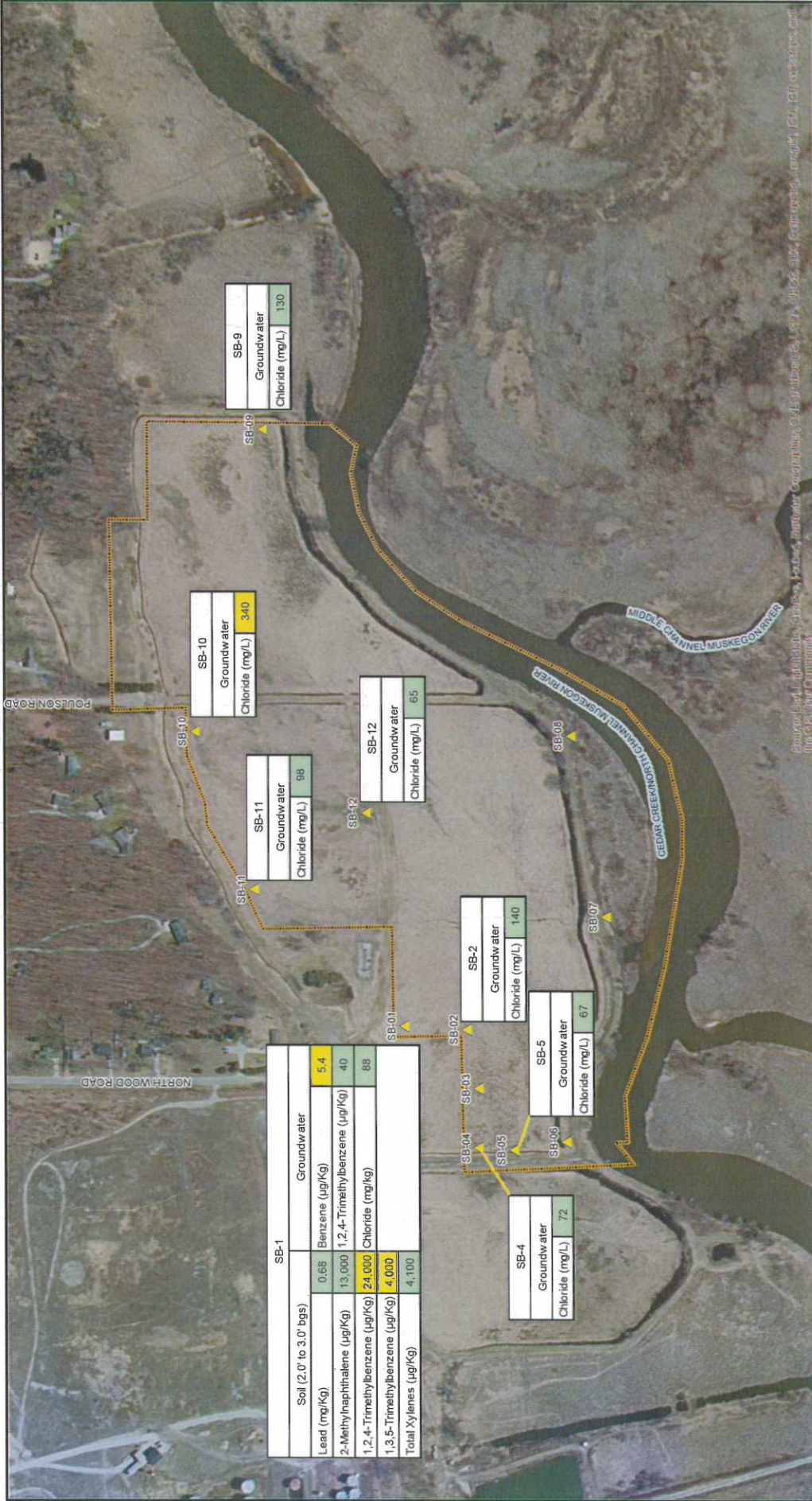


**PART 201 EXCEEDANCES**



Groundwater, Soil, and Sediment Sampling and Analysis Report for the BOSMA Site, North Muskegon, Michigan. Prepared by ERM, Inc. for Ducks Unlimited, Inc. on 12/30/13.

<b>Legend</b> SOIL BORING/TEMPORARY MONITORING WELL LOCATION APPROXIMATE SITE BOUNDARY Notes: -Green shaded cells exceed MDEQ Part 201 GSI/GSP Criteria -Yellow shaded cells exceed MDEQ Part 201 Residential and Non-Residential Drinking Water Criteria	 <b>ERM</b> Environmental Resources Management	DRWN: RMK - 10/28/2014	<b>DUCKS UNLIMITED</b> BOSMA SITE (South end of N. Wood and Poulson Roads) North Muskegon, Michigan	CADD Review: FGB
				CHKD: AD-HOL 0214223

**Figure 3**



Table 1 - Summary of Soil Sampling Results

Ducks Unlimited, Inc  
 Bosma Property - North Wood Road, Muskegon, Michigan

Analyte	Residential Drinking Water Protection Criteria	Non-Residential Drinking Water Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Residential Direct Contact Criteria	Non-Residential Direct Contact Criteria	Soil Saturation Concentration Screening Levels	Groundwater Surface Water Interface Protection Criteria	SB-1 (2-3') 08/07/14
<b>Metals (mg/Kg)</b>								
Arsenic	4.6	4.6	NLV	7.6	37	NA	4.6	0.12
Barium	1,300	1,300	NLV	37,000	1.3E+05	NA	1,300	1.8
Chromium	1.0E+06	1.0E+06	NLV	7.9E+05	1.0E+06 (D)	NA	9.4	1.4
Copper	5,800	5,800	NLV	20,000	73,000	NA	38	0.61
Lead	700	700	NLV	400	900	NA	0.19	0.68
Selenium	4.0	4.0	NLV	2,600	9,600	NA	400	0.20
Sodium	4,600	7,000	NLV	1.0E+06 (D)	1.0E+06	NA	NA	6.9
Zinc	2,400	5,000	NLV	1.7E+05	6.3E+05	NA	16	1.4
<b>Semi-Volatile Organic Compounds (µg/Kg)</b>								
2-Methylnaphthalene	57,000	1.7E+05	4.9E+06	8,100	2.6E+07	NA	4,200	3,200
Phenanthrene	56,000	1.6E+05	5.1E+06	1,600	5.2E+06	NA	2,100	860
<b>Volatile Organic Compounds (µg/Kg)</b>								
Benzene	100	100	8,400	1.8E+05	8.4E+05 (C)	4.0E+05	12	< 360
Isopropylbenzene	91,000	2.6E+05	7.3E+05 (C)	2.5E+07 (C)	8.0E+07 (C)	3.9E+05	3,200	1,200
n-Propylbenzene	1,600	4,600	ID	2.5E+06	8.0E+06	1.0E+07	ID	2,200
2-Methylnaphthalene	57,000	1.7E+05	4.9E+06	8.1E+06	2.6E+07	NA	4,200	13,000
1,2,4-Trimethylbenzene	2,100	2,100	8.0E+06 (C)	3.2E+07 (C)	1.0E+08 (C)	1.1E+05	570	24,000
1,3,5-Trimethylbenzene	1,800	1,800	4.8E+06 (C)	3.2E+07(C)	1.0E+08 (C)	94,000	1,100	4,000
Total Xylenes	5,600	5,600	1.2E+07 (C)	4.10E+08 (C)	1.0E+09 (C,D)	1.5E+05	820	4,100

Notes: (Cleanup Criteria Per Michigan Act 451, Part 201 Rules: R 299.44 to 299.50, 12/30/13)

µg/Kg Micrograms per kilogram.

NLV Hazardous substance is not likely to volatilized under most conditions

ID Insufficient data to develop criterion.

NA Criterion or value is not available

< 360 Laboratory reporting limit is about cleanup criteria

Concentration exceeds MDEQ Part 201 Groundwater Surface Water Interface Protection Criteria

Concentration exceeds MDEQ Part 201 Residential and Non-Residential Drinking Water Protection Criteria

(C) Value presented is a screening level based on the chemical-specific generic soil saturation concentration (Csat) since the calculated risk-based criterion is greater than

(D) Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+09 parts per billion (ppb)

(X) The GSI criterion shown is not protective for surface water that is used as a drinking water source

BOLD Value detected above laboratory reporting limit

Table 2 - Summary of Groundwater Sampling Results  
 Ducks Unlimited, Inc  
 Bosma Property - North Wood Road, Muskegon, Michigan

Parameter	Part 201 Generic Cleanup Criteria										Phase II Environmental Site Assessment Results									
	Drinking Water Criteria		GSI	Groundwater Volatilization to Indoor Air Inhalation Criteria		SB-1 08/07/14	SB-1 Duplicate 08/07/14	SB-2 08/06/14	SB-3 08/06/14	SB-4 08/06/14	SB-5 08/07/14	SB-6 08/07/14	SB-7 08/07/14	SB-8 08/07/14	SB-9 08/07/14	SB-10 08-07-14	SB-11 08-07-14	SB-12 08/07/14	Trip Blank	
	Residential	Non-Residential		Residential	Non-Residential															
	5.0 (A)	5.0 (A)	12	5,600	35,000	5.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzene	800	2,300	28	56,000 (S)	56,000 (S)	4.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
n-propylbenzene	80	230	ID	ID	ID	4.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
1,2,4-Trimethylbenzene	63 (E)	63 (E)	17	56,000 (S)	56,000 (S)	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
1,3,5-Trimethylbenzene	72 (E)	72 (E)	45	61,000 (S)	61,000 (S)	6.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Total Xylenes	280 (E)	280 (E)	41	1.9E+05 (S)	1.9E+05 (S)	21	<3.0	<3.0	<15	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Antions USEPA method Ion Chromatography (mg/L)																				
Chloride	250 (E)	250 (E)	50 (FF)	NLV	NLV	88	140	29	72	67	19	22	30	130	340	98	65	65	NT	
SVOCs USEPA method 8270D (µg/L)																				
2-Methylnaphthalene	750	750	19.0	25,000 (S)	25,000 (S)	8.3	<5.0	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Metals USEPA method 6020A (mg/L)																				
Arsenic	0.010 (A)	0.010 (A)	0.010	NLV	NLV	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	0.0054	<0.0050	<0.0050	0.0087	<0.0050	<0.0050	NT	
Barium	2.0 (A)	2.0 (A)	160	NLV	NLV	0.012	0.026	0.028	0.039	0.016	0.057	<0.0050	0.027	0.051	0.16	0.036	0.030	0.030	NT	
Copper	1.0 (E)	1.0 (E)	38	NLV	NLV	<0.0040	<0.0040	0.0042	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0056	0.020	<0.0040	<0.0040	NT	
Sodium	230	350	N/A	NLV	NLV	34	61	23	47	34	6.9	15	14	72	140	51	37	37	NT	
Zinc	2.4	5.0 (E)	16	NLV	NLV	0.012	<0.010	0.012	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NT	



Notes:

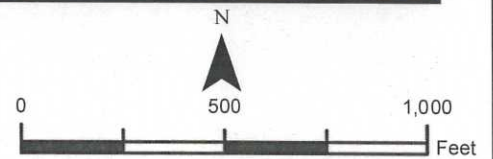
- Cleanup criteria per Michigan Act 451, Part 201 Rules; R 299.44 to R 299.50, 12/30/13
- For simplification, generally only detected concentrations are shown on this table. See analytical laboratory report for full list of compounds analyzed.
- GSI = Groundwater Surface Water Interface Criteria
- ID = Insufficient data to develop criterion.
- NT Indicates parameter not tested.
- NLV = Hazardous substance is not likely to volatilized under most conditions
- (A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
- (E) Criterion is the aesthetic drinking water value, as required by Section 201.20(A)(5) of the Natural Resources and Environmental (NREPA).
- (S) Criterion defaults to the hazardous substance-specific water solubility limit
- (FF) Chloride GSI criterion shall be 50 mg/L when the discharge is to the Great Lakes or connecting waters.
- Yellow shaded cells = value exceeds Residential and Non-Residential Drinking Water Criteria
- Green shaded cells = value exceeds GSI Criteria

# SOIL BORING LOCATION MAP

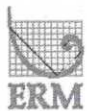


### Legend

-  SOIL BORING/TEMPORARY MONITORING WELL LOCATION
-  APPROXIMATE SITE BOUNDARY



Path: R:\Cadd\CintA-D\DUCKS UNLIMITED\0214223\0214223-F2-SAMPLOC.mxd



## DUCKS UNLIMITED

BOSMA SITE (South end of No. Wood and Poulson Roads)  
North Muskegon, Michigan

CADD Review: FGB

CHK'D: JW-HOL

0214223

DRWN:  
RMK - 08/19/2014

Environmental Resources Management

Figure 2





3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-1**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR	Terra Probe Environmental, Inc. Ottawa Lake, MI	ERM REPRESENTATIVE	Stephen Hoekwater and Andrew DeWitt
DRILLING FOREMAN	Pat Hogan	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hand Auger	DATE: START	08/06/2014
DRILLING EQUIPMENT	Hand Auger	FINISH	08/06/2014

HORIZONTAL DATUM		BOREHOLE DEPTH	5.5 ft
NORTHING		BOREHOLE DIAMETER	3.25 in
EASTING		DEPTH TO WATER (INITIAL) $\nabla$	2.5 ft
VERTICAL DATUM	ELEVATION	DEPTH TO WATER (FINAL) $\nabla$	

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) non plastic, loose, trace fine to medium sand, trace clay, moist, black, ["Peat with roots]		OL				0	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, moist, grayish brown, hydrocarbon-like odor, [Contained brown oil-like substance]	2	SP			66/66	457	SB-1 [(2-3ft) (1, 23, 40)]
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown, hydrocarbon-like odor, [Contained brown oil-like substance]	4	SP				351	
5	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	5.5	SP				111	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown						95.9	
	[END OF BORING AT 5.5' BGS]							
10								
15								
20								
25								
30								

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-5' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:  
1 = VOLATILE ORGANICS  
23 = PAHs  
40 = METALS

Auger Cuttings

BORING LOG - PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-10**  
ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR	Terra Probe Environmental, Inc. Ottawa Lake, MI	ERM REPRESENTATIVE	Andrew DeWitt
DRILLING FOREMAN	Pat Hogan	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hand Auger	DATE: START	08/06/2014
DRILLING EQUIPMENT	Hand Auger	FINISH	08/06/2014
HORIZONTAL DATUM		BOREHOLE DEPTH	6 ft
NORTHING		BOREHOLE DIAMETER	3.25 in
EASTING		DEPTH TO WATER (INITIAL) $\nabla$	2.5 ft
VERTICAL DATUM	ELEVATION	DEPTH TO WATER (FINAL) $\nabla$	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			
						SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	Observations / Remarks
		SILT (OL) trace fine to medium sand, trace clay, dry, black, "Peat" with roots	1	OL				2.4	
		SILTY SAND (SM) trace clay, dry, black, some roots	2	SM				2	
		CLAY (OL) dry to moist, light brown	2.5	OL				1	
		AS ABOVE EXCEPT: (OL) wet	3	OL				0.4	
		SAND (SP) poorly graded, fine to medium grained SAND; little clay, little silt, wet, grayish brown	4	SP			72/72	0.1	
5		SAND (SP) poorly graded, fine to medium grained SAND; some clay, some silt, wet, grayish brown	6	SP					
10		[END OF BORING AT 6' BGS]							

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 1-6' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings





3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-11**  
ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4.5 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 2 ft  
DEPTH TO WATER (FINAL) 2 ft

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) trace fine to medium sand, trace clay, moist, black, ["Peat" with roots]	1	OL				0	
	SILT (OL) poorly graded, trace fine to medium sand, moist, gray	2	OL				0	
	SAND (SP) trace clay, wet, light gray to light brown		SP		54/54		0	
5	[END OF BORING AT 4.5' BGS]	4.5						

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4.5' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG - PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-12**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 5 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 3 ft  
DEPTH TO WATER (FINAL) 3 ft

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SAND (SP) poorly graded, loose, trace silt, moist, light brown, [some organic material]	1	SP				1.5	
	SAND (SW) well graded, coarse grained SAND; loose, trace fine gravel, trace silt, moist, light brown, [0-3' bgs = possible well construction materials/non-native]	2	SW				0.7	
	GRAVEL (GW) well graded, loose, trace coarse sand, moist, dark gray to dark tan	3	GW			60/60	0.2	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	5	SP				0.5	
	[END OF BORING AT 5' BGS]							

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-5' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-2**  
ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR	Terra Probe Environmental, Inc. Ottawa Lake, MI	ERM REPRESENTATIVE	Stephen Hoekwater and Andrew DeWitt
DRILLING FOREMAN	Pat Hogan	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hand Auger	DATE: START	08/06/2014
DRILLING EQUIPMENT	Hand Auger	FINISH	08/06/2014

HORIZONTAL DATUM		BOREHOLE DEPTH	4 ft
NORTHING		BOREHOLE DIAMETER	3.25 in
EASTING		DEPTH TO WATER (INITIAL) ▼	0.5 ft
VERTICAL DATUM	ELEVATION	DEPTH TO WATER (FINAL) ▼	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
						SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
		SILT (OL) non plastic, loose, trace fine to medium sand, trace clay, wet, black, ["Peat" with roots]		OL				1.2	
		SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	2	SP		48/48		0.9	
		[END OF BORING AT 4' BGS]	4					1	
5								0.6	
10									
15									
20									
25									
30									

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG - PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-3**  
ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR	Terra Probe Environmental, Inc. Ottawa Lake, MI	ERM REPRESENTATIVE	Stephen Hoekwater and Andrew DeWitt
DRILLING FOREMAN	Pat Hogan	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hand Auger	DATE: START	08/06/2014
DRILLING EQUIPMENT	Hand Auger	FINISH	08/06/2014

HORIZONTAL DATUM		BOREHOLE DEPTH	4 ft
NORTHING		BOREHOLE DIAMETER	3.25 in
EASTING		DEPTH TO WATER (INITIAL) ▼	0.5 ft
VERTICAL DATUM	ELEVATION	DEPTH TO WATER (FINAL) ▼	

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) non plastic, loose, trace fine to medium sand, trace clay, wet, black, ["Peat" with roots]		OL			48/48	0.8	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	3.5 4	SP				0.7 1.7 0.4	
5	[END OF BORING AT 4' BGS]							
10								
15								
20								
25								
30								

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-4**

ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 2 ft  
DEPTH TO WATER (FINAL) 2 ft

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) non plastic, loose, trace fine to medium sand, trace clay, moist, black, ["Peat" with roots]		OL				1.1	
	AS ABOVE EXCEPT: (OL) wet	2	OL			48/48	1	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	3.5	SP				0.1	
5	[END OF BORING AT 4' BGS]	4					0.1	
10								
15								
20								
25								
30								

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG - PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-5**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 2.5 ft  
DEPTH TO WATER (FINAL)

