Prepared by

Renew Harbor Island

Work today, protect tomorrow.

Monitoring Well Installation Report

For Michigan Part 115 CCR Solid Waste Regulations

Former J.B. Sims Generating Station

November 27, 2023

Revised – May 1, 2024

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FIGURES

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1.0 Introduction

The purpose of this Monitoring Well Installation Report is to document details pertaining to the drilling, construction, and development of groundwater monitoring wells installed at the former J.B. Sims Generating Station (facility or Site) in Grand Haven, Michigan operated by Grand Haven Board of Light and Power (GHBLP) (**Figure 1**). The groundwater monitoring system is intended to support compliance with the U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule (40 CFR §257.91.) and Part 115 Solid Water Management, of the Michigan Natural Resourced and Environmental Protection Act, 1994 PA 451 (Part 115) and the Part 115 regulations. The Site has two units subject to the CCR Rule: Units 1/2 Impoundment and Unit 3A/B Impoundments (**Figure 2**). The two CCR units are currently inactive. WSP was contracted by HDR to assist with locating certain wells used for the CCR program. WSP located, designed, and oversaw the installation of eight new groundwater monitoring wells at the Site.

2.0 Background Information

2.1 Monitoring Well Network

In January 2017, Environmental Resources Management (ERM) installed the initial four monitoring wells around Unit 3A/B (MW-01 through MW-04). Construction details of monitoring well construction is provided in *Groundwater Monitoring System Certification* (ERM, 2017). Monitoring well MW-01 was used as the upgradient location and MW-02, MW-03, MW-04 were placed on the downgradient waste boundary. In July 2018 Golder & Associates (Golder) expanded the monitoring well network to include MW-05 through MW-10. Based on available groundwater contours prior to well installation, monitoring well MW-07 was utilized as the upgradient monitoring location. Monitoring well MW-06 was placed on the waste boundary, MW-08 was placed up gradient along the northern access road, and MW-09 and MW-10 were placed further downgradient near the property boundary. In January 2021 the Michigan Department of Environment, Great Lakes, and Energy (EGLE), EPA, and GLBLP agreed that Units 1/2 would be addressed pursuant to state and federal CCR regulations, subsequently the monitoring well network was expanded. Golder began installing monitoring wells in August 2021 to include PZ-11 through PZ-32. The network expansion was documented in *Field Summary Report of Results from Approved Work Plan - Piezometer Installation and Additional Data Collection* (Field Summary Report) (Golder, 2022). In 2022 the monitoring well network was revised, as stated in the *2022 Harbor Island Work Plan for CCR Compliance* (HDR, 2022). The revisions included changes to nomenclature of well identification to reflect piezometer locations, previously only used for water levels, that have been added to the list of wells used for water quality monitoring (e.g., changing the well ID from PZ-# to MW-#). In the event of monitoring well network is updated, the nomenclature will be updated to reflect which wells are sampled (MW-X) and which wells are to be used as water level only (PZ-X). Note the numbers following "MW" or "PZ" will not be changed and can be used to identify a location that has been updated based on the well network. The well construction details for wells installed by others in previous

phases of the project (ERM and Golder) will be included herein for quick reference; however ERM (2017) and Golder (2022) represent the actual well installation reports for all onsite wells except for the new eight wells, MW-33, MW-34, MW-35, MW-36, MW-37, MW-38, MW-39, and MW-40 which are described herein.

2.2 Hydrogeology

The regional general direction of groundwater flow across Harbor Island is west to southwest towards Lake Michigan (Western Michigan University, 1981). The Grand River is located on the northern and western sides of the Site, and the South Channel is located on the south side of Harbor Island. Internal to the Island there are several influences to groundwater flow and direction. These influences are specifically related to:

- Various fill materials
- Surface water features, such as the inactive Units 1/2 Impoundment and wetlands
- Former coal yard area which may have lower infiltration rates due to compaction from heavy equipment and stockpiling.

These features influence the groundwater velocity and direction and are very localized. Boring logs contained in the *Field Summary Report of Results from Approved Work Plan - Piezometer Installation and Additional Data Collection* show the observed fill materials encountered during well installation (Golder, 2022). During the water level monitoring events conducted between September 2022 and February 2024, groundwater mounding is shown around monitoring well MW-01R, consistent with observations made by Golder between October and December 2021 (Golder, 2022). Groundwater flow in the area east of the internal wetland is consistent with regional groundwater flow and the flow of the Grand River toward the west. Groundwater data from the 2023 show groundwater flow beneath Unit 3A/B Impoundments is consistently west toward the Grand River (HDR, 2024). Groundwater flow beneath Units 1/2 Impoundment is seasonably and spatially variable; flow is generally northward toward near the North Channel (**Figure 2**), east from the ponds of Units 1/2 Impoundment toward the wetland, and potentially south near MW-05 (HDR, 2024). The wetland east of the Units 1/2 Impoundment appears to provide a hydraulic sink between the CCR impoundments and the wells situated to the east of the wetland (PZ-23 through PZ-26, MW-27, MW-33, and MW-34).

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Figure 1 | Site Vicinity Map

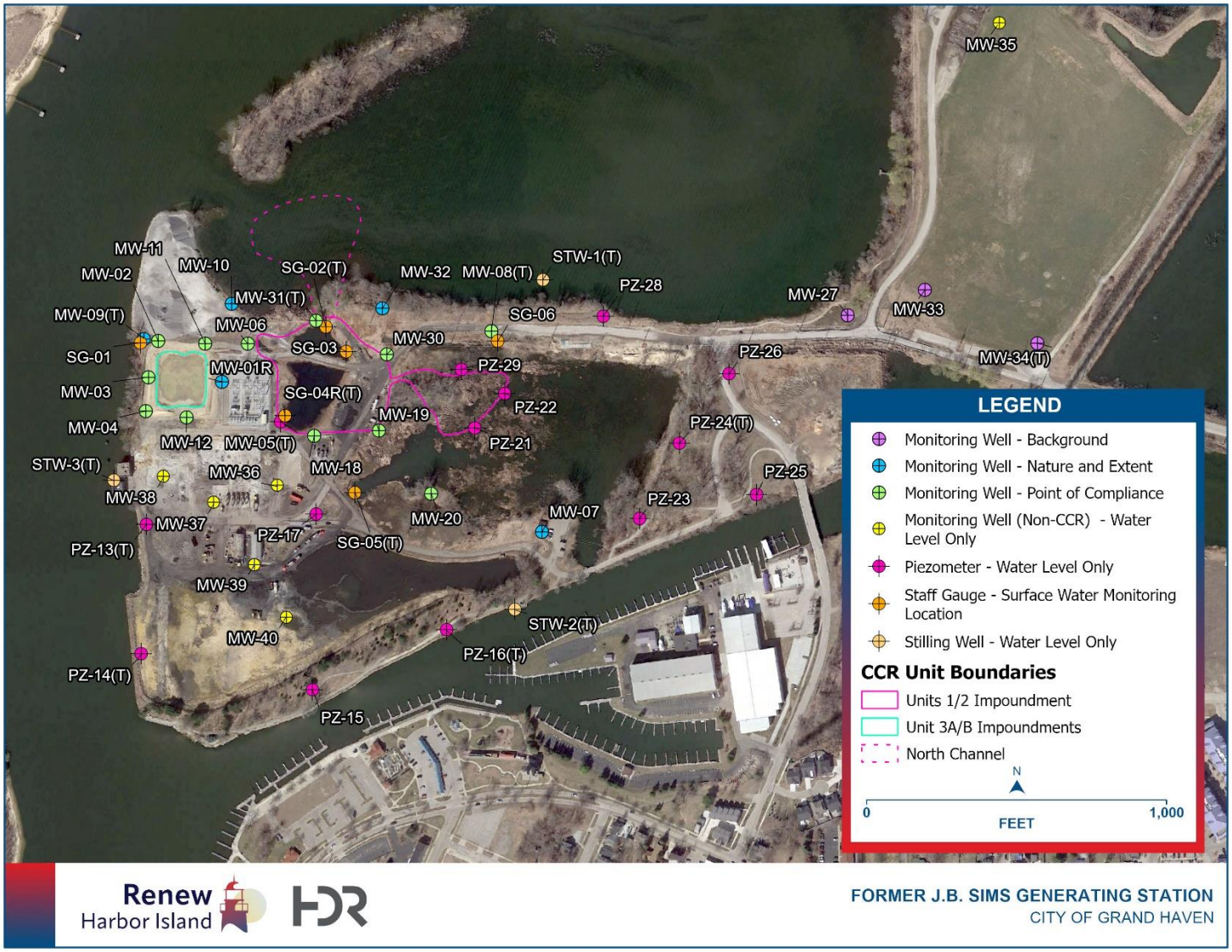

Figure 2 | Former J.B. Sims CCR Units and Monitoring Wells

3.0 Field and Laboratory Methods

3.1 Borehole Drilling

Table 1 contains the installation date, oversight company, driller, and drill method for each CCR monitoring location. Soils from boreholes were logged by the field geologist to document soil characteristics. The geologist visually classified soil type, consistency/relative density, color, and water content in accordance with the Unified Soil Classification System (USCS) as well as grain size, mineralogy, sorting, roundness, hardness, and matrix/clast support, among other textural properties.

In November 2022, WSP provided oversite of the installation of background monitoring wells MW-33 and MW-34. Based on the available groundwater flow data, the east arm of Harbor Island is upgradient of the CCR units. The two new monitoring wells were installed east of MW-27 to serve as background monitoring wells for the CCR program. In January 2023, WSP provided oversite of the installation of background monitoring wells MW-35 through MW-40 for a non-CCR groundwater monitoring investigation. The well locations were chosen based on sampling results of the non-CCR program and are shown on **Figure 2**. Monitoring wells MW-35, 39, and MW-40 are not sampled under the CCR program, however, water levels are collected as additional information for potentiometric contour maps.

Table 1. Monitoring Well Installation Information

Well	Date Completed	Well Design and Drilling Oversite Company	Drilling Company	Drilling Rig Type and Drilling Method
Monitoring Wells				
MW-01	1/18/2017	ERM	EDAC	GUS Peck - Hollow Stem Auger
MW-01R	5/1/2020	Golder & Assoc.	EDAC	GUS Peck - Hollow Stem Auger
MW-02	1/18/2017	ERM	EDAC	GUS Peck - Hollow Stem Auger
MW-03	1/18/2017	ERM	EDAC	GUS Peck - Hollow Stem Auger
MW-04	1/18/2017	ERM	EDAC	GUS Peck - Hollow Stem Auger
MW-05	5/22/2018	Golder & Assoc.	EDAC	GUS Peck - Hollow Stem Auger
MW-06	5/22/2018	Golder & Assoc.	EDAC	GUS Peck - Hollow Stem Auger
MW-07	5/22/2018	Golder & Assoc.	EDAC	GUS Peck - Hollow Stem Auger
MW-08	5/22/2018	Golder & Assoc.	EDAC	GUS Peck - Hollow Stem Auger
MW-09	8/12/2019	Golder & Assoc.	GeoServe	Direct Push - Geoprobe
MW-10	8/12/2019	Golder & Assoc.	GeoServe	Direct Push - Geoprobe
MW-11	8/19/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-12	8/17/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-16	8/25/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-17	8/17/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-18	8/18/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-19	8/20/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-20	8/18/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-27	8/23/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe

Table 1. Monitoring Well Installation Information				
Well	**Date Completed**	**Well Design and Drilling Oversite Company**	**Drilling Company**	**Drilling Rig Type and Drilling Method**
MW-28	8/23/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-30	8/19/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-31	9/1/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-32	8/30/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-33	11/28/2022	WSP	Job Site Services	Direct Push - Geoprobe
MW-34	11/28/2022	WSP	Job Site Services	Direct Push - Geoprobe
MW-36	1/30/2023	WSP	Job Site Services	Direct Push - Geoprobe
MW-37	1/30/2023	WSP	Job Site Services	Direct Push - Geoprobe
MW-38	1/30/2023	WSP	Job Site Services	Direct Push - Geoprobe
Piezometers				
PZ-13	8/17/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-14	8/16/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-15	8/25/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-21	8/30/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-22	8/31/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-23	8/25/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-24	8/24/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-25	8/24/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-26	8/23/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-28	8/23/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
PZ-29	8/30/2021	Golder & Assoc.	MATECO	Direct Push - Geoprobe
MW-35	1/30/2023	WSP	Job Site Services	Direct Push - Geoprobe
MW-39	1/31/2023	WSP	Job Site Services	Direct Push - Geoprobe
MW-40	1/31/2023	WSP	Job Site Services	Direct Push - Geoprobe

3.2 Soil Samples – Geotechnical Analysis

The drilling method for each groundwater monitoring location is contained in **Table 1**. Locations MW-33, MW-34, MW-35, MW-36, MW-37, MW-38, MW-39, and MW-40 were continuously logged using direct push methods and soils were classified based on USCS guidelines. No soil samples were retained from the wells above for further geotechnical analysis.

3.3 Well Construction

Per the CCR Rule and Part 115 regulations, the uppermost aquifer is the target for groundwater monitoring. Monitoring wells are screened in the uppermost aquifer across the Island. The well construction details from ERM, Golder, and HDR/WSP are shown in **Table 2**. Similar to wells installed prior to 2022, monitoring wells MW-33, MW-34, MW-35, MW-36, MW-37, MW-38, MW-39, and MW-40 have 5-foot screen intervals targeting the uppermost aquifer. These eight wells are constructed of schedule 40, 2-inch Polyvinyl Chloride (PVC) pipe with 5-foot (10 slot) screens. Wells MW-33, MW-34, and MW-35 were completed with flush-mounted covers and 2-foot circular cement pads. Wells MW-36 through MW-40 were completed with 4-foot steel

protective casings and 1 by 1-foot cement pads. Wells MW-35 through MW-40 were installed as part of a non-CCR Site investigation and water levels are collected to further characterize the groundwater flow direction. Boring and well construction logs are contained in **Appendix A**. As described in **Section 2.2**, the uppermost aquifer is encountered at or near ground surface and extending to approximately 39.0 feet below surface. The shallow nature of the groundwater is the driving factor behind the shallow screen intervals shown in **Table 2**.

3.4 Well Development

Monitoring wells MW-33 and MW-34 were developed to improve hydraulic connectivity in the area immediately surrounding the well. Well development involves removing as much of the introduced drilling fluids, cuttings, and particulates from within and adjacent to the well as possible.

Well development of monitoring wells MW-33 and MW-34 was performed by HDR in tandem with Job Site Services (JSS). Post well installation, JSS began well development using a submersible pump. The pump was used to surge groundwater though the well screen and into the filter pack and vice versa. JSS recorded 22 gallons purged from MW-33 and 27 gallons removed from MW-34. HDR field staff completed well development using a peristaltic pump while monitoring water quality to verify stabilization of water quality parameters, as well as water clarity. In total 35.3 gallons or 44.1 well volumes were removed from MW-33. A total of 38.2 gallons or 27.3 well volumes were removed from MW-34. Well development logs for MW-33 and MW-34 are contained in **Appendix B**. Both wells achieved stabilization within the following parameters:

- Turbidity - below 5.0 NTU and three consecutive readings within 10%
- pH - three consecutive readings within 0.1 S.U.
- Conductivity – three consecutive readings within 3.0%
- Dissolved Oxygen – three consecutive readings within 0.3 mg/L
- Oxidation Reduction Potential – three consecutive readings within 10 mV

Well development of MW-35 through MW-40 was conducted by WSP. The monitoring wells were developed a minimum of 24-hours after installation through alternating cycles of surging and purging the well using a clean decontaminated submersible pump and new HDPE tubing. The initial depth to water, total depth of well, development method, pumping rate, cumulative volume removed during well development, and depth to water after development were recorded on the well development form for each well (**Appendix B**). Water quality parameters were not monitored during well development, however, they were monitored as part of groundwater sample collection procedures. Well development was considered complete following removal of at least 12 well volumes and visual clarity of purge water. Job Site decontaminated the DPT drilling core barrels and submersible pump in between monitoring well installation and development locations using a pressure washer and Liquinox® soap.

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Table 2. Well Construction Details

Well I.D.	Northing	Easting	Date Installed	Ground Surface Elevation	Top of Casing (Staff Gauge) Elevation	Total Boring Depth (feet bgs)	Total Well Depth (feet bgs)	Stickup	Screen length (feet)	Screen Interval (feet bgs)	Comments
Monitoring Wells											
MW-01	578100.82	12624468.08	1/18/2017	584.34	587.29	12.3	12.3	2.95	5.0	4.0-9.0	Abandoned
MW-01R	578101.30	12624432.00	5/1/2020	585.73	588.45	10.0	9.0	2.72	5.0	4.0-9.0	
MW-02	578241.91	12624222.64	1/18/2017	592.67	595.64	21.0	20.0	2.97	5.0	15.0-20.0	
MW-03	578125.03	12624180.40	1/18/2017	590.42	593.08	17.0	17.0	2.66	5.0	12.0-17.0	
MW-04	578003.96	12624165.24	1/18/2017	588.66	591.49	17.0	15.0	2.83	5.0	10.0-15.0	
MW-05	577970.06	12624634.16	5/22/2018	585.31	587.67	12.0	9.0	2.36	5.0	4.0-9.0	
MW-06	578229.40	12624525.24	5/22/2018	588.22	590.40	17.0	14.0	2.18	5.0	9.0-14.0	
MW-07	577585.75	12625513.56	5/22/2018	583.65	586.49	16.0	16.0	2.84	5.0	11.0-16.0	
MW-08	578261.14	12625341.26	5/22/2018	582.74	585.40	15.0	9.0	2.66	5.0	4.0-9.0	
MW-09	578241.35	12624185.62	8/12/2019	586.8	589.65	12.0	12.0	2.85	5.0	7.0-12.0	
MW-10	578367.40	12624470.20	8/12/2019	583.71	586.73	10.0	10.0	3.02	5.0	5.0-10.0	
MW-11	578236.87	12624377.19	8/19/2021	592.46	595.27	40.0	15.0	2.81	5.0	10.0-15.0	
MW-12	577987.57	12624312.28	8/17/2021	584.94	588.03	40.0	8.0	3.09	5.0	3.0-8.0	
MW-16	577273.65	12625194.83	8/25/2021	582.18	584.87	35.0	8.0	2.69	5.0	3.0-8.0	
MW-17	577652.81	12624744.16	8/17/2021	584.03	587.02	40.0	8.0	2.99	5.0	3.0-8.0	
MW-18	577919.12	12624742.18	8/18/2021	584.12	587.22	34.0	8.0	3.1	5.0	3.0-8.0	
MW-19	577938.05	12624957.16	8/20/2021	583.06	585.86	25.0	8.0	2.8	5.0	3.0-8.0	
MW-20	577722.50	12625131.40	8/18/2021	582.43	585.74	34.0	8.0	3.31	5.0	3.0-8.0	
MW-27	578303.89	12626551.81	8/23/2021	581.87	585.09	40.0	8.0	3.22	5.0	3.0-8.0	
MW-28	578314.93	12625722.71	8/23/2021	585.11	588.07	29.5	9.0	2.96	5.0	4.0-9.0	
MW-30	578196.17	12624990.23	8/19/2021	583.02	585.80	34.0	8.0	2.78	5.0	3.0-8.0	
MW-31	578307.16	12624752.70	9/1/2021	582.56	585.85	27.0	8.0	3.29	5.0	3.0-8.0	
MW-32	578348.32	12624980.14	8/30/2021	583.08	586.26	40.0	8.0	3.18	5.0	3.0-8.0	
MW-33	578403.66	12626765.24	11/28/2022	583.23	582.81	7.0	7.0	-0.42	5.0	2.0-7.0	
MW-34	578225.86	12627140.54	11/28/2022	584.69	584.36	15.0	13.0	-0.33	5.0	8.0-13.0	

Table 2. Well Construction Details

Well I.D.	Northing	Easting	Date Installed	Ground Surface Elevation	Top of Casing (Staff Gauge) Elevation	Total Boring Depth (feet bgs)	Total Well Depth (feet bgs)	Stickup	Screen length (feet)	Screen Interval (feet bgs)	Comments
MW-36	577753.42	12624605.70	1/30/2023	589.12	585.62	20.0	9.0	-3.51	5.0	4.0-9.0	
MW-37	577696.74	12624393.06	1/30/2023	585.59	589.62	20.0	9.0	4.03	5.0	4.0-9.0	
MW-38	577782.86	12624225.55	1/30/2023	586.26	590.51	20.0	9.0	4.25	5.0	4.0-9.0	
Piezometers											
PZ-13	577623.94	12624190.94	8/17/2021	583.23	586.08	34.0	9.0	2.85	5.0	4.0-9.0	
PZ-14	577191.85	12624160.04	8/16/2021	583.46	586.39	35.0	9.0	2.93	5.0	3.0-8.0	
PZ-15	577062.51	12624730.23	8/25/2021	589.32	592.38	40.0	20.0	3.06	5.0	15.0-20.0	
PZ-21	577941.39	12625280.33	8/30/2021	N/A	583.32	30.0	9.0	N/A	5.0	4.0-9.0	Seal unable to be verified, no groundwater sampling
PZ-22	578056.88	12625387.96	8/31/2021	N/A	583.42	22.0	9.0	N/A	5.0	4.0-9.0	Seal unable to be verified, no groundwater sampling
PZ-23	577627.71	12625841.35	8/25/2021	584.39	587.21	25.0	9.0	2.82	5.0	4.0-9.0	
PZ-24	577884.7	12625979.33	8/24/2021	583.92	587.34	30.0	9.0	3.42	5.0	4.0-9.0	
PZ-25	577703.65	12626240.18	8/24/2021	583.46	586.37	30.0	8.0	2.91	5.0	3.0-8.0	
PZ-26	578114.39	12626145.22	8/23/2021	583.81	586.27	30.0	8.0	2.46	5.0	3.0-8.0	
PZ-29	578138.08	12625241.56	8/30/2021	N/A	583.49	35.0	9.0	N/A	5.0	4.0-9.0	Seal unable to be verified, no groundwater sampling
MW-35	579293.34	12627013.41	1/30/2023	590.42	589.72	18.0	12.30	-0.70	5.0	7.3-12.3	
MW-39	577488.79	12624528.83	1/31/2023	583.27	587.36	20.0	7.0	4.09	5.0	2.0-7.0	
MW-40	577313.68	12624636.21	1/31/2023	582.75	586.78	10.0	6.5	4.03	5.0	1.5-6.5	
Staff Gauges											
SG-01	578234.49	12624159.06	8/12/2019	NA	585.10[1]	NA	NA	NA	NA	NA	
SG-02	578287.85	12624784.61	8/12/2019	NA	583.43[1]	NA	NA	NA	NA	NA	
SG-03	578201.99	12624858.11	8/12/2019	NA	584.37[1]	NA	NA	NA	NA	NA	
SG-04	577984.43	12624649.47	8/12/2019	NA	584.53[1]	NA	NA	NA	NA	NA	
SG-04R	577966.13	12624647.67	6/9/2020	NA	585.04[1]	NA	NA	NA	NA	NA	
SG-05	577717.81	12624888.51	8/12/2019	NA	584.83[1]	NA	NA	NA	NA	NA	
SG-06	578227.56	12625365.56	8/12/2019	NA	584.88[1]	NA	NA	NA	NA	NA	

Table 2. Well Construction Details

Well I.D.	Northing	Easting	Date Installed	Ground Surface Elevation	Top of Casing (Staff Gauge) Elevation	Total Boring Depth (feet bgs)	Total Well Depth (feet bgs)	Stickup	Screen length (feet)	Screen Interval (feet bgs)	Comments
SG-07	577514.07	12625667.88	2/12/2024	NA	577.32[1]	NA	NA	NA	NA	NA	
Stilling Wells											
STW-1	578433.87	12625522.16	4/17/2023	NA	583.03	NA	NA	NA	1	NA	
STW-2	577340.3	12625423.18	4/17/2023	NA	583.47	NA	NA	NA	5	NA	
STW-3	577771.11	12624083.74	4/17/2023	NA	591.17	NA	NA	NA	5	NA	

1. Elevation referenced to 0 foot mark on gauge.

3.5 Well Survey

Survey information collected at each location includes elevations for top of PVC well casing (TOC), ground surface elevation, northing, and easting coordinates of the wells. Well survey information is contained in **Table 2**.

3.6 Groundwater Level and Aquifer (Slug) Testing

Slug tests were completed at 10 locations including MW-01R, MW-02, MW-04, MW-05, MW-07, MW-08, PZ-17, PZ-20, PZ-26, and PZ-31 by Golder in August 2021. The methodology and results from the tests are contained in the Field Summary Report (Golder, 2022). Additional monitoring well installation is anticipated for further Site investigation in 2024 and supplemental slug testing will be included in subsequent report updates.

4.0 References

ERM, 2017. Groundwater Monitoring System Certification for the Grand Haven Board of Light and Power, Environmental Resources Management Michigan, Inc. November 2017.

Golder Associates, Inc., 2022. Field Summary Report of Results from Approved Work Plan -Piezometer Installation and Additional Data Collection. February 15, 2022.HDR Inc, 2022. 2022 Harbor Island Work Plan for CCR Compliance. April 8, 2022. Amended June 23, 2022.

HDR, 2022., 2022 Harbor Island Work Plan for CCR Compliance. April 8, 2022. Revised June 23, 2022.

HDR, 2024., 4th Quarter 2023 Groundwater Monitoring Report. January 31, 2024.

Western Michigan University, Department of Geology. “Hydrogeologic Atlas of Michigan, Volume 1”. The Department of Geology, Kalamazoo, Michigan. 1981.

Appendix A

Borehole Logs and Well Construction Diagrams

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # MW-01

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017

HORIZONTAL DATUM (NAD 1983 StatePlane Michigan South (US Feet))		BOREHOLE DEPTH	10 ft
NORTHING	176201.037	BOREHOLE DIAMETER	
EASTING	3847934.632	DEPTH TO WATER (INITIAL) ▼	5 ft
VERTICAL DATUM (NGVD 29 (US Feet)) ELEVATION	96.08 ft	DEPTH TO WATER (FINAL) ▽	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA: SAMPLE TYPE	RECOVERY		Observations / Remarks
		SAND (SP) poorly graded, fine grained SAND; loose, little gravel, moist, dark brown to black		SP					
	95	SAND (GW-SW) well graded, fine grained SAND; loose, some gravel, moist, brown to grayish brown	1	GW-SW					
2		SAND (SP) fine grained SAND; loose, moist, black, [Bottom ash.]	2	SP					
		SILTY SAND (SP) poorly graded, fine grained SAND; loose, little clay, moist to wet, dark brown to black, [Concrete, metal and wood fragments. Wet @ 5']	3						
4									
6	90			SP					
8									
		SILT (OL) soft, little clay, trace fine sand, wet to moist, dark grayish brown	9	OL					

REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

LAB ANALYSIS:

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # **MW-01**

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI
DRILLING FOREMAN	Sean Smith
DRILLING METHOD	Hollow-Stem Augers
DRILLING EQUIPMENT	Gus Peck
ERM REPRESENTATIVE	Brian Beach
OFFICE LOCATION	Holland, MI
DATE: START	01/18/2017
FINISH	01/18/2017

GEOGRAPHIC COORDINATES
(NAD 1983 StatePlane Michigan South (US Feet))

NORTHING	176201.037
EASTING	3847934.632
Elevation/Top of Casing Elev.	96.08 ft/ 99.35 ft

WELL CONSTRUCTION

	Riser	Screen
Material:	*Schedule 40 PVC*	*Schedule 40 PVC, 0.010-slot*
Diameter (ID):	*2-inch*	*2-inch*
Coupling:	*Threaded*	*Threaded*

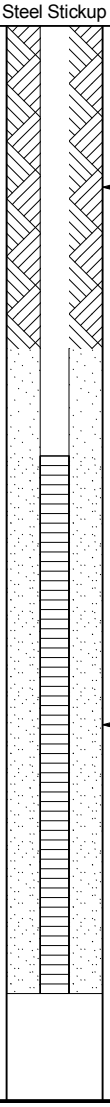
WELL DEVELOPMENT
Method: *Overpumping*
Duration: *0.5 hours*
Gals. Purged: *30*

Well Permit #: *No permit required.*

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG
		SAND (SP) poorly graded, fine grained SAND; loose, little gravel, moist, dark brown to black		SP	
	95	SAND (GW-SW) well graded, fine grained SAND; loose, some gravel, moist, brown to grayish brown	1	GW-SW	
2		SAND (SP) fine grained SAND; loose, moist, black, [Bottom ash.]	2	SP	
		SILTY SAND (SP) poorly graded, fine grained SAND; loose, little clay, moist to wet, dark brown to black, [Concrete, metal and wood fragments. Wet @ 5']	3		
4					
6	90			SP	
8					
		SILT (OL) soft, little clay, trace fine sand, wet to moist, dark grayish brown	9	OL	

WELL CONSTRUCTION

Casing Type:
6-inch Diameter
Steel Stickup



REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

WELL INSTALLATION NOTES:

RECORD OF WELL DECOMMISSIONING: MW-01

CLIENT: Grand Haven BLP
PROJECT: GHBLP - JB Sims Generating Station
PROJECT NO: 20141048
LOCATION: Grand Haven, MI
DATE: May 01, 2020
CONTRACTOR: EDAC
ELEVATION: 584.3 ft (Ground)
COORDINATES: N: 176201.0 ft E: 3847934.6 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: GP-1100 ATV Rig
DRILL METHOD: Hollow Stem Auger

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)
0	SAND, poorly graded, fine grained, loose, little gravel, moist, dark brown to black.	SP		0.0 / 583.3
1	SAND, well graded, fine grained, loose, some gravel, moist, brown to grayish brown.	SW		1.0 / 582.3
2	SAND, poorly graded, fine grained, loose, moist, black (bottom ash).	SP		2.0 / 581.3
3	Silty SAND, poorly graded, fine grained, loose, little clay, moist to wet, dark brown to black (concrete, metal, and wood fragments). Wet at 5 feet.	SC-SM		3.0 / 575.3
9	SILT, soft, little clay, trace fine sand, wet to moist, dark grayish brown.	ML		9.0 / 574.3
10	End of hole at 10.0 ft.			

SAMPLES: Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30-in drop
NUMBER | TYPE | REC % | BLOWS | N-VALUE

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen; Q; U; 0 20 40 60 80 100

ADDITIONAL LAB TESTING

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

0.0 - 10.0 ft bgs: Hydrated Bentonite Chips

DEPTH SCALE: 1:53

REV:

GOLDER

LOGGED: Adam Near, CPG DATE: May 01, 2020
CHECKED: Dawn Prell, CPG DATE: Jun 11, 2020

RECORD OF BOREHOLE / WELL: MW-01R

CLIENT: Grand Haven BLP
PROJECT: GHBLP - JB Sims Generating Station
PROJECT NO: 20141048
LOCATION: Grand Haven, MI
DATE: May 01, 2020
CONTRACTOR: EDAC
ELEVATION: 585.7 ft (Ground)
COORDINATES: N: 578101.3 ft E: 12624432.0 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: GP-1100 ATV Rig
DRILL METHOD: Hollow Stem Auger

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)
0	Fine SAND, loose, dark brown to black, little Gravel, moist.	SP		0.0 / 584.7
1	Fine to coarse SAND, loose, brown to gray, some Gravel, moist.	SW		1.0 / 583.7
2	Fine SAND, loose, black (bottom ash), moist.	SP		2.0 / 582.7
3	Silty fine SAND, loose, dark brown to black, some Clay, wood fragments, wet.	SP-SM		3.0 / 577.5
8	SILT, loose, dark brown to black, trace Sand, wet.	ML		8.2 / 575.7
10	End of hole at 10.0 ft.			

SAMPLES (Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30-in drop)

NUMBER	TYPE	REC %	BLOWS	N-VALUE
	Air Knife	100		
1	SS	98	13-10-16	23
2	SS	55	5-3-3	8
3	SS	10	5-2-2	7

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen; Q; U; 0 20 40 60 80 100

ADDITIONAL LAB TESTING

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 2.7 ft
Pipe Elev: 588.4 ft

0.0 - 0.5 ft bgs: Concrete

0.5 - 2.5 ft bgs: Hydrated Bentonite Chips

Schedule 40 PVC Riser (2-inch diameter)

2.5 - 10.0 ft bgs: Filter Sand

0.010-inch slot PVC screen

DEPTH SCALE: 1:53

REV:

GOLDER

LOGGED: Adam Near, CPG
DATE: May 01, 2020
CHECKED: Dawn Prell, CPG
DATE: Jun 11, 2020

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # MW-02

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017

HORIZONTAL DATUM (NAD 1983 StatePlane Michigan South (US Feet))		BOREHOLE DEPTH	21 ft
NORTHING	176247.026	BOREHOLE DIAMETER	
EASTING	3847865.054	DEPTH TO WATER (INITIAL) ▼	15 ft
VERTICAL DATUM (NGVD 29 (US Feet)) ELEVATION	104.49 ft	DEPTH TO WATER (FINAL) ▽	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA: SAMPLE TYPE	RECOVERY		Observations / Remarks
		SILTY CLAY (CL) medium stiff, some silt, trace fine gravel, trace fine sand; moist, mottled, brown and gray		CL					
5	100								
10	95								
		SAND (GW-SW) well graded, fine grained SAND; loose, some gravel, little silt, trace clay; moist, dark brownish gray to black, [Wood fragments]	11	GW-SW					
		SILTY CLAY (CL) soft, little fine sand, trace gravel, moist, dark gray to black, [Glass, wood, plastic debris]	13	CL					
	90		14	CL					
15		SILTY CLAY (CL) soft, some silt, trace fine sand, moist, dark gray to dark brownish gray ▼	14.9						
		SAND (SP) poorly graded, fine grained SAND; loose, wet, light grayish brown, [silt/clay stringers throughout.]		SP					
		SILTY CLAY (CL) soft, some silt, wet, dark gray to dark brownish gray, [Grey fine sand seams throughout]	17.25	CL					
	85	SAND (SP) poorly graded, fine grained SAND; loose, little clay, laminated, gray to dark gray	19	SP					
20		SILTY CLAY (CL) soft, some silt, wet, dark gray to dark brownish gray	20	CL					
	80		21						

REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

LAB ANALYSIS:

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # **MW-02**

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI
DRILLING FOREMAN	Sean Smith
DRILLING METHOD	Hollow-Stem Augers
DRILLING EQUIPMENT	Gus Peck
ERM REPRESENTATIVE	Brian Beach
OFFICE LOCATION	Holland, MI
DATE: START	01/18/2017
FINISH	01/18/2017

GEOGRAPHIC COORDINATES
(NAD 1983 StatePlane Michigan South (US Feet))
NORTHING 176247.026
EASTING 3847865.054
Elevation/Top of Casing Elev. 104.49 ft/ 107.75 ft

WELL CONSTRUCTION

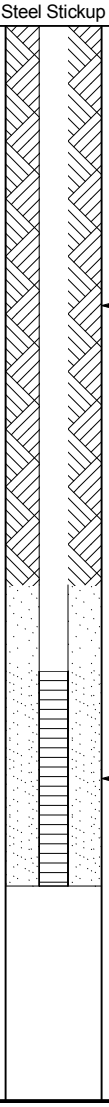
	Riser	Screen
Material:	*Schedule 40 PVC*	*Schedule 40 PVC, 0.010-slot*
Diameter (ID):	*2-inch*	*2-inch*
Coupling:	*Threaded*	*Threaded*

Well Permit #: *No permit required.*

WELL DEVELOPMENT
Method: *Overpumping*
Duration: *0.5 hours*
Gals. Purged: *30*

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG
0	105	SILTY CLAY (CL) medium stiff, some silt, trace fine gravel, trace fine sand; moist, mottled, brown and gray		CL	
5	100				
10	95				
		SAND (GW-SW) well graded, fine grained SAND; loose, some gravel, little silt, trace clay; moist, dark brownish gray to black, [Wood fragments]	11	GW-SW	
		SILTY CLAY (CL) soft, little fine sand, trace gravel, moist, dark gray to black, [Glass, wood, plastic debris]	13	CL	
			14	CL	
15	90	SILTY CLAY (CL) soft, some silt, trace fine sand, moist, dark gray to dark brownish gray	14.9	SP	
		SAND (SP) poorly graded, fine grained SAND; loose, wet, light grayish brown, [silt/clay stringers throughout.]	17.25	CL	
		SILTY CLAY (CL) soft, some silt, wet, dark gray to dark brownish gray, [Grey fine sand seams throughout]	19	SP	
20	85	SAND (SP) poorly graded, fine grained SAND; loose, little clay, laminated, gray to dark gray	20	CL	
		SILTY CLAY (CL) soft, some silt, wet, dark gray to dark brownish gray	21		
	80				

WELL CONSTRUCTION
Casing Type:
6-inch Diameter
Steel Stickup



REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

WELL INSTALLATION NOTES:

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # MW-03

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017
HORIZONTAL DATUM (NAD 1983 StatePlane Michigan South (US Feet))		BOREHOLE DEPTH	17 ft
NORTHING	176214.1	BOREHOLE DIAMETER	
EASTING	3847846.674	DEPTH TO WATER (INITIAL) ▼	13 ft
VERTICAL DATUM (NGVD 29 (US Feet)) ELEVATION	102.17 ft	DEPTH TO WATER (FINAL) ▽	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA: SAMPLE TYPE	RECOVERY		Observations / Remarks
2	100	SAND (SW) well graded, fine grained SAND; loose, some silt, little gravel, moist, grayish brown, [Brick and concrete fragments.]		SW					
4									
6			6						
	95	SAND (SW) well graded, fine grained SAND; loose, little silt, little gravel, moist, grayish brown to dark brown		SW					
8			8						
		SAND (SW) well graded, fine grained SAND; loose, some silt, some gravel, trace clay; moist, grayish brown to dark brown, [Wood fragments.]		SW					
10									
12	90	CLAYEY SILT (ML) soft, trace fine sand, moist, dark grayish brown to dark brown	12	ML					
		SAND (SP) poorly graded, fine grained SAND; loose, moist to wet, gray, [Wet @ 13']	12.75	SP					
14			14.5						
		SANDY SILT (OL) soft, little clay, trace fine sand, moist to wet, dark gray to dark brownish gray, [Silt loam.]		OL					
16									
	85		17						
18									

REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

LAB ANALYSIS:

3352 128th Avenue
Holland, MI 49424
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PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # **MW-03**

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017

GEOGRAPHIC COORDINATES
(NAD 1983 StatePlane Michigan South (US Feet))

NORTHING	176214.1
EASTING	3847846.674
Elevation/Top of Casing Elev.	102.17 ft/ 105.2 ft

WELL CONSTRUCTION

	Riser	Screen
Material:	*Schedule 40 PVC*	*Schedule 40 PVC, 0.010-slot*
Diameter (ID):	*2-inch*	*2-inch*
Coupling:	*Threaded*	*Threaded*

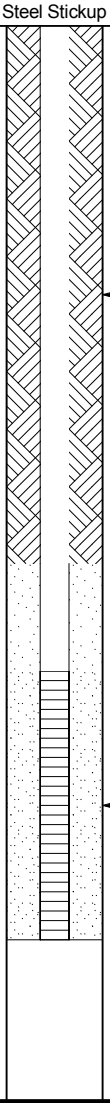
WELL DEVELOPMENT
Method: *Overpumping*
Duration: *0.5 hours*
Gals. Purged: *30*

Well Permit #: *No permit required.*

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG
2	100	SAND (SW) well graded, fine grained SAND; loose, some silt, little gravel, moist, grayish brown, [Brick and concrete fragments.]		SW	
4					
6	95	SAND (SW) well graded, fine grained SAND; loose, little silt, little gravel, moist, grayish brown to dark brown	6	SW	
8		SAND (SW) well graded, fine grained SAND; loose, some silt, some gravel, trace clay; moist, grayish brown to dark brown, [Wood fragments.]	8	SW	
10					
12	90	CLAYEY SILT (ML) soft, trace fine sand, moist, dark grayish brown to dark brown	12	ML	
			12.75		
14		SAND (SP) poorly graded, fine grained SAND; loose, moist to wet, gray, [Wet @ 13']		SP	
16		SANDY SILT (OL) soft, little clay, trace fine sand, moist to wet, dark gray to dark brownish gray, [Silt loam.]	14.5	OL	
18	85		17		

WELL CONSTRUCTION

Casing Type:
6-inch Diameter
Steel Stickup



REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

WELL INSTALLATION NOTES:

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # MW-04

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017

HORIZONTAL DATUM (NAD 1983 StatePlane Michigan South (US Feet))		BOREHOLE DEPTH	17 ft
NORTHING	176182.574	BOREHOLE DIAMETER	
EASTING	3847848.69	DEPTH TO WATER (INITIAL) ▼	8.5 ft
VERTICAL DATUM (NGVD 29 (US Feet)) ELEVATION	100.60 ft	DEPTH TO WATER (FINAL) ▽	

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS	GRAPHIC LOG	SAMPLING DATA: SAMPLE TYPE	RECOVERY		Observations / Remarks
	100	GRAVELLY SAND (SW) well graded, fine grained SAND; loose, some gravel, moist, brown, [Concrete fragments]		SW					
2									
4									
	95	GRAVELLY SAND (SP) poorly graded, fine grained SAND; loose, some gravel, moist, dark brown to black	5.5	SP					
6			6.5	SW					
		SAND (SW) well graded, fine grained SAND; loose, moist, brown	7	SC					
		CLAYEY SAND (SC) soft, some silt, little gravel, moist, brown to dark gray, [Roots]	7.5	SW					
8		SAND (SW) well graded, fine grained SAND; loose, some silt, some gravel, moist, dark brown, [Concrete and wood fragments.]	8.5 ▼	SW					
10		SAND (SW) well graded, medium to coarse grained SAND; loose, wet, dark grayish brown to black, [Bottom ash and concrete fragments.]	10	SP					
	90	SAND (SP) poorly graded, fine grained SAND; loose, wet, dark grayish brown	10.5	OL					
		SANDY SILT (OL) soft, moist, dark grayish brown, [Silt loam.]	11.5	SP					
12		SAND (SP) poorly graded, fine grained SAND; loose, wet, gray	12.5	OL					
14		SANDY SILT (OL) soft, trace fine sand, trace clay, moist, dark grayish brown, [Clay stringer (14 - 14.25). Grey fine sand seam (14.25 - 14.5).]	14.5	MLS					
	85	SANDY SILT (MLS) soft, little clay, moist, dark grayish brown, [Wood fragments. Grey fine sand seam (15.75 - 16); (16.25 - 16.5); (16.75 - 17).]							
16			17						
18									

REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

LAB ANALYSIS:

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

PROJECT:
Grand Haven Board of Light and Power
CCR Well Installation
1231 N 3rd Street
Grand Haven, Michigan

BORING # **MW-04**

ERM PROJECT # 0387368

SHEET 1 OF 1

DRILLING CONTRACTOR	EDAC Holland, MI	ERM REPRESENTATIVE	Brian Beach
DRILLING FOREMAN	Sean Smith	OFFICE LOCATION	Holland, MI
DRILLING METHOD	Hollow-Stem Augers	DATE: START	01/18/2017
DRILLING EQUIPMENT	Gus Peck	FINISH	01/18/2017

GEOGRAPHIC COORDINATES
(NAD 1983 StatePlane Michigan South (US Feet))

NORTHING	176182.574
EASTING	3847848.69
Elevation/Top of Casing Elev.	100.60 ft/ 103.59 ft

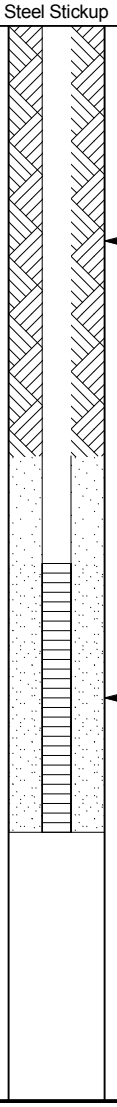
WELL CONSTRUCTION

	Riser	Screen
Material:	*Schedule 40 PVC*	*Schedule 40 PVC, 0.010-slot*
Diameter (ID):	*2-inch*	*2-inch*
Coupling:	*Threaded*	*Threaded*

Well Permit #: *No permit required.*

WELL DEVELOPMENT
Method: *Overpumping*
Duration: *0.5 hours*
Gals. Purged: *30*

DEPTH	ELEVATION	STRATA DESCRIPTION	DEPTH	USCS
	100	GRAVELLY SAND (SW) well graded, fine grained SAND; loose, some gravel, moist, brown, [Concrete fragments]		SW
2				
4				
	95	GRAVELLY SAND (SP) poorly graded, fine grained SAND; loose, some gravel, moist, dark brown to black	5.5	SP
6		SAND (SW) well graded, fine grained SAND; loose, moist, brown	6.5	SW
			7	SC
		CLAYEY SAND (SC) soft, some silt, little gravel, moist, brown to dark gray, [Roots]	7.5	SW
8			8.5	SW
		SAND (SW) well graded, fine grained SAND; loose, some silt, some gravel, moist, dark brown, [Concrete and wood fragments.]		
10			10	SP
	90	SAND (SW) well graded, medium to coarse grained SAND; loose, wet, dark grayish brown to black, [Bottom ash and concrete fragments.]	10.5	OL
12			11.5	SP
		SAND (SP) poorly graded, fine grained SAND; loose, wet, dark grayish brown	12.5	OL
14		SANDY SILT (OL) soft, moist, dark grayish brown, [Silt loam.]		
		SAND (SP) poorly graded, fine grained SAND; loose, wet, gray	14.5	MLS
	85	SANDY SILT (OL) soft, trace fine sand, trace clay, moist, dark grayish brown, [Clay stringer (14 - 14.25). Grey fine sand seam (14.25 - 14.5).]		
16				
		SANDY SILT (MLS) soft, little clay, moist, dark grayish brown, [Wood fragments. Grey fine sand seam (15.75 - 16); (16.25 - 16.5); (16.75 - 17).]	17	
18				



REMARKS:
Elevation data established from referenced benchmark set at 100.00'.

WELL INSTALLATION NOTES:

RECORD OF WELL LOG MW-05

SHEET 1 of 1

PROJECT: GHBLP 2018 Wells
PROJECT NUMBER: 1775416B
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

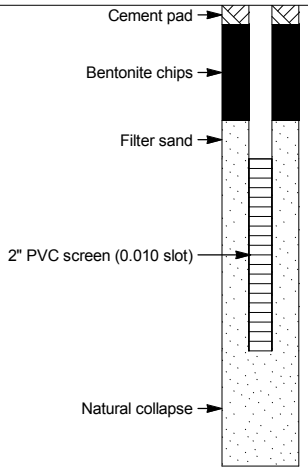
DRILLING METHOD: Hollow-Stem Auger
DRILLING DATE: 5/22/18
DRILL RIG: GP-1100 ATV

DATUM: Ground Surface
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION:
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	REC / ATT
0	Hand auger	VEGETATION:							
		0.0 - 8.5 ASH, fine-grained, many small brick fragments, black; wet at 4 ft. More coarse at bottom, some glass and wood fragments	ASH				AG		24.0
5	Hollow-stem auger					1	SS	16-13-9-9	18.0 / 24.0
		8.5 - 10.0 (SC-CL) clayey SAND, fine-medium sand; dark grey, moist, semi-cohesive	SC		8.5	2	SS	1-1-1-2	24.0 / 24.0
10		10.0 - 12.0 Sandy PEAT, some fibrous material, shell fragments; organic odor, dark grey	OL		10.0	3	SS	H-1-1-1	24.0 / 24.0
		Boring completed at 12.0 ft.							
15									
20									
25									
30									
35									
40									

NOTES
WATER LEVELS
WELL INSTALLATION GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: EDAC
DRILLER: SS

LOGGED: AJS
CHECKED:
DATE: 07/06/2018

ANC_WELLLOG GHBLP 2018.GPJ GLDR_ANC.GDT 7/10/18

RECORD OF WELL LOG MW-06

SHEET 1 of 1

PROJECT: GHBLP 2018 Wells
PROJECT NUMBER: 1775416B
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

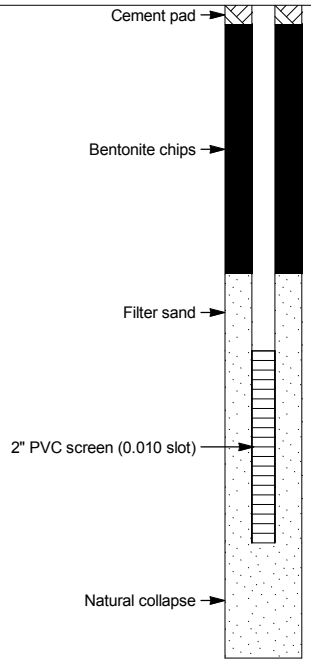
DRILLING METHOD: Hollow-Stem Auger
DRILLING DATE: 5/22/18
DRILL RIG: GP-1100 ATV

DATUM: Ground Surface
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION:
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	REC / ATT
0	Hand auger	VEGETATION:							
		0.0 - 7.5 Clayey SAND, medium sand, some 1" clay nodules (brown with reddish mottling), trace small brick fragments; dark brown	SC				AG		24.0
5	Hollow-stem auger					1	SS	9-19-24-24	24.0 / 24.0
		7.5 - 9.0 Refuse, plastic mesh, brick fragments; wet	Refuse		7.5	2	SS	5-2-5-5	24.0 / 24.0
		9.0 - 10.0 SAND, some black organic fines, rounded; wet	SP		9.0				
10		10.0 - 15.0 Refuse, black, sandy (medium with some angular coarse sand), fiberglass in top and bottom of spoon; wet; steel fragment at 14.5 ft	Refuse		10.0	3	SS	2-2-8-8	24.0
						4	SS	6-8-3-3	6.0 / 24.0
15		15.0 - 17.0 PEAT, black, leaf intact, fibrous wood; wet	OL		15.0	5	SS	2-2-2-3	24.0 / 24.0
		Boring completed at 17.0 ft.							
20									
25									
30									
35									
40									

NOTES
WATER LEVELS
WELL INSTALLATION
GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: EDAC
DRILLER: SS

LOGGED: AJS
CHECKED: DR
DATE: 07/06/2018

ANC_WELLLOG GHBLP 2018.GPJ GLDR_ANC.GDT 7/10/18

RECORD OF WELL LOG MW-07

SHEET 1 of 1

PROJECT: GHBLP 2018 Wells
PROJECT NUMBER: 1775416B
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

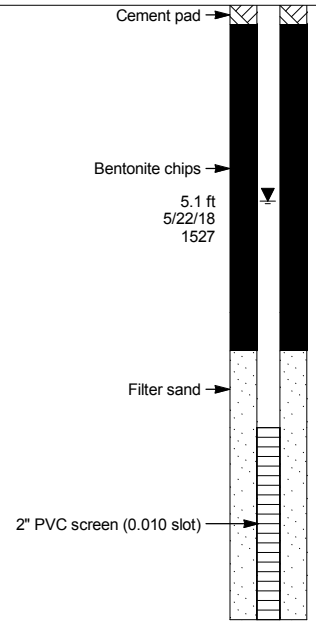
DRILLING METHOD: Hollow-Stem Auger
DRILLING DATE: 5/22/18
DRILL RIG: GP-1100 ATV

DATUM: Ground Surface
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION:
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	REC / ATT
0	Hand auger	VEGETATION:							
		0.0 - 7.5 Sandy CLAY, some gravel; brown, stiff, w<PL	CL				AG		24.0
5						1	SS	4-5-7-9	12.0 / 24.0
	Hollow-stem auger	7.5 - 11.5 Sandy PEAT, some shell fragments; black, moist, cohesiv, firm, cannot roll thread	OL		7.5	2	SS	0-1-3-5	24.0 / 24.0
10						3	SS	1-3-5-8	24.0 / 24.0
		11.5 - 15.0 Silty SAND, some shell fragments, medium sand; black-brown; wet	SM		11.5	4	SS	6-9-11-16	24.0 / 24.0
15		Boring completed at 16.0 ft.			15.0				
20									
25									
30									
35									
40									

NOTES
WATER LEVELS
WELL INSTALLATION
GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: EDAC
DRILLER: SS

LOGGED: AJS
CHECKED: DR
DATE: 07/06/2018

ANC_WELLLOG GHBLP 2018.GPJ GLDR_ANC.GDT 7/10/18

RECORD OF WELL LOG MW-08

SHEET 1 of 1

PROJECT: GHBLP 2018 Wells
PROJECT NUMBER: 1775416B
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

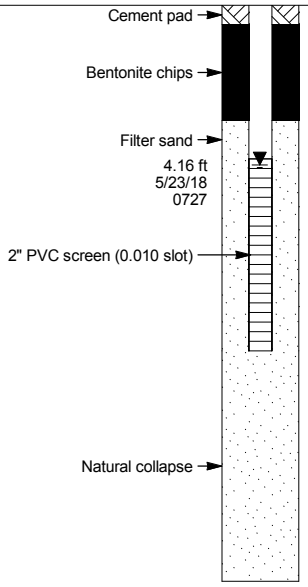
DRILLING METHOD: Hollow-Stem Auger
DRILLING DATE: 5/22/18
DRILL RIG: GP-1100 ATV

DATUM: Ground Surface
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION:
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	REC / ATT
0	Hand auger	VEGETATION:							
		0.0 - 3.5 Medium SAND, fill; wet, light brown	SP				AG		24/0
5		3.5 - 8.5 Refuse, plastic bags	Refuse		3.5	1	SS	7-2-7-4	0.0/24.0
	Hollow-stem auger								
10		8.5 - 15.0 Clayey SAND, medium sand, some shell fragments; brown, some pockets of cohesion; wet	SC		8.5	2	SS	2-2-2-5	12.0/24.0
						3	SS	0-1-3-5	3.0/24.0
						4	SS	2-1-2-5	6.0/24.0
15		Boring completed at 15.0 ft.							
20									
25									
30									
35									
40									

NOTES
WATER LEVELS
WELL INSTALLATION
GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: EDAC
DRILLER: SS

LOGGED: AJS
CHECKED: DR
DATE: 07/06/2018

ANC_WELLLOG GHBLP 2018.GPJ GLDR_ANC.GDT 7/10/18

RECORD OF WELL LOG MW-09

SHEET 1 of 1

PROJECT: GHBLP Monitoring Wells
PROJECT NUMBER: 18113500
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

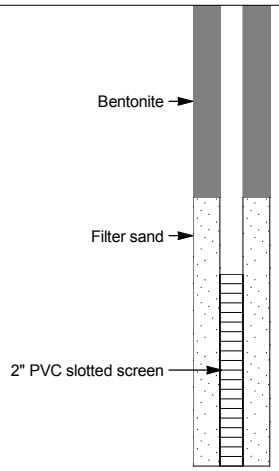
DRILLING METHOD: Direct-Push
DRILLING DATE: 8/12/2019
DRILL RIG: Geoprobe 7288DT

DATUM: Local
AZIMUTH: n/a
COORDS: N: 578,241.35 E: 12,624,185.62

GS ELEVATION: 586.80
TOC ELEVATION: 589.65
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (lb hammer 30 inch drop)	REC / ATT
0	Hand Auger	VEGETATION:							
		0.0 - 0.3 Brown topsoil w/ organics, dry	Topsoil		0.3				
		0.3 - 3.8 Brown fine sand, moist	SP				AG		3.0 / 3.0
	DPT (macro core)				583.0		MC		1.6 / 2.0
5		3.8 - 7.2 Brown fine to coarse sand some gravel, wet at 5'	SW		3.8 579.6				
		7.2 - 8.6 Dark brown sandy silt, trace gravel, wet	ML		7.2 578.2		MC		4.5 / 5.0
		8.6 - 10.7 Dark brown silt, some sand, wet	ML		8.6 576.1				
10		10.7 - 11.7 Fine gray sand, wet	SP		10.7 575.1		MC		2.0 / 2.0
		11.7 - 12.0 Dark brown silt, some sand, wet	ML						
		Boring completed at 12.0 ft.							
15									
20									
25									
30									
35									
40									

NOTES
WATER LEVELS
WELL INSTALLATION
GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: GeoServe
DRILLER: GeoServe

LOGGED: ACN
CHECKED: CEP
DATE: 10/24/2019

ANC_WELLLOG GHBLP 2019.GPJ GLDR_ANC.GDT 10/29/19

RECORD OF WELL LOG MW-10

SHEET 1 of 1

PROJECT: GHBLP Monitoring Wells
PROJECT NUMBER: 18113500
LOCATION: Grand Haven, Michigan
CLIENT: Grand Haven Board of Light and Power

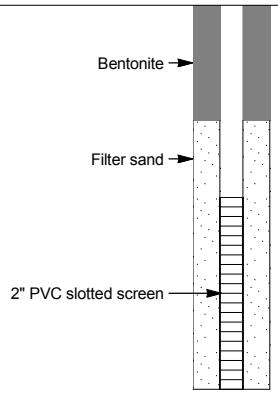
DRILLING METHOD: Direct-Push
DRILLING DATE: 8/12/2019
DRILL RIG: Geoprobe 7288DT

DATUM: Local
AZIMUTH: n/a
COORDS: N: 578,367.40 E: 12,624,470.20

GS ELEVATION: 583.71
TOC ELEVATION: 586.73
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (lb hammer 30 inch drop)	REC / ATT
0	Hand Auger	VEGETATION: 0.0 - 0.3 Brown topsoil w/ organics, dry	Topsoil		0.3				
		0.3 - 4.7 Brown fine sand, trace gravel, wet at 2.8'	SP				AG		3.0 / 3.0
							MC		0.5 / 2.0
5	DPT (macro core)	4.7 - 5.1 Brown sandy silt, trace gravel, wet	ML		579.0 5.1				
		5.1 - 10.0 Brown fine to coarse sand w/ gravel, wet	SW				MC		1.0 / 5.0
10		Boring completed at 10.0 ft.			573.7				

NOTES
WATER LEVELS
WELL INSTALLATION GRAPHIC



GOLDER

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: GeoServe
DRILLER: GeoServe

LOGGED: ACN
CHECKED: CEP
DATE: 10/24/2019

ANC_WELLLOG GHBLP 2019.GPJ GLDR_ANC.GDT 10/29/19

RECORD OF BOREHOLE: PZ-11

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

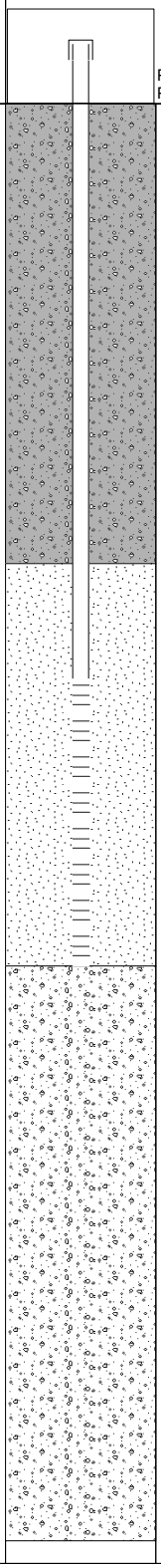
DATE: August 19, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 592.5 ft (Ground)
COORDINATES: N: 578236.9 ft E: 12624377.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES REC %	SAMPLES BLOWS	SAMPLES N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Brown silty CLAY, dry, firm, brittle.	CL		0.0		SS	100				
5				587.3							
	Brown fine SAND, dry, loose.			5.2							
	Dark gray SAND, dry to moist, loose.	SP		587.0 5.5		SS	92				
8				584.5							
	Brown and gray mottled CLAY, moist, soft to firm.	CL		8.0							
10				582.4							
	Brown fine SAND, dry, loose, trace gravel.	SP		10.1		SS	80				
11				581.3							
	Brown and gray sandy mottled CLAY, moist, soft to firm.	CL		11.2							
12				580.3							
	Gray and black SAND, moist, loose, trace silt, trace gravel, glass fragments, wood present.	SP		12.2							
15											
16				575.7							
	Black peaty SILT, soft, moist, wood present, plastic present, glass present.	OL		16.8		SS	48				
18				573.5							
	Black and gray fine SAND, wet, loose.	SP		19.0							
20				572.5							
	Black peaty SILT, moist, soft, wood and glass present, shell fragments. Gray sand seams present from 25' to 30' BGS.	OL		20.0		SS	64				
25											
	Continued on Next Page										

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.81 ft
Pipe Elev: 595.3 ft

0.0 - 8.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

8.0 - 15.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 19, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-11

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 19, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 592.5 ft (Ground)
COORDINATES: N: 578236.9 ft E: 12624377.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–40	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Black peaty SILT, moist, soft, wood and glass present, shell fragments. Gray sand seams present from 25' to 30' BGS.	OL		561.5		SS	100					Pipe Stickup: 2.81 ft Pipe Elev: 595.3 ft 15.0 - 40.0 ft bgs: Material Collapse
			Gray fine SAND, wet, loose, shell fragments.	SP		31.0 558.7		SS	60					
			Black peaty SILT, moist, soft, wood present.	OL		33.8 558.1								
			Gray fine SAND, wet, loose, medium to coarse grained from 36' to E.O.B.	SP		34.4		SS	100					
40–50			End of hole at 40.0 ft. Target Depth Reached Refer to diagram for well construction details.			552.5								

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 19, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-12

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 584.9 ft (Ground)
COORDINATES: N: 577987.6 ft E: 12624312.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown sandy CLAY, dry, firm.	CL	0.0 / 583.9					
1	Brown SAND, wet, loose.	SP	1.0 / 577.9		SS	100		
7	Brown clayey PEAT, moist to wet, soft, trace sand.		7.0 / 570.7		SS	66		
13	Gray fine SAND, wet, loose.	SP	14.2 / 569.7		SS	64		
15	Dark gray clayey PEAT, moist, soft, some gray sand seams present.		15.2 / 565.9		SS	64		
19	Gray fine SAND, wet, loose, trace medium grained sand.	SP	19.0		SS	66		
25	Continued on Next Page							

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 3.09 ft
Pipe Elev: 588.0 ft

- 0.0 - 1.0 ft bgs: Bentonite Chips
- 2" Schedule 40 PVC
- 1.0 - 8.0 ft bgs: Filter Sand
- 2" Schedule 40 slotted PVC
- 8.0 - 40.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-12

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 584.9 ft (Ground)
COORDINATES: N: 577987.6 ft E: 12624312.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
26	Gray fine SAND, wet, loose, trace medium grained sand.	SP	553.9		SS	72		
31	Gray silty fine SAND, moist, compact.	SM	31.0 / 547.9		SS	74		
37	Gray SILT, moist, hard.	ML	37.0 / 545.9		SS	100		
39	Gray CLAY, moist, firm to soft.	CH	39.0 / 544.9					
40	End of hole at 40.0 ft. Target Depth Reached Refer to diagram for well construction details.							

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS
Pipe Stickup: 3.09 ft
Pipe Elev: 588.0 ft

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-13

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI
DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS
ELEVATION: 583.2 ft (Ground)
COORDINATES: N: 577623.9 ft E: 12624190.9 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

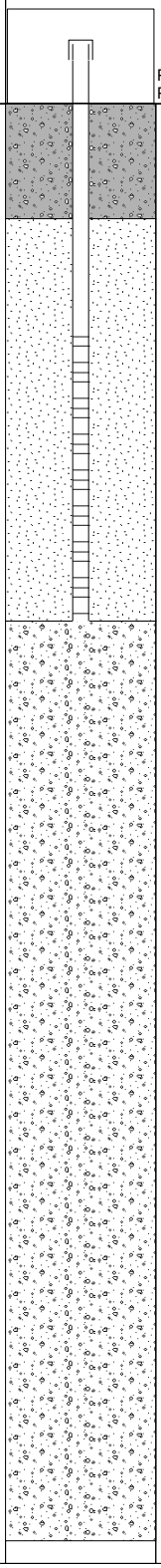
DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
	Brown fine SAND, dry, loose.		0.0 / 582.7					
1	Gray fine SAND, dry to moist, loose, trace silt.	SP	0.5		SS	100		
4	Gray fine to medium SAND, wet, loose.		4.0 / 579.2					
5	Dark gray silty SAND, wet, loose.	SM	5.0 / 578.2					
6	Gray fine SAND, wet, loose.	SP	5.7 / 577.5		SS	68		
10	Dark gray GRAVEL & SAND, wet, loose.	GP	10.3 / 572.9					
11	Gray silty SAND, wet, cohesive, some organics present.	SM	11.5 / 571.7		SS	40		
17	Gray fine SAND, wet, loose, some medium grained sand present below 20' BGS.	SP	17.0 / 566.2		SS	66		
21					SS	50		
25	Continued on Next Page							

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.85 ft
Pipe Elev: 586.1 ft

0.0 - 2.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

2.0 - 9.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

9.0 - 34.0 ft bgs: Matieral Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-13

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.2 ft (Ground)
COORDINATES: N: 577623.9 ft E: 12624190.9 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray fine SAND, wet, loose, some medium grained sand present below 20' BGS.	SP		557.8								Pipe Stickup: 2.85 ft Pipe Elev: 586.1 ft
			Gray silty fine SAND, wet, cohesive.			25.4								
27								SS	80					
28				SM										
29														
30														
31								SS	100					
32						551.2								
			Gray fine SAND & SILT, wet, hard.	SP-SM		32.0								
33														
34						549.2								
			End of hole at 34.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-14

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 16, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.5 ft (Ground)
COORDINATES: N: 577191.9 ft E: 12624160.0 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

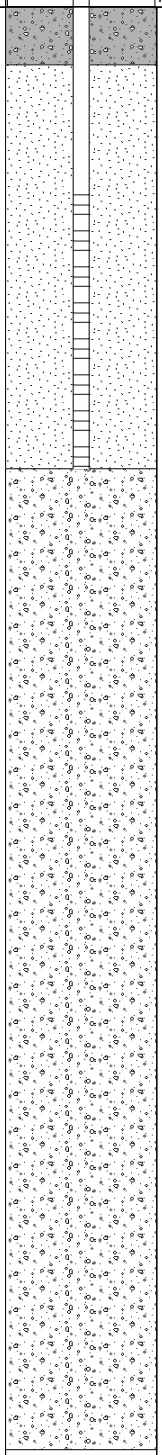
DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown SAND, dry to wet, loose, some medium grained sand.	SP	0.0		SS	100		
6	Brown silty SAND, wet, loose.	SM	577.5 6.0					
6	Brown fine SAND, wet, loose.	SP	577.2 6.3		SS	80		
10	Black fine SAND, wet, loose, some organics present.	SP	573.2 10.3					
11	Black CLAY, moist, soft, some sand, organics present, organic scent.	CL	572.7 10.8		SS	54		
15	Brown silty SAND, wet, loose.	SM	568.5 15.0					
15	Dark gray PEAT, wet, soft, some clay present, organic scent.		568.3 15.2		SS	50		
19	Gray silty SAND, wet, loose, organics present.	SM	563.8 19.7					
21	Gray medium SAND, wet, loose.	SP	562.5 21.0		SS	70		
25	Continued on Next Page							

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.93 ft
Pipe Elev: 586.4 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 35.0 ft bgs: Matieral Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 16, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-14

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 16, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.5 ft (Ground)
COORDINATES: N: 577191.9 ft E: 12624160.0 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
25	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray medium SAND, wet, loose.	SP		558.1								Pipe Stickup: 2.93 ft Pipe Elev: 586.4 ft
			Gray sandy SILT, wet, non-cohesive.			25.4		SS	100					
30				ML				SS	88					
						550.0								
			Gray SILT, wet, cohesive, trace sand.			33.5								
35						548.5								
			End of hole at 35.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 16, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-15

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 25, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 589.3 ft (Ground)
COORDINATES: N: 577062.5 ft E: 12624730.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown sandy TOPSOIL, dry, loose.		0.0					
			588.8					
0	Light brown SAND, dry to moist, loose.		0.5					
1		SP			SS	100		
2								
3								
4								
5								
6					SS	50		
7								
8			580.8					
8	COAL.		8.5					
9			579.8					
9	Black gravelly SAND, moist, loose.		9.5					
10		SP						
11								
12			577.0		SS	76		
12	Black mucky PEAT, moist, soft, trace silt, some trash present at 14.8' BGS.		12.3					
13								
14			574.4					
15	Black fine SAND, wet, loose, some glass present.		14.9					
15	Dark gray mucky SAND, moist to wet, soft.		574.2 15.1					
16		SP						
17					SS	46		
18								
19								
20								
21								
22			567.2					
22	Dark gray sandy PEAT, moist, soft, shell fragments present.		22.1		SS	66		
23								
24			565.1					
24	Pale black PEAT, moist, soft. Gray sand seams present @ 24.9', 25.7', and 28.0' BGS.		24.2					
25								

Continued on Next Page

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 3.05 ft
Pipe Elev: 592.4 ft

0.0 - 10.0 ft bgs: Surface Cuttings

2" Schedule 40 PVC

10.0 - 13.0 ft bgs: Bentonite Chips

13.0 - 20.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 25, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-15

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 25, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 589.3 ft (Ground)
COORDINATES: N: 577062.5 ft E: 12624730.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–30	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Pale black PEAT, moist, soft. Gray sand seams present @ 24.9', 25.7', and 28.0' BGS.			559.3		SS	74					Pipe Stickup: 3.05 ft Pipe Elev: 592.4 ft
30–32			Dark gray medium SAND, wet, loose, shell fragments present.			30.0 557.0		SS	100					20.0 - 40.0 ft bgs: Material Collapse
32–40			Gray fine SAND, moist, loose to compact.	SP		32.3 549.7		SS	100					
40			Gray silty SAND, moist, compact.	SM		39.6								
			End of hole at 40.0 ft. Target Depth Reached Refer to diagram for well construction details.			549.3								

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 25, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-16

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 25, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 582.2 ft (Ground)
COORDINATES: N: 577273.6 ft E: 12625194.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	Brown TOPSOIL, moist, loose.			0.0								Pipe Stickup: 2.69 ft Pipe Elev: 584.9 ft
	Dark gray fine SAND, wet, loose.	SP		581.7 0.5		SS	100					0.0 - 1.0 ft bgs: Bentonite Chips
1	Black GRAVEL & SAND fill, wet, loose.			581.2 1.0								2" Schedule 40 PVC
	Black peaty CLAY, moist, soft.	CH		580.7 1.5								
4				578.2								
	Gray fine SAND, wet, loose.	SP		4.0								1.0 - 8.0 ft bgs: Filter Sand
5				576.9								2" Schedule 40 slotted PVC
	WOOD ORGANICS, mucky fines mixed in.			5.3		SS	42					
10						SS	6					
15	Black mucky PEAT, moist, soft.			15.0		SS	58					
20				562.2								
	Black mucky fine SAND, some shell fragments present.	SP		20.0		SS	80					8.0 - 35.0 ft bgs: Material Collapse
22				559.7								
	Dark gray medium SAND, wet, loose.			22.5								
24												
25	Gray very fine SAND, moist, compact, trace silt.			557.4 24.8								

Continued on Next Page

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 25, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-16

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 25, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 582.2 ft (Ground)
COORDINATES: N: 577273.6 ft E: 12625194.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–35	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray very fine SAND, moist, compact, trace silt.	SP				SS	80					Pipe Stickup: 2.69 ft Pipe Elev: 584.9 ft
						550.5								
			Gray sandy SILT, moist, firm.	ML		31.7								
			Gray CLAY, moist, soft, sticky, high plasticity.	CH		550.2 32.0		SS	80					
						547.2								
35			End of hole at 35.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
36–50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 25, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-17

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI
DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS
ELEVATION: 584.0 ft (Ground)
COORDINATES: N: 577652.8 ft E: 12624744.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

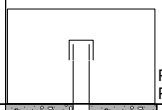
DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	REC %	BLOWS	N-VALUE
0	Brown SAND, dry, loose, some gravel.	SP	0.0		SS	100		
5	Black SAND, moist, loose, trace organics.		579.3 / 4.7					
	Brown gravelly SAND, dry, compact.		579.0 / 5.0					
6	Black gravelly SILT, wet, compact, trace organics present.	ML	578.5 / 5.5		SS	60		
8			575.5					
9	Black silty PEAT, moist, soft.		8.5					
10			574.0		SS	44		
10	Black sandy SILT, moist, soft, trace organics.	ML	10.0					
19			564.5		SS	50		
20	Gray fine SAND, wet, loose.	SP	19.5		SS	54		
25	Continued on Next Page							

Drill Rig: Geoprobe 7822DT
Drill Method: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.99 ft
Pipe Elev: 587.0 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 40.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-17

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 17, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 584.0 ft (Ground)
COORDINATES: N: 577652.8 ft E: 12624744.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
26	Gray fine SAND, wet, loose.	SP	557.5 / 26.5		SS	100		
27	Gray silty SAND, wet, loose to compact, trace silt seams.	SM						
28								
29								
30								
31			552.9 / 31.1					
	Gray sandy SILT, wet, hard.	ML	552.5 / 31.5		SS	70		
32	Gray silty SAND, wet, hard.	SM						
33								
34			549.4 / 34.6					
35	Gray sandy SILT, wet, hard.	ML			SS	84		
36								
37								
38								
39			545.0 / 39.0					
	Gray CLAY, moist, soft, high plasticity.	CH	544.0					
40	End of hole at 40.0 ft.							
41	Target Depth Reached Refer to diagram for well construction details.							
42								
43								
44								
45								
46								
47								
48								
49								
50								

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS
Pipe Stickup: 2.99 ft
Pipe Elev: 587.0 ft

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 17, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-18

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI
DATE: August 18, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS
ELEVATION: 584.1 ft (Ground)
COORDINATES: N: 577919.1 ft E: 12624742.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown TOPSOIL, dry, loose.		0.0					
			583.6					
0	Brown GRAVEL & SAND, moist to wet, loose.		0.5					
1		GW			SS	100		
2								
3								
4								
5								
6			577.6					
6	Brown peaty SILT, moist, soft, trace sand, cohesive.		6.5					
7		ML			SS	60		
8								
9			574.3					
10	Gray fine to medium SAND, wet, loose.	SP	9.8					
10	Brown peaty sandy SILT, moist, soft, cohesive.		574.0					
10			10.1					
11								
12					SS	50		
13								
14		ML						
15								
16								
17					SS	54		
18			565.6					
18	Gray fine SAND, wet, loose, some organics and shell fragments at 23' BGS.		18.5					
19								
20								
21		SP			SS	42		
22								
23								
24			559.9					
24	Gray silty SAND, wet, loose, some organics and shell fragments present. Compact starting at 28' BGS.	SM	24.2					
25								

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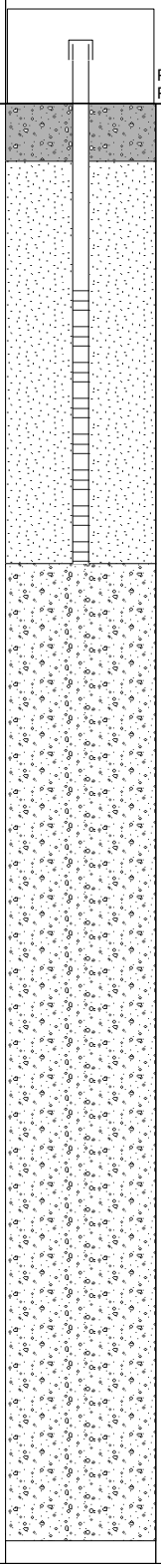
ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 3.10 ft
Pipe Elev: 587.2 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 34.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 18, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-18

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI
DATE: August 18, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS
ELEVATION: 584.1 ft (Ground)
COORDINATES: N: 577919.1 ft E: 12624742.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–33	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray silty SAND, wet, loose, some organics and shell fragments present. Compact starting at 28' BGS.	SM		550.9		SS	100					Pipe Stickup: 3.10 ft Pipe Elev: 587.2 ft
32–33								SS	100					
33–34			Gray sandy SILT, moist, firm to hard, cohesive.	ML		33.2 550.1								
34–50			End of hole at 34.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 18, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-19

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

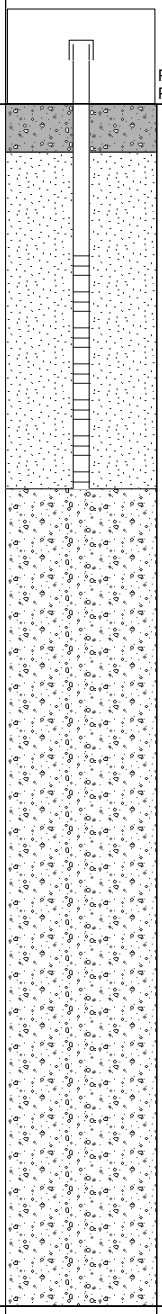
DATE: August 20, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.1 ft (Ground)
COORDINATES: N: 577938.0 ft E: 12624957.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Black clayey TOPSOIL, moist, soft, organics present.		0.0							
			580.6							
3	Black peaty SAND, wet, loose, trace gravel.	SP	2.5		SS	100				
			577.7							
6	Black coarse SAND, wet, loose.		5.4							
	Brown peaty SILT, moist, soft, some sand present, shell fragments present.	ML	577.4 5.7		SS	44				
			571.6							
12	Brown fine SAND, wet, loose, trace organics present until 15' BGS.	SP	11.5		SS	52				
			562.5		SS	92				
21	Gray silty fine SAND, wet, compact.	SM	20.6		SS	86				
			558.1							
25	End of hole at 25.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.									

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.80 ft
Pipe Elev: 585.9 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 25.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 20, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-20

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 18, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 582.4 ft (Ground)
COORDINATES: N: 577722.5 ft E: 12625131.4 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	TOPSOIL		582.4 / 0.0					
0	Brown peaty SAND, wet, soft, trash present (Glass, metal, coal).		581.9 / 0.5		SS	100		
5	Gray fine SAND, wet, loose.	SP	577.2 / 5.2		SS	42		
5	Brown peaty SILT, moist, soft, metal sheet present at 13' BGS.	ML	576.9 / 5.5		SS	58		
13	Gray fine SAND, wet, loose, shell fragments present.	SP	568.9 / 13.5		SS	60		
20	Brown silty SAND, wet, cohesive, shell fragments present, trace organics.	SM	562.4 / 20.0		SS	68		
23	Gray sandy SILT, moist, hard.	ML	559.2 / 23.2					
25	Continued on Next Page							

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS

Pipe Stickup: 3.32 ft
Pipe Elev: 585.7 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 34.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 18, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-20

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 18, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 582.4 ft (Ground)
COORDINATES: N: 577722.5 ft E: 12625131.4 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–30	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray sandy SILT, moist, hard.	ML		552.4		SS	66					Pipe Stickup: 3.32 ft Pipe Elev: 585.7 ft
30			Gray medium SAND, wet, loose, shell fragments present.	SP		30.0 551.2								
31–33			Gray silty SAND, wet, compact.	SM		31.2 548.9		SS	100					
34			Gray sandy SILT, moist, firm.	ML		33.5 548.4								
34–50			End of hole at 34.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 18, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-21

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 30, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 580.3 ft (Top of Casing)
COORDINATES: N: 577941.4 ft E: 12625280.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Marsh Master Geoprobe
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	Black sandy MUCK, wet, soft, trace organics.			0.0		SS	28					Pipe Elev: 583.3 ft
3				576.8								0.0 - 0.2 ft bgs: Bentonite Chips
3.5	Brown MUCK, wet, soft, some organics.			3.5								2" Schedule 40 PVC
5				575.3								0.2 - 9.0 ft bgs: Filter Sand
5.0	Gray fine SAND, wet, loose, trace silt starting at 13.5' BGS.			5.0		SS	50					2" Schedule 40 slotted PVC
10						SS	36					
15		SP		565.3								
15.0	Dark gray medium SAND, wet, loose.			15.0								
17				563.3		SS	56					
17.0	Brown fine SAND, wet, loose.			17.0								9.0 - 30.0 ft bgs: Material Collapse
20						SS	100					
25	Continued on Next Page											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 30, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-21

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 30, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 580.3 ft (Top of Casing)
COORDINATES: N: 577941.4 ft E: 12625280.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Marsh Master Geoprobe	Direct Push - 4-in Hole Dia.	Brown fine SAND, wet, loose.	SP				SS	100					Pipe Elev: 583.3 ft
27														
28														
29														
30						550.3								
31			End of hole at 30.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details. Ground elevation survey unable to be collected due to piezometer placement in standing water.											
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 30, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-22

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

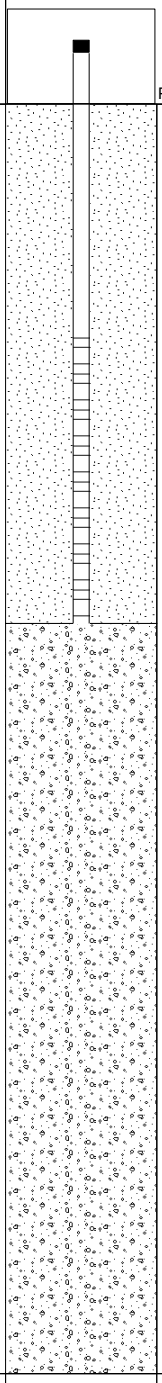
DATE: August 31, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 580.4 ft (Top of Casing)
COORDINATES: N: 578056.9 ft E: 12625388.0 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Marsh Master Geoprobe
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Black sandy MUCK, wet, soft, some organics present.			0.0 / 575.3		SS	18				
5	Gray fine SAND, wet, loose, shell fragments present. Trace silt starting at 14' BGS.	SP		5.1 / 565.9		SS	40				
10						SS	58				
15	Dark gray medium SAND, wet, compact.			14.5 / 564.2							
15	Gray silty fine SAND, wet, compact.	SM		16.2 / 558.4		SS	100				
20						SS	100				
22	End of hole at 22.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details. Ground elevation survey unable to be collected due to piezometer placement in standing water.										

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Elev: 583.4 ft

2" Schedule 40 PVC

0.0 - 9.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

9.0 - 22.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 31, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-23

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

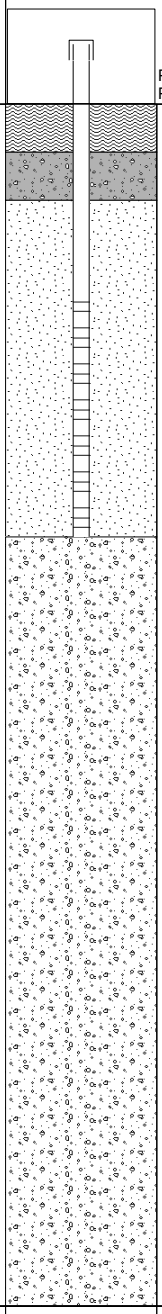
DATE: August 25, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 584.4 ft (Ground)
COORDINATES: N: 577627.7 ft E: 12625841.4 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Brown fine & medium SAND, dry to moist, loose.	SP	0.0		SS	100				
4	Gray fine SAND, wet, loose, some glass fragments present.		580.4 / 4.0							
6	Black PEAT, moist, loose, trace silt.		578.3 / 6.1		SS	60				
7	Brown to gray fine SAND, wet, loose.	SP	577.7 / 6.7							
12	Dark brown silty SAND, wet, loose, organics present.	SM	572.3 / 12.1		SS	50				
13	Brown fine to medium SAND, wet, loose.	SP	571.9 / 12.5							
17	Gray very fine SAND, moist, compact, trace silt.		567.9 / 16.5		SS	100				
18	Gray fine SAND, wet, loose, trace silt starting at 22' BGS.		566.6 / 17.8							
24	Gray silty SAND, wet, cohesive.	SM	560.4 / 24.0		SS	100				
25	End of hole at 25.0 ft. Refusal Completed as well - refer to diagram.		559.4							

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.82 ft
Pipe Elev: 587.2 ft

0.0 - 1.0 ft bgs: Cement

1.0 - 2.0 ft bgs: Bentonite Chips
2" Schedule 40 PVC

2.0 - 9.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

9.0 - 25.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 25, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-24

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 24, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.9 ft (Ground)
COORDINATES: N: 577884.7 ft E: 12625979.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown sandy TOPSOIL, dry, loose.		583.5 / 0.0					
1	Brown fine SAND, dry, loose, trace gravel.		0.4					
2			581.4		SS	100		
3	Dark brown SAND, moist, loose, leather, glass, metal shavings present		2.5					
4		SP						
5								
6					SS	70		
7			576.6					
8	Gray fine to medium SAND, wet, loose, shell fragments present.		7.3					
9								
10								
11					SS	66		
12			571.9					
13	Black PEAT, moist, soft, wood organics.		12.0					
14	Gray fine SAND, wet, loose. Silty sand seam from 19-19.2' BGS.		571.7 / 12.2					
15								
16					SS	100		
17		SP						
18								
19								
20								
21								
22			561.9					
23	Gray sandy SILT, moist, firm.	ML	22.0		SS	80		
24			559.8					
25	Gray fine SAND, wet, compact, trace silt.	SP	24.1					

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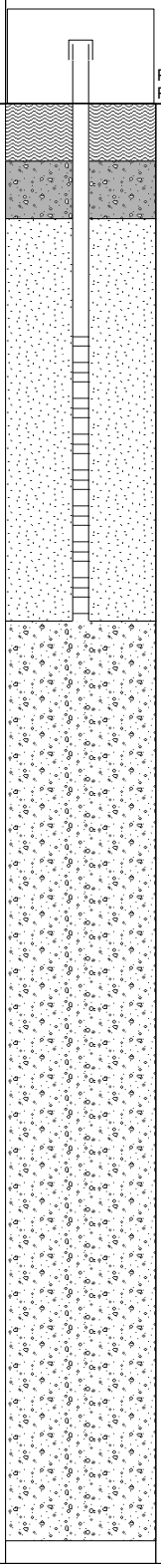
ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 3.41 ft
Pipe Elev: 587.3 ft

0.0 - 1.0 ft bgs: Cement

1.0 - 2.0 ft bgs: Bentonite Chip
2" Schedule 40 PVC

2.0 - 9.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

9.0 - 30.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 24, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-24

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 24, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.9 ft (Ground)
COORDINATES: N: 577884.7 ft E: 12625979.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray fine SAND, wet, compact, trace silt.	SP		558.6								Pipe Stickup: 3.41 ft Pipe Elev: 587.3 ft
			Gray CLAY, moist, firm, high plasticity.			25.3								
27				CH				SS	100					
28														
29														
30						553.9								
			End of hole at 30.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 24, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-25

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 24, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.5 ft (Ground)
COORDINATES: N: 577703.7 ft E: 12626240.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	Brown TOPSOIL, moist, loose.			0.0								Pipe Stickup: 2.91 ft Pipe Elev: 586.4 ft
	Gray SAND, wet, loose, trace gravel.	SP		583.1 0.4		SS	100					0.0 - 1.0 ft bgs: Bentonite Chips
1	Black peaty SAND, wet, loose.			582.5 1.0								2" Schedule 40 PVC
2												
3												
4				579.5								
	Black peaty SILT, wet, loose, hydrocarbon scent, some trash present.	ML		4.0		SS	48					1.0 - 8.0 ft bgs: Filter Sand
5												2" Schedule 40 slotted PVC
6												
7												
8				575.5								
	Dark gray SAND, wet, loose, shell fragments.	SP		8.0		SS	60					
9												
10												
11				572.5								
	Dark brown peaty SILT, moist, soft.	ML		11.0								
12				571.1								
	Brown fine SAND, wet, loose, shell fragments.	SP		12.4								
13												
14				568.7								
	Gray silty SAND, wet, loose to firm.	SM		14.8		SS	100					
15												
16												
17												
18												
19												8.0 - 30.0 ft bgs: Material Collapse
20												
21												
22				561.5								
	Gray sandy SILT, moist, compact.	ML		22.0		SS	100					
23				560.5								
	Gray CLAY, moist, firm to hard, trace sand, High plasticity.	CH		23.0								
24												
25												

Continued on Next Page

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 24, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-25

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 24, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.5 ft (Ground)
COORDINATES: N: 577703.7 ft E: 12626240.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray CLAY, moist, firm to hard, trace sand, High plasticity.	CH				SS	100					Pipe Stickup: 2.91 ft Pipe Elev: 586.4 ft
27														
28														
29														
30						553.5								
31			End of hole at 30.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 24, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-26

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.8 ft (Ground)
COORDINATES: N: 578114.4 ft E: 12626145.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
												Pipe Stickup: 2.46 ft Pipe Elev: 586.3 ft
0	Black sandy TOPSOIL			0.0								0.0 - 1.0 ft bgs: Bentonite Chips
				583.3								
1	Brown fine to very fine SAND, moist to wet, loose.			0.5								
2						SS	100					2" Schedule 40 PVC
3												
4												
5												1.0 - 8.0 ft bgs: Filter Sand
6												
7				576.3		SS	50					2" Schedule 40 slotted PVC
	Dark gray medium SAND, wet, loose, some organics present.			7.5								
8		SP										
9												
10												
11						SS	38					
12												
13												
14												
				568.8								
15	Brown fine sand, wet, loose, trace gravel.			15.0								
16												
17						SS	66					
18												
19												8.0 - 30.0 ft bgs: Material Collapse
20				563.3								
	Gray SILT, wet, compact.	ML		20.5								
21	Gray CLAY, moist, soft to firm, sticky, high plasticity.			563.0 20.8								
22						SS	80					
23		CH										
24												
25	Continued on Next Page											

Geoprobe 7822DT
Direct Push - 4-in Hole Dia.

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-26

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.8 ft (Ground)
COORDINATES: N: 578114.4 ft E: 12626145.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray CLAY, moist, soft to firm, sticky, high plasticity.	CH				SS	82					Pipe Stickup: 2.46 ft Pipe Elev: 586.3 ft
27														
28														
29														
30						553.8								
31			End of hole at 30.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-27

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 581.9 ft (Ground)
COORDINATES: N: 578303.9 ft E: 12626551.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES REC %	SAMPLES BLOWS	SAMPLES N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	Brown TOPSOIL, moist, soft.			581.4 / 0.0								Pipe Stickup: 3.21 ft Pipe Elev: 585.1 ft
1	Gray medium SAND, wet, loose.	SP		0.5		SS	100					0.0 - 1.0 ft bgs: Bentonite Chips
2												2" Schedule 40 slotted PVC
3				578.4								
4	Black SAND, wet, loose, organics present, hydrocarbon scent.			3.5								
5				576.4								1.0 - 8.0 ft bgs: Filter Sand
6	Black peaty SAND, moist, loose, trace silt.			5.5		SS	40					2" Schedule 40 slotted PVC
7												
8				573.9								
	Dark gray peaty SILT, moist, soft, trace sand.	ML		8.0 / 573.2								
9	Light black peaty SAND & SILT, moist, soft, trace shell fragments.	SP-SM		8.7		SS	54					
10												
11												
12				569.4								
13	Black peaty SILT, moist, soft, shell fragments present, trace gray sand, organics present.	ML		12.5		SS	66					
14												
15												
16												
17												
18												
19												
20				561.9								
	Gray fine SAND, wet, loose, trace shell fragments.	SP		20.0 / 561.1								
21	Black peaty SILT, moist, soft, trace gray sand.	ML		20.8		SS	60					
22												
23												
24												8.0 - 40.0 ft bgs: Material Collapse
25												

Continued on Next Page

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-27

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 581.9 ft (Ground)
COORDINATES: N: 578303.9 ft E: 12626551.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–40	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Black peaty SILT, moist, soft, trace gray sand.	ML				SS	72					Pipe Stickup: 3.21 ft Pipe Elev: 585.1 ft
								SS	76					
								SS	90					
40						541.9								
40			End of hole at 40.0 ft. Target Depth Reached Refer to diagram for well construction details.											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-28

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

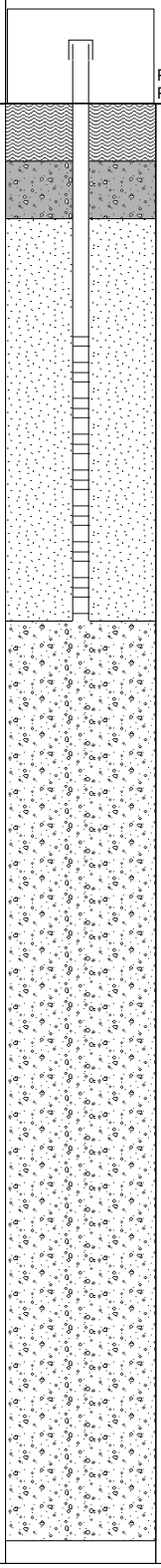
ELEVATION: 585.1 ft (Ground)
COORDINATES: N: 578314.9 ft E: 12625722.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Brown sandy TOPSOIL, dry, loose, some gravel.		0.0 / 581.1		SS	100		
4	Brown fine SAND, dry, loose, trace gravel.	SP	4.0 / 579.1		SS	54		
6	Black peaty SAND, dry, loose.		6.0 / 578.8					
7	Gray fine SAND, dry to moist, loose, organics present starting at 9.4' BGS.		6.3 / 575.4					
10	Gray GRAVEL, wet, loose.	GW	9.7 / 575.1					
10	Black gravelly SAND, wet, loose, glass and rubber trash present.	SP	10.0 / 574.6		SS	48		
11	Dark gray peaty silty SAND, moist, soft.	SM	10.5 / 570.1					
15	Black mucky SAND, wet, loose.		15.0 / 569.8		SS	52		
15	Dark gray medium SAND, wet, loose, trace shell fragments.	SP	15.3 / 566.5					
19	Gray fine SAND, wet, slightly cohesive.		18.6 / 563.7					
21	Gray silty SAND, moist, firm.	SM	21.4 / 562.5		SS	72		
22	Gray fine to very fine SAND, moist, compact. Wet from 25-28' BGS.	SP	22.6					
25	Continued on Next Page							

ADDITIONAL OBSERVATIONS:
GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.96 ft
Pipe Elev: 588.1 ft

0.0 - 1.0 ft bgs: Cement

1.0 - 2.0 ft bgs: Bentonite Chips
2" Schedule 40 PVC

2.0 - 9.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

9.0 - 29.5 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-28

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 23, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 585.1 ft (Ground)
COORDINATES: N: 578314.9 ft E: 12625722.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26–29	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray fine to very fine SAND, moist, compact. Wet from 25-28' BGS.	SP				SS	100					Pipe Stickup: 2.96 ft Pipe Elev: 588.1 ft
29						555.6								
30			End of hole at 29.5 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 23, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-29

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

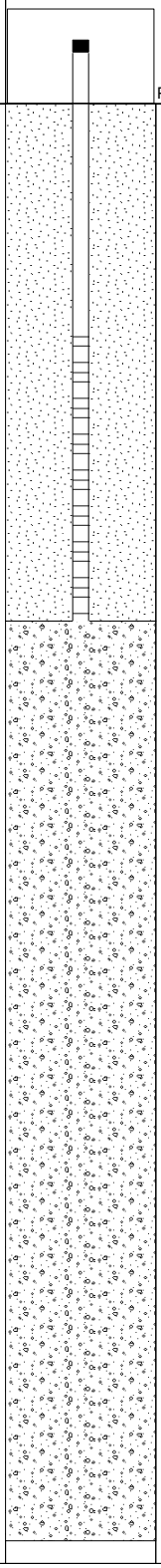
DATE: August 30, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 580.5 ft (Top of Casing)
COORDINATES: N: 578138.1 ft E: 12625241.6 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Marsh Master Geoprobe
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Black sandy MUCK, wet, loose / soft.			0.0 / 580.0							
0	Gray fine SAND, wet, loose.			0.5		SS	26				
4	Black peaty SAND, wet, loose, metal present, glass present, paper present. Hydrocarbon scent and sheen.			576.5 / 4.0							
5	Gray fine SAND, wet, loose, shell fragments present. Silty sand seam present from 11.5-12' BGS.			575.2 / 5.3		SS	16				
10		SP				SS	52				
15						SS	76				
20						SS	48				
25	Continued on Next Page										

CONSTRUCTION AND INSTALLATION DETAILS



HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 30, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-29

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 30, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 580.5 ft (Top of Casing)
COORDINATES: N: 578138.1 ft E: 12625241.6 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Marsh Master Geoprobe	Direct Push - 4-in Hole Dia.	Gray fine SAND, wet, loose, shell fragments present. Silty sand seam present from 11.5-12' BGS.	SP		555.2								Pipe Elev: 583.5 ft
			Brown SILT, wet, soft, trace sand.	ML		25.3								
27						553.5								
			Brown fine SAND, wet, loose, shell fragments present.			27.0		SS	100					
28														
29														
30				SP										
31								SS	100					
32														
33						547.0								
			Dark gray to gray silty SAND, wet, compact.	SM		33.5								
34														
35						545.5								
			End of hole at 35.0 ft.											
36			Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
37			Ground elevation survey unable to be collected due to piezometer placement in standing water.											
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 30, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-30

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 19, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.0 ft (Ground)
COORDINATES: N: 578196.2 ft E: 12624990.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

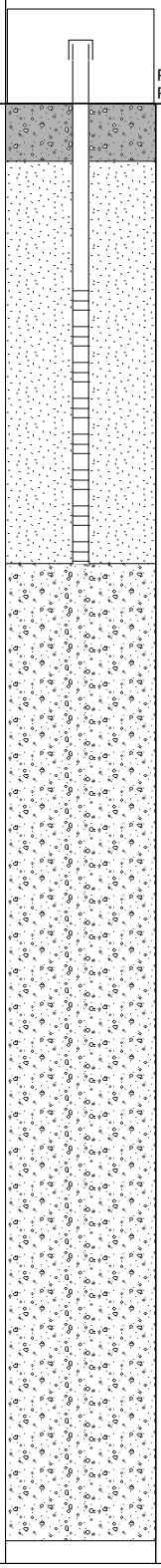
DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE
0	Black sandy TOPSOIL, moist, soft, organics present.		0.0					
			582.5					
1	Black peaty SAND, moist to wet, soft, wet @ 1.5' BGS.	SP	0.5		SS	100		
2			580.5					
3	Brown silty SAND, wet, loose, some trash present.	SM	2.5					
4								
5								
6			577.0					
	Gray sandy SILT, moist, firm.	ML	6.0					
			576.5					
7	Black peaty SAND, moist, soft, some trash present.	SP	6.5		SS	58		
8								
			574.3					
9	Gray silty SAND, moist to wet, loose.	SM	8.7					
10			572.6					
	Gray silty SAND, wet, loose, some organics present.		10.4					
11								
12					SS	54		
13			569.0					
14	Brown fine SAND, wet, loose.	SP	14.0					
15								
16								
17					SS	68		
18			565.0					
	Gray silty SAND, wet, loose to firm.		18.0					
19								
20								
21		SM						
22					SS	82		
23								
24								
25			558.0					
	Continued on Next Page		25.0					

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.78 ft
Pipe Elev: 585.8 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 34.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 19, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-30

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 19, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.0 ft (Ground)
COORDINATES: N: 578196.2 ft E: 12624990.2 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	Geoprobe 7822DT	Direct Push - 4-in Hole Dia.	Gray fine SAND, wet, loose.	SP		557.2								Pipe Stickup: 2.78 ft Pipe Elev: 585.8 ft
26			Gray sandy SILT, wet, firm.			25.8		SS	94					
27														
28														
29				ML										
30														
31								SS	100					
32						550.2								
33			Gray silty CLAY, moist, firm, high plasticity.	CL-ML		32.8								
34						549.0								
			End of hole at 34.0 ft. Refusal prior to 40-ft target depth. Refer to diagram for well construction details.											
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 19, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-31

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: September 01, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 582.6 ft (Ground)
COORDINATES: N: 578307.2 ft E: 12624752.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

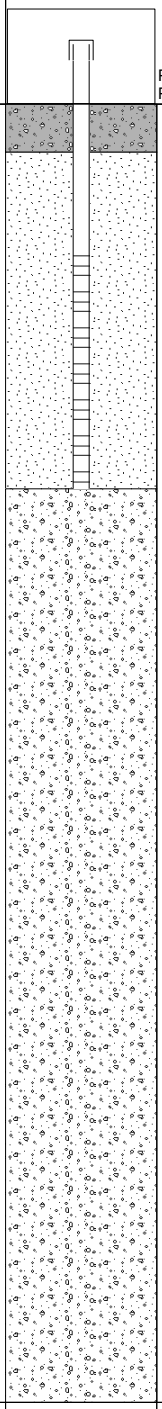
DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE
0	Black marshy TOPSOIL, moist, soft.		0.0					
0	Gray fine SAND, moist to wet, loose.	SP	582.2 / 0.4		SS	62		
2			579.9					
3	Black mucky SAND, wet, loose, trash present.		2.7					
4			578.4					
4	Black sandy PEAT, moist, loose, shell fragments present, wood and plastic trash present down to 5' BGS.		4.2		SS	46		
8								
8					SS	50		
12								
15	Gray fine SAND, wet, loose.	SP	15.0		SS	50		
20								
20					SS	92		
23			559.4					
23	Gray coarse SAND, wet, loose.		23.2					
24	Gray very fine SAND, wet, firm.		558.8 / 23.8					
25					SS	100		
27			555.6					
27	End of hole at 27.0 ft.							
28	Refusal prior to 40-ft target depth. Refer to diagram for well construction details.							

DRILL RIG: Marsh Master Geoprobe
DRILL METHOD: Direct Push - 4-in Hole Dia.

ADDITIONAL OBSERVATIONS:

GROUNDWATER OBSERVATIONS:

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 3.29 ft
Pipe Elev: 585.9 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 27.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Sep 01, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-32

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

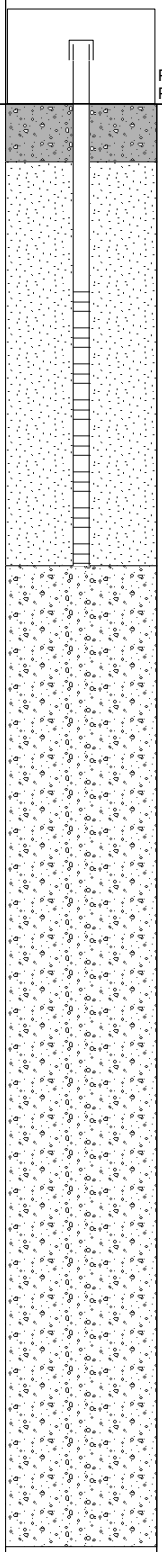
DATE: August 20, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.1 ft (Ground)
COORDINATES: N: 578348.3 ft E: 12624980.1 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DRILL RIG: Geoprobe 7822DT
DRILL METHOD: Direct Push - 4-in Hole Dia.

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Brown sandy TOPSOIL, moist, loose.			0.0 / 582.6							
1	Brown fine SAND, moist to wet, loose.	SP		0.5 / 580.1		SS	100				
3	Dark brown peaty SILT, moist to wet, soft, trash (glass) present down to 9' BGS. Hydrocarbon scent from 7-9' BGS. Gray sand seams present starting at 9' BGS.	ML		3.0 / 569.6		SS	40				
5						SS	36				
13	Gray fine SAND, wet, loose, shell fragments present. trace silt, some medium sand.	SP		13.5 / 567.7		SS	60				
15	Gray silty fine SAND, wet, loose, small shell fragments.	SM		15.4 / 565.1		SS	76				
17	Gray fine SAND, wet, loose.	SP		18.0 / 560.8							
22	Gray very fine sandy SILT, wet, soft.	ML		22.3							
25	Continued on Next Page										

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 3.18 ft
Pipe Elev: 586.3 ft

0.0 - 1.0 ft bgs: Bentonite Chips

2" Schedule 40 PVC

1.0 - 8.0 ft bgs: Filter Sand

2" Schedule 40 slotted PVC

8.0 - 40.0 ft bgs: Material Collapse

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 20, 2021
DATE: Nov 03, 2021

RECORD OF BOREHOLE: PZ-32

CLIENT: GHBLP
PROJECT: J.B. Sims Well Installations
PROJECT NO: 21464427
LOCATION: Grand Haven, MI

DATE: August 20, 2021
CONTRACTOR: MATECO Drilling
SURVEYOR: GPS

ELEVATION: 583.1 ft (Ground)
COORDINATES: N: 578348.3 ft E: 12624980.1 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
	Gray very fine sandy SILT, wet, soft.	ML	557.7								Pipe Stickup: 3.18 ft Pipe Elev: 586.3 ft
26	Gray very fine SAND, wet, loose.	SP	25.4		SS	64					
			556.3								
27	Gray silty SAND, wet, compact, cohesive.	SM	26.8								
28											
29											
30											
31					SS	80					
32											
33											
34											
35											
36					SS	100					
37											
38											
39											
			543.1								
40	End of hole at 40.0 ft. Target Depth Reached Refer to diagram for well construction details.										
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											

Geoprobe 7822DT
Direct Push - 4-in Hole Dia.

HAMMER TYPE: Automatic

REV: 0

GOLDER
MEMBER OF WSP

LOGGED: Parker Sutton
CHECKED: Caroyln Powrozek

DATE: Aug 20, 2021
DATE: Nov 03, 2021

MW-33

CLIENT City of Grand Haven
PROJECT NAME Former J.B. Sims Generating Station
PROJECT NUMBER 10337505
PROJECT LOCATION Harbor Island - Grand Haven, MI
DATE STARTED 11/28/22 00:00 **COMPLETED** 11/28/22 00:00
GROUND ELEVATION 583.23 ft **HOLE DIAMETER** 2
DRILLING CONTRACTOR JSS **DRILLER**
GROUND WATER LEVELS:
DRILLING METHOD DPT **EQUIPMENT**
AT TIME OF DRILLING 2.00 ft / Elev 581.23 ft
LOGGED BY Zach McCurley **CHECKED BY** Tanten Buszka
AFTER DRILLING 1.68 ft / Elev 581.55 ft
NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0.0					Casing Top Elev: 582.81 (ft) Casing Type: 2" Sch 40 PVC
			Top Soil	582.7	Bentonite Seal
		0.5	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, loose	582.2	
		1.0	CLAYEY SAND, (SC) very dark brown and gray, moist, medium dense, Saturated at 1.8 ft bgs		
2.5					
		3.0	POORLY GRADED SAND, (SP) brown, fine to medium grained, saturated, loose	580.2	Filter Pack
5.0					Well Screen
		5.5	POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, loose, Wood fragments observed at 6.5 ft bgs	577.7	
		7.0		576.2	

Bottom of borehole at 7.0 feet.

MW-34

CLIENT City of Grand Haven
PROJECT NAME Former J.B. Sims Generating Station
PROJECT NUMBER 10337505
PROJECT LOCATION Harbor Island - Grand Haven, MI
DATE STARTED 01/28/22 00:00 **COMPLETED** 11/28/22 00:00
GROUND ELEVATION 584.69 ft **HOLE DIAMETER** 2
DRILLING CONTRACTOR JSS **DRILLER**
GROUND WATER LEVELS:
DRILLING METHOD DPT **EQUIPMENT**
▽ **AT TIME OF DRILLING** 9.50 ft / Elev 575.19 ft
LOGGED BY Zach McCurley **CHECKED BY** Tanten Buszka
▼ **AFTER DRILLING** 4.21 ft / Elev 580.48 ft
NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0.0					Casing Top Elev: 584.36 (ft) Casing Type: 2" Sch 40 PVC
			Topsoil	584.2	
0.5			POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, loose, Trace gravel		
1.5				583.2	
2.0			POORLY GRADED SAND, (SP) black, fine to medium grained, moist, loose, Trace organics	582.7	
2.5			SILTY SAND, (SM) gray, moist, medium dense		Bentonite Seal
4.0				580.7	
5.0			▼ POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, medium dense, Trace clay, wood fragments observed at 9.5 ft bgs.		
7.5					
10.0			▽		Filter Pack Well Screen
10.0			POORLY GRADED SAND, (SP) black, saturated, hydrocarbon odor, Observed bricks, metal, and oily sheen at 11 ft bgs.	574.7	
12.5					
13.0				571.7	
			POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, medium dense, Trace gravel		
15.0				569.7	

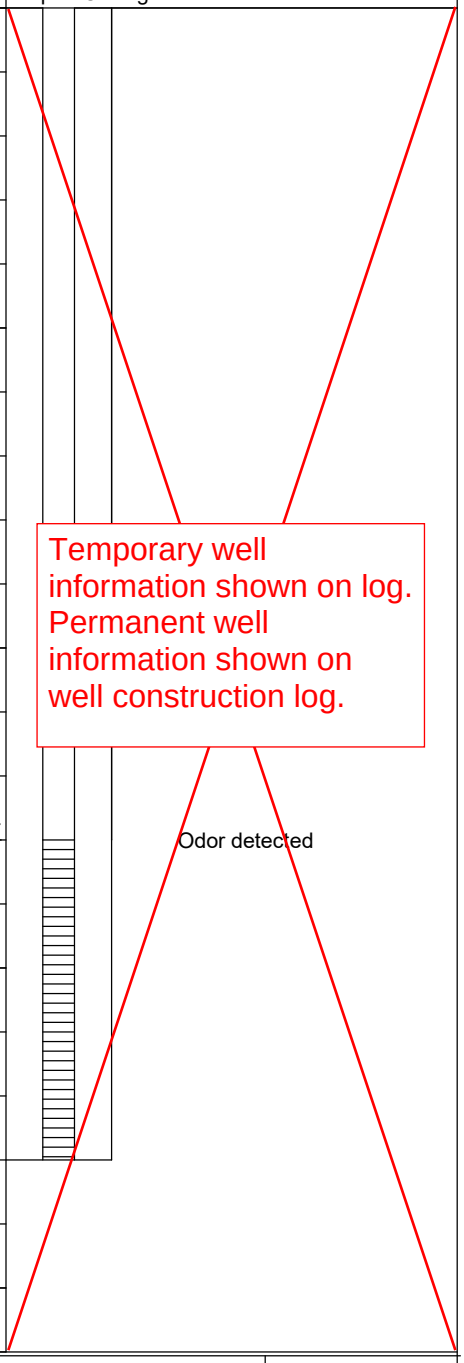
Bottom of borehole at 15.0 feet.

PROJECT: Former JB Sims Generating Station Harbor Island Grand Haven, Michigan	**Log of Soil Boring GP-01/MW-35**
BORING LOCATION: Harbor Island	SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Job Site Services	DATE STARTED: 11/29/22 / DATE FINISHED: 11/29/22
DRILLING METHOD: DPT	TOTAL DEPTH (ft.): 18.0 / SCREEN INTERVAL (ft.): 13-18
DRILLING EQUIPMENT: Geoprobe 7822DT	DEPTH TO WATER ATD (ft): 13.0 / CASING: 1", Sch-40 PVC
SAMPLING METHOD: Dual Tube	DEPTH TO WATER ATS (ft): 13.0
HAMMER WEIGHT: NA / DROP: NA	LOGGED BY: Kiersten White / REG. NO. NA

DEPTH (feet)	Sample No.	Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency	Depth (ft)
				0.0	Fill (GW):	
				0.0	SILTY SAND (SM): olive, dry, fine to medium silty sand, loose	
				0.0		
				0.0		
5				0.0		
				0.0	SILTY SAND (SM): olive, dry, fine to medium silty sand, trace gravel, loose	
				0.0	SILTY SAND (SM): gray, dry, fine to medium silty sand, loose	
				0.0		
10				0.0	CLAYEY SAND (SC): gray, moist, slight plasticity	
				0.0		
				0.0		
				0.0	CLAYEY SAND (SC): gray, saturated, slight plasticity	▼
	GP-01			51.6		
				NM	SILTY SAND (SM): light gray, saturated, loose	
15				NM		
				NM	SILTY SAND (SM): light gray, saturated, silty sand with clay, slight plasticity	
				NM		
				NM	End of boring at 18 ft bgs.	
20						

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD



WELL10

Acronyms
ATD - At Time of Drilling
ATS - At Time of Sampling

Project No. 3650220203

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-35

Location ID: GP-01

Drilling Subcontractor: Job Site Services

Installation Date: 01/30/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives: None.

Measurement Point (riser)
Elevation (ft msl): 589.724

Land Surface Elevation (ft): 590.421

Approximate Diameter of Borehole (in): 3.75 inches

Depth to Water (ft): 9.20
- **During Drilling:** 8.30
  - **Date:** 01/30/2023
- **Post Development:** 8.30
  - **Date:** 01/31/2023

Hydrologic Unit: NA

Water added during drilling (gal): .0

Water removed during development (gal): 20

Top of Bentonite Seal (ft): 1.0

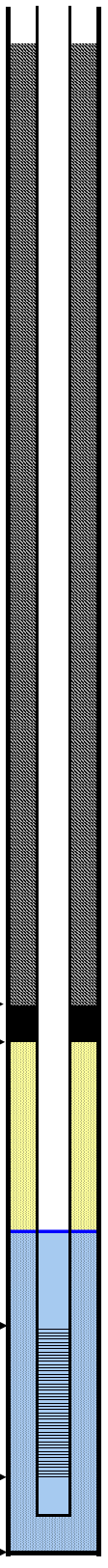
Top of Filter Pack (ft): 5.0

Top of Screen Interval (ft): 7.30

Bottom of Screened Interval (ft): 12.30

Bottom of Filter Pack (ft): 12.30

Bottom of Borehole (ft): 12.30 feet bgs



Protective Casing:
- **Type:** Flush Mount
- **Dimensions (in):** 8
- **Stickup (ft):** 0
- **Length (ft):** 1
- **Guard Post:** None

Surface Pad:
- **Dimensions:** 12”x12”
- **Type:** Concrete

Annular Seal (grout above well seal):
- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:
- **Manufacturer:** Baroid
- **Material:** BENTONITE 3/8"
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:
- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.33

Well Casing (Riser):
- **Manufacturer:** ECT Manufacturing Inc
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 7.3'
- **Diameter (in):** 2

Well Screen:
- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes: None.

Technician Signature: Jared Walbert

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

QA/QC Date:

PROJECT: Former JB Sims Generating Station Harbor Island Grand Haven, Michigan	**Log of Soil Boring VAS20/MW-36**
BORING LOCATION: Harbor Island	SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Job Site Services	DATE STARTED: 12/7/22 / DATE FINISHED: 12/7/22
DRILLING METHOD: DPT	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): 5-9; 16-20
DRILLING EQUIPMENT: Geoprobe 7822DT	DEPTH TO WATER ATD (ft): 5.0 / CASING: 1", stainless steel
SAMPLING METHOD: Dual Tube	DEPTH TO WATER ATS (ft): 5.85
HAMMER WEIGHT: NA / DROP: NA	LOGGED BY: Jared Walbert / REG. NO. NA

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION (NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency)	Depth (ft)
0				0.0	POORLY-GRADED SAND (SP): yellowish brown (10 YR 5/8), moist	
				0.0		
				0.0		
				0.0		
5				0.0	POORLY-GRADED SAND (SP): yellowish brown (10 YR 5/8), saturated	
	VAS20-5-9			NM	WELL-GRADED SAND with GRAVEL (SW): yellowish brown (10 YR 5/8), saturated	
				NM	WELL-GRADED GRAVEL (GW): gray (GLEY 1 6/N), saturated	
				NM		
10				NM		
				NM		
				NM	SILTY GRAVEL (GM): very dark brown (10 YR 2/2), saturated	
				NM		
				NM		
15				NM	CLAYEY SILT (ML): very dark brown (10 YR 2/2), saturated, low plasticity	
				NM		
	VAS20-16-20			NM	SANDY SILT (ML): dark gray (5 Y 4/1), saturated	
				NM	SILT (ML): very dark brown (10 YR 2/2), saturated	
				NM	POORLY-GRADED SAND (SP): gray (5 Y 6/1), saturated	
20				NM	End of boring at 20 ft bgs.	

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD

1", stainless steel screen used

Temporary well information shown on log. Permanent well information shown on well construction log.

1", stainless steel screen used

Acronymns
ATD - At Time of Drilling
ATS - At Time of Sampling

Project No. 3650220203

WELL10

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-36

Location ID: VAS20

Drilling Subcontractor: Job Site Services

Installation Date: 01/30/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives: None

Measurement Point (riser)

Elevation (ft msl): 589.121

Land Surface Elevation (ft): 585.615

Approximate Diameter of Borehole (in): 3.75 Inches

Depth to Water (ft):

- **During Drilling:** 5.60
  - **Date:** 01/30/2023
- **Post Development:** 5.08
  - **Date:** 02/01/2023

Hydrologic Unit:

Water added during drilling (gal): .0

Water removed during development (gal): 15

Top of Bentonite Seal (ft): 1.0

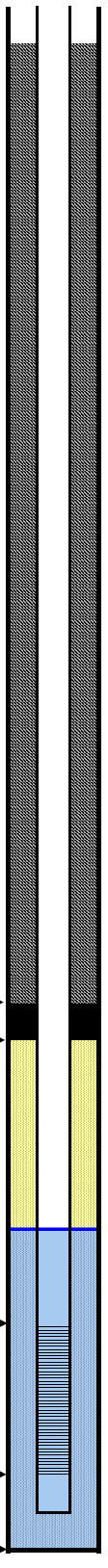
Top of Filter Pack (ft): 3.0

Top of Screen Interval (ft): 4.0

Bottom of Screened Interval (ft): 9.0

Bottom of Filter Pack (ft): 9.0

Bottom of Borehole (ft): 9.0 feet bgs



Protective Casing:

- **Type:** Round Well Monument
- **Dimensions (in):** 4
- **Stickup (ft):** 4
- **Length (ft):** 5
- **Guard Post:** None

Surface Pad:

- **Dimensions:** 12”x12”x6”
- **Type:** Concrete

Annular Seal (grout above well seal):

- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:

- **Manufacturer:** Baroid
- **Material:** BENTONITE 3/8"
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:

- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.5

Well Casing (Riser):

- **Manufacturer:** ECT Manufacturing Inc
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 4'
- **Diameter (in):** 2

Well Screen:

- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes: None.

Technician Signature: Jared Walbert

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

QA/QC Date:

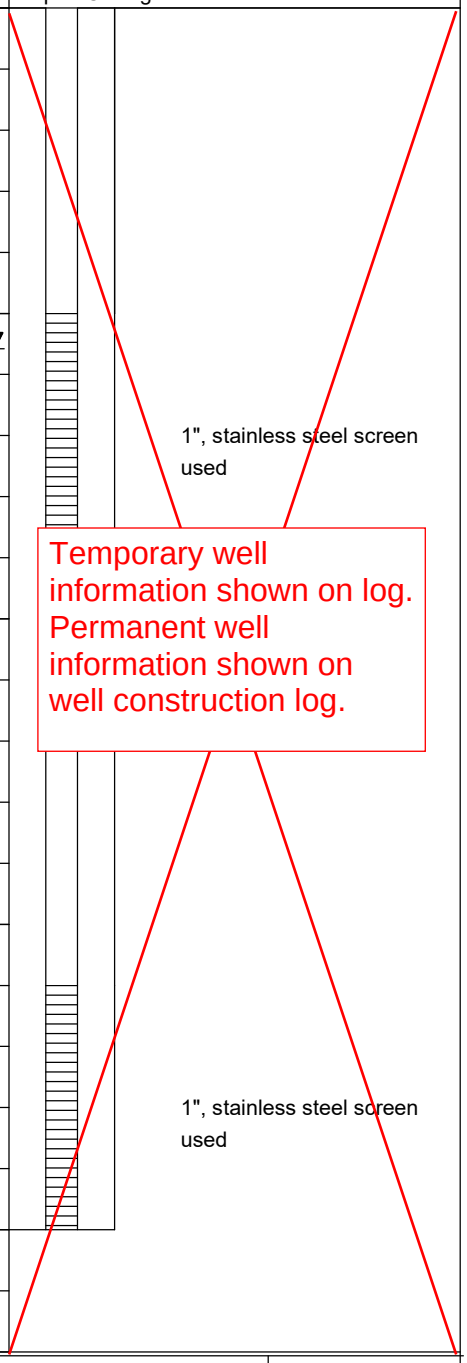
PROJECT: Former JB Sims Generating Station Harbor Island Grand Haven, Michigan	**Log of Soil Boring VAS21/MW37**
BORING LOCATION: Harbor Island	SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Job Site Services	DATE STARTED: 12/7/22 / DATE FINISHED: 12/7/22
DRILLING METHOD: DPT	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): 5-9; 16-20
DRILLING EQUIPMENT: Geoprobe 7822DT	DEPTH TO WATER ATD (ft): 5.0 / CASING: 1", stainless steel
SAMPLING METHOD: Dual Tube	DEPTH TO WATER ATS (ft): 5.58
HAMMER WEIGHT: NA / DROP: NA	LOGGED BY: Jared Walbert / REG. NO. NA

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION: NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency
0				0.0	SILTY GRAVEL (GM): gray (10 YR 6/1), damp
				0.0	POORLY-GRADED SAND (SP): yellowish brown (10 YR 5/8), damp
				0.0	SILTY GRAVEL (GM): very dark brown (10 YR 2/2), damp
				0.0	POORLY-GRADED SAND (SP): brown (10 YR 5/3), moist
5	VAS21-5-9, VAS21-SB-5-7			0.0	POORLY-GRADED SAND (SP): brown (10 YR 5/3), wet
				NM	POORLY-GRADED SAND (SP): brown (10 YR 5/3), saturated, glass fragments at 7 ft bgs
				NM	POORLY-GRADED SAND (SP): dark gray (10 YR 4/1), saturated
				NM	POORLY-GRADED SAND (SP): black (GLEY 1 2.5/N), saturated
10				NM	
				NM	
				NM	
				NM	
				NM	SILTY GRAVEL (GM): black (GLEY 1 2.5/N), saturated, poorly graded
15				NM	
				NM	POORLY-GRADED SAND (SP): black (GLEY 1 2.5/N), saturated
	VAS21-16-20			NM	SILTY CLAY (CL): very dark brown (10 YR 2/2), wet, plastic
				NM	
				NM	POORLY-GRADED SAND (SP): dark gray (GLEY 1 4/N), saturated
20				NM	SILTY CLAY (CL): very dark brown (10 YR 2/2), wet, plastic
					End of boring at 20 ft bgs.

Depth (ft)

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD



Acronymns
ATD - At Time of Drilling
ATS - At Time of Sampling

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-37

Location ID: VAS21

Drilling Subcontractor: Job Site Services

Installation Date: 01/30/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives: None.

Measurement Point (riser)
Elevation (ft msl): 589.619

Land Surface Elevation (ft): 585.59

Approximate Diameter of Borehole (in): 3.75 inches

Depth to Water (ft): 5.30
- **During Drilling:** 5.30
  - **Date:** 01/30/2023
- **Post Development:** 5.60
  - **Date:** 02/01/2023

Hydrologic Unit: NA

Water added during drilling (gal): .0

Water removed during development (gal): 15

Top of Bentonite Seal (ft): 1.0

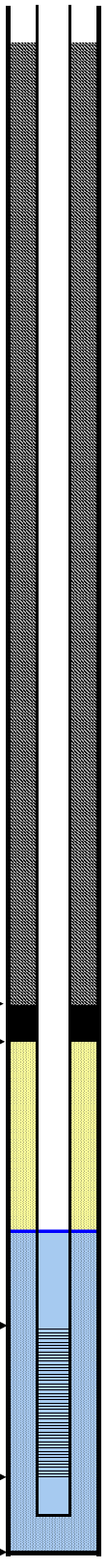
Top of Filter Pack (ft): 3.0

Top of Screen Interval (ft): 4.0

Bottom of Screened Interval (ft): 9.0

Bottom of Filter Pack (ft): 9.0

Bottom of Borehole (ft): 9.0 feet bgs



Protective Casing:
- **Type:** Round Well Monument
- **Dimensions (in):** 4
- **Stickup (ft):** 4
- **Length (ft):** 5
- **Guard Post:** None

Surface Pad:
- **Dimensions:** 12”x12”x6”
- **Type:** Concrete

Annular Seal (grout above well seal):
- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:
- **Manufacturer:** Baroid
- **Material:** BENTONITE 3/8"
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:
- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.25

Well Casing (Riser):
- **Manufacturer:** ECT Manufacturing Inc
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 4
- **Diameter (in):** 2

Well Screen:
- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes: None

Technician Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

QA/QC Date:

PROJECT: Former JB Sims Generating Station Harbor Island
Grand Haven, Michigan

Log of Soil Boring VAS22/MW-38

BORING LOCATION: Harbor Island

SURFACE ELEVATION AND DATUM: TBD

DRILLING CONTRACTOR: Job Site Services

DATE STARTED: 12/7/22

DATE FINISHED: 12/7/22

DRILLING METHOD: DPT

TOTAL DEPTH (ft.): 20.0

SCREEN INTERVAL (ft.): 5-9; 16-20

DRILLING EQUIPMENT: Geoprobe 7822DT

DEPTH TO WATER ATD (ft): 5.0

CASING: 1", stainless steel

SAMPLING METHOD: Dual Tube

DEPTH TO WATER ATS (ft): 5.50

HAMMER WEIGHT: NA

DROP: NA

LOGGED BY: Jared Walbert

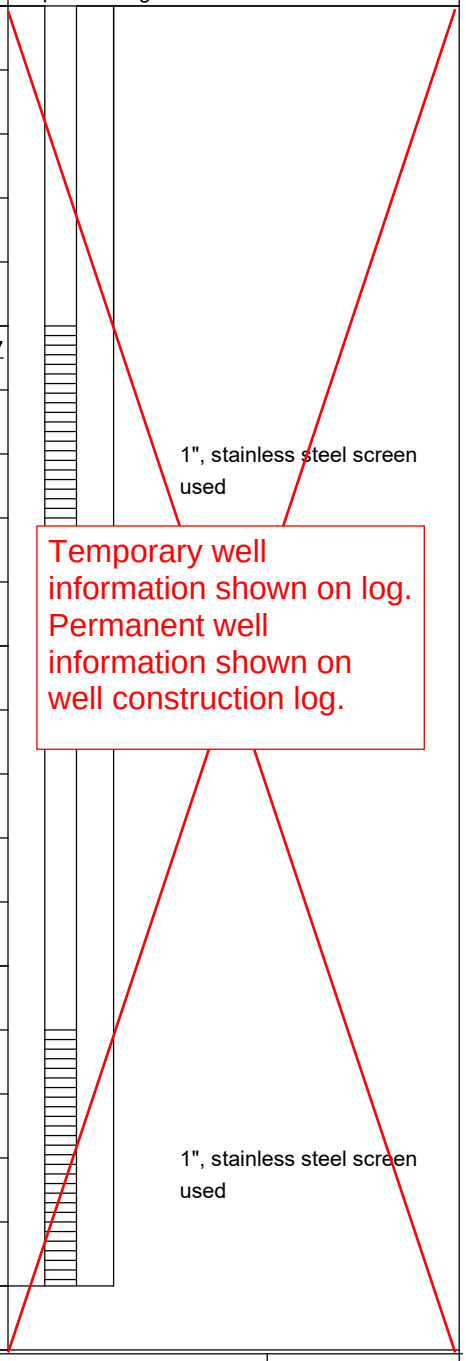
REG. NO. NA

DRAFT

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION: NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency	Depth (ft)
0				0.0	SILTY GRAVEL (GM): black (GLEY 1 2.5/N), damp	
				0.0		
				0.0		
				0.0		
5	VAS22-5-9			0.0	POORLY-GRADED SAND (SP): black (GLEY 1 2.5/N), wet	
				NM	POORLY-GRADED SAND (SP): brownish yellow (10 YR 6/8), saturated	
				NM	CLAYEY SILT (ML): black (GLEY 1 2.5/N), wet, coal fragments, low plasticity	
				NM		
				NM	POORLY-GRADED SAND (SP): brownish yellow to black (10 YR 6/8 to GLEY 1 2.5/N), saturated, wood and coal at 9.5-10.0 ft bgs	
10				NM		
				NM	CLAYEY SILT (ML): very dark grayish brown (10 YR 3/2), saturated, low plasticity	
				NM		
				NM	POORLY-GRADED SAND (SP): very dark gray (GLEY 1 3/N), saturated	
				NM	SILT (ML): very dark gray (GLEY 1 3/N), saturated	
				NM	CLAYEY SILT (ML): very dark grayish brown (10 YR 3/2), saturated, leaves and roots at 16.0-17.0 ft bgs, low plasticity	
15				NM		
				NM		
	VAS22-16-20			NM	POORLY-GRADED SAND (SP): gray (GLEY 1 5/N), saturated	
				NM		
				NM		
20				NM	End of boring at 20 ft bgs.	

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD



Acronymns
ATD - At Time of Drilling
ATS - At Time of Sampling

Project No. 3650220203

WELL10

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB sims generating station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-38

Location ID: VAS22

Drilling Subcontractor: Job Site Services

Installation Date: 01/30/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives:

Measurement Point (riser)
Elevation (ft msl): 590.51

Land Surface Elevation (ft): 586.258

Approximate Diameter of Borehole (in): 3.75

Depth to Water (ft): 5.90
- **During Drilling:** 5.90
  - **Date:** 01/30/2023
- **Post Development:** 6.37
  - **Date:** 02/01/2023

Hydrologic Unit: NA

Water added during drilling (gal): .0

Water removed during development (gal): 10.5

Top of Bentonite Seal (ft): 1.0

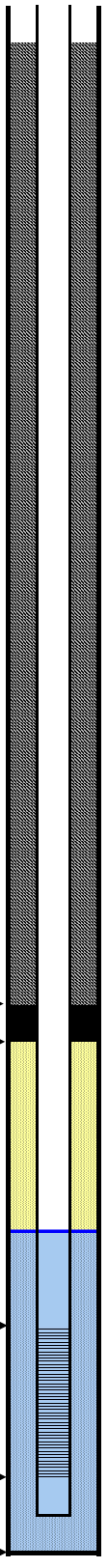
Top of Filter Pack (ft): 3.0

Top of Screen Interval (ft): 4.0

Bottom of Screened Interval (ft): 9.0

Bottom of Filter Pack (ft): 9.0

Bottom of Borehole (ft): 9.37



Protective Casing:
- **Type:** Round Well Monument
- **Dimensions (in):** 4
- **Stickup (ft):** 4
- **Length (ft):** 5
- **Guard Post:** None

Surface Pad:
- **Dimensions:** 12”x12”x6”
- **Type:** Concrete

Annular Seal (grout above well seal):
- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:
- **Manufacturer:** Baroid
- **Material:** BENTONITE 3/8"
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:
- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.5

Well Casing (Riser):
- **Manufacturer:** ECT manufacturing inc
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 4'
- **Diameter (in):** 2

Well Screen:
- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes:
None.

Technician Signature: Jared Walbert

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

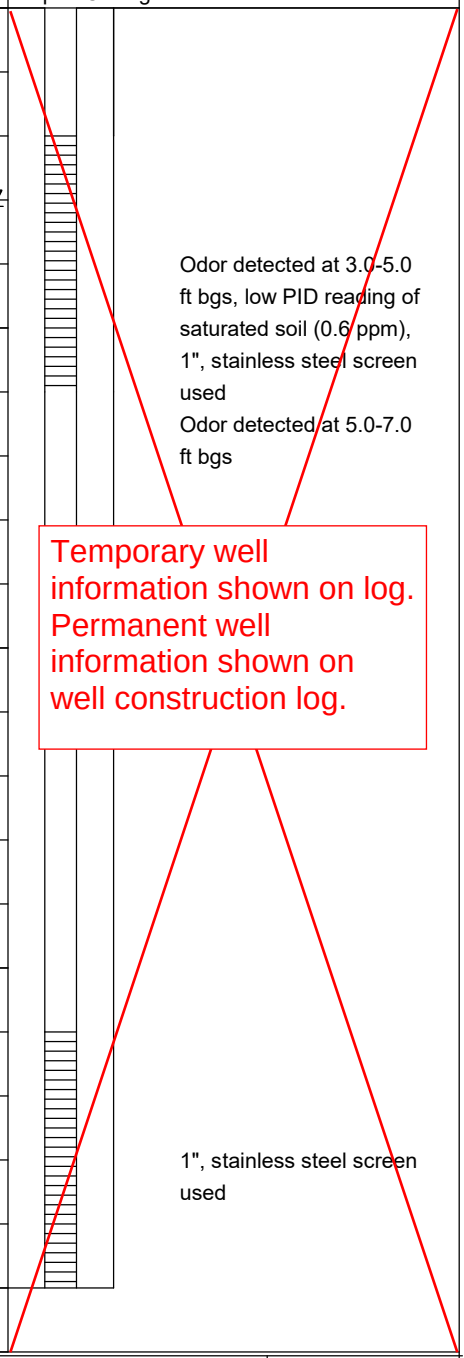
QA/QC Date:

PROJECT: Former JB Sims Generating Station Harbor Island Grand Haven, Michigan	**Log of Soil Boring VAS15/MW-39**
BORING LOCATION: Harbor Island	SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Job Site Services	DATE STARTED: 12/5/22 / DATE FINISHED: 12/6/22
DRILLING METHOD: DPT	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): 3-7; 16-20
DRILLING EQUIPMENT: Geoprobe 7822DT	DEPTH TO WATER ATD (ft): 3.0 / CASING: 1", stainless steel
SAMPLING METHOD: Dual Tube	DEPTH TO WATER ATS (ft): 3.10
HAMMER WEIGHT: NA / DROP: NA	LOGGED BY: Jared Walbert / REG. NO. NA

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION (NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency)	Depth (ft)
0	VAS15-3-7, VAS15-SB-3-5			0.0	POORLY-GRADED SAND (SP): yellowish brown (10 YR 5/8), dry	0
				0.0		
				0.0	POORLY-GRADED SAND (SP): very dark brown (10 YR 2/2), saturated, waste consisting of ceramics, glass and metal	
				0.6		
5				NM	SILTY GRAVEL (GM): very dark brown (10 YR 2/2), saturated, waste consisting of ceramic and glass	
				NM		
				NM	CLAYEY SILT (ML): black to very dark gray (10 YR 2/1 to 10 YR 3/1), saturated, wood fibers, low plasticity	
				NM		
				NM	SANDY SILT (ML): brown (10 YR 5/3), saturated, shells at 9.0 ft bgs	
10				NM	CLAYEY SILT (ML): very dark grayish brown (10 YR 3/2), saturated	
				NM		
				NM		
				NM	SILTY CLAY (ML): very dark grayish brown (10 YR 3/2), wet	
				NM	CLAYEY SILT (ML): very dark grayish brown (10 YR 3/2), saturated, leaf and wood debris at 14.0-15.0 ft bgs	
15				NM		
				NM		
	VAS15-16-20			NM	POORLY-GRADED SAND (SP): gray (10 YR 6/1), saturated	
				NM		
				NM		
20				NM	End of boring at 20 ft bgs.	

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD



Acronyms
ATD - At Time of Drilling
ATS - At Time of Sampling

Project No. 3650220203

WELL10

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-39

Location ID: VAS15

Drilling Subcontractor: Job Site Services

Installation Date: 01/31/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives: None

Measurement Point (riser)
Elevation (ft msl): 587.359

Land Surface Elevation (ft): 583.272

Approximate Diameter of Borehole (in): 3.75 inches

Depth to Water (ft): 3.10
- **During Drilling:** 2.76
  - **Date:** 01/31/2023
- **Post Development:** 3.17
  - **Date:** 02/01/2023

Hydrologic Unit: NA

Water added during drilling (gal): .0

Water removed during development (gal): 15

Top of Bentonite Seal (ft): 0.5

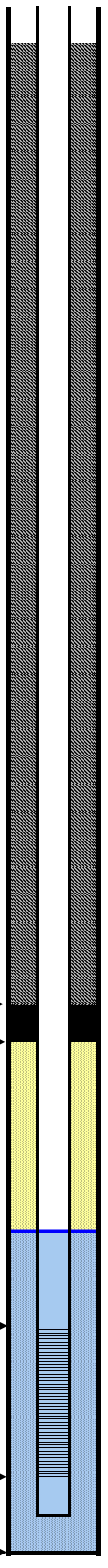
Top of Filter Pack (ft): 1.5

Top of Screen Interval (ft): 2.0

Bottom of Screened Interval (ft): 7.0

Bottom of Filter Pack (ft): 7.0

Bottom of Borehole (ft): 7.0



Protective Casing:
- **Type:** Round Well Monument
- **Dimensions (in):** 4
- **Stickup (ft):** 4.5
- **Length (ft):** 5
- **Guard Post:** None

Surface Pad:
- **Dimensions:** 12”x12”x6”
- **Type:** Concrete

Annular Seal (grout above well seal):
- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:
- **Manufacturer:** Baroid
- **Material:** BENTONITE
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:
- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.5

Well Casing (Riser):
- **Manufacturer:** ECT Manufacturing inc
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 2'
- **Diameter (in):** 2

Well Screen:
- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes: None.

Technician Signature: Jared Walbert

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

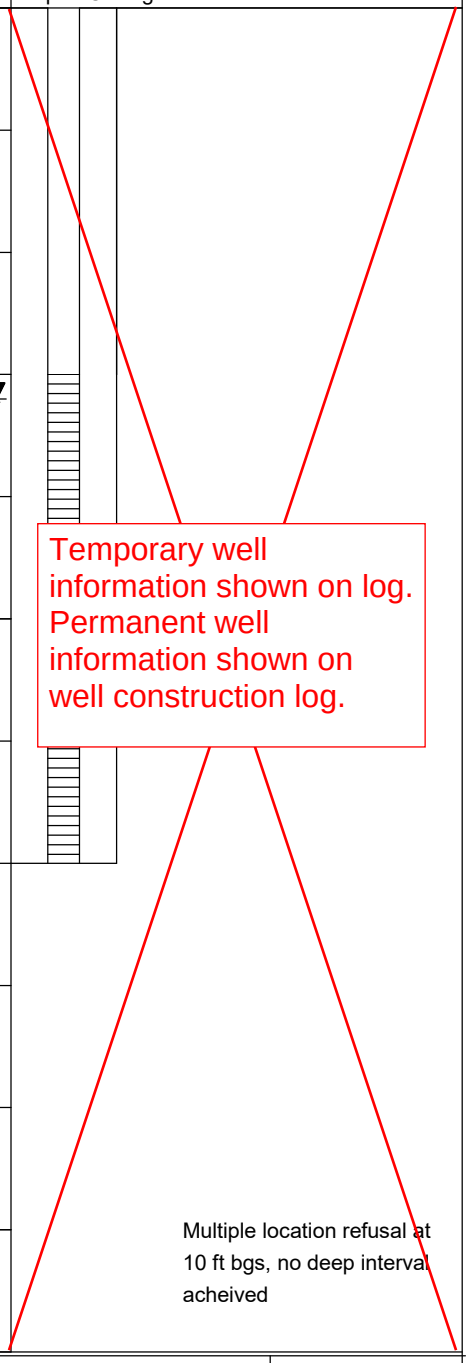
QA/QC Date:

PROJECT: Former JB Sims Generating Station Harbor Island Grand Haven, Michigan	**Log of Soil Boring VAS16/MW-40**
BORING LOCATION: Harbor Island	SURFACE ELEVATION AND DATUM: TBD
DRILLING CONTRACTOR: Job Site Services	DATE STARTED: 12/6/22 / DATE FINISHED: 12/6/22
DRILLING METHOD: DPT	TOTAL DEPTH (ft.): 10.0 / SCREEN INTERVAL (ft.): 3-7
DRILLING EQUIPMENT: Geoprobe 7822DT	DEPTH TO WATER ATD (ft): 3.0 / CASING: 1", stainless steel
SAMPLING METHOD: Dual Tube	DEPTH TO WATER ATS (ft): 3.2
HAMMER WEIGHT: NA / DROP: NA	LOGGED BY: Jared Walbert / REG. NO. NA

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Recovery (%)	Blow Counts	PID Reading (ppm)	DESCRIPTION (NAME (USCS): color, moist, % by wt., plasticity, dilatancy, toughness, dry strength, consistency)	Depth (ft)
				0.0	POORLY-GRADED SAND (SP): dark grayish brown (10 YR 4/2), damp	
				0.0	SILTY GRAVEL (GM): black (GLEY 1 2.5/N), damp, coal fragments	
				0.0	POORLY-GRADED SAND (SP): dark grayish brown (10 YR 4/2), saturated	
				NM		
5	VAS16-3-7			NM	SILTY GRAVEL (GM): grayish brown (10 YR 5/2), saturated	
				NM		
				NM		
				NM		
				NM		
10				NM	End of boring at 10 ft bgs.	

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Top of Casing Elevation: TBD



Acronymns
ATD - At Time of Drilling
ATS - At Time of Sampling

Project No. 3650220203

WELL10

SCREENED WELL CONSTRUCTION FORM

DRAFT

Site Name: Former JB Sims Generating Station

Project Number: 3650220203.02.02

Well ID: MW-40

Location ID: VAS16

Drilling Subcontractor: Job Site Services

Installation Date: 01/31/2023

Drilling Personnel: David Mokma & Jeremiah Chapman

Decon Performed: Yes

Technician Name: Jared Walbert

Drilling Method: Direct Push

Other Amec Foster Wheeler Representatives: None.

Measurement Point (riser)
Elevation (ft msl): 586.783

Land Surface Elevation (ft): 582.748

Approximate Diameter of Borehole (in): 3.75

Depth to Water (ft): 3.10
- **During Drilling:** 1.50
  - **Date:** 01/31/2023
- **Post Development:** 1.46
  - **Date:** 02/01/2023

Hydrologic Unit: NA

Water added during drilling (gal): .0

Water removed during development (gal): 10

Top of Bentonite Seal (ft): 0.5

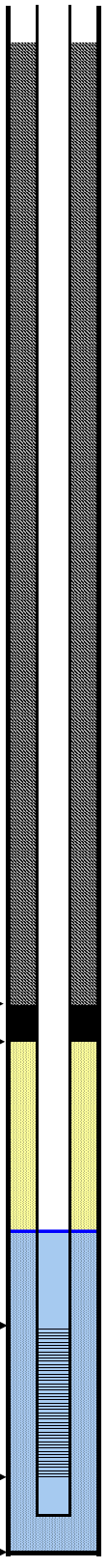
Top of Filter Pack (ft): 1.25

Top of Screen Interval (ft): 1.5

Bottom of Screened Interval (ft): 6.5

Bottom of Filter Pack (ft): 6.5

Bottom of Borehole (ft): 6.5



Protective Casing:
- **Type:** Round Well Monument
- **Dimensions (in):** 4
- **Stickup (ft):** 4
- **Length (ft):** 5
- **Guard Post:** None

Surface Pad:
- **Dimensions:** 12”x12”x6”
- **Type:** Concrete

Annular Seal (grout above well seal):
- **Material:** BENTONITE
- **Installation Method:** Gravity

Bentonite Seal:
- **Manufacturer:** Baroid
- **Material:** BENTONITE 3/8"
- **Type:** Chips
- **Installation Method:** Gravity
- **Hydration time (hrs):** 24

Filter Pack Material:
- **Manufacturer:** K&E
- **Material:** #2 Well Gravel
- **Size:** 0.03
- **Installation Method:** Gravity
- **Surging time:** 0.5

Well Casing (Riser):
- **Manufacturer:** ECT Manufacturing
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Length:** 1.5
- **Diameter (in):** 2

Well Screen:
- **Manufacturer:** Johnson Screens
- **Type/Material:** POLYVINYL CHLORIDE (PVC)
- **Diameter (in):** 2
- **Slot Size (in):** 0.010
- **Slot Type:** Factory Slot

Sump/End Cap: Point

Notes: None

Technician Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Technician Name (print): Jared Walbert

QA/QC’d by:

QA/QC Date:

Renew Harbor Island
Work today, protect tomorrow.

Appendix B

Well Development Forms

Well Development Field Sheet

Site Name: City of Grand Haven - Harbor Island
Well Number: MW-33
Job Number: 10337505
Owner: City of Grand Haven
Date(s): 11/30/2022 - 12/1/2022

Date	Time	Conductivity (mS/cm)	pH (S.U.)	Temp (C)	Turbidity (NTU)	Water Volume Removed (gal)
11/30/2022	9:00	Job Site Services begins development				
	12:00	Not Measured				22
12/1/2022	16:15	HDR begins development				
	17:15	1.10	7.13	7.9	1.22	1.6
	17:30	1.10	7.12	8.2	0.65	1.7
	17:45	1.10	7.13	8.2	0.02	1.6
	18:00	1.10	7.12	8.3	0.02	1.7
	18:15	1.10	7.12	8.3	0.02	1.7
			Total Vol. Purged (gal)			30.3

Notes:

Well Development Field Sheet

Site Name: City of Grand Haven - Harbor Island
Well Number: MW-34
Job Number: 10337505
Owner: City of Grand Haven
Date(s): 11/30/2022 - 12/1/2022

Date	Time	Conductivity (mS/cm)	pH (S.U.)	Temp (C)	Turbidity (NTU)	Water Volume Removed (gal)
11/30/2022	13:00	Job Site Services begins development				
	16:00	Not Measured				27
12/1/2022	13:41	HDR begins development				
	14:00	2.02	6.58	13.0	7.38	2.0
	14:15	2.09	6.63	12.9	6.61	1.5
	14:30	2.09	6.65	12.8	4.57	1.7
	14:45	2.11	6.66	12.9	6.55	1.6
	15:00	2.12	6.64	13.0	5.18	1.2
	15:15	2.12	6.66	12.8	5.11	1.6
	15:30	2.14	6.65	12.9	4.96	1.6
		Total Vol. Purged (gal)				38.2

Notes:

WELL DEVELOPMENT LOG

Site Name:	Former JB Sims Generating Station. Harbor Island, Gand Haven	**Project Number:**	3650220203
Well ID:	MW-33	**Start Date:**	11/30/22
Sample Technician:	Kiersten White	**End Date:**	11/30/22
Initial Depth to Water:	2.25	**Total Depth of Well:**	7.0
Development Method:	PUMPED	**Depth to Water After Purging:**	2.25
Pump Start Time:	11:37	**1 Casing Volume (gal):**	0.8
Total Volume Purged (gal):	22	**3 Casing Volumes (gal):**	2.3

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)

Instruments (Manufacturer, Model, and Serial No.):

Water Quality Meter
,
na na na

Calculations:

Technician Signature:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 4.75 * 7.48 gal/ft^3
= 0.8

Notes:

na
Measuring Point: Top of Riser
no parameters taken

Technician Name (print):

Kiersten White

QA/QC'd by:

QA/QC Date:

WELL DEVELOPMENT LOG

Site Name:	Former JB Sims Generating Station. Harbor Island, Gand Haven	**Project Number:**	3650220203
Well ID:	MW-34	**Start Date:**	11/30/22
Sample Technician:	Kiersten White	**End Date:**	11/30/22
Initial Depth to Water:	4.21	**Total Depth of Well:**	12.5
Development Method:	PUMPED	**Depth to Water After Purging:**	4.21
Pump Start Time:	11:37	**1 Casing Volume (gal):**	1.4
Total Volume Purged (gal):	27	**3 Casing Volumes (gal):**	4.1

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)

Instruments (Manufacturer, Model, and Serial No.):

Water Quality Meter
,
na na na

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 8.29 * 7.48 gal/ft^3
= 1.4

Technician Signature:

Notes:

No parameters were taking during development.
Measuring Point: Top of Riser
no parameters taken

Technician Name (print):

Kiersten White

QA/QC'd by:

QA/QC Date:

WELL DEVELOPMENT LOG

Site Name:	Former JB Sims Generating Station, Harbor Island, Grand Haven, MI	**Project Number:**	3650220203.02.02
Well ID:	MW-35	**Start Date:**	01/31/2023
Sample Technician:	Jared Walbert	**End Date:**	01/31/2023
Initial Depth to Water:	8.32	**Total Depth of Well:**	11.7
Development Method:	PUMPED	**Depth to Water After Purging:**	8.30
Pump Start Time:	14:40	**1 Casing Volume (gal):**	0.6
Total Volume Purged (gal):	20.0	**3 Casing Volumes (gal):**	1.7

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
14:45	10	1.0	8.32							5.0	Brown opaque color
14:50	10	1.0								10.0	Brown opaque color
14:55	10.0	1.0								15.0	clear
15:00	10.0	1.0								20.0	clear

Instruments (Manufacturer, Model, and Serial No.):

Geosubmersible Pump
,

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 3.38 * 7.48 gal/ft^3
= 0.6

Technician Signature:

Notes:

None.
Measuring Point: Top of Casing

Technician Name (print)**:**

Jared Walbert

QA/QC'd by: **QA/QC Date:**

WELL DEVELOPMENT LOG

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI

Project Number: 3650220203.02.02

Well ID: MW-36

Start Date: 01/31/2023

Sample Technician: Jared Walbert

End Date: 01/31/2023

Initial Depth to Water: 5.6

Total Depth of Well: 9.0

Development Method: PUMPED

Depth to Water After Purging: 5.08

Pump Start Time: 13:45

1 Casing Volume (gal): 0.6

Total Volume Purged (gal): 15.0

3 Casing Volumes (gal): 1.7

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
13:50	8.8	0.5								2.5	Brown opaque color
13:55	8.8	0.5								5.0	clear
14:00	8.8	0.5								7.5	clear
14:05	8.8	0.5								10.0	clear
14:10	8.8	0.5								12.5	clear
14:15	8.8	0.5								15.0	clear

Instruments (Manufacturer, Model, and Serial No.):

Geosubmersible Pump

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Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 3.40 * 7.48 gal/ft^3
= 0.6

Technician Signature:

Notes:

None.
Measuring Point: Top of Casing

Technician Name (print)**:**

Jared Walbert

QA/QC'd by:

QA/QC Date:

WELL DEVELOPMENT LOG

Site Name: Former JB Sims Generating Station, Harbor Island, Grand Haven, MI
Project Number: 3650230203.02.02

Well ID:	MW-37	**Start Date:**	01/31/2023
Sample Technician:	Jared Walbert	**End Date:**	01/31/2023
Initial Depth to Water:	5.3	**Total Depth of Well:**	9.0
Development Method:	PUMPED	**Depth to Water After Purging:**	5.60
Pump Start Time:	13:15	**1 Casing Volume (gal):**	0.6
Total Volume Purged (gal):	15.0	**3 Casing Volumes (gal):**	1.8

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
13:20	8.8	1.0								5.0	Brown opaque color
13:25	8.8	1.0								10.0	clear
13:30	8.8	1.0								15.0	clear

Instruments (Manufacturer, Model, and Serial No.):

Geosubmersible Pump
,

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 3.70 * 7.48 gal/ft^3
= 0.6

Technician Signature:

Notes:

None.
Measuring Point: Top of Casing

Technician Name (print)**:**

Jared Walbert

QA/QC'd by:

QA/QC Date:

WELL DEVELOPMENT LOG

Site Name:	Former JB Sims Generating Station, Harbor Island, Grand Haven, MI	**Project Number:**	3650220203.02.02
Well ID:	MW-38	**Start Date:**	01/31/2023
Sample Technician:	Jared Walbert	**End Date:**	01/31/2023
Initial Depth to Water:	5.9	**Total Depth of Well:**	9.0
Development Method:	PUMPED	**Depth to Water After Purging:**	6.37
Pump Start Time:	12:00	**1 Casing Volume (gal):**	0.5
Total Volume Purged (gal):	10.50	**3 Casing Volumes (gal):**	1.5

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
12:05	8.8	0.25								1.25	Brown opaque color
12:10	8.8	0.25								2.50	Brown opaque color
12:15	8.8	0.25								3.75	Brown opaque color
12:20	8.8	0.25								5.00	clear
12:25	8.8	0.25								6.75	clear
12:30	8.8	0.25								8.00	clear
12:35	8.8	0.25								9.25	clear
12:40	8.8	0.25								10.50	clear

Instruments (Manufacturer, Model, and Serial No.):

Geosubmersible Pump
,

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 3.10 * 7.48 gal/ft^3
= 0.5

Technician Signature:

Notes:

None.
Measuring Point: Top of Casing

Technician Name (print)**:**

Jared Walbert

QA/QC'd by: **QA/QC Date:**

WELL DEVELOPMENT LOG

DRAFT

Site Name:	Former JB Sims Generating Station, Harbor Island, Grand Haven, MI	**Project Number:**	3650220203.02.02
Well ID:	MW-39	**Start Date:**	01/31/2023
Sample Technician:	Jared Walbert	**End Date:**	01/31/2023
Initial Depth to Water:	2.76	**Total Depth of Well:**	7.18
Development Method:	PUMPED	**Depth to Water After Purging:**	3.17
Pump Start Time:	11:10	**1 Casing Volume (gal):**	0.7
Total Volume Purged (gal):	15.0	**3 Casing Volumes (gal):**	2.2

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
11:10	7.0	0.5								0.0	Brown opaque color.
11:15	7.0	0.5								2.5	Clear
11:20	7.0	0.5								5.0	Clear
11:25	7.0	0.5								7.5	Clear
11:30	7.0	0.5								10.0	Clear
11:35	7.0	0.5								12.5	Clear
11:40	7.0	0.5								15.0	Clear

Instruments (Manufacturer, Model, and Serial No.):

Mega Monsoon Pump
,

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 4.42 * 7.48 gal/ft^3
= 0.7

Technician Signature:

Notes:

None.
Measuring Point: Top of Riser

Technician Name (print)**:**

Jared Walbert

QA/QC'd by: **QA/QC Date:**

WELL DEVELOPMENT LOG

DRAFT

Site Name:	Former JB Sims Generating Station	**Project Number:**	3650220203.02.02
Well ID:	MW-40	**Start Date:**	01/31/2023
Sample Technician:	Jared Walbert	**End Date:**	01/31/2023
Initial Depth to Water:	1.5	**Total Depth of Well:**	6.5
Development Method:	PUMPED	**Depth to Water After Purging:**	1.42
Pump Start Time:	10:15	**1 Casing Volume (gal):**	0.8
Total Volume Purged (gal):	10	**3 Casing Volumes (gal):**	2.5

Time	Intake Depth (feet)	Rate (gpm)	Water Level (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
10:20	10	0.33								1.66	
10:25	10	0.33								3.33	
10:30	10	0.33								4.99	
10:35	10	0.33								6.65	
10:40	10	0.33								8.31	
10:45	10	0.33								10	

Instruments (Manufacturer, Model, and Serial No.):

Mega Monsoon Pump
,

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 5.00 * 7.48 gal/ft^3
= 0.8

Technician Signature:

Notes:

None.
Measuring Point: Top of Casing

Technician Name (print)**:**

Jared Walbert

QA/QC'd by:

QA/QC Date: