



# Groundwater Monitoring Network System Certification

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for Compliance with the Coal Combustion  
Residuals (CCR) Rule

Former BC Cobb Power Plant

*Muskegon Environmental Redevelopment  
Group, LLC*

November 1, 2024



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## Table of Abbreviations and Acronyms

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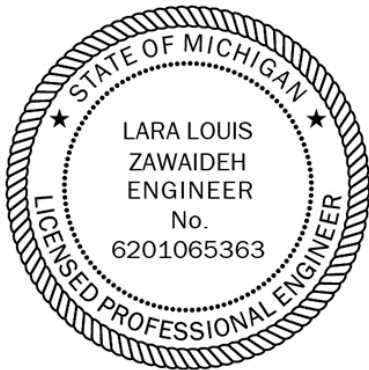
<b>Abbreviation</b>	<b>Definition</b>
AMSL	above mean sea level
BC Cobb	Former BC Cobb Power Plant
BGS	below ground surface
BTV	background threshold values
CCR	Coal Combustion Residuals
CEC	Consumers Energy Company
COI	constituent of interest
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	U.S. Environmental Protection Agency
MERG	Muskegon Environmental Redevelopment Group, LLC
TDS	total dissolved solids
TOC	top of casing
TSS	total suspended solids

## Certification

### Groundwater Monitoring System for Compliance with the Coal Combustion Residuals Rule

**Muskegon Environmental Redevelopment Group  
Former B.C. Cobb Power Plant, Muskegon, Michigan**

I hereby certify that the groundwater monitoring system at the Former B.C. Cobb Power Plant is designed to meet the performance standard in Sections §257.91 of the Federal Coal Combustion Residuals Rule, and that the groundwater monitoring system has been designed and constructed to ensure that the groundwater monitoring will meet this performance standard for the CCR unit located at the Former B.C. Cobb Power Plant.



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License Renewal Date 02/03/2026



# 1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. The Former BC Cobb Power Plant ("BC Cobb" or "Site"), located at 151 North Whitehall Road in Muskegon, Muskegon County, Michigan was owned and operated by Consumers Energy Company (CEC) from 1948 until operation ceased and the plant was demolished in 2016. The property is currently owned by the Muskegon Environmental Redevelopment Group (MERG) (**Figure 1**). BC Cobb has two CCR units subject to the CCR Rule: Ponds 0-8 and the Bottom Ash Pond.

This document supports compliance with the CCR Rule by demonstrating that the groundwater monitoring system at BC Cobb meets the requirements outlined in Section §257.91 of the Rule, which states:

- Section §257.91(f): *'The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet requirements of this section [§257.91]. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section [Section § 257.91], the certification must document the basis supporting this determination.'*

**Table 1** summarizes components required by groundwater monitoring systems, per the CCR Rule and the professional engineer's certification of compliance with these requirements. The remainder of this document provides information to support certification for the multiunit groundwater monitoring system at BC Cobb.



<b>Table 1. Summary of 40 CFR Section §257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance</b>	
<b>Groundwater Monitoring System Requirements</b>	<b>Compliance with Requirement</b>
<p><b>(a) Performance standard.</b> The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:</p> <p>(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:</p> <p style="padding-left: 40px;">(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or (ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and</p> <p>(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.</p>	<p><b>Yes.</b> A groundwater monitoring system has been established that includes the minimum number of wells at appropriate locations and depths to yield the uppermost groundwater samples surrounding each CCR facility.</p> <p>See Sections 3.0 and 4.0. The background wells for the facility are: MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008. The downgradient wells for the facility are: MW-15009, MW-15010, MW-15013, MW-15014R, MW-15015R, MW-15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, MW-15023, MW-17001R, MW-17002, MW-17003, MW-17004, MW-17005, and MW-17006.</p>
<p><b>(b)</b> The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:</p> <p>(1) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and</p> <p>(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.</p>	<p><b>Yes.</b> The monitoring system was designed based on results of technical, site-specific data, including (b)(1) and (b)(2).</p> <p>See Sections 3.0 and 4.0, which describes the hydrogeologic parameters of the Site. In addition, cross sections in Appendix A display the lithologies, stratigraphy, and overlying and underlying geologic units.</p>
<p><b>(c)</b> The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:</p> <p>(1) A minimum of one upgradient and three downgradient monitoring wells; and</p> <p>(2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.</p>	<p><b>Yes.</b> Monitoring wells that meet the performance standards are located at the CCR units.</p> <p>The background wells for the facility are: MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008. The downgradient wells for the facility are: MW-15009, MW-15010, MW-15013, MW-15014R, MW-15015R, MW-15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, MW-15023, MW-17001R, MW-17002, MW-17003, MW-17004, MW-17005, and MW-17006.</p> <p>See Section 4.0.</p>



<b>Table 1. Summary of 40 CFR Section §257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance</b>	
<b>Groundwater Monitoring System Requirements</b>	<b>Compliance with Requirement</b>
<p><b>(d)</b> The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.</p> <p>(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors: (i) Number, spacing, and orientation of each CCR unit; (ii) Hydrogeologic setting; (iii) Site history; and (iv) Engineering design of the CCR unit.</p> <p>(2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by §257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under §257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under §257.101(a) to retrofit or close.</p>	<p><b>Yes.</b> A multiunit system capable of detecting monitored constituents per (d)(1) was installed for the two CCR units.</p> <p>See Sections 2.0 and 4.0.</p> <p>There are unlined active CCR units included in the multiunit system, requirements per (d)(2) do apply.</p>
<p><b>(e)</b> Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (<i>i.e.</i>, the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.</p> <p>(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.</p> <p>(2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.</p>	<p><b>Yes.</b> Well design meets requirements (e). Well logs are provided in Appendix B. See Section 4.0.</p> <p>The design, installation, and development of monitoring wells is documented in the Summary of Monitoring Well Design, Installation, and Development (Arcadis, 2016). Groundwater monitoring devices, including pumps and field instruments, are operated and maintained according to manufacturer's recommendations and the monitoring system will be maintained per (e)(2).</p>
<p><b>(f)</b> The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.</p>	<p><b>Yes.</b> System designed and constructed to meet the requirements of Section §257.91. Technical information to support certification and number of wells, per (c)(1).</p> <p>See Sections 2.0, 3.0 and 4.0.</p> <p>The PE certification of this GMS Certification satisfies paragraph (f).</p>



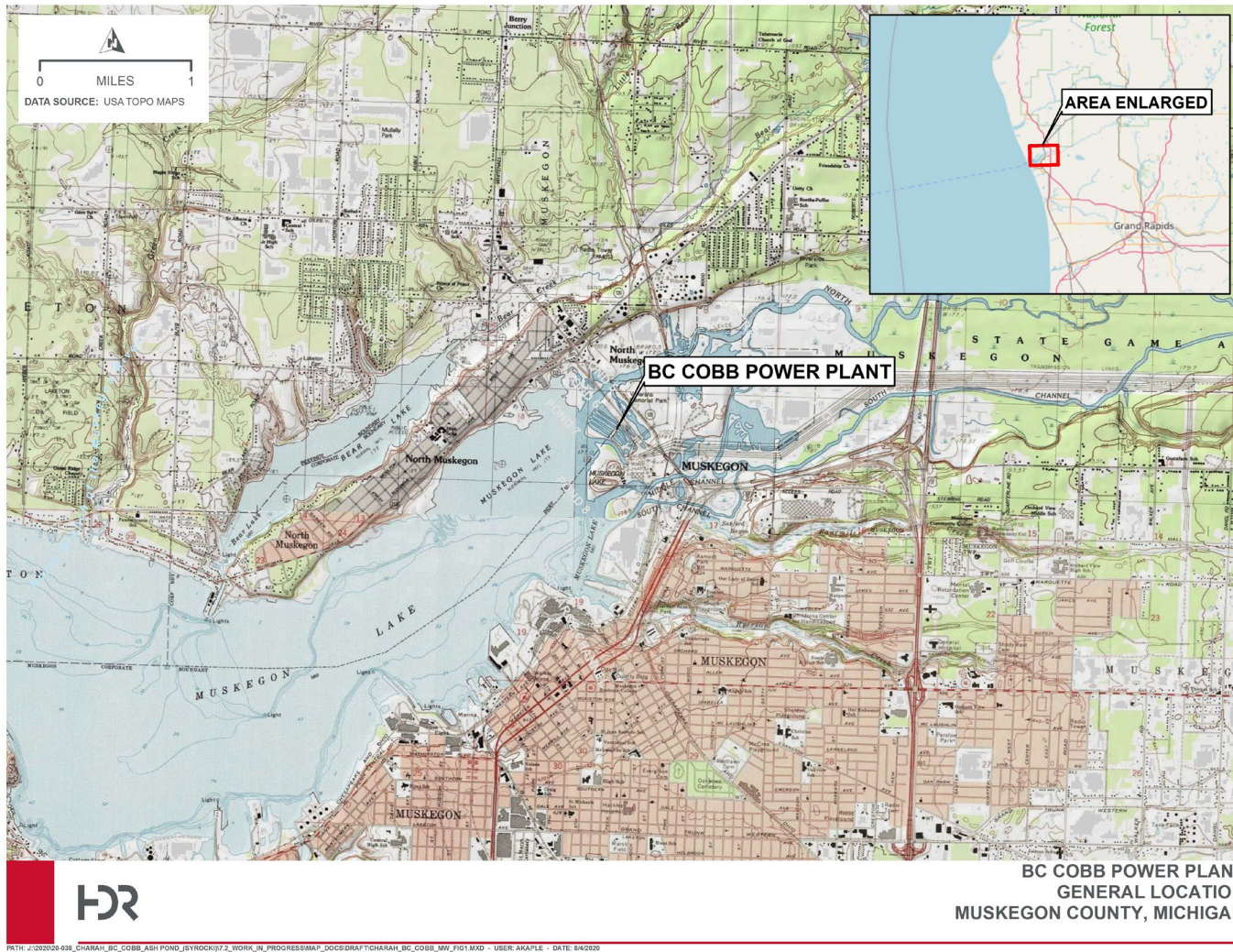


Figure 1. Vicinity Map for the Former BC Cobb Power Plant



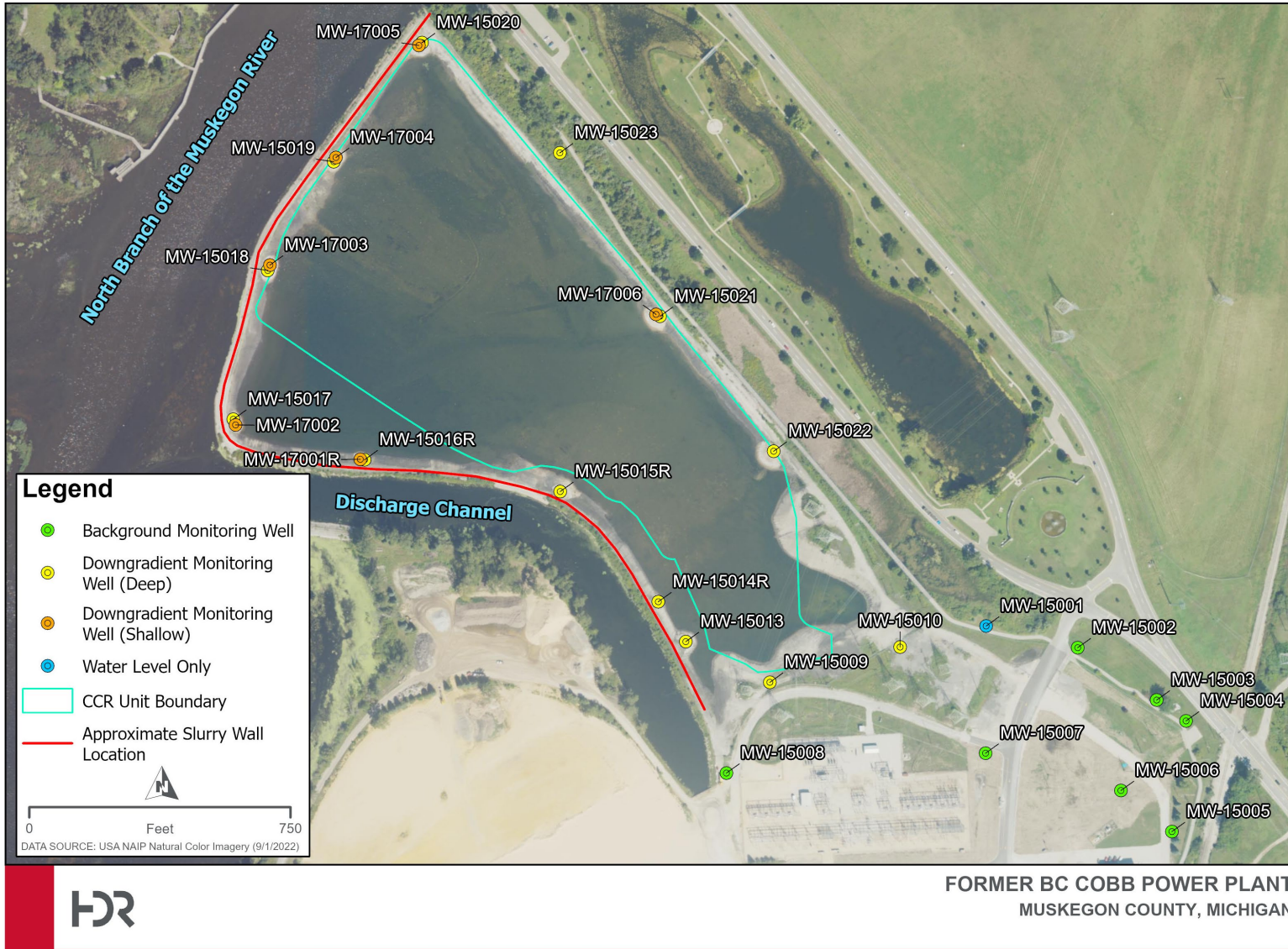


Figure 2. BC Cobb – CCR Units and Monitoring Well Location Map

## 2.0 Facility Description

The Former BC Cobb is the site of a former coal power generation facility located at 151 North Whitehall Road in Muskegon, Muskegon County, Michigan. The facility was owned and operated by CEC from 1948 until operation ceased and the plant was demolished in 2016. The property is currently owned by the MERG (**Figure 1**).

BC Cobb was retired from operations on April 15, 2016. Ponds 0-8 were used to treat CCR contact wash water and miscellaneous low volume wastewaters during decommissioning. MERG initiated clean closure of the ponds in 2020 by installing a slurry wall around the perimeter berm adjacent to the North Branch of the Muskegon River. Dewatering began in July 2020 to prepare for excavation and removal of waste CCR and disposal offsite. Ash removal began in August 2020. Excavation, and ash removal was completed in April of 2022, and dewatering ceased on June 15, 2022 (HDR, 2022).

### 2.1 CCR Bottom Ash Pond

From 1948 through plant closure in 2016, CCR was deposited in the ponds by utilizing sluicing methods. Bottom ash slurry was directed into the Bottom Ash Pond, with Bottom Ash Pond overflow being directed into Ponds 5 or 6. Overflow from these ponds was subsequently directed to Pond 1 before being routed through Ponds 2, 3, and 4 (CEC, 2016). Each pond allowed a portion of CCR particles to settle out before the overflow was transferred to the next pond. The overflow from Pond 4 was discharged to a National Pollutant Discharge Elimination System (NPDES) outfall located on the Discharge Channel.

### 2.2 CCR Ponds 0-8

During active operations, fly ash from the power plant was directed into Ponds 7 and 8. Overflow from Ponds 7 and 8 was then directed to Pond 1 before being routed through Ponds 2, 3, and 4 and discharged through the NPDES outfall location (CEC, 2016). CCR was periodically removed from the ponds and disposed or beneficially reused. During operation of the CCR units, the pond surface water elevations were at 588 feet. Since plant closure in 2016, the pond water elevation has lowered and appears to be below that of the adjacent Muskegon River.

CEC performed a document search and was unable to find design and construction records for Ponds 0-8. Permits from 1956 approved an expansion of earthen dikes to support coal ash storage. Ponds 0-4 are identifiable on a 1968 aerial photograph (CEC, 2016). A CEC drill hole location map from 1979 shows Ponds 0-4 and Ponds 6-8 in similar configuration to that shown in Figure 3, which represents the site condition at the time MERG took ownership of the property. This provides an estimate of when Ponds 0-8 were constructed.





Figure 3. BC Cobb – CCR Units and Well Location Map - 2020 Condition

### 3.0 Site Hydrogeology and Conceptual Model

Ponds 0-8 are primarily comprised of CCR and sand fill. According to historic U.S. Geologic Survey (USGS) topographic maps and aerial photographs dating back to 1929, the area currently occupied by the ash ponds was originally marsh land. The subsurface materials in the pond area generally consist of CCR ranging from 3 to 28 feet below ground surface (ft bgs) overlying 10 to 20 feet of poorly graded, fine-grained sand. Discontinuous layers of organic materials (i.e., humus and peat) are present within the fine-grained sand. Organic-rich silt was also encountered at depths ranging from 20 to 30 ft bgs, beneath the fine-grained sand, ranging in thickness from approximately 1 to 13 feet. The organic-rich silt deposits are thickest in the perimeter berms along the southernmost edge of the pond area (toward Muskegon Lake). Thinner deposits of the organic-rich silt were encountered toward the northernmost edge of the pond area. Silty clay and/or poorly graded, fine- to medium-grained sand is generally observed within 30 to 40 ft bgs, beneath the organic-rich silt. An underlying clay was encountered throughout the pond area at approximately 40 ft bgs, beneath the fine to medium-grained sand. Geologic cross sections are provided in Appendix A.

Geologic maps of Michigan and local well records indicate that 120 to 190 feet of glacio-lacustrine sand, gravel, moraine and lacustrine clay deposits are present throughout Muskegon County. These lacustrine deposits are situated on top of the sandstone bedrock that is part of the Marshall Formation, typically encountered at approximately 200 to 250 ft bgs throughout Muskegon County. Glacio-lacustrine sands dominate in the western and southern areas surrounding Muskegon Lake.

Ponds 0-8 are bound by surface water features (**Figure 3**): The North Branch Muskegon River and former plant-associated discharge channel adjoin the western and southernmost boundaries of the pond area, and Veterans Memorial Park is located north and northeast of the pond area. MERG understands that there is surface water pumping at the Veterans Memorial Park on an occasional basis to limit the flooding in some areas of the park. Pumping performed at the park has the potential to have an effect on the groundwater flow conditions at BC Cobb. Therefore, changes over time in groundwater flow conditions at the Site boundary will need to give consideration to that potential for impact.

Groundwater flow within the uppermost aquifer has varied during plant operations and the post-shutdown period. While the ponds were actively receiving CCR and non-CCR wastewater, groundwater in the pond area was several feet higher than the surrounding surface water in Muskegon River and upgradient groundwater, creating a mound under the BC Cobb surface impoundments, with groundwater flowing outward toward the surface water features. Since the power plant shut down in April 2016, groundwater is encountered at a similar elevation to the surrounding surface water, generally within the range of 579 to 583 feet above mean sea level (ft AMSL).

During the most recent monitoring event in March 2024, groundwater elevations varied little across the site, ranging between 579.63 and 580.40 AMSL, with a flow direction generally northeast (**Figure 3** and **Figure 4**). The gradient across the site in March 2024 was 0.0009 ft/ft.





Using the average hydraulic conductivity measured at the Ponds 0-8 monitoring wells of 58 feet/day (ARCADIS, 2016), and an assumed effective porosity of 0.3, this results in groundwater flow rate of approximately 0.31 feet/day (approximately 113 feet/year).

