



## CCR Removal Report

Former B.C. Cobb Power Plant  
Bottom Ash Pond and Ponds 0-8

September 19, 2022

*Prepared for:*  
Muskegon Environmental Redevelopment Group, LLC  
(MERG)  
Muskegon, Michigan

*Prepared by:*  
HDR MICHIGAN, Inc.  
5405 Data Court  
Ann Arbor, Michigan 48108

## Executive Summary

The Coal Combustion Residuals (CCR) removal activities have been presented in this CCR Removal Report to document the removal of CCR from the Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8, in Muskegon, Michigan.

Golder Associates, Inc. (Golder) developed the B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Work Plan describing multiple lines of evidence to document waste removal at the site. An objective standard of 95 percent CCR removal was established in the Closure Work Plan.

Muskegon Environmental Redevelopment Group, LLC (MERG) acquired the B.C. Cobb property from Consumers Energy Company (CEC) as part of an Environmental Liability Transfer (ELT). MERG performed the CCR removal in the Bottom Ash Pond and Ponds 0-8 in accordance with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) approved Closure Work Plan.

HDR MICHIGAN, Inc. (HDR) performed the field verification in accordance with the approved Closure Work Plan. HDR performed Closure Area observation visits once excavation and removal of CCR was performed by MERG. A total of four observation visits were performed at four Closure Areas. A 50-foot grid with a total of 506 nodes was established across the footprint of the excavation limits. Field notes and observations were documented on Observation Reports at the time of the field visits. As outlined in the Closure Work Plan, CCR removal was verified based on the following three lines of evidence:

- First line of evidence - comparison of interim excavation termination grades to known elevations of CCR from previous site characterizations and engineering records.
  - The Excavation Plan (Figure 2) provides the established design grade across the site. Excavation elevations were compared to design elevation of the Excavation Plan. As construction expanded across the site, MERG identified many areas where native sand was encountered above the planned design grade elevation. Through discussions and approval with EGLE, areas where clean sand was encountered higher than design grade were considered as variances and potholing was performed by HDR at node locations where excavation grade was higher than Closure Work Plan excavation grade. Potholing was performed to the cut/fill depth shown on Table 3. If underlying CCR was encountered, further excavation was performed.
- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes (performed at 50 percent of total nodes).
  - Photographic documentation of the general area-wide excavation is presented in Attachment C and photographs of the randomly selected grid nodes are presented in Attachment D.
- Third line of evidence – microscopic quantification of CCR content at random grid nodes to confirm CCR removal (performed at 50 percent of photographic nodes).
  - Microscopic analyses were performed by HDR at 50 percent of randomly selected photographic grid nodes; and the results of 10 percent of the microscopic analyses were also performed as quality control by Construction Technology Laboratories, Inc. (CTL Group). The results of the microscopic quantification are presented on the Sample Node Summary on Table 3. Example photographs taken during the

microscopic quantification by HDR are included in Attachment E. The Microscopic Summary Reports provided by CTL Group are presented in Attachment F.

In summary, a total of 440 nodes out of 506 total nodes are located within the area of sample nodes that meet the three lines of evidence for documentation of CCR removal as stated in the Closure Work Plan. Through on-going excavation activities, concerns of slope instability and uplift instability were notified to HDR for further assessment regarding the perimeter embankments (adjacent to the Muskegon River and Discharge Channel and an area of former wood debris stockpiling in the western interior of the site). Excavation to Closure Work Plan design grade was not performed in some locations due to risk of excavation bottom instability and embankment instability within specific areas of the excavation. Therefore, 33 nodes fall within the areas of the perimeter embankment and 33 nodes were not observable after bridging activities for a total of 66 nodes which did not fully conform to all three lines of evidence. Of these 66 nodes, 43 nodes were within 0.1 feet of the Closure Work Plan design grade or below design grade. Therefore, a total of 483 out of 506 nodes were excavated to 0.1 feet or below design grade, reflecting 95.5% removal of the total CCR material on a node-by-node basis.

The Closure Work Plan established a cut volume of 653,713 cubic yards anticipated for the excavation. A comparison of the May 2022 final composite survey surface to the Closure Work Plan surface indicates that MERG removed approximately 660,000 cubic yards of CCR within the excavation. It should be noted that the total volume removed by MERG included areas left above design grade where clean sand was encountered (supported by pothole verification).

Considering the extent of the removal of CCR within the excavation and the results of the observations and documentation performed during the site visits, the work documented herein has met the intent of the Closure Work Plan, with limited exceptions. The exceptions include 33 nodes on the perimeter embankment which were not further excavated due to stability concerns and 33 nodes within the excavation bottom which were bridged due to uplift potential, of which each exception was justified based on stability analyses.

## Contents

1	Introduction and Purpose .....	1
1.1	Site Location and Description .....	2
2	CCR Removal Verification.....	2
2.1	First Line of Evidence - Documentation of Excavation Grades.....	4
2.2	Second Line of Evidence - Photographic Documentation.....	5
2.3	Third Line of Evidence - Microscopic Quantification .....	6
3	Areas of Remaining CCR .....	7
3.1	Areas Adjacent to Perimeter Embankment .....	8
3.2	Wood Stockpile Area .....	9
4	Summary .....	11
5	Certification.....	13
6	References .....	14

## Tables

Table 1. Excavation Zone #2 Node Summary .....	9
Table 2. Excavation Zone #3 Node Summary .....	10
Table 3. Sample Node Summary .....	16

## Figures

Vicinity Map .....	Figure 1
Excavation Plan .....	Figure 2
Sample Node Layout.....	Figure 3
Excavation Zone Layout.....	Figure 4
Final Survey Cross-Section Views .....	Figures 5-8
Final Survey Comparison.....	Figure 9

## Attachments

HDR Closure Standard Operating Procedures .....	Attachment A
HDR Closure Area Observation Reports .....	Attachment B
Photographic Documentation - General Site Photographs.....	Attachment C
Photographic Documentation - Photographic Nodes.....	Attachment D
Photographic Documentation - Microscopic Quantification .....	Attachment E
CTL Group Microscopic Summary Reports .....	Attachment F
Perimeter Berm Seepage and Stability Review Memo.....	Attachment G
Water Intrusion within Wood Chip Area Memo .....	Attachment H
Closure Work Plan Submittals .....	Attachment I
Aerial Photographs.....	Attachment J



*This page is intentionally left blank.*

# 1 Introduction and Purpose

HDR MICHIGAN, Inc. (HDR) has prepared this CCR Removal Report for Bottom Ash Pond and Ponds 0-8 at the Former B.C. Cobb Power Plant (B.C. Cobb) in Muskegon, Michigan following the requirements of the Federal Coal Combustion Residuals (CCR) Rule to demonstrate CCR removal compliance.

Consumers Energy Company (CEC) identified the Bottom Ash Pond and Ponds 0-8 located at B.C. Cobb as existing CCR surface impoundments under the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257, Subpart D) due to actively receiving CCR and non-CCR wastewater on the effective date of the CCR RCRA Rule (October 19, 2015).

Golder Associates, Inc. (Golder) developed the B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Work Plan (Ref. [1]) dated May 30, 2018 for submittal to the Michigan Department of Environment, Great Lakes, and Energy (EGLE, formerly Michigan Department of Environmental Quality) to request agreement from EGLE on CEC's plan to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR. The Closure Work Plan was approved by EGLE on October 16, 2018. The Closure Work Plan provided general descriptions of the following:

- Plans for removal of waste
- Multiple lines of evidence to document waste removal including the basis for an objective waste removal standard to address potential long-term sources of groundwater impacts
- Schedule for implementing the work
- Performance monitoring after waste removal in accordance with the CCR RCRA Rule

Additionally, a Technical Memorandum (Ref. [2]) was developed by Golder to supplement the Closure Work Plan. This memorandum distinguished ash placed prior to January 11, 1979, which would be treated separately from the Bottom Ash Pond and Ponds 0-8 closure and not required to be removed. Further details are available in the Technical Memorandum. As a result of the Technical Memorandum, a revised Closure Work Plan (Ref. [3]) was developed by Golder, dated September 20, 2019, which was submitted to EGLE by CEC. The Closure Work Plan, Technical Memorandum, and Revised Closure Work Plan are provided in Attachment I.

In April 2020, Muskegon Environmental Redevelopment Group, LLC (MERG) acquired the B.C. Cobb property from CEC as part of an Environmental Liability Transfer (ELT). MERG performed the CCR removal from the Bottom Ash Pond and Ponds 0-8 and CCR removal documentation was collected in accordance with the EGLE approved Closure Work Plan.

This report has been prepared to document and certify the removal of CCR from the B.C. Cobb Bottom Ash Pond and Ponds 0-8.

## 1.1 Site Location and Description

B.C. Cobb is a former electrical power generation facility located along North Causeway (M-120) in Muskegon, Michigan which was previously owned by CEC and acquired by MERG in 2020. The latitude and longitude of B.C. Cobb are approximately 43.254355 N and 86.241224 W. The site is located north of Muskegon, Michigan and south of the intersection of North Causeway (M-120) and the Muskegon River, as shown on the vicinity map on Figure 1.

B.C. Cobb began operations in the 1940s with five coal-burning units, later converting three of those units to natural gas until operations were ceased by CEC in 2016. The CCR units, which includes Ponds 0-8 and the Bottom Ash Pond, were National Pollutant Discharge Elimination System (NPDES) treatment units. Historically, 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 directed into either Ponds 5 or 6. Fly ash from the power plant was directed into Ponds 7 and 8. The ponded CCR was routed through the remaining ponds in series. Each pond allowed a portion of CCR particles to settle out before the overflow was transferred to the next pond.

MERG initiated closure of the ponds in June 2020 by installing a soil-bentonite wall in the perimeter embankment adjacent to the Discharge Channel and the North Branch of the Muskegon River to promote dewatering activities. Dewatering began in July 2020 to prepare for excavation and removal of waste CCR. The excavation was dewatered by pumping decant water through the site treatment system and ultimately NPDES permitted outfall. Ash removal began in August 2020. Aerial photographs, provided by MERG, displaying the CCR removal progress across the site are presented in Attachment J.

## 2 CCR Removal Verification

The CCR removal procedures were implemented in accordance the Closure Work Plan (Ref. [1]) and as supplemented in the Technical Memorandum (Ref. [2]). An objective standard of 95 percent CCR removal was established in the Closure Work Plan.

As outlined in the Closure Work Plan, verification of CCR removal was documented based on the following three lines of evidence:

- First line of evidence - comparison of interim excavation termination grades to known elevations of CCR from previous site characterizations and engineering records.
- Second line of evidence - photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes (performed at 50 percent of total nodes).
- Third line of evidence - microscopic quantification of CCR content at random grid nodes to confirm CCR removal (performed at 50 percent of photographic nodes).
  - Microscopic quantification was incorporated as the third line of evidence for CCR removal verification as opposed to quantitative colorimetric analyses due to natural soils not matching the site specific colorimetric

curved developed for this site. Further discussion is provided in Section 2.3.

Beginning in August 2020, MERG performed excavation and removal of CCR from the site. As large areas become available for observation, HDR performed Closure Area observation visits. The HDR procedures followed for the closure activities are provided in Attachment A. A total of four verification visits were performed at four Closure Areas. As stated in the Closure Work Plan, a 50-foot grid with a total of 506 nodes was established across the footprint of the excavation limits with alphabetical horizontal labeling and numerical vertical labeling (e.g., node labels of B2, B3, etc.) A Sample Node Layout is presented on Figure 3. As Closure Areas became available for observation, MERG field personnel staked each node within the given Closure Area to aid in documentation of three lines of evidence verifying CCR removal (discussed in Sections 2.1 through 2.3). Field notes and observations were documented on Observation Reports at the time of the field visits.

The Sample Node Summary presented on Table 3 details sample node location information, microscopic quantification results, and/or potholing results and displays the following information in each column:

- Node ID: designated grid node ID using alphabetical horizontal labeling and numerical vertical labeling as presented on the Sample Node Layout on Figure 3.
- Date Sampled: date of sample node observation during Closure Area visit.
- Northing/Easting: sample node northing and easting (Michigan State Plane – South Zone).
- Final Field Elevation: Elevation of sample node at time of Closure Area visit.
- Design Elevation: Elevation of sample node from Excavation Plan presented on Figure 2.
- Final Excavation Elevation Difference Relative to Closure Work Plan: Difference between Design Elevation and Final Field Elevation. Positive numbers indicate elevation above design grade; negative numbers indicate elevation below design grade.
- Final Surface Elevation May 2022: Elevation taken from composite survey surface developed by MERG of the final configuration of the site in May 2022 using land survey data and drone survey data.
- HDR Microscopic Estimation of CCR: Percentage estimation of CCR in sample node from microscopic quantification by HDR (see Section 2.3 for further discussion).
- CTL Microscopic Estimation: Percentage estimation of CCR in sample node from microscopic quantification performed as quality control by Construction Technology Laboratories, Inc. (CTL Group) (see Section 2.3 for further discussion).
- HDR Microscopy Pass/Fail: Determination of pass/fail of sample node for microscopic quantification. If microscopic quantification estimates CCR greater

than 5 percent, sample node is considered failing (see Section 2.3 for further discussion).

- Potholing Pass/Fail: Determination of pass/fail of sample node from potholing activities (see Section 2.1 for further discussion).
- CCR Present at Surface: CCR is present at the ground surface at the sample node location and further excavation is not being performed (if cell equals “Yes”).
- General comments on field observations/microscopy results for sample nodes.

Observation Reports documenting the field activities for each Closure Area are presented in Attachment B. The following subsections detail the lines of evidence used in the documentation and verification of CCR removal in accordance with the Closure Work Plan.

## 2.1 First Line of Evidence - Documentation of Excavation Grades

The first line of evidence to verify CCR removal was to confirm that excavations were complete to at least the elevations established in the Closure Work Plan. The elevation of the base of CCR was established based on historical facility information and subsurface investigations performed at the site in October 2015, May 2017, and November/December 2017. The Excavation Plan issued for construction is presented on Figure 2.

As discussed previously, the site was observed in separate Closure Areas depending on the extents that excavation was performed and when areas were ready for closure observation. Prior to commencing the Closure Area observation visit, MERG provided to HDR the surveyed elevations at each node of the given Closure Area. The elevations of the surveyed nodes were processed by HDR and compared to the design elevations established by the Excavation Plan to confirm that the vertical limits had been achieved.

Visual observations for the presence of CCR was then performed during the Closure Area observation visits. Site photographs of each Closure Area were taken to document the condition of the excavation. Photographic documentation of the general area-wide excavation is presented in Attachment C.

As excavation expanded across the site, MERG identified many areas where native sand was encountered above the planned design grade elevation. Through discussions and approval with EGLE<sup>1</sup>, areas where clean sand was encountered higher than design grade were considered as variances that meet closure grade. E-mail communication approval record by EGLE is included in Attachment 1. All nodes that were located within these areas were potholed to design grade to confirm no underlying CCR was present. Depths of potholing performed were calculated using design grade elevations compared to current survey elevations at the time of the Closure Area visits. Potholing was performed to the Cut/Fill depth shown on Table 3 (i.e., nodes that surveyed at higher elevation than design grade). Where underlying CCR was encountered, further excavation was performed. The locations and results of the potholing activities are summarized in Table 3.

---

<sup>1</sup> T. Unseld (EGLE), e-mail communication on-file with EGLE, May 21, 2021.

At the conclusion of excavation activities, MERG developed a composite survey consisting of surface data across the footprint of the excavation using field survey points and recent drone surveys. This data was processed and compared to the design grades developed for the Closure work Plan. Cross-section views at four sections across the site are presented on Figures 5 through 7 and cross-section views of six locations along the perimeter embankment are presented on Figure 8. Each cross-section indicates the previous grade prior to construction (designated as existing grade on the figures), the proposed excavation grade, and the final closure grade. The locations of the cross-sections are shown on Figure 2. Additionally, a Final Survey Comparison is presented on Figure 9 displaying an isopach indicating cut/fill elevations across the site comparing the proposed design grade to the final closure grade.

## 2.2 Second Line of Evidence - Photographic Documentation

The second line of evidence to verify CCR removal was photographic documentation at random nodes across the excavation. As stated previously, a 50-foot grid with a total of 506 nodes was established across the footprint of the excavation limits. After determining the total number of nodes available for each Closure Area, 50 percent of the nodes were randomly selected using the Microsoft Excel® *RANDARRAY* function. The nodes randomly selected for photographic documentation are presented on the Sample Node Layout on Figure 3. Photographic documentation was conducted at a total of 258 nodes. Additionally, photographic documentation was conducted for the general area-wide excavation.

The photography procedure at each randomly selected node consisted of the following:

- Photographs were taken of a representative sample measuring one-square-foot area that contained surficial materials present at the base of the excavation at each randomly selected grid node.
- Photographs were taken from a standardized height of approximately 2.5 feet to ensure the same area and level of detail was obtained by each photograph.
  - The camera was positioned directly over the excavated surface facing downwards with as little tilt as possible.
  - The photographs had a pixel resolution of 4608 x 3456 (i.e., 15.9 megapixels).
- Each photograph included a white plate detailing the date, time, and node ID.

Photographic documentation of the general area-wide excavation is presented in Attachment C. Photographic documentation of the randomly selected grid nodes (identified on Figure 3) is presented in Attachment D. It should be noted that there are nodes considered passing for the Photographic Documentation which display windblown CCR in the photographs in Attachments C and D. This windblown CCR occurs during certain weather events where CCR is blown from the embankments, outside of the excavation footprint, into the excavation. MERG continued to remove the windblown CCR throughout the excavation process.

## 2.3 Third Line of Evidence - Microscopic Quantification

Initially, colorimetric confirmation was to be the third line of evidence to verify CCR removal. As part of the Closure Work Plan, a site-specific color-concentration calibration curve was established to estimate CCR amounts in samples at the grid nodes during CCR removal verification. HDR acquired a PCE-CSM 5 Colorimeter and conducted trials on natural sand samples obtained from the site in comparison to the site-specific color-concentration calibration curve. After several sample trials using the colorimeter, it was determined that, due to lack of consistency in the results of the colorimeter readings on natural sands at the site, microscopic quantification would be performed in place of colorimeter confirmation. This change in the closure procedures was discussed and approved by EGLE<sup>1</sup> prior to conducting the initial Closure Area visit.

The third line of evidence to verify CCR removal was microscopic quantification at random nodes across the excavation. Microscopic quantification was conducted at 50 percent of the photographic nodes randomly selected using the Microsoft Excel<sup>®</sup> *RANDARRAY* function. The nodes randomly selected for microscopic quantification are presented on the Sample Node Layout on Figure 3. Microscopic quantification was conducted at a total of 133 sample nodes (along with an additional 34 analyses performed on follow-up failure nodes).

At each randomly selected microscopy node, a 12-inch by 12-inch by 6-inch (L x W x H) sample was collected and placed in a sealed bag for transport to the HDR laboratory. A representative sample was then oven-dried (100° F) for approximately 12-24 hours to remove moisture for microscopic analyses. The sample was then sieved through a #30 (600 µm) sieve to remove debris, wood chips, and larger granular particles. The sample processing was performed in accordance with guidance from CTL Group and similar project procedures used at other sites and presented in the HDR procedures, approved by EGLE<sup>1</sup>, in Attachment A.

Three individual specimens from the processed sample were then observed under a Trinocular Microscope (7X-45X zoom magnification) to estimate the visual quantification percent of CCR to natural materials. Microscopy samples estimated to contain less than 5 percent CCR were considered “passing” nodes, as this met the 95 percent CCR removal criteria. Microscopy samples estimated to contain greater than 5 percent CCR were considered “failing” nodes and coordination with MERG was conducted to excavate further around the failing node. After further excavation was performed, five additional samples were collected at the previously failing node (i.e., at the node center and the north, east, south, and west extents of the re-excavated area). The resampled locations were then processed in the same manner as previously stated and reassessed via microscopic quantification. This method was repeated until the microscopy estimates were lower than the 5 percent threshold.

Quality control was then performed on 10 percent of the microscopic quantification samples by an independent laboratory specializing in microscopic quantification of CCR materials, CTL Group. The samples selected for quality control microscopic quantification were randomly chosen using the Microsoft Excel<sup>®</sup> *RANDARRAY* function. CTL Group performed the independent microscopic quantification and provided summary reports to HDR. In the event that the HDR and CTL Group microscopic quantification values varied more than +/- 2 percent, the CTL Group value was to prevail.



After the microscopic quantification was complete, the samples collected from the field were placed in sealed bags, labeled, and returned to the B.C. Cobb site, and ultimately archived onsite by MERG.

The results of the microscopic quantification are presented on the Sample Node Summary on Table 3. Example photographs taken during the microscopic quantification by HDR are included in Attachment E. The Microscopic Summary Reports provided by CTL Group are presented in Attachment F.

### 3 Areas of Remaining CCR

Prior to the commencement of excavation at the site, geotechnical recommendations were provided by HDR pertaining to embankment slope stability, uplift analyses, and groundwater dewatering to adequately perform the site excavation while maintaining the integrity of the perimeter embankments and the excavation bottom. Through on-going excavation activities, concerns of instability were notified to HDR for further assessment regarding the perimeter embankments (adjacent to the Muskegon River and Discharge Channel) and an area of former wood debris stockpiling in the western interior of the site.

The discussion of remaining CCR in the following subsections does not pertain to the pre-1979 CCR which was not included within the excavation boundaries as discussed in the Golder Technical Memorandum (Ref. [2]).

An Excavation Zone Layout is presented on Figure 4 depicting the three areas across the site that differ as follows:

- Excavation Zone #1: Area of excavation which meets the three lines of evidence as required by the Closure Work Plan and EGLE approved modifications to the Closure Work Plan. Excavation Zone #1 contains 440 nodes. This area met Closure Work Plan verification and all nodes which were sampled within this zone passed verification standards.
- Excavation Zone #2: Area of excavation which CCR is present at the surface, or at least one line of evidence failed at the sample node. Further excavation in this excavation zone was not performed due to stability concerns of the perimeter embankment. Excavation Zone #2 contains 33 total nodes. See Section 3.1 for further discussion.
- Excavation Zone #3: Area of excavation which Documentation of Excavation Grades, Photographic Documentation, and Microscopic Quantification were not performed on sample nodes due to standing water and bridging of the excavation bottom to counteract uplift stability concerns. Final excavation grades were documented through a July 2021 drone survey prior to bridging the area. Excavation Zone #3 contains 33 total nodes. See Section 3.2 for further discussion.

It should be noted that three sample nodes (B4, B7, and B19) included in Excavation Zone #1 originally failed verification due to the following reasons:

- B4 was not considered a randomly selected node for photography (and microscopy), however the node was potholed due to the documentation of grade

being slightly higher than design grade. CCR was encountered approximately 1-inch below grade during potholing.

- B7 and B19 were randomly selected for photography and microscopy, which both nodes ultimately did not pass the microscopy analyses.

Through communication with MERG, these areas were over-excavated to remove any remaining CCR and were considered ready for re-verification in early 2022. However, MERG indicated that there were on-going issues with the deep dewatering wells, and this portion of the excavation remained inundated with water at the time of the April 2022 observation visit and ultimately inaccessible.

### 3.1 Areas Adjacent to Perimeter Embankment

In 2020 and prior to commencing excavation activities, HDR developed a 3D stratigraphy model using existing subsurface information at the site. Additionally, HDR performed transient seepage and stability analyses assessing the hydraulic gradient, uplift, and slope stability related to the adjacent body of water (Muskegon River and Lake). HDR provided MERG with a groundwater monitoring plan and monitoring levels for MERG's use during the on-going excavation to assess the monitoring well levels in the upper and lower water bearing layers (aquifers) with respect to determined factors of safety to heave and uplift in the overlying CCR and in the low permeability layer separating the two aquifers.

As excavation continued near the perimeter embankment, MERG indicated that CCR was still present at the current excavation bottom elevation, which is at, or slightly below, the originally proposed excavation grade. MERG requested HDR to provide guidance on the minimum elevation that could be safely excavated without impacting the stability of the perimeter embankment.

MERG provided monitoring well readings as of August 13, 2021, close to the area of the excavation. HDR assessed the potential risk for instability with further excavation in terms of the critical hydraulic gradient through the subsurface confining layer and uplift of the confining layer. Through assessment of the monitoring well readings, excavation elevations, confining layer thickness and location, and lack of success with lowering the lower aquifer through dewatering pumping, it was recommended to not excavate lower than already achieved due to the risk posed by the current pressure head of the Lower Aquifer and the potential of compromising the confining layer by removing additional overburden (which is required to resist uplift and prevent damage to the confining layer). Therefore, areas adjacent to the perimeter embankment (which including sample node locations) still contain CCR. Further details of the assessment are provided in the HDR Memorandum (Ref. [4]) provided to MERG and included in Attachment G.

The approximate areas of remaining CCR discussed in this section are identified as Excavation Zone #2 on the Excavation Zone Layout presented Figure 4 and includes 33 nodes. Table 1 summarizes the nodes within Excavation Zone #2 and the difference in final elevation to design elevation (positive number indicates final elevation of node is above design grade, negative number indicates final elevation of node is below design grade). In summary, 21 nodes of Excavation Zone #2 were below design grade, 11 nodes were less than 0.5 feet above design grade, and 1 node (C2) was approximately 0.8 feet above design grade.

**Table 1. Excavation Zone #2 Node Summary**

Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)
C2	+0.80	P6	-0.14
D2	-0.41	P19	+0.30
E2	-0.23	Q6	-0.34
E3	-0.09	Q18	+0.40
F3	+0.07	R7	-0.10
H3	+0.44	R17	-1.10
I3	+0.11	S8	-0.11
K4	-1.09	S16	+0.11
K27	-0.83	T8	-0.16
L4	-0.84	T9	-0.12
M4	-0.12	T15	+0.25
M22	+0.04	V10	-0.21
M23	+0.08	V11	-1.70
N5	-0.21	V13	-0.17
N21	-0.05	W11	-0.41
O5	-0.07	W12	+0.09
O20	+0.30		

## 3.2 Wood Stockpile Area

HDR was notified by MERG that beginning on Saturday October 23, 2021, field members of MERG noticed higher flow in the dewatering pumping systems and anoxic/organic odors coming from an excavated area on the western portion of the site. Charah had been continuing to excavate the bottom of this area to remove CCR impacted soils and attain the project cleanup criteria when wood debris and sawdust was encountered at the bottom of the excavation. The additional excavation extended to a depth of 18 to 24 inches. The depth of wood debris is unknown. The area had been previously covered with standing water that has since been controlled with the addition of sumps and ditches. MERG indicated to HDR the following:

1. Higher flow was observed in the dewatering pumping systems (approx. 200 gpm higher than normal).
2. Odors present in the area indicative of anoxic/organic materials coming from the excavation in the area of the standing water.

3. Small sand boils/bubbling present in some areas around the standing water (Pin Boils mostly with boils up to 4 inches in diameter).
4. The exposed subgrade in this area is very weak and heavy equipment cannot be supported by the surficial material. Further excavation has not been performed nor is planned to be performed.

HDR recommended that the area of wood chips and standing water be bridged with a blanket of soil to add weight to resist the uplift forces from the lower aquifer and to improve uplift stability and that MERG continue to monitor the site for signs of pressure development in the lower aquifer and be prepared to mitigate and respond to excessive seepage. Further details of the assessment are provided in the HDR Memorandum (Ref. [5]) provided to MERG and included in Attachment H.

The area described above is identified as Excavation Zone #3 on the Excavation Zone Layout presented Figure 4 and includes 33 nodes.

After bridging activities were performed by MERG, water then inundated the excavation in this area. Considering the presence of standing water and the excavation bottom being covered with fill material, the three lines of evidence (Documentation of Excavation Grades, Photographic Documentation and Microscopic Quantification) were not performed at the nodes within this area.

Survey data of the nodes within this area was obtained through a July 2021 drone survey provided by MERG prior to fill placement and water inundation and the survey data was assessed. It should be noted that surveyed grade, photographic documentation, and microscopic quantification were previously performed (prior to bridging and water inundation) at three nodes: N6 (failed microscopic quantification), N8 (passed microscopic quantification but failed potholing), and O7 (failed microscopic quantification). Follow-up analyses was not able to be conducted at these three sample nodes due to the stabilization process discussed previously in this section.

Table 2 summarizes the nodes within Excavation Zone #3 and the difference in final elevation to design elevation (positive number indicates final elevation of node is above design grade, negative number indicates final elevation of node is below design grade). In summary, the survey recorded 18 nodes of Excavation Zone #3 that were below design grade, 13 nodes were less than 0.7 feet above design grade, and 2 nodes (N8 and Q14) were approximately 1.2 feet above design grade.

**Table 2. Excavation Zone #3 Node Summary**

Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)
N6	-0.11	Q8	-0.83
N8	+1.20	Q9	+0.53
O10	+0.16	R10	-0.58
O7	-0.33	R11	-0.70

Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Node ID	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)
O8	-0.12	R12	-0.60
O9	+0.57	R13	-0.60
P10	+0.21	R14	-0.36
P11	+0.51	R9	-0.64
P12	+0.52	S10	-1.07
P13	+0.67	S11	-0.78
P8	-0.76	S12	-0.93
P9	+0.05	S13	-0.87
Q10	+0.46	T11	-0.92
Q11	+0.58	T12	+0.19
Q12	+0.44	U11	-0.75
Q13	+0.64	U12	-0.20
Q14	+1.15		

## 4 Summary

The results of the CCR removal activities have been presented in this CCR Removal Report to document the removal of CCR from the Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8.

Golder developed the B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Work Plan describing multiple lines of evidence to document waste removal at the site. In 2020, MERG acquired the B.C. Cobb property from CEC as part of an ELT and in accordance with the ELT, MERG performed the CCR removal from the Bottom Ash Pond and Ponds 0-8 in accordance with the EGLE approved Closure Work Plan.

In accordance with the Closure Work Plan, HDR developed Closure Standard Operating Procedures to verify the removal of CCR at the site. An objective standard of 95 percent CCR removal was established in the Closure Work Plan.

As outlined in the Closure Work Plan, verification of CCR removal was documented based on the following three lines of evidence:

- excavation termination grades relative to Closure Work Plan design grades.
- photographic documentation of CCR removal at 50 percent of total nodes.
- microscopic quantification of CCR content at 50 percent of photographic nodes to evaluate if CCR is <5%.

HDR performed Closure Area observation visits once excavation and removal of CCR was performed by MERG. A total of four observation visits were performed at four Closure Areas. A 50-foot grid with a total of 506 nodes was established across the footprint of the excavation limits. Field notes and observations were documented on Observation Reports at the time of the field visits.

A total of 440 nodes within the Excavation Zone #1 footprint meet the three lines of evidence for documentation of CCR removal.

Excavation Areas #2 and #3 are both areas that have stability concerns. Through ongoing excavation activities, concerns of slope instability and uplift instability were notified to HDR for further assessment regarding the perimeter embankments (adjacent to the Muskegon River and Discharge Channel and an area of former wood debris stockpiling in the western interior of the site). Further excavation was not performed due to risk of excavation bottom instability and embankment instability within certain areas of the excavation. Therefore, 33 nodes fall within Excavation Zone #2 of remaining CCR, and 33 nodes fall within the Excavation Zone #3 for which the nodes were not observable after bridging activities. Of these 66 nodes, 43 nodes were within 0.1 feet of the Closure Work Plan design grade or below design grade. Therefore, a total of 483 out of 506 nodes were excavated to 0.1 feet or below design grade, reflecting 95.5% removal of the total CCR material on a node-by-node basis.

The Closure Work Plan established a cut volume of 653,713 cubic yards anticipated for the excavation. A comparison of the May 2022 final composite survey surface to the Closure Work Plan surface indicates that MERG removed approximately 660,000 cubic yards of CCR within the excavation. It should be noted, as displayed on Figure 9, that the total volume removed by MERG included areas left above design grade where clean sand was encountered (supported by pothole verification).

## 5 Certification

Based on the review of the B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Work Plan developed by Golder Associates, Inc. dated May 30, 2018, the modifications of the Closure Work Plan approved by the Michigan Department of Environment, Great Lakes, and Energy, and the attached documentation of this report, I certify to the best of my knowledge, information, and belief that this CCR Removal Report is accurate and that MERG has met the intent of the Closure Work Plan with limited exceptions. The exceptions include 33 nodes adjacent to the perimeter embankment which were not further excavated due to stability concerns and 33 nodes within the excavation bottom which were bridged due to uplift potential, of which each exception was justified based on stability analyses.



Bryce Burkett, P.E.  
Senior Geotechnical Project Manager



19 Sep 2022



## 6 References

- Ref. [1]* Golder Associates, Inc. B.C. Cobb Generating Facility, Bottom Ash Pond and Ponds 0-8 Closure Work Plan, May 30, 2018.
- Ref. [2]* Golder Associates, Inc. Technical Memorandum, B.C. Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan Closure Boundaries, August 6, 2018.
- Ref. [3]* Golder Associates, Inc. B.C. Cobb Generating Facility, Bottom Ash Pond and Ponds 0-8 Closure Work Plan, September 20, 2019.
- Ref. [4]* HDR Michigan, Inc. Memorandum, Pond 2 and 3 Perimeter Berm Excavation – Seepage and Stability Review and Recommendation, August 18, 2021.
- Ref. [5]* HDR Michigan, Inc. Water Intrusion within Wood Chip Area, October 28, 2021.

**TABLE 3**  
**SAMPLE NODE SUMMARY**



Table 3: Sample Node Summary

Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
B2	9/15/2021	647379.6	12622634.4	573.77	571.31	+2.46	+573.27	<1%	NS	Pass	Pass	No	
B3	6/14/2021	647341.3	12622666.6	576.13	573.90	+2.23	+573.00	NS	NS	NS	Pass	No	
B4	6/14/2021	647303.0	12622698.7	575.78	575.70	+0.08	+573.00	NS	NS	NS	Fail	Yes	CCR encountered at approx. 1-inch below existing grade. Additional excavation performed and to be reassessed.
B4A	--	--	--	--	575.70	--	+573.00	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B5	6/14/2021	647264.8	12622730.9	576.93	576.77	+0.16	+573.00	2-3%	2.5-3.5%	Pass	Pass	No	
B6	6/14/2021	647226.5	12622763.2	577.35	577.15	+0.20	+573.00	NS	NS	NS	Pass	No	
B7	6/14/2021	647188.1	12622795.3	577.41	577.25	+0.16	+573.51	30-35%	20-25%	Fail	Pass	No	B7 microscopy failed during Closure Area #1 visit. Area to be excavated and reassessed.
B7A	--	--	--	--	577.25	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B7B	--	--	--	--	577.25	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B7C	--	--	--	--	577.25	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B7D	--	--	--	--	577.25	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B7E	--	--	--	--	577.25	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B8	6/14/2021	647150.0	12622827.5	577.36	577.29	+0.07	+573.56	NS	NS	NS	Pass	No	
B9	6/14/2021	647111.6	12622859.7	577.28	577.11	+0.17	+573.80	NS	NS	NS	Pass	No	
B10	6/14/2021	647073.4	12622891.8	574.97	574.78	+0.19	+573.76	NS	NS	NS	Pass	No	
B11	6/14/2021	647035.2	12622924.1	573.88	573.99	-0.11	+573.81	NS	NS	NS	N/A	No	
B12	6/14/2021	646996.8	12622956.2	573.79	574.14	-0.35	+573.80	NS	NS	NS	N/A	No	
B13	6/14/2021	646958.6	12622988.4	573.46	574.01	-0.55	+573.80	NS	NS	NS	N/A	No	
B14	6/14/2021	646920.3	12623020.5	573.43	574.01	-0.58	+574.00	NS	NS	NS	N/A	No	
B15	6/14/2021	646882.0	12623052.8	573.21	573.99	-0.78	+574.00	NS	NS	NS	N/A	No	
B16	6/14/2021	646843.8	12623084.9	573.37	573.23	+0.14	+574.00	NS	NS	NS	Pass	No	
B17	6/14/2021	646805.5	12623117.0	572.77	572.33	+0.44	+573.00	NS	NS	NS	Pass	No	
B18	6/14/2021	646767.2	12623149.2	572.82	571.46	+1.36	+573.00	NS	NS	NS	Pass	No	
B19	6/14/2021	646728.9	12623181.4	572.71	570.69	+2.02	+573.00	25-30%	NS	Fail	Pass	No	B19 microscopy failed during Closure Area #1 visit. Area to be excavated and reassessed.
B19A	9/15/2021	646728.7	12623181.6	572.74	570.69	+2.05	+573.00	5-10%	NS	Fail	N/A	No	B19A microscopy failed during Closure Area #2 visit. Area to be excavated and reassessed.
B19AA	--	--	--	--	570.69	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B19B	9/15/2021	646722.4	12623169.6	572.85	570.55	+2.30	+573.00	5-10%	NS	Fail	N/A	No	B19B microscopy failed during Closure Area #2 visit. Area to be excavated and reassessed.
B19BB	--	--	--	--	570.55	--	--	NS	NS	NS	N/A	--	Further excavation performed, but follow-up assessment not available due to ponding water in excavation and node not accessible.
B19C	9/15/2021	646737.3	12623171.6	572.86	570.86	+2.00	+573.00	4-5%	NS	Pass	N/A	No	
B19D	9/15/2021	646735.5	12623193.5	572.75	570.83	+1.92	+573.00	1-2%	NS	Pass	N/A	No	
B19E	9/15/2021	646716.2	12623192.0	572.80	570.43	+2.37	+573.00	4-5%	NS	Pass	N/A	No	
B20	6/14/2021	646690.7	12623213.6	574.82	569.99	+4.83	+573.33	NS	NS	NS	Pass	No	
B21	6/14/2021	646652.4	12623245.7	574.88	569.99	+4.89	+574.00	<1%	NS	Pass	Pass	No	
B22	6/14/2021	646614.1	12623277.9	574.90	570.02	+4.88	+573.79	NS	NS	NS	Pass	No	
B23	6/14/2021	646575.9	12623310.2	574.25	571.76	+2.49	+574.00	NS	NS	NS	Pass	No	
B24	6/14/2021	646537.6	12623342.2	574.32	572.54	+1.78	+574.00	NS	NS	NS	Pass	No	
B25	6/14/2021	646499.3	12623374.5	574.35	572.48	+1.87	+574.00	1-2%	NS	Pass	Pass	No	
B26	12/16/2021	646461.1	12623406.7	572.78	572.74	+0.04	+574.00	NS	NS	NS	Pass	No	
B27	12/16/2021	646422.8	12623438.9	572.70	573.01	-0.32	+574.00	NS	NS	NS	N/A	No	
B28	12/16/2021	646384.5	12623470.9	573.00	573.28	-0.28	+574.00	1-2%	NS	Pass	N/A	No	
B29	12/16/2021	646346.2	12623503.2	573.35	571.00	+2.35	+574.00	NS	NS	NS	Pass	No	
B30	12/16/2021	646308.0	12623535.3	573.50	567.78	+5.73	+574.00	NS	NS	NS	Pass	No	
B31	12/16/2021	646269.6	12623567.5	573.47	565.55	+7.92	+574.26	4-5%	NS	Pass	Pass	No	
B32	12/16/2021	646231.5	12623599.7	573.60	573.75	-0.15	+575.00	10-15%	NS	Fail	N/A	No	B32 microscopy failed during Closure Area #3 visit. Area to be excavated and reassessed.
B32A	4/29/2022	646231.5	12623599.7	575.14	573.75	+1.39	+575.00	1-2%	NS	Pass	Pass	No	
B32B	4/29/2022	646246.5	12623599.7	575.14	573.75	+1.39	+575.00	3-4%	NS	Pass	Pass	No	
B32C	4/29/2022	646231.5	12623614.7	575.14	573.75	+1.39	+575.00	2-3%	NS	Pass	Pass	No	
B32D	4/29/2022	646216.5	12623599.7	575.14	573.75	+1.39	+575.00	2-3%	NS	Pass	Pass	No	
B32E	4/29/2022	646231.5	12623584.7	575.14	573.75	+1.39	+575.00	1-2%	NS	Pass	Pass	No	
B33	4/29/2022	646193.1	12623631.9	573.91	574.40	-0.49	+574.00	NS	NS	NS	N/A	No	
B34	4/29/2022	646154.9	12623664.1	573.62	574.00	-0.37	+574.48	4-5%	NS	Pass	N/A	No	
C2	9/15/2021	647347.4	12622596.1	574.20	573.40	+0.80	+574.37	NS	NS	NS	Fail	Yes	CCR Encountered at 6" below grade. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
C3	9/15/2021	647309.1	12622628.3	574.98	574.95	+0.03	+574.00	1-2%	NS	Pass	Pass	No	
C4	6/14/2021	647270.8	12622660.5	575.56	575.36	+0.20	+573.00	2-3%	NS	Pass	Pass	No	
C5	6/14/2021	647232.5	12622692.7	575.65	575.46	+0.19	+573.00	NS	NS	NS	Pass	No	
C6	6/14/2021	647194.3	12622724.8	575.76	575.57	+0.19	+573.00	NS	NS	NS	Pass	No	
C7	6/14/2021	647156.1	12622757.0	575.87	575.67	+0.20	+573.00	1-2%	NS	Pass	Pass	No	
C8	6/14/2021	647117.7	12622789.2	575.70	575.56	+0.14	+573.00	NS	NS	NS	Pass	No	
C9	6/14/2021	647079.5	12622821.4	575.49	575.38	+0.11	+573.21	NS	NS	NS	Pass	No	
C10	6/14/2021	647041.2	12622853.5	574.15	574.02	+0.13	+573.26	NS	NS	NS	Pass	No	
C11	6/14/2021	647002.9	12622885.7	573.46	573.38	+0.08	+573.33	NS	NS	NS	Pass	No	
C12	6/14/2021	646964.6	12622917.9	573.57	573.82	-0.25	+573.38	NS	NS	NS	N/A	No	
C13	6/14/2021	646926.4	12622950.1	573.37	574.01	-0.64	+573.54	<1%	<1%	Pass	N/A	No	
C14	6/14/2021	646888.1	12622982.3	573.45	574.01	-0.56	+573.80	NS	NS	NS	N/A	No	
C15	6/14/2021	646849.8	12623014.4	573.27	574.01	-0.74	+574.00	NS	NS	NS	N/A	No	
C16	6/14/2021	646811.6	12623046.6	573.37	573.05	+0.32	+573.97	1-2%	NS	Pass	Pass	No	
C17	6/14/2021	646773.4	12623078.8	572.75	571.76	+0.99	+573.00	1-2%	NS	Pass	Pass	No	
C18	6/14/2021	646735.0	12623110.9	572.69	570.80	+1.89	+573.00	NS	NS	NS	Pass	No	
C19	6/14/2021	646696.8	12623143.1	572.76	570.04	+2.72	+573.00	2-3%	NS	Pass	Pass	No	
C20	6/14/2021	646658.5	12623175.3	573.82	570.24	+3.58	+573.20	NS	NS	NS	Pass	No	
C21	6/14/2021	646620.3	12623207.5	574.92	570.50	+4.42	+573.78	NS	NS	NS	Pass	No	
C22	6/14/2021	646581.9	12623239.6	575.00	570.76	+4.24	+573.29	1-2%	NS	Pass	Pass	No	
C23	6/14/2021	646543.6	12623271.9	574.10	571.03	+3.07	+574.00	1-2%	NS	Pass	Pass	No	
C24	6/14/2021	646505.5	12623304.0	574.32	571.99	+2.33	+574.00	NS	NS	NS	Pass	No	
C25	6/14/2021	646467.1	12623336.2	574.46	571.70	+2.76	+574.00	NS	NS	NS	Pass	No	
C26	12/16/2021	646428.8	12623368.4	573.43	571.26	+2.18	+573.00	NS	NS	NS	Pass	No	
C27	12/16/2021	646390.6	12623400.6	573.45	570.99	+2.46	+573.12	NS	NS	NS	Pass	No	
C28	12/16/2021	646352.3	12623432.7	573.77	569.95	+3.81	+573.84	NS	NS	NS	Pass	No	
C29	12/16/2021	646314.0	12623464.9	573.92	568.73	+5.19	+574.00	NS	NS	NS	Pass	No	
C30	12/16/2021	646275.8	12623497.0	574.08	568.18	+5.91	+574.01	NS	NS	NS	Pass	No	
C31	12/16/2021	646237.6	12623529.2	574.13	570.17	+3.95	+574.39	2-3%	NS	Pass	Pass	No	

N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy

Table 3: Sample Node Summary



Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
C32	12/16/2021	646199.3	12623561.4	574.15	575.26	-1.11	+574.89	NS	NS	NS	N/A	No	
C33	4/29/2022	646161.0	12623593.6	573.89	574.99	-1.10	+574.02	2-3%	NS	Pass	N/A	No	
C34	4/29/2022	646122.7	12623625.8	573.79	574.99	-1.20	+574.00	4-5%	NS	Pass	N/A	No	
C41	4/29/2022	645854.8	12623851.0	571.42	573.42	-1.99	+572.00	4-5%	NS	Pass	N/A	No	
C42	4/29/2022	645816.5	12623883.2	571.47	574.44	-2.97	+571.99	<1%	1-2%	Pass	N/A	No	
D2	9/15/2021	647315.2	12622557.9	574.58	574.99	-0.41	+574.73	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
D3	9/15/2021	647277.0	12622590.0	574.96	575.01	-0.05	+574.31	NS	NS	NS	N/A	No	
D4	6/14/2021	647238.7	12622622.3	574.41	574.23	+0.18	+574.01	1-2%	NS	Pass	Pass	No	
D5	6/14/2021	647200.4	12622654.4	574.10	573.88	+0.22	+573.00	NS	NS	NS	Pass	No	
D6	6/14/2021	647162.1	12622686.6	574.18	573.99	+0.19	+573.00	1-2%	NS	Pass	Pass	No	
D7	6/14/2021	647123.9	12622718.8	574.22	574.03	+0.19	+573.00	1-2%	NS	Pass	Pass	No	
D8	6/14/2021	647085.5	12622750.9	574.08	573.83	+0.25	+573.00	<1%	NS	Pass	Pass	No	
D9	6/14/2021	647047.3	12622783.1	573.82	573.65	+0.17	+573.00	NS	NS	NS	Pass	No	
D10	6/14/2021	647009.1	12622815.2	573.25	573.25	+0.00	+573.00	NS	NS	NS	N/A	No	
D11	6/14/2021	646970.8	12622847.5	572.68	572.99	-0.31	+573.00	NS	NS	NS	N/A	No	
D12	6/14/2021	646932.4	12622879.6	573.05	573.31	-0.26	+573.02	<1%	NS	Pass	N/A	No	
D13	6/14/2021	646894.2	12622911.9	573.41	573.74	-0.33	+573.29	NS	NS	NS	N/A	No	
D14	6/14/2021	646855.9	12622944.0	573.46	574.01	-0.55	+573.42	NS	NS	NS	N/A	No	
D15	6/14/2021	646817.6	12622976.1	573.55	573.92	-0.37	+573.89	NS	NS	NS	N/A	No	
D16	6/14/2021	646779.5	12623008.4	573.40	572.56	+0.84	+573.44	NS	NS	NS	Pass	No	
D17	6/14/2021	646741.1	12623040.5	572.72	571.22	+1.50	+573.00	2-3%	NS	Pass	Pass	No	
D18	6/14/2021	646702.8	12623072.6	572.67	570.62	+2.05	+573.00	NS	NS	NS	Pass	No	
D19	6/14/2021	646664.6	12623104.9	572.78	570.51	+2.27	+573.00	NS	NS	NS	Pass	No	
D20	6/14/2021	646626.4	12623137.0	573.36	570.92	+2.44	+573.00	NS	NS	NS	Pass	No	
D21	6/14/2021	646588.1	12623169.2	574.91	571.21	+3.70	+573.00	NS	NS	NS	Pass	No	
D22	6/14/2021	646549.8	12623201.4	574.94	571.49	+3.45	+573.45	NS	NS	NS	Pass	No	
D23	6/14/2021	646511.6	12623233.6	575.01	571.77	+3.24	+574.00	NS	NS	NS	Pass	No	
D24	6/14/2021	646473.3	12623265.7	574.30	572.09	+2.21	+574.00	NS	NS	NS	Pass	No	
D25	9/15/2021	646435.0	12623298.0	573.30	571.97	+1.33	+574.00	NS	NS	NS	Pass	No	
D26	12/16/2021	646396.7	12623330.1	573.67	571.87	+1.80	+574.00	NS	NS	NS	Pass	No	
D27	12/16/2021	646358.5	12623362.3	573.76	572.01	+1.75	+573.42	NS	NS	NS	Pass	No	
D28	12/16/2021	646320.2	12623394.5	574.01	571.90	+2.11	+573.99	<1%	NS	Pass	Pass	No	
D29	12/16/2021	646281.9	12623426.6	575.48	573.66	+1.82	+574.00	NS	NS	NS	Pass	No	
D30	12/16/2021	646243.6	12623458.8	574.23	575.55	-1.33	+574.29	NS	NS	NS	N/A	No	
D31	12/16/2021	646205.3	12623490.9	574.29	576.00	-1.72	+574.76	NS	NS	NS	N/A	No	
D32	12/16/2021	646167.1	12623523.2	574.37	575.73	-1.36	+574.73	2-3%	NS	Pass	N/A	No	
D33	4/29/2022	646128.8	12623555.3	573.61	574.99	-1.38	+574.00	3-4%	NS	Pass	N/A	No	
D34	4/29/2022	646090.5	12623587.5	574.18	574.82	-0.64	+574.00	1-2%	NS	Pass	N/A	No	
D35	4/29/2022	646052.3	12623619.7	573.42	574.66	-1.23	+574.00	NS	NS	NS	N/A	No	
D38	4/29/2022	645937.4	12623716.2	573.55	573.99	-0.44	+573.79	1-2%	NS	Pass	N/A	No	
D39	4/29/2022	645899.2	12623748.4	572.32	573.79	-1.47	+572.56	NS	NS	NS	N/A	No	
D40	4/29/2022	645860.9	12623780.6	571.58	573.12	-1.54	+572.00	NS	NS	NS	N/A	No	
D41	4/29/2022	645822.6	12623812.7	570.94	573.35	-2.41	+571.63	<1%	1.5-2.5%	Pass	N/A	No	
D42	4/29/2022	645784.4	12623844.9	572.07	574.50	-2.43	+572.50	NS	NS	NS	N/A	No	
E2	9/15/2021	647283.0	12622519.6	574.76	574.99	-0.23	+574.98	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
E3	9/15/2021	647244.7	12622551.7	574.92	575.01	-0.09	+574.52	5-10%	NS	Fail	N/A	No	Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
E4	6/14/2021	647206.5	12622583.9	574.23	574.00	+0.23	+574.01	NS	NS	NS	Pass	No	
E5	6/14/2021	647168.2	12622616.1	572.56	572.32	+0.24	+573.00	NS	NS	NS	Pass	No	
E6	6/14/2021	647129.9	12622648.3	572.70	572.42	+0.28	+573.00	NS	NS	NS	Pass	No	
E7	6/14/2021	647091.7	12622680.4	572.39	572.30	+0.09	+573.00	NS	NS	NS	Pass	No	
E8	6/14/2021	647053.4	12622712.6	572.05	572.12	-0.07	+573.00	1-2%	NS	Pass	N/A	No	
E9	6/14/2021	647015.1	12622744.8	571.85	571.93	-0.08	+573.00	NS	NS	NS	N/A	No	
E10	6/14/2021	646976.8	12622777.0	571.82	572.06	-0.24	+573.00	NS	NS	NS	N/A	No	
E11	6/14/2021	646938.5	12622809.2	572.36	572.59	-0.23	+573.00	1-2%	NS	Pass	N/A	No	
E12	6/14/2021	646900.4	12622841.4	572.84	573.15	-0.31	+573.00	NS	NS	NS	N/A	No	
E13	6/14/2021	646862.1	12622873.5	573.47	573.70	-0.23	+573.05	NS	NS	NS	N/A	No	
E14	6/14/2021	646823.7	12622905.8	573.69	573.88	-0.19	+573.02	NS	NS	NS	N/A	No	
E15	6/14/2021	646785.5	12622937.9	573.28	573.28	+0.00	+573.00	3-4%	NS	Pass	N/A	No	
E16	6/14/2021	646747.2	12622970.1	572.78	572.71	+0.07	+573.00	NS	NS	NS	Pass	No	
E17	6/14/2021	646708.9	12623002.2	572.82	571.74	+1.08	+573.00	NS	NS	NS	Pass	No	
E18	6/14/2021	646670.7	12623034.5	572.67	570.79	+1.88	+573.00	3-4%	NS	Pass	Pass	No	
E19	6/14/2021	646632.4	12623066.6	572.70	570.99	+1.71	+573.00	NS	NS	NS	Pass	No	
E20	6/14/2021	646594.1	12623098.8	573.71	570.99	+2.72	+573.00	NS	NS	NS	Pass	No	
E21	6/14/2021	646555.9	12623130.9	574.78	571.27	+3.51	+573.20	NS	NS	NS	Pass	No	
E22	6/14/2021	646517.6	12623163.1	574.94	572.96	+1.98	+573.51	NS	NS	NS	Pass	No	
E23	9/15/2021	646479.3	12623195.3	573.36	574.65	-1.29	+573.95	NS	NS	NS	N/A	No	
E24	9/15/2021	646441.1	12623227.5	573.62	574.08	-0.46	+574.00	NS	NS	NS	N/A	No	
E25	9/15/2021	646402.8	12623259.7	573.42	573.32	+0.10	+574.00	1-2%	NS	Pass	Pass	No	
E26	9/15/2021	646364.5	12623291.8	574.06	573.54	+0.52	+574.00	5-10%	NS	Fail	Fail	Yes	CCR encountered immediately below surface. E26 microscopy failed during Closure Area #2 visit. Area to be excavated and reassessed.
E26A	12/16/2021	646364.5	12623291.8	574.07	573.54	+0.53	+574.00	1-2%	NS	Pass	Pass	No	
E26B	12/16/2021	646364.5	12623306.8	574.07	573.54	+0.53	+574.00	<1%	NS	Pass	Pass	No	
E26C	12/16/2021	646349.5	12623291.8	574.07	573.54	+0.53	+574.00	10-15%	NS	Fail	Pass	No	E26C microscopy failed during Closure Area #3 visit. Area to be excavated and reassessed.
E26CC	4/29/2022	646334.5	12623291.8	574.00	573.54	+0.46	+574.00	<1%	NS	Pass	Pass	No	
E26D	12/16/2021	646364.5	12623276.8	574.07	573.54	+0.53	+574.00	10-15%	NS	Fail	Pass	No	E26D microscopy failed during Closure Area #3 visit. Area to be excavated and reassessed.
E26DD	4/29/2022	646364.5	12623291.8	574.00	573.54	+0.46	+574.00	<1%	NS	Pass	Pass	No	
E26E	12/16/2021	646379.5	12623291.8	574.07	573.54	+0.53	+574.00	1-2%	NS	Pass	Pass	No	
E27	12/16/2021	646326.2	12623324.1	574.19	573.68	+0.51	+573.49	NS	NS	NS	Pass	No	
E28	12/16/2021	646287.9	12623356.2	574.08	573.50	+0.57	+574.00	NS	NS	NS	Pass	No	
E29	12/16/2021	646249.7	12623388.4	574.15	574.20	-0.05	+574.17	<1%	NS	Pass	N/A	No	
E30	12/16/2021	646211.4	12623420.6	574.34	575.86	-1.52	+574.63	NS	NS	NS	N/A	No	
E31	12/16/2021	646173.2	12623452.7	574.39	576.00	-1.61	+574.41	3-4%	NS	Pass	N/A	No	

Table 3 (Page 2 of 7)

N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy



Table 3: Sample Node Summary

Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
E32	12/16/2021	646135.0	12623484.9	574.49	576.00	-1.51	+574.70	NS	NS	NS	N/A	No	
E33	4/29/2022	646096.6	12623517.1	573.93	575.27	-1.34	+574.00	4-5%	NS	Pass	N/A	No	
E34	4/29/2022	646058.3	12623549.2	573.97	575.01	-1.04	+574.00	NS	NS	NS	N/A	No	
E35	4/29/2022	646020.1	12623581.4	574.04	574.84	-0.80	+574.00	NS	NS	NS	N/A	No	
E36	4/29/2022	645981.8	12623613.6	573.40	574.25	-0.85	+573.70	NS	NS	NS	N/A	No	
E37	4/29/2022	645943.5	12623645.8	572.85	573.99	-1.14	+573.00	1-2%	NS	Pass	N/A	No	
E38	4/29/2022	645905.3	12623677.9	572.99	573.99	-1.01	+572.99	NS	NS	NS	N/A	No	
E39	4/29/2022	645867.0	12623710.1	572.68	573.99	-1.31	+572.49	NS	NS	NS	N/A	No	
E40	4/29/2022	645828.7	12623742.3	571.68	573.64	-1.96	+572.00	NS	NS	NS	N/A	No	
E41	4/29/2022	645790.4	12623774.5	571.13	573.75	-2.62	+572.00	2-3%	NS	Pass	N/A	No	
F3	9/15/2021	647212.6	12622513.5	575.08	575.01	+0.07	+575.00	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
F4	6/14/2021	647174.4	12622545.7	573.70	573.77	-0.07	+573.55	NS	NS	NS	N/A	No	
F5	6/14/2021	647136.0	12622577.9	571.90	571.67	+0.23	+573.00	NS	NS	NS	Pass	No	
F6	6/14/2021	647097.8	12622610.1	571.21	570.99	+0.22	+573.00	NS	NS	NS	Pass	No	
F7	6/14/2021	647059.4	12622642.2	571.26	570.99	+0.27	+573.00	NS	NS	NS	Pass	No	
F8	6/14/2021	647021.3	12622674.4	571.37	571.36	+0.01	+573.00	2-3%	NS	Pass	Pass	No	
F9	6/14/2021	646983.0	12622706.6	571.52	571.76	-0.24	+573.00	1-2%	NS	Pass	N/A	No	
F10	6/14/2021	646944.6	12622738.8	572.03	572.01	+0.02	+573.00	NS	NS	NS	Pass	No	
F11	6/14/2021	646906.5	12622770.9	572.41	572.65	-0.24	+573.00	NS	NS	NS	N/A	No	
F12	6/14/2021	646868.1	12622803.0	572.92	573.21	-0.29	+573.00	NS	NS	NS	N/A	No	
F13	6/14/2021	646829.8	12622835.3	572.96	573.70	-0.74	+573.00	NS	NS	NS	N/A	No	
F14	6/14/2021	646791.7	12622867.4	572.98	573.09	-0.11	+573.20	1-2%	4-5%	Pass	N/A	No	
F15	6/14/2021	646753.3	12622899.6	572.67	572.47	+0.20	+573.00	NS	NS	NS	Pass	No	
F16	6/14/2021	646715.0	12622931.8	572.99	571.89	+1.10	+573.00	NS	NS	NS	Pass	No	
F17	6/14/2021	646676.8	12622964.0	572.97	571.34	+1.63	+573.00	1-2%	NS	Pass	Pass	No	
F18	6/14/2021	646638.5	12622996.2	572.99	570.93	+2.06	+573.00	NS	NS	NS	Pass	No	
F19	6/14/2021	646600.2	12623028.4	572.73	571.28	+1.45	+572.36	NS	NS	NS	Pass	No	
F20	6/14/2021	646562.0	12623060.5	573.48	572.97	+0.51	+572.99	1-2%	NS	Pass	Pass	No	
F21	6/14/2021	646523.7	12623092.7	574.56	574.66	-0.10	+574.00	3-4%	NS	Pass	N/A	No	
F22	9/15/2021	646485.5	12623124.8	573.24	576.35	-3.11	+574.00	NS	NS	NS	N/A	No	
F23	9/15/2021	646447.2	12623157.0	573.79	577.44	-3.65	+574.00	NS	NS	NS	N/A	No	
F24	9/15/2021	646409.0	12623189.2	573.56	576.21	-2.65	+574.00	2-3%	NS	Pass	N/A	No	
F25	9/15/2021	646370.7	12623221.4	574.52	575.68	-1.16	+574.00	NS	NS	NS	N/A	No	
F26	9/15/2021	646332.4	12623253.6	575.00	575.51	-0.51	+574.00	NS	NS	NS	N/A	No	
F27	9/15/2021	646294.0	12623285.8	575.52	575.25	+0.27	+573.95	NS	NS	NS	Pass	No	
F28	12/16/2021	646255.8	12623318.0	574.29	575.05	-0.77	+574.08	1-2%	NS	Pass	N/A	No	
F29	12/16/2021	646217.6	12623350.1	574.26	574.99	-0.73	+574.42	4-5%	NS	Pass	N/A	No	
F30	12/16/2021	646179.2	12623382.2	574.52	575.32	-0.80	+574.80	NS	NS	NS	N/A	No	
F31	12/16/2021	646141.0	12623414.5	574.56	576.00	-1.44	+574.66	NS	NS	NS	N/A	No	
F32	12/16/2021	646102.7	12623446.6	574.59	576.00	-1.40	+574.90	NS	NS	NS	N/A	No	
F33	4/29/2022	646064.4	12623478.8	573.95	575.74	-1.79	+574.00	NS	NS	NS	N/A	No	
F34	4/29/2022	646026.2	12623511.0	573.77	574.99	-1.23	+574.00	1-2%	NS	Pass	N/A	No	
F35	4/29/2022	645987.9	12623543.1	573.89	575.01	-1.12	+574.00	2-3%	NS	Pass	N/A	No	
F36	4/29/2022	645949.6	12623575.3	573.86	574.87	-1.01	+573.87	4-5%	NS	Pass	N/A	No	
F37	4/29/2022	645911.4	12623607.5	573.14	574.18	-1.03	+573.00	NS	NS	NS	N/A	No	
F38	4/29/2022	645873.1	12623639.7	572.77	573.99	-1.22	+572.97	<1%	NS	Pass	N/A	No	
F39	4/29/2022	645834.8	12623671.9	573.04	573.99	-0.95	+573.00	NS	NS	NS	N/A	No	
F40	4/29/2022	645796.5	12623704.0	572.76	574.08	-1.32	+572.93	NS	NS	NS	N/A	No	
G3	9/15/2021	647180.4	12622475.2	575.36	575.01	+0.35	+575.14	1-2%	NS	Pass	Pass	No	
G4	6/14/2021	647142.1	12622507.3	575.83	573.54	+2.29	+573.32	NS	NS	NS	Pass	No	
G5	6/14/2021	647103.9	12622539.6	573.35	571.23	+2.12	+573.00	NS	NS	NS	Pass	No	
G6	6/14/2021	647065.6	12622571.8	572.98	568.13	+4.85	+573.00	3-4%	NS	Pass	Pass	No	
G7	6/14/2021	647027.3	12622603.9	572.42	569.83	+2.59	+573.00	NS	NS	NS	Pass	No	
G8	6/14/2021	646989.1	12622636.1	572.17	571.48	+0.69	+573.00	NS	NS	NS	Pass	No	
G9	6/14/2021	646950.7	12622668.3	572.67	571.88	+0.79	+573.00	NS	NS	NS	Pass	No	
G10	6/14/2021	646912.5	12622700.4	573.16	572.01	+1.15	+573.00	NS	NS	NS	Pass	No	
G11	6/14/2021	646874.3	12622732.6	573.30	572.70	+0.60	+573.00	NS	NS	NS	Pass	No	
G12	6/14/2021	646836.0	12622764.9	573.26	573.27	-0.01	+573.00	NS	NS	NS	N/A	No	
G13	6/14/2021	646797.7	12622797.0	573.16	572.89	+0.27	+573.01	2-3%	NS	Pass	Pass	No	
G14	6/14/2021	646759.5	12622829.1	573.22	572.29	+0.93	+573.00	NS	NS	NS	Pass	No	
G15	6/14/2021	646721.2	12622861.4	572.79	571.66	+1.13	+573.00	NS	NS	NS	Pass	No	
G16	6/14/2021	646682.9	12622893.6	572.99	571.09	+1.90	+573.00	NS	NS	NS	Pass	No	
G17	6/14/2021	646644.6	12622925.7	572.91	570.52	+2.39	+573.00	<1%	NS	Pass	Pass	No	
G18	6/14/2021	646606.3	12622958.0	573.44	570.88	+2.56	+572.66	3-4%	NS	Pass	Pass	No	
G19	9/15/2021	646568.1	12622990.0	573.34	574.88	-1.54	+572.37	NS	NS	NS	N/A	No	
G20	9/15/2021	646529.8	12623022.2	573.37	576.49	-3.12	+573.00	<1%	NS	Pass	N/A	No	
G21	9/15/2021	646491.6	12623054.4	573.35	578.08	-4.73	+573.99	NS	NS	NS	N/A	No	
G22	9/15/2021	646453.2	12623086.5	573.52	579.76	-6.24	+574.00	NS	NS	NS	N/A	No	
G23	9/15/2021	646415.0	12623118.7	573.93	579.83	-5.90	+574.00	NS	NS	NS	N/A	No	
G24	9/15/2021	646376.7	12623151.0	574.46	578.62	-4.16	+574.00	<1%	NS	Pass	N/A	No	
G25	9/15/2021	646338.4	12623183.1	574.78	577.32	-2.54	+574.47	NS	NS	NS	N/A	No	
G26	9/15/2021	646300.1	12623215.3	575.08	576.02	-0.94	+574.29	NS	NS	NS	N/A	No	
G27	9/15/2021	646261.8	12623247.5	576.05	576.49	-0.44	+573.99	NS	NS	NS	N/A	No	
G28	12/16/2021	646223.7	12623279.7	574.92	576.17	-1.25	+576.44	<1%	NS	Pass	N/A	No	
G29	12/16/2021	646185.3	12623311.8	574.41	576.01	-1.60	+575.00	NS	NS	NS	N/A	No	
G30	12/16/2021	646147.1	12623344.0	574.59	575.99	-1.40	+574.93	NS	NS	NS	N/A	No	
G31	12/16/2021	646108.9	12623376.2	574.65	575.99	-1.35	+574.89	NS	NS	NS	N/A	No	
G32	12/16/2021	646070.6	12623408.3	574.78	575.85	-1.08	+574.95	1-2%	NS	Pass	N/A	No	
G33	4/29/2022	646032.3	12623440.5	574.00	575.46	-1.46	+574.00	4-5%	NS	Pass	N/A	No	
G34	4/29/2022	645994.0	12623472.7	573.88	575.25	-1.37	+574.00	3-4%	NS	Pass	N/A	No	
G35	4/29/2022	645955.7	12623504.9	573.66	574.99	-1.33	+573.96	NS	NS	NS	N/A	No	

N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy

Table 3: Sample Node Summary



Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
G36	4/29/2022	645917.5	12623537.1	573.74	575.01	-1.27	+573.52	NS	NS	NS	N/A	No	
G37	4/29/2022	645879.2	12623569.2	573.45	574.87	-1.42	+573.22	NS	NS	NS	N/A	No	
G38	4/29/2022	645840.9	12623601.4	573.21	574.83	-1.61	+573.07	NS	NS	NS	N/A	No	
G39	4/29/2022	645802.6	12623633.6	573.15	575.01	-1.86	+573.00	2-3%	NS	Pass	N/A	No	
G40	4/29/2022	645764.4	12623665.8	573.10	573.99	-0.89	+573.00	3-4%	NS	Pass	N/A	No	
H3	9/15/2021	647148.2	12622437.0	575.45	575.01	+0.44	+575.31	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
H4	9/15/2021	647109.9	12622469.1	573.40	573.31	+0.09	+573.71	NS	NS	NS	Pass	No	
H5	6/14/2021	647071.7	12622501.2	573.40	565.99	+7.41	+573.15	NS	NS	NS	Pass	No	
H6	6/14/2021	647033.4	12622533.5	573.33	565.16	+8.17	+573.00	NS	NS	NS	Pass	No	
H7	6/14/2021	646995.1	12622565.7	573.18	566.59	+6.59	+573.00	NS	NS	NS	Pass	No	
H8	6/14/2021	646956.9	12622597.8	573.08	568.04	+5.04	+573.00	NS	NS	NS	Pass	No	
H9	6/14/2021	646918.6	12622630.0	572.99	569.48	+3.51	+573.00	2-3%	NS	Pass	Pass	No	
H10	6/14/2021	646880.4	12622662.2	573.33	570.93	+2.40	+573.65	<1%	NS	Pass	Pass	No	
H11	6/14/2021	646842.1	12622694.4	573.32	572.41	+0.91	+573.81	NS	NS	NS	Pass	No	
H12	6/14/2021	646803.8	12622726.6	573.22	572.71	+0.51	+573.62	NS	NS	NS	Pass	No	
H13	6/14/2021	646765.6	12622758.7	573.30	572.11	+1.19	+573.00	NS	NS	NS	Pass	No	
H14	6/14/2021	646727.3	12622790.9	573.24	571.48	+1.76	+573.00	NS	NS	NS	Pass	No	
H15	6/14/2021	646688.9	12622823.1	572.57	570.86	+1.71	+573.00	NS	NS	NS	Pass	No	
H16	6/14/2021	646650.7	12622855.3	572.69	570.26	+2.43	+573.00	NS	NS	NS	Pass	No	
H17	6/14/2021	646612.4	12622887.5	572.77	569.69	+3.08	+572.64	NS	NS	NS	Pass	No	
H18	6/14/2021	646574.1	12622919.7	573.15	573.51	-0.36	+572.00	2-3%	NS	Pass	N/A	No	
H19	9/15/2021	646536.0	12622951.7	573.33	576.17	-2.84	+573.00	NS	NS	NS	N/A	No	
H20	9/15/2021	646497.6	12622983.9	573.13	577.51	-4.38	+573.00	NS	NS	NS	N/A	No	
H21	9/15/2021	646459.3	12623016.2	573.36	578.87	-5.51	+573.37	NS	NS	NS	N/A	No	
H22	9/15/2021	646421.1	12623048.3	573.36	580.01	-6.65	+573.87	NS	NS	NS	N/A	No	
H23	9/15/2021	646382.9	12623080.4	574.24	580.01	-5.77	+574.00	NS	NS	NS	N/A	No	
H24	9/15/2021	646344.6	12623112.7	574.35	578.94	-4.59	+574.00	NS	NS	NS	N/A	No	
H25	9/15/2021	646306.2	12623144.8	574.76	577.62	-2.86	+574.64	2-3%	2-3%	Pass	N/A	No	
H26	9/15/2021	646268.0	12623177.0	575.72	576.50	-0.78	+574.78	10-15%	6-7%	Fail	N/A	No	H26 microscopy failed during Closure Area #2 visit. Area excavated and reassessed.
H26A	12/16/2021	646268.0	12623176.9	574.41	576.50	-2.09	+574.78	1-2%	NS	Pass	N/A	No	
H26B	12/16/2021	646268.0	12623191.9	574.41	576.50	-2.09	+574.78	<1%	NS	Pass	N/A	No	
H26C	12/16/2021	646253.0	12623176.9	574.41	576.50	-2.09	+574.78	10-15%	NS	Fail	N/A	No	H26C microscopy failed during Closure Area #3 visit. Area to be excavated and reassessed.
H26CC	4/29/2022	646253.0	12623176.9	574.43	576.50	-2.08	+574.78	1-2%	NS	Pass	N/A	No	
H26D	12/16/2021	646268.0	12623161.9	574.41	576.50	-2.09	+574.78	1-2%	NS	Pass	N/A	No	
H26E	12/16/2021	646283.0	12623176.9	574.41	576.50	-2.09	+574.78	4-5%	NS	Pass	N/A	No	
H27	9/15/2021	646229.7	12623209.1	576.01	580.65	-4.64	+574.61	NS	NS	NS	N/A	No	
H28	12/16/2021	646191.5	12623241.3	575.29	577.27	-1.98	+577.48	8-10%	NS	Fail	N/A	No	H28 microscopy failed during Closure Area #3 visit. Area to be excavated and reassessed.
H28A	4/29/2022	646191.5	12623241.3	574.51	577.27	-2.76	+577.48	4-5%	NS	Pass	N/A	No	
H28B	4/29/2022	646206.5	12623241.3	574.51	577.27	-2.76	+577.48	3-4%	NS	Pass	N/A	No	
H28C	4/29/2022	646191.5	12623256.3	574.51	577.27	-2.76	+577.48	<1%	NS	Pass	N/A	No	
H28D	4/29/2022	646176.5	12623241.3	574.51	577.27	-2.76	+577.48	<1%	NS	Pass	N/A	No	
H28E	4/29/2022	646191.5	12623226.3	574.51	577.27	-2.76	+577.48	<1%	NS	Pass	N/A	No	
H29	9/15/2021	646153.2	12623273.5	574.46	576.01	-1.55	+575.00	4-5%	NS	Pass	N/A	No	
H30	12/16/2021	646115.0	12623305.7	574.66	575.99	-1.33	+575.00	4-5%	NS	Pass	N/A	No	
H31	12/16/2021	646076.6	12623337.9	574.88	575.99	-1.11	+575.00	NS	NS	NS	N/A	No	
H32	12/16/2021	646038.3	12623370.0	574.92	576.30	-1.37	+574.99	NS	NS	NS	N/A	No	
H33	4/29/2022	646000.1	12623402.3	574.35	576.02	-1.67	+574.55	2-3%	NS	Pass	N/A	No	
H34	4/29/2022	645961.8	12623434.4	573.97	575.52	-1.55	+574.00	NS	NS	NS	N/A	No	
H35	4/29/2022	645923.5	12623466.6	573.56	575.08	-1.52	+573.87	2-3%	NS	Pass	N/A	No	
H36	4/29/2022	645885.3	12623498.8	573.67	577.01	-3.34	+573.63	NS	NS	NS	N/A	No	
H37	4/29/2022	645847.0	12623531.0	573.57	576.05	-2.47	+573.42	NS	NS	NS	N/A	No	
H38	4/29/2022	645808.7	12623563.1	573.51	574.99	-1.48	+573.46	4-5%	NS	Pass	N/A	No	
H39	4/29/2022	645770.5	12623595.3	573.09	574.45	-1.36	+573.17	NS	NS	NS	N/A	No	
H40	4/29/2022	645732.2	12623627.5	573.16	573.34	-0.18	+573.00	NS	NS	NS	N/A	No	
I3	9/15/2021	647116.0	12622398.7	575.51	575.40	+0.11	+579.43	70-80%	NS	Fail	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
I4	9/15/2021	647077.8	12622430.8	573.99	571.29	+2.70	+573.91	NS	NS	NS	Pass	No	
I5	6/14/2021	647039.5	12622463.1	573.36	569.73	+3.63	+573.04	NS	NS	NS	Pass	No	
I6	6/14/2021	647001.2	12622495.2	573.32	566.71	+6.61	+573.00	NS	NS	NS	Pass	No	
I7	6/14/2021	646963.0	12622527.4	573.20	566.79	+6.41	+573.00	<1%	NS	Pass	Pass	No	
I8	6/14/2021	646924.8	12622559.5	573.02	568.24	+4.78	+573.00	NS	NS	NS	Pass	No	
I9	6/14/2021	646886.5	12622591.7	573.04	569.68	+3.36	+573.00	NS	NS	NS	Pass	No	
I10	6/14/2021	646848.2	12622623.9	573.00	571.13	+1.87	+573.00	NS	NS	NS	Pass	No	
I11	6/14/2021	646809.9	12622656.1	573.30	572.13	+1.17	+573.66	NS	NS	NS	Pass	No	
I12	6/14/2021	646771.6	12622688.3	573.25	572.01	+1.24	+573.18	NS	NS	NS	Pass	No	
I13	6/14/2021	646733.4	12622720.5	572.94	571.65	+1.29	+573.00	NS	NS	NS	Pass	No	
I14	6/14/2021	646695.1	12622752.7	572.91	570.67	+2.24	+573.00	NS	NS	NS	Pass	No	
I15	6/14/2021	646656.8	12622784.9	572.85	570.07	+2.78	+573.00	<1%	NS	Pass	Pass	No	
I16	6/14/2021	646618.5	12622817.0	572.66	569.44	+3.22	+572.73	<1%	NS	Pass	Pass	No	
I17	6/14/2021	646580.2	12622849.2	573.04	570.50	+2.54	+572.00	NS	NS	NS	Pass	No	
I18	6/14/2021	646542.0	12622881.3	572.93	573.22	-0.29	+572.77	<1%	NS	Pass	N/A	No	
I19	9/15/2021	646503.7	12622913.5	573.03	575.50	-2.47	+573.00	<1%	NS	Pass	N/A	No	
I20	9/15/2021	646465.4	12622945.6	572.96	576.92	-3.96	+573.00	NS	NS	NS	N/A	No	
I21	9/15/2021	646427.2	12622977.8	573.20	578.16	-4.96	+573.00	NS	NS	NS	N/A	No	
I22	9/15/2021	646388.9	12623010.0	573.00	579.00	-6.00	+573.60	NS	NS	NS	N/A	No	
I23	9/15/2021	646350.6	12623042.2	573.78	579.75	-5.97	+574.00	NS	NS	NS	N/A	No	
I24	9/15/2021	646312.4	12623074.4	574.10	579.67	-5.57	+574.99	<1%	NS	Pass	N/A	No	
I25	9/15/2021	646274.1	12623106.6	575.40	578.20	-2.80	+574.99	NS	NS	NS	N/A	No	
I26	9/15/2021	646235.8	12623138.8	576.37	576.99	-0.62	+575.00	NS	NS	NS	N/A	No	
I27	9/15/2021	646197.6	12623170.9	575.22	582.33	-7.11	+575.00	2-3%	NS	Pass	N/A	No	
I28	9/15/2021	646159.2	12623203.2	575.42	580.26	-4.84	+574.10	2-3%	NS	Pass	N/A	No	
I29	12/16/2021	646121.0	12623235.3	574.73	577.47	-2.74	+575.00	NS	NS	NS	N/A	No	

Table 3 (Page 4 of 7)

N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy





Table 3: Sample Node Summary

Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
I30	12/16/2021	646082.8	12623267.5	574.84	575.99	-1.15	+575.00	NS	NS	NS	N/A	No	
I31	12/16/2021	646044.5	12623299.6	574.94	575.99	-1.05	+575.00	NS	NS	NS	N/A	No	
I32	12/16/2021	646006.1	12623331.8	575.05	576.40	-1.35	+575.00	NS	NS	NS	N/A	No	
I33	4/29/2022	645967.9	12623364.0	574.62	576.79	-2.17	+574.54	2-3%	3-4%	Pass	N/A	No	
I34	4/29/2022	645929.6	12623396.2	574.65	576.54	-1.89	+574.07	NS	NS	NS	N/A	No	
I35	4/29/2022	645891.4	12623428.3	573.84	575.76	-1.92	+574.00	NS	NS	NS	N/A	No	
I36	4/29/2022	645853.1	12623460.5	573.61	576.29	-2.68	+573.83	NS	NS	NS	N/A	No	
I37	4/29/2022	645814.8	12623492.7	573.70	575.94	-2.24	+573.67	NS	NS	NS	N/A	No	
I38	4/29/2022	645776.6	12623524.9	573.62	574.90	-1.28	+573.74	2-3%	NS	Pass	N/A	No	
I39	4/29/2022	645738.3	12623557.0	573.50	573.46	+0.05	+573.57	NS	NS	NS	Pass	No	
I40	4/29/2022	645700.0	12623589.2	573.08	572.18	+0.89	+573.00	NS	NS	NS	Pass	No	
I41	--	645661.7	12623621.4	--	573.99	--	--	NS	NS	NS	NS	--	I41 not accessible due to guy-wire present from adjacent transmission tower.
J4	9/15/2021	647045.6	12622392.6	575.31	575.22	+0.09	+574.77	NS	NS	NS	Pass	No	
J5	6/14/2021	647007.4	12622424.8	573.34	573.42	-0.08	+573.00	NS	NS	NS	N/A	No	
J6	6/14/2021	646969.0	12622456.9	573.35	570.56	+2.79	+573.00	NS	NS	NS	Pass	No	
J7	6/14/2021	646931.4	12622489.8	573.34	566.99	+6.35	+573.00	NS	NS	NS	Pass	No	
J8	6/14/2021	646892.5	12622521.4	572.85	568.44	+4.41	+573.00	NS	NS	NS	Fail	Yes	CCR encountered at approx. 12- to 18-inches below existing grade at J8. Additonal potholing performed around J8. An 8- to 10-ft wide layer of ash was uncovered approx. 200 lineal feet between the J and K node lines. Between Rows 7 and 11. Additional excavation was performed and CCR was removed. Area to be reassessed.
J8A	9/15/2021	646892.5	12622521.3	572.68	568.44	+4.24	+573.00	NS	NS	NS	Pass	No	J8A reassessed during Closure Area #2 visit. No signs of CCR from potholing.
J9	6/14/2021	646854.2	12622553.4	572.92	569.88	+3.04	+573.00	NS	NS	NS	Pass	No	
J10	6/14/2021	646815.9	12622585.7	572.92	571.33	+1.59	+573.00	NS	NS	NS	Pass	No	
J11	6/14/2021	646777.8	12622617.9	573.10	572.01	+1.09	+573.00	NS	NS	NS	Pass	No	
J12	6/14/2021	646739.5	12622650.0	573.14	572.01	+1.13	+573.00	NS	NS	NS	Pass	No	
J13	6/14/2021	646701.1	12622682.2	573.08	571.87	+1.21	+573.00	NS	NS	NS	Pass	No	
J14	6/14/2021	646662.9	12622714.3	573.10	570.89	+2.21	+573.00	NS	NS	NS	Pass	No	
J15	6/14/2021	646624.6	12622746.6	572.89	569.89	+3.00	+572.48	<1%	NS	Pass	Pass	No	
J16	6/14/2021	646586.3	12622778.7	572.88	568.99	+3.89	+572.00	1-2%	NS	Pass	Pass	No	
J17	6/14/2021	646548.1	12622810.9	572.88	570.10	+2.78	+572.19	NS	NS	NS	Pass	No	
J18	6/14/2021	646509.8	12622843.0	572.76	572.40	+0.36	+572.91	NS	NS	NS	Pass	No	
J19	9/15/2021	646471.5	12622875.2	572.89	574.68	-1.79	+572.81	NS	NS	NS	N/A	No	
J20	9/15/2021	646433.2	12622907.4	572.69	576.28	-3.59	+573.00	NS	NS	NS	N/A	No	
J21	9/15/2021	646395.0	12622939.7	572.78	577.16	-4.38	+573.00	NS	NS	NS	N/A	No	
J22	9/15/2021	646356.7	12622971.8	573.26	577.96	-4.70	+573.22	NS	NS	NS	N/A	No	
J23	9/15/2021	646318.5	12623003.9	573.97	578.72	-4.75	+574.00	NS	NS	NS	N/A	No	
J24	9/15/2021	646280.2	12623036.1	574.56	579.47	-4.91	+574.53	NS	NS	NS	N/A	No	
J25	9/15/2021	646241.9	12623068.3	574.71	578.92	-4.21	+574.18	NS	NS	NS	N/A	No	
J26	9/15/2021	646203.6	12623100.5	573.66	577.45	-3.79	+573.64	4-5%	NS	Pass	N/A	No	
J27	12/16/2021	646165.4	12623132.7	574.42	580.53	-6.11	+571.00	1-2%	NS	Pass	N/A	No	
J28	12/16/2021	646127.1	12623164.9	574.67	578.41	-3.74	+572.32	1-2%	NS	Pass	N/A	No	
J29	12/16/2021	646088.9	12623197.0	574.91	576.41	-1.50	+575.00	NS	NS	NS	N/A	No	
J30	12/16/2021	646050.6	12623229.2	575.01	575.03	-0.02	+575.00	NS	NS	NS	N/A	No	
J31	12/16/2021	646012.3	12623261.3	575.11	572.87	+2.24	+575.00	NS	NS	NS	Pass	No	
J32	12/16/2021	645974.1	12623293.6	575.15	574.82	+0.34	+574.99	NS	NS	NS	Pass	No	
J33	4/29/2022	645935.7	12623325.7	574.55	575.56	-1.00	+574.66	NS	NS	NS	N/A	No	
J34	4/29/2022	645897.5	12623357.9	574.46	573.70	+0.77	+574.30	NS	NS	NS	Pass	No	
J35	4/29/2022	645859.2	12623390.1	573.81	573.24	+0.57	+574.00	NS	NS	NS	Pass	No	
J36	4/29/2022	645820.9	12623422.2	573.81	575.43	-1.63	+574.00	1-2%	2.5-3.5%	Pass	N/A	No	
J37	4/29/2022	645782.7	12623454.4	573.70	574.97	-1.27	+573.95	NS	NS	NS	N/A	No	
J38	4/29/2022	645744.4	12623486.6	573.76	575.01	-1.25	+574.00	2-3%	NS	Pass	N/A	No	
J39	4/29/2022	645706.1	12623518.8	573.30	573.15	+0.15	+574.00	NS	NS	NS	Pass	No	
K4	9/15/2021	647013.4	12622354.3	576.79	577.88	-1.09	+576.80	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
K5	6/14/2021	646975.1	12622386.5	573.39	576.59	-3.20	+573.07	NS	NS	NS	N/A	No	
K6	6/14/2021	646936.8	12622418.7	573.37	574.43	-1.06	+573.00	NS	NS	NS	N/A	No	
K7	6/14/2021	646898.6	12622450.8	573.31	570.44	+2.87	+573.00	NS	NS	NS	Pass	No	
K8	6/14/2021	646860.3	12622483.1	573.34	568.65	+4.69	+573.00	NS	NS	NS	Pass	No	
K9	6/14/2021	646822.1	12622515.2	572.90	570.10	+2.80	+573.00	<1%	NS	Pass	Pass	No	
K10	6/14/2021	646783.8	12622547.4	573.38	571.15	+2.23	+573.00	NS	NS	NS	Pass	No	
K11	6/14/2021	646745.6	12622579.6	573.16	572.01	+1.15	+573.00	NS	NS	NS	Pass	No	
K12	6/14/2021	646707.3	12622611.7	573.17	572.01	+1.16	+572.82	NS	NS	NS	Pass	No	
K13	6/14/2021	646669.0	12622643.9	573.16	572.01	+1.15	+572.41	NS	NS	NS	Pass	No	
K14	6/14/2021	646630.7	12622676.1	573.10	570.97	+2.13	+572.00	1-2%	NS	Pass	Pass	No	
K15	6/14/2021	646592.5	12622708.3	573.18	569.99	+3.19	+572.00	NS	NS	NS	Pass	No	
K16	6/14/2021	646554.1	12622740.5	573.17	569.77	+3.40	+572.00	NS	NS	NS	Pass	No	
K17	9/15/2021	646515.9	12622772.6	571.75	570.30	+1.45	+572.00	NS	NS	NS	Pass	No	
K18	9/15/2021	646477.7	12622804.8	572.20	570.80	+1.40	+572.13	NS	NS	NS	Pass	No	
K19	9/15/2021	646439.4	12622836.9	572.32	573.05	-0.73	+572.46	<1%	NS	Pass	N/A	No	
K20	9/15/2021	646401.2	12622869.1	572.99	575.28	-2.29	+573.00	NS	NS	NS	N/A	No	
K21	9/15/2021	646362.8	12622901.4	573.54	576.16	-2.62	+573.00	NS	NS	NS	N/A	No	
K22	9/15/2021	646324.5	12622933.5	574.41	576.92	-2.51	+574.00	NS	NS	NS	N/A	No	
K23	9/15/2021	646286.3	12622965.6	573.88	577.67	-3.79	+574.00	NS	NS	NS	N/A	No	
K24	9/15/2021	646248.1	12622997.9	574.40	578.43	-4.03	+574.06	NS	NS	NS	N/A	No	
K25	12/16/2021	646209.7	12623030.0	574.86	579.18	-4.33	+572.67	NS	NS	NS	N/A	No	
K26	12/16/2021	646171.4	12623062.2	576.14	578.18	-2.04	+576.07	NS	NS	NS	N/A	No	
K27	12/16/2021	646133.2	12623094.4	577.84	578.67	-0.83	+577.74	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
K35	4/29/2022	645827.0	12623351.8	574.72	571.25	+3.47	+574.60	NS	NS	NS	Pass	No	
K36	4/29/2022	645788.7	12623384.0	574.15	574.27	-0.13	+574.41	NS	NS	NS	N/A	No	
K37	4/29/2022	645750.5	12623416.1	574.12	571.19	+2.93	+574.66	NS	NS	NS	Pass	No	
K38	4/29/2022	645712.2	12623448.3	573.89	573.89	-0.00	+574.00	NS	NS	NS	N/A	No	
L4	9/15/2021	646981.2	12622316.0	578.29	579.13	-0.84	+578.11	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
L5	9/15/2021	646942.9	12622348.3	573.70	576.30	-2.60	+573.98	<1%	NS	Pass	N/A	No	

N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy



Table 3: Sample Node Summary



Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
L6	6/14/2021	646904.6	12622380.4	573.30	573.48	-0.18	+573.16	NS	NS	NS	N/A	No	
L7	6/14/2021	646866.4	12622412.6	573.45	571.83	+1.62	+573.00	<1%	1-2%	Pass	Pass	No	
L8	6/14/2021	646828.2	12622444.8	573.11	570.31	+2.80	+573.00	NS	NS	NS	Pass	No	
L9	6/14/2021	646789.9	12622477.0	573.14	570.07	+3.07	+572.64	NS	NS	NS	Pass	No	
L10	6/14/2021	646751.6	12622509.0	573.03	570.81	+2.22	+572.00	NS	NS	NS	Pass	No	
L11	6/14/2021	646713.3	12622541.2	572.76	571.57	+1.19	+572.00	NS	NS	NS	Pass	No	
L12	6/14/2021	646675.1	12622573.5	572.52	572.01	+0.51	+572.00	NS	NS	NS	Pass	No	
L13	6/14/2021	646636.8	12622605.6	572.75	572.01	+0.74	+571.00	NS	NS	NS	Pass	No	
L14	9/15/2021	646598.5	12622637.8	570.82	570.96	-0.14	+571.00	1-2%	NS	Pass	N/A	No	
L15	9/15/2021	646560.2	12622670.0	570.94	570.39	+0.55	+571.00	2-3%	NS	Pass	Pass	No	
L16	9/15/2021	646522.0	12622702.2	571.25	570.90	+0.35	+571.77	NS	NS	NS	Pass	No	
L17	9/15/2021	646483.7	12622734.4	571.44	571.43	+0.01	+572.00	NS	NS	NS	Pass	No	
L18	9/15/2021	646445.4	12622766.6	571.82	571.93	-0.11	+572.00	NS	NS	NS	N/A	No	
L19	9/15/2021	646407.1	12622798.6	572.07	572.01	+0.06	+572.00	3-4%	NS	Pass	Pass	No	
L20	9/15/2021	646369.0	12622830.9	573.01	573.82	-0.81	+572.66	1-2%	NS	Pass	N/A	No	
L21	9/15/2021	646330.6	12622863.0	574.47	575.14	-0.67	+573.00	NS	NS	NS	N/A	No	
L22	--	646292.4	12622895.2	576.46	575.88	+0.58	+573.14	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
L23	12/16/2021	646254.1	12622927.5	575.73	576.64	-0.90	+574.71	NS	NS	NS	N/A	No	
L24	12/16/2021	646215.8	12622959.6	577.07	577.39	-0.32	+576.78	NS	NS	NS	N/A	No	
L39	4/29/2022	645641.8	12623442.2	574.04	573.54	+0.50	+574.00	NS	NS	NS	Pass	No	
M4	9/15/2021	646949.1	12622277.8	578.43	578.55	-0.12	+577.99	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
M5	9/15/2021	646910.9	12622310.0	575.10	575.31	-0.21	+575.01	NS	NS	NS	N/A	No	
M6	6/14/2021	646872.6	12622342.1	573.00	572.41	+0.59	+572.90	NS	NS	NS	Pass	No	
M7	6/14/2021	646834.3	12622374.3	572.84	570.02	+2.82	+572.40	NS	NS	NS	Pass	No	
M8	6/14/2021	646796.0	12622406.5	572.51	569.09	+3.42	+571.32	NS	NS	NS	Pass	No	
M9	6/14/2021	646757.7	12622438.7	572.30	569.65	+2.65	+571.00	NS	NS	NS	Pass	No	
M10	6/14/2021	646719.5	12622470.8	572.43	570.29	+2.14	+571.00	<1%	NS	Pass	Pass	No	
M11	9/15/2021	646681.2	12622503.1	570.75	571.02	-0.27	+570.99	NS	NS	NS	N/A	No	
M12	9/15/2021	646642.8	12622535.2	570.64	571.76	-1.12	+571.00	3-4%	NS	Pass	N/A	No	
M13	9/15/2021	646604.6	12622567.4	571.02	572.01	-0.99	+571.00	2-3%	NS	Pass	N/A	No	
M14	9/15/2021	646566.4	12622599.6	570.81	571.01	-0.20	+571.00	NS	NS	NS	N/A	No	
M15	9/15/2021	646528.2	12622631.7	571.26	571.52	-0.26	+571.00	<1%	NS	Pass	N/A	No	
M16	9/15/2021	646489.8	12622663.9	571.93	572.01	-0.08	+571.26	NS	NS	NS	N/A	No	
M17	9/15/2021	646451.5	12622696.0	572.14	572.01	+0.13	+571.66	NS	NS	NS	Pass	No	
M18	9/15/2021	646413.3	12622728.3	572.56	572.01	+0.55	+571.22	NS	NS	NS	Pass	No	
M19	9/15/2021	646375.0	12622760.4	572.49	572.01	+0.48	+572.02	NS	NS	NS	Pass	No	
M20	9/15/2021	646336.8	12622792.6	572.79	572.98	-0.19	+572.34	NS	NS	NS	N/A	No	
M21	--	646298.5	12622824.8	574.63	574.20	+0.43	+572.21	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
M22	12/16/2021	646260.2	12622856.9	575.15	575.10	+0.04	+574.55	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
M23	12/16/2021	646221.9	12622889.1	576.09	576.01	+0.08	+576.00	80-90%	NS	Fail	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
N5	9/15/2021	646878.6	12622271.7	575.02	575.23	-0.21	+574.77	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
N6	6/14/2021	646840.3	12622303.8	571.89	572.00	-0.11	+571.96	20-25%	NS	Fail	N/A	Yes	N6 microscopy failed during Closure Area #1 visit. Excavation Zone #3 (See text for discussion).
N6A	9/15/2021	646840.6	12622303.9	571.87	572.01	-0.14	+571.96	5-10%	NS	Fail	N/A	No	N6A microscopy failed during Closure Area #2 visit. Further excavation not intended due to stability concerns.
N6B	9/15/2021	646850.7	12622296.1	572.53	572.83	-0.30	+571.96	15-20%	NS	Fail	N/A	No	N6B microscopy failed during Closure Area #2 visit. Further excavation not intended due to stability concerns.
N6C	9/15/2021	646852.2	12622313.4	572.22	572.21	+0.01	+571.96	10-15%	NS	Fail	N/A	No	N6C microscopy failed during Closure Area #2 visit. Further excavation not intended due to stability concerns.
N6D	9/15/2021	646829.2	12622312.6	571.86	571.09	+0.77	+571.96	5-10%	NS	Fail	N/A	No	N6D microscopy failed during Closure Area #2 visit. Further excavation not intended due to stability concerns.
N6E	9/15/2021	646830.0	12622294.9	571.60	571.84	-0.24	+571.96	10-15%	NS	Fail	N/A	No	N6E microscopy failed during Closure Area #2 visit. Further excavation not intended due to stability concerns.
N7	6/14/2021	646802.0	12622336.0	571.92	568.99	+2.93	+571.36	NS	NS	NS	Pass	No	
N8	9/15/2021	646763.8	12622368.2	570.19	568.99	+1.20	+570.18	<1%	NS	Pass	Fail	Yes	CCR encountered from 1-2 feet below grade. Further excavation not intended due to stability concerns. Excavation Zone #3 (See text for discussion).
N9	9/15/2021	646725.5	12622400.4	570.23	568.99	+1.24	+570.00	NS	NS	NS	Pass	No	
N10	9/15/2021	646687.3	12622432.6	569.65	569.37	+0.28	+570.00	NS	NS	NS	Pass	No	
N11	9/15/2021	646649.0	12622464.8	570.46	570.64	-0.18	+570.25	NS	NS	NS	N/A	No	
N12	9/15/2021	646610.8	12622496.9	571.19	571.30	-0.11	+570.99	NS	NS	NS	N/A	No	
N13	9/15/2021	646572.5	12622529.0	571.77	571.89	-0.12	+571.00	2-3%	NS	Pass	N/A	No	
N14	9/15/2021	646534.2	12622561.2	571.58	571.98	-0.40	+571.00	NS	NS	NS	N/A	No	
N15	9/15/2021	646495.9	12622593.5	571.63	571.95	-0.32	+571.00	NS	NS	NS	N/A	No	
N16	9/15/2021	646457.7	12622625.7	571.75	571.93	-0.18	+571.00	NS	NS	NS	N/A	No	
N17	9/15/2021	646419.3	12622657.8	571.67	571.90	-0.23	+570.95	NS	NS	NS	N/A	No	
N18	9/15/2021	646381.1	12622690.0	571.66	571.87	-0.21	+571.85	2-3%	NS	Pass	N/A	No	
N19	9/15/2021	646342.9	12622722.2	571.64	571.84	-0.20	+571.68	NS	NS	NS	N/A	No	
N20	--	646304.6	12622754.3	571.04	572.77	-1.73	+571.01	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
N21	12/16/2021	646266.3	12622786.4	574.11	574.16	-0.05	+574.00	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
O5	9/15/2021	646846.5	12622233.5	575.07	575.14	-0.07	+574.65	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
O6	9/15/2021	646808.1	12622265.6	572.03	571.90	+0.13	+572.00	NS	NS	NS	Pass	No	
O7	9/15/2021	646769.9	12622297.8	569.52	569.85	-0.33	+569.90	5-10%	4-5%	Fail	N/A	No	O7 microscopy failed during Closure Area #2 visit. Area to be excavated and reassessed. Excavation Zone #3 (See text for discussion).
O8	--	646731.6	12622329.9	568.87	568.99	-0.12	+568.99	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
O9	--	646693.4	12622362.1	569.67	569.10	+0.57	+569.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
O10	--	646655.1	12622394.3	569.88	569.72	+0.16	+570.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
O11	9/15/2021	646616.8	12622426.4	570.17	570.36	-0.19	+570.00	NS	NS	NS	N/A	No	
O12	9/15/2021	646578.5	12622458.7	570.83	570.73	+0.10	+570.42	NS	NS	NS	Pass	No	
O13	9/15/2021	646540.3	12622490.8	570.41	570.61	-0.20	+570.45	NS	NS	NS	N/A	No	
O14	9/15/2021	646502.0	12622523.1	571.07	571.01	+0.06	+570.76	NS	NS	NS	Pass	No	
O15	9/15/2021	646463.7	12622555.2	571.30	571.26	+0.04	+571.00	NS	NS	NS	Pass	No	
O16	9/15/2021	646425.5	12622587.3	571.17	571.39	-0.22	+570.46	NS	NS	NS	N/A	No	
O17	9/15/2021	646387.2	12622619.6	571.20	571.37	-0.17	+570.43	NS	NS	NS	N/A	No	
O18	9/15/2021	646348.9	12622651.7	571.22	571.34	-0.12	+571.00	NS	NS	NS	N/A	No	
O19	--	646310.7	12622683.9	570.69	571.31	-0.62	+571.00	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
O20	12/16/2021	646272.4	12622716.1	572.84	572.54	+0.30	+572.99	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
P6	9/15/2021	646776.0	12622227.3	573.06	573.20	-0.14	+572.77	30-40%	NS	Fail	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
P7	9/15/2021	646737.8	12622259.4	570.62	570.75	-0.13	+570.49	3-4%	NS	Pass	N/A	No	
P8	--	646699.5	12622291.7	568.23	568.99	-0.76	+568.29	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).

Table 3 (Page 6 of 7)



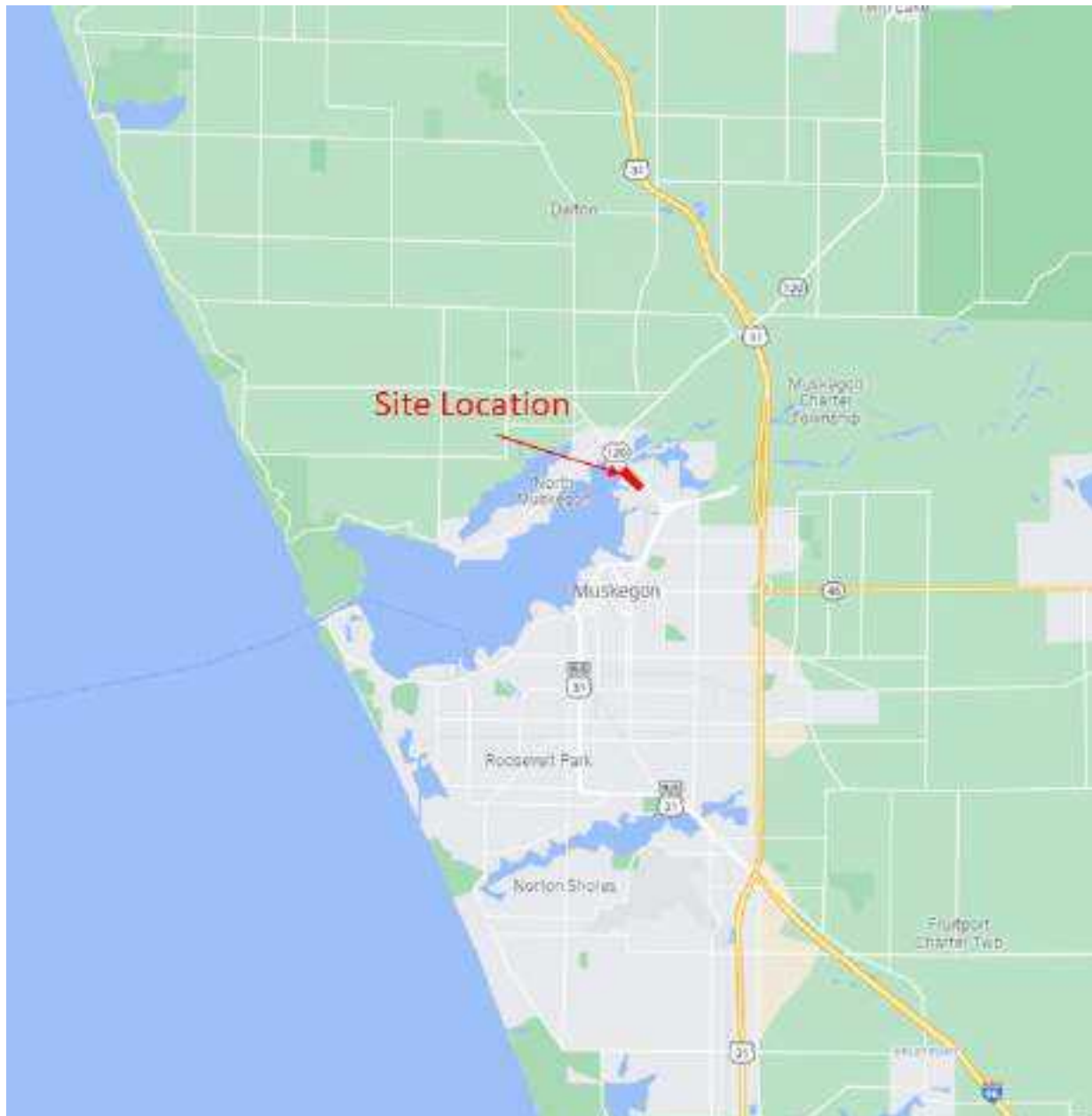
Table 3: Sample Node Summary

Node ID	Date Sampled	Northing (feet)	Easting (feet)	Final Field Elevation (feet)	Design Elevation (feet)	Final Elevation Difference Relative to Closure Work Plan (-/+ feet)	Final Surface Elevation May 2022 (feet)	HDR Microscopic Estimation of CCR (%)	CTL Microscopic Estimation QC (%)	HDR Microscopy Pass/Fail (< 5%)	Potholing Pass/Fail	CCR Present at Surface	Comments
P9	--	646661.2	12622323.9	569.04	568.99	+0.05	+568.89	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
P10	--	646622.9	12622356.0	569.54	569.33	+0.21	+569.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
P11	--	646584.6	12622388.2	569.72	569.21	+0.51	+569.02	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
P12	--	646546.4	12622420.4	569.61	569.09	+0.52	+568.99	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
P13	--	646508.1	12622452.6	569.63	568.96	+0.67	+568.83	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
P14	9/15/2021	646469.9	12622484.7	570.11	570.45	-0.34	+570.22	NS	NS	NS	N/A	No	
P15	9/15/2021	646431.5	12622516.9	570.87	571.01	-0.14	+570.78	NS	NS	NS	N/A	No	
P16	9/15/2021	646393.3	12622549.1	570.78	571.01	-0.23	+570.52	NS	NS	NS	N/A	No	
P17	9/15/2021	646355.0	12622581.3	570.77	570.99	-0.22	+570.63	NS	NS	NS	N/A	No	
P18	--	646316.7	12622613.4	570.91	570.99	-0.08	+570.16	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
P19	12/16/2021	646278.5	12622645.6	571.29	570.99	+0.30	+571.67	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
Q6	9/15/2021	646743.8	12622189.0	575.16	575.50	-0.34	+575.70	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
Q7	9/15/2021	646705.6	12622221.2	572.58	572.74	-0.16	+572.22	<1%	NS	Pass	N/A	No	
Q8	--	646667.3	12622253.4	567.87	568.70	-0.83	+568.65	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q9	--	646629.0	12622285.6	568.34	567.81	+0.53	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q10	--	646590.7	12622317.8	568.15	567.69	+0.46	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q11	--	646552.5	12622349.9	568.15	567.57	+0.58	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q12	--	646514.2	12622382.1	567.89	567.45	+0.44	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q13	--	646475.9	12622414.3	567.97	567.33	+0.64	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q14	--	646437.7	12622446.5	569.78	568.63	+1.15	+568.80	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
Q15	9/15/2021	646399.4	12622478.7	570.63	570.61	+0.02	+570.08	NS	NS	NS	Pass	No	
Q16	9/15/2021	646361.1	12622510.8	570.96	571.01	-0.05	+570.48	NS	NS	NS	N/A	No	
Q17	9/15/2021	646322.9	12622542.9	570.92	571.01	-0.09	+570.90	NS	NS	NS	N/A	No	
Q18	12/16/2021	646284.6	12622575.1	571.39	570.99	+0.40	+571.54	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
R7	9/15/2021	646673.4	12622182.9	575.62	575.72	-0.10	+575.39	90-95%	NS	Fail	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
R8	9/15/2021	646635.1	12622215.2	571.93	572.12	-0.19	+571.91	NS	NS	NS	N/A	No	
R9	--	646596.8	12622247.3	568.25	568.89	-0.64	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R10	--	646558.6	12622279.5	567.92	568.50	-0.58	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R11	--	646520.3	12622311.7	567.43	568.13	-0.70	+568.05	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R12	--	646482.0	12622343.8	567.17	567.77	-0.60	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R13	--	646443.7	12622376.0	567.03	567.63	-0.60	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R14	--	646405.5	12622408.2	568.06	568.42	-0.36	+568.31	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
R15	9/15/2021	646367.2	12622440.4	569.59	569.77	-0.18	+569.98	<1%	NS	Pass	N/A	No	
R16	--	646328.9	12622472.5	570.70	571.01	-0.31	+570.00	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
R17	12/16/2021	646290.7	12622504.7	571.47	572.56	-1.10	+571.72	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
S8	9/15/2021	646602.9	12622176.9	575.51	575.62	-0.11	+575.08	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
S9	9/15/2021	646564.7	12622209.1	572.26	572.39	-0.13	+572.03	4-5%	NS	Pass	N/A	No	
S10	--	646526.4	12622241.2	568.76	569.83	-1.07	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
S11	--	646488.1	12622273.4	568.58	569.36	-0.78	+569.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
S12	--	646449.8	12622305.6	568.46	569.39	-0.93	+569.45	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
S13	--	646411.6	12622337.7	568.54	569.41	-0.87	+569.29	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
S14	9/15/2021	646373.3	12622369.9	569.86	570.07	-0.21	+569.61	NS	NS	NS	N/A	No	
S15	--	646335.0	12622402.1	569.91	570.79	-0.88	+569.08	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
S16	12/16/2021	646296.8	12622434.3	571.10	570.99	+0.11	+571.40	70-80%	NS	Fail	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
T8	9/15/2021	646570.7	12622138.5	577.51	577.67	-0.16	+577.60	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
T9	9/15/2021	646532.5	12622170.8	574.32	574.44	-0.12	+573.67	30-40%	NS	Fail	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
T10	9/15/2021	646494.3	12622203.0	569.74	571.36	-1.62	+569.77	NS	NS	NS	N/A	No	
T11	--	646455.9	12622235.1	568.83	569.75	-0.92	+569.21	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
T12	--	646417.7	12622267.3	570.00	569.81	+0.19	+569.70	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
T13	9/15/2021	646379.4	12622299.4	570.10	570.01	+0.09	+569.72	NS	NS	NS	Pass	No	
T14	--	646341.1	12622331.6	569.97	570.34	-0.37	+570.01	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
T15	12/16/2021	646302.9	12622363.8	571.02	570.77	+0.25	+571.40	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
U9	9/15/2021	646500.4	12622132.5	575.86	575.91	-0.05	+575.52	NS	NS	NS	N/A	No	
U10	9/15/2021	646462.0	12622164.6	572.31	572.84	-0.53	+571.73	<1%	NS	Pass	N/A	No	
U11	--	646423.8	12622196.8	569.06	569.81	-0.75	+568.14	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
U12	--	646385.5	12622229.0	569.21	569.41	-0.20	+568.00	NS	NS	NS	N/A	--	Sample node not assessed due to ponding water and bridging. Final elevation taken from drone survey in July 2021. Excavation Zone #3 (See text for discussion).
U13	--	646347.2	12622261.2	569.79	569.70	+0.09	+568.00	NS	NS	NS	NS	--	Node located in drainage swale for dewatering and inaccessible. Final elevation taken from drone survey in July 2021.
U14	12/16/2021	646308.9	12622293.3	570.65	570.18	+0.47	+570.99	NS	NS	NS	Pass	No	
V10	9/15/2021	646429.8	12622126.4	574.10	574.31	-0.21	+573.51	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
V11	9/15/2021	646391.5	12622158.5	569.58	571.28	-1.70	+569.92	50-60%	NS	Fail	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
V12	9/15/2021	646353.4	12622190.8	569.86	569.02	+0.84	+569.36	NS	NS	NS	Pass	No	
V13	9/15/2021	646315.1	12622223.0	569.64	569.81	-0.17	+570.61	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
W11	9/15/2021	646359.5	12622120.3	572.33	572.74	-0.41	+573.77	NS	NS	NS	N/A	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).
W12	12/16/2021	646321.2	12622152.5	570.91	570.81	+0.09	+572.40	NS	NS	NS	Fail	Yes	CCR encountered at surface. Further excavation not intended due to stability concerns. Excavation Zone #2 (See text for discussion).

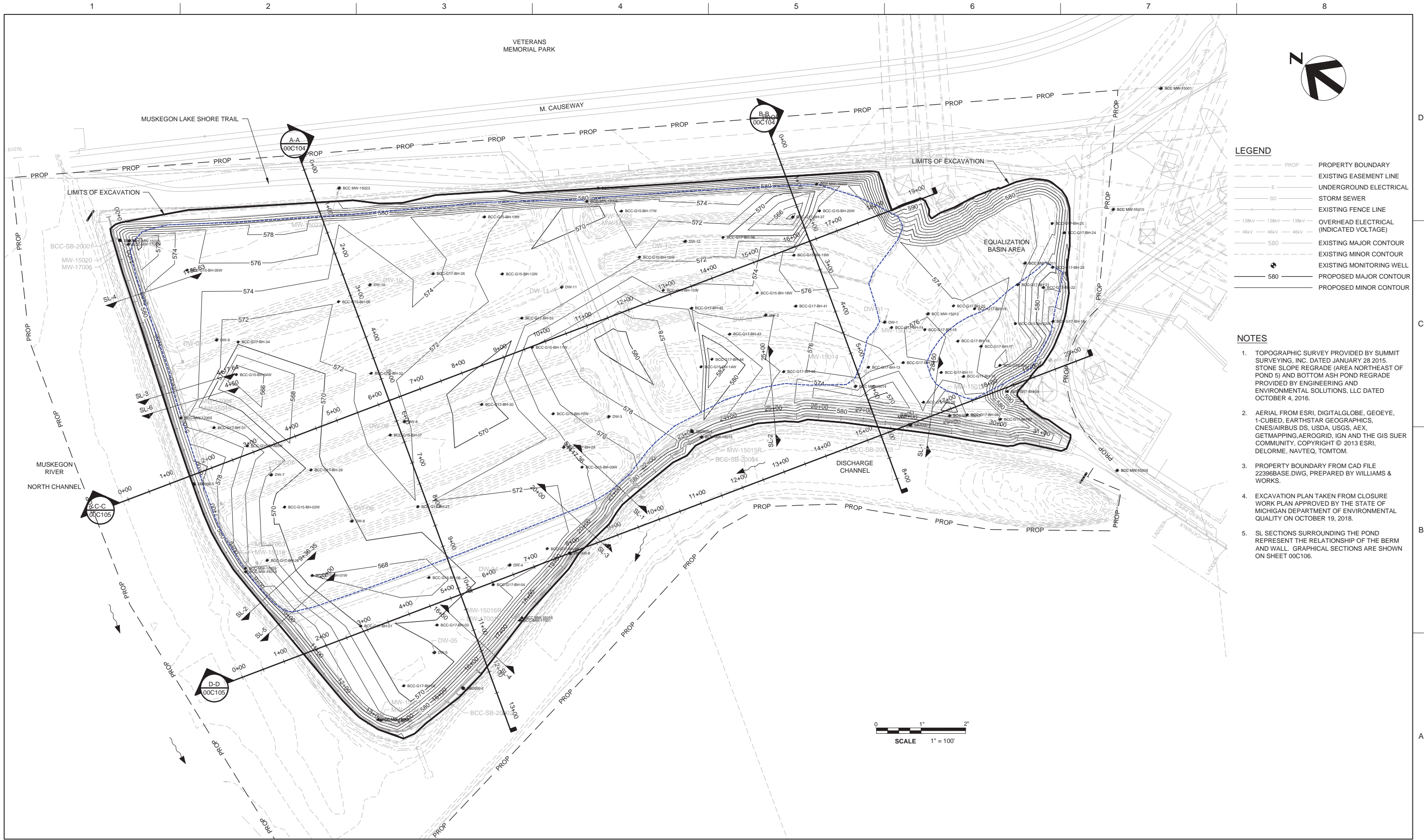
N/A - Potholing not performed as design elevation was achieved.  
NS - Sample not randomly taken for microscopy

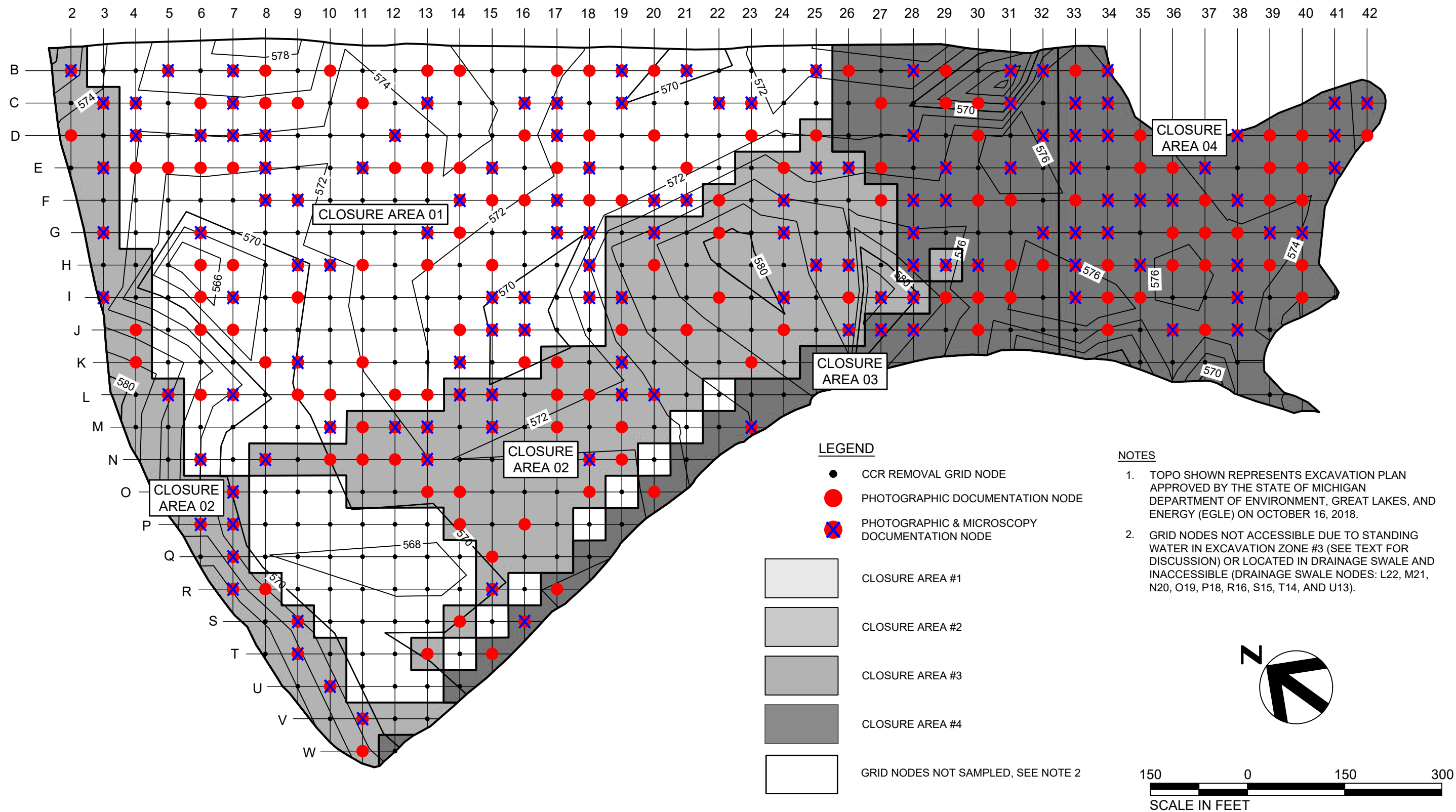
## FIGURES

**DATA SOURCE:** Google Maps









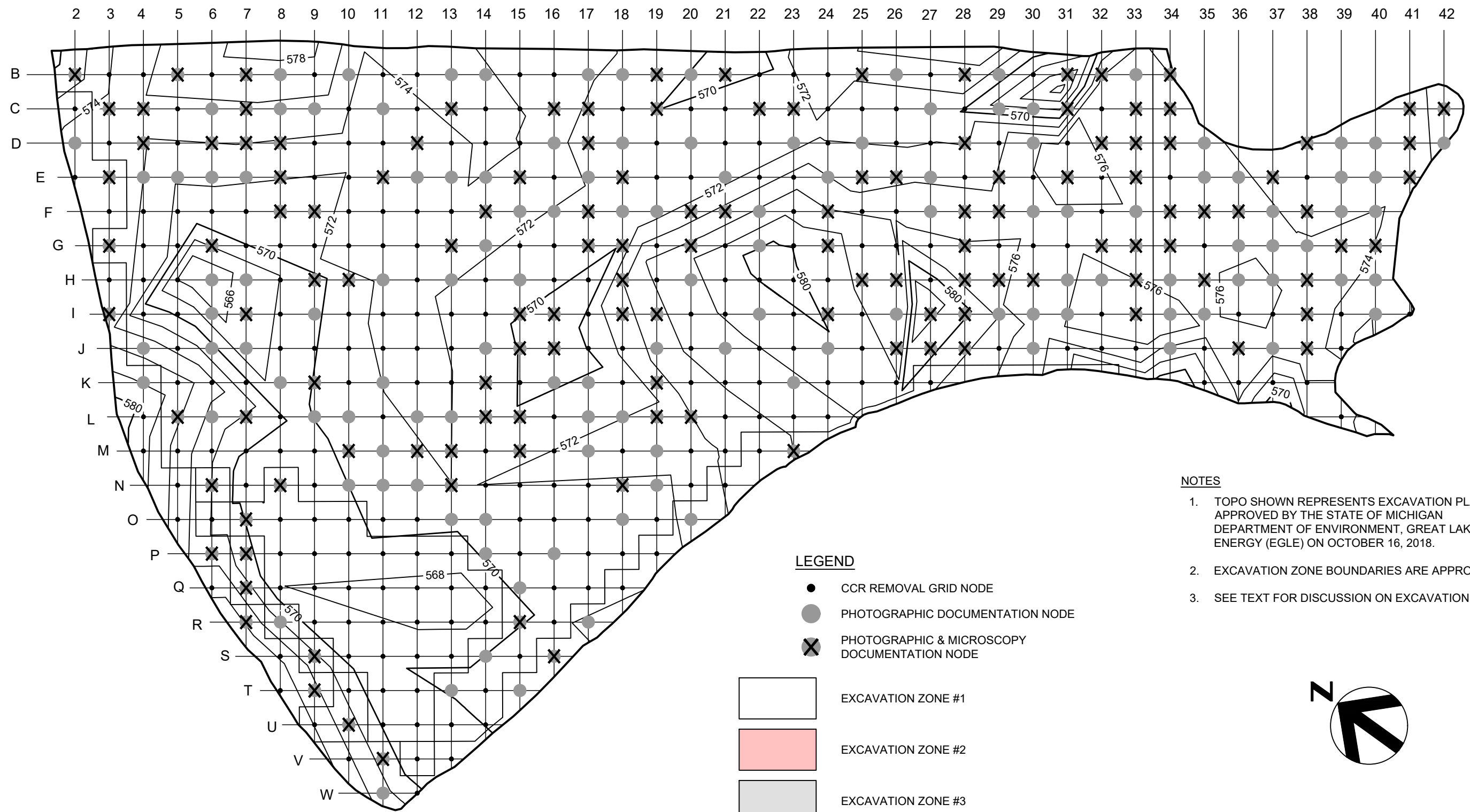
# **MUSKEGON ENVIRONMENTAL REDEVELOPMENT GROUP, LLC (MERG) BC COBB ASH POND CLOSURE**

SAMPLE NODE LAYOUT

DATE  
MAY 2022

FIGURE  
3





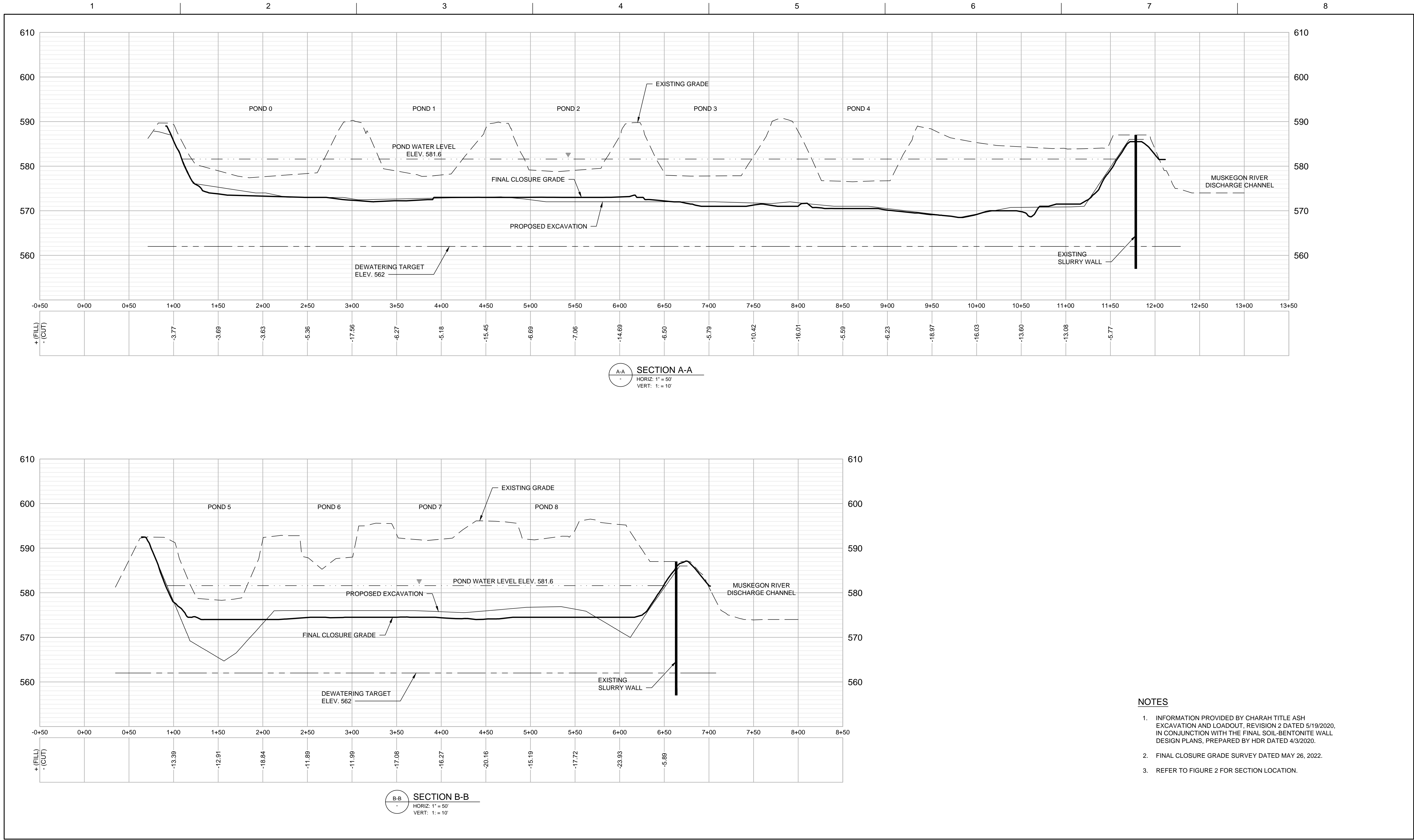
**MUSKEGON ENVIRONMENTAL  
REDEVELOPMENT GROUP, LLC (MERG)  
BC COBB ASH POND CLOSURE**

EXCAVATION ZONE LAYOUT

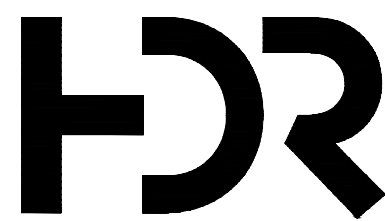
DATE  
MAY 2022

FIGURE  
4





- NOTES**
1. INFORMATION PROVIDED BY CHARAH TITLE ASH EXCAVATION AND LOADOUT, REVISION 2 DATED 5/19/2020, IN CONJUNCTION WITH THE FINAL SOIL-BENTONITE WALL DESIGN PLANS, PREPARED BY HDR DATED 4/3/2020.
  2. FINAL CLOSURE GRADE SURVEY DATED MAY 26, 2022.
  3. REFER TO FIGURE 2 FOR SECTION LOCATION.

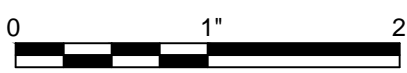


2	06/09/2022	FINAL CLOSURE GRADE UPDATE
1	12/09/2020	ISSUED FOR CONSTRUCTION
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	G. WILLIAMS
DRAWN BY	M. BICKFORD
PROJECT NUMBER	10220433

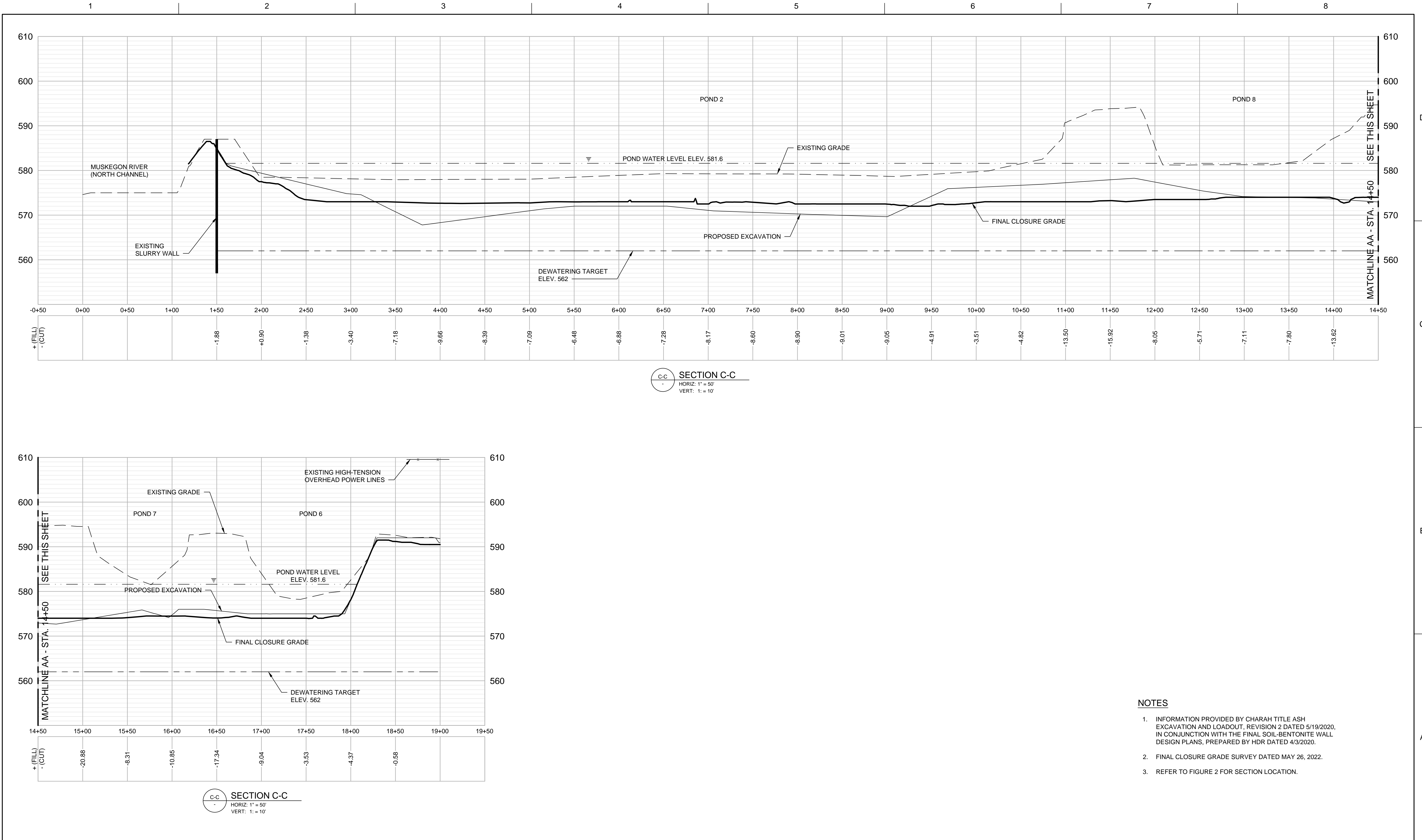
MUSKEGON ENVIRONMENTAL  
REDEVELOPMENT GROUP, LLC (MERG)  
BC COBB ASH POND CLOSURE  
PONDS 0-8 AND BOTTOM ASH POND  
MUSKEGON COUNTY, MI

ASH POND  
CROSS SECTIONS  
(1 OF 3)



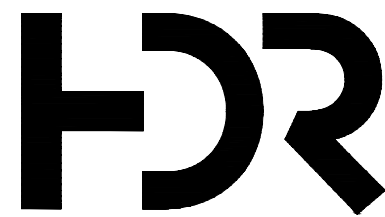
FILENAME | 00C104.dwg  
SCALE | 1" = 50'

C:\pwworking\camra01\0321964\00C105.dwg, Layout1, 7/13/2022 12:16:40 PM, MBICKFORD



NOTES

1. INFORMATION PROVIDED BY CHARAH TITLE ASH EXCAVATION AND LOADOUT, REVISION 2 DATED 5/19/2020, IN CONJUNCTION WITH THE FINAL SOIL-BENTONITE WALL DESIGN PLANS, PREPARED BY HDR DATED 4/3/2020.
2. FINAL CLOSURE GRADE SURVEY DATED MAY 26, 2022.
3. REFER TO FIGURE 2 FOR SECTION LOCATION.



1	12/09/2020	ISSUED FOR CONSTRUCTION
---	------------	-------------------------

ISSUE DATE DESCRIPTION

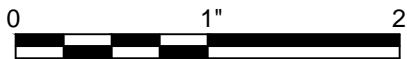
PROJECT MANAGER G. WILLIAMS

DRAWN BY M. BICKFORD

PROJECT NUMBER 10220433

MUSKEGON ENVIRONMENTAL  
REDEVELOPMENT GROUP, LLC (MERG)  
BC COBB ASH POND CLOSURE  
PONDS 0-8 AND BOTTOM ASH POND  
MUSKEGON COUNTY, MI

ASH POND  
CROSS SECTIONS  
(2 OF 3)

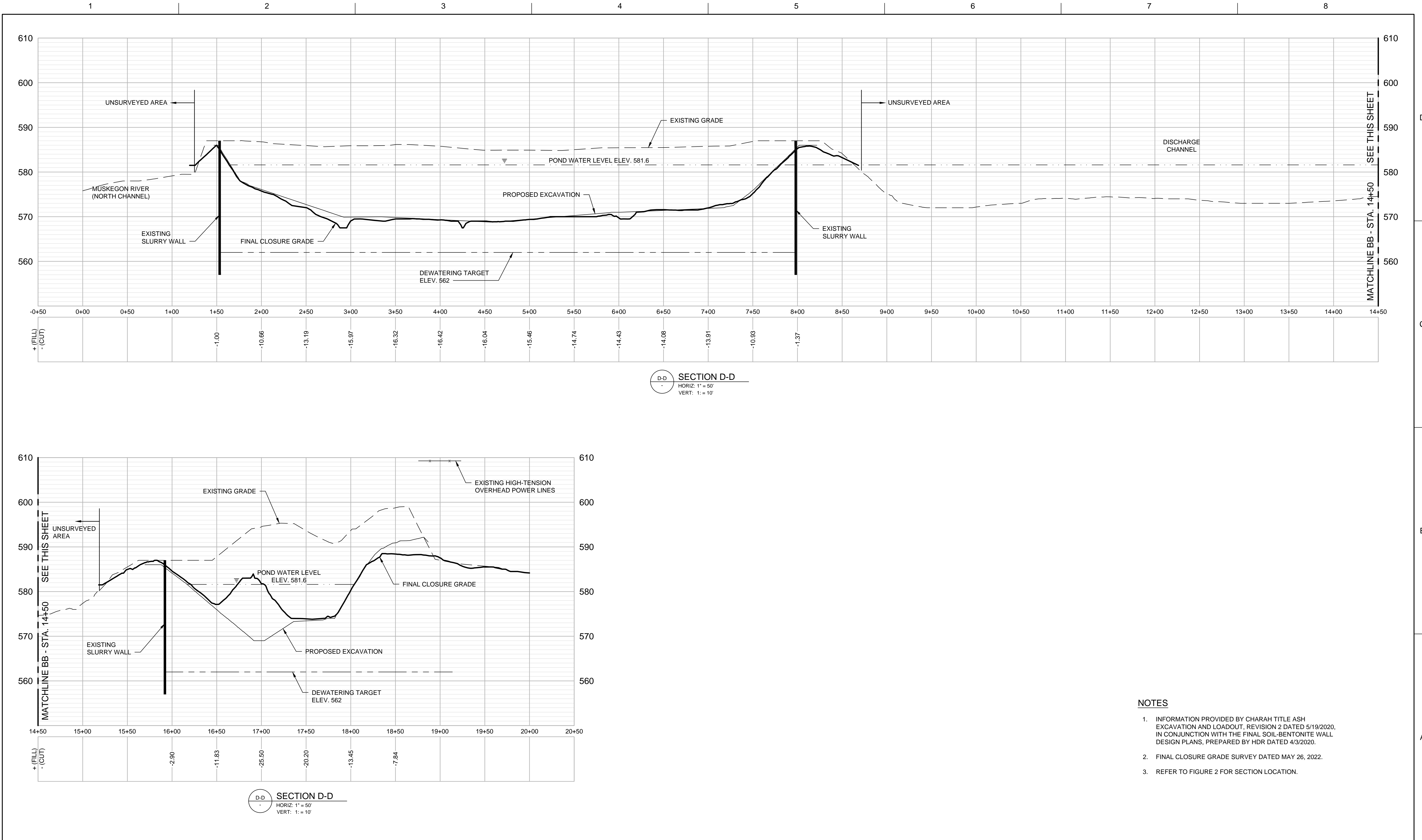


FILENAME 00C105.dwg  
SCALE 1" = 50'

FIGURE

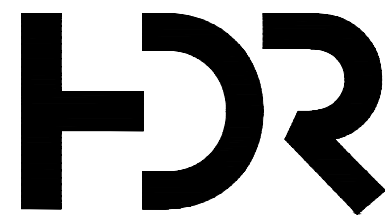
6

C:\pwworking\camra01\0321964\00C106.dwg, Layout1, 7/13/2022 12:11:17 PM, MBICKFORD



NOTES

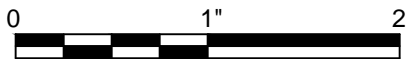
1. INFORMATION PROVIDED BY CHARAH TITLE ASH EXCAVATION AND LOADOUT, REVISION 2 DATED 5/19/2020, IN CONJUNCTION WITH THE FINAL SOIL-BENTONITE WALL DESIGN PLANS, PREPARED BY HDR DATED 4/3/2020.
2. FINAL CLOSURE GRADE SURVEY DATED MAY 26, 2022.
3. REFER TO FIGURE 2 FOR SECTION LOCATION.



1	12/09/2020	ISSUED FOR CONSTRUCTION
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	G. WILLIAMS
DRAWN BY	M. BICKFORD
PROJECT NUMBER	10220433

MUSKEGON ENVIRONMENTAL  
REDEVELOPMENT GROUP, LLC (MERG)  
BC COBB ASH POND CLOSURE  
PONDS 0-8 AND BOTTOM ASH POND  
MUSKEGON COUNTY, MI



ASH POND  
CROSS SECTIONS  
(3 OF 3)

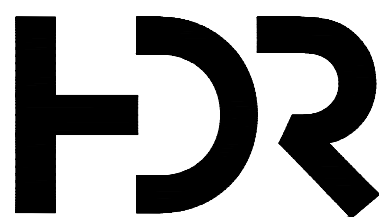
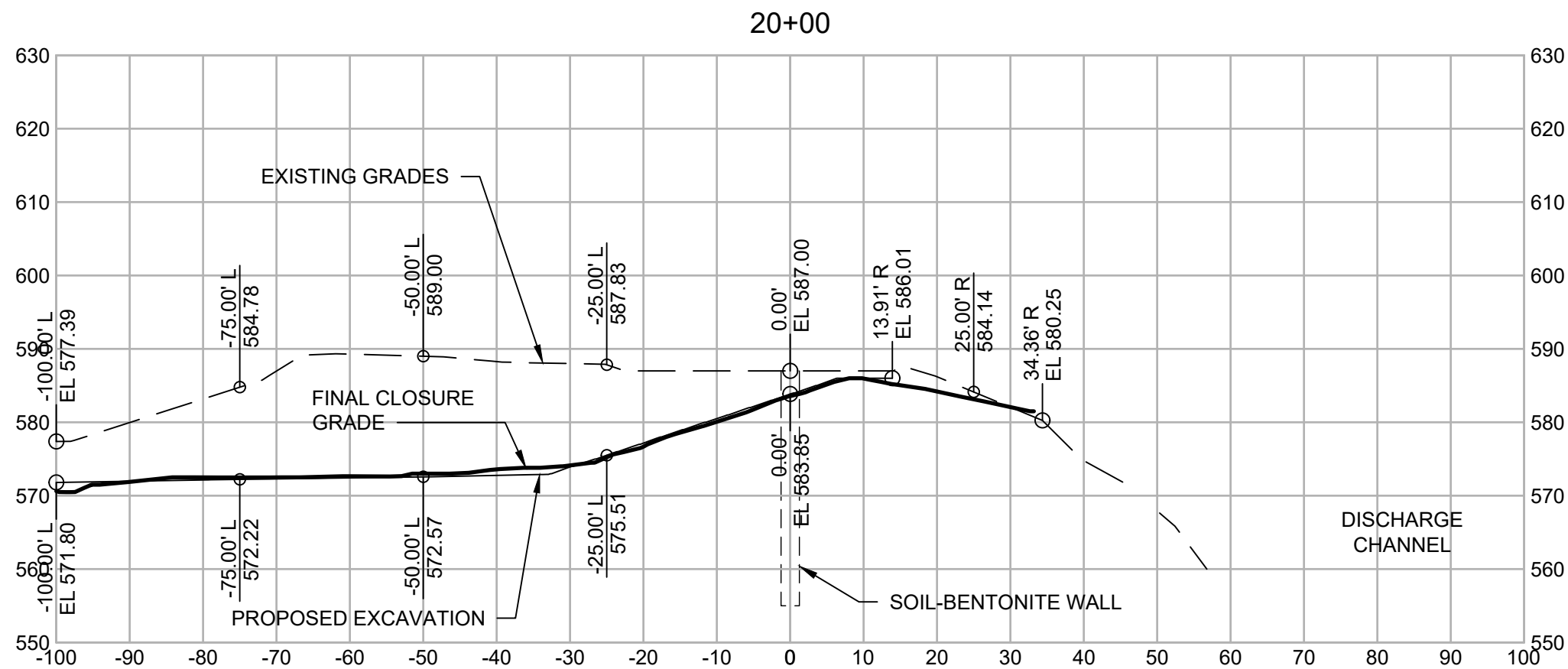
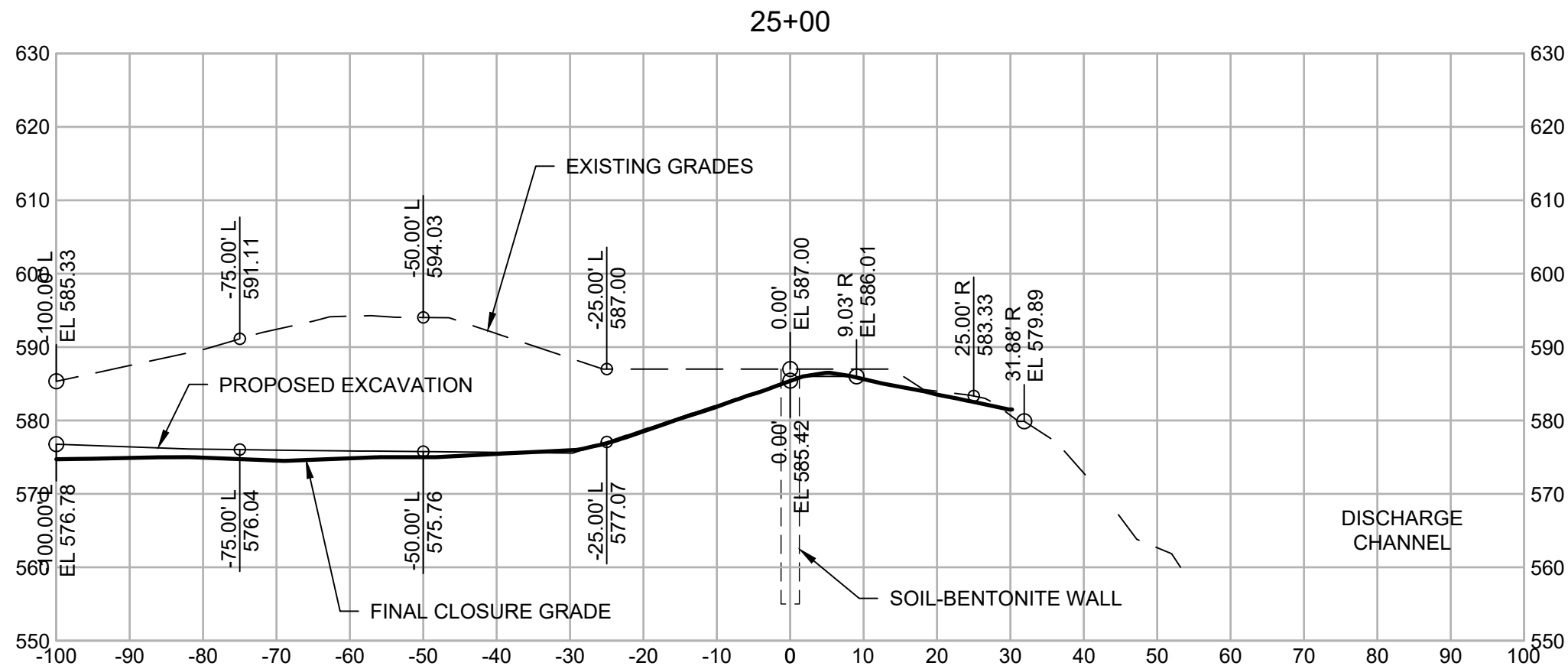
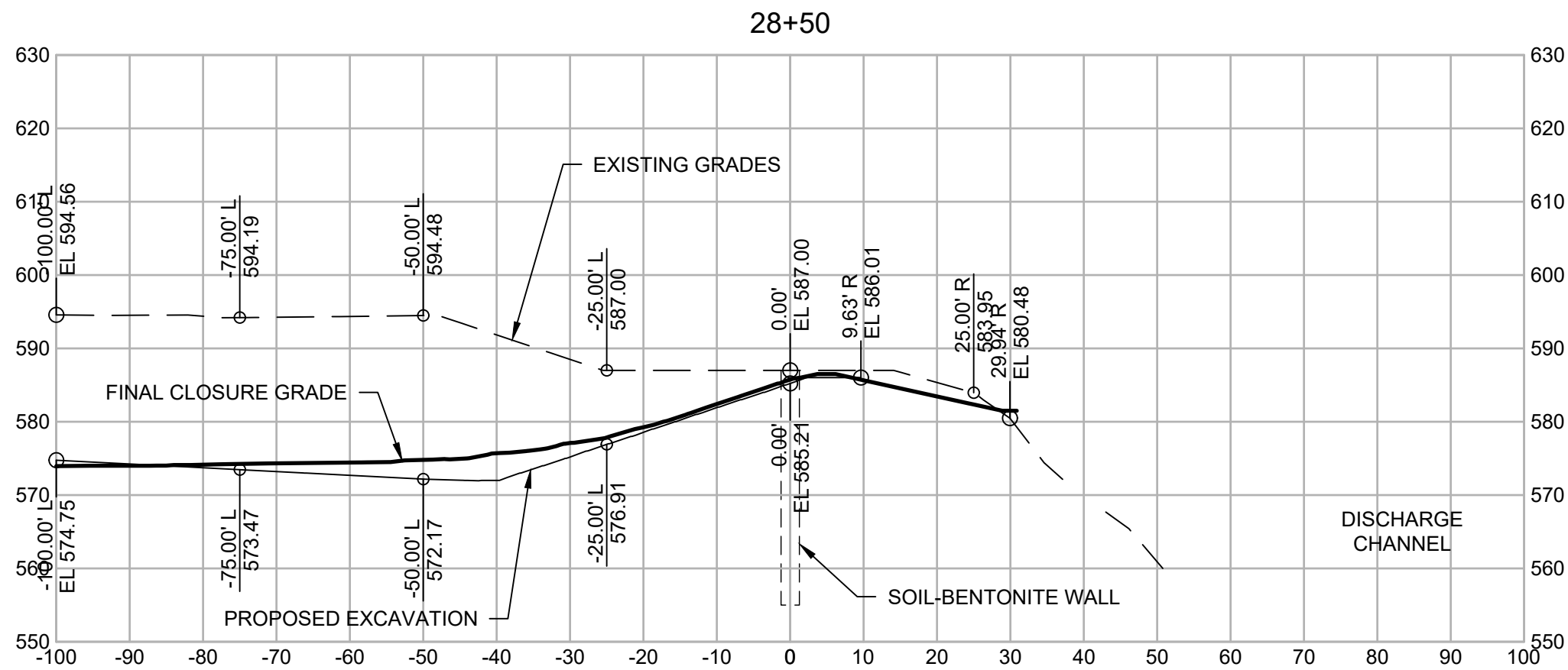
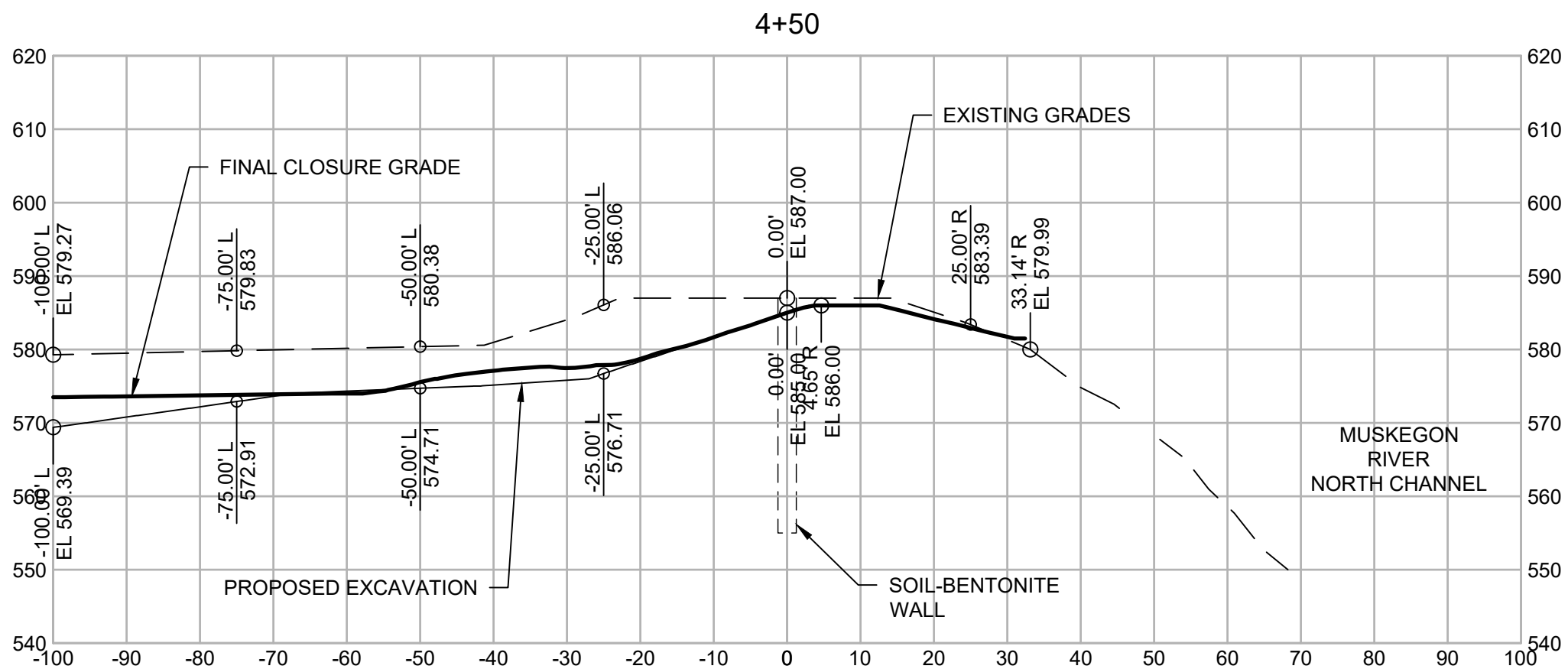
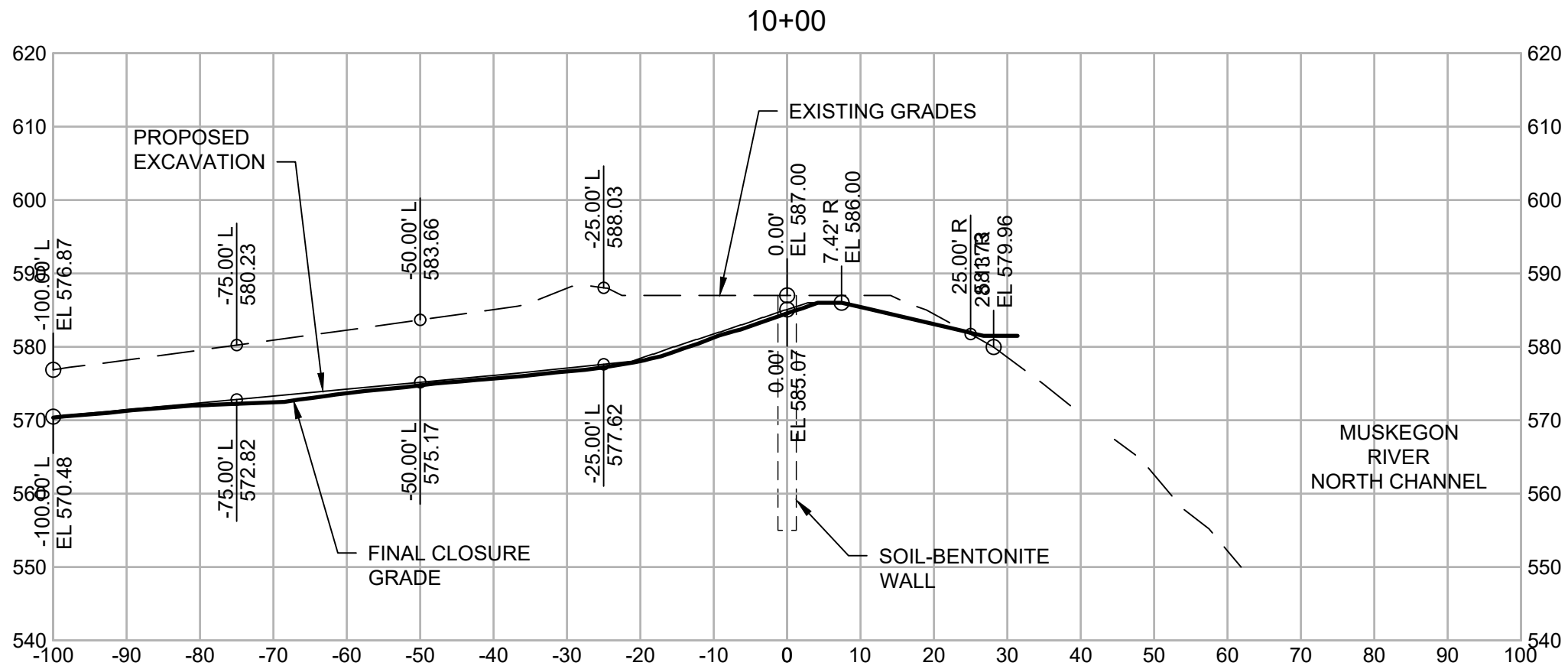
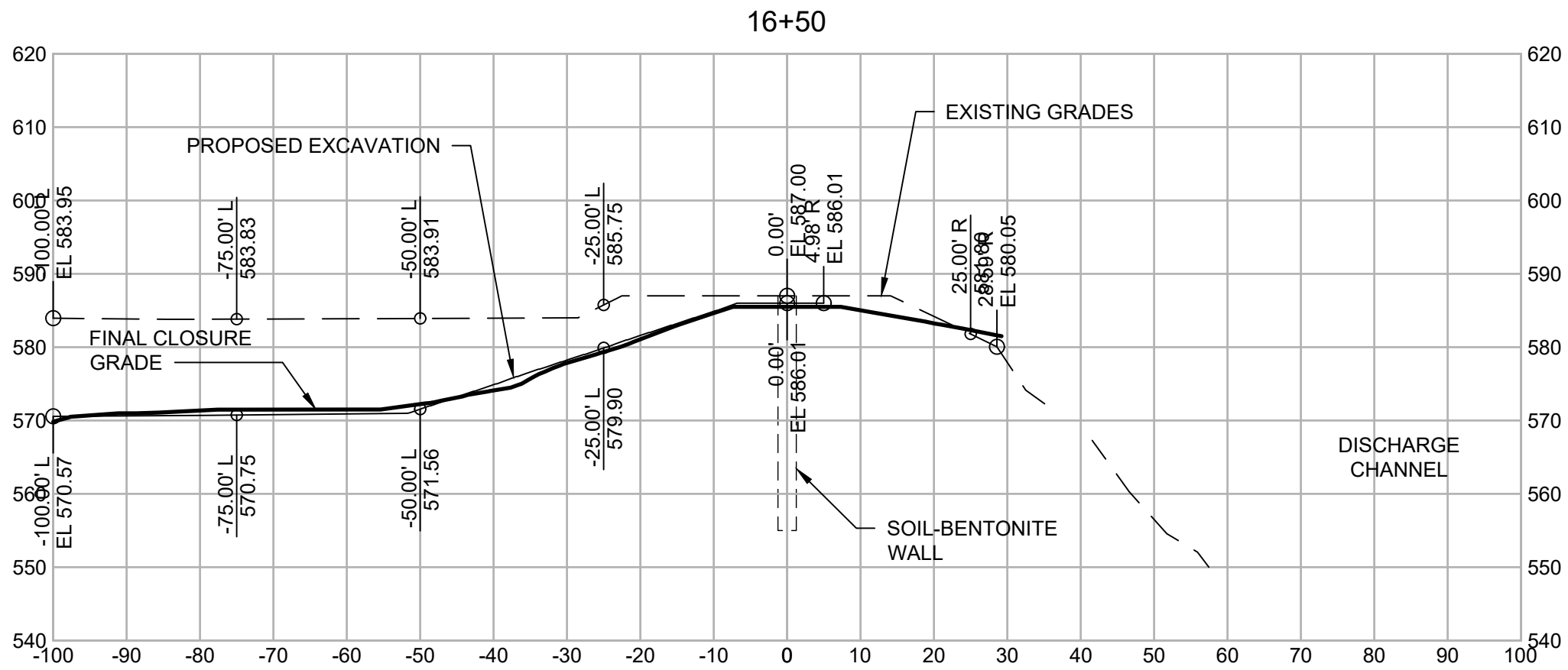
FILENAME 00C106.dwg  
SCALE 1" = 50'

FIGURE  
7

SCALE  
HORIZ: 1" = 20'  
VERT: 1" = 20'

NOTES

- 1. FINAL CLOSURE GRADE SURVEY DATED MAY 26, 2022.
- 2. REFER TO FIGURE 2 FOR SECTION LOCATIONS.



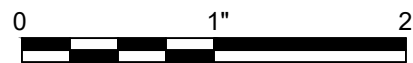
2	06/09/2022	FINAL CLOSURE GRADE UPDATE
1	12/09/2020	ISSUED FOR CONSTRUCTION
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER G. WILLIAMS  
DRAWN BY M. BICKFORD

PROJECT NUMBER 10220433

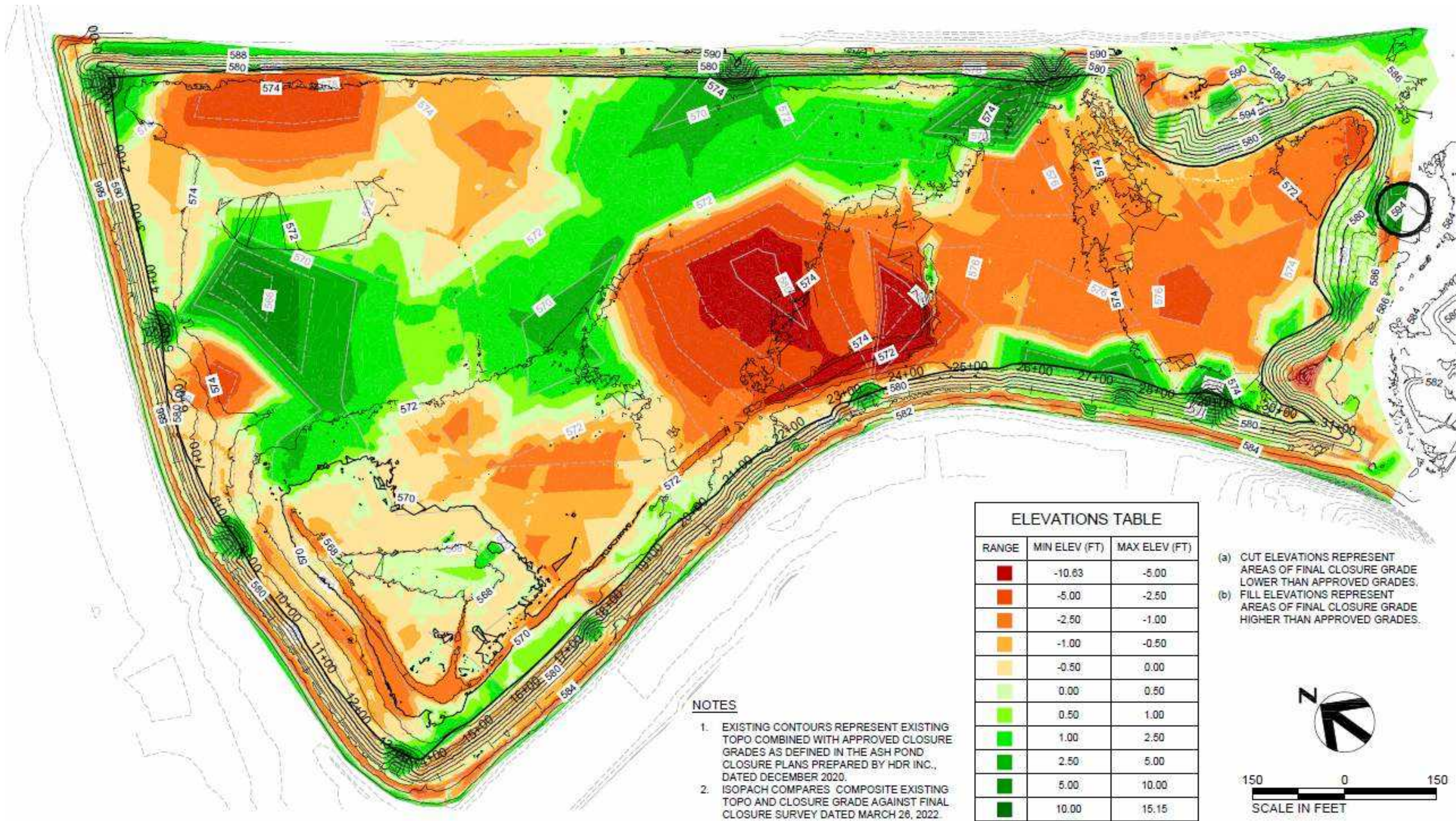
MUSKEGON ENVIRONMENTAL  
REDEVELOPMENT GROUP, LLC (MERG)  
BC COBB ASH POND CLOSURE  
PONDS 0-8 AND BOTTOM ASH POND  
MUSKEGON COUNTY, MI

CROSS SECTIONS  
PERIMETER BERM



FILENAME 00C107.dwg  
SCALE 1" = 20'







**ATTACHMENT A**  
**HDR CLOSURE**  
**STANDARD OPERATING PROCEDURES**

## **HDR Closure Standard Operating Procedures**

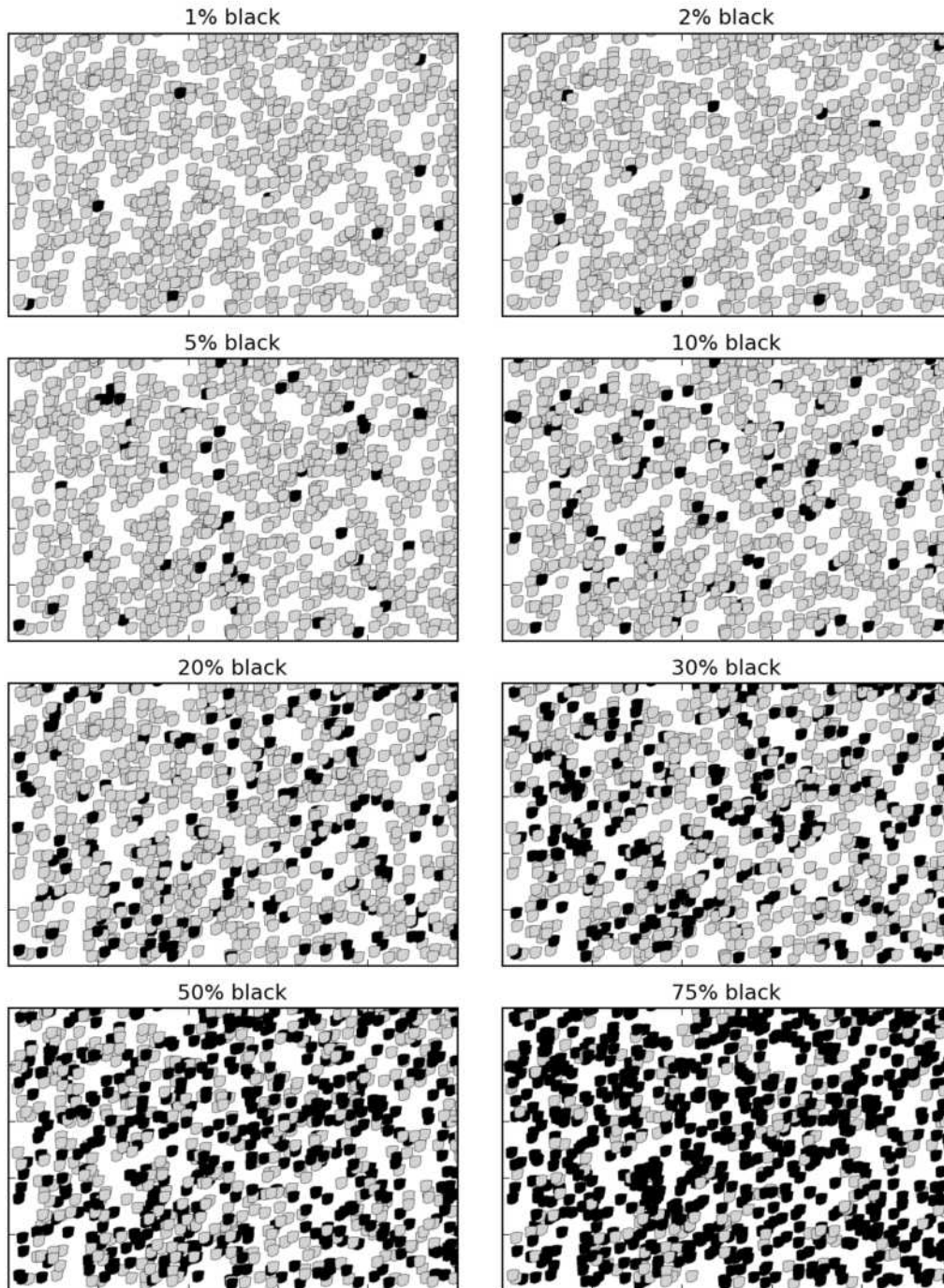
### **B.C. Cobb Ash Pond Closure**

1. Documentation of Excavation Grades
  - a. Charah to provide .csv file with topography of excavation area at grid nodes and break lines.
  - b. HDR to compare elevations points to closure topography and provide acceptance/refusal of elevation of area to be inspected.
  - c. Areas where clean sand has been encountered above the closure plan excavation grades will be noted by Charah. These areas will be identified as variances within the areas of accompanying grid nodes by HDR. All areas that are identified as variances will be treated as areas that meet closure grades for further analysis. Areas that are identified as being above final closure grades will be potholed using an appropriate field method to verify there is no underlying CCR. The results of pot holing will be recorded in field notes and photographed, if possible, based on depth and visibility.
2. Visual Inspection of Area
  - a. Visual observation and photographs of closure areas to identify if area generally conforms to closure requirements for removal of CCR.
3. Photographic Documentation
  - a. Performed at 50% of grid nodes (randomly generated using the Microsoft Excel *RANDARRAY* function).
  - b. Charah to provide field assistance in locating nodes using on-site survey grade GPS.
  - c. Photograph will be taken at each selected node with 12" x 12" frame indicating soil area.
  - d. Whiteboard will be present in photo and will document:
    - i. Site Name/Project ID, Date, Time, and Node ID
4. Microscopy Documentation
  - a. Performed at 50% of photographed nodes (randomly generated using the Microsoft Excel *RANDARRAY* function).
  - b. Sample will be collected at sample node using a shovel and placed in sealed plastic bag. The sample will be split between an archived sample and analysis sample after reduction.
    - i. Field Sample Size: 12" x 12" x 6" (L x W x H)
  - c. Sample will be dried in oven overnight at 100 °F.
  - d. After drying, sample will be hand-sieved using only the No. 30 sieve in general accordance with sieving procedures of ASTM D6913.
  - e. Representative sample will be placed in clean container for microscopy analyses by HDR.
    - i. Three representative portions of the sample will be analyzed for CCR materials and compared to a Visual Estimate Chart (included at the end of the SOP) to estimate %CCR in sample.
      1. If %CCR<5% - Node passes.
      2. If %CCR>5% - Node fails and additional material will be excavated around the failing node based on field conditions and discretion. New samples will be collected at the node location as well as adjacent to the north, south, east, and west extents of the additionally excavated area and tested via microscopy until all nodes pass screening.
    - ii. Representative samples of 10% of microscopy test nodes will be sent to CTL for independent verification of microscopy analyses and QC.
    - iii. In the event QC testing by CTL varies by more than +/-2% between the field microscopy analysis and the CTL review, the CTL result will prevail as the reported sampling result.



5. Archived Sample
  - a. The dried/sieved sample that was analyzed will be bagged and stored in a container (container will be designated for each site visit) with following ID information:
    - i. Site Name/Project ID
    - ii. Date
    - iii. Node ID
  - b. Sample will be stored at site at location determined by Charah.
6. Daily Inspection Report will be completed documenting activities/measurements collected for each day on site.

## Visual estimates of proportions of mixtures



<http://all-geo.org/volcan01010/2012/09/pumicelithicsproportions>

## Burkett, Bryce

---

**From:** Unseld, Timothy (EGLE) <UNSELDT@michigan.gov>  
**Sent:** Friday, May 21, 2021 3:28 PM  
**To:** Kyle Hoover, P.E., P.G., PMP; Walters, Kent (EGLE)  
**Cc:** Syrocki, Lara; Burkett, Bryce; Reeves, Molly; Eric D. Effinger; Joe Watson PMP; Jason Kennedy, PMP, STS-C; Vernon Sommers; Matthew Edwards; Zachary Bryan, CES, PQM, CPESC, CESCO; Norman Divers  
**Subject:** RE: BC Cobb | Closure Methods Discussion - Final Closure Verification SOP

**CAUTION:** [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Kyle,

The revised closure SOP for BC Cobb which you submitted today is approved. I will print a copy of the SOP for our files.

You may reference this email as the approval date and mechanism when you submit certification of closure at the conclusion of the project. Please note that this approval is made under Part 115 of Michigan's Environmental statute. (PA 451, 1994 as amended). This approval does not constitute an approval under the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule) which is overseen by the USEPA.

---

**From:** Kyle Hoover, P.E., P.G., PMP <khoover@charah.com>  
**Sent:** Friday, May 21, 2021 12:43 PM  
**To:** Unseld, Timothy (EGLE) <UNSELDT@michigan.gov>  
**Cc:** Syrocki, Lara <Lara.Syrocki@hdrinc.com>; Burkett, Bryce <Bryce.Burkett@hdrinc.com>; Reeves, Molly <Molly.Reeves@hdrinc.com>; Eric D. Effinger <eeffinger@charah.com>; Joe Watson PMP <jwatson@charah.com>; Jason Kennedy, PMP, STS-C <jkennedy@charah.com>; Vernon Sommers <VSommers@charah.com>; Matthew Edwards <medwards@charah.com>; Zachary Bryan, CES, PQM, CPESC, CESCO <zbryan@charah.com>; Norman Divers <ndivers@charah.com>  
**Subject:** RE: BC Cobb | Closure Methods Discussion - Final Closure Verification SOP

**CAUTION:** This is an External email. Please send suspicious emails to [abuse@michigan.gov](mailto:abuse@michigan.gov)

Tim,

Per our conversation this morning, please see attached for the revised closure SOP for BC Cobb. We have included further detail on how we intend to verify that CCR has been removed from areas of sand/soil that are above the final closure grades to ensure CCR has been removed.

Please let me know if this is acceptable.

Best,

KH

**Kyle Hoover, P.E., P.G., PMP**

Director of Engineering, Environmental & Quality | Charah Solutions, Inc.

Mobile: 502-415-8844 | Office: 502-245-1353 |

[khoover@charah.com](mailto:khoover@charah.com) | <https://www.charah.com>



---

**From:** Kyle Hoover, P.E., P.G., PMP

**Sent:** Tuesday, May 18, 2021 3:03 PM

**To:** 'Unsel, Timothy (EGLE)' <[UNSELDT@michigan.gov](mailto:UNSELDT@michigan.gov)>; 'Walters, Kent (DEQ)' <[WaltersK7@michigan.gov](mailto:WaltersK7@michigan.gov)>; 'Ring, Margie (EGLE)' <[RINGM@michigan.gov](mailto:RINGM@michigan.gov)>

**Cc:** 'Syrocki, Lara' <[Lara.Syrocki@hdrinc.com](mailto:Lara.Syrocki@hdrinc.com)>; 'Burkett, Bryce' <[Bryce.Burkett@hdrinc.com](mailto:Bryce.Burkett@hdrinc.com)>; 'Reeves, Molly' <[Molly.Reeves@hdrinc.com](mailto:Molly.Reeves@hdrinc.com)>; Eric D. Effinger <[eeffinger@charah.com](mailto:eeffinger@charah.com)>; Joe Watson PMP <[jwatson@charah.com](mailto:jwatson@charah.com)>; Jason Kennedy, PMP, STS-C <[jkennedy@charah.com](mailto:jkennedy@charah.com)>; Vernon Sommers <[VSommers@charah.com](mailto:VSommers@charah.com)>; Matthew Edwards <[medwards@charah.com](mailto:medwards@charah.com)>; Zachary Bryan, CES, PQM, CPESC, CESCO <[zbryan@charah.com](mailto:zbryan@charah.com)>; Norman Divers <[ndivers@charah.com](mailto:ndivers@charah.com)>

**Subject:** BC Cobb | Closure Methods Discussion - Final Closure Verification SOP

Tim, Kent, and Margie,

Thank you for your input on our revised SOP for verifying closure at BC Cobb.

We have taken your comments and incorporated them into a revised and final SOP (attached) that addresses questions concerning how we would like to proceed with closure verification at the BC Cobb site.

Please let me know if you have any additional questions. We would like to begin implementation within in the next 1-2 weeks upon approval.

Best,

Kyle

**ATTACHMENT B**  
**HDR CLOSURE AREA OBSERVATION REPORTS**

## OBSERVATION REPORT – Closure Area #1

<b>HDR Project No.</b>	10220433	<b>Project Name:</b>	B.C. Cobb Ash Pond Closure
<b>Client:</b>	MERG	<b>Site Location:</b>	Muskegon, Michigan

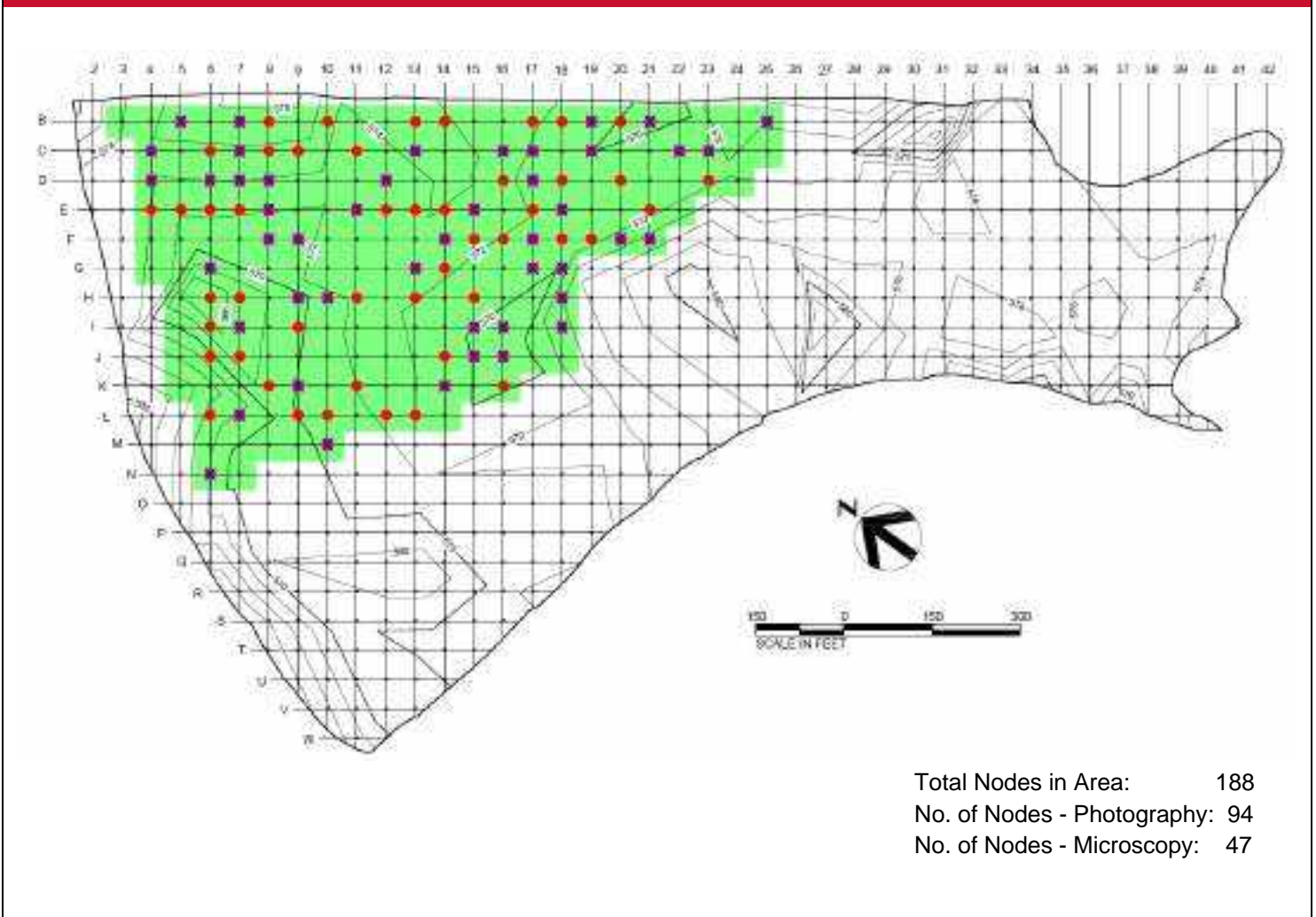
### DAILY REPORT DATA

<b>Inspection Date:</b>	June 14-15, 2021	<b>Report No.:</b>	001
<b>Inspected By:</b>	Bryce Burkett		

### WEATHER CONDITIONS

<b>Conditions:</b>	Sunny	<b>Temperature:</b>	70-75 °F
<b>Wind:</b>	10-20 mph	<b>Precipitation:</b>	None

### AREA INSPECTED



### DOCUMENTATION OF EXCAVATION GRADES

<b>Data Survey Received from Charah:</b>	June 10, 2021
<b>No. of Nodes Above Excavation Grade:</b>	150
<b>No. of Nodes Hand-Augered (Potholed):</b>	150



## VISUAL INSPECTION OF AREA – Closure Area #1

**Photographs Taken of Area:** Yes

**Closure Area #1 Notes:**

### General Site Conditions:

- The overall excavation area consisted of clean light-colored sand with organic material (wood chips/mulch) vastly present. Area photographs taken of the excavation area for Closure Area #1.

### Potholing Investigation:

- Hand-augering took place at all node locations that were above design grade (150 nodes). Depths varied depending on surface elevation at each node. Depths of hand-augering were predetermined using the difference between the current elevation at each node and the design elevation of each node. Photographs of representative samples hand-augered were documented for each node.
- Underlying CCR was encountered at Nodes J8 and B4.
- Additional potholing was performed around J8 and CCR was encountered approx. 1 to 1.5 feet below the surface.
- Excavation for Node J8 was performed on June 15. CCR was exposed for about 200 LF (approximately 8-10 feet in width) in a fairly straight line at J8. CCR ran primarily between the J and K grid lines from approximately Rows 7 to 11. Further excavation and removal was performed by MERG.
- Node B4 is to be excavated and further inspected at later date.
- Nodes J8 and B4 will be inspected again at later Closure Area visit for removal verification.

### HDR Microscopy Results:

- 44 nodes pass, 3 nodes fail
- Further excavation to be performed around 3 failing nodes (B7, B19, N6)
- 5 samples (approx. 10%) of the microscopy samples sent to CTL:

Node ID	HDR Microscopic Estimation of CCR (%)	HDR Microscopy Pass/Fail (< 5%)	CTL Microscopy QC (%)
B5	2-3%	Pass	2.5-3.5%
B7	30-35%	Fail	20-25%
C13	<1%	Pass	<1%
F14	1-2%	Pass	4-5%
L7	<1%	Pass	1-2%



## OBSERVATION REPORT – Closure Area #2

<b>HDR Project No.</b>	10220433	<b>Project Name:</b>	B.C. Cobb Ash Pond Closure
<b>Client:</b>	MERG	<b>Site Location:</b>	Muskegon, Michigan

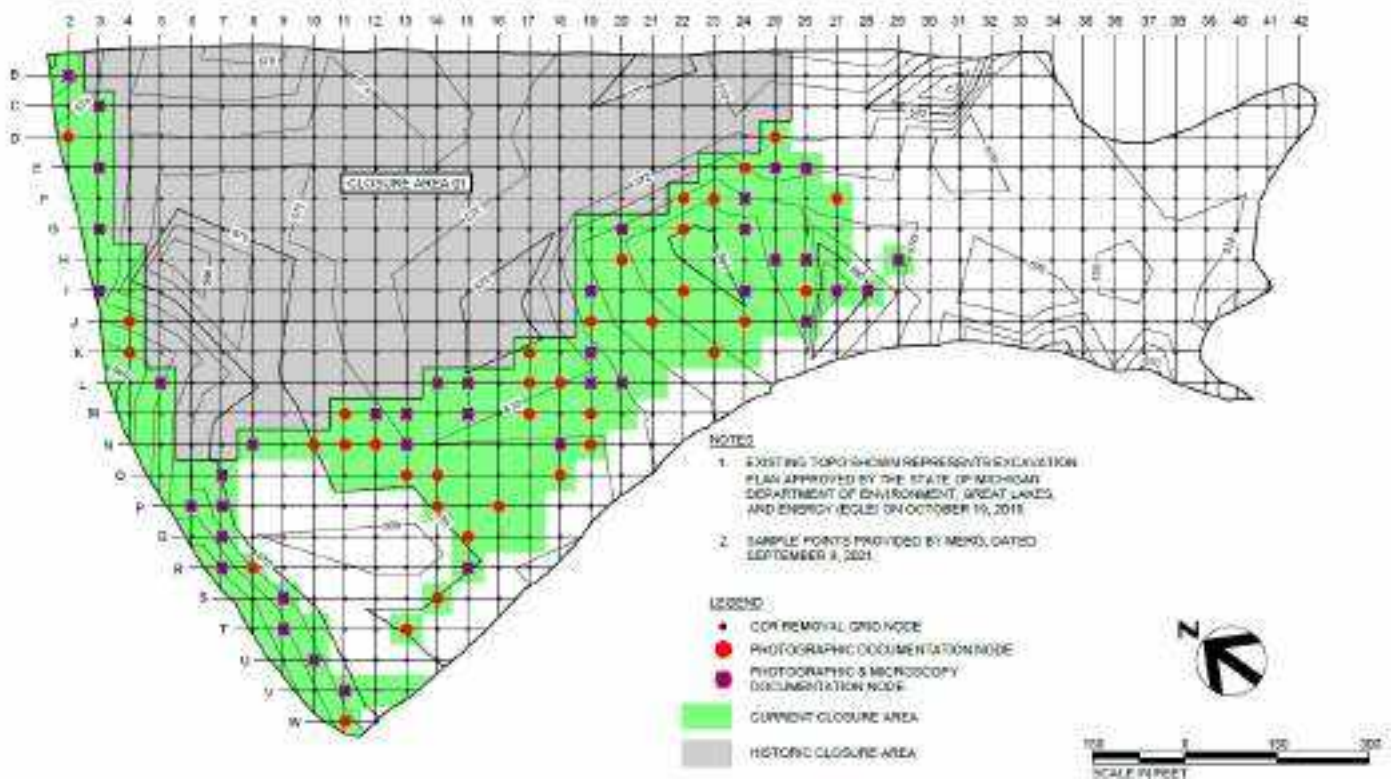
### DAILY REPORT DATA

<b>Inspection Date:</b>	September 15, 2021	<b>Report No.:</b>	002
<b>Inspected By:</b>	Bryce Burkett		

### WEATHER CONDITIONS

<b>Conditions:</b>	Sunny	<b>Temperature:</b>	70-75 °F
<b>Wind:</b>	0-5 mph	<b>Precipitation:</b>	None

### AREA INSPECTED



Total Nodes in Area: 146  
No. of Nodes - Photography: 75  
No. of Nodes - Microscopy: 40  
Reassessed Nodes in Area: 10

### DOCUMENTATION OF EXCAVATION GRADES

<b>Data Survey Received from Charah:</b>	September 13, 2021
<b>No. of Nodes Above Excavation Grade:</b>	33
<b>No. of Nodes Hand-Augered (Potholed):</b>	33

## VISUAL INSPECTION OF AREA – Closure Area #2

**Photographs Taken of Area:** Yes

**Closure Area #2 Notes:**

### General Site Conditions:

- The overall excavation area consisted of clean light-colored sand with organic material (wood chips/mulch) vastly present. Area photographs taken of the excavation area for Closure Area #2.

### Potholing Investigation:

- Hand-augering took place at all node locations that were above design grade (33 nodes). One additional probe took place at Node J8A which failed probing during Closure Area #2. Depths varied depending on surface elevation at each node. Depths of hand-augering were predetermined using the difference between the current elevation at each node and the design elevation of each node. Photographs of representative samples hand-augered were documented for each probed node.
- E26 – CCR encountered immediately below surface. E26 is currently 0.53 feet above design grade
- N8 – CCR encountered approximately 1-2 feet below grade. N8 is currently 2.73 feet above design grade
- Nodes C2, F3, H3, and I3: CCR encountered during pot-holing due to nodes being above design grade
  - These nodes are adjacent to perimeter embankment where further excavation is not planned.

### HDR Microscopy Results:

- 31 nodes pass, 9 nodes fail from nodes within Closure Area #2.
- 3 nodes pass, 7 nodes fail from reassessment of nodes from previous Closure Area #1 (B19 and N6).
- Six of the failing nodes (E3, I3, P6, R7, T9, V11) are adjacent to perimeter embankment where further excavation is not planned.
- Further excavation needed around three failing nodes (E26, H26, O7) and microscopy to be performed at 5 locations at each node.
- Two additional nodes were reassessed (B19 and N6) from failing microscopy from Closure Area #1. These two nodes failed the second microscopy. Further excavation required at each and microscopy will need to be performed at 5 locations around each node according to SOP.
- 4 samples (approx. 10%) of the microscopy samples sent to CTL:

Node ID	HDR Microscopic Estimation of CCR (%)	HDR Microscopy Pass/Fail (< 5%)	CTL Microscopy QC (%)
H25	2-3%	Pass	2-3%
H26	10-15%	Fail	6-7%
O7	5-10%	Fail <sup>1</sup>	4-5%
S9	4-5%	Pass	4-5%

#### Note:

- Node O7 was considered a failing node due to the deviation between HDR and CTL microscopy results being less than 2%, therefore the HDR result will override. Additionally, a conservative approach is being taken to continue excavation at this node due to adjacent nodes (N6 and N8) also needing further excavation due to a failing microscopy result (N6) and a failing potholing result (N8).

## OBSERVATION REPORT – Closure Area #3

<b>HDR Project No.</b>	10220433	<b>Project Name:</b>	B.C. Cobb Ash Pond Closure
<b>Client:</b>	MERG	<b>Site Location:</b>	Muskegon, Michigan

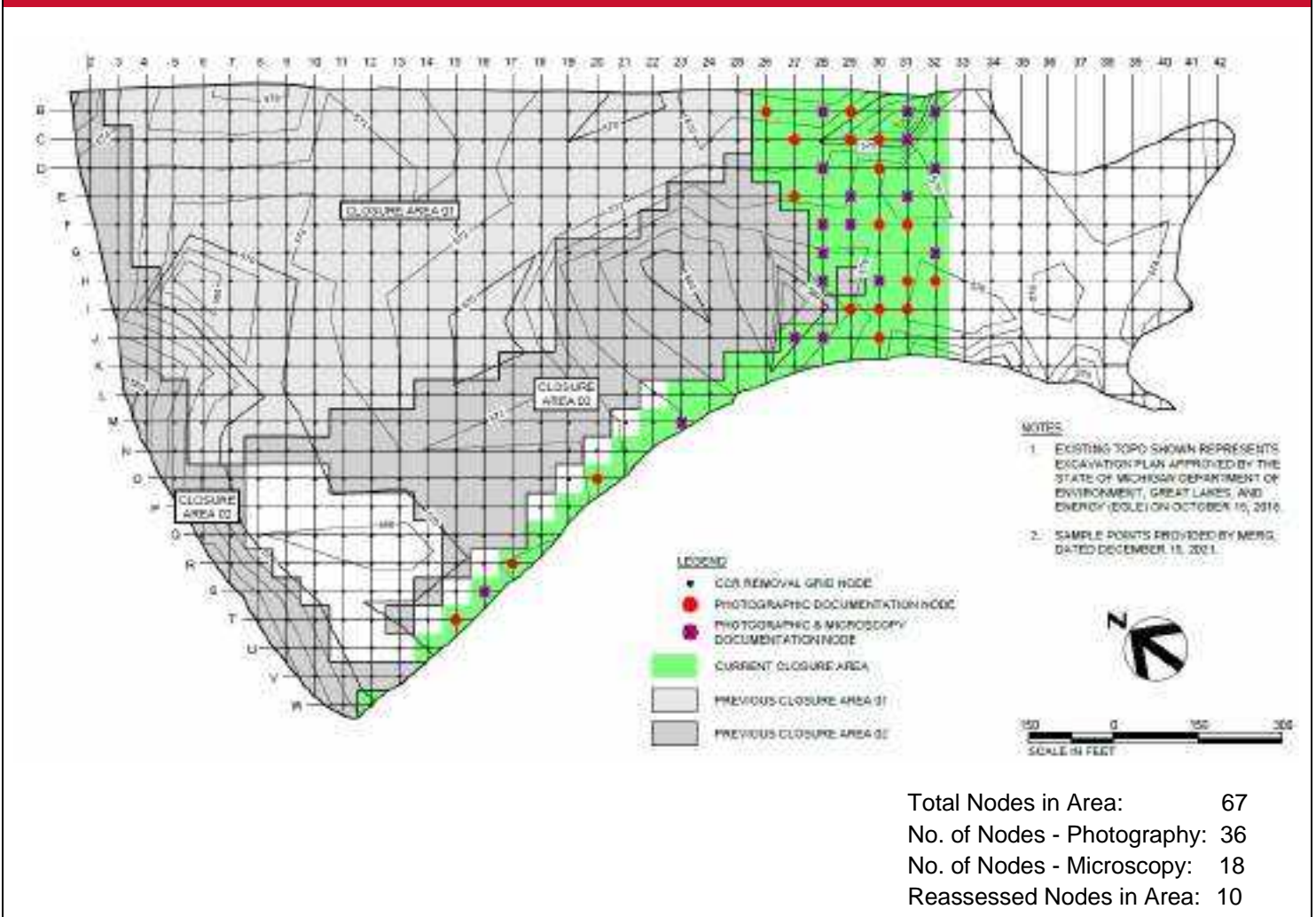
## DAILY REPORT DATA

<b>Inspection Date:</b>	December 16, 2021	<b>Report No.:</b>	003
<b>Inspected By:</b>	Bryce Burkett		

## WEATHER CONDITIONS

<b>Conditions:</b>	Sunny, windy	<b>Temperature:</b>	40-45 °F
<b>Wind:</b>	20-30 mph	<b>Precipitation:</b>	None

## AREA INSPECTED



## DOCUMENTATION OF EXCAVATION GRADES

<b>Data Survey Received from Charah:</b>	December 15, 2021
<b>No. of Nodes Above Excavation Grade:</b>	27
<b>No. of Nodes Hand-Augered (Potholed):</b>	27

VISUAL INSPECTION OF AREA – Closure Area #3	
Photographs Taken of Area:	Yes
Closure Area #3 Notes:	<p><b>General Site Conditions:</b></p> <ul style="list-style-type: none"> <li>The overall excavation area consisted of clean light-colored sand with organic material (wood chips/mulch) vastly present. Area photographs taken of the excavation area for Closure Area #3.</li> </ul> <p><b>Potholing Investigation:</b></p> <ul style="list-style-type: none"> <li>Hand-augering took place at all Closure Area #3 node locations that were above design grade (27 nodes). One additional probe took place at Node E26A which failed probing during Closure Area #2. Depths varied depending on surface elevation at each node. Depths of hand-augering were predetermined using the difference between the current elevation at each node and the design elevation of each node. Photographs of representative samples hand-augered were documented for each probed node.</li> <li>Nodes M22, M23, O20, P19, Q18, S16, T15, W12: CCR encountered during pot-holing due to nodes being above design grade. These nodes are adjacent to perimeter embankment where further excavation is not planned.</li> </ul> <p><b>HDR Microscopy Results:</b></p> <ul style="list-style-type: none"> <li>14 nodes pass, 4 nodes fail from nodes within Closure Area #3.</li> <li>7 nodes pass, 3 nodes fail from reassessment of nodes from previous Closure Area #2 (E26 and H26).</li> <li>Two of the failing nodes adjacent to perimeter embankment (M23 and S16) where further excavation is not planned.</li> <li>Further excavation needed around two failing nodes of Closure Area #3 (B32 and H28)</li> <li>Two additional nodes were reassessed (E26 and H26) from failing microscopy from Closure Area #2 after further excavation was performed at E26 and H26 since the last site visit. <ul style="list-style-type: none"> <li>E26A, E26B, and E26E passed microscopy. E26C and E26D failed and further excavation required at E26C and E26D and microscopy will need to be performed at each node according to SOP. Recommend excavating 6-inches in the area of each node.</li> <li>H26A, H26B, H26D, and H26E passed microscopy. H26C failed and further excavation required at H26C and microscopy will need to be performed at node according to SOP. Recommend excavating 6-inches in the area of the node.</li> </ul> </li> </ul>



## OBSERVATION REPORT – Closure Area #4

<b>HDR Project No.</b>	10220433	<b>Project Name:</b>	B.C. Cobb Ash Pond Closure
<b>Client:</b>	MERG	<b>Site Location:</b>	Muskegon, Michigan

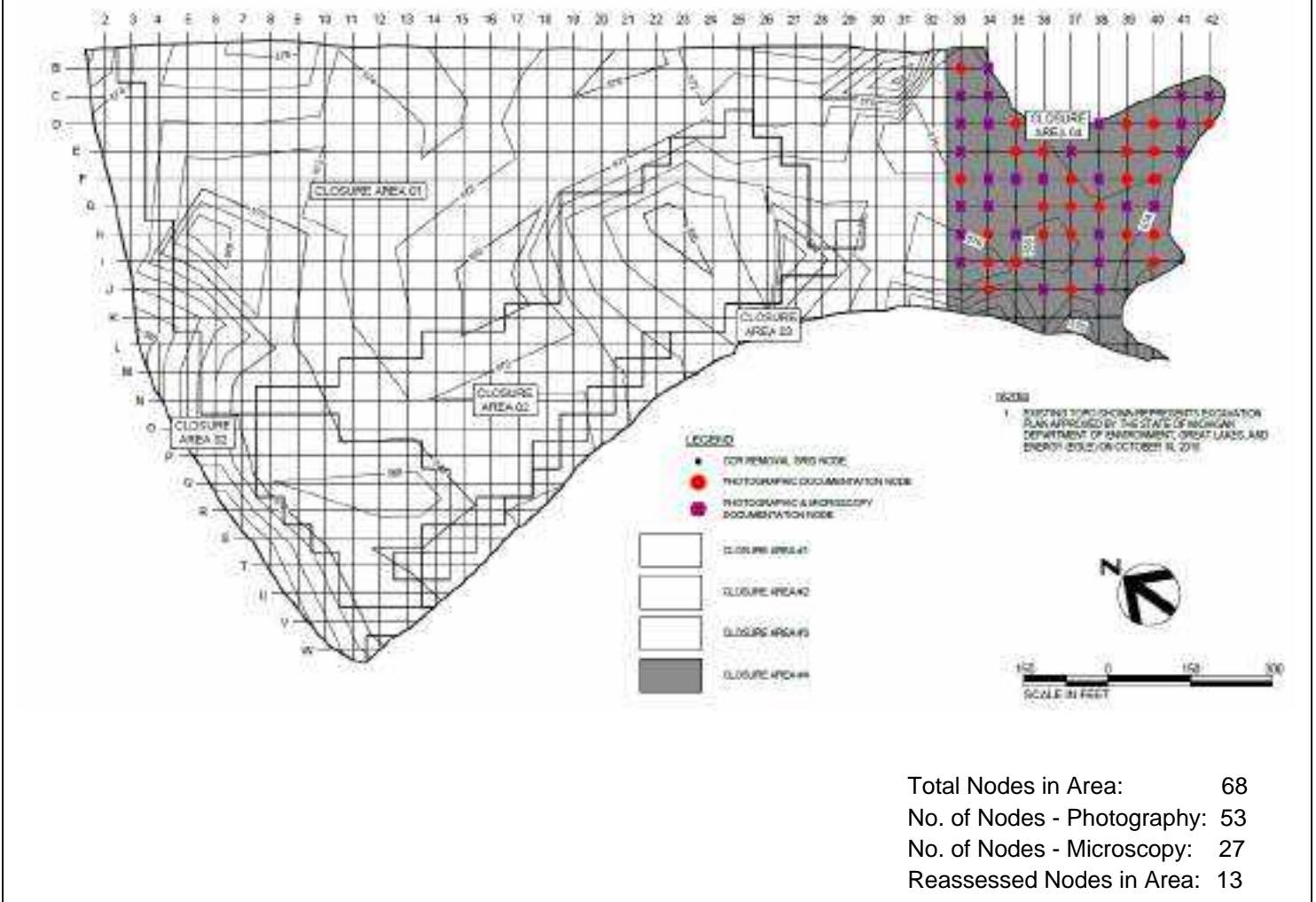
## DAILY REPORT DATA

<b>Inspection Date:</b>	April 29, 2022	<b>Report No.:</b>	004
<b>Inspected By:</b>	Bryce Burkett		

## WEATHER CONDITIONS

<b>Conditions:</b>	Overcast, windy	<b>Temperature:</b>	40-50 °F
<b>Wind:</b>	10-20 mph	<b>Precipitation:</b>	None

## AREA INSPECTED



## DOCUMENTATION OF EXCAVATION GRADES

<b>Data Survey Received from Charah:</b>	April 28, 2022
<b>No. of Nodes Above Excavation Grade:</b>	8
<b>No. of Nodes Hand-Augered (Potholed):</b>	8

## VISUAL INSPECTION OF AREA – Closure Area #4

**Photographs Taken of Area:** Yes

**Closure Area #4 Notes:**

### General Site Conditions:

- The overall excavation area consisted of clean light-colored sand with organic material (wood chips/mulch) vastly present. Area photographs taken of the excavation area for Closure Area #4.

### Potholing Investigation:

- Hand-augering took place at all Closure Area #4 node locations that were above design grade (8 nodes). Depths varied depending on surface elevation at each node. Depths of hand-augering were predetermined using the difference between the current elevation at each node and the design elevation of each node. Photographs of representative samples hand-augered were documented for each probed node.





### HDR Microscopy Results:

- 27 nodes pass, 0 nodes fail within Closure Area #4.
- 13 nodes pass, 0 nodes fail from reassessment of nodes from previous Closure Area #2 (E26 and H26) and previous Closure Area #3 (B32 and H28).
- 4 samples (approx. 10%) of the microscopy samples sent to CTL:

Node ID	HDR Microscopic Estimation of CCR (%)	HDR Microscopy Pass/Fail (< 5%)	CTL Microscopy QC (%)
C42	<1%	Pass	1-2%
D41	<1%	Pass	1.5-2.5%
I33	2-3%	Pass	3-4%
J36	1-2%	Pass	2.5-3.5%

**ATTACHMENT C**  
PHOTOGRAPHIC DOCUMENTATION –  
GENERAL SITE PHOTOGRAPHS



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 1</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Perimeter embankment to right of photo.</p> <p><b>Date:</b> June 14, 2021</p> <p><b>Orientation:</b> Looking southwest</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 2</b></p> <p><b>Description:</b> Typical clean sand in excavation area.</p> <p><b>Date:</b> June 14, 2021</p> <p><b>Orientation:</b> Looking northwest</p> <p><b>Approximate Location</b></p> 		




Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 3</b>		
<b>Description:</b> Typical clean sand in excavation area. Excavation of CCR in background.		
<b>Date:</b> June 14, 2021		
<b>Orientation:</b> Looking south		
<b>Approximate Location</b> 		
<b>Photograph No. 4</b>		
<b>Description:</b> Typical clean sand in excavation area. Perimeter embankment in background.		
<b>Date:</b> June 14, 2021		
<b>Orientation:</b> Looking northwest		
<b>Approximate Location</b> 		



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 5</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Excavation of CCR in background.</p> <p><b>Date:</b> June 14, 2021</p> <p><b>Orientation:</b> Looking southwest</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 6</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Embankment to left of photo.</p> <p><b>Date:</b> June 14, 2021</p> <p><b>Orientation:</b> Looking east</p> <p><b>Approximate Location</b></p> 		



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 7</b>		
<b>Description:</b> Additional excavation at Node J8 where potholing encountered CCR during Closure Area #1 visit.		
<b>Date:</b> June 14, 2021		
<b>Orientation:</b> Looking southwest		
<b>Approximate Location</b> 		
<b>Photograph No. 8</b>		
<b>Description:</b> Lenses of uncovered CCR at Node J8 during potholing. Additional excavation performed.		
<b>Date:</b> June 14, 2021		
<b>Orientation:</b> Looking northwest		
<b>Approximate Location</b> 		



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 9</b></p> <p><b>Description:</b> Typical clean sand in excavation area.</p> <p><b>Date:</b> September 15, 2021</p> <p><b>Orientation:</b> Looking east</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 10</b></p> <p><b>Description:</b> Abundance of wood chips mixed with sand at grade in excavation area. Ponding water in background.</p> <p><b>Date:</b> September 15, 2021</p> <p><b>Orientation:</b> Looking west</p> <p><b>Approximate Location</b></p> 		



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433

#### Photograph No. 11

**Description:**

Ongoing excavation at perimeter embankment adjacent to Discharge Channel.

**Date:**

September 15, 2021

**Orientation:**

Looking south

**Approximate Location**

#### Photograph No. 12

**Description:**

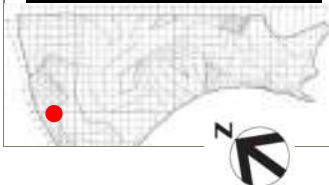
Clean sand with CCR particles blown from embankments on top of excavation from wind/rain events.

**Date:**

September 15, 2021

**Orientation:**

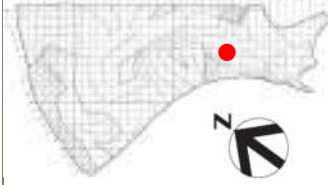
Looking south

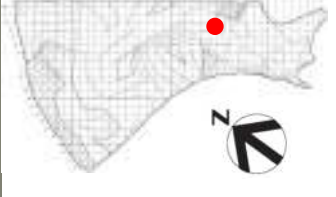



**Approximate Location**



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 13</b></p> <p><b>Description:</b> Perimeter embankment consisting of CCR and fill with surficial CCR runoff in excavation overlaying sand.</p> <p><b>Date:</b> June 14, 2021</p> <p><b>Orientation:</b> Looking north</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 14</b></p> <p><b>Description:</b> Perimeter embankment consisting of CCR and fill with surficial CCR runoff in excavation overlaying sand.</p> <p><b>Date:</b> December 16, 2021</p> <p><b>Orientation:</b> Looking west</p> <p><b>Approximate Location</b></p> 		



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 15</b>		
<b>Description:</b> Windblown CCR particles overlaying clean sand in excavation. See Photos 21 and 24 showing clean sand with windblown CCR removed by April 2022.		
<b>Date:</b> December 16, 2021		
<b>Orientation:</b> Looking west		
<b>Approximate Location</b>		
		
<b>Photograph No. 16</b>		
<b>Description:</b> Typical clean sand in excavation area. CCR stockpile in background.		
<b>Date:</b> December 16, 2021		
<b>Orientation:</b> Looking southeast		
<b>Approximate Location</b>		
		

Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 17</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Embankment to right of photo.</p> <p><b>Date:</b> December 16, 2021</p> <p><b>Orientation:</b> Looking north</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 18</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Perimeter embankment in distance.</p> <p><b>Date:</b> December 16, 2021</p> <p><b>Orientation:</b> Looking west</p> <p><b>Approximate Location</b></p> 		





Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433

**Photograph No. 19**

**Description:**

Trench for dewatering collection.

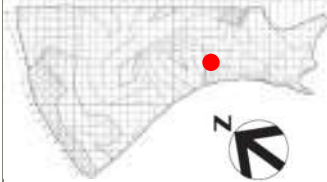
**Date:**

December 16, 2021

**Orientation:**

Looking west

**Approximate Location**



**Photograph No. 20**

**Description:**

Typical clean sand in excavation area.  
Perimeter embankment in background.

**Date:**

April 29, 2022

**Orientation:**

Looking southeast

**Approximate Location**



Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 21</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Perimeter embankment in background.</p> <p><b>Date:</b> April 29, 2022</p> <p><b>Orientation:</b> Looking west</p> <p><b>Approximate Location</b></p> 		
<p><b>Photograph No. 22</b></p> <p><b>Description:</b> Typical clean sand in excavation area. Perimeter embankment in background.</p> <p><b>Date:</b> April 29, 2022</p> <p><b>Orientation:</b> Looking south</p> <p><b>Approximate Location</b></p> 		





Client Name:	Site Location:	General Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433

#### Photograph No. 23

**Description:**

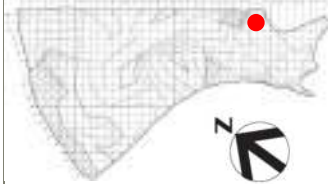
Clean wet sand in excavation area due to ongoing pumping operations.

**Date:**

April 29, 2022

**Orientation:**

Looking south

**Approximate Location**

#### Photograph No. 24

**Description:**

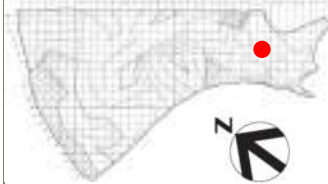
Typical clean sand in excavation area.  
Perimeter embankment in background.

**Date:**

April 29, 2022

**Orientation:**

Looking north

**Approximate Location**





**ATTACHMENT D**  
PHOTOGRAPHIC DOCUMENTATION –  
PHOTOGRAPHIC NODES



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 1</b></p> <p>Node: B2</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Windblown CCR present at surface overlaying clean sands.</p>		
<p><b>Photograph No. 2</b></p> <p>Node: B5</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 3		
Node: B7  HDR Microscopic Quantification Result: 30-35%		
Photograph No. 4		
Node: B8		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 5</b>  Node: B10		
<b>Photograph No. 6</b>  Node: B13		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 7		
Node: B14		
Photograph No. 8		
Node: B17		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 9</b></p> <p>Node: B18</p>		
<p><b>Photograph No. 10</b></p> <p>Node: B19</p> <p>HDR Microscopic Quantification Result: 25-30%</p>		








Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 11		
Node: B20		
Photograph No. 12		
Node: B21  HDR Microscopic Quantification Result: <1%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 13</b></p> <p>Node: B25</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 14</b></p> <p>Node: B26</p>		








Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 15		
Node: B28  HDR Microscopic Quantification Result: 1-2%		
Photograph No. 16		
Node: B29		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 17</b></p> <p>Node: B31</p> <p>HDR Microscopic Quantification Result: 4-5%</p>		
<p><b>Photograph No. 18</b></p> <p>Node: B32</p> <p>HDR Microscopic Quantification Result: 10-15%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 19		
Node: B33		
Photograph No. 20		
Node: B34  HDR Microscopic Quantification Result: 4-5%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 21</b></p> <p>Node: C3</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 22</b></p> <p>Node: C4</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 23</b>		
Node: C6		
<b>Photograph No. 24</b>		
Node: C7  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 25</b>  Node: C8		
<b>Photograph No. 26</b>  Node: C9		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 27</b>		
Node: C11		
<b>Photograph No. 28</b>		
Node: C13  HDR Microscopic Quantification Result: <1%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 29</b></p> <p>Node: C16</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 30</b></p> <p>Node: C17</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 31</b>		
Node: C19  HDR Microscopic Quantification Result: 2-3%		
<b>Photograph No. 32</b>		
Node: C22  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 33</b></p> <p>Node: C23</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 34</b></p> <p>Node: C27</p>		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 35		
Node: C29		
Photograph No. 36		
Node: C30		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 37</b></p> <p>Node: C31</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		
<p><b>Photograph No. 38</b></p> <p>Node: C33</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 39</b>		
Node: C34  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 40</b>		
Node: C41  HDR Microscopic Quantification Result: 4-5%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 41</b>		
<p>Node: C42</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		
<b>Photograph No. 42</b>		
<p>Node: D2</p> <p>Note: Windblown CCR present at surface overlaying clean sands</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 43</b>		
Node: D4  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 44</b>		
Node: D6  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 45</b></p> <p>Node: D7</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 46</b></p> <p>Node: D8</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 47</b>		
Node: D12  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 48</b>		
Node: D16		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 49</b></p> <p>Node: D17</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		
<p><b>Photograph No. 50</b></p> <p>Node: D18</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 51</b>		
Node: D20		
<b>Photograph No. 52</b>		
Node: D23		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 53</b></p> <p>Node: D25</p>		
<p><b>Photograph No. 54</b></p> <p>Node: D28</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 55</b>		
Node: D30		
<b>Photograph No. 56</b>		
Node: D32  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 57</b>		
Node: D33  HDR Microscopic Quantification Result: 3-4%		
<b>Photograph No. 58</b>		
Node: D34  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 59		
Node: D35		
Photograph No. 60		
Node: D38  HDR Microscopic Quantification Result: 1-2%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 61</b>		
Node: D39		
<b>Photograph No. 62</b>		
Node: D40		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 63		
Node: D41  HDR Microscopic Quantification Result: <1%		
Photograph No. 64		
Node: D42		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 65</b></p> <p>Node: E3</p> <p>HDR Microscopic Quantification Result: 5-10%</p>		
<p><b>Photograph No. 66</b></p> <p>Node: E4</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 67</b>		
Node: E5		
<b>Photograph No. 68</b>		
Node: E6		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 69</b></p> <p>Node: E7</p>		
<p><b>Photograph No. 70</b></p> <p>Node: E8</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 71</b>		
Node: E11  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 72</b>		
Node: E12		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 73</b>  Node: E13		
<b>Photograph No. 74</b>  Node: E14		







Client Name:		Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)		Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 75			
Node: E15  HDR Microscopic Quantification Result: 3-4%			
Photograph No. 76			
Node: E17			

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 77</b></p> <p>Node: E18</p> <p>HDR Microscopic Quantification Result: 3-4%</p>		
<p><b>Photograph No. 78</b></p> <p>Node: E21</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 79		
Node: E24		
Photograph No. 80		
Node: E25  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 81</b>  Node: E26  HDR Microscopic Quantification Result: 5-10%		
<b>Photograph No. 82</b>  Node: E27		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 83		
Node: E29  HDR Microscopic Quantification Result: <1%		
Photograph No. 84		
Node: E31  HDR Microscopic Quantification Result: 3-4%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 85</b>		
Node: E33  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 86</b>		
Node: E35		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 87		
Node: E36		
Photograph No. 88		
Node: E37  HDR Microscopic Quantification Result: 1-2%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 89</b>	 <p>A photograph showing a square sampling area defined by a black frame in a dark, muddy pond. A white data tag is placed in the center of the frame. The tag contains the following information: HDR logo, Date: 4/29/22, Time: 9:48, and Node: E39.</p>	
Node: E39		
<b>Photograph No. 90</b>	 <p>A photograph showing a square sampling area defined by a black frame in a dark, muddy pond. A white data tag is placed in the center of the frame. The tag contains the following information: HDR logo, Date: 4/29/22, Time: 9:52, and Node: E40.</p>	
Node: E40		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 91		
Node: E41  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 92</b></p> <p>Node: F8</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		
<p><b>Photograph No. 93</b></p> <p>Node: F9</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 94</b>		
Node: F14  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 95</b>		
Node: F15		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 96</b>  Node: F16		
<b>Photograph No. 97</b>  Node: F17  HDR Microscopic Quantification Result: 1-2%		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 98		
Node: F18		
Photograph No. 99		
Node: F19		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 100</b>  Node: F20  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 101</b>  Node: F21  HDR Microscopic Quantification Result: 3-4%		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 102		
Node: F22		
Photograph No. 103		
Node: F24  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 104</b></p> <p>Node: F27</p>		
<p><b>Photograph No. 105</b></p> <p>Node: F28</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 106</b>		
Node: F29  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 107</b>		
Node: F30		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 108</b>		
Node: F31		
<b>Photograph No. 109</b>		
Node: F33		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 110</b>		
Node: F34  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 111</b>		
Node: F35  HDR Microscopic Quantification Result: 2-3%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 112</b>		
Node: F36  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 113</b>		
Node: F37		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 114</b>		
Node: F38  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 115</b>		
Node: F39		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 116</b>		
Node: F40		
<b>Photograph No. 117</b>		
Node: G3  HDR Microscopic Quantification Result: 1-2%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 118		
Node: G6  HDR Microscopic Quantification Result: 3-4%		
Photograph No. 119		
Node: G13  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 120</b></p> <p>Node: G14</p>		
<p><b>Photograph No. 121</b></p> <p>Node: G17</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 122</b>		
Node: G18  HDR Microscopic Quantification Result: 3-4%		
<b>Photograph No. 123</b>		
Node: G20  HDR Microscopic Quantification Result: <1%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 124</b>  Node: G22		
<b>Photograph No. 125</b>  Node: G24  HDR Microscopic Quantification Result: <1%		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 126</b>		
Node: G28  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 127</b>		
Node: G32  HDR Microscopic Quantification Result: 1-2%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 128</b>		
Node: G33  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 129</b>		
Node: G34  HDR Microscopic Quantification Result: 3-4%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 130		
Node: G36		
Photograph No. 131		
Node: G37		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 132</b>		
Node: G38		
<b>Photograph No. 133</b>		
Node: G39  HDR Microscopic Quantification Result: 2-3%		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 134		
Node: G40  HDR Microscopic Quantification Result: 3-4%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 135</b>  Node: H6		
<b>Photograph No. 136</b>  Node: H7		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 137		
Node: H9  HDR Microscopic Quantification Result: 2-3%		
Photograph No. 138		
Node: H10  HDR Microscopic Quantification Result: <1%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 139</b>  Node: H11		
<b>Photograph No. 140</b>  Node: H13		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 141		
Node: H15		
Photograph No. 142		
Node: H18  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 143</b>  Node: H20		
<b>Photograph No. 144</b>  Node: H25  HDR Microscopic Quantification Result: 2-3%		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 145</b>		
Node: H26  HDR Microscopic Quantification Result: 10-15%		
<b>Photograph No. 146</b>		
Node: H28  HDR Microscopic Quantification Result: 8-10%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 147</b>  Node: H29  HDR Microscopic Quantification Result: 4-5%		
<b>Photograph No. 148</b>  Node: H30  HDR Microscopic Quantification Result: 4-5%		






Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 149		
Node: H31		
Photograph No. 150		
Node: H32		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 151</b>		
Node: H33  HDR Microscopic Quantification Result: 2-3%		
<b>Photograph No. 152</b>		
Node: H34		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 153		
Node: H35  HDR Microscopic Quantification Result: 2-3%		
Photograph No. 154		
Node: H36		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 155</b>		
Node: H37		
<b>Photograph No. 156</b>		
Node: H38  HDR Microscopic Quantification Result: 4-5%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 157		
Node: H39		
Photograph No. 158		
Node: H40		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 159</b></p> <p>Node: I3</p> <p>HDR Microscopic Quantification Result: 70-80%</p>		
<p><b>Photograph No. 160</b></p> <p>Node: I6</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433

**Photograph No. 161**

Node: I7

HDR Microscopic  
Quantification Result:  
<1%





**Photograph No. 162**

Node: I9





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 163</b></p> <p>Node: I15</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		
<p><b>Photograph No. 164</b></p> <p>Node: I16</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 165</b>		
Node: I18  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 166</b>		
Node: I19  HDR Microscopic Quantification Result: <1%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 167</b>  Node: I22		
<b>Photograph No. 168</b>  Node: I24  HDR Microscopic Quantification Result: <1%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 169</b>		
Node: 126		
<b>Photograph No. 170</b>		
Node: 127  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 171</b>  Node: I28  HDR Microscopic Quantification Result: 2-3%		
<b>Photograph No. 172</b>  Node: I29		






Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 173		
Node: I30		
Photograph No. 174		
Node: I31		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 175</b>		
Node: I33  HDR Microscopic Quantification Result: 1-2%		
<b>Photograph No. 176</b>		
Node: I34		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 177</b>		
Node: I35		
<b>Photograph No. 178</b>		
Node: I38  HDR Microscopic Quantification Result: 2-3%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 179</b>		
Node: I40		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433


Photograph No. 180	
Node: J4	

Photograph No. 181	
Node: J6	


Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 182</b></p> <p>Node: J7</p>		
<p><b>Photograph No. 183</b></p> <p>Node: J14</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 184</b>		
Node: J15  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 185</b>		
Node: J16  HDR Microscopic Quantification Result: 1-2%		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 186</b></p> <p>Node: J19</p>		
<p><b>Photograph No. 187</b></p> <p>Node: J21</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 188		
Node: J24		
Photograph No. 189		
Node: J26  HDR Microscopic Quantification Result: 4-5%		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 190</b></p> <p>Node: J27</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 191</b></p> <p>Node: J28</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 192		
Node: J30		
Photograph No. 193		
Node: J34		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 194</b>		
Node: J36  HDR Microscopic Quantification Result: 1%		
<b>Photograph No. 195</b>		
Node: J37		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 196</b>		
Node: J38  HDR Microscopic Quantification Result: 2-3%		
<b>Photograph No. 197</b>		
Node: K4		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 198</b></p> <p>Node: K8</p>		
<p><b>Photograph No. 199</b></p> <p>Node: K9</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 200</b>		
Node: K11		
<b>Photograph No. 201</b>		
Node: K14  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 202</b>  Node: K16		
<b>Photograph No. 203</b>  Node: K17		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 204</b>		
Node: K19  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 205</b>		
Node: K23		

Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 206</b>  Node: L5  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 207</b>  Node: L6		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 208</b>		
Node: L7  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 209</b>		
Node: L9		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 210</b>  Node: L10		
<b>Photograph No. 211</b>  Node: L12		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 212</b>		
Node: L13		
<b>Photograph No. 213</b>		
Node: L14  HDR Microscopic Quantification Result: 1-2%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 214</b></p> <p>Node: L15</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		
<p><b>Photograph No. 215</b></p> <p>Node: L17</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 216		
Node: L18		
Photograph No. 217		
Node: L19  HDR Microscopic Quantification Result: 3-4%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 218</b></p> <p>Node: L20</p> <p>HDR Microscopic Quantification Result: 1-2%</p>		
<p><b>Photograph No. 219</b></p> <p>Node: M10</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 220</b>		
Node: M11		
<b>Photograph No. 221</b>		
Node: M12  HDR Microscopic Quantification Result: 3-4%		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 222</b></p> <p>Node: M13</p> <p>HDR Microscopic Quantification Result: 2-3%</p>		
<p><b>Photograph No. 223</b></p> <p>Node: M15</p> <p>HDR Microscopic Quantification Result: &lt;1%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 224		
Node: M17		
Photograph No. 225		
Node: M19		


Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 226</b></p> <p>Node: M23</p> <p>HDR Microscopic Quantification Result: 80-90%</p>		
<p><b>Photograph No. 227</b></p> <p>Node: N6</p> <p>HDR Microscopic Quantification Result: 20-25%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 228</b>		
Node: N8  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 229</b>		
Node: N10		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 230</b></p> <p>Node: N11</p>		
<p><b>Photograph No. 231</b></p> <p>Node: N12</p>		






Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 232</b>		
Node: N13  HDR Microscopic Quantification Result: 2-3%		
<b>Photograph No. 233</b>		
Node: N18  HDR Microscopic Quantification Result: 2-3%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 234</b></p> <p>Node: N19</p>		
<p><b>Photograph No. 235</b></p> <p>Node: O7</p> <p>HDR Microscopic Quantification Result: 5-10%</p>		







Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 236		
Node: O13		
Photograph No. 237		
Node: O14		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 238</b></p> <p>Node: O18</p>		
<p><b>Photograph No. 239</b></p> <p>Node: O20</p>		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 240</b>		
Node: P6  HDR Microscopic Quantification Result: 30-40%		
<b>Photograph No. 241</b>		
Node: P7  HDR Microscopic Quantification Result: 3-4%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 242</b></p> <p>Node: P14</p>		
<p><b>Photograph No. 243</b></p> <p>Node: P16</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 244</b>		
Node: Q7  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 245</b>		
Node: Q15		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 246</b></p> <p>Node: R7</p> <p>HDR Microscopic Quantification Result: 90-95%</p>		
<p><b>Photograph No. 247</b></p> <p>Node: R8</p>		





Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 248</b>		
Node: R15  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 249</b>		
Node: R17		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 250</b></p> <p>Node: S9</p> <p>HDR Microscopic Quantification Result: 4-5%</p>		
<p><b>Photograph No. 251</b></p> <p>Node: S14</p>		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 252</b>		
Node: S16  HDR Microscopic Quantification Result: 70-80%		
<b>Photograph No. 253</b>		
Node: T9  HDR Microscopic Quantification Result: 30-40%		




Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 254</b>		
Node: T13		
<b>Photograph No. 255</b>		
Node: T15		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 256</b>		
Node: U10  HDR Microscopic Quantification Result: <1%		
<b>Photograph No. 257</b>		
Node: V11  HDR Microscopic Quantification Result: 50-60%		



Client Name:	Site Location:	Node Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<div> <b>Photograph No. 258</b> </div> <div> Node: W11 </div>		
		

**ATTACHMENT E**  
**PHOTOGRAPHIC DOCUMENTATION –**  
**MICROSCOPIC QUANTIFICATION**





Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<div> <b>Photograph No. 1</b> </div> <div> <p>Node: B2</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Light colored and transparent quartz along with chert.</p> </div>		
<div> <b>Photograph No. 2</b> </div> <div> <p>Node: B5</p> <p>HDR Microscopic Quantification Result: 2-3%</p> <p>CTL Group Quantification Result: 2.5-3.5%</p> <p>Note: CCR particle (red arrow) surrounded by natural sands primarily quartz along with small organic material</p> </div>		









Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<b>Photograph No. 3</b>		
Node: B7  HDR Microscopic Quantification Result: 30-35%  CTL Group Quantification Result: 20-25%  Note: CCR particles mixed with sand and CCR dusting adhered to sand particles.		
<b>Photograph No. 4</b>		
Node: B19  HDR Microscopic Quantification Result: 25-30%  Note: CCR particles mixed with sand and CCR dusting adhered to sand particles.		



Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 5</b></p> <p>Node: B19A</p> <p>HDR Microscopic Quantification Result: 5-10%</p> <p>Note: CCR particles mixed with sand and CCR dusting adhered to sand particles. Red arrow shows glass-like CCR shard.</p>		
<p><b>Photograph No. 6</b></p> <p>Node: B21</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Very clean sand with light colored and transparent quartz. Red arrow indicates CCR particle.</p>		



Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433

**Photograph No. 7**

Node: C13

HDR Microscopic  
Quantification Result:  
<1%

CTL Group  
Quantification Result:  
<1%

Note: Clean sand, small  
white/gray slag like  
material present (red  
arrows) but scarce.



**Photograph No. 8**



Node: D6

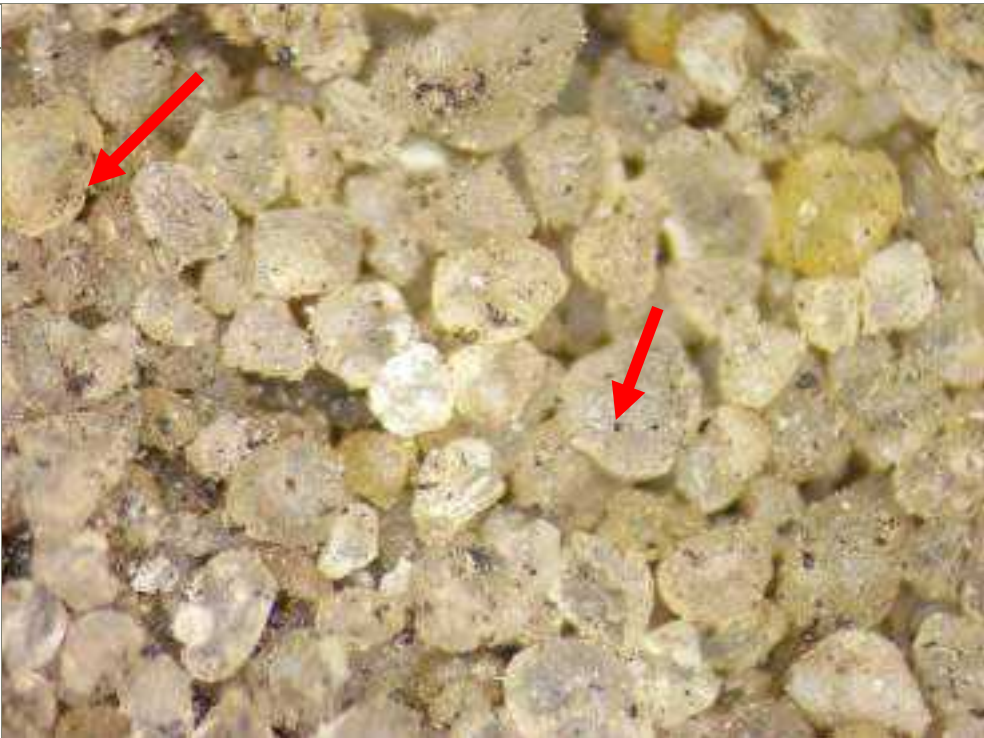

HDR Microscopic  
Quantification Result:  
1-2%

Note: Clean sand with  
various organic material  
present. Scarce CCR  
present.







Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 9</b></p> <p>Node: E3</p> <p>HDR Microscopic Quantification Result: 5-10%</p> <p>Note: CCR particles mixed with sand and CCR dusting adhered to sand particles giving sands are darker tone.</p>		
<p><b>Photograph No. 10</b></p> <p>Node: E29</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Clean sand with organic material present.</p>		

Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 11		
Node: F14  HDR Microscopic Quantification Result: 1-2%  CTL Group Quantification Result: 4-5%  Note: Sand particles with fine CCR particles and spheres adhered to sand particles. Red arrows indicate examples of the CCR spheres.		
Photograph No. 12		
Node: G20  HDR Microscopic Quantification Result: <1%  Note: Clean sand, scarce CCR present.		



Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<div> <b>Photograph No. 13</b> </div> <div> <p>Node: G24</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Clean sand particles.</p> </div>		
		
<div> <b>Photograph No. 14</b> </div> <div> <p>Node: H10</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Clean sand, agglomerate CCR particle shown by red arrow.</p> </div>		
		

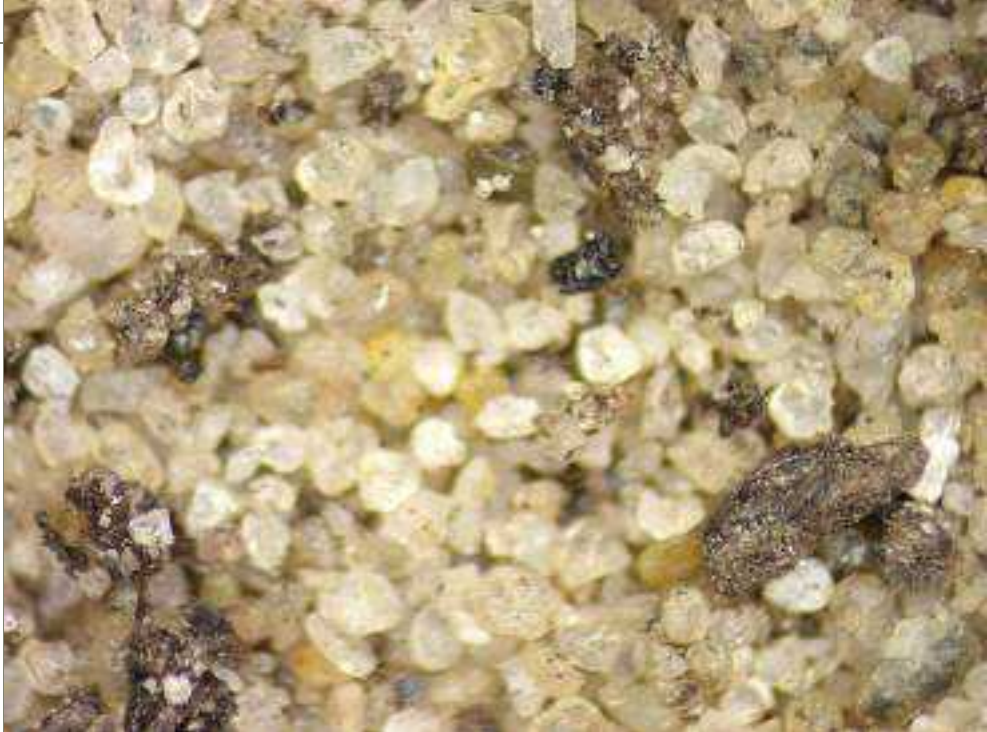

Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<div><b>Photograph No. 15</b></div> <div> <p>Node: H25</p> <p>HDR Microscopic Quantification Result: 2-3%</p> <p>CTL Group Quantification Result: 2-3%</p> <p>Note: Clean Sand, organic material present and minor CCR. Red arrow showing CCR material clumped to natural sands</p> </div>		
<div><b>Photograph No. 16</b></div> <div> <p>Node: K14</p> <p>HDR Microscopic Quantification Result: 1-2%</p> <p>Note: Clean sand particles with small CCR particles present. Red arrow indicates example of glass-like CCR.</p> </div>		







Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<div> <b>Photograph No. 17</b> </div> <div> <p>Node: L7</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>CTL Group Quantification Result: 1-2%</p> <p>Note: Clean sand particles.</p> </div>		
		
<div> <b>Photograph No. 18</b> </div> <div> <p>Node: M10</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Clean sand particles with organics present.</p> </div>		
		



Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
Photograph No. 19		
Node: N6  HDR Microscopic Quantification Result: 20-25%  Note: Sand material with, organic material present and CCR.		
Photograph No. 20		
Node: O7  HDR Microscopic Quantification Result: 5-10%  CTL Group Quantification Result: 4-5%  Note: CCR present, small CCR particles adhering to sand particles. Organic material is present.		



Client Name:	Site Location:	Microscopic Photographic Log
Muskegon Environmental Redevelopment Group, LLC (MERG)	Former B.C. Cobb Power Plant Bottom Ash Pond and Ponds 0-8 Muskegon, Michigan	HDR Project No. 10220433
<p><b>Photograph No. 21</b></p> <p>Node: S9</p> <p>HDR Microscopic Quantification Result: 4-5%</p> <p>CTL Group Quantification Result: 4-5%</p> <p>Note: White, yellow, and transparent quartz with some CCR present. Little organic material present.</p>		
<p><b>Photograph No. 22</b></p> <p>Node: U10</p> <p>HDR Microscopic Quantification Result: &lt;1%</p> <p>Note: Clean sand particles.</p>		

**ATTACHMENT F**  
CTL GROUP MICROSCOPIC  
SUMMARY REPORTS



July 5, 2021

Mr. Bryce Burkett

via Email: [Bryce.Burkett@HDRInc.com](mailto:Bryce.Burkett@HDRInc.com)

HDR Michigan, Inc.  
5405 Data Court  
Ann Arbor, MI 48108

**Microscopy Analysis of Soil Samples from B. C. Cobb Pond Closures, Muskegon, MI  
CTLGroup Project No. 150463**

Dear Mr. Burkett:

At your request, CTLGroup has conducted optical microscopy examinations of five samples (Fig. 1) received from you on June 22, 2021. Microscopical examination was performed to quantify the amount of CCR in the samples.

*Optical Microscopy:* Microscopical examination was performed using a Leica S9D stereomicroscope to assess the quantity of CCR in each node sample. The amount of CCR was visually determined in at least ten fields of view at magnifications of 25X to 55X using comparison charts.<sup>1</sup>

Results are presented in Table 1. The samples mainly consist of quartz sand particles and smaller amounts of dark colored rocks and minerals. Lighter colored samples, C13 and L7, contain less than 2% CCR. Samples B5 and F14 are darker in color, in part due to the present of plant-based material. The CCR content of these samples is estimated to be less than 2.5 to 3.5% and 4 to 5%, respectively. The darkest sample, B7, contains a significant amount of CCR, estimated at 20 to 25%. Photomicrographs of each sample are presented in Figs. 2 through 6.

---

<sup>1</sup> Terry, R. D. and Chilingar, G. V., 1955, *Summary of "Concerning Some Additional Aids in Studying Sedimentary Formations"* by M. S. Shvetsov, *Journal of Sedimentary Petrology*, Vol. 25, No. 3, pp. 229-234.

**Table 1. B. C. Cobb Pond Closure Soil Samples**

Sample	Microscopy	
	Quantity (%)	Description <sup>1</sup>
B5	2.5 - 3.5	Sand particles are mainly transparent quartz with minor adhered dark brown organic matter. Small amounts of darker colored chert and fine-grained rocks, red granite, and tan limestone. Small amounts of plant-based material contributed to dark color. Trace coal-like particles. Small amounts of white-blue slag-like CCR, most CCR particles are larger irregularly shaped, porous particles consisting of mixtures of dark gray-black and light gray to white glass. Fines estimated at 0.5 to 1% contain abundant minute white and black spherical CCR.
B7	20 - 25	Similar to B5. Dark coatings on sand particles are more common. Greater abundance of minute white and black spherical CCR and porous glassy agglomerates. Loose fines estimated at 5 to 7%.
C13	< 1	Sand particles are clean. No significant organic matter. Small amounts of white-blue-gray slag-like material. Fines estimated at 0.5%. The smallest particles include trace amounts of white, gray, and black spheres.
F14	4 - 5	Similar to B5; coatings on sand particles are not as heavy. Small amounts of plant-based material. Fines estimated at 2 to 3%. Abundant CCR in fines.
L7	1 - 2	Sand particles are clean and similar to C13. Small amounts of white-blue-gray slag-like particles. Minute white and black spheres are common among the smallest particles. Fines estimated at 0.5 to 1%.

<sup>1</sup>Constituents are listed in order of decreasing abundance

We appreciate the opportunity to be of service to you. Please contact me if you have any questions at (847) 972-3126 or [lpowers@ctlgroup.com](mailto:lpowers@ctlgroup.com). Your samples will be returned as requested.

Sincerely,

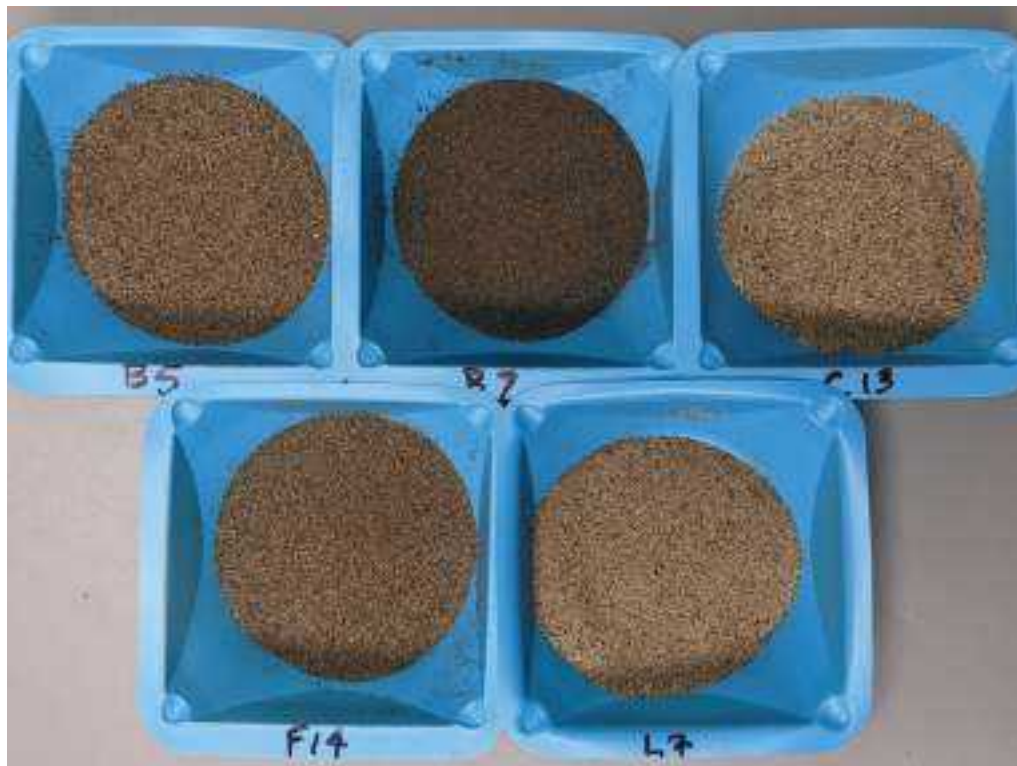


Laura J. Powers  
Principal Materials Scientist  
Petrography Group

LJP/

- Notes: 1. Results refer specifically to the samples submitted.  
2. This report may not be reproduced except in its entirety.

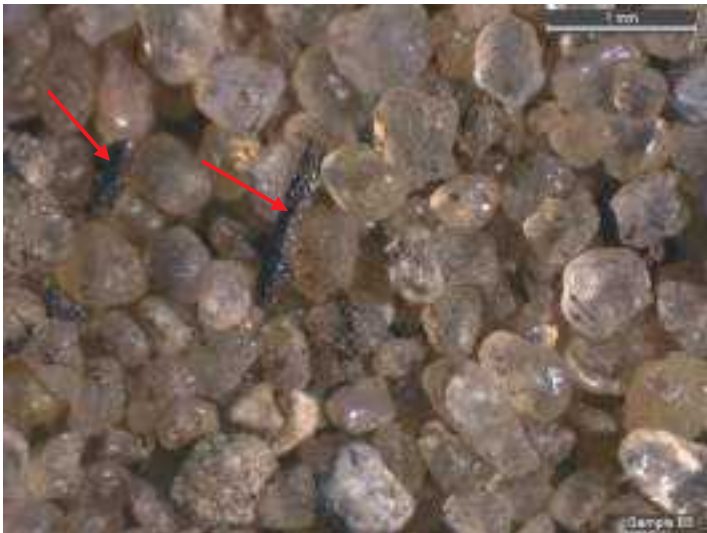




**Fig. 1** Top photograph shows the samples received for examination. Bottom photograph shows a ~35 gram portion of each labeled sample.



**2a. Quartz sand particles are the major constituent.**



**2b. Arrow shows plant material.**



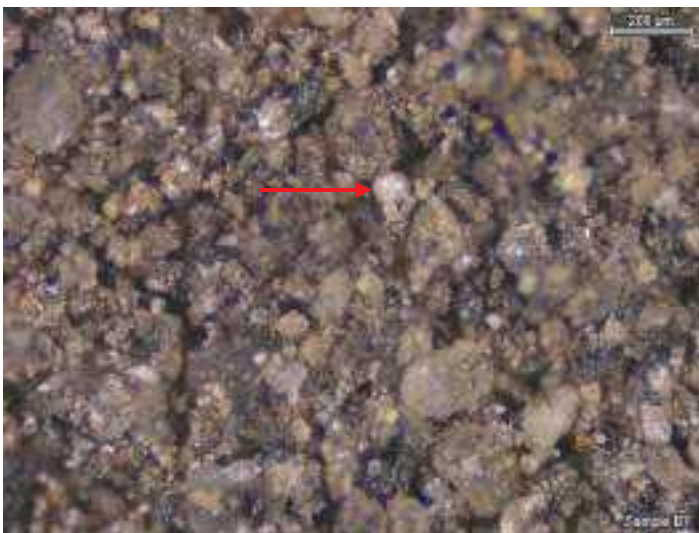
**2c. Dark particles are CCR.**

**Fig. 2 Sample B5.**

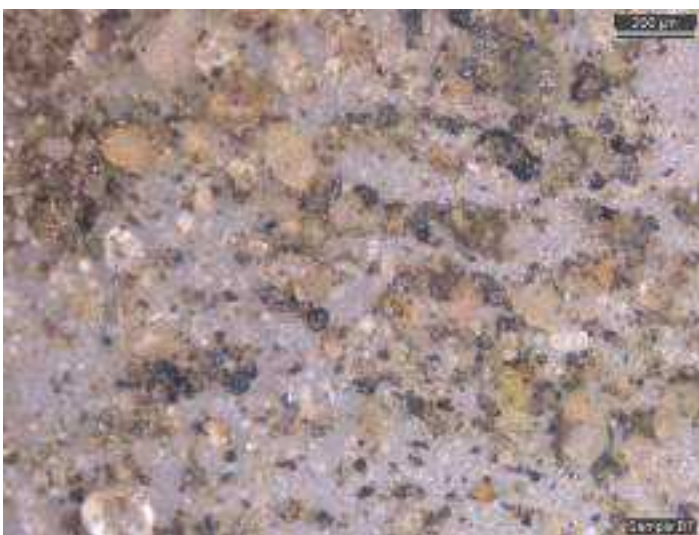




**3a. A fairly clean portion of the sample is shown. Dark particle near center is CCR.**



**3b. Arrow shows spherical white CCR particle. Dark particles are predominantly CCR.**



**3c. The sample contains abundant fines. Dark particles, some spherical, are CCR.**

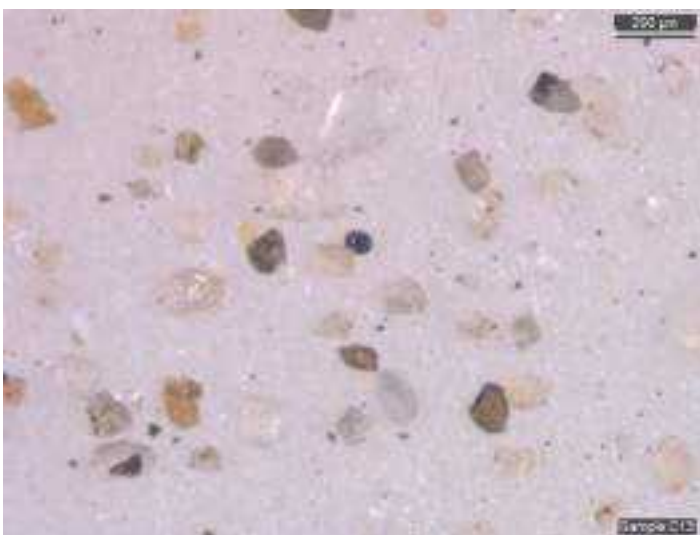
**Fig. 3 Sample B7.**



**4a. The sample is fairly clean and consists of quartz sand particles and multi-colored rock fragments.**



**4b. Dark particle near center is CCR.**



**4c. Small dark particles are CCR.**

**Fig. 4 Sample C13.**





**5a. Arrows show examples of larger pieces of plant material. Sand particles are fairly clean.**

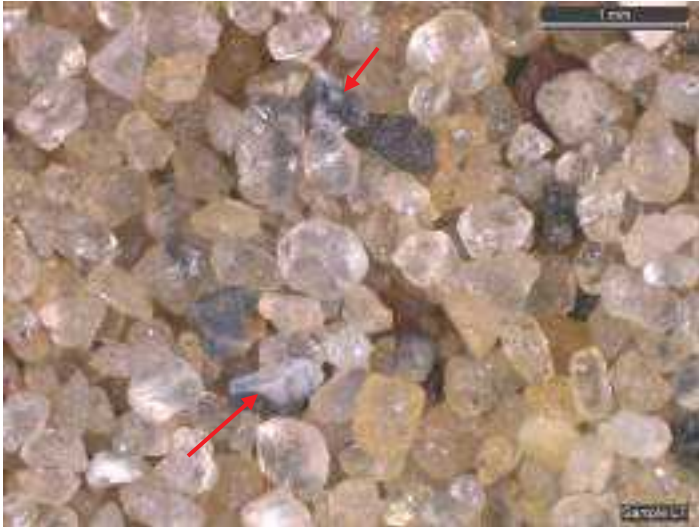


**5b. Red arrows show CCR particles. Yellow arrow shows slag-like material thought to be CCR.**



**5c. Black particle and the small black specks adhered to quartz sand particles are CCR.**

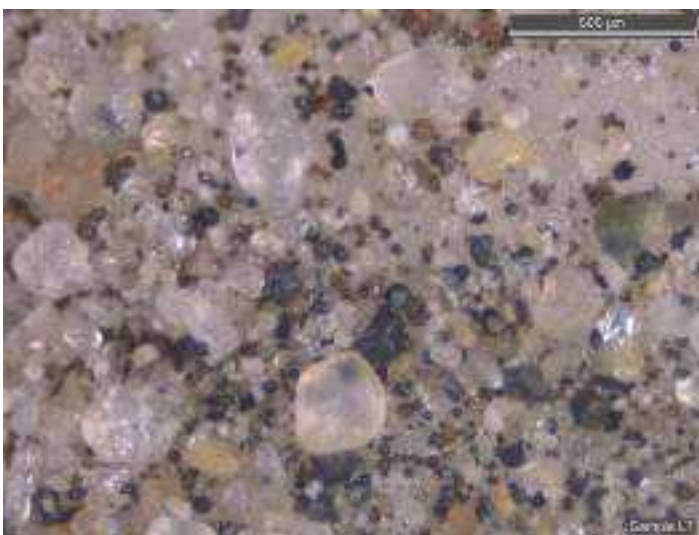
**Fig. 5 Sample F14.**



6a. Sand particles are generally free of coatings. Arrows show examples of glassy slag-like particles that are thought to be CCR.



6b. Arrows show two CCR particles. The larger dark particle is chert.



6c. The sample contains a small amount of fine particles. Dark and light colored spherical particles are CCR. The overall abundance of CCR is low.

Fig. 6 Sample L7.



October 8, 2021

Mr. Bryce Burkett

via Email: [Bryce.Burkett@HDRInc.com](mailto:Bryce.Burkett@HDRInc.com)

HDR Michigan, Inc.  
5405 Data Court  
Ann Arbor, MI 48108

**Microscopy Analysis of Soil Samples from B. C. Cobb Pond Closures, Muskegon, MI  
CTLGroup Project No. 150463 – September 2021 Submittal**

Dear Mr. Burkett:

At your request, CTLGroup has conducted optical microscopy examinations of four samples, identified as H25, H26, O7, and S9 (Fig. 1), received from you on July 8, 2021. Microscopical examination was performed to quantify the amount of CCR in the samples.

The submitted samples are dry, loose, granular material. Each sample was thoroughly mixed and a 35 to 38-gram test specimen was drawn from the bulk sample for microscopical examination. Following examination, each test specimen was passed over a No. 100 (150 µm) sieve. The particles smaller than 150 µm were collected and weighed. This is a modification of the standard procedure intended to aid in assessing the quantity of CCR.

*Optical Microscopy:* Microscopical examination was performed using a Leica S9D stereomicroscope to assess the quantity of CCR in each sample. The amount of CCR was visually determined in at least ten fields of view at magnifications up to 55X using comparison charts.<sup>1</sup> Dark material in each sample was examined with a polarized-light microscope using immersion mounts.

Results are presented in Table 1. The samples consist of transparent to translucent light-colored quartz sand particles, smaller amounts of a variety of darker colored rocks and minerals, varying amounts of plant-based materials, and small amounts of CCR. CCR particles are predominantly light gray to medium gray agglomerates of spheres embedded in friable glassy slag-like material; small spherical black, gray, and white beads; and angular fragments of bluish white slag. The amount of material smaller than No. 100 sieve is highest in H26 (2.3 wt. %) and is less than 1.5 wt.% in the other samples. CCR in the fine particles mostly consists

---

<sup>1</sup> Terry, R. D. and Chilingar, G. V., 1955, *Summary of "Concerning Some Additional Aids in Studying Sedimentary Formations" by M. S. Shvetsov*, Journal of Sedimentary Petrology, Vol. 25, No. 3, pp. 229-234.

of black, gray, and white spherical particles. Photomicrographs of each sample are presented in Figs. 2 through 5.

**Table 1. B. C. Cobb Pond Closure Soil Samples**

Sample	Microscopy	
	Quantity (%)	Description <sup>1</sup>
H25	2 to 3%	<p>Sand mainly consists transparent, white, and yellow quartz particles with smaller amounts of feldspar, chert, limestone, and darker colored rocks and minerals. Clay/silt and organic coatings on some particles.</p> <p>Small amount of brown plant-based material.</p> <p>Brown and gray friable CCR particles contain embedded white and black spheres; porous black particles are common; small amounts of white-blue slag-like CCR. 0.8 wt.% passing No. 100 sieve. CCR is abundant in the fines.</p>
H26	6 to 7%	<p>Sand particles resemble sand in H25 except for the greater abundance of clay/silt coatings and black material adhered to the sand particles. Some black material is CCR.</p> <p>CCR consists of bluish white slag-like particles, porous black and dark brown particles, friable gray and brown gray glass containing embedded black and white spheres, and isolated black and white spheres. Black spheres are typically magnetic. 2.3 wt.% passing No. 100 sieve. Black CCR is abundant in the fines.</p> <p>Minor amount of brown plant-based material.</p>
O7	4 to 5%	<p>Sand particles resemble sand in H25 and H26. Small amount of black CCR adhered to sand particles.</p> <p>Small amount of brown plant-based material (more than H27 and S9)</p> <p>CCR as for H26. 2.1 wt.% passing No. 100 sieve. Black magnetic CCR is abundant in the fines.</p>
S9	4 to 5%	<p>Sand particles resemble sand in H25, H26, and O7. Particles are mostly clean except for specks of adhered CCR. Some small sand particles are bound together with CCR.</p> <p>CCR particles as for H26 except for greater abundance of porous black semi-metallic particles. 1.0 wt.% passing No. 100 sieve. Black magnetic CCR is abundant in the fines.</p> <p>Minor amount of brown plant-based material.</p>

<sup>1</sup>Constituents are listed in order of decreasing abundance



We appreciate the opportunity to be of service to you. Please contact me if you have any questions at (847) 972-3126 or [lpowers@ctlgroup.com](mailto:lpowers@ctlgroup.com). Samples for your project have been retained and will be returned as requested.

Sincerely,



Laura J. Powers  
Principal Materials Scientist  
Petrography Group

LJP/

Notes: 1. Results refer specifically to the samples submitted.  
2. This report may not be reproduced except in its entirety.



Fig. 1 Top photograph shows the samples received for examination.  
Bottom photograph shows the 35 to 38 gram test specimens.





**2a. Black and bluish white CCR particles are intermixed with clean predominantly quartz sand particles.**



**2b. Arrow shows an elongate fragment of plant material. Irregularly shaped black particles are CCR. The sand contains a small amount of rounded dark colored grains.**



**2c. Arrows show two large CCR particles. Small black spots on sand grains are spherical CCR particles.**

**Fig. 2 Sample H25.**



**3a. Black and bluish white CCR particles (circled) are intermixed with clean predominantly quartz sand particles.**



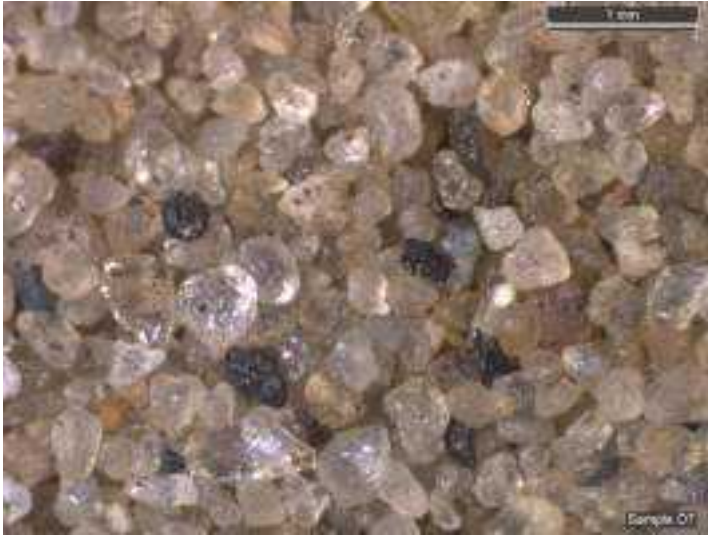
**3b. Arrow shows typical elongate brown plant material. Black particles are CCR. Beige particles are quartz particles coated with clay.**



**3c. Arrows show black CCR particles.**

**Fig. 3 Sample H26.**

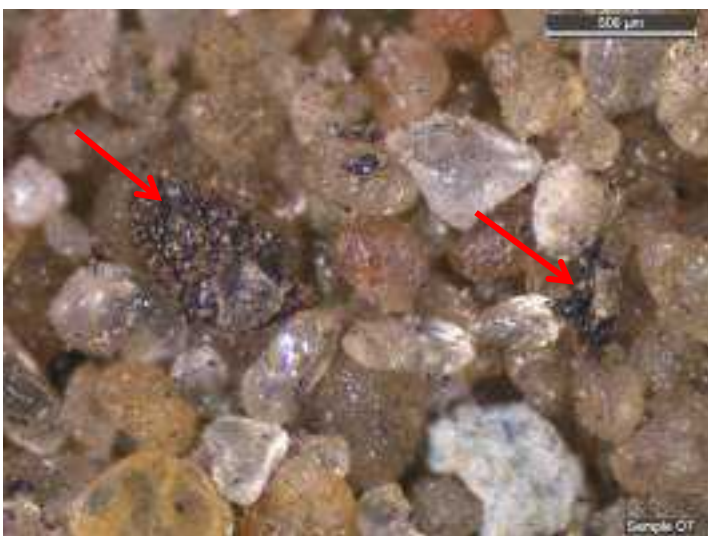




**4a. Black CCR particles intermixed with clean quartz sand particles.**



**4b. Arrows show elongate brown plant material. Black particles are CCR.**



**4c. Arrows show two CCR particles. Small black spots on sand grains are spherical CCR particles.**

**Fig. 4 Sample O7.**



**5a. Clean quartz sand containing a single CCR particles near the center of the field.**



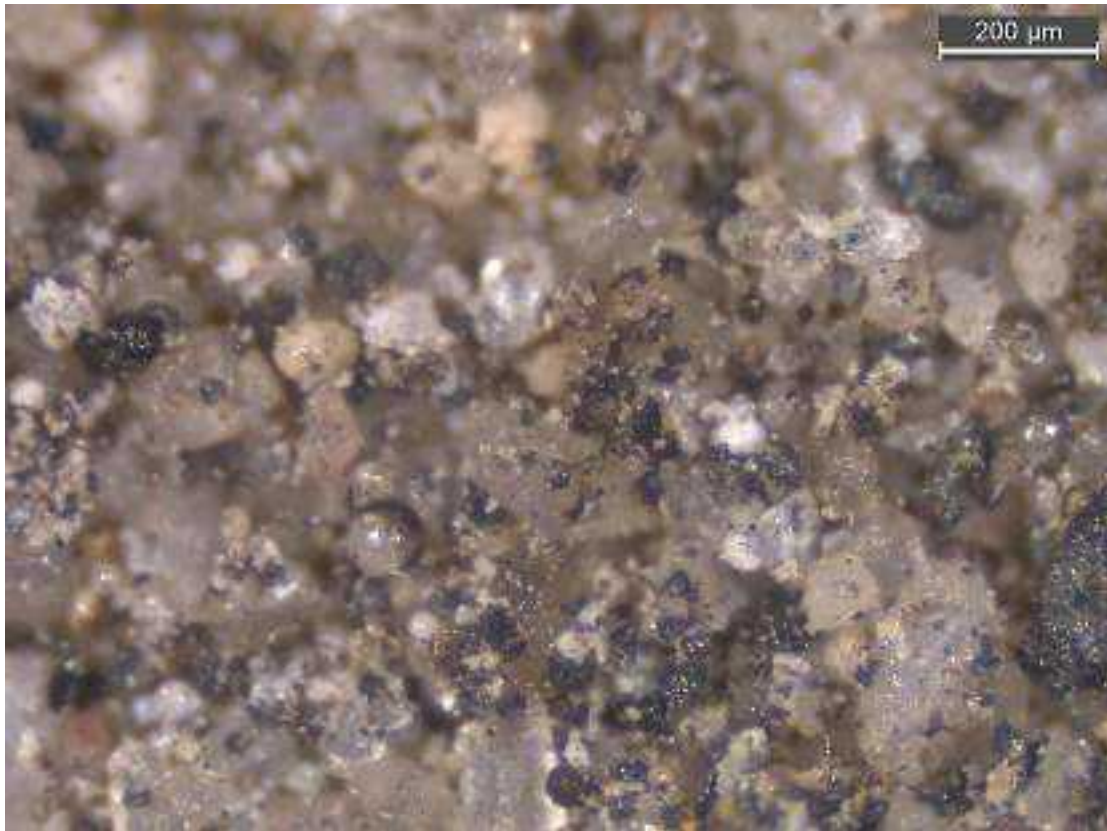
**5b. Colorless, white, and yellow particles are quartz, feldspar and chert sand. Brown particles (arrow shows example) are plant-based material. Black particles are predominantly CCR.**



**5c. White spherical particle (arrow) and black particles are CCR. Small black spots on sand particles are organic material.**

**Fig. 5 Sample S9.**





**Fig. 6 Sample O7 Fines (minus No. 100 sieve). Black particles and spherical white particles are CCR.**

May 27, 2022

Mr. Bryce Burkett  
HDR Michigan, Inc.  
5405 Data Court  
Ann Arbor, MI 48108

via Email: [Bryce.Burkett@HDRInc.com](mailto:Bryce.Burkett@HDRInc.com)

**Microscopy Analysis of Soil Samples from B. C. Cobb Ash Removal, Muskegon, MI  
CTLGroup Project No. 150463 – May 2022 Submittal**

Dear Mr. Burkett:

At your request, CTLGroup has conducted optical microscopical examination of four samples, identified as C42, D41, I33, and J36 (Fig. 1), received from you on May 6, 2022. Microscopical examination was performed to quantify the amount of coal combustion residuals (CCR) in the samples.

The submitted samples are dry, loose, granular material. Each sample was thoroughly homogenized (mixed), and a 35-gram test specimen was drawn from the bulk sample for microscopical examination. Following examination, each test specimen was passed over a No. 100 (150  $\mu$ m) sieve. Particles smaller than 150  $\mu$ m were collected and weighed. This is a modification of the standard procedure intended to aid in assessing the quantity of CCR.

*Optical Microscopy:* Microscopical examination was performed using a Nikon SMZ 745T stereomicroscope. The amount of CCR was visually determined in at least ten fields of view at magnifications up to 50X using comparison charts.<sup>1</sup>

Results are presented in Table 1. The samples consist of transparent to translucent light-colored quartz sand particles, smaller amounts of a variety of darker colored rocks and minerals, none to small amounts of plant-based materials, and small amounts of CCR. CCR particles are predominantly small spherical black, gray, and white beads, or small, irregularly shaped black particles. Less common, the CCR particles are light gray to medium gray agglomerates of spheres embedded in friable glassy slag-like material and angular fragments of bluish white slag. The amount of material passing the No. 100 sieve is 5.5 wt. % in C42, 6.5 wt. % in D41, 8.6 wt.% in I33, and 3.2 wt. % in J36. CCR in the fine particles mostly consists of black, gray, and white spherical particles, or irregularly shaped black particles. Photomicrographs of each sample are presented in Figs. 2 through 5.

---

<sup>1</sup> Terry, R. D. and Chilingar, G. V., 1955, *Summary of "Concerning Some Additional Aids in Studying Sedimentary Formations" by M. S. Shvetsov*, Journal of Sedimentary Petrology, Vol. 25, No. 3, pp. 229-234.



**Table 1 Description of B. C. Cobb Ash Removal Soil Samples**

Sample	Microscopy	
	Estimated CCR Quantity (volume %)	Description <sup>1</sup>
C42	1 to 2%	Sand mainly consists transparent, white, and yellow quartz particles with smaller amounts of feldspar, chert, limestone, and darker colored rocks and minerals. Particles are mostly clean except for a small amount/specks of black CCR adhered to sand particles. Black magnetic CCR is present in small amounts in the fines (5.5 wt.% passing No. 100 sieve). No plant-based material observed.
D41	1.5 to 2.5%	Sand particles resemble the sand in C42. Small to moderate amount of black CCR adhered to sand particles. Black magnetic CCR is present in small amounts in the fines (6.5 wt.% passing No. 100 sieve). No plant-based material observed.
I33	3 to 4%	Sand particles resemble the sand in C42 and D41, except small amounts of clay/silt coatings are adhered to sand particles. Small to moderate amount of black CCR adhered to sand particles. Black magnetic CCR is abundant in the fines (8.6 wt.% passing No. 100 sieve). Very minor amount of brown plant-based material (more than C42, D41, and J36).
J36	2.5 to 3.5%	Sand particles resemble sand in C42, D41, and I33. Particles are mostly clean except for a small amount/specks of black CCR adhered to sand particles. Black magnetic CCR is present in small amounts in the fines (3.2 wt.% passing No. 100 sieve). No plant-based material observed.

We appreciate the opportunity to be of service to you. If you have any questions, please contact me at (847) 972-3220 or [jferraro@ctlgroup.com](mailto:jferraro@ctlgroup.com). Samples for your project have been retained and will be returned as requested.

Sincerely,



Jaclyn Ferraro  
Group Director & Senior Petrographer  
Petrography Group

JMF/

Notes: 1. Results refer specifically to the samples submitted.  
2. This report may not be reproduced except in its entirety.





1a.



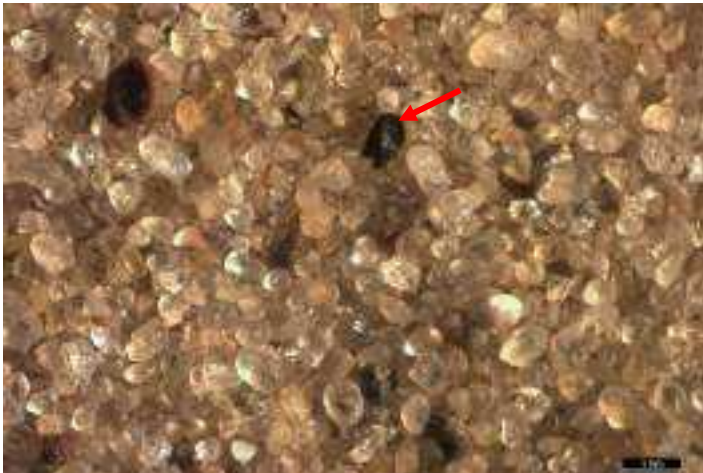
1b.

Fig. 1 Samples as received for examination.

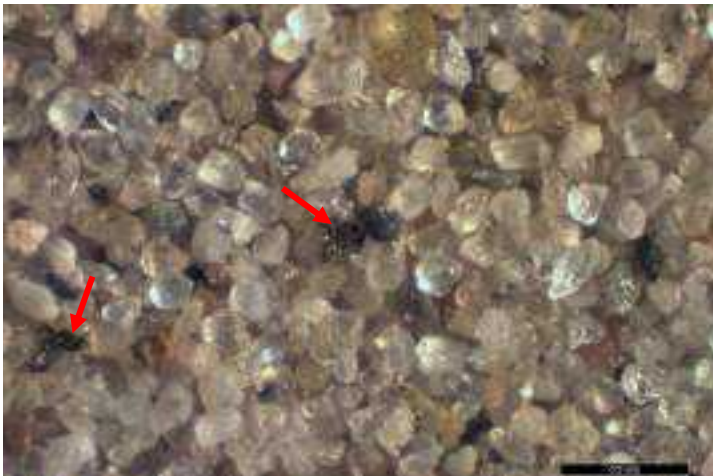




**2a. Black CCR particles intermixed with predominantly quartz sand particles.**



**2b. Colorless, white, and yellow particles are quartz and feldspar. Irregularly shaped black particles are CCR (red arrow). The sand contains a small amount of rounded dark colored grains.**

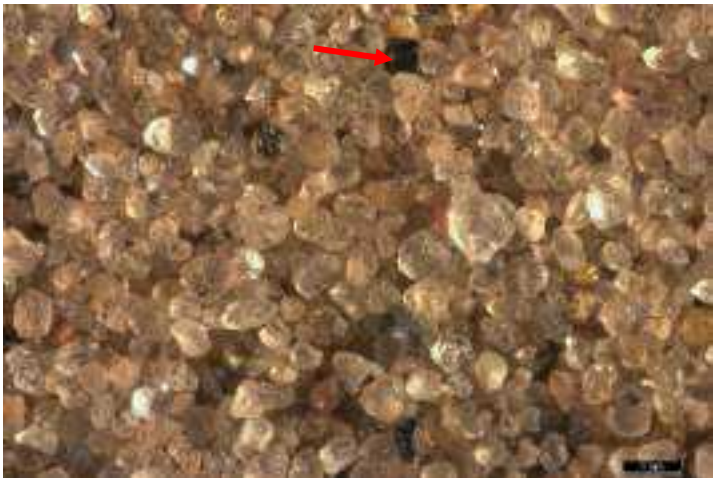


**2c. Fines (minus No. 100 sieve). Irregularly shaped black particles are CCR (red arrows). Small black spots on sand grains are spherical CCR particles.**

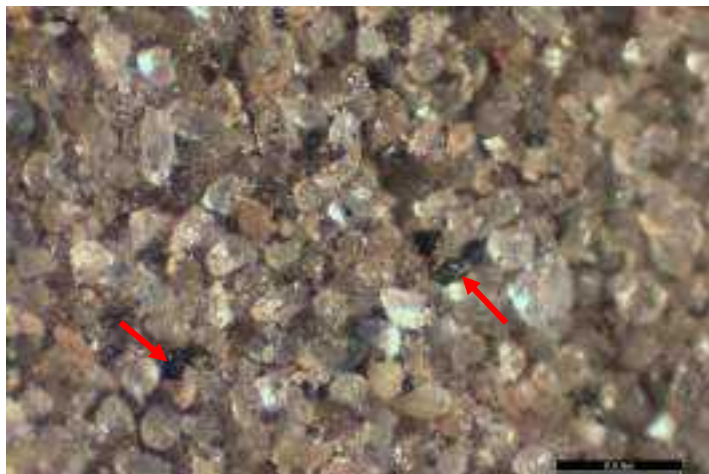
**Fig. 2 Sample C42. The three images show different magnifications.**



**3a. Black CCR particles intermixed with predominantly quartz sand particles.**



**3b. Colorless, white, and yellow particles are quartz and feldspar. Irregularly shaped black particles are CCR (red arrow).**



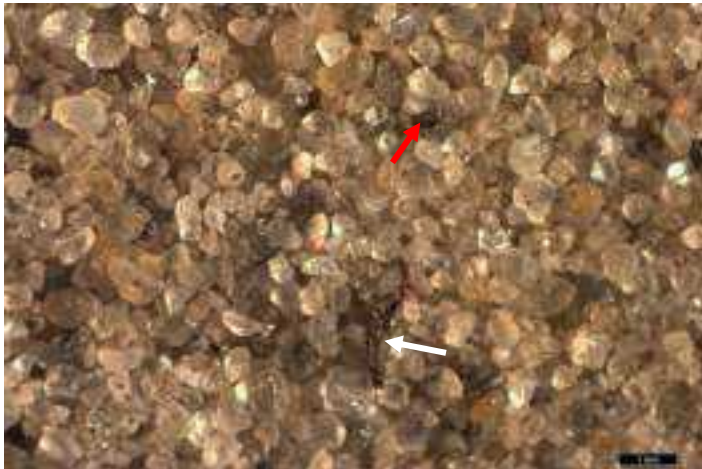
**3c. Fines (minus No. 100 sieve). Irregularly shaped black particles are CCR (red arrows). Small black spots on sand grains are spherical CCR particles.**

**Fig. 3 Sample D41. The three images show different magnifications.**

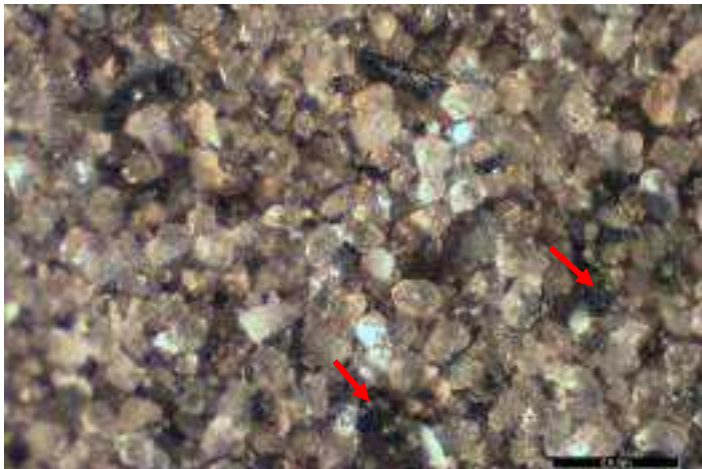




**4a. Black CCR particles intermixed with predominantly quartz sand particles.**



**4b. White arrow shows elongate brown plant material. Irregularly shaped black particles are CCR (red arrow).**

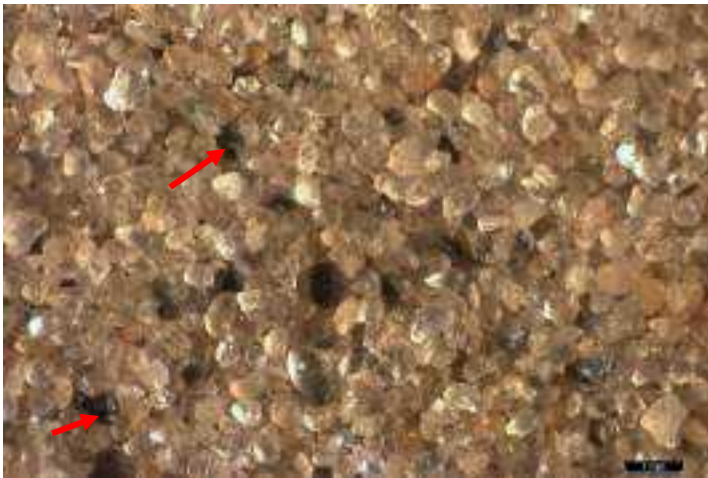


**4c. Fines (minus No. 100 sieve). Irregularly shaped black particles are CCR (red arrows). Small black spots on sand grains are spherical CCR particles.**

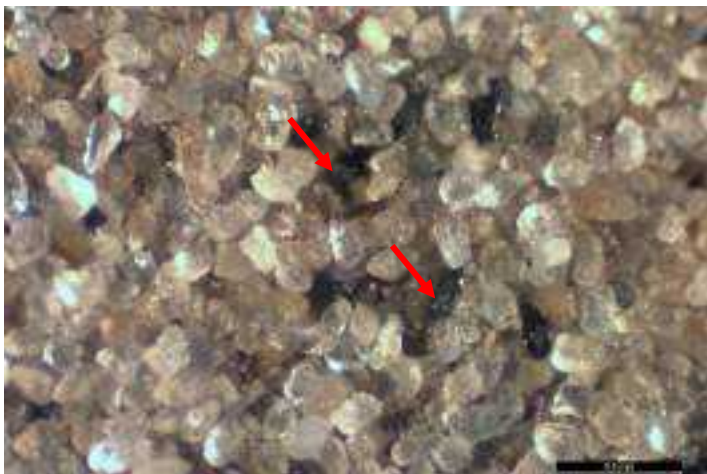
**Fig. 4 Sample I33. The three images show different magnifications.**



**5a. Black CCR particles intermixed with predominantly quartz sand particles.**



**5b. Colorless, white, and yellow particles are quartz and feldspar. Irregularly shaped black particles are CCR (red arrows). The sand contains a small amount of rounded dark colored grains.**



**5c. Fines (minus No. 100 sieve). Irregularly shaped black particles are CCR (red arrows). Small black spots on sand grains are spherical CCR particles.**

**Fig. 5 Sample J36. The three images show different magnifications.**



**ATTACHMENT G**  
PERIMETER BERM SEEPAGE AND  
STABILITY REVIEW MEMO



# Memo

Date: Wednesday, August 18, 2021

Project: BC Cobb CCR Removal

To: **Muskegon Environmental Redevelopment Group LLC**

Kyle Hoover, P.E., P.G., PMP

*Director of Engineering, Environmental & Quality*

From: **HDR Michigan, Inc.**

Bryce Burkett, P.E.

*Senior Geotechnical Project Manager*

Mark Stanley, P.E.

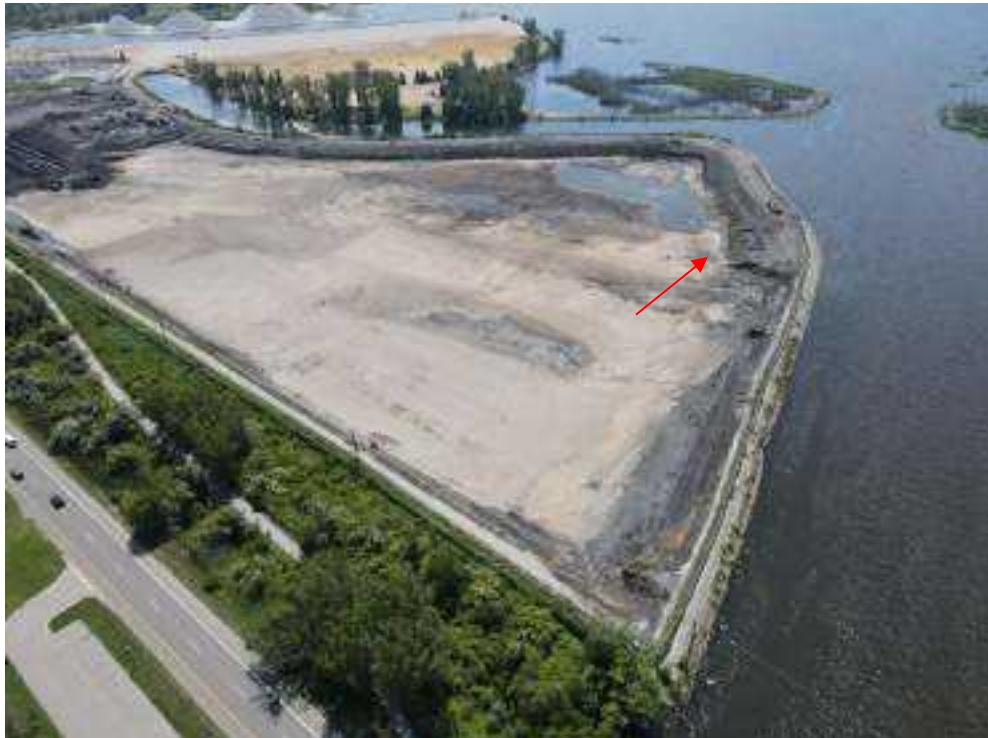
*Principal Geotechnical Engineer*

Greta Backman, P.E.

*Geotechnical Engineer*

Subject: Pond 2 and 3 Perimeter Berm Excavation – Seepage and Stability Review and Recommendation

This memorandum provides the review and recommendation of the current proposed excavation planned adjacent to the western perimeter embankment adjacent to former CCR Ponds 2 and 3. HDR understands that Muskegon Environmental Redevelopment Group LLC (MERG) has removed CCR across Ponds 2 and 3 and is currently at, or slightly below, design excavation grade (El. 576 to 578) adjacent to the western perimeter berm (approximate area identified by red arrow in image below).







MERG indicated that CCR is still present at the current excavation bottom elevation, which is at, or slightly below, the originally proposed excavation grade. MERG has requested HDR to provide guidance on the minimum elevation that could be safely excavated without impacting the stability of the perimeter berm.

In 2020 and prior to commencing excavation activities, HDR developed a 3D stratigraphy model using existing subsurface information at the site. Additionally, HDR performed transient seepage and stability analyses assessing the hydraulic gradient, uplift, and slope stability related to the adjacent body of water (Muskegon River and Lake). HDR provided MERG with a monitoring plan (HDR, 2020) and monitoring levels for MERG's use during the on-going excavation to assess the monitoring well levels in the upper and lower water bearing layers (aquifers) with respect to determined factors of safety to heave and uplift in the overlying CCR and in the low permeability layer separating the two aquifers.

For the purpose of the assessment of potential uplift and stability concerns for Ponds 2 and 3, MERG provided current monitoring well readings, shown in Table 1 as of August 13, 2021 close to the area of the excavation:

**Table 1. Water Level Readings on August 13, 2021**

Station	Monitoring Well	Water Level Elevation (feet)	Aquifer
4+17.64	MW-15019	578.2	Lower Aquifer
	MW-17004	571.8	Upper Aquifer
9+36.35	MW-15018	578.5	Lower Aquifer
	MW-17003	569.4	Upper Aquifer

The pairs of wells, MW-15019/17004 and MW-15018/17003 are screened in separated aquifers, defined as the Upper Aquifer and Lower Aquifer, which are separated by a low permeability confining layer. MERG installed and has been operating dewatering wells in both aquifers for the past year and dewatering has successfully lowered the water levels of the Upper Aquifer (MW-17004 and MW-17003 in Table 1), whereas lowering the water levels in the Lower Aquifer (MW-15019 and MW-15018 in Table 1) have been unsuccessful. The Upper Aquifer is cutoff from the river/lake by a low permeability Slurry Wall constructed through the berm. The Slurry Wall was terminated in the confining layer. The lower Aquifer is hydraulically connected to the river/lake. As shown in Table 1, the pressure head of the Lower Aquifer is approximately El. 578 feet, the same elevation as the current excavation grade. Additionally, the elevation of the Lower Aquifer is higher than the highest recommended pressure head differential established in the HDR monitoring plan. Therefore, the concern is the potential uplift of the confining layer with deepening the excavation.

Considering the current reported excavation grade adjacent to the perimeter berm (El. 576 to 578) and the current water level readings of the monitoring wells, HDR assessed the potential risk for instability with further excavation in terms of the critical hydraulic gradient through the confining layer and uplift of the confining layer. At the current excavation elevation, the factor of safety (with respect to heave) is at most  $FS=1.5$  and could be lower depending on the thickness of the confining layer. However, the uplift factor of safety is sensitive to the thickness of material above the confining layer and removing additional CCR material will rapidly drop the factor of safety to



unacceptable levels and provide a potential for uplift/piping from the pressure head of the Lower Aquifer. As previously stated, MERG has been pumping the lower aquifer with little success in drawing down the total pressure head. Therefore, the ability to respond should the confining layer be breached is very limited and could lead to, at a minimum, flooding of the pond followed by progressive failure of the berm.

It is HDR's opinion to not excavate lower than already achieved, which is below the original design grades, due to the risk posed by the current pressure head of the Lower Aquifer and the potential of compromising the confining layer by removing additional overburden (which is required to resist uplift and damage to the confining layer). Reduction of the pressure in the Lower Aquifer would need to be achieved to allow deeper excavation.



**ATTACHMENT H**  
WATER INTRUSION WITHIN  
WOOD CHIP AREA MEMO



# Memo

Date: Thursday, October 28, 2021

Project: BC Cobb CCR Removal

To: **Muskegon Environmental Redevelopment Group LLC**

Kyle Hoover, P.E., P.G., PMP  
*Director of Engineering, Environmental & Quality*

From: **HDR Michigan, Inc.**

Bryce Burkett, P.E.  
*Senior Geotechnical Project Manager*

Mark Stanley, P.E.  
*Principal Geotechnical Engineer*

Greta Backman, P.E.  
*Geotechnical Engineer*

Subject: Water Intrusion within Wood Chip Area

This memorandum provides a summary of the discussion of the concern raised by Charah regarding water intrusion into a portion of the excavation and odors noticed by onsite members.

HDR was notified by Kyle Hoover, P.E. of Charah on Tuesday, October 26, 2021 that beginning on Saturday October 23, 2021, field members of Charah's staff noticed higher flow in the dewatering pumping systems and anoxic/organic odors coming from the excavated area. Charah had been continuing to excavate the bottom of the "Bermuda Triangle" area to remove CCR impacted soils and attain the project cleanup criteria when wood debris and sawdust was encountered at the bottom of the excavation. The additional excavation extended to a depth of 18 to 24 inches. The depth of wood debris is unknown. The area had been previously covered with standing water that has since been controlled with the addition of sumps and ditches. HDR and Charah discussed the matter during a conference call on October 26, 2021. Charah indicated to HDR the following:

1. Higher flow was observed in the dewatering pumping systems (approx. 200 gpm higher than normal).
2. Odors have become present in the area indicative of anoxic/organic materials coming from the excavation in the area of the standing water.
3. Small sand boils/bubbling present in some areas around the standing water (Pin Boils mostly with boils up to 4 inches in diameter).
4. The exposed subgrade in this area is very weak and heavy equipment cannot be supported by the surficial material. Further excavation has not been performed nor is planned to be performed.

HDR discussed the recent analyses (performed for stability and uplift at an area near the current area of concern presented in a memorandum submitted August 18, 2021) and the low factors of





safety present during the current condition of the excavation and high pressure of the lower aquifer. Additionally, the wood chips present in the subgrade are lighter than soil (and can float). HDR's previous analysis assumed typical unit weights for soils when calculating uplift factors of safety and, therefore, the uplift factor of safety in the area of the wood debris is much lower than the established levels included in the groundwater monitoring criteria. The odor present is likely due to the organic nature of the soils, below the fill material, and the odor is being brought to the surface from the groundwater.

It is HDR's opinion that the area of the wood chips and standing water should be bridged with a blanket of soil to add weight to resist the uplift forces from the lower aquifer and to improve uplift stability. The initial bridge layer should predominantly consist of a clean sand to allow for upward flow but protect the underlying material from particle migration. If placing sand directly over the area of concern is not possible, a woven filter fabric can be placed on the existing ground surface. The geotextile should have a maximum apparent opening size (AOS) of 0.4 mm (#30 sieve) to allow water to pass through the geotextile and not create potential of the mat to float. In areas around the pumps, filter stone should be placed. Charah should continue to monitor the site for signs of pressure development in the lower aquifer and be prepared to mitigate and respond to excessive seepage. If migration of fine particles is evident through the stabilization fabric, a fabric with #70 sieve opening should be used.

Charah will proceed with placing 18 inches of soil over the 2-acre area initially and could place additional soil if seepage and boils persist. Charah will use low ground pressure equipment to spread the material. Fill should be placed from the outside of the soft area and progress inward. Loaded trucks or other heavy equipment should not travel over the newly placed fill until there is sufficient thickness placed to support loaded vehicle loads. Care should be taken not to induce pumping in the fill that could lead to loss of vehicle support and break through. Fill thickness may need to be increased to establish haul roads to support vehicle traffic.

Also, Charah should have material, equipment and personnel onsite to address seepage boils, such as sand bags to encircle boils, should flow rates increase and/or the boils actively are transporting materials to the ground surface until the new soil balance layer is in place.

**ATTACHMENT I**  
**CLOSURE WORK PLAN SUBMITTALS**



September 30, 2019

Mr. Tim Unseld and Mr. Kent Walters  
Michigan Department of Environment, Great Lakes, and Energy  
Materials Management Division  
Grand Rapids District  
350 Ottawa Avenue NW, Unit 10  
Grand Rapids, MI 49503-2341

Subject: B.C. Cobb Ash Pond Closure Work Plan September 20, 2019 Revision  
Muskegon, MI

Dear Messrs. Unseld and Walters,

Please find attached a revised BC Cobb Ash Pond Closure Work Plan, dated September 20, 2019, that clarifies the new excavation boundaries on Figures 1 and Figures 3 which resulted from the Technical Memorandum prepared by Golder Associates Inc. to distinguish pre-1979 vs post-1979 ash used as structural fill and assure the ash placed during operational sluicing activities is removed from the ponds.

The August 13, 2018 Memorandum supplements the May 31, 2018 Work Plan. Both documents were approved. However, as stated in the August 13, 2018 cover letter, as a result of further investigating the pre-1979 vs post-1979, we were planning to adjust the CCR removal geometry somewhat, primarily on the eastern perimeter berm, to provide some assurance that the CCR accumulated in the ponds after 1979 are removed. That resulting geometry is now clarified visually in Figures 1 and 3 of the attached revised Work Plan. Consumers Energy (CE) believes this clarified Work Plan, dated September 20, 2019, which only clarifies the geometries established by the August 13, 2018 Technical Memorandum, remains approved. However, CE is providing it to the Department of Environment, Great Lakes, and Energy (EGLE) to ensure there are no questions or concerns now that the excavation boundary is visually available.

If there are any concerns or questions with this clarification or if you would like to discuss this further, please contact me at the phone number or e-mail address below.

Sincerely,



Michelle A. Marion  
Sr. Environmental Engineer  
Phone: (517) 788-5824  
Email: [michelle.marion@cmsenergy.com](mailto:michelle.marion@cmsenergy.com)

cc Mr. Fred Sellers, MDEQ



# Bottom Ash Pond and Ponds 0-8 Closure Work Plan

## B.C. COBB GENERATING FACILITY

## BOTTOM ASH POND AND PONDS 0-8 CLOSURE WORK PLAN

Muskegon, Michigan



**Submitted To:** Consumer Energy Company  
1945 W. Parnall Road  
Jackson, Michigan 49201

**Submitted By:** Golder Associates Inc.  
15851 South US 27, Suite 50  
Lansing, Michigan 48906

**September 20, 2019**

**1667572**







## Table of Contents

1.0	CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES .....	1
2.0	FACILITY BACKGROUND.....	2
3.0	REGULATORY BACKGROUND.....	3
4.0	SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR .....	4
4.1	Narrative Summary of Closure.....	4
4.2	CCR Removal and Documentation – Phase I.....	5
4.2.1	CCR Excavation and Documentation Summary.....	5
4.2.1.1	Removal Criteria Background .....	6
4.2.2	Documentation of CCR Removal Overview.....	8
4.2.2.1	Documentation of Excavation Grades – First Line of Evidence.....	8
4.2.2.2	Photographic Documentation – Second Line of Evidence.....	9
4.2.2.3	Colorimetric Confirmation – Third Line of Evidence .....	9
4.2.2.4	Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence ....	10
4.3	Post-Excavation Monitoring – Phase II .....	10
5.0	CLOSING .....	12
6.0	REFERENCES.....	13

## List of Tables

Table 1 RCRA CCR Constituents from Appendix III and Appendix IV

## List of Figures

Figure 1	General Site Plan
Figure 2	B.C. Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule
Figure 3	Bottom Ash Pond and Ponds 0-8 Excavation Plan
Figure 4	Boron Concentrations in CCR and Native Soils
Figure 5	Colorimetry Results for CCR and Native Soils
Figure 6	Site-Specific Calibration Curve for Colorimetric Analysis

## List of Appendices

Appendix A	Site Boring Photographs
Appendix B	Soil Boring Logs



## 1.0 CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES

This closure work plan is a revision from the original closure work plan that was prepared to request agreement from the Michigan Department of Environmental Quality (MDEQ) with Consumers Energy Company's (CEC) plan to close the Bottom Ash Pond and Ponds 0-8 at its B.C. Cobb Generating Facility (BC Cobb) located in Muskegon, Michigan. The original closure work plan was submitted to the MDEQ on May 31, 2018. On August 13, 2018 CEC provided a technical memo as a response to MDEQ questions concerning the CCR surface impoundment boundaries. On October 16, 2018, the MDEQ provided a letter to CEC accepting the closure work plan submitted on May 31, 2018 and the memo submitted on August 13, 2018. This revised closure work plan includes an updated CCR removal surface that was proposed in the August 13, 2018 memo to the MDEQ.

This document provides a general description of the following:

- Plans for removal of waste
- Multiple lines of evidence to document waste removal including the basis for an objective waste removal standard to address potential long-term sources of groundwater impacts
- Schedule for implementing the work
- Performance monitoring after waste removal in accordance with the CCR RCRA Rule

CEC provided the Notification of Intent to Initiate Closure of the Bottom Ash Pond and Ponds 0-8 to the Michigan Department of Environmental Quality on March 30, 2018, per 40 CFR 257.102(g). CEC plans to initiate construction for closure of the Bottom Ash Pond and Ponds 0-8 in 2020.

This closure work plan proposes an identical CCR removal method and similar documentation procedures that were previously approved by the MDEQ and implemented for closing and documenting removal of CCR for Bottom Ash Pond 3N at the J.H. Campbell Generating Facility (JH Campbell) in West Olive, Michigan (JHC Bottom Ash Pond 3N). CCR was removed from JHC Bottom Ash Pond 3N from March 2017 through June 2017. The removal was documented in the *J.H. Campbell Generating Facility Bottom Ash Pond 3N CCR Removal Documentation Interim Report* (JHC Bottom Ash Pond 3N Closure Report; Golder, 2017), which was submitted to the MDEQ on June 20, 2017 and approved on July 18, 2017.



## 2.0 FACILITY BACKGROUND

BC Cobb was a coal-fueled power generating facility located in Muskegon, Michigan. The plant operated five coal-burning units (Units 1 through 5) and later converted three to natural gas peaking units (Units 1 through 3). Beginning with plant operation in the 1940s, CCR produced by the coal-fired power generation units (fly ash and bottom ash) was disposed in the area currently occupied by the Bottom Ash Pond and Ponds 0-8. Based on a review of historical documentation, the exterior berm surrounding the area currently occupied by the Bottom Ash Pond and Ponds 0-8 was constructed prior to July 1968. Ponds 0, 1, 2, 3, and 4 were also constructed prior to July 1968. Ponds 5, 6, 7, and 8 were constructed prior to April 1977. As of 1984, CCR was deposited exclusively in the Bottom Ash Pond and Ponds 0-8 by wet sluicing methods. The locations of the Bottom Ash Pond and Ponds 0-8 are provided on Figure 1 – General Site Plan. Electrical generation at BC Cobb ceased on April 15, 2016.

While receiving CCR, the Bottom Ash Pond and Ponds 0-8 water surface elevations were maintained at an approximate elevation of 588 feet NAVD88. Currently, the Bottom Ash Pond and Ponds 0-8 water surface elevations are at an approximate elevation of 580 feet NAVD88.





### 3.0 REGULATORY BACKGROUND

CEC has identified the Bottom Ash Pond and Ponds 0-8 at BC Cobb as “existing CCR surface impoundments” under the CCR RCRA Rule, as they were directly receiving and storing commingled CCR and low volume miscellaneous wastewaters as of the effective date (October 19, 2015) of the CCR RCRA Rule. As such, there are specific criteria and schedules under the CCR RCRA Rule for CEC to conduct closure.

The BC Cobb Bottom Ash Pond and Ponds 0-8 were not licensed as units for waste disposal under the Michigan Natural Resources and Environmental Protection Act (NREPA) Part 115. Instead, the Bottom Ash Pond and Ponds 0-8 were permitted under Michigan’s NREPA Part 31 as part of the National Pollution Discharge Elimination System (NPDES). A solid waste disposal area construction permit authorizing conditions for storage and/or disposal was not issued for the ponds pursuant to solid waste authorities, since the wastewaters containing CCR discharging into the Bottom Ash Pond and Ponds 0-8 were “other wastes regulated by statute”, as defined in Rule 110 of the Part 115 Solid Waste Rules. This regulatory exception to authorize activity only under the NPDES permit is limited in scope and application with respect to the disposal and end of life considerations of CCR from these units. Furthermore, CEC has regularly removed CCR from these ponds for beneficial use markets or disposal in the JH Campbell Dry Ash Landfill.



#### 4.0 SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR

CEC intends to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR in accordance with self-implementing requirements under the CCR RCRA Rule. Upon approval of the closure work plan, CEC intends for this document to serve as an agreement with MDEQ on applicable elements of its self-implementing plan to achieve closure in accordance with the CCR RCRA Rule. Documentation and certifications necessary under the CCR RCRA Rule will be provided to MDEQ as part of the notification requirements to the relevant State Director detailed in 40 CFR 257.106. Additionally, the applicable certifications and documents will be posted to the CCR Rule Compliance Data and Information publicly-available website pursuant to 40 CFR 257.107.

As part of closure self-implementation, the United States Environmental Protection Agency (EPA) required an initial closure plan certified by a qualified professional engineer to be placed in the operating record and posted on a publicly-accessible internet site for existing CCR surface impoundments by October 17, 2016, which has been completed. The initial closure plan indicated that the Bottom Ash Pond and Ponds 0-8 would be closed with CCR in place. However, CEC determined it is likely feasible to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR as described herein, assuming it is feasible to dewater as necessary to verify CCR removal. Therefore, the RCRA Closure Plan for the Bottom Ash Pond and Ponds 0-8 was revised, placed in the CCR unit operating record, and posted on CEC's publicly-accessible internet site.

#### 4.1 Narrative Summary of Closure

The Bottom Ash Pond and Ponds 0-8 will be closed by removal of visible CCR. This plan is consistent with the clearly visible interface between CCR and underlying substrate materials observed at the base of the Bottom Ash Pond and Ponds 0-8 in sonic core and borehole soil samples recovered from site investigations, as shown in photographs provided in Appendix A – Site Boring Photographs. Removal of all visible CCR is also in accordance with 40 CFR 257.102(c), which states “CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 257.95(h).” The CCR RCRA Rule also prescribes the closure timeframe for existing CCR surface impoundments as five years from the commencement of closure activities [40 CFR 257.102(f)(1)(ii)].

The Bottom Ash Pond and Ponds 0-8 will be closed in compliance with the CCR RCRA Rule using a phased approach that will include: 1) physical removal of CCR for purposes of removing regulated waste and sources of potential long-term groundwater contamination, and 2) use of the balance of the five-year closure timeframe provided for in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV



constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h). This compliance monitoring schedule is provided in Figure 2.

The horizontal excavation limits of CCR in the Bottom Ash Pond and Ponds 0-8 will extend to the wetted pond boundary on the northern and western exterior perimeter berms. The eastern excavation limits of CCR extend one foot beyond the wetted pond boundary to provide additional assurance that post-1979 CCR is removed, as discussed in *B.C. Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan Closure Boundaries Technical Memo* dated August 6, 2018 (Golder, 2018). CCR removal limits have been adjusted around existing transmission pole foundations and a substation to the south. Interior berms that separate the individual ponds will be removed. The lateral extent of the Bottom Ash Pond and Ponds 0-8 excavation limits is shown on Figure 1.

The excavation will reach approximate depths of 3 to 30 feet below the existing grade. Proposed excavation contours are provided in Figure 3 – Bottom Ash Pond and Ponds 0-8 Excavation Plan. CEC does not plan to regrade and/or backfill the ponds once the CCR is removed.

## 4.2 CCR Removal and Documentation – Phase I

The first phase of closure activities will be CCR removal and documentation. Descriptions of activities to remove CCR and document adequate removal are provided in this section, along with the basis for the various lines of evidence.

### 4.2.1 CCR Excavation and Documentation Summary

This section provides a list of the tasks to be completed during excavation and documentation and includes more details regarding method development and rationale. Excavation will be performed to remove CCR to elevations identified during site investigations; visual observations and field analyses will be made to confirm the CCR removal objective is met. Documentation of CCR removal will then be performed to provide lines of evidence that validate the extent of the excavation and visual observations made in the field. During CCR removal and documentation, the following tasks will be completed:

- Excavation
  - The Bottom Ash Pond and Ponds 0-8 will be dewatered by actively pumping in a manner that maintains NPDES permitted effluent limits.
  - Hydraulic structures will be abandoned in-place or removed
  - CCR removal will be complete when the following are achieved:
    - The contractor meets horizontal and vertical excavation limits determined from previous site investigations, and,
    - Visual observations determine that the CCR removal objective has been met
- Documentation and final certification





- Final excavation grades will be compared to the elevations of known CCR at the base of the Bottom Ash Pond and Ponds 0-8 developed from previous site investigations
- Photographs will be taken to document CCR removal in excavated areas
- Quantitative colorimetric analysis will be completed to confirm CCR removal meets objective limits:
  - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content, as described in the Pond 3N Closure Report (Golder, 2017), will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site-specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

Results will be documented in a BC Cobb Bottom Ash Pond and Ponds 0-8 CCR removal documentation report. Detailed descriptions and supporting information to describe the activities proposed to document CCR removal are included in the subsequent sections.

#### 4.2.1.1 Removal Criteria Background

CEC is proposing to implement the same methodology for documenting removal of CCR at BC Cobb Bottom Ash Pond and Ponds 0-8 that was developed for closing JH Campbell Bottom Ash Pond 3N. Various characteristics of CCR were evaluated to determine the feasibility of different methods to document CCR removal including color, density, particle size, and particle shape. Based on evaluation of the material characteristics, color, as determined by visual inspection and confirmed by digital quantitative colorimetric analysis, was determined to be superior to other documentation methods such as centrifuge separation, petrography via microscope, or scanning electron microscopy with electron dispersive X-ray spectroscopy (SEM/EDX) because CCR is significantly darker than the native sand material at the BC Cobb site. The visually-apparent transition from CCR to underlying native materials at the Bottom Ash Pond and Ponds 0-8 is similar to the conditions observed at JHC Bottom Ash Pond 3N/S, which is to be expected since BC Cobb is located approximately 25 miles north of JH Campbell. The density of the CCR and native sands is too similar for centrifugal separation; sieving is not practical due to the overlapping range of particle sizes for the different materials; and SEM/EDX is a different visual/color analysis, which requires complex equipment that cannot be readily mobilized to the field and specific personnel to operate it. Colorimetry allows evaluation of larger sample sizes and is easily adapted for use in the field; thus, it also has the potential for additional sampling to verify reproducibility of results. Therefore, colorimetry was selected as the final and preferred line of evidence to identify and quantify the amount of CCR present in samples collected from the Bottom Ash Pond and Ponds 0-8 excavation footprint.



Some color variability may exist in native soils at the base of the excavation footprint due to their deposition in a fluvial system, and therefore an adaptive testing method has been developed. Based on colorimetric and microscopic evaluation of bottom ash, fly ash, and native soils, Golder found that darker color variations are more likely to occur, which have the effect of causing an over-estimation of the CCR content in the sample (i.e. 'false negative' results) when compared to the typical color of the sand grains that comprise most native soils at BC Cobb (typically the lightest in color of all materials present). If native soil color variability is encountered at one of the grid nodes identified for colorimetric testing, field microscopic quantification of CCR content will be utilized to determine if the CCR removal objective was met.

The composition of CCR and underlying soil samples collected from the Bottom Ash Pond and Ponds 0-8 by drilling (64 samples of CCR and 48 samples of underlying soils) were compared to the MDEQ Cleanup Criteria Requirements for Response Activity, R 299.48 Generic Soil Cleanup Criteria for Non-residential Category Groundwater and Surface Water Interaction (GSI) protection and drinking water protection criteria to determine which constituents could be used as indicators of potential groundwater impacts.

A site-specific threshold for CCR removal was selected as a ratio of CCR and underlying soil that would reduce the boron concentration of the mixed materials to less than the respective non-residential drinking water protection criteria for soil. This quantitative threshold for boron is shown on the graph in Figure 4 – Boron Concentrations in CCR and Native Soils by reading the x-axis value where the trend line between the average (mean) boron concentrations measured in the CCR and the underlying soils intercepts the non-residential drinking water criteria. Based on Figure 4, the threshold for boron is between 5 percent and 10 percent CCR. Therefore, to be conservative, an initial threshold of 5 percent CCR was selected based on the non-residential drinking water protection criteria for boron. The selected threshold of 5 percent CCR is consistent with the threshold established for JH Campbell Bottom Ash Ponds 3N/S, which was demonstrated to be achievable during construction.

Cobalt, lithium, mercury, molybdenum, and selenium also occur in samples of CCR from the Bottom Ash Pond and Ponds 0-8 at concentrations that may exceed the GSI or non-residential drinking water protection criteria, but require less removal of CCR than boron to meet the respective criteria. Barium, beryllium, cadmium, chromium (III), copper, fluoride, lead, thallium, and zinc are not included as indicator constituents in this assessment because they were not detected in CCR or they exist in native soils at concentrations greater than their respective GSI protection or drinking water protection criteria. Antimony and silver were not considered, because they were not detected in CCR at concentrations above their respective method detection limits. Arsenic was removed from the list of potential indicator constituents because the state background level exceeds GSI and non-residential drinking water protection criteria and even with complete removal of CCR, any material tested has the potential to exceed the GSI protection criteria for arsenic.



#### 4.2.2 Documentation of CCR Removal Overview

An objective standard of 95 percent CCR removal (i.e. 95 percent sand and 5 percent CCR in the soil mixture at the base of the excavation) has been established. Although the purpose of this work plan is to define methods for removal of CCR as a regulated waste, the 95 percent removal criteria is based on chemical analyses that have shown the criteria to be protective of groundwater based on non-residential drinking water criteria.

Verification of CCR removal will be documented based on the following three lines of evidence:

- First line of evidence – comparison of interim excavation termination grades to known elevations of CCR from previous site characterizations and engineering records
- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes
- Third line of evidence – quantitative colorimetric analysis at random grid nodes to confirm CCR removal
  - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

This multiple lines of evidence approach provides a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The basis for this approach relies on laboratory analyses that demonstrate how the criteria are protective of groundwater. The approach takes advantage of the visible demarcation between CCR and the underlying soil at the base of the Bottom Ash Pond and Ponds 0-8 observed during previous removal activities and in soil borings, and uses these material characteristics to identify and quantify CCR.

##### 4.2.2.1 Documentation of Excavation Grades – First Line of Evidence

The first line of evidence to assess CCR removal activities will be to confirm that excavations are complete to at least the elevation established as the base of CCR from existing information. The elevation of the base of CCR was established based on historical facility information and drilling and sampling completed in the Bottom Ash Pond and Ponds 0-8 in October 2015, May 2017, and November and December 2017. Descriptions of sample materials were used to prepare boring logs for each boring. The boring logs are included in Appendix B – Soil Boring Logs. The boring logs identified CCR up to a depth of 23.2 feet below ground surface in the Bottom Ash Pond [elevation 575 feet (NAVD88)] and 22.1 feet (12.5 foot of CCR submerged below 9.6 feet of water) in Ponds 0-8 [elevation 565.2 feet (NAVD88)].

Once the excavation has met the horizontal and vertical limits shown in Figure 3, visual observations for the presence of CCR will be completed. Excavated areas that do not meet the CCR removal objective





based on visual inspections within the horizontal CCR removal limits will be excavated further until the CCR removal objective is met.

#### 4.2.2.2 Photographic Documentation – Second Line of Evidence

Consistent with MDEQ guidance, Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM); a 50-foot grid will be established across the excavation area for assessment, and the grid nodes to be sampled will be selected using a random number generator (the outer extent of the grid depends on the materials encountered during excavation). Photographic documentation will be completed on 50 percent of the nodes followed by hand sampling and colorimetric analysis at 50 percent of the photographed nodes.

The excavation surface will be inspected visually to identify residual CCR materials that are present on the exposed surface of the excavation. If CCR is still visible, additional material will be removed.

When no or only minor visible signs of CCR are observed, photographs and written descriptions will be taken at 50 percent of the grid nodes to document the material left in place. The photography procedure will be standardized such that it includes the following elements:

- Photographs will be taken of the general area-wide excavation
- Photographs will be taken of a representative sample measuring approximately one-square-foot area of surficial materials present at the base of the excavation at each grid node
- Photographs will be taken from a standardized height (approximately 2.5 feet) to ensure the same area and level of detail is obtained by each photograph
  - The camera will be positioned directly over the excavated surfaced facing downwards with as little tilt as possible
  - Photographs will have a pixel resolution of 4608 x 3456 (i.e., 15.9 megapixels)

#### 4.2.2.3 Colorimetric Confirmation – Third Line of Evidence

A colorimetric analysis method that utilizes a digital colorimeter instrument to precisely measure the color of a soil sample will be used to verify CCR removal. The analysis will be conducted in general accordance with ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry. The method involves measuring color values of a field sample and converting these values with a color-concentration calibration curve to determine the amount of CCR in the sample.

Colorimetry testing was performed on 14 samples of CCR and 9 samples of native soil obtained from the November and December 2017 investigation to establish end member color values for the different types of material that will be encountered during excavation. Results of the colorimetry analysis used to support the development of a color threshold value are provided in Figure 5. A combination of darker (lower RGB integer value) native soil samples and lighter (higher RGB integer value) CCR samples were selected to



create mixtures of 1%, 2%, 3%, and 5% CCR to develop a series of conservative site-specific color-concentration curves. To be further conservative, the ultimate color threshold, which is included as Figure 6, is based on a series of fly ash and native soil mixtures that produced the lightest color values of the laboratory-prepared mixtures. While a fly ash-native soil contact may only occur in a limited number of locations, a darker contrast is anticipated when bottom ash is in contact with native soil, which is more easily detected. The repeatability of the color-concentration curve at estimating the CCR content and identifying materials that contain more than 5 percent CCR, was validated in the laboratory using blind testing of “unknown” mixtures of low concentrations of CCR (less than 10 percent) prepared by one chemist and analyzed by a different chemist.

The colorimetry method described herein is easily adapted for use in the field and can be performed on replicate samples (three to five readings are typical), which increases the reproducibility of the analysis and allows for rapid response if the readings yield inconsistent results. Because the method has been validated in the laboratory, it does not rely solely on a field expert’s judgement when examining CCR.

Soil samples will be collected from the base of the excavation at randomly-selected locations using the same grid node methodology developed for the photographic documentation. Fifty percent of the photographed grid nodes will be randomly selected for CCR quantification by colorimetry. The samples will be tested in the field to evaluate the presence of CCR materials. These samples will only be collected from grid nodes after the excavation has reached a depth such that there are no visible signs of CCR present.

#### 4.2.2.4 Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence

As previously discussed, color determined by visual inspection and confirmed by colorimetric analysis was determined to be superior to other documentation methods because CCR is significantly darker than the underlying native sand material at BC Cobb. However, our experience documenting CCR removal at JHC Bottom Ash Pond 3N demonstrated that some color variability can exist in certain soils at the base of the excavation footprint and cannot be identified in every instance prior to excavation. If similar conditions exist at the Bottom Ash Pond and Ponds 0-8, microscopic quantification of CCR content will be utilized to confirm the CCR removal objective was met as an alternative line of physical evidence.

### **4.3 Post-Excavation Monitoring – Phase II**

After removal of the CCR in Phase I, CEC will use the balance of the five-year closure timeframe provided in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h) for two consecutive sampling events.

The current RCRA CCR groundwater monitoring system for BC Cobb Bottom Ash Pond and Ponds 0-8 consists of 23 monitoring wells that are depicted in Figure 1. These monitoring wells were installed during



the fourth quarter of 2015 to commence a compliance program pursuant to 40 CFR 257.91(e)(1). This monitoring well network is anticipated to be used to determine compliance with groundwater protection standards and achievement with the standard of clean closure pursuant to 40 CFR 257.102(c).

The initial Annual Groundwater Monitoring and Corrective Action Report for the BC Cobb site was certified by January 31, 2018 with notifications to the State Director and public posting to the CCR Rule Compliance Data and Information website by March 2, 2018. A schedule for the groundwater implementation program is provided in Figure 2. If the groundwater-based standard cannot be achieved following removal and verification that CCR has been removed to the 5 percent threshold standard, then the necessary technical requirements are in place to implement an assessment monitoring program and corrective actions, if necessary.

Groundwater samples collected at BC Cobb are submitted for the analyses specified in 40 CFR 257, Appendix III and IV. The analytical methods and reporting limits for each constituent are summarized in Table 1 - RCRA CCR Constituents from Appendix III and Appendix IV.

There are differences between the CCR RCRA Rule monitoring requirements and MDEQ requirements (e.g. field-filtering). Therefore, a more detailed groundwater monitoring program will be provided to MDEQ upon excavation and verification of CCR removal that will include a Sampling and Analysis Plan (SAP), definition of groundwater monitoring system, and coordination with groundwater sampling protocols and analyses pursuant to State groundwater monitoring requirements. It is anticipated that the existing groundwater monitoring well network will be utilized to collect a subset of field-filtered samples utilizing the analyte list from Rules 450, 451, and 452.





## 5.0 CLOSING

This closure work plan is respectfully submitted to CEC. If you have questions or require additional information, please contact Mark Bergeon at (920) 491-2500.

Sincerely,

**GOLDER ASSOCIATES INC.**

Hugh Davies  
Senior Geochemist

Mark Bergeon, PG  
Program Leader, Associate

Jeff Piaskowski, PE  
Senior Project Engineer



## 6.0 REFERENCES

Golder, 2017, J.H. Campbell Bottom Ash Pond 3 N CCR Removal Documentation Interim Report, June 2017.

Golder, 2018, B.C. Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan Closure Boundaries Technical Memo, August 6, 2018.

“Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments,” Title 40 – Protection of the Environment Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

## TABLES



**Table 1 – RCRA CCR Constituents from Appendix III and Appendix IV**

**Appendix III to Part 257—Constituents**

Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Boron	EPA 6020B	HNO <sub>3</sub> , pH <2	180	20
Calcium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1,000
Chloride	EPA 300.0	None, <6°C	28	1,000
Fluoride <sup>#</sup>	EPA 300.0	None	28	1,000
pH	Stabilized field measurement	NA	NA	0.1 standard units
Sulfate	EPA 300.0	None, <6°C	28	2,000
Total Dissolved Solids	SM 2540C	None, <6°C	7	1,000

HNO<sub>3</sub> – Nitric acid

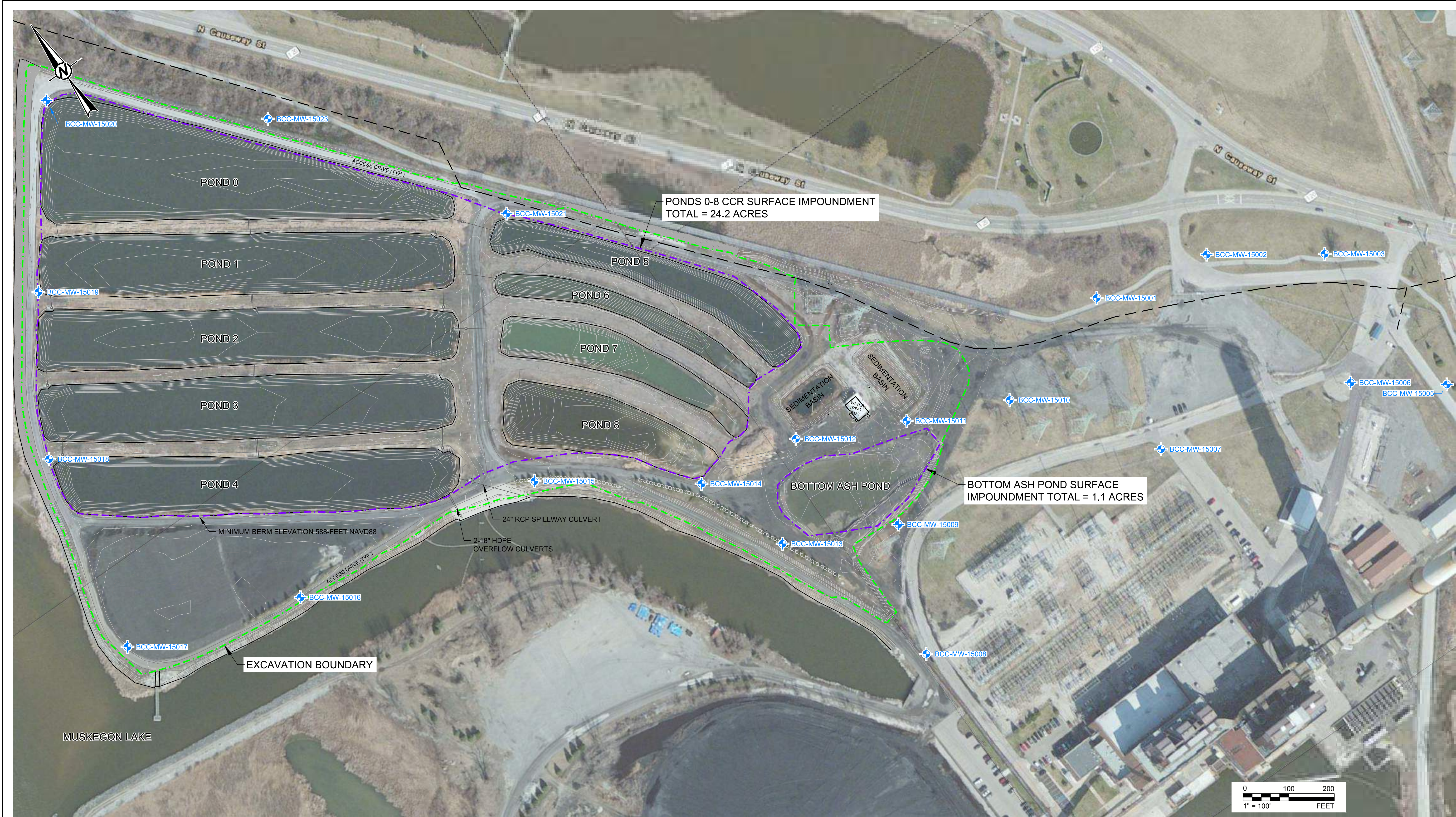
NA – Not applicable

**Appendix IV to Part 257—Constituents**

Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Antimony	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Arsenic	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Barium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	5
Beryllium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Cadmium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	0.2
Chromium, total	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Cobalt	EPA 6020B	HNO <sub>3</sub> , pH <2	180	15
Fluoride <sup>#</sup>	EPA 300	None, <6°C	28	1,000
Lead	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Lithium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	10
Mercury	EPA 7470A	HNO <sub>3</sub> , pH <2	28	0.2
Molybdenum	EPA 6020B	HNO <sub>3</sub> , pH <2	180	5
Selenium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Thallium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	2
Radium 226 and 228 combined <sup>^</sup>	EPA 903.1/904.0	HNO <sub>3</sub> , pH <2	None	1 picocurie per liter

## FIGURES





**LEGEND**

- GROUNDWATER MONITORING WELL
- EXISTING MAJOR AND MINOR TOPOGRAPHIC CONTOUR
- EXCAVATION BOUNDARY
- SURFACE IMPOUNDMENTS
- CULVERT
- CONCRETE VAULT
- TREE LINE
- POWER LINE AND TOWER STRUCTURE
- WASTEWATER PRESSURIZED WATER MAIN (SEE REFERENCE 2)

**REFERENCE(S)**

- TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015.
- WASTEWATER PRESSURIZED WATERMAIN FROM GIS SHAPEFILE WASTEWATER\_PRESSURIZED\_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.

CLIENT  
**CONSUMERS ENERGY COMPANY**  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT



YYYY-MM-DD	2019-09-06
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
**B.C. COBB PLANT**  
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN  
MUSKEGON, MI 49445

TITLE  
**GENERAL SITE PLAN**

PROJECT NO. <b>1667572</b>	CONTROL <b>B015</b>	REV. <b>0</b>	FIGURE <b>1</b>
-------------------------------	------------------------	------------------	--------------------

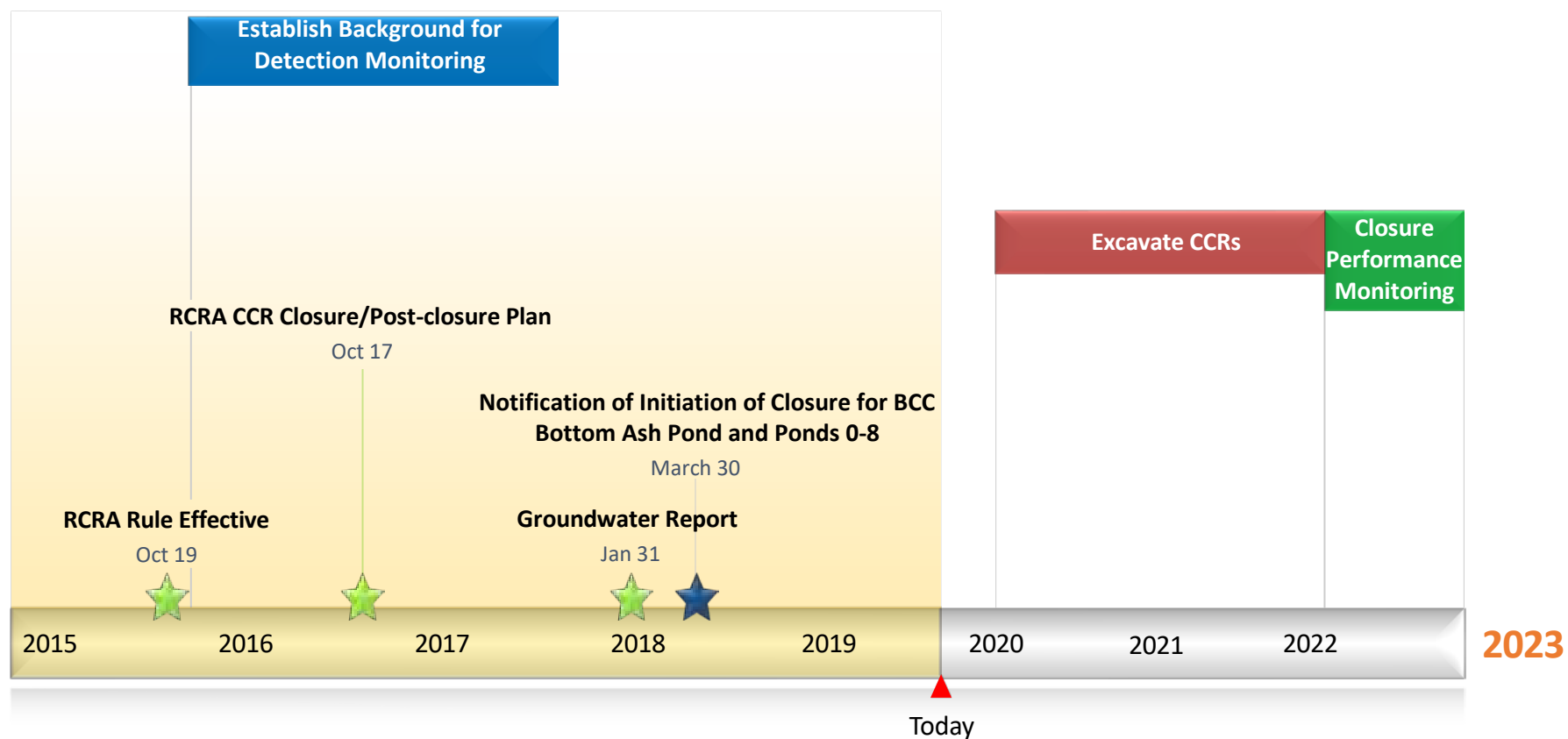
Path: \\mblaur\cadd\Projects\2016\1667572 - Consumers - BC Cobb\PRODUCTION - Closure Strategies | File Name: 1667572015.dwg

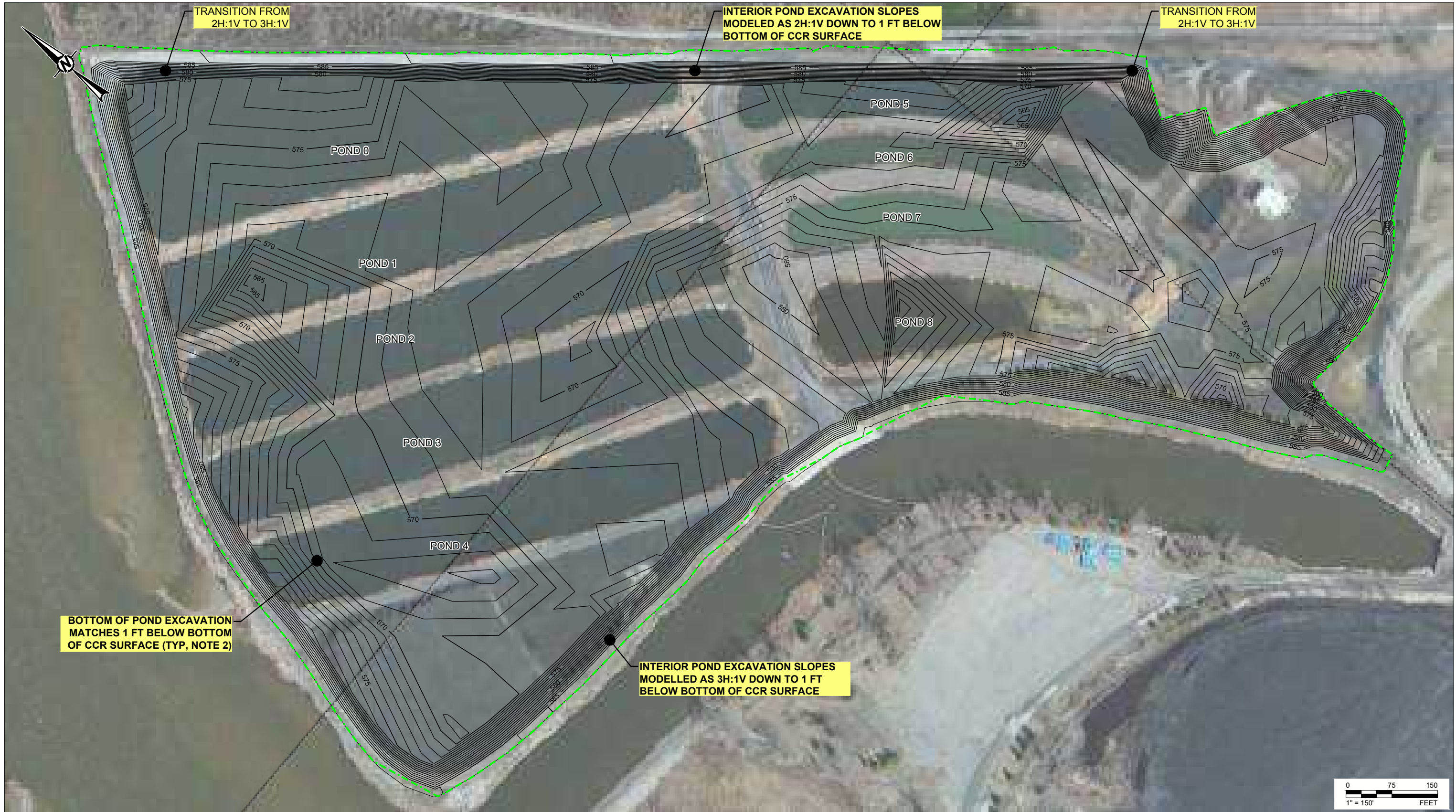
1" IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D





Figure 2 – BC Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule





**LEGEND**

--- EXCAVATION BOUNDARY

--- CONCEPTUAL EXCAVATION SURFACE

**NOTES**

1. BOTTOM OF CCR SURFACE DEVELOPED FROM 2015-2017 SITE INVESTIGATIONS.

2. 1 FT BELOW BOTTOM OF CCR SURFACE WAS DEVELOPED BY LOWERING THE BOTTOM OF CCR SURFACE VERTICALLY 1 FT.

**CUT VOLUME = 653,713 C.Y.**

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

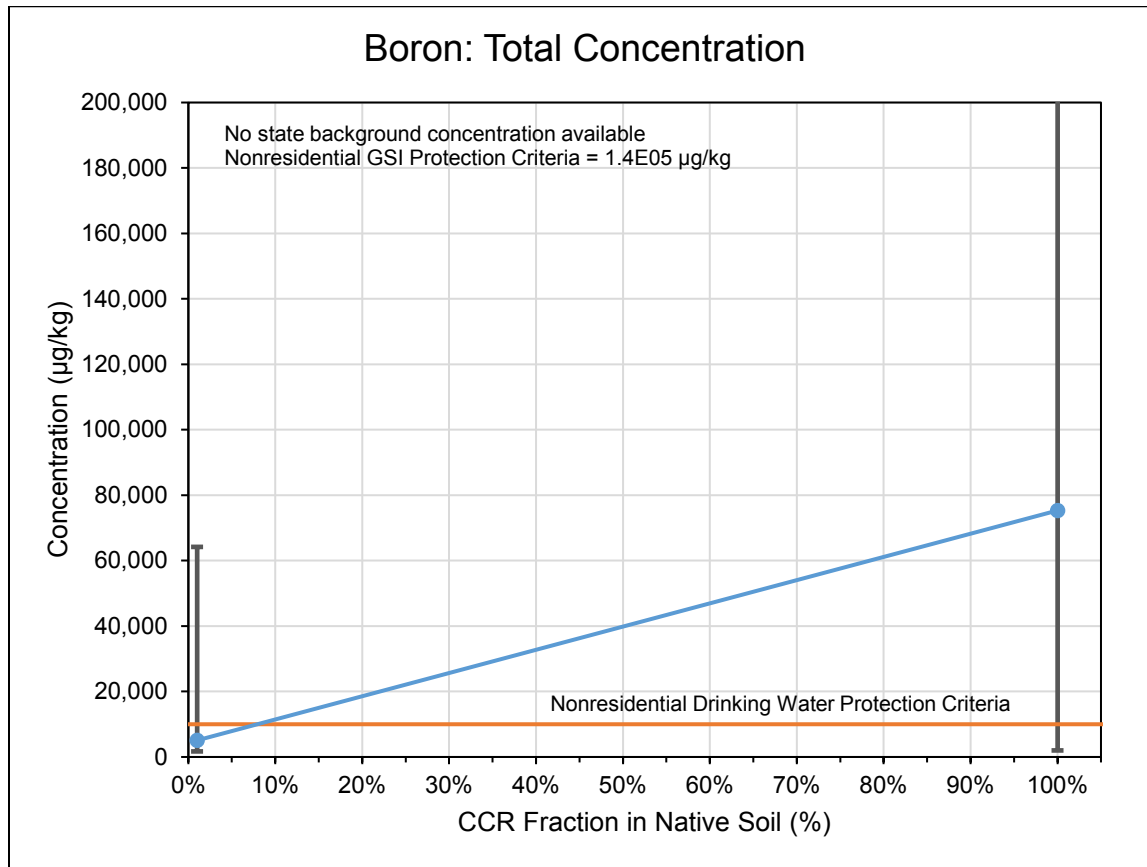


YYYY-MM-DD	2019-02-06
DESIGNED	JRP
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN  
MUSKEGON, MI 49445

TITLE  
**BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN**

PROJECT NO. 1667572	CONTROL B014	REV. 1	FIGURE <b>3</b>
------------------------	-----------------	-----------	--------------------

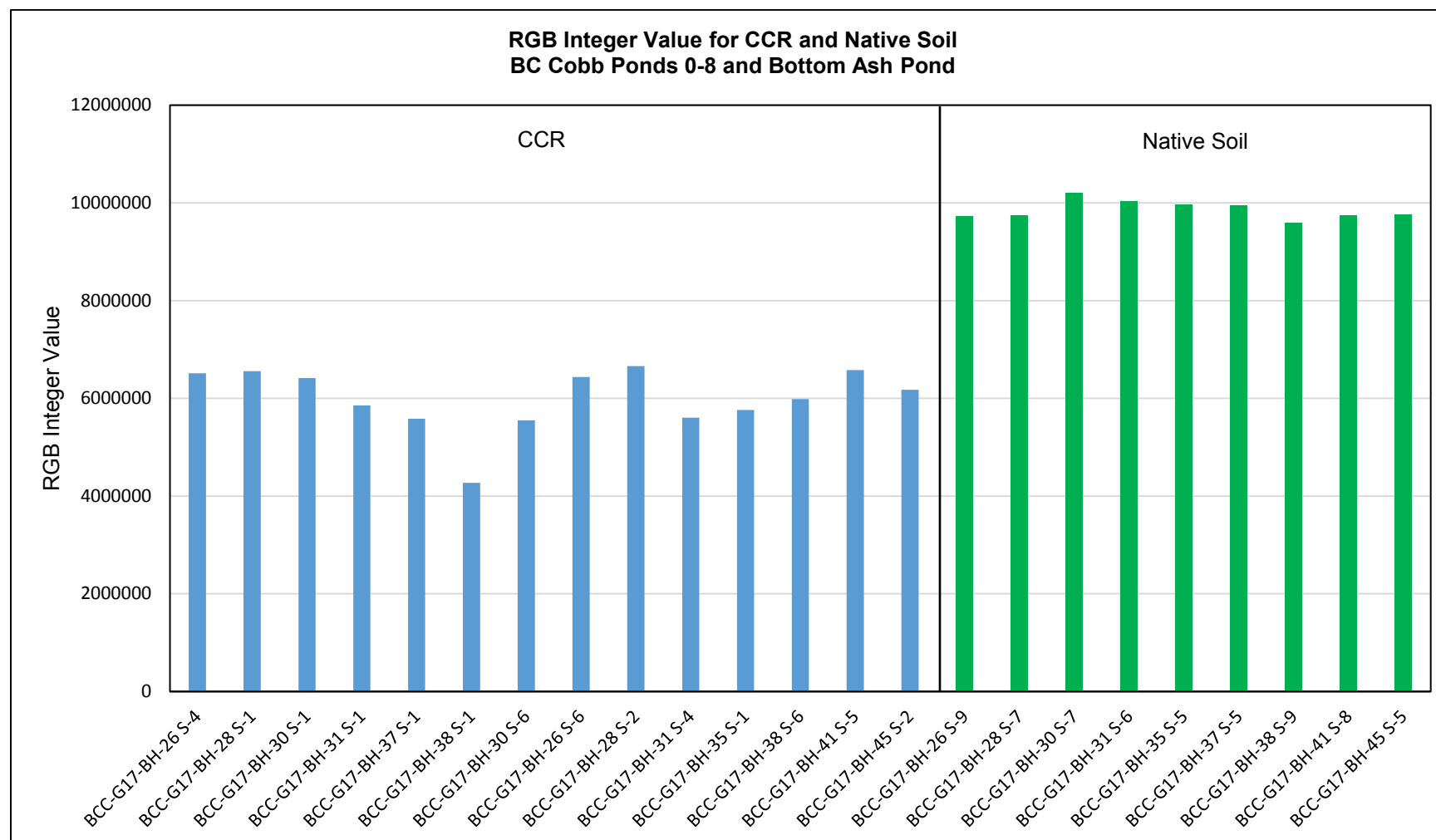
**Figure 4 – Boron Concentrations in CCR and Native Soils****Notes:**

Orange line shows Nonresidential Drinking Water Protection criteria for boron in soil (10,000 µg/kg).  
Blue line shows average metals concentrations in CCR and native soil connected by a trend line to allow comparison.  
Error bars show maximum and minimum concentrations measured in all 64 CCR and 48 underlying native soil samples.



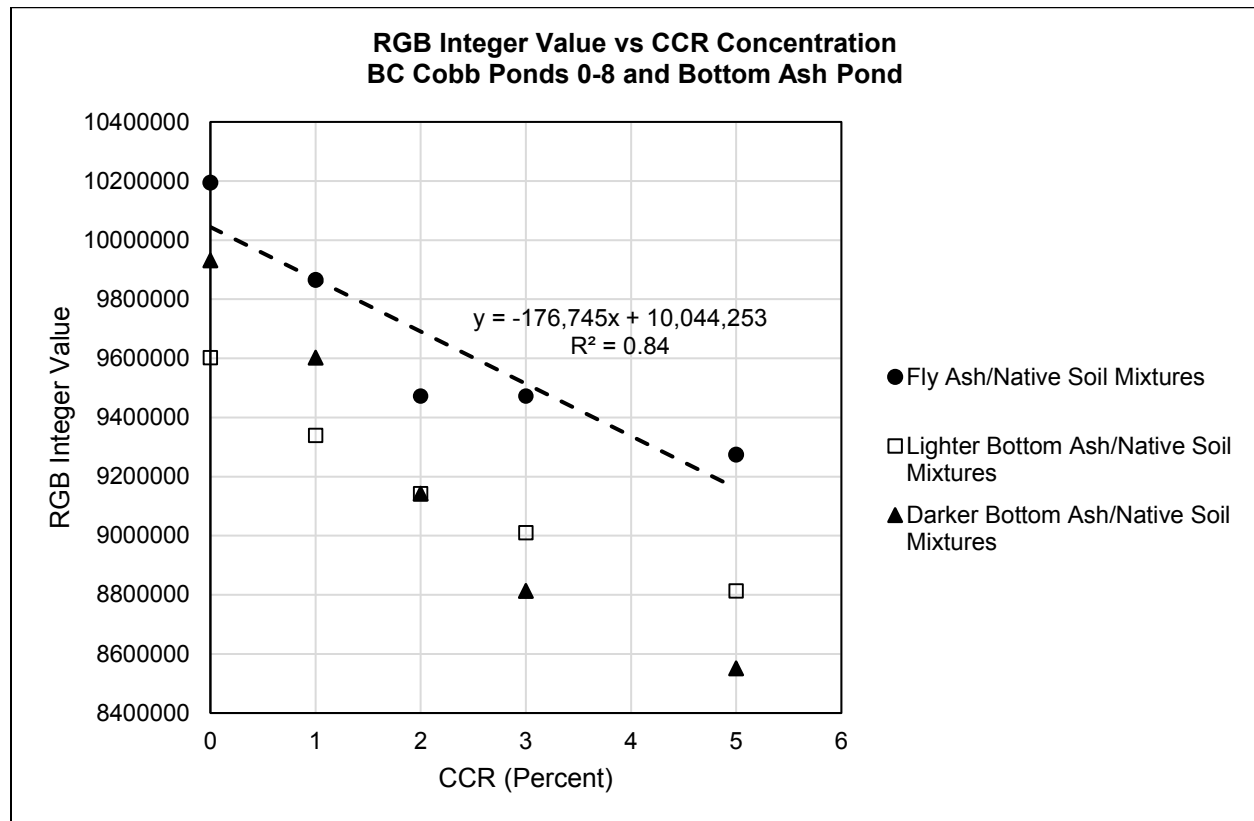


Figure 5 – Colorimetry Results of CCR and Native Soil





**Figure 6 – Site-Specific Calibration Curve for Colorimetric Analysis**



**APPENDIX A**  
**SITE BORING PHOTOGRAPHS**



**PHOTOGRAPH 1**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
5.0 – 10.0 ft

**PHOTOGRAPH 2**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
10.0 – 15.0 ft



**PHOTOGRAPH 3**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
14.0 – 15.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 4**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
15.0 – 20.0 ft







**PHOTOGRAPH 5**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
0.0 – 2.0 ft



**PHOTOGRAPH 6**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
2.0 – 3.0 ft





**PHOTOGRAPH 7**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
3.0 – 4.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 8**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
4.0 – 5.0 ft





**PHOTOGRAPH 9**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
0.0 – 5.0 ft



**PHOTOGRAPH 10**

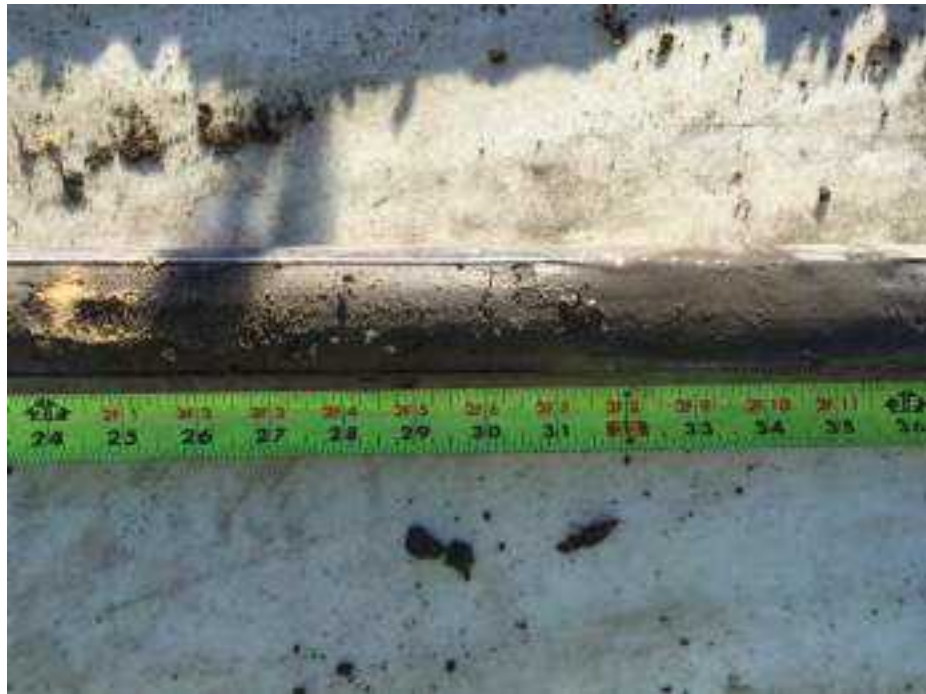
B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
5.0 – 10.0 ft





**PHOTOGRAPH 11**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
6.0 – 7.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 12**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
10.0 – 15.0 ft



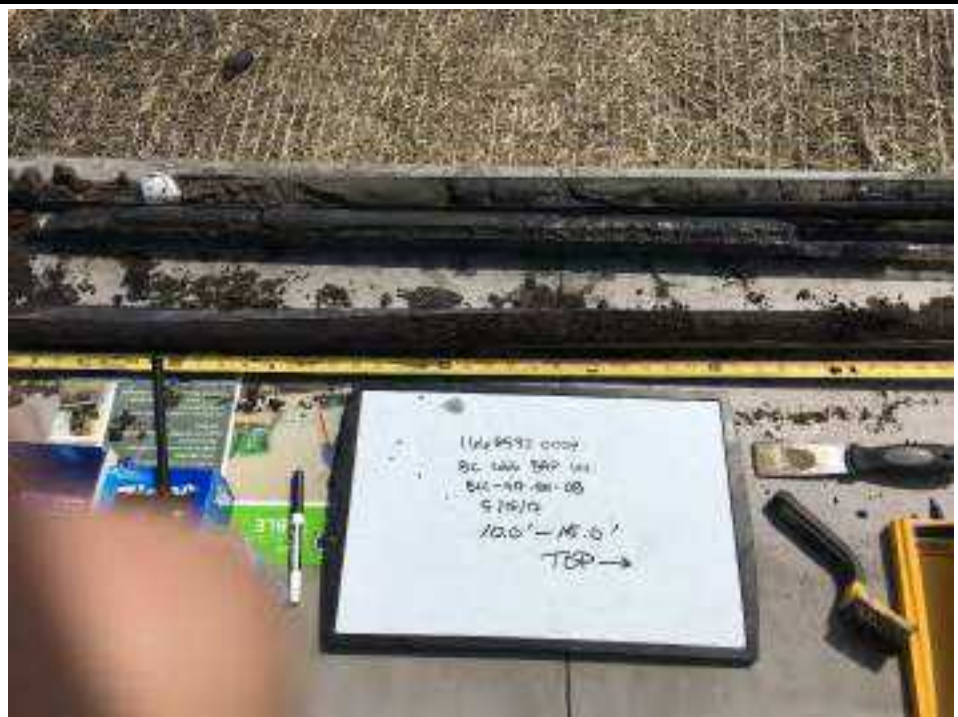


**PHOTOGRAPH 13**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
5.0 – 10.0 ft

**PHOTOGRAPH 14**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
10.0 – 15.0 ft



**PHOTOGRAPH 15**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
15.0 – 20.0 ft

**PHOTOGRAPH 16**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
20.0 – 25.0 ft





**PHOTOGRAPH 17**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
22.0 – 23.0 ft  
(CCR-Native Soil  
Contact)





**APPENDIX B  
SOIL BORING  
LOGS  
(OMITTED)**

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates Inc.**  
**15851 South US 27, Suite 50**  
**Lansing, MI 48906 USA**  
**Tel: (517) 482-2262**  
**Fax: (517) 482-2460**



**Engineering Earth's Development, Preserving Earth's Integrity**

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
GRAND RAPIDS DISTRICT OFFICE



G. HE DI GRETHIER