Sediment Sampling Investigation

This memorandum summarizes the findings of a marine sediment investigation requested by the Department of Environment, Great Lakes, and Energy (EGLE), Remediation and Redevelopment Division's (RRD's), Gaylord District Office for the subject site. RRD's Geological Services Section (GSS) conducted sediment sampling at the Portage Creek outflow from Lake Margrethe on September 12, 2020.

The data package includes the following:

- Site Map (Fig 1)
- Sediment Sampling Location Map (Fig 2)
- Sediment Sample Coordinates (Table 1)
- Sediment Analytical Summary (Table 2)
- Surface Water Analytical Summary (Table 3)
- Sediment Core Logs (Appendix A)

Site Location and Description

The investigation area is at the Lake Margrethe outflow into Portage Creek (approximately 100 feet upstream of the Portage Creek dam) in Section 8, T26N-R4W, Grayling Township, Crawford County, Michigan (Fig 1).

Sediment Sampling

The GSS conducted sediment sampling for per- and polyfluoroalkyl substances (PFAS) following the Michigan PFAS Action Response Team (MPART) "Sediment PFAS Sampling Guidance" document. Five sediment cores where collected in a transect across Portage Creek upstream of the dam (Fig 2). Sediment cores were collected using a post pounder to advance 2-inch diameter, 8-foot long polycarbonate tubes. The polycarbonate tubes were advanced into the sediment to depths ranging from 47-83.5 inches. Sediment core locations were recorded using a Trimble Geo7X handheld global positioning system (GPS) unit (Table 1).

After collection, the sediment cores were logged following the Unified Soil Classification System (Appendix A), divided into upper and lower sampling intervals, and placed into sampling jars. A composite sample (LM-SD-COMP-0820), consisting of approximately 60 grams (or about half a trowel) from each interval of all five cores, was also collected. A surface water sample (LM-SW-1-0820) was collected from Portage Creek on the downstream side of the dam near the dam. The sediment samples, surface water sample, and QA/QC duplicate samples, were submitted under Chain-of-Custody to Vista Analytical Laboratory for PFAS analyses using the modified EPA Method 537 (PFAS Isotope Dilution Method). The laboratory results are included in Content Manager (Vista Analytical Laboratory – 2001759).

Additional sediment samples were submitted to Merit Laboratories for PFAS and Total Organic Carbon (TOC) analyses using the Lloyd Kahn method (Table 2), and surface water analytical analyses using Modified EPA Method 537 (Table 3). The laboratory results are included in Content Manager (Merit Laboratories, Inc. – 190-23882-1).

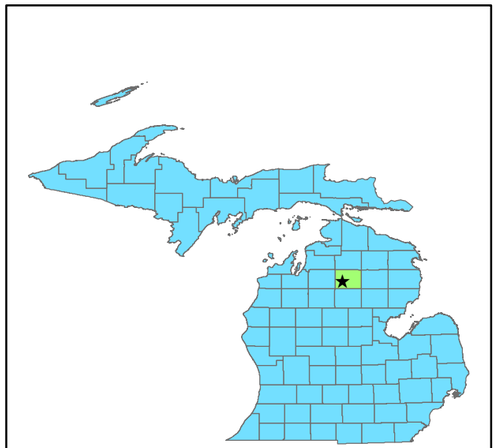
If you have any questions, contact me at 517-242-1170.

Attachments

cc: Burrell P. Shirey, EGLE
Jeff Pincumbe, EGLE
Scott Densteadt, EGLE

LEGEND

- Investigation Area
- Roads
- Township, Range, Section



DATUM - NAD83
PROJECTION: MICHIGAN GEOREF
NORTHING AND EASTING COORDINATES (IN METERS)
ARE IN CORNERS OF MAP

AERIAL PHOTO SOURCE: MICHIGAN IMAGERY

0 0.3 0.6 Miles

1 in = 0.33 miles

0 850 1,700 2,550 3,400 Feet

1 inch = 1,760 feet

N
W E
S

Camp Grayling PFAS - Lake Margrethe Outflow

GRAYLING TOWNSHIP, CRAWFORD COUNTY

SITE LOCATION MAP

GEOLOGIST Brian Eustice Geological Services Section	EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY	CREATION DATE October 2020
Remediation and Redevelopment Division		FIGURE 1

LEGEND

- Sediment Sample Locations
- Roads

DATUM - NAD83
PROJECTION: MICHIGAN GEOREF
NORTHING AND EASTING COORDINATES (IN METERS)
ARE IN CORNERS OF MAP

AERIAL PHOTO SOURCE: MICHIGAN IMAGERY

0 0.01 0.02 Miles

1 in = 0.014 miles

0 30 60 90 120 Feet

1 inch = 73 feet

N W E S

Camp Grayling PFAS - Lake Margrethe Outflow

GRAYLING TOWNSHIP, CRAWFORD COUNTY
T26N, R04W, SECTION 8

SEDIMENT SAMPLE LOCATION MAP

GEOLOGIST Brian Eustice Geological Services Section	EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY	CREATION DATE October 2020
Remediation and Redevelopment Division		FIGURE 2

GPS Data

Camp Grayling-Lake Margrethe,
Crawford County

Table #1

Location	Latitude	Longitude	Northing (m)	Easting (m)	Max_PDOP	Corr_Type	GPS_Date	Feat_Name	Unfilt_Pos	GNSS_Heigh	Vert_Prec	Horz_Prec	Std_Dev	Point_ID
LM-SD-1	44.659778498°	-84.817983239°	457142.958	593548.756	2	Postprocessed Carrier Fixed	8/12/2020	Point_ge	9	309.696	0.1	0	0.000013	1
LM-SD-2	44.659719885°	-84.817975509°	457136.456	593549.463	2.1	Postprocessed Carrier Fixed	8/12/2020	Point_ge	11	310.153	0	0	0.000019	2
LM-SD-3	44.659663493°	-84.817972299°	457130.196	593549.809	2.2	Postprocessed Carrier Fixed	8/12/2020	Point_ge	10	309.953	0	0	0.000006	3
LM-SD-4	44.659602698°	-84.817955988°	457123.462	593551.200	1.4	Postprocessed Carrier Fixed	8/12/2020	Point_ge	9	309.866	0	0	0.00001	4
LM-SD-5	44.659539133°	-84.817969114°	457116.387	593550.262	2	Postprocessed Code	8/12/2020	Point_ge	10	309.175	0.3	0.3	0.000009	5

Northing and Easting are in Michigan GeoRef meters.

Vista Analytical Laboratory
Work Order: 2001759
Report Date: September 9, 2020
Client: EGLE-RRD-GAYLORD
Attention: Christiaan Bon
Project Name: Camp Grayling - Lake Margrethe

Sample ID			LM-SD-1-0-2'-0820	LM-SD-1-2-4'-0820	LM-SD-2-0-30"-0820	LM-SD-2-30-45"-0820	LM-SD-2-45-57"-0820
Analyte	Units	Method					
L-PFBA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFPeA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFBS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-4:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFHxA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFPeS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
HFPO-DA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFHpA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
ADONA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Br-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Total PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-6:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Br-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Total PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
PFecHS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFHpS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFNA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFOSA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Br-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Total PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
9Cl-PF3ONS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-8:2FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFNS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Br-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Total MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Br-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Total EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFUnA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFDS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
11Cl-PF3OUdS	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFDoA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFTrDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
L-PFTeDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND	ND
Percent Moisture	%	Method 2540G	23.9	15	21.5	27.3	21.1
Percent Solids	%	Method 2540G	76.1	85	78.5	72.7	79.9
TOC	mg/kg	Lloyd Kahn	3,000	5,000	<1300	8,600	<1300

Grey indicates contaminant was detected.
ND = Analyte was not detected

Vista Analytical Laboratory
Work Order: 2001759
Report Date: September 9, 2020
Client: EGLE-RRD-GAYLORD
Attention: Christiaan Bon
Project Name: Camp Grayling - Lake Margrethe

Sample ID			LM-SD-3-0-15"-0820	LM-SD-3-15-31"-0820	LM-SD-4-0-15"-0820	LM-SD-4-15-30.5"-0820
Analyte	Units	Method	PFAS			
L-PFBA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFPeA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFBS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-4:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHxA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFPeS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
HFPO-DA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHpA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
ADONA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-6:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
PFecHS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHpS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFNA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOSA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
9Cl-PF3ONS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-8:2FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFNS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFUnA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
11Cl-PF3OUdS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDoA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFTrDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFTeDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
			General Chemistry			
Percent Moisture	%	Method 2540G	34.6	22.5	35.7	20.4
Percent Solids	%	Method 2540G	65.4	77.5	64.3	79.6
TOC	mg/kg	Lloyd Kahn	13,000	<1300	17,000	4,700

Grey indicates contaminant was detected.
ND = Analyte was not detected

Vista Analytical Laboratory
Work Order: 2001759
Report Date: September 9, 2020
Client: EGLE-RRD-GAYLORD
Attention: Christiaan Bon
Project Name: Camp Grayling - Lake Margrethe

Sample ID			LM-SD-5-0-16"-0820	LM-SD-DUP-0820	LM-SD-5-16-33"-0820	LM-SD-COMP-0820
Analyte	Units	Method				
L-PFBA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFPeA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFBS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-4:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHxA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFPeS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
HFPO-DA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHpA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
ADONA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFHxS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-6:2 FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFOA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
PFecHS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFHpS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFNA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOSA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total PFOS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
9Cl-PF3ONS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-8:2FTS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFNS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total MeFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Br-EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Total EtFOSAA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFUnA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
11Cl-PF3OUdS	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFDoA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFTrDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
L-PFTeDA	ng/g	Modified EPA Method 537	ND	ND	ND	ND
Percent Moisture	%	Method 2540G	32.9	31.3	26.7	21.3
Percent Solids	%	Method 2540G	67.1	68.7	93.3	78.7
TOC	mg/kg	Lloyd Kahn	9,300	3,100	5,500	5,400

Grey indicates contaminant was detected.
ND = Analyte was not detected

Merit Laboratories, Inc.
Work Order: 190-23882-1
Report Date: September 1, 2020
Client: EGLE-RRD-GAYLORD
Attention: Christiaan Bon
Project Name: Camp Grayling - Lake Margrethe

Sample ID			LM-SW-1-0820
Analyte	Units	Method	
L-PFBA	ng/L	Modified EPA Method 537	ND
L-PFPeA	ng/L	Modified EPA Method 537	**3.60 J**
L-PFBS	ng/L	Modified EPA Method 537	ND
L-4:2 FTS	ng/L	Modified EPA Method 537	ND
L-PFHxA	ng/L	Modified EPA Method 537	**1.85 J**
L-PFPeS	ng/L	Modified EPA Method 537	ND
HFPO-DA	ng/L	Modified EPA Method 537	ND
L-PFHpA	ng/L	Modified EPA Method 537	**1.61 J**
ADONA	ng/L	Modified EPA Method 537	ND
L-PFHxS	ng/L	Modified EPA Method 537	**2.67 J**
Br-PFHxS	ng/L	Modified EPA Method 537	ND
Total PFHxS	ng/L	Modified EPA Method 537	**2.67 J**
L-6:2 FTS	ng/L	Modified EPA Method 537	ND
L-PFOA	ng/L	Modified EPA Method 537	**1.09 J**
Br-PFOA	ng/L	Modified EPA Method 537	ND
Total PFOA	ng/L	Modified EPA Method 537	**1.09 J**
PFecHS	ng/L	Modified EPA Method 537	ND
L-PFHpS	ng/L	Modified EPA Method 537	ND
L-PFNA	ng/L	Modified EPA Method 537	ND
L-PFOSA	ng/L	Modified EPA Method 537	ND
L-PFOS	ng/L	Modified EPA Method 537	**1.66 J**
Br-PFOS	ng/L	Modified EPA Method 537	ND
Total PFOS	ng/L	Modified EPA Method 537	**2.37 J**
9Cl-PF3ONS	ng/L	Modified EPA Method 537	ND
L-PFDA	ng/L	Modified EPA Method 537	ND
L-8:2FTS	ng/L	Modified EPA Method 537	ND
L-PFNS	ng/L	Modified EPA Method 537	ND
L-MeFOSAA	ng/L	Modified EPA Method 537	ND
Br-MeFOSAA	ng/L	Modified EPA Method 537	ND
Total MeFOSAA	ng/L	Modified EPA Method 537	ND
L-EtFOSAA	ng/L	Modified EPA Method 537	ND
Br-EtFOSAA	ng/L	Modified EPA Method 537	ND
Total EtFOSAA	ng/L	Modified EPA Method 537	ND
L-PFUnA	ng/L	Modified EPA Method 537	ND
L-PFDS	ng/L	Modified EPA Method 537	ND
11Cl-PF3OUdS	ng/L	Modified EPA Method 537	ND
L-PFDoA	ng/L	Modified EPA Method 537	ND
L-PFTrDA	ng/L	Modified EPA Method 537	ND
L-PFTeDA	ng/L	Modified EPA Method 537	ND

Grey indicates contaminant was detected.
J = The amount detected is below the Reporting Limit/LOQ.
ND = Analyte was not detected.

APPENDIX A

Camp Grayling-Lake Margrethe, Crawford County
Site ID #20000100

EGLE Sediment Core Logs

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BOREHOLE LOG

BORING/WELL: LM-SD-1

SITE: Camp Grayling - Lake Margrethe Outflow

COUNTY: Crawford
TOWNSHIP: Grayling
TOWN: 26N
RANGE: 4W
SECTION: 8
LOCATION DESCRIPTION: Portage Creek

DATE: 9/12/20
DRILLER: B. Eustice
GEOLOGIST: B. Eustice
DRILL METHOD: Post Pounder
TOTAL DEPTH: 66" of sediment in 28" of water
SITE ID# 20000100

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	MEASURED RECOVERY (FT/FT)	SAMPLE TYPE	SAMPLE ID	NOTES
		Lake Bottom	0				
		SAND gray to light gray, fine to coarse grain, poorly sorted, wet.					
		SAND dark gray, with organics (roots), fine grain, well sorted, wet.				LM-SD-1-0-2'-0820	
		SAND gray, fine grain, well sorted, wet.		4/5.5		LM-SD-1-2-4'-0820	
		No Recovery	5				
		E.O.B.					

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: NA
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: NA

LATITUDE: 44.6597785°
LONGITUDE: -84.81798324°
PROJECTION: MI GeoRef (m)
NORTHING: 457142.958
EASTING: 593548.756

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BOREHOLE LOG

BORING/WELL: LM-SD-2

SITE: Camp Grayling - Lake Margrethe Outflow

COUNTY: Crawford
TOWNSHIP: Grayling
TOWN: 26N
RANGE: 4W
SECTION: 8
LOCATION DESCRIPTION: Portage Creek

DATE: 9/12/20
DRILLER: B. Eustice
GEOLOGIST: B. Eustice
DRILL METHOD: Post Pounder
TOTAL DEPTH: 83.5" of sediment in 12.5" of water
SITE ID# 20000100

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	MEASURED RECOVERY (FT/FT)	SAMPLE TYPE	SAMPLE ID	NOTES
		Lake Bottom	0				
		SAND gray, fine to medium grain, wet.				LM-SD-2-0-30"-0820	
		SAND with fines, many shells and other organics, wet.		4.75/6.96		LM-SD-2-30-45"-0820	
		SAND gray, fine grain, wet.				LM-SD-2-45-57"-0820	
		No Recovery	5				
		E.O.B.					

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: NA
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: NA

LATITUDE: 44.659719885°
LONGITUDE: -84.81797551°
PROJECTION: MI GeoRef (m)
NORTHING: 457136.456
EASTING: 593549.463

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BOREHOLE LOG

BORING/WELL: LM-SD-3

SITE: Camp Grayling - Lake Margrethe Outflow

COUNTY: Crawford
TOWNSHIP: Grayling
TOWN: 26N
RANGE: 4W
SECTION: 8
LOCATION DESCRIPTION: Portage Creek

DATE: 9/12/20
DRILLER: B. Eustice
GEOLOGIST: B. Eustice
DRILL METHOD: Post Pounder
TOTAL DEPTH: 50" of sediment in 10" of water
SITE ID# 20000100

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	MEASURED RECOVERY (FT/FT)	SAMPLE TYPE	SAMPLE ID	NOTES
		Lake Bottom	0				
		ORGANICS fines, fluffy, wet.				LM-SD-3-0-15"-0820	
		SAND gray, fine grain, trace to few shell fragments, wet.				LM-SD-3-15-31"-0820	
		SAND dark gray to gray, fine grain, wet.		2.58/4.16			
		No Recovery					
		E.O.B.	5				

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: NA
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: NA

LATITUDE: 44.659663493°
LONGITUDE: -84.817972299°
PROJECTION: MI GeoRef (m)
NORTHING: 457130.196
EASTING: 593549.809

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BOREHOLE LOG

BORING/WELL: LM-SD-4

SITE: Camp Grayling - Lake Margrethe Outflow

COUNTY: Crawford
TOWNSHIP: Grayling
TOWN: 26N
RANGE: 4W
SECTION: 8
LOCATION DESCRIPTION: Portage Creek

DATE: 9/12/20
DRILLER: B. Eustice
GEOLOGIST: B. Eustice
DRILL METHOD: Post Pounder
TOTAL DEPTH: 48.5" of sediment in 23" of water
SITE ID# 20000100

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	MEASURED RECOVERY (FT/FT)	SAMPLE TYPE	SAMPLE ID	NOTES
		Lake Bottom	0				
		ORGANICS dark brown, fluffy, wet.				LM-SD-4-0-15"-0820	
		SAND gray, fine grain, well sorted, few shell fragments throughout.		2.54/4.04		LM-SD-4-15-30.5"-0820	
		No Recovery					
		E.O.B.	5				

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: NA
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: NA

LATITUDE: 44.659602698°
LONGITUDE: -84.817955988°
PROJECTION: MI GeoRef (m)
NORTHING: 457123.462
EASTING: 593551.200

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BOREHOLE LOG

BORING/WELL: LM-SD-5

SITE: Camp Grayling - Lake Margrethe Outflow

COUNTY: Crawford
TOWNSHIP: Grayling
TOWN: 26N
RANGE: 4W
SECTION: 8
LOCATION DESCRIPTION: Portage Creek

DATE: 9/12/20
DRILLER: B. Eustice
GEOLOGIST: B. Eustice
DRILL METHOD: Post Pounder
TOTAL DEPTH: 47" of sediment in 14" of water
SITE ID# 20000100

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	MEASURED RECOVERY (FT/FT)	SAMPLE TYPE	SAMPLE ID	NOTES
		Lake Bottom	0				
		ORGANICS dark brown, fluffy, wet.				LM-SD-5-0-16"-0820	
		SAND gray, fine grain, well sorted, soom organics (wood).		2.75/4.75		LM-SD-5-16-33"-0820	
		No Recovery					
		E.O.B.	5				

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: NA
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: NA

LATITUDE: 44.659539133°
LONGITUDE: -84.817969114°
PROJECTION: MI GeoRef (m)
NORTHING: 457116.387
EASTING: 593550.262