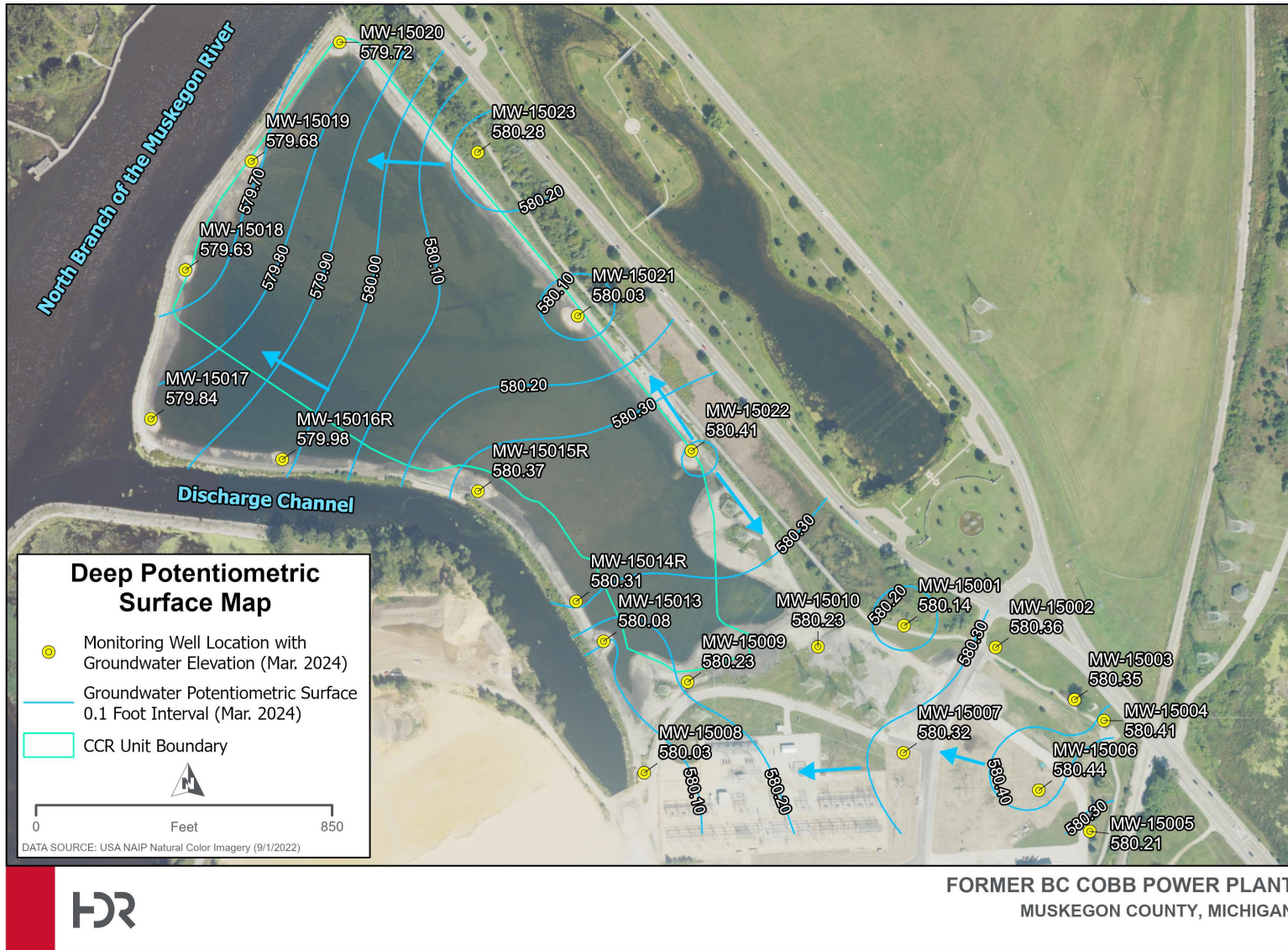


Figure 4. Deep Groundwater Potentiometric Surface – March 2024



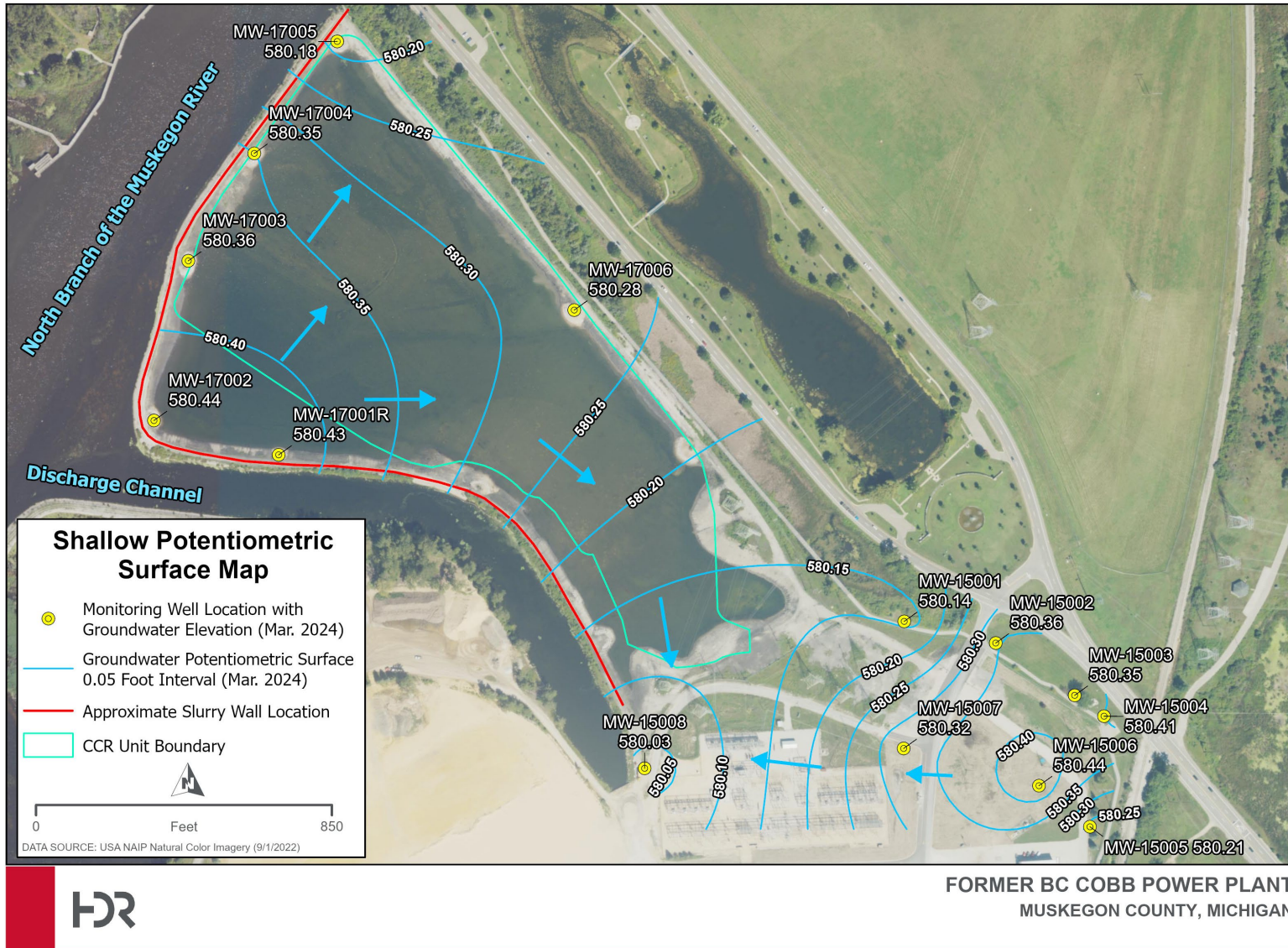


Figure 5. Shallow Groundwater Potentiometric Surface – March 2024

## 4.0 Groundwater Monitoring System Wells

The CCR Rule requires, at a minimum, one upgradient and three downgradient monitoring wells per CCR unit to be completed in the uppermost aquifer. Section §257.91 of the Rule states that the operator: “...*may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.*” In addition, the CCR Rule states that downgradient monitoring wells should be installed to: “*accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer.*”

Based on the CCR requirements, hydrogeological data, and site visits, there are a total of twenty-six (26) wells in the certified monitoring system (**Figure 2**), including:

- Seven background (upgradient wells): MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008
- Nineteen compliance wells:
  - Thirteen deep wells: MW-15009, MW-15010, MW-15013, MW-15014R, MW-15015R, MW-15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, and MW-15023
  - Six shallow wells: MW-17001R, MW-17002, MW-17003, MW-17004, MW-17005, and MW-17006
- One water level only well: MW-15001 (not included in the certified network)

The monitoring system at the CCR multiunit meets the requirements of the CCR rule and provides a sufficient number and spacing of wells at depths and screened intervals to accurately represent the quality of groundwater passing the waste boundary of the CCR unit to ensure detection of groundwater contaminants in the uppermost aquifer and monitor all potential contaminant pathways from the CCR units.

**Figure 3** displays the monitoring well locations in the 2020 condition, when the embankments between Ponds 0-8 and the Bottom Ash Pond were visible. Monitoring wells could not be installed in the embankments due to concerns with structural integrity. Based on the CCR requirements, hydrogeological data, site visits, and the embankments separating impoundments, Ponds 0-8 and the Bottom Ash Pond were treated as one CCR multi-unit and 23 monitoring wells (MW-15001 through MW-15023) were originally installed surrounding the unit boundary, with MW-15001 through MW-15008 representing background water quality and MW-15009 through MW-15023 representing downgradient water quality. The groundwater level contour maps provided in **Figure 4** and **Figure 5** confirm that the groundwater flow direction is generally northwest and MW-15002 through MW-15008 are upgradient.

MW-15001 was sampled during the background monitoring phase of the CCR Rule compliance program but now serves as a nature and extent well with only static water level measurement required.



Shallow wells (identified as MW-17001 through MW-17006) were installed in 2017 and were paired with existing wells MW-15016 through MW-15021 to better characterize shallow groundwater quality and flow direction (**Figure 2**). MW-15016R through MW-15021 now provide data on deeper groundwater while MW-17001R through MW-17006 provide shallow groundwater data.

To accommodate pond closure construction in 2020, MW-15012 was abandoned and wells MW-15015, MW-15016, and MW-17001 were relocated to within 10 feet of the original location. In February 2022, monitoring wells MW-15014 and MW-15011 were abandoned to accommodate continued CCR removal efforts. Well MW-15014 was relocated approximately 100 feet south. Relocated wells are distinguished with an “R” following the well identifier (MW-15014R, MW-15015R, MW-15016R and MW-17001R).

#### 4.1 Background Monitoring Wells

The upgradient wells for the unit are MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008. Well locations for each upgradient well are in (**Figure 2**). MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008 will capture background water quality in the aquifer before passing under the CCR unit and reaching the downgradient wells.

#### 4.2 Downgradient Monitoring Wells

A multiunit monitoring network of 21 wells, listed below, was installed around the boundary of the CCR unit to serve as downgradient wells (**Figure 2**). The downgradient well locations will detect constituents of interest from the CCR units, if present.

- MW-15009
- MW-15010
- MW-15013
- MW-15014R
- MW-15015R
- MW-15016R
- MW-15017
- MW-15018
- MW-15019
- MW-15020
- MW-15021
- MW-15022
- MW-15023
- MW-17001R
- MW-17002
- MW-17003
- MW-17004
- MW-17005
- MW-17006

#### 4.3 Perimeter and Characterization Wells

MW-15001 was sampled during the background monitoring phase of the CCR Rule compliance program but now serves as a nature and extent well with only static water level measurement required.

#### 4.4 Well Construction

The CCR monitoring wells were drilled by a licensed well driller using hollow-stem auger or sonic drilling methods. Wells MW-15001 through MW-15023 were installed in 2015 and details are provided in the Summary of Monitoring Well Design, Installation, and Development by Arcadis (Arcadis, 2016). Wells MW-17001 through MW-17006 were installed in 2017 (TRC,

2019). Wells MW-15015R, MW-15016R, and MW-17001R were installed in 2020, replacing MW-15015, MW-15016, and MW-17001, respectively. MW-15014R was installed in 2022, replacing MW-15014.

Boreholes were drilled to depths ranging from 20 to 50 feet below ground surface. Once the target drilling depth was reached at each borehole, the 2-inch diameter, Schedule 40 PVC casing and well screen (0.010-inch slots) were assembled and installed. The length of the monitoring well screens vary from 3 feet to 10 feet. Well construction details for all CCR wells are summarized in **Table 2** and boring logs are provided in Appendix B.



**Table 2. Well Construction Details for Groundwater Monitoring at Former BC Cobb**

Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup <sup>3</sup> (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
<b>MW-15001</b> Water Level Only	12624262.18	645763.32	586.52	10-20	20	2.92	2-inch Sch. 40 PVC	6.38	580.14
<b>MW-15002</b>	12624512.86	645701.73	586.87	15-20	20	3.07	2-inch Sch. 40 PVC	6.51	580.36
<b>MW-15003</b>	12624726.22	645555.93	587.12	13-18	18	3.02	2-inch Sch. 40 PVC	6.77	580.35
<b>MW-15004</b>	12624824.48	645491.68	590.57	5-15	15	2.87	2-inch Sch. 40 PVC	10.16	580.41
<b>MW-15005</b>	12624783.15	645166.74	587.77	5-15	15	2.97	2-inch Sch. 40 PVC	7.56	580.21
<b>MW-15006</b>	12624610.52	645291.65	587.81	5-15	15	2.91	2-inch Sch. 40 PVC	7.37	580.44
<b>MW-15007</b>	12624188.85	645409.39	587.43	4-10	10	2.93	2-inch Sch. 40 PVC	7.11	580.32
<b>MW-15008</b>	12623510.47	645340.01	587.76	4-9	9	2.96	2-inch Sch. 40 PVC	7.73	580.03
<b>MW-15009</b>	12623622.98	645606.92	589.27	14-24	24	2.97	2-inch Sch. 40 PVC	9.04	580.23
<b>MW-15010</b>	12623979.47	645690.69	588.11	12-22	22	2.91	2-inch Sch. 40 PVC	7.88	580.23
<b>MW-15011<sup>6</sup></b>	12623765.87	645780.29	595.22	21-31	31	2.92	2-inch Sch. 40 PVC	22.58	572.64
<b>MW-15012<sup>5</sup></b>	12623545.99	645889.92	597.39	21-31	31	2.89	2-inch Sch. 40 PVC	15.05	582.34





Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup <sup>3</sup> (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
<b>MW-15013</b>	12623389.21	645716.41	598.50	30-40	40	2.60	2-inch Sch. 40 PVC	9.92	580.08
<b>MW-15014<sup>6</sup></b>	12623318.73	645925.93	599.04	23-31	31	2.84	2-inch Sch. 40 PVC	16.50	573.02
<b>MW-15014R</b>	12323293.80	645827.80	589.7	27-32	32	2.8	2-inch Sch. 40 PVC	9.39	580.31
<b>MW-15015<sup>1</sup> Abandoned</b>	12623024.09	646138.93	596.75	20-30	30	2.85	2-inch Sch. 40 PVC	14.19	582.56
<b>MW-15015R</b>	12623028.78	646150.02	586.52	13-23	23	-0.27	2-inch Sch. 40 PVC	6.15	580.37
<b>MW-15016<sup>1</sup> Abandoned</b>	12622459.26	646227.56	589.05	35-40	45	2.85	2-inch Sch. 40 PVC	6.65	582.40
<b>MW-15016R</b>	12622458.17	646237.39	586.62	40-44	44	-0.20	2-inch Sch. 40 PVC	6.64	579.98
<b>MW-15017</b>	12622085.55	646354.69	588.61 586.33 <sup>4</sup>	35-40	40	2.91 -0.29 <sup>4</sup>	2-inch Sch. 40 PVC	6.49	579.84
<b>MW-15018</b>	12622179.74	646789.54	592.43 586.33 <sup>4</sup>	37.5-42.5	42.5	3.03 -0.26 <sup>4</sup>	2-inch Sch. 40 PVC	6.70	579.63
<b>MW-15019</b>	12622369.93	647103.13	592.42 586.32 <sup>4</sup>	37-42	42	3.02 -0.29 <sup>4</sup>	2-inch Sch. 40 PVC	6.64	579.68
<b>MW-15020</b>	12622626.85	647436.97	592.23 586.26 <sup>4</sup>	35-40	40	2.73 -0.41 <sup>4</sup>	2-inch Sch. 40 PVC	6.54	579.72
<b>MW-15021</b>	12623310.03	646654.84	593.73	39.5-42.5	42.5	3.03	2-inch Sch. 40 PVC	13.70	580.03
<b>MW-15022</b>	12623634.96	646263.16	595.82	24-30	30	3.22	2-inch Sch. 40 PVC	15.41	580.41





Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup <sup>3</sup> (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
<b>MW-15023</b>	12622999.24	647125.15	588.08	12-19.5	19.5	2.68	2-inch Sch. 40 PVC	7.80	580.28
<b>MW-17001<sup>1</sup> Abandoned</b>	12622452.1	646228.0	589.29	15-20	20	3.19	2-inch Sch. 40 PVC	6.75	582.54
<b>MW-17001R</b>	12622452.13	646239.58	586.61	15-20	20	-0.22	2-inch Sch. 40 PVC	6.18	580.43
<b>MW-17002</b>	12622087.2	646348.8	588.79 586.26 <sup>4</sup>	13.5-18.5	18.5	2.99 -0.28 <sup>4</sup>	2-inch Sch. 40 PVC	5.82	580.44
<b>MW-17003</b>	12622184.8	646794.9	592.37 586.31 <sup>4</sup>	17-22	22	3.07 -0.26 <sup>4</sup>	2-inch Sch. 40 PVC	5.95	580.36
<b>MW-17004</b>	12622373.4	647110.1	591.84 586.27 <sup>4</sup>	17.5-22.5	22.5	2.74 -0.32 <sup>4</sup>	2-inch Sch. 40 PVC	5.92	580.35
<b>MW-17005</b>	12622619.7	647433.9	592.42 586.33 <sup>4</sup>	20-25	25	3.12 -0.24 <sup>4</sup>	2-inch Sch. 40 PVC	6.15	580.18
<b>MW-17006</b>	12623301.6	646657.7	593.78	24.5-29.5	29.5	3.33	2-inch Sch. 40 PVC	13.33	580.28

<sup>1</sup>Wells were removed in May 2020 during the construction of a soil bentonite wall (SBW) and relocated within 10 feet of previous location. Relocated wells denoted with "R" after original well ID number.

Easting/Northing location data obtained from MERG survey May 21, 2020.

<sup>2</sup>Static water level for wells were measured March 27, 2024. The static water levels shown for abandoned wells MW-15011 and MW-15014 were measured the week of October 19, 2021. The static water levels shown for abandoned wells MW-15012, MW-15015, MW-15016, and MW-17001 were measured the week of May 7, 2020.

<sup>3</sup>Location and construction data (Easting/Northing, Elevation TOC, Screen Interval, Well Stickup, and Casing Type) for wells MW-15001 – MW-15023 was obtained from *Summary of Monitoring Well Design, Installation, and Development* report by Arcadis 2016. Location and construction data for wells MW-17001 – MW-17006 was obtained from the *2019 Annual Groundwater Monitoring Report* prepared by TRC (TRC, 2020). Construction data was obtained for MW-15015R, MW-15016R, and MW-17001R from Final Boring-Well Logs prepared by SME May 12, 2020. These can be found in Appendix B.

<sup>4</sup>Well elevations changed from stick up to flush mount for construction activities May 12, 2020.

<sup>5</sup>Well was abandoned in June 2020 to accommodate construction activities.

<sup>6</sup>Well was abandoned in February 2022, MW-15014 was replaced with MW-15014R to accommodate construction activities.

## 5.0 Groundwater Quality Sampling

### 5.1 Schedule

Sampling is conducted at a frequency compliant with CCR Part §257.94. CEC completed eight rounds of upgradient and downgradient monitoring well sampling for the original well network between November 2015 and September 2017 to represent background water quality and establish background threshold values (BTVs) for each constituent of interest (COI) in **Table 3**. Upon completion of the eight rounds of sampling to establish background groundwater quality, semi-annual (twice per year) groundwater detection monitoring was initiated. Groundwater quality sampling will be conducted in all upgradient, and downgradient monitoring wells and samples will be analyzed for the parameters in Appendix III and IV of Part §257, plus TSS, as described below in compliance with CCR Part 257.94 and 257.95. Groundwater monitoring will continue as appropriate based upon the results of sampling.

### 5.2 Sample Collection

Samples are collected following the protocol in the Groundwater Sampling Collection Standard Operating Procedure (HDR, 2020). Groundwater quality sampling is conducted in all upgradient and downgradient monitoring wells unless wells are dry. In accordance with the CCR Rule and the Standard Operating Procedure, groundwater samples are not field filtered. The field parameters of turbidity, pH, ORP, and temperature are measured using a YSI Professional Plus (or an equivalent) portable water quality instrument that has been calibrated prior to use.

### 5.3 Analytical Testing

Analytical testing of groundwater samples will be performed by an EPA certified laboratory. For the initial eight background sample events, samples were analyzed for the constituents shown on **Table 3**, with the exception of Total Suspended Solids (TSS), which was added when MERG acquired the property. For detection monitoring, the constituents listed in Appendix III will be analyzed. Subsequent sampling events will be analyzed for the constituents listed in Appendix III or IV and TSS as appropriate, based upon the results of previous sampling and statistical evaluation of results. For quality control, two field duplicate samples will be collected for each sample event.

<b>Table 3. Groundwater Quality Constituents</b>
<b>Appendix III Constituents for Detection Monitoring</b>
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)
<b>Appendix IV Constituents for Assessment Monitoring</b>

<b>Table 3. Groundwater Quality Constituents</b>
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined
<b>Additional Parameters</b>
Total Suspended Solids (TSS)

## 6.0 Reporting

The CCR Part §297.90(e) identifies the reporting requirements for the groundwater monitoring program for the CCR units. The first annual reporting document was completed by January 31, 2018 and annually thereafter. The annual reports are placed in the BC Cobb operating record. Annual reports will summarize key monitoring actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For CCR compliance, MERG will file the report in the operating record.

The statistical methods used to analyze each specified constituent in each monitoring well is described in a separate Statistical Methods Certification document (HDR, 2020).

MERG will comply with the CCR Rule recordkeeping requirements specified in §257.105(h), notification requirements specified in §257.106(h), and internet requirements specified in §257.107(h).

## 7.0 References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development. BC Cobb Electric Generation Facility – Muskegon, Michigan. Prepared for Consumers Energy Company.

Consumers Energy Company, 2016. History of Construction. October 17, 2016.

HDR, Inc. September 19, 2022. CCR Removal Report. Prepared for Muskegon Environmental Redevelopment Group, LLC.

HDR, Inc. August 14, 2020. Hydrogeologic Monitoring Plan. Prepared for Muskegon Environmental Redevelopment Group, LLC.

HDR, Inc. August 14, 2020. Groundwater Sample Collection Standard Operating Procedure. Prepared for Muskegon Environmental Redevelopment Group, LLC.

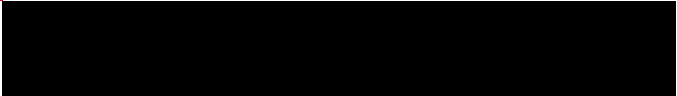
TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report, Consumers Energy, Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Consumers Energy, Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.



**A**

Geological Cross-Sections



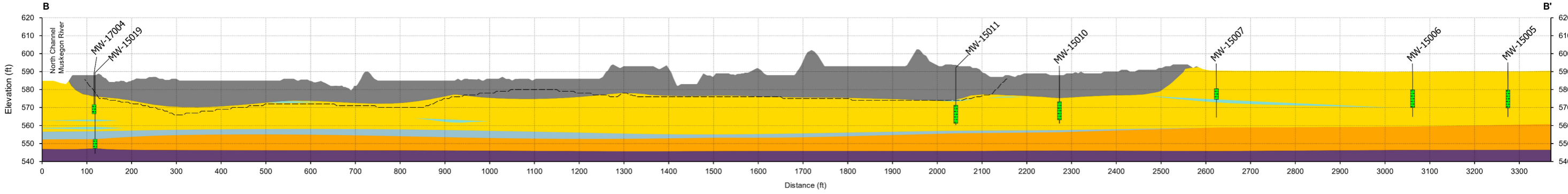




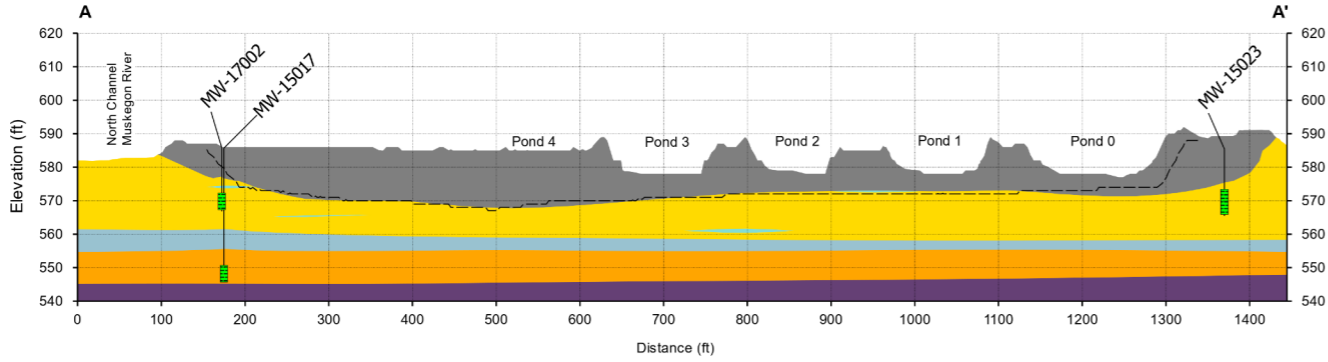
BC COBB POWER PLANT  
MUSKEGON COUNTY, MICHIGAN



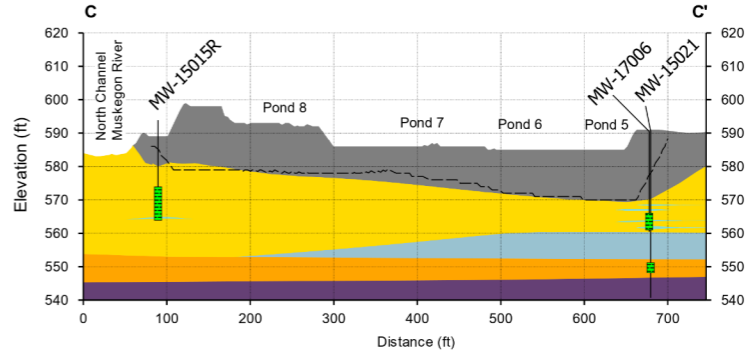
### Profile B-B'



### Profile A-A'



### Profile C-C'



Vertical exaggeration: 4x

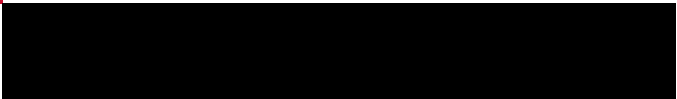
0ft 250ft

Coal Combustion Residuals (CCR)	Sand - Lower
Sand - Upper	Basal Clay
Peat, Organic Clay, Organic Silt - Interbeds	
Peat, Organic Clay, Organic Silt	
Closure Excavation Grade	Screen



# B

## Well Logs








<b>Date Start:</b> 10/12/15 <b>Date Finish:</b> 10/12/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> John Pitsch <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 3.8 <b>Water Level Finish (ft. btoc.):</b> 5.96	<b>Northing:</b> 645763.32 <b>Easting:</b> 12624262.15 <b>Casing Elevation:</b> 586.52  <b>Borehole Depth (ft. bgs.):</b> 20.0 <b>Surface Elevation:</b> 583.6  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15001  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Cloudy, Windy
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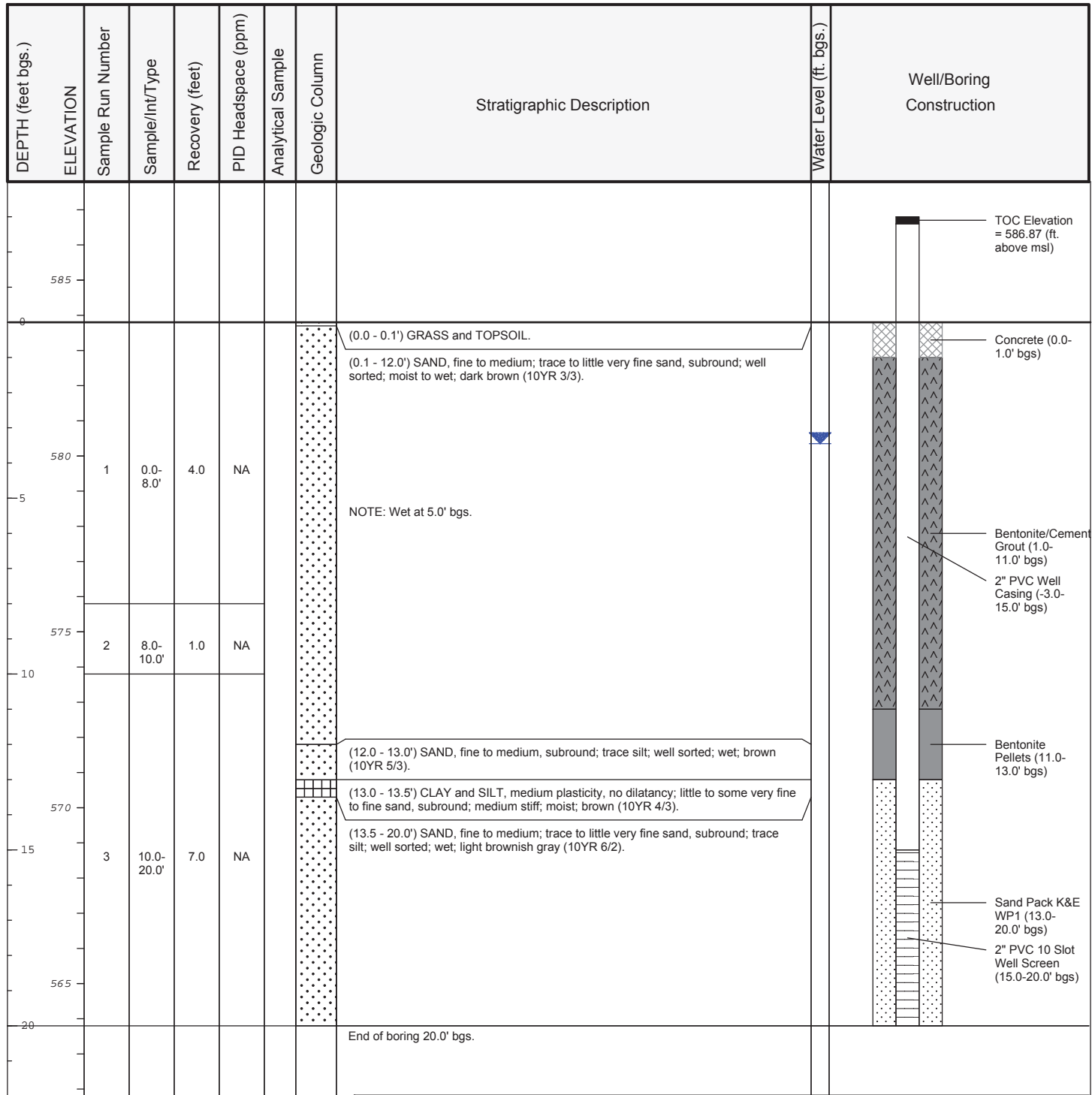
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15		3	10.0-20.0'	9.0	NA					
570										
565								NOTE: organic matter, roots, from 18.8 to 18.9' bgs.		
20								End of boring 20.0' bgs.		
560										
25										

	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Hand Auger to 6.0' bgs. Groundwater encountered at 3.8' bgs during drilling. Water level at development was 5.96' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.84 feet
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**Date Start:** 10/12/15  
**Date Finish:** 10/12/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** John Pitsch  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 5.0  
**Water Level Finish (ft. btoc.):** 6.45

**Northing:** 645701.73  
**Easting:** 12624512.86  
**Casing Elevation:** 586.87  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 583.8  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15002  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Cloudy, Windy



**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 5.0' bgs during drilling.  
 Water level at development was 6.45' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.86 feet



**Date Start:** 10/12/15  
**Date Finish:** 10/12/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** John Pitsch  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 11.0  
**Water Level Finish (ft. btoc.):** 6.77

**Northing:** 645555.93  
**Easting:** 12624726.22  
**Casing Elevation:** 587.12  
  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 584.1  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15003  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Cloudy, Windy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
585										
0								(0.0 - 0.1') GRASS and TOPSOIL.		TOC Elevation = 587.12 (ft. above msl)
580		1	0.0-8.0'	3.5	NA			(0.1 - 10.0') SAND, fine to medium; trace to little very fine sand, subround; well sorted; moist to wet; dark brown (10YR 3/3).		Concrete (0.0-1.0' bgs)
575		2	8.0-10.0'	1.0	NA					Bentonite/Cement Grout (1.0-9.0' bgs) 2" PVC Well Casing (-3.0-13.0' bgs)
10								(10.0 - 11.0') CLAY and SILT, medium plasticity, no dilatancy; little to some very fine to fine sand, subround; medium stiff; moist; brown (10YR 4/3). NOTE: little to some organic matter; roots, wood.		Bentonite Pellets (9.0-11.0' bgs)
								(11.0 - 18.0') SAND, fine to medium; trace to little very fine sand, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/2).		

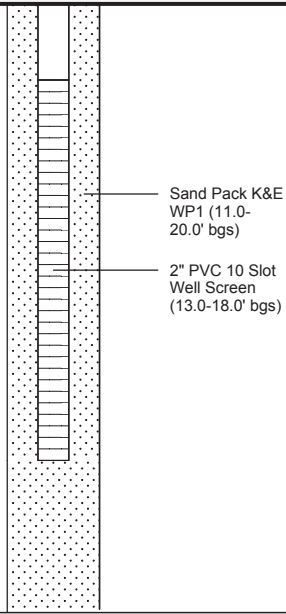
**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 11.0' bgs during drilling.  
 Water level at development was 6.77' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.84 feet



**Date Start:** 10/12/15  
**Date Finish:** 10/12/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** John Pitsch  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 11.0  
**Water Level Finish (ft. btoc.):** 6.77

**Northing:** 645555.93  
**Easting:** 12624726.22  
**Casing Elevation:** 587.12  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 584.1  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15003  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Cloudy, Windy


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15	570	3	10.0-20.0'	9.0	NA					
	565							(18.0 - 20.0') SAND, very fine to fine, subround; little to trace silt; well sorted; wet; grayish brown (10YR 5/2) to gray (10YR 6/1).  NOTE: Organic matter; roots, leaves, wood from 18.0 to 18.3' bgs and 19.0 to 19.1' bgs.		
20								End of boring 20.0' bgs.		
25	560									



**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 11.0' bgs during drilling.  
 Water level at development was 6.77' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.84 feet

<b>Date Start:</b> 10/13/15 <b>Date Finish:</b> 10/13/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 7.0 <b>Water Level Finish (ft. btoc.):</b> 10.27	<b>Northing:</b> 645491.68 <b>Easting:</b> 12624824.48 <b>Casing Elevation:</b> 590.57  <b>Borehole Depth (ft. bgs.):</b> 20.0 <b>Surface Elevation:</b> 587.7  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15004  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 50 F Cloudy, Windy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
590										TOC Elevation = 590.57 (ft. above msl)
0								(0.0 - 0.1') GRASS and TOPSOIL.		Concrete (0.0-1.0' bgs)
585		1	0.0-8.0'	3.5	NA			(0.1 - 10.0') SAND, fine; little very fine sand, subround; trace granules, subround; trace silt; well sorted; dry to moist; light yellowish brown (10YR 6/4).		2" PVC Well Casing (-3.0-5.0' bgs)
5								NOTE: Wet at 7.0' bgs.		Bentonite Pellets (1.0-4.0' bgs)
580								(10.0 - 14.0') SAND, fine; little medium, subround; trace to little silt; well sorted; wet; grayish brown (10YR 5/2).		Sand Pack K&E WP1 (4.0-20.0' bgs)
10								NOTE: Trace organic material; wood at 13.5' bgs.		2" PVC 10 Slot Well Screen (5.0-15.0' bgs)
575		2	8.0-20.0'	10.0	NA			(14.0 - 17.0') SAND, medium; little coarse sand, subround; trace granules, subround; little silt; well sorted; wet; grayish brown (10YR 5/2).		
15								NOTE: Organic matter, wood; dark brown (10YR 3/3) from 16.5 to 17.0' bgs.		
570								(17.0 - 20.0') SAND, very fine to fine, subround; little silt; well sorted; wet; grayish brown (10YR 5/2).		
20								End of boring 20.0' bgs.		

	<p><b>Remarks:</b> bgs = below ground surface btoc = below top of casing</p> <p>Air Knife to 8.0' bgs. Groundwater encountered at 7.0' bgs during drilling. Water level at development was 10.27' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.82 feet</p>
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**Date Start:** 10/13/15  
**Date Finish:** 10/13/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 6.0  
**Water Level Finish (ft. btoc.):** 7.61

**Northing:** 645166.74  
**Easting:** 12624783.15  
**Casing Elevation:** 587.77  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 584.8  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15005  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 50 F Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	585							(0.0 - 0.1') GRASS and TOPSOIL.		TOC Elevation = 587.77 (ft. above msl)
0 - 5	580	1	0.0-6.0'	6.0	NA		(0.1 - 10.0') SAND, fine; little very fine sand, subround; trace granules, subround; little to trace silt; well sorted; moist to wet; pale brown (10YR 6/3).			Concrete (0.0-1.0' bgs) 2" PVC Well Casing (-3.0-5.0' bgs) Bentonite Pellets (1.0-4.0' bgs)
5 - 10	575	2	6.0-10.0'	4.0	NA		NOTE: Wet at 6.0' bgs.			
10 - 15	570	3	10.0-20.0'	8.0	NA		(10.0 - 10.5') SAND, fine, subround; little silt; well sorted; wet; very dark gray (10YR 3/1). NOTE: trace organic matter, large wood fragments. (10.5 - 20.0') SAND, fine to medium; trace coarse sand, subround; little to trace silt; well sorted; wet; grayish brown (10YR 5/2).			Sand Pack K&E WP1 (4.0-20.0' bgs) 2" PVC 10 Slot Well Screen (5.0-15.0' bgs)
15 - 20	565						End of boring 20.0' bgs.			

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 6.0' bgs.  
 Groundwater encountered at 6.0' bgs during drilling.  
 Water level at development was 7.61' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.54 feet



**Date Start:** 10/13/15  
**Date Finish:** 10/13/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 5.0  
**Water Level Finish (ft. btoc.):** 7.45

**Northing:** 645291.65  
**Easting:** 12624610.52  
**Casing Elevation:** 587.81  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 584.9  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15006  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 50 F Cloudy

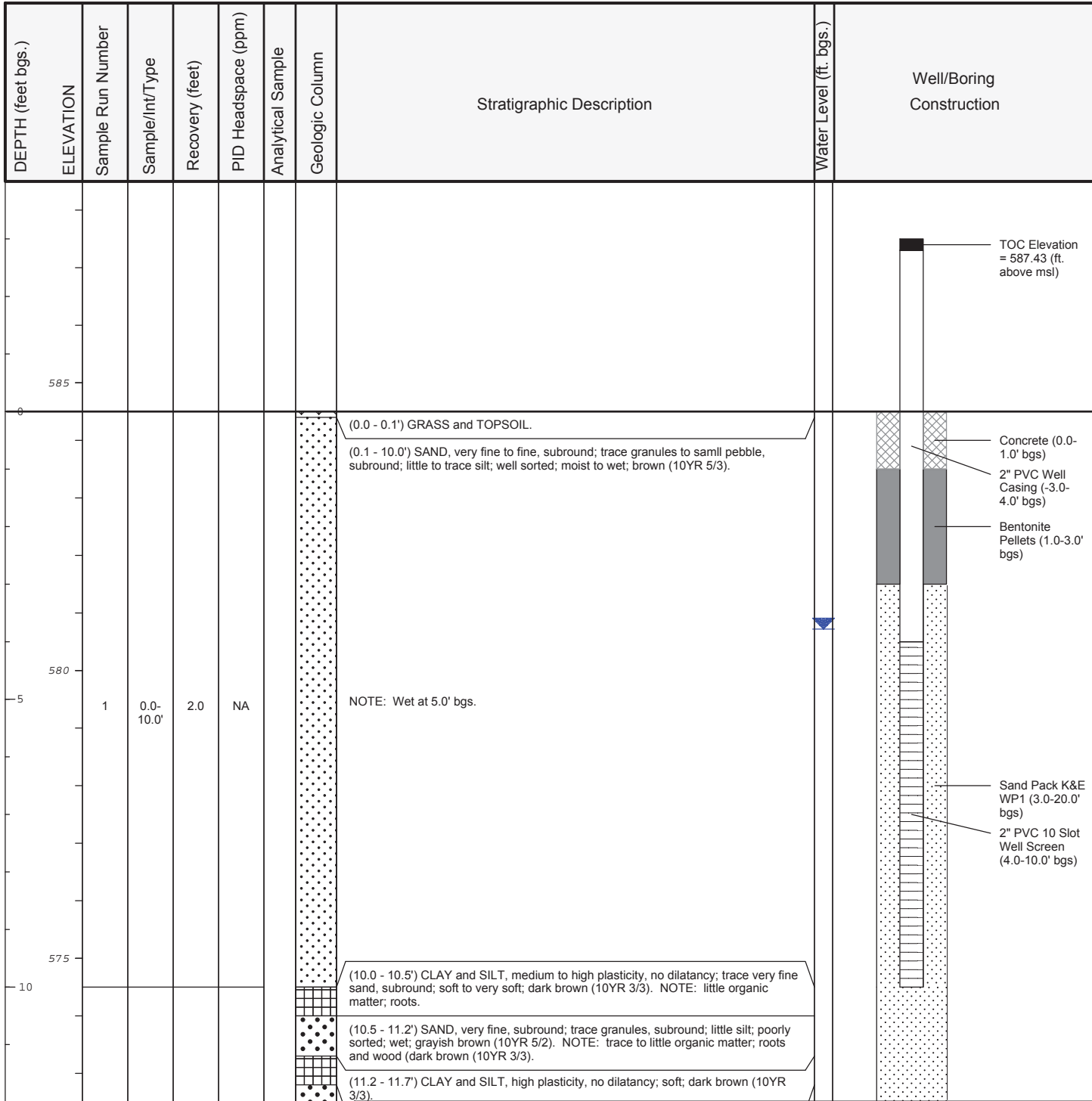
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	585							(0.0 - 0.1') LANDSCAPING STONE.		TOC Elevation = 587.81 (ft. above msl)
0 - 5	580	1	0.0-10.0'	4.0	NA		(0.1 - 9.0') SAND, fine, subround; trace granules, subround; trace silt; well sorted; moist to wet; light yellowish brown (10YR 6/4).			Concrete (0.0-1.0' bgs) 2" PVC Well Casing (-3.0-5.0' bgs) Bentonite Pellets (1.0-4.0' bgs)
5 - 10	575						(9.0 - 20.0') SAND, fine to medium, subround; trace granules, subround; well sorted; wet; light brownish gray (10YR 6/2).	NOTE: Wet at 5.0' bgs.		Sand Pack K&E WP1 (4.0-20.0' bgs) 2" PVC 10 Slot Well Screen (5.0-15.0' bgs)
10 - 15	570	2	10.0-20.0'	8.0	NA					
15 - 20	565							End of boring 20.0' bgs.		

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 6.0' bgs.  
 Groundwater encountered at 5.0' bgs during drilling.  
 Water level at development was 7.45' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 581.14 feet





<b>Date Start:</b> 10/14/15 <b>Date Finish:</b> 10/14/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 5.0 <b>Water Level Finish (ft. btoc.):</b> 6.78	<b>Northing:</b> 645409.39 <b>Easting:</b> 12624188.85 <b>Casing Elevation:</b> 587.43  <b>Borehole Depth (ft. bgs.):</b> 20.0 <b>Surface Elevation:</b> 584.5  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15007  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 50 F Cloudy
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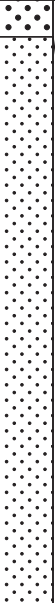
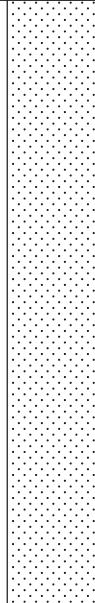



**Remarks:** bgs = below ground surface  
btoc = below top of casing

Air Knife to 9.0' bgs.  
Groundwater encountered at 5.0' bgs during drilling.  
Water level at development was 6.78' btoc.  
No odor or staining observed.  
Groundwater elevation measured on November 30, 2015 was 581.13 feet



<b>Date Start:</b> 10/14/15 <b>Date Finish:</b> 10/14/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 5.0 <b>Water Level Finish (ft. btoc.):</b> 6.78	<b>Northing:</b> 645409.39 <b>Easting:</b> 12624188.85 <b>Casing Elevation:</b> 587.43  <b>Borehole Depth (ft. bgs.):</b> 20.0 <b>Surface Elevation:</b> 584.5  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15007  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 50 F Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15	570	2	10.0-20.0'	8.0	NA			<p>(11.7 - 12.5') SAND, very fine to fine, subround; little silt; poorly sorted; wet; pale brown (10YR 6/3).</p> <p>NOTE: Organic rich matter roots and wood; dark brown (10YR 3/3) from 12.0 to 12.5' bgs.</p> <p>(12.5 - 20.0') SAND, fine to medium; little very fine sand, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/2).</p> <p>NOTE: Organic matter wood; dark brown (10YR 3/3) from 19.5 to 20.0' bgs.</p>		
20	565							End of boring 20.0' bgs.		
25	560									

 <small>Design &amp; Consultancy for natural and built assets</small>	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 9.0' bgs. Groundwater encountered at 5.0' bgs during drilling. Water level at development was 6.78' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 581.13 feet
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**Date Start:** 10/14/15  
**Date Finish:** 10/14/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 4.5  
**Water Level Finish (ft. btoc.):** 7.11

**Northing:** 645340.01  
**Easting:** 12623510.47  
**Casing Elevation:** 587.76  
**Borehole Depth (ft. bgs.):** 20.0  
**Surface Elevation:** 584.8  
**Descriptions By:** A. Westhuis

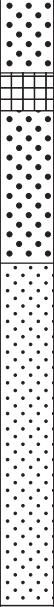
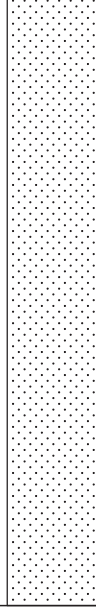
**Well/Boring ID:** BCC MW-15008  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	585							(0.0 - 0.1') LANDSCAPING STONE.		TOC Elevation = 587.76 (ft. above msl)
0 - 5	580	1	0.0-10.0'	3.0	NA		(0.1 - 9.5') SAND, fine to very fine, subround; trace granules to small pebble, subround; little silt; well sorted; moist to wet; brown (10YR 5/3).	NOTE: Wet at 4.5' bgs.	4.5	Concrete (0.0-1.0' bgs) 2" PVC Well Casing (-3.0-4.0' bgs) Bentonite Pellets (1.0-3.0' bgs)
5 - 10	575						(9.5 - 12.0') SAND, fine, little medium sand, subround; little to trace silt; well sorted; wet; grayish brown (10YR 5/2).		7.11	Sand Pack K&E WP1 (3.0-20.0' bgs) 2" PVC 10 Slot Well Screen (4.0-9.0' bgs)

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 4.5' bgs during drilling.  
 Water level at development was 7.11' btoc.  
 No staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.99 feet



<b>Date Start:</b> 10/14/15 <b>Date Finish:</b> 10/14/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 4.5 <b>Water Level Finish (ft. btoc.):</b> 7.11	<b>Northing:</b> 645340.01 <b>Easting:</b> 12623510.47 <b>Casing Elevation:</b> 587.76  <b>Borehole Depth (ft. bgs.):</b> 20.0 <b>Surface Elevation:</b> 584.8  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15008  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15	570	2	10.0-20.0'	9.0	NA			<p>(12.0 - 13.0') SAND, fine, little medium sand, subround; little to some silt; poorly sorted; wet; dark grayish brown (10YR 4/2). NOTE: wood fragments; very dark gray (10YR 3/1), slight odor at 12.0' bgs.</p> <p>(13.0 - 13.5') CLAY and SILT, low plasticity, no dilatancy; little to trace very fine to fine sand, subround; soft; dark brown (10YR 3/3). NOTE: little organic matter, roots.</p> <p>(13.5 - 15.5') SAND, fine, subround; some silt; poorly sorted; wet; brown (10YR 4/3). NOTE: trace organics.</p> <p>(15.5 - 20.0') SAND, fine to medium; trace silt; well sorted; wet; grayish brown (10YR 5/2).</p>		
20	565							End of boring 20.0' bgs.		
25	560									

	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 8.0' bgs. Groundwater encountered at 4.5' bgs during drilling. Water level at development was 7.11' btoc. No staining observed. Groundwater elevation measured on November 30, 2015 was 580.99 feet
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<b>Date Start:</b> 10/14/15 <b>Date Finish:</b> 10/14/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 0.5 <b>Water Level Finish (ft. btoc.):</b> 7.51	<b>Northing:</b> 645606.92 <b>Easting:</b> 12623622.98 <b>Casing Elevation:</b> 589.27  <b>Borehole Depth (ft. bgs.):</b> 24.0 <b>Surface Elevation:</b> 586.3  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15009  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
590										<p>TOC Elevation = 589.27 (ft. above msl)</p>
0								(0.0 - 8.0') NO RECOVERY, soils not logged, air knife soil cuttings disposed in CE approved area.		<p>Concrete (0.0-1.0' bgs)</p>
585		1	0.0-8.0'	0.0	NA			NOTE: Wet at 4.5' bgs.	7.51	<p>2" PVC Well Casing (-3.0-14.0' bgs) Bentonite/Cement Grout (1.0-11.0' bgs)</p>
580		2	8.0-10.0'	2.0	NA	X X X X X		(8.0 - 10.0') ASH, rapid dilatancy; wet; soft; very dark gray (10YR 3/1). NOTE: Fill material. Little to trace organic matter; roots and wood fragments.		
10								(10.0 - 12.0') CLAY and SILT, low plasticity, no dilatancy; some to little very fine to fine sand, subround; soft; dark brown (10YR 3/3).		

	<p><b>Remarks:</b> bgs = below ground surface btoc = below top of casing</p> <p>Air Knife to 8.0' bgs. Groundwater encountered at 0.5' bgs during drilling. Water level at development was 7.51' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 581.88 feet</p>
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**Date Start:** 10/14/15  
**Date Finish:** 10/14/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 0.5  
**Water Level Finish (ft. btoc.):** 7.51

**Northing:** 645606.92  
**Easting:** 12623622.98  
**Casing Elevation:** 589.27  
  
**Borehole Depth (ft. bgs.):** 24.0  
**Surface Elevation:** 586.3  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15009  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
575		3	10.0-15.0'	4.0	NA			(12.0 - 17.2') SAND, fine, subround; little silt; well sorted; wet; brown (10YR 4/3). NOTE: Some clay, low plasticity, no dilatancy; soft; dark brown (10YR 3/3).		Bentonite Pellets (11.0-13.0' bgs)
15										
570		4	15.0-20.0'	5.0	NA			NOTE: Some organic rich matter, roots and wood; wet; very dark brown (10YR 2/2) from 17.0 to 17.2' bgs.  (17.2 - 24.0') CLAY and SILT, low plasticity, no dilatancy; little to trace very fine to fine sand, subround; soft; dark brown (10YR 3/3). NOTE: little organic matter, roots.		Sand Pack K&E WP1 (13.0-24.0' bgs) 2" PVC 10 Slot Well Screen (14.0-24.0' bgs)
20										
565		5	20.0-24.0'	4.0	NA					
25								End of boring 24.0' bgs.		



**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 0.5' bgs during drilling.  
 Water level at development was 7.51' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 581.88 feet

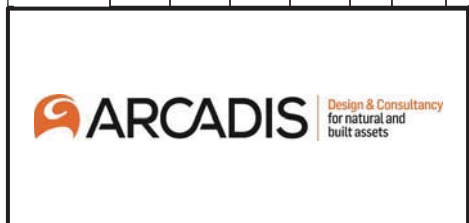


**Date Start:** 10/14/15  
**Date Finish:** 10/15/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 0.3  
**Water Level Finish (ft. btoc.):** 6.93

**Northing:** 645690.69  
**Easting:** 12623979.47  
**Casing Elevation:** 588.11  
**Borehole Depth (ft. bgs.):** 24.0  
**Surface Elevation:** 585.2  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15010  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15	570	2	10.0-20.0'	8.0	NA			NOTE: Little silt and organic matter near 17.0' bgs.		<p>           Sand Pack K&amp;E WP1 (11.0-22.0' bgs)            2" PVC 10 Slot Well Screen (12.0-22.0' bgs)         </p>
20	565	3	20.0-24.0'	4.0	NA					
25	560							End of boring 24.0' bgs.		



**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 0.3' bgs during drilling.  
 Water level at development was 6.93' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 581.42 feet



**Date Start:** 10/15/15  
**Date Finish:** 10/15/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 6.5  
**Water Level Finish (ft. btoc.):** 13.03

**Northing:** 64578029  
**Easting:** 12623765.87  
**Casing Elevation:** 595.22  
  
**Borehole Depth (ft. bgs.):** 32.0  
**Surface Elevation:** 592.3  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15011  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
575							X X X X	(18.0 - 19.0') CLAY and SILT, medium to high plasticity, no dilatancy; medium stiff to soft; moist; dark brown (10YR 3/3). NOTE: organic rich, some wood and roots; slight odor.		
20							X	(19.0 - 26.0') SAND, fine, subround; some to little silt; well sorted; wet; light brownish gray (10YR 6/2).		Bentonite Pellets (18.0-20.0' bgs)
570		3	20.0-32.0'	9.0	NA		.	(26.0 - 27.0') SAND, fine, little medium sand, subround; little silt; poorly sorted; wet; dark grayish brown (10YR 4/2). NOTE: organic rich, some roots and wood.		
25							.	(27.0 - 32.0') SAND, fine, little very fine sand, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/2).		Sand Pack K&E WP1 (20.0-32.0' bgs) 2" PVC 10 Slot Well Screen (21.0-31.0' bgs)
565							.			
30							.			
560							.	End of boring 32.0' bgs.		
35							.			

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 9.0' bgs.  
 Groundwater encountered at 6.5' bgs during drilling.  
 Water level at development was 13.03' btoc.  
 No staining observed.  
 Groundwater elevation measured on November 30, 2015 was 582.13 feet





<b>Date Start:</b> 10/15/15 <b>Date Finish:</b> 10/15/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 8.0 <b>Water Level Finish (ft. btoc.):</b> 13.79	<b>Northing:</b> 645889.92 <b>Easting:</b> 12623545.99 <b>Casing Elevation:</b> 597.39  <b>Borehole Depth (ft. bgs.):</b> 35.0 <b>Surface Elevation:</b> 594.5  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15012  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
595										TOC Elevation = 597.39 (ft. above msl)
590		1	0.0-10.0'	3.0	NA		(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 9.0') SAND, fine, subround, and ASH; little silt; poorly sorted; wet; soft; dark grayish brown (10YR 4/2).  NOTE: Wet at 8.0' bgs.			Concrete (0.0-1.0' bgs)
585							(9.0 - 18.0') ASH, little fine sand, subround; non-plastic, rapid dilatancy; poorly sorted; wet; soft; gray (10YR 5/1). NOTE: Fill material.  NOTE: Laminated from 13.0-15.0' bgs.			2" PVC Well Casing (-3.0-21.0' bgs) Bentonite/Cement Grout (1.0-18.0' bgs)
580		2	10.0-20.0'	9.0	NA					

**Remarks:** bgs = below ground surface  
btoc = below top of casing

Air Knife to 9.0' bgs.  
Groundwater encountered at 8.0' bgs during drilling.  
Water level at development was 13.79' btoc.  
No staining observed.  
Groundwater elevation measured on November 30, 2015 was 583.46 feet


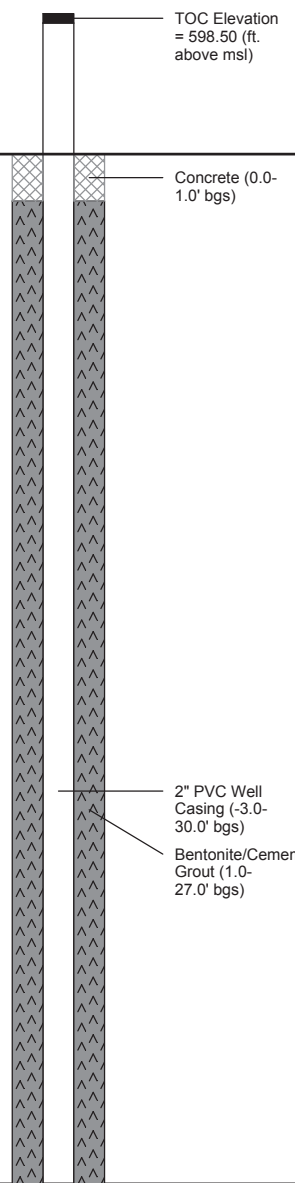

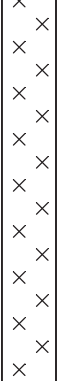





**Date Start:** 10/15/15  
**Date Finish:** 10/16/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 9.5  
**Water Level Finish (ft. btoc.):** 16.38

**Northing:** 645716.41  
**Easting:** 12623389.21  
**Casing Elevation:** 598.5  
**Borehole Depth (ft. bgs.):** 40.0  
**Surface Elevation:** 595.9  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15013  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	595	1	0.0-10.0'	5.0	NA			(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 9.5') SAND, fine, subround, and ASH; poorly sorted; moist; yellowish brown (10YR 5/6) to dark yellowish brown (10YR 3/6).  NOTE: Wet at 9.5' bgs.		
5	590							(9.5 - 10.5') ASH, little fine sand, subround; non-plastic, rapid dilatancy; poorly sorted; wet; soft; gray (10YR 5/1) to dark gray (10YR 4/1). NOTE: Fill material. (10.5 - 13.5') SAND, fine to medium, and ASH; trace coarse sand, subround; poorly sorted; moist to wet; dark yellowish brown (10YR 4/4) to brown (10YR 4/3).		
10	585							(13.5 - 28.0') ASH; little fine sand, subround; non-plastic, rapid dilatancy; poorly sorted; wet; very soft; gray (10YR 5/1) to grayish brown (10YR 5/2).		2" PVC Well Casing (-3.0-30.0' bgs) Bentonite/Cement Grout (1.0-27.0' bgs)
15	580	2	10.0-20.0'	9.0	NA					
20	575									

**Remarks:** bgs = below ground surface  
  
 Air Knife to 9.0' bgs.  
 Groundwater encountered at 9.5' bgs during drilling.  
 Water level at development was 16.38' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 582.33 feet above mean sea level.



**Date Start:** 10/15/15  
**Date Finish:** 10/16/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 9.5  
**Water Level Finish (ft. btoc.):** 16.38

**Northing:** 645716.41  
**Easting:** 12623389.21  
**Casing Elevation:** 598.5  
  
**Borehole Depth (ft. bgs.):** 40.0  
**Surface Elevation:** 595.9  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15013  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	570	3	20.0-25.0'	4.0	NA		X X X X X X X X X X			
30	565		25.0-30.0	5.0	NA		X X X X X X X X X X	(28.0 - 36.0') SAND, fine, trace medium sand, subround; trace silt; well sorted; wet; light gray (10YR 7/2) to very pale brown (10YR 7/3).		Bentonite Pellets (27.0-29.0' bgs)
35	560		30.0-35.0	5.0	NA		X X X X X X X X X X	(36.0 - 36.5') SAND, fine, subround; trace silt and organics; light gray (10YR 7/1) to dark yellowish brown (10YR 4/4). NOTE: some leaves and small sticks.		Sand Pack K&E WP1 (29.0-40.0' bgs)
40	555		35.0-40.0	4.0	NA		X X X X X X X X X X	(36.5 - 37.5') CLAY and SILT, low plasticity to non-plastic, no dilatancy; moist; medium stiff; dark brown (10YR 3/3). NOTE: some organics, leaves, roots and wood.  (37.5 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; light gray (10YR 7/2).		2" PVC 10 Slot Well Screen (30.0-40.0' bgs)
45	550							End of boring 40.0' bgs.		

**Remarks:** bgs = below ground surface  
  
 Air Knife to 9.0' bgs.  
 Groundwater encountered at 9.5' bgs during drilling.  
 Water level at development was 16.38' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 582.33 feet above mean sea level.



<b>Date Start:</b> 10/16/15 <b>Date Finish:</b> 10/16/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 14.0 <b>Water Level Finish (ft. btoc.):</b> 15.50	<b>Northing:</b> 645925.93 <b>Easting:</b> 12623318.73 <b>Casing Elevation:</b> 599.04  <b>Borehole Depth (ft. bgs.):</b> 40.0 <b>Surface Elevation:</b> 596.2  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15014  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
600										
0								(0.0 - 0.1') GRASS, ROOTS and ASH.		TOC Elevation = 599.04 (ft. above msl)
595		1	0.0-10.0'	3.0	NA			(0.1 - 14.0') SAND, fine to medium, subround, and ASH; poorly sorted; soft; moist to wet; brown (10YR 5/3) to dark grayish brown (10YR 4/2). NOTE: Fill material.		Concrete (0.0-1.0' bgs)
590										
585								(14.0 - 14.5') ASH, little fine sand, subround; non-plastic, rapid dilatancy; poorly sorted; wet; soft; very dark grayish brown (10YR 5/2) to dark gray (10YR 4/1). NOTE: Fill material. Little to trace organics; roots.		2" PVC Well Casing (-3.0-23.0' bgs)
15		2	10.0-20.0'	9.0	NA			(14.5 - 17.5') ASH, non-plastic, rapid dilatancy; poorly sorted; wet; soft; dark gray (10YR 4/1). NOTE: Fill material.		Bentonite/Cement Grout (1.0-20.0' bgs)
580								(17.5 - 20.0') ASH, non-plastic, rapid dilatancy; poorly sorted; wet; soft; grayish brown (10YR 5/2) to dark gray (10YR 4/1). NOTE: Fill material, laminated.		
20								(20.0 - 27.0') SAND, fine, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/2). NOTE: Organic rich matter, roots, leaves; dark brown (10YR 3/3) from 20.0 to 20.5' bgs.		Bentonite Pellets (20.0-22.0' bgs)
575										

**Remarks:** bgs = below ground surface  
btoc = below top of casing

Air Knife to 9.25' bgs.  
Groundwater encountered at 14.0' bgs during drilling.  
Water level at development was 15.50' btoc.  
No odor or staining observed.  
Groundwater elevation measured on November 30, 2015 was 583.19 feet





<b>Date Start:</b> 10/16/15 <b>Date Finish:</b> 10/16/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 14.0 <b>Water Level Finish (ft. btoc.):</b> 15.50	<b>Northing:</b> 645925.93 <b>Easting:</b> 12623318.73 <b>Casing Elevation:</b> 599.04  <b>Borehole Depth (ft. bgs.):</b> 40.0 <b>Surface Elevation:</b> 596.2  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15014  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	570	3	20.0-30.0'	8.0	NA					<p>Sand Pack K&amp;E WP1 (22.0-40.0' bgs) 2" PVC 10 Slot Well Screen (23.0-31.0' bgs)</p>
30	565						(27.0 - 31.0') SAND, fine, subround; some silt; little clay; poorly sorted; wet; light brownish gray (10YR 6/2). NOTE: little to some organics, roots and wood from 27.0 to 27.1' bgs and at 30.0' bgs.			
35	560	4	30.0-40.0	9.0	NA		(31.0 - 34.0') SAND and SILT; trace clay; non-plastic, rapid dilatancy; wet; poorly sorted; soft; dark grayish brown (10YR 4/2). NOTE: rich organic layer; some roots and wood.			
							(34.0 - 36.0') SAND, fine, subround; little silt; well sorted; wet; light brownish gray (10YR 6/2).			
							(36.0 - 37.5') SAND, fine, and ORGANICS; poorly sorted; wet; dark brown (10YR 3/3) to light gray (10YR 7/2).			
							(37.5 - 39.0') SAND, fine, subround; well sorted; wet; light brownish gray (10YR 6/2).			
40	555						(39.0 - 40.0') CLAY and SILT, low plasticity to non-plastic, no dilatancy; moist; medium stiff; dark brown (10YR 3/3).			
45	550						End of boring 40.0' bgs.			

	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 9.25' bgs. Groundwater encountered at 14.0' bgs during drilling. Water level at development was 15.50' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 583.19 feet
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**Date Start:** 10/16/15  
**Date Finish:** 10/19/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.5  
**Water Level Finish (ft. btoc.):** 12.16

**Northing:** 646138.93  
**Easting:** 12623024.09  
**Casing Elevation:** 596.75  
**Borehole Depth (ft. bgs.):** 30.0  
**Surface Elevation:** 593.9  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15015  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
595										
0								(0.0 - 8.5') SAND, fine to medium, and ASH, subangular; poorly sorted; moist; dark grayish brown (4/2). NOTE: Fill material.		TOC Elevation = 596.75 (ft. above msl) Concrete (0.0-1.0' bgs)
5		1	0.0-10.0'	2.0	NA					
585								(8.5 - 14.0') ASH, non-plastic, rapid dilatancy; wet; soft; very dark grayish brown (10YR 3/2). NOTE: Fill material.		2" PVC Well Casing (-3.0-20.0' bgs) Bentonite/Cement Grout (1.0-17.0' bgs)
10										
580										

NOTE: Wood fragments at 14.0' bgs.

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 8.5' bgs during drilling.  
 Water level at development was 12.16' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.81 feet



**Date Start:** 10/16/15  
**Date Finish:** 10/19/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.5  
**Water Level Finish (ft. btoc.):** 12.16

**Northing:** 646138.93  
**Easting:** 12623024.09  
**Casing Elevation:** 596.75  
**Borehole Depth (ft. bgs.):** 30.0  
**Surface Elevation:** 593.9  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15015  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15		2	10.0-20.0'	9.0	NA		(14.0 - 17.0') SAND, fine, subround; well sorted; wet; light brownish gray (10YR 6/4). NOTE: light yellowish brown (10YR 6/4) from 14.0-16.0' bgs; pale brown (10YR 6/3) from 16.-17.0' bgs.			
575						X X X X	(17.0 - 19.0') FILL material, wood fragments; brown (10YR 4/3) to very dark brown (10YR 2/2).			Bentonite Pellets (17.0-19.0' bgs)
20							(19.0 - 29.0') SAND, fine, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/4).			
570										
25		3	20.0-30.0'	10.0	NA			NOTE: Little clay and silt at 27.0' bgs.		
565							(29.0 - 29.5') CLAY and SILT, low to medium plasticity, no dilatancy; little fine sand, subround; moist; medium stiff; brown (10YR 4/3). NOTE: organic rich, wood near 29.5' bgs.			
30							(29.5 - 30.0') SAND, fine, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/4).			Sand Pack K&E WP1 (19.0-30.0' bgs) 2" PVC 10 Slot Well Screen (20.0-30.0' bgs)
							End of boring 30.0' bgs.			

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 8.5' bgs during drilling.  
 Water level at development was 12.16' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.81 feet



**Date Start:** 10/19/15  
**Date Finish:** 10/19/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.5  
**Water Level Finish (ft. btoc.):** 8.65

**Northing:** 646227.56  
**Easting:** 12622459.26  
**Casing Elevation:** 589.05  
**Borehole Depth (ft. bgs.):** 45.0  
**Surface Elevation:** 586.2  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15016  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
590										TOC Elevation = 589.05 (ft. above msl)
8								(0.0 - 15.0') SAND, fine to medium, and ASH; little coarse, subround; poorly sorted; moist to wet; dark grayish brown (10YR 4/2). NOTE: Fill material, trace coal fragments.		Concrete (0.0-1.0' bgs)
5		1	0.0-10.0'	3.0	NA			NOTE: Wet at 9.0' bgs.	8.5	
580										
10										
575		2	10.0-20.0'	10.0	NA			(15.0 - 17.0') SAND, fine, subround; little silt; well sorted; wet; light brownish gray (10YR 6/4).		2" PVC Well Casing (-3.0-35.0' bgs)
15								(17.0 - 19.0') FILL material, wood fragments; some fine sand, subround; brown (10YR 4/3) to very dark brown (10YR 2/2).		Bentonite/Cement Grout (1.0-32.0' bgs)
570								(19.0 - 25.0') SAND, fine, subround; some clay; some to trace silt, non-plastic, no dilatancy; medium stiff; well sorted; wet; light brownish gray (10YR 6/4).		
20								NOTE: organic rich matter, leaves, sticks, wood; moist; dark brown (10YR 3/3) from 21.0 to 25.0' bgs.		
565										

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 8.5' bgs during drilling.  
 Water level at development was 8.65' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.08 feet



**Date Start:** 10/19/15  
**Date Finish:** 10/19/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.5  
**Water Level Finish (ft. btoc.):** 8.65

**Northing:** 646227.56  
**Easting:** 12622459.26  
**Casing Elevation:** 589.05  
  
**Borehole Depth (ft. bgs.):** 45.0  
**Surface Elevation:** 586.2  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15016  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Partly Cloudy

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	560	3	20.0-30.0'	10.0	NA			(25.0 - 27.0') SAND, fine, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/4).		
								(27.0 - 28.5') CLAY and SILT, low plasticity to non-plastic, no dilatancy; little fine sand, subround; moist; soft; dark brown (10YR 3/3). NOTE: organic rich, trace roots.		
								(28.5 - 28.8') SAND, fine, subround; trace silt; well sorted; wet; light brownish gray (10YR 6/4).		
30	555							(28.8 - 35.0') CLAY and SILT, low plasticity to non-plastic, no dilatancy; little fine sand, subround; moist; soft; dark brown (10YR 3/3). NOTE: Organic rich; trace roots from 28.8 to 30.0' bgs.		
								NOTE: Trace shell fragments at 34.0' bgs.		
35	550	4	30.0-40.0'	9.0	NA			(35.0 - 37.0') SAND, fine, subround; little silt; well sorted; wet; yellowish brown (10YR 5/4).		
								(37.0 - 40.5') SAND, fine, subround; trace silt; well sorted; wet; pale brown (10YR 6/3).		
								NOTE: Trace small pebble, subround at 39.0' bgs.		
40	545	5	40.0-45.0'	5.0	NA			(40.5 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; medium stiff to soft; gray (10YR 7/1).		
45	540							End of boring 45.0' bgs.		

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 8.5' bgs during drilling.  
 Water level at development was 8.65' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.08 feet

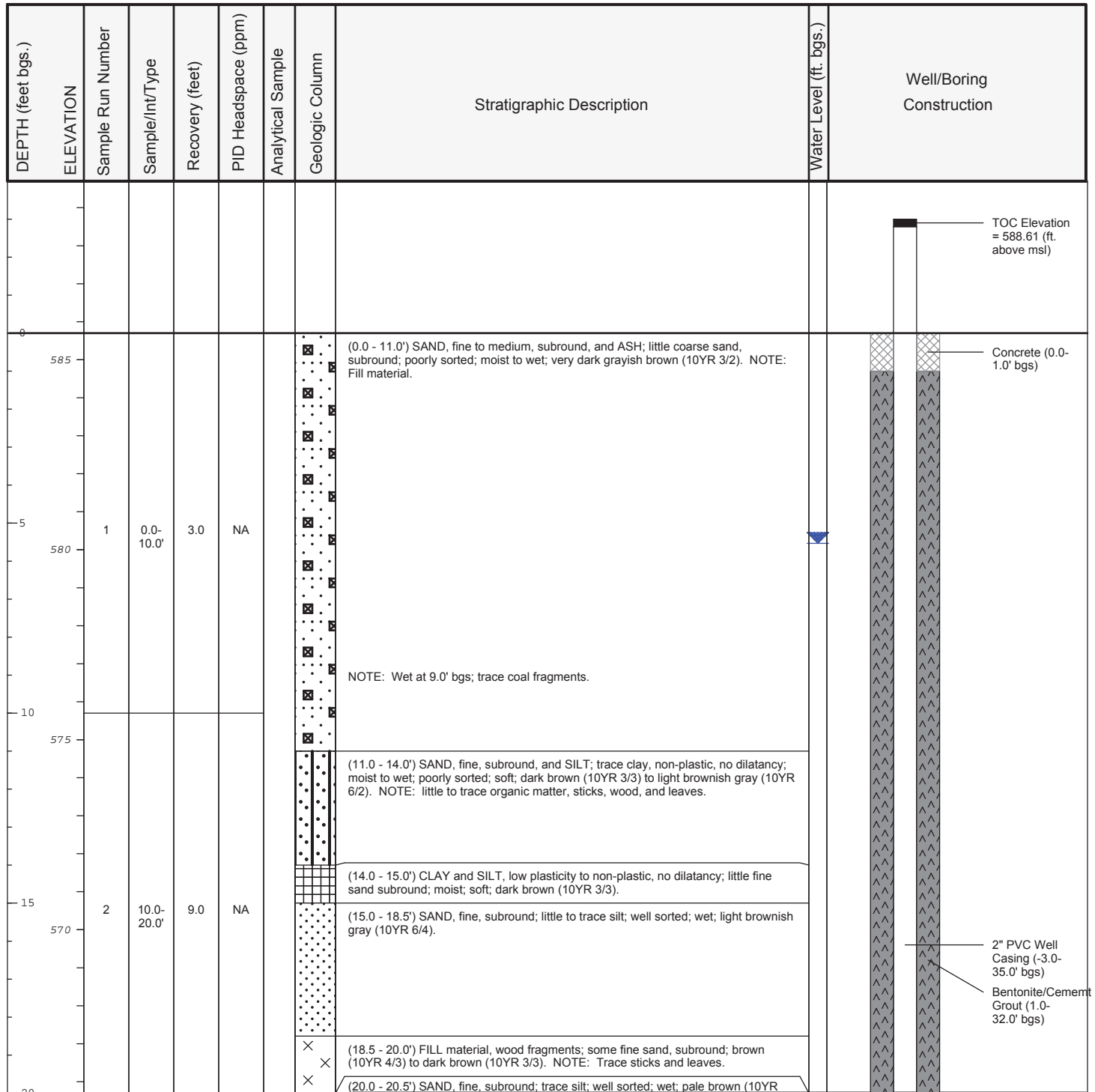




**Date Start:** 10/19/15  
**Date Finish:** 10/20/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.0  
**Water Level Finish (ft. btoc.):** 8.53

**Northing:** 646354.69  
**Easting:** 12622085.55  
**Casing Elevation:** 588.61  
**Borehole Depth (ft. bgs.):** 40.0  
**Surface Elevation:** 585.7  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15017  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy, Windy



**Remarks:** bgs = below ground surface  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 8.0' bgs during drilling.  
 Water level at development was 8.53' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 579.99 feet above mean sea level.



<b>Date Start:</b> 10/19/15 <b>Date Finish:</b> 10/20/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 8.0 <b>Water Level Finish (ft. btoc.):</b> 8.53	<b>Northing:</b> 646354.69 <b>Easting:</b> 12622085.55 <b>Casing Elevation:</b> 588.61  <b>Borehole Depth (ft. bgs.):</b> 40.0 <b>Surface Elevation:</b> 585.7  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15017  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy, Windy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
565								6/3). (20.5 - 21.5') SAND, fine, subround; trace silt; trace wood; poorly sorted; wet; pale brown (10YR 6/3) to dark brown (10YR 3/3). NOTE: Organic rich matter, wood, sticks; dark brown (10YR 3/3) from 21.0 to 21.5' bgs. (21.5 - 22.0') SAND, fine subround; trace silt; well sorted; wet; pale brown (10YR 6/3). (22.0 - 23.5') CLAY and SILT, non-plastic, no dilatancy; little fine sand, subround; moist; soft; brown (10YR 3/3). (23.5 - 33.0') CLAY and SILT, non-plastic, no dilatancy; some fine sand, subround; moist; soft; brown (10YR 3/3).		
25		3	20.0-30.0'	9.0	NA					
560								NOTE: Some wood and sticks; trace shell fragments at 33.0' bgs. (33.0 - 35.0') SAND, fine, subround; trace silt; well sorted; wet; yellow (10YR 7/6).		
30										
555								(35.0 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; pale brown (10YR 6/3).		
35		4	30.0-40.0'	9.0	NA					
550										
40								End of boring 40.0' bgs.		
545										

**Remarks:** bgs = below ground surface

Air Knife to 8.0' bgs.  
 Groundwater encountered at 8.0' bgs during drilling.  
 Water level at development was 8.53' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 579.99 feet above mean sea level.



**Date Start:** 10/20/15  
**Date Finish:** 10/20/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 8.0  
**Water Level Finish (ft. btoc.):** 11.78

**Northing:** 646789.54  
**Easting:** 12622179.74  
**Casing Elevation:** 592.43  
**Borehole Depth (ft. bgs.):** 45.0  
**Surface Elevation:** 589.4  
**Descriptions By:** A. Westhuis


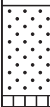

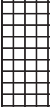
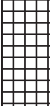
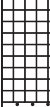
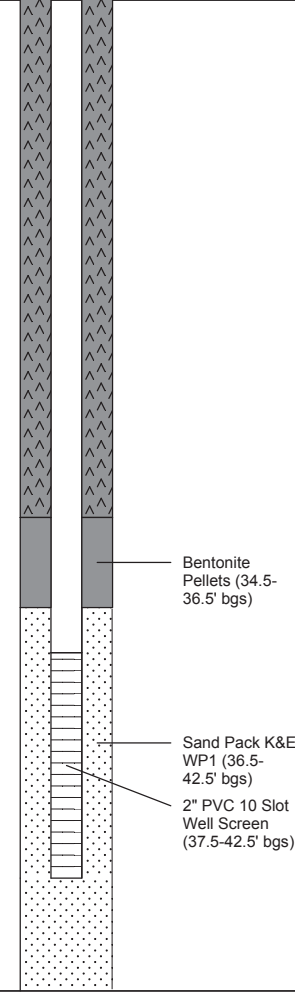
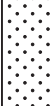
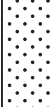
**Well/Boring ID:** BCC MW-15018  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Cloudy


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
8	590							(0.0 - 0.3') STONE, aggregate for road base.		TOC Elevation = 592.43 (ft. above msl)
5	585	1	0.0-10.0'	3.0	NA	X	X	(0.3 - 14.0') ASH, trace to little fine sand, subround; non-plastic; slow dilatancy; moist to wet; soft; very dark gray (10YR 3/1). NOTE: Fill material.		Concrete (0.0-1.0' bgs)
10	580							NOTE: Wet at 8.0' bgs.	580.08	
15	575	2	10.0-20.0'	9.0	NA	.	.	(14.0 - 23.0') SAND, fine, subround; some silt; trace granules; trace clay; poorly sorted; wet; light brownish gray (10YR 6/4). NOTE: Some large wood fragments at 17.5' and 20.0' bgs.		2" PVC Well Casing (-3.0-37.5' bgs)
20	570							NOTE: Increase in silt at 20.0' bgs		Bentonite/Cement Grout (1.0-34.5' bgs)
								NOTE: Organic Rich Matter, wood, sticks, leaves; dark brown (10YR 3/3) from 22.0 to 23.0' bgs.		

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 8.0' bgs during drilling.  
 Water level at development was 11.78' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.08 feet



<b>Date Start:</b> 10/20/15 <b>Date Finish:</b> 10/20/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 8.0 <b>Water Level Finish (ft. btoc.):</b> 11.78	<b>Northing:</b> 646789.54 <b>Easting:</b> 12622179.74 <b>Casing Elevation:</b> 592.43  <b>Borehole Depth (ft. bgs.):</b> 45.0 <b>Surface Elevation:</b> 589.4  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15018  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	565	3	20.0-30.0'	10.0	NA			(23.0 - 25.5') SAND, fine, subround; some silt; poorly sorted; wet; light brownish gray (10YR 6/4). NOTE: wood debris from 24.0 to 24.3' bgs.  NOTE: Organic rich matter, wood, sticks, leaves; dark brown (10YR 3/3) from 25.0 to 25.5' bgs.		
								(25.5 - 27.5') SAND, fine, subround; little to some silt; well sorted; wet; light brownish gray (10YR 6/4). NOTE: wood debris, sticks, brown (10YR 3/3) from 26.0 to 26.3' bgs.		
								(27.5 - 28.0') CLAY and SILT, low plasticity to non-plastic, no dilatancy; little fine sand, subround; moist; soft; dark brown (10YR 3/3).		
30	560							(28.0 - 30.0') SAND, fine, subround, and SILT; wet; poorly sorted; soft; light brownish gray (10YR 6/4) to dark brown (10YR 3/3). NOTE: little wood debris, organic rich near 29.0' bgs.		
								(30.0 - 37.0') CLAY and SILT, low plasticity to non-plastic, no dilatancy; trace fine sand, subround; moist; medium stiff to soft; dark brown (10YR 3/3) to very dark brown (10YR 2/2). NOTE: organic rich, large sticks at 31.0' bgs; white shell fragments from 35.0 to 37.0' bgs.		
35	555	4	30.0-40.0'	10.0	NA			(37.0 - 42.5') SAND, fine, subround; well sorted; wet; very pale brown (10YR 7/3).		
40	550							(42.5 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; medium stiff to soft; gray (10YR 7/1).		
45	545	5	40.0-45.0'	5.0	NA			End of boring 45.0' bgs.		
50	540									

 <small>Design &amp; Consultancy for natural and built assets</small>	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 8.5' bgs. Groundwater encountered at 8.0' bgs during drilling. Water level at development was 11.78' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.08 feet
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<b>Date Start:</b> 10/20/15 <b>Date Finish:</b> 10/20/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 7.0 <b>Water Level Finish (ft. btoc.):</b> 12.22	<b>Northing:</b> 647103.13 <b>Easting:</b> 12622369.93 <b>Casing Elevation:</b> 592.42  <b>Borehole Depth (ft. bgs.):</b> 45.0 <b>Surface Elevation:</b> 589.4  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15019  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	565	3	20.0-30.0'	9.0	NA			(26.0 - 27.0') CLAY and SILT, non-plastic, no dilatancy; little fine sand, subround; moist; soft; dark brown (10YR 3/3). (27.0 - 27.5') SAND, fine, subround; little silt; well sorted; wet; light brownish gray (10YR 6/2). NOTE: some organic debris, sticks. (27.5 - 29.0') SAND, fine, subround; and SILT; trace clay, non-plastic, slow dilatancy; poorly sorted; wet; brown (10YR 4/3) to dark brown (10YR 3/3). (29.0 - 30.0') SAND, fine, subround; some silt; trace clay; poorly sorted; wet; light brownish gray (10YR 6/2). NOTE: some roots, sticks and wood. (30.0 - 31.5') CLAY and SILT, low plasticity, no dilatancy; little to trace fine sand, subround; moist; soft to medium stiff; dark brown (10YR 3/3). NOTE: organic rich. (31.5 - 32.5') SAND, fine, subround, and SILT; poorly sorted; wet; grayish brown (10YR 5/2). (32.5 - 37.0') CLAY and SILT, low plasticity, no dilatancy; little fine sand, subround; moist; medium stiff; dark brown (10YR 3/3). NOTE: ganic rich; trace white shell fragments at 32.5 to 36.5' bgs.		
35	555	4	30.0-40.0'	9.0	NA			(37.0 - 42.0') SAND, fine, subround; trace silt; well sorted; wet; pale brown (10YR 6/3).		
40	550	5	40.0-45.0'	5.0	NA			(42.0 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; medium stiff; gray (10YR 7/1).		
45	545							End of boring 45.0' bgs.		

	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 8.5' bgs. Groundwater encountered at 7.0' bgs during drilling. Water level at development was 12.22' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.11 feet
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**Date Start:** 10/21/15  
**Date Finish:** 10/21/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 7.0  
**Water Level Finish (ft. btoc.):** 12.19

**Northing:** 647436.97  
**Easting:** 12622626.85  
**Casing Elevation:** 592.23  
**Borehole Depth (ft. bgs.):** 45.0  
**Surface Elevation:** 589.5  
**Descriptions By:** A. Westhuis

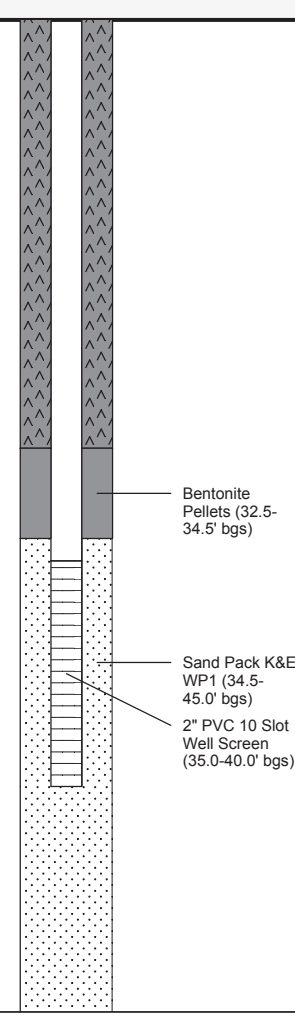
**Well/Boring ID:** BCC MW-15020  
**Client:** Consumers Energy  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
**Weather Conditions:** 60 F Partly Cloudy


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	590									TOC Elevation = 592.23 (ft. above msl) Concrete (0.0-1.0' bgs)
5	585	1	0.0-10.0'	0.0	NA			(0.0 - 10.0') NO RECOVERY; most soil cuttings from air knife were not placed back into the hole.		
10	580								▼	
15	575	2	10.0-20.0'	5.0	NA		(10.0 - 18.0') SAND, fine, subround; some ash; little medium sand; trace granules to small pebble, subangular; moist to wet; poorly sorted; very dark grayish brown (10YR 3/2). NOTE: little large stones; road base fill material.			
20	570						(18.0 - 20.0') ASH, trace fine sand, subround; non-plastic, rapid dilatancy; wet; soft; very dark gray (10YR 4/1). NOTE: Fill material.			2" PVC Well Casing (-3.0-35.0' bgs) Bentonite/Cement Grout (1.0-32.5' bgs)
							(20.0 - 31.0') SAND fine, subround; little silt; well sorted; wet; light brownish gray (10YR 6/2).			

**Remarks:** bgs = below ground surface  
 btoc = below top of casing  
 Air Knife to 8.5' bgs.  
 Groundwater encountered at 7.0' bgs during drilling.  
 Water level at development was 12.19' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.14 feet



<b>Date Start:</b> 10/21/15 <b>Date Finish:</b> 10/21/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 7.0 <b>Water Level Finish (ft. btoc.):</b> 12.19	<b>Northing:</b> 647436.97 <b>Eastings:</b> 12622626.85 <b>Casing Elevation:</b> 592.23  <b>Borehole Depth (ft. bgs.):</b> 45.0 <b>Surface Elevation:</b> 589.5  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15020  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 60 F Partly Cloudy
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	565	3	20.0-30.0'	5.0	NA					
30	560							(31.0 - 32.5') CLAY and SILT, medium plasticity, no dilatancy; trace fine sand, subround; moist; medium stiff; dark brown (10YR 3/3). NOTE: trace white shell fragments.		
35	555	4	30.0-40.0'	10.0	NA			(32.5 - 34.0') SAND, fine, subround; some to little silt; well sorted; wet; brown (10YR 5/3).  (34.0 - 35.0') CLAY and SILT, low plasticity to non-plastic; some fine sand, subround; wet; soft to very soft; brown (10YR 4/3).  (35.0 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; light gray (10YR 7/2). NOTE: large cobble at 35.0' bgs.		
40	550							(40.0 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; medium stiff to soft; gray (10YR 5/1).		
45	545	5	40.0-45.0'	4.0	NA			End of boring 45.0' bgs.		
50	540									

	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 8.5' bgs. Groundwater encountered at 7.0' bgs during drilling. Water level at development was 12.19' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.14 feet
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**Date Start:** 10/21/15  
**Date Finish:** 10/21/15  
**Drilling Company:** Mateco Drilling  
**Driller's Name:** Dan Mourer  
**Drilling Method:** Air Knife/Sonic  
**Sampling Method:** Continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 5.0  
**Water Level Finish (ft. btoc.):** 14.00

**Northing:** 646654.84  
**Easting:** 12623310.03  
**Casing Elevation:** 593.73  
  
**Borehole Depth (ft. bgs.):** 50.0  
**Surface Elevation:** 590.7  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** BCC MW-15021  
**Client:** Consumers Energy  
  
**Location:** BC Cobb Facility  
 151 N Causeway St.  
 Muskegon, MI  
  
**Weather Conditions:** 60 F Partly Cloudy

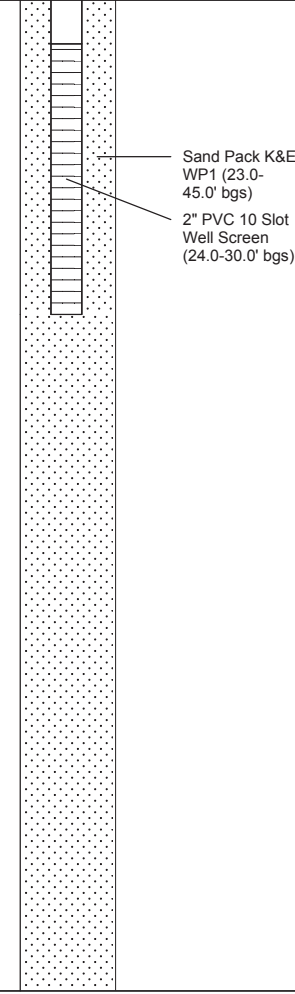
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
565		3	20.0-30.0'	10.0	NA			(23.5 - 25.0') SAND, fine, subround; little silt; well sorted; wet; light gray (10YR 7/2).		
								(25.0 - 27.0') SAND, fine, subround, and SILT; poorly sorted; moist to wet; brown (10YR 4/3) to dark gray (10YR 4/1). NOTE: some organic debris, sticks, wood, leaves.		
								(27.0 - 28.5') SAND, fine, subround; little to some silt; well sorted; wet; light gray (10YR 7/2).		
30								(28.5 - 29.5') CLAY and SILT, non-plastic, no dilatancy; little fine sand, subround; medium stiff; moist; dark brown (10YR 3/3). NOTE: some organic debris, wood from 29.0 to 29.5' bgs.		
560								(29.5 - 32.5') SAND, fine, subround, and SILT; poorly sorted; moist; dark brown (10YR 3/3). NOTE: wood, sticks and leaves from 29.5 to 30.0' and 32.0 to 32.5' bgs.		
								(32.5 - 35.0') SAND, fine, subround; little silt; well sorted; wet; pale brown (10YR 6/3).		
35		4	30.0-40.0'	10.0	NA			(34.5 - 35.0') NOTE: Organics, wood, sticks.		
555								(35.0 - 39.5') CLAY, medium to high plasticity, no dilatancy; little to some silt; medium stiff; very dark brown (10YR 2/2).  NOTE: White shell fragments at 37.5' and 38.0' bgs.		
40								(39.5 - 42.5') SAND, fine, subround; trace silt; well sorted; wet; light gray (10YR 7/2).		
550								(42.5 - 50.0') CLAY, high plasticity, no dilatancy; trace silt; moist; medium stiff; gray (10YR 5/1).		
45		5	40.0-50.0'	10.0	NA					
545										
50								End of boring 50.0' bgs.		
540										


**Remarks:** bgs = below ground surface  
  
 Air Knife to 8.0' bgs.  
 Groundwater encountered at 5.0' bgs during drilling.  
 Water level at development was 14.00' btoc.  
 No odor or staining observed.  
 Groundwater elevation measured on November 30, 2015 was 580.1 feet above mean sea level.





<b>Date Start:</b> 10/23/15 <b>Date Finish:</b> 10/23/15 <b>Drilling Company:</b> Mateco Drilling <b>Driller's Name:</b> Dan Mourer <b>Drilling Method:</b> Air Knife/Sonic <b>Sampling Method:</b> Continuous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 7.0 <b>Water Level Finish (ft. btoc.):</b> 12.28	<b>Northing:</b> 646263.16 <b>Easting:</b> 12623634.96 <b>Casing Elevation:</b> 595.82  <b>Borehole Depth (ft. bgs.):</b> 45.0 <b>Surface Elevation:</b> 592.6  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> BCC MW-15022  <b>Client:</b> Consumers Energy  <b>Location:</b> BC Cobb Facility 151 N Causeway St. Muskegon, MI  <b>Weather Conditions:</b> 40 F Sunny
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	570	3	20.0-30.0'	8.0	NA					 <p>Sand Pack K&amp;E WP1 (23.0-45.0' bgs) 2" PVC 10 Slot Well Screen (24.0-30.0' bgs)</p>
30	565						(30.0 - 33.0') SAND, fine, subround, and SILT, non-plastic, no dilatancy to slow dilatancy; moist to wet; poorly sorted; light brownish gray (10YR 6/2) to grayish brown (10YR 5/2). NOTE: little to some organic debris.			
35	560	4	30.0-40.0'	9.0	NA		(33.0 - 37.0') SILT, non-plastic, no dilatancy; some fine sand, subround; little clay; poorly sorted; moist to wet; grayish brown (10YR 5/2) to dark brown (10YR 3/3).  NOTE: Organic rich debris, sitcks and wood from 36.0 to 37.0' bgs.			
40							(37.0 - 40.5') SAND, fine, subround; little silt; well sorted; wet; light brownish gray (10YR 6/2).			
45	555	5	40.0-45.0'	5.0	NA		(40.5 - 43.0') CLAY and SILT, non-plastic, no dilatancy; some to little fine sand, subround; poorly sorted; moist; dark brown (10YR 3/3). NOTE: white shell fragments at 41.0' bgs; organic rich.			
							(43.0 - 44.0') SAND, fine, subround; well sorted; light grayish brown (10YR 6/2).			
							(44.0 - 45.0') CLAY and SILT, non-plastic to low plasticity, no dilatancy; little to trace fine sand, subround; moist; dark gray (10YR 3/3).			
45	550						End of boring 45.0' bgs.			

 <p>Design &amp; Consultancy for natural and built assets</p>	<b>Remarks:</b> bgs = below ground surface btoc = below top of casing  Air Knife to 9.0' bgs. Groundwater encountered at 7.0' bgs during drilling. Water level at development was 12.28' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 583.42 feet
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# SOIL DESCRIPTION

Udden-Wenworth Scale Modified ARCADIS, 2008			
Size Class	Millimeters	Inches	Standard Sieve #
Boulder	256 – 4096	10.09+	
Large cobble	128 - 256	5.04 -10.08	
Small cobble	64 - 128	2.52 – 5.04	
Very large pebble	32 – 64	0.16 - 2.52	
Large pebble	16 – 32	0.63 – 1.26	
Medium pebble	8 – 16	0.31 – 0.63	
Small pebble	4 – 8	0.16 – 0.31	No. 5 +
Granule	2 – 4	0.08 – 0.16	No.5 – No.10
Very coarse sand	1 -2	0.04 – 0.08	No.10 – No.18
Coarse sand	½ - 1	0.02 – 0.04	No.18 - No.35
Medium sand	¼ - ½	0.01 – 0.02	No.35 - No.60
Fine sand	1/8 -¼	0.005 – 0.1	No.60 - No.120
Very fine sand	1/16 – 1/8	0.002 – 0.005	No. 120 – No. 230
Silt (subgroups not included)	1/256 – 1/16	0.0002 – 0.002	Not applicable (analyze by pipette or hydrometer)
Clay (subgroups not included)	1/2048 – 1/256	.00002 – 0.0002	

Modifier	Percent of Total Sample (by volume)
and	36 - 50
some	21 - 35
little	10 - 20
trace	<10

Description	Criteria
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Description	Criteria
Dry	Absence of moisture, dry to touch, dusty.
Moist	Damp but no visible water.
Wet (Saturated)	Visible free water, soil is usually below the water table.

## Fine-grained soil – Consistency

Description	Criteria
Very soft	N-value < 2 or easily penetrated several inches by thumb.
Soft	N-value 2-4 or easily penetrated one inch by thumb.
Medium stiff	N-value 9-15 or indented about ¼ inch by thumb with great effort.
Very stiff	N-value 16-30 or readily indented by thumb nail.
Hard	N-value > than 30 or indented by thumbnail with difficulty

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

## Coarse-grained soil – Density

Description	Criteria
Very loose	N-value 1- 4
Loose	N-value 5-10
Medium dense	N-value 11-30
Dense	N-value 31- 50
Very dense	N-value >50



**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17001**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/6/17</b>	Date Drilling Completed: <b>12/6/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>586.1</b>	TOC Elevation (ft) <b>589.29</b>	Total Depth (ft bgs) <b>20.0</b>
Boring Location: 7 feet west of BCC-MW-15016. N: 646228.0 E: 12622452.1		Personnel Logged By - T. Hess Driller - B. Marshal		Drilling Equipment: <b>Geoprobe 8140 LS</b>
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/6/17 00:00</b> Depth (ft bgs) <u>10.0</u> After Drilling: Date/Time <b>12/7/17 11:35</b> Depth (ft bgs) <u>5.81</u>	

SAMPLE	NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
	1	HA	100	2	<b>SANDY COAL ASH</b> mostly coal ash, some fine to medium sand, dark gray (10YR 4/1), loose, dry.				
	2	CS	100	6	Change to some woody material at 5.0 feet.				
				8	<b>SILTY SAND WITH ASH</b> mostly fine to medium sand, some silt and ash, few to little woody material, light brownish gray (10YR 6/2), loose, moist.	SM			
				10	Change to saturated at 10.0 feet.				
				12	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, moist.	SP			
				16	<b>PEAT</b> dark organic woody material (10YR 2/1), brittle, saturated.				
				16	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
				18	<b>PEAT</b> dark organic woody material (10YR 2/1), brittle, saturated.				
				18	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
				20	End of boring at 20.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC\_CORP\_INCHES.GDT 2/7/18

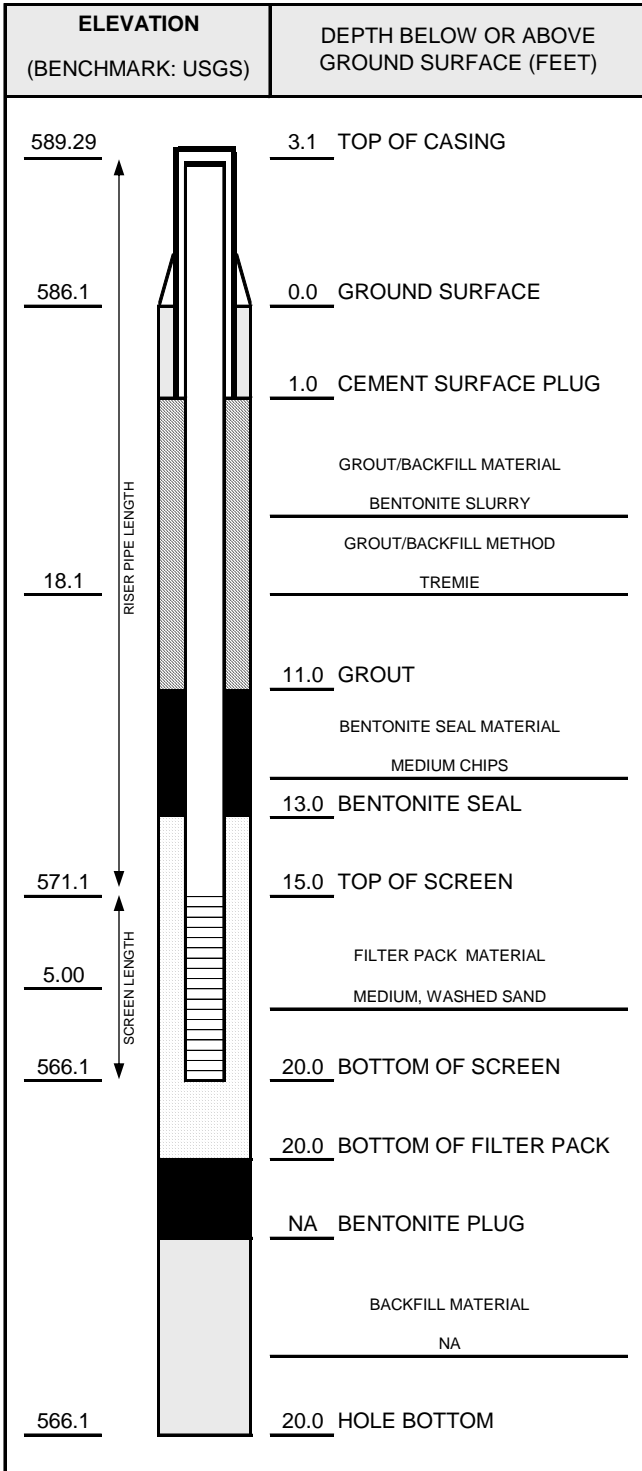
Signature:	Firm: TRC Environmental Corporation	(734) 971-7080
For Tanner Hess	1540 Eisenhower Place Ann Arbor, MI 48108	Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: <b>BCC-MW-17001</b>
PROJ. NO: 269767.0000	DATE INSTALLED: 12/6/2017    INSTALLED BY: Tanner Hess    CHECKED BY: CS



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>20</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>0.5</u> HOURS
WATER REMOVED:	<u>9.5</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>CLOUDY</u>
COLOR BEFORE:	<u>BROWN</u>
CLARITY AFTER:	<u>CLEAR</u>
COLOR AFTER:	<u>CLEAR</u>
ODOR (IF PRESENT):	<u>NONE</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	23.36	T/PVC	12/6/2017	1653
DTB AFTER DEVELOPING:	23.36	T/PVC	12/6/2017	1727
SWL BEFORE DEVELOPING:	8.99	T/PVC	12/6/2017	1653
SWL AFTER DEVELOPING:	9.59	T/PVC	12/6/2017	1727
OTHER SWL:	8.91	T/PVC	12/7/2017	1135
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>



**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17002**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/6/17</b>	Date Drilling Completed: <b>12/6/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>585.8</b>	TOC Elevation (ft) <b>588.79</b>	Total Depth (ft bgs) <b>19.0</b>
Boring Location: 6 feet southeast of BCC-MW-15017. N: 646348.8 E: 12622087.2		Personnel Logged By - T. Hess Driller - B. Marshal		Drilling Equipment: <b>Geoprobe 8140 LS</b>
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/6/17 00:00</b> Depth (ft bgs) <u>10.0</u> After Drilling: Date/Time <b>12/7/17 11:28</b> Depth (ft bgs) <u>5.43</u>	

SAMPLE	NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
	1	HA	100	2	<b>SANDY COAL ASH</b> mostly coal ash, some fine to medium sand, trace gravel, dark gray (10YR 4/1), loose, dry.				
	2	CS	100	6	<b>COAL ASH</b> mostly coal ash, dark gray (10YR 4/1), loose, dry.				
				10	<b>SAND WITH COAL ASH</b> mostly fine to medium sand, little coal ash, dark gray (10YR 4/1), loose, dry.	SP			
				10	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.				
	3	CS	100	14		SP			
				18	<b>PEAT</b> mostly organic material, some silt and woody material, black (10YR 2/1), saturated.				
				19.0	End of boring at 19.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC.CORP.\_INCHES.GDT 2/7/18

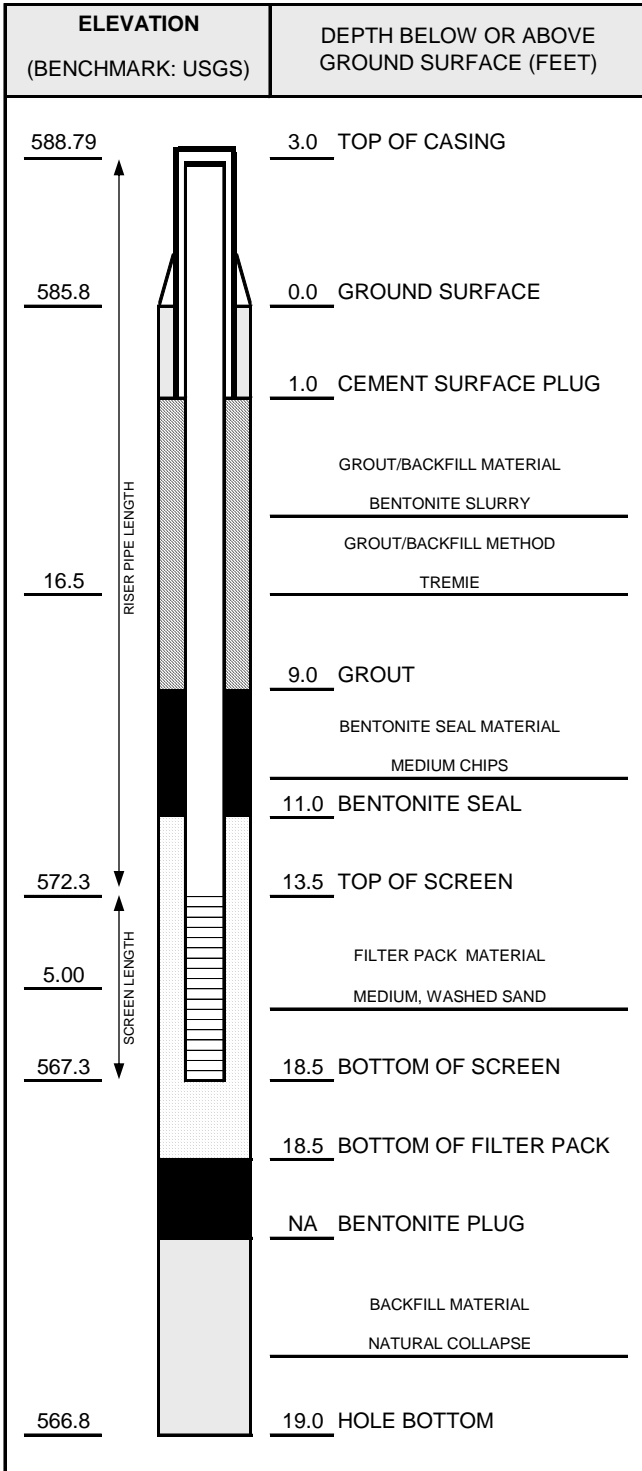
Signature:	Firm: TRC Environmental Corporation	(734) 971-7080
For Tanner Hess	1540 Eisenhower Place Ann Arbor, MI 48108	Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: <b>BCC-MW-17002</b>
PROJ. NO: 269767.0000	DATE INSTALLED: 12/6/2017    INSTALLED BY: Tanner Hess    CHECKED BY: CS



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>18</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>0.5</u> HOURS
WATER REMOVED:	<u>9.5</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>CLOUDY</u>
COLOR BEFORE:	<u>LIGHT BROWN</u>
CLARITY AFTER:	<u>CLEAR</u>
COLOR AFTER:	<u>CLEAR</u>
ODOR (IF PRESENT):	<u>SLIGHT SULFUR</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	21.49	T/PVC	12/6/2017	1533
DTB AFTER DEVELOPING:	21.49	T/PVC	12/6/2017	1615
SWL BEFORE DEVELOPING:	8.49	T/PVC	12/6/2017	1533
SWL AFTER DEVELOPING:	8.58	T/PVC	12/6/2017	1615
OTHER SWL:	8.43	T/PVC	12/7/2017	1128
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>





**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17003**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/5/17</b>	Date Drilling Completed: <b>12/5/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>589.3</b>	TOC Elevation (ft) <b>592.37</b>	Total Depth (ft bgs) <b>22.0</b>
Boring Location: <b>7.5 feet northeast of BCC-MW-15018.</b>		Personnel Logged By - <b>T. Hess</b> Driller - <b>B. Marshal</b>		Drilling Equipment: <b>Geoprobe 8140 LS</b>
N: <b>646794.9</b> E: <b>12622184.8</b>				
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/5/17 00:00</b> Depth (ft bgs) <u>11.0</u> After Drilling: Date/Time <b>12/7/17 11:24</b> Depth (ft bgs) <u>9.07</u>	

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 HA	100		2	<b>SANDY COAL ASH</b> mostly coal ash, some fine to medium sand, trace gravel, brown (10YR 4/3), loose, dry.				
2 CS	100		8	<b>COAL ASH</b> mostly coal ash, dark gray (10YR 4/1), loose, dry.				
			10	▼ ▽ Change to saturated at 11.0 feet.				
3 CS	100		14	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
4 CS	100		22	End of boring at 22.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC\_CORP\_INCHES.GDT 2/7/18

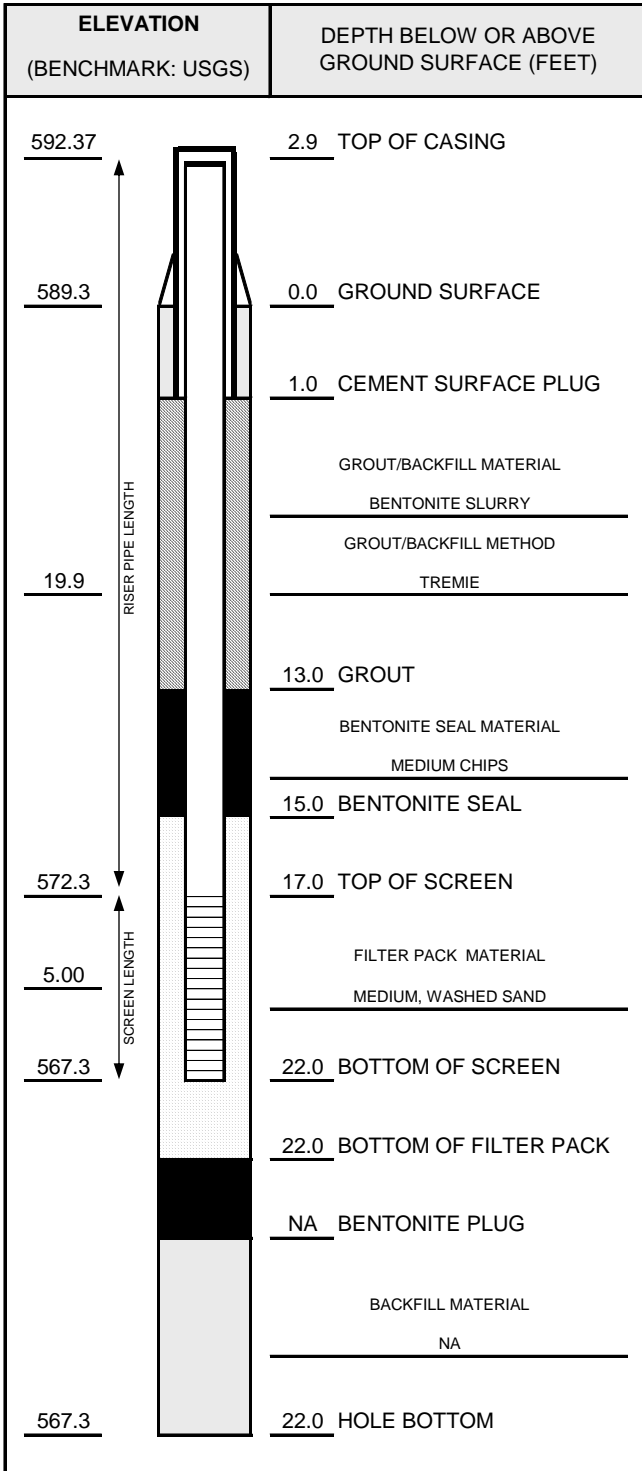
Signature:	Firm: TRC Environmental Corporation	(734) 971-7080
For Tanner Hess	1540 Eisenhower Place Ann Arbor, MI 48108	Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: <b>BCC-MW-17003</b>
PROJ. NO: 269767.0000	DATE INSTALLED: 12/6/2017    INSTALLED BY: Tanner Hess    CHECKED BY: CS



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>22</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>0.5</u> HOURS
WATER REMOVED:	<u>9.5</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>CLOUDY</u>
COLOR BEFORE:	<u>BROWN</u>
CLARITY AFTER:	<u>CLEAR</u>
COLOR AFTER:	<u>CLEAR</u>
ODOR (IF PRESENT):	<u>NONE</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	25.25	T/PVC	12/6/2017	1258
DTB AFTER DEVELOPING:	25.25	T/PVC	12/6/2017	1337
SWL BEFORE DEVELOPING:	12.05	T/PVC	12/6/2017	1258
SWL AFTER DEVELOPING:	12.10	T/PVC	12/6/2017	1337
OTHER SWL:	11.97	T/PVC	12/7/2017	1124
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>



**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17004**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/5/17</b>	Date Drilling Completed: <b>12/5/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>589.1</b>	TOC Elevation (ft) <b>591.84</b>	Total Depth (ft bgs) <b>22.5</b>
Boring Location: <b>8 feet northeast of BCC-MW-15019.</b>		Personnel Logged By - <b>T. Hess</b> Driller - <b>B. Marshal</b>		Drilling Equipment: <b>Geoprobe 8140 LS</b>
N: <b>647110.1</b> E: <b>12622373.4</b>				
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/5/17 00:00</b> ▾ Depth (ft bgs) <u>10.0</u> After Drilling: Date/Time <b>12/7/17 11:20</b> ▽ Depth (ft bgs) <u>9.03</u>	

SAMPLE	NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
	1	100		2	<b>SANDY COAL ASH</b> mostly coal ash, some fine to medium sand, trace gravel, brown (10YR 4/3), loose, dry.				
	2	0		8					
				10	<b>COAL ASH</b> mostly coal ash, dark gray (10YR 4/1), loose.				No recovery from 5.0 to 10.0 feet.
				10	Change to saturated at 10.0 feet.				
	3	100		14	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
	4	80		22					
				22.5	End of boring at 22.5 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC\_CORP\_INCHES.GDT 2/7/18

Signature: *Tanner Hess*  
For Tanner Hess

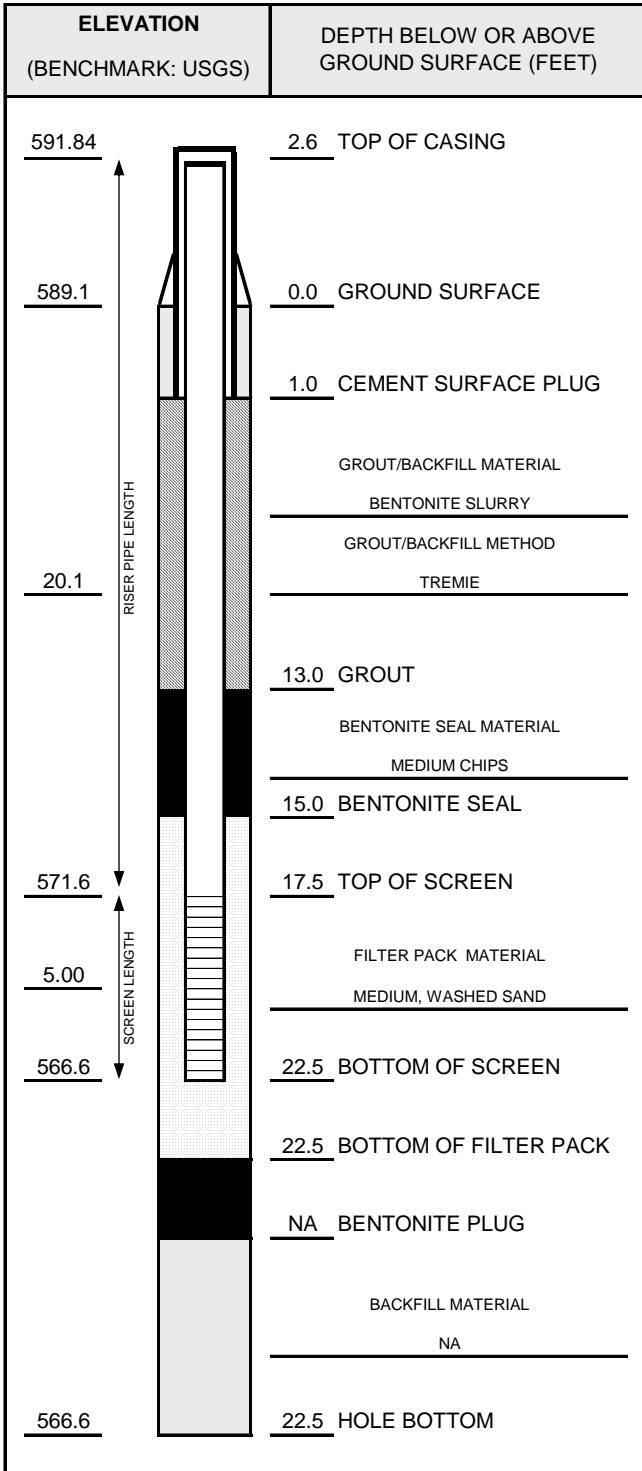
Firm: TRC Environmental Corporation (734) 971-7080  
1540 Eisenhower Place Ann Arbor, MI 48108 Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: <b>BCC-MW-17004</b>
PROJ. NO: 269767.0000	DATE INSTALLED: 12/5/2017    INSTALLED BY: Tanner Hess    CHECKED BY: CS



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>22</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>0.5</u> HOURS
WATER REMOVED:	<u>9.5</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>CLOUDY</u>
COLOR BEFORE:	<u>BROWN</u>
CLARITY AFTER:	<u>CLEAR</u>
COLOR AFTER:	<u>CLEAR</u>
ODOR (IF PRESENT):	<u>NONE</u>

WATER LEVEL SUMMARY				
MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	25.27	T/PVC	12/5/2017	1544
DTB AFTER DEVELOPING:	25.27	T/PVC	12/5/2017	1625
SWL BEFORE DEVELOPING:	11.20	T/PVC	12/5/2017	1544
SWL AFTER DEVELOPING:	11.30	T/PVC	12/5/2017	1625
OTHER SWL:	11.63	T/PVC	12/7/2017	1120
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>



**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17005**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/4/17</b>	Date Drilling Completed: <b>12/5/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>589.3</b>	TOC Elevation (ft) <b>592.42</b>	Total Depth (ft bgs) <b>30.0</b>
Boring Location: 8 feet southwest of BCC-MW-15020. N: 647433.9 E: 12622619.7		Personnel Logged By - T. Hess Driller - B. Marshal		Drilling Equipment: <b>Geoprobe 8140 LS</b>
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/4/17 00:00</b> Depth (ft bgs) <b>11.5</b> After Drilling: Date/Time <b>12/7/17 11:17</b> Depth (ft bgs) <b>9.96</b>	

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 HA	100		0	<b>GRAVEL</b> mostly gravel, white (10YR 8/1), road base.	GP			
2 CS	50		5	<b>SANDY COAL ASH</b> mostly coal ash, some fine to medium sand, trace gravel, brown (10YR 4/3), loose, dry.				
			8	Change to very dark gray (10YR 3/1) at 8.0 feet.				
3 CS	100		10	<b>COAL ASH</b> mostly coal ash, dark gray (10YR 4/1), loose, saturated.				
4 CS	100		15	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
			25	<b>PEAT</b> mostly organic material, some silt and woody material, black (10YR 2/1), saturated.				
			30	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
			30	End of boring at 30.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC\_CORP\_INCHES.GDT 2/7/18

Signature: *Tanner Hess*  
For Tanner Hess

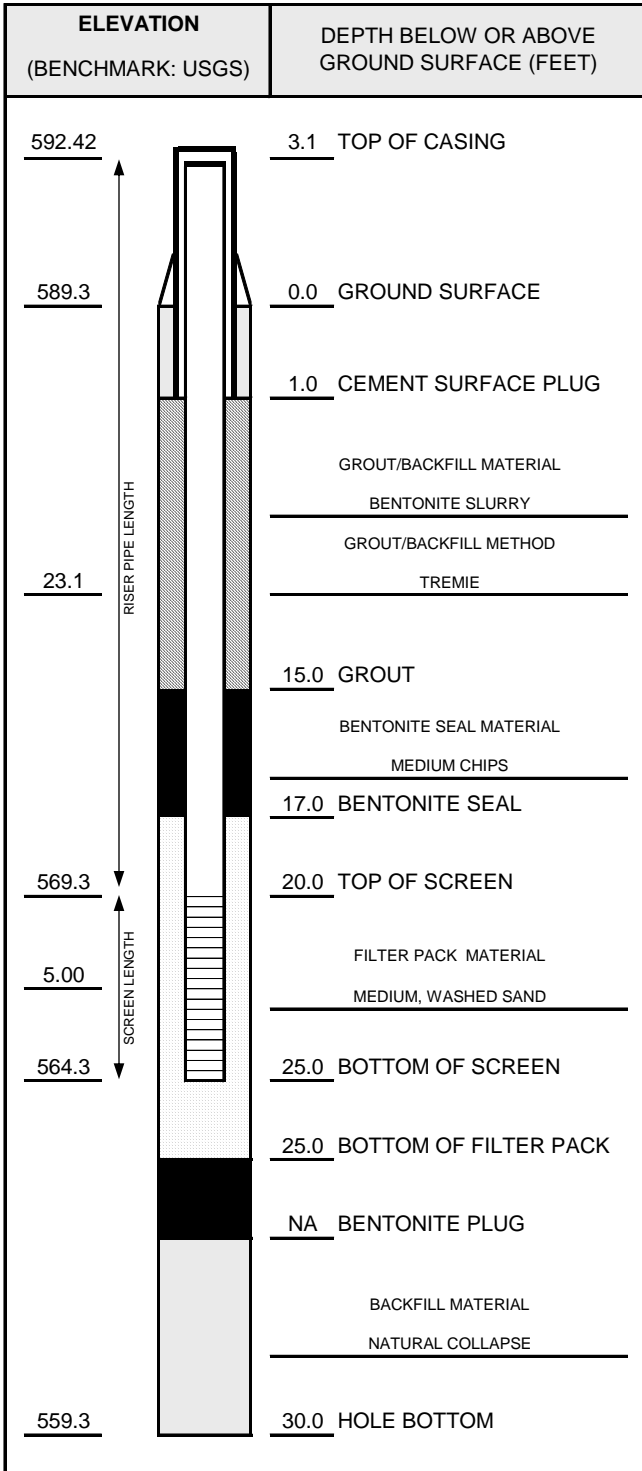
Firm: TRC Environmental Corporation (734) 971-7080  
1540 Eisenhower Place Ann Arbor, MI 48108 Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: BCC-MW-17005
PROJ. NO: 269767.0000	DATE INSTALLED: 12/5/2017 INSTALLED BY: Tanner Hess
CHECKED BY: CS	



CASING AND SCREEN DETAILS	
TYPE OF RISER: <u>2-INCH PVC</u>	
PIPE SCHEDULE: <u>40</u>	
PIPE JOINTS: <u>THREADED O-RINGS</u>	
SCREEN TYPE: <u>2-INCH PVC</u>	
SCR. SLOT SIZE: <u>0.01-INCH</u>	
BOREHOLE DIAMETER: <u>6</u> IN. FROM <u>0</u> TO <u>24</u> FT.	
SURF. CASING DIAMETER: _____ IN. FROM _____ TO _____ FT.	

WELL DEVELOPMENT	
DEVELOPMENT METHOD: <u>SURGE AND PUMP</u>	
TIME DEVELOPING: <u>0.5</u> HOURS	
WATER REMOVED: <u>9.5</u> GALLONS	
WATER ADDED: <u>0</u> GALLONS	
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE: <u>CLOUDY</u>	
COLOR BEFORE: <u>BROWN</u>	
CLARITY AFTER: <u>CLEAR</u>	
COLOR AFTER: <u>CLEAR</u>	
ODOR (IF PRESENT): <u>NONE</u>	

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	27.89	T/PVC	12/5/2017	1400
DTB AFTER DEVELOPING:	27.89	T/PVC	12/5/2017	1445
SWL BEFORE DEVELOPING:	12.73	T/PVC	12/5/2017	1400
SWL AFTER DEVELOPING:	12.80	T/PVC	12/5/2017	1445
OTHER SWL:	13.06	T/PVC	12/7/2017	1117
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>





**WELL CONSTRUCTION LOG**

**WELL NO. BCC-MW-17006**

Facility/Project Name: <b>CEC: BC Cobb</b>		Date Drilling Started: <b>12/4/17</b>	Date Drilling Completed: <b>12/4/17</b>	Project Number: <b>269767.0000.0000</b>
Drilling Firm: <b>Stearns</b>	Drilling Method: <b>Sonic</b>	Surface Elev. (ft) <b>590.5</b>	TOC Elevation (ft) <b>593.78</b>	Total Depth (ft bgs) <b>30.0</b>
Boring Location: 9 feet west of BCC-MW-15021. N: 646657.7 E: 12623301.3		Personnel Logged By - T. Hess Driller - B. Marshal		Drilling Equipment: <b>Geoprobe 8140 LS</b>
Civil Town/City/or Village: <b>Muskegon</b>	County: <b>Muskegon</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>12/4/17 00:00</b> Depth (ft bgs) <b>11.5</b> After Drilling: Date/Time <b>12/7/17 11:11</b> Depth (ft bgs) <b>13.5</b>	

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 HA	100		0 - 5	<b>TOPSOIL</b> black (10YR 2/1).				
2 CS	100		5 - 10	<b>COAL ASH</b> mostly coal ash, dark gray (10YR 4/1), fine, soft, loose.  Change to moist at 9.0 feet. Change to dry at 10.0 feet.				
3 CS	100		10 - 25	Change to saturated at 11.5 feet.				
4 CS	100		25 - 30	<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated. <b>PEAT</b> mostly organic material, some silt and woody material, black (10YR 2/1), saturated.	SP			
				<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated. <b>PEAT</b> mostly organic material, some silt and woody material, black (10YR 2/1), saturated.	SP			
				<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.	SP			
			30	End of boring at 30.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG BCC.GSI.WELLS.GPJ TRC\_CORP\_INCHES.GDT 2/7/18

Signature: *Tanner Hess*  
For Tanner Hess

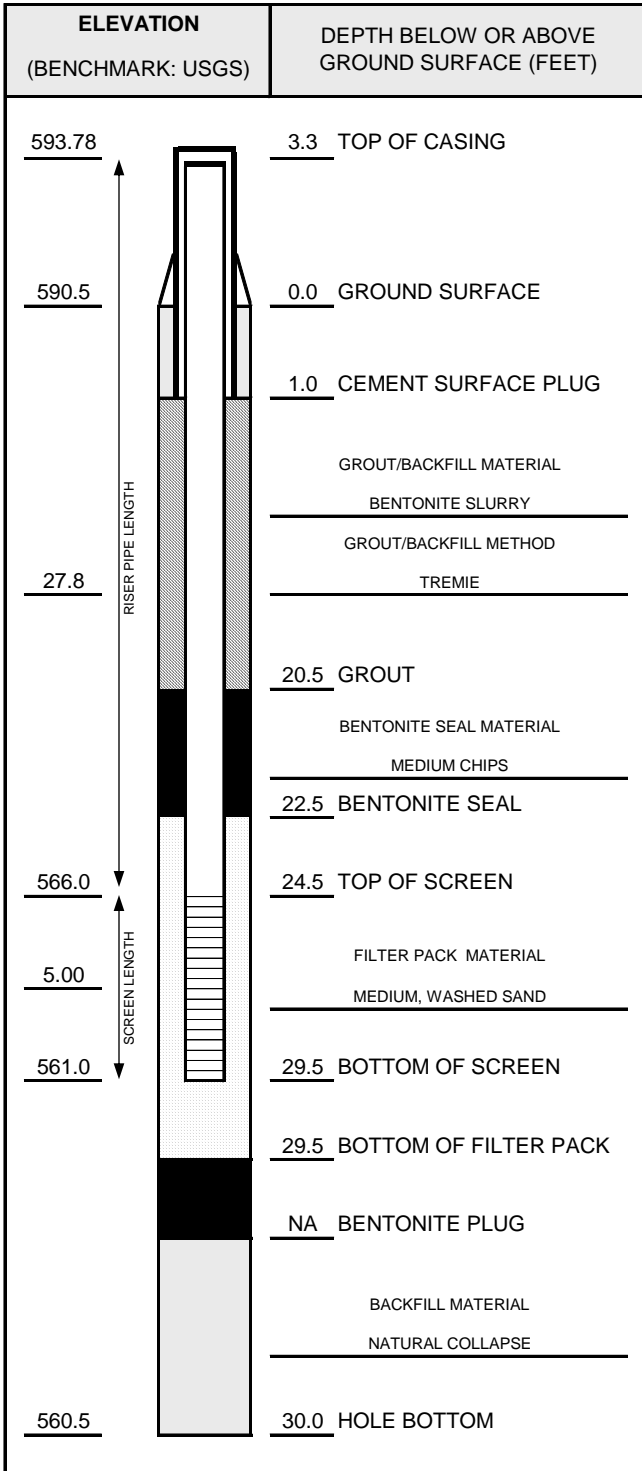
Firm: TRC Environmental Corporation (734) 971-7080  
1540 Eisenhower Place Ann Arbor, MI 48108 Fax (734) 971-9022

Checked By: C. Scieszka



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: CEC: BC Cobb	WELL ID: BCC-MW-17006
PROJ. NO: 269767.0000	DATE INSTALLED: 12/4/2017 INSTALLED BY: Tanner Hess
CHECKED BY: CS	



CASING AND SCREEN DETAILS	
TYPE OF RISER:	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
SCREEN TYPE:	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>30</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>0.75</u> HOURS
WATER REMOVED:	<u>14.25</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>CLOUDY</u>
COLOR BEFORE:	<u>BROWN</u>
CLARITY AFTER:	<u>CLEAR</u>
COLOR AFTER:	<u>CLEAR</u>
ODOR (IF PRESENT):	<u>NONE</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	32.69	T/PVC	12/5/2017	1153
DTB AFTER DEVELOPING:	32.69	T/PVC	12/5/2017	1315
SWL BEFORE DEVELOPING:	16.60	T/PVC	12/5/2017	1153
SWL AFTER DEVELOPING:	16.90	T/PVC	12/5/2017	1315
OTHER SWL:	16.80	T/PVC	12/7/2017	1111
OTHER SWL:		T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers</u>





**PROJECT NAME:** BC Cobb

**PROJECT NUMBER:** 083742.02

**CLIENT:** HDR Michigan Inc

**PROJECT LOCATION:** Muskegon, Michigan

**DATE STARTED:** 5/12/20

**COMPLETED:** 5/12/20

**BORING METHOD:** Hollow-stem Augers

**OPERATOR:** BG (Stearns Drilling)

**RIG NO.:** ATV

**LOGGED BY:** MLS

**CHECKED BY:** CES

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE NO. INTERVAL	RECOVERY (inches)	PID (ppm)	SOIL ANALYTICAL SAMPLE	TEMPORARY WELL SCREEN	REMARKS
	0		SURFACE ELEVATION: 586.8 FT						
	1.0		FILL- Fine to Medium SAND with Silt- Dark Brown- Moist (SP-SM)	585.8					9-inch diameter flush mounted protective casing set in concrete
585									Filter Sand
	5		FILL- Fine to Medium Sandy COAL ASH- Silt from 4 to 4.25 Feet- Black and Gray- Moist	LS1	24	<1			Bentonite Grout
580									
	8.0		FILL- Fine to Medium SAND- Some Ash, Wood Pieces and Organics- Dark Brown- Wet (SP)	578.8					
575				LS2	24	<1			
	15.0		Fine to Medium SAND- Dark Gray- Wet (SP)	571.8					
570				LS3	15	<1			
	23.0		Fine to Medium SAND with Silt- Wood Pieces- Dark Gray- Wet (SP-SM)	563.8					
565				LS4	11	<1			
	24.5		Fine to Medium SAND- Wood Pieces from 28 to 28.5 Feet- Gray- Wet (SP)	562.3					
560				LS5	18	<1			
	28.5		Fine to Medium SANDY SILT- Dark Gray- Wet (ML/SM)	558.3					
557.3	29.5			LS6	19	<1			

**GROUNDWATER & BACKFILL INFORMATION**

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	8.0	578.8
▼ AT END OF BORING:	4.8	582.0

**BACKFILL METHOD:** Well

NOTES: 1. Soil samples were classified according to ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) for environmental purposes only. Therefore, the boring logs and associated report(s) should not be used for geotechnical evaluation or design.  
 2. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.  
 3. Listed depths under the profile description are rounded to the nearest tenth of a foot (e.g. 5.75 = 5.8). Refer to the report and attachments for actual sample depths and/or intervals (where applicable).  
 4. No odors noted and no staining observed.





**PROJECT NAME:** BC Cobb

**PROJECT NUMBER:** 083742.02

**CLIENT:** HDR Michigan Inc

**PROJECT LOCATION:** Muskegon, Michigan

**DATE STARTED:** 5/12/20

**COMPLETED:** 5/12/20

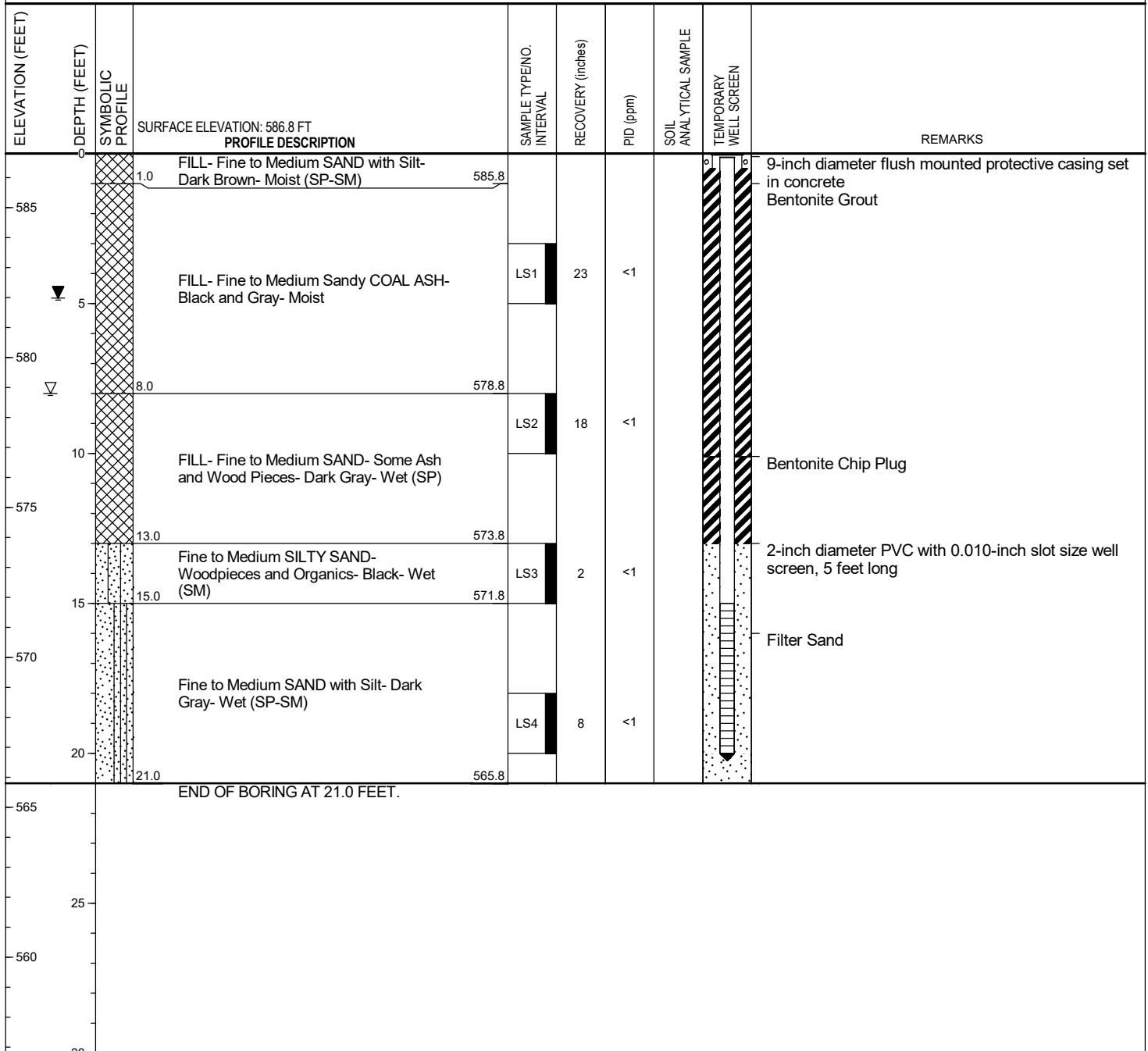
**BORING METHOD:** Hollow-stem Augers

**OPERATOR:** BG (Stearns Drilling)

**RIG NO.:** ATV

**LOGGED BY:** MLS

**CHECKED BY:** CES



GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	8.0	578.8
▽ AT END OF BORING:	4.8	582.0
<b>BACKFILL METHOD:</b> Well		

- NOTES: 1. Soil samples were classified according to ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) for environmental purposes only. Therefore, the boring logs and associated report(s) should not be used for geotechnical evaluation or design.  
 2. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.  
 3. Listed depths under the profile description are rounded to the nearest tenth of a foot (e.g. 5.75 = 5.8). Refer to the report and attachments for actual sample depths and/or intervals (where applicable).  
 4. No staining observed.  
 5. Sulfur-type odor noted during drilling.

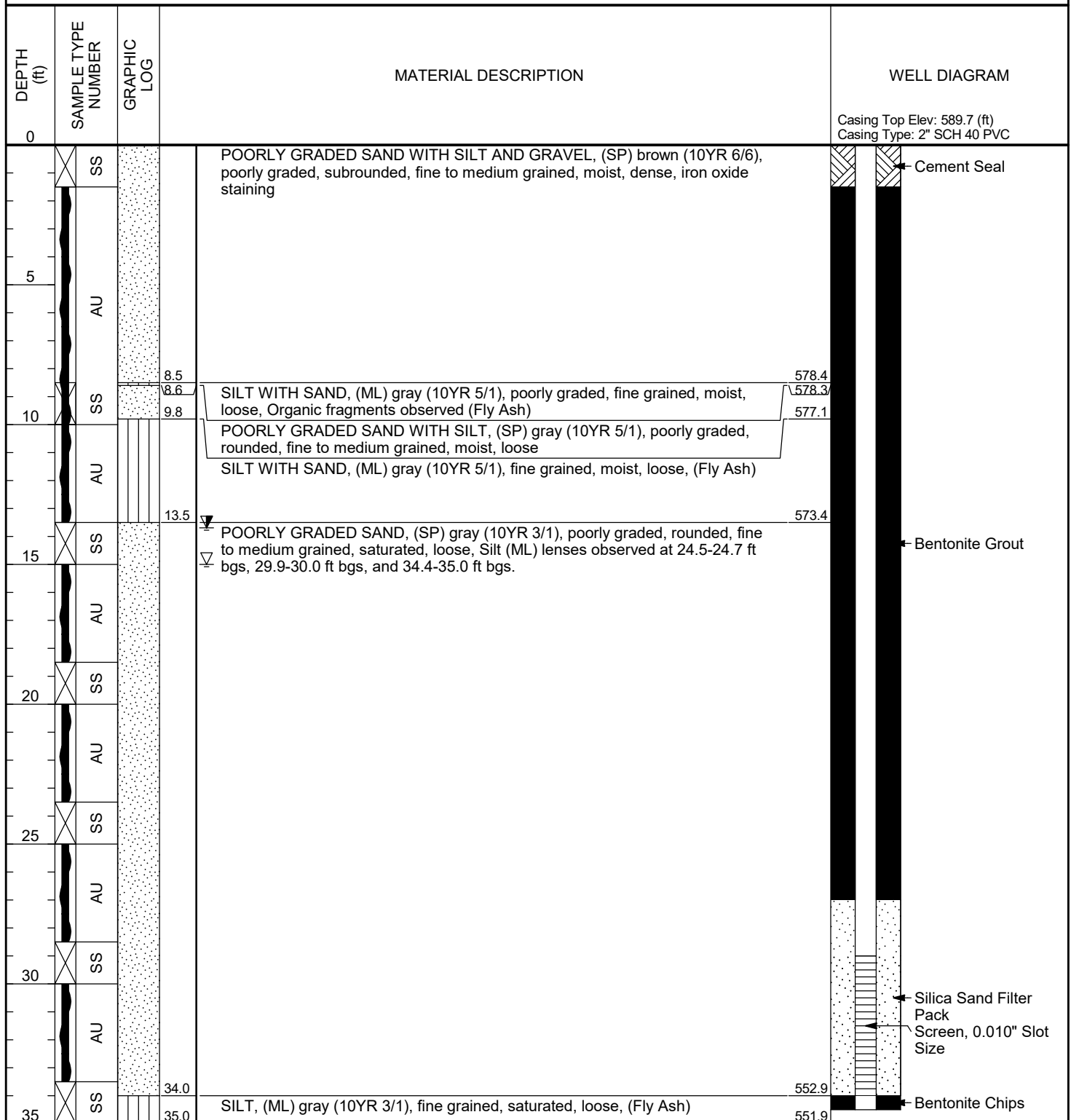




CLIENT Muskegon Environmental Redevelopment Group  
 PROJECT NUMBER 10220433  
 DATE STARTED 01/31/22 10:15 COMPLETED 01/31/22 12:15  
 DRILLING CONTRACTOR Stearns DRILLER Gary Greerlings  
 DRILLING METHOD HSA EQUIPMENT CME 55  
 LOGGED BY Tanten Buszka CHECKED BY \_\_\_\_\_

PROJECT NAME Former BC Cobb Power Plant  
 PROJECT LOCATION Muskegon, MI  
 GROUND ELEVATION 586.9 ft MSL HOLE DIAMETER 8  
 GROUND WATER LEVELS:  
 ∇ AT TIME OF DRILLING 15.00 ft / Elev 571.90 ft  
 ∇ 20 HRS AFTER DRILLING 13.69 ft / Elev 573.21 ft

NOTES \_\_\_\_\_



Bottom of borehole at 35.0 feet.