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) non plastic, loose, trace fine to medium sand, trace clay, moist, black, ["Peat" with roots]	2	OL				0	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, moist, grayish brown	2.5	SP			48/48	0.7	
	AS ABOVE EXCEPT: (SP) wet	4	SP				0.9	
	[END OF BORING AT 4' BGS]						0	

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

Auger Cuttings

LAB ANALYSIS:

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-6**

ERM PROJECT # 0214223  
SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 5 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 3 ft  
DEPTH TO WATER (FINAL)

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
						SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
		SILTY SAND (SM) loose, trace clay, moist, blackish gray, [with grass/plant roots]		SM				1.8	
		SILTY SAND (SM) poorly graded, loose, moist, grayish black	2	SM				0	
		SILT (OL) loose, trace fine sand, moist, black, [organic rich]	2.5	OL				0	
			3	SP			60/60	0	
5		SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	5						
		[END OF BORING AT 5' BGS]							
10									
15									
20									
25									
30									

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-5' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-7**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 1 ft  
DEPTH TO WATER (FINAL) 1 ft

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
						SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
0.5		SILT (OL) trace clay, moist, black, ["Peat" with roots]	0.5	OL				0.6	
1		SILTY CLAY (CL-ML) trace sand, moist, grayish black	1	CL-ML				1.6	
2		AS ABOVE EXCEPT: (CL-ML) wet	2	CL-ML			48/48	0.8	
4		SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	4	SP					
5		[END OF BORING AT 4' BGS]							

REMARKS:

Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14





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Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-8**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 2 ft  
DEPTH TO WATER (FINAL) 2 ft

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) trace clay, moist, black, ["Peat" with roots]	1	OL				2.4	
	SILTY CLAY (CL-ML) trace sand, moist, grayish black	2	CL-ML			48/48	1.2	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown		SP				0.7	
	[END OF BORING AT 4' BGS]	4					0.4	
5								
10								
15								
20								
25								
30								

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14



3352 128th Avenue  
Holland, MI 49424  
P: 616-399-3500

PROJECT: Ducks Unlimited  
Phase II Investigation - Bosma Property

BORING # **SB-9**

ERM PROJECT # 0214223

SHEET 1 OF 1

DRILLING CONTRACTOR Terra Probe Environmental, Inc.  
Ottawa Lake, MI  
DRILLING FOREMAN Pat Hogan  
DRILLING METHOD Hand Auger  
DRILLING EQUIPMENT Hand Auger

ERM REPRESENTATIVE Andrew DeWitt  
OFFICE LOCATION Holland, MI  
DATE: START 08/06/2014  
FINISH 08/06/2014

HORIZONTAL DATUM  
NORTHING  
EASTING  
VERTICAL DATUM ELEVATION

BOREHOLE DEPTH 4.5 ft  
BOREHOLE DIAMETER 3.25 in  
DEPTH TO WATER (INITIAL) 2.5 ft  
DEPTH TO WATER (FINAL)

DEPTH ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA			Observations / Remarks
					SAMPLE TYPE	RECOVERY	PID (ppm) 10.6 eV Lamp	
	SILT (OL) trace clay, moist, black, ["Peat" with roots]	1	OL				1.9	
	SILT (OL) contains sand, trace clay, moist, black, ["Peat" organic material with roots]	2.5	OL			54/54	1.1	
	AS ABOVE EXCEPT: (OL) wet	3.5	OL				0.4	
	SAND (SP) poorly graded, fine to medium grained SAND; loose, wet, grayish brown	4.5	SP				0	
5	[END OF BORING AT 4.5' BGS]							
10								
15								
20								
25								
30								

REMARKS:  
Installed temporary 1" PVC monitoring well with 10 slot screen from 0-4.5' bgs. Sampled groundwater and analyzed for VOC's, PAH's, MI 10 Metals, Sodium, and Chloride

LAB ANALYSIS:

Auger Cuttings

BORING LOG PHASE II SOIL BORING LOGS.GPJ ERM DATA TEMPLATE.GDT 8/19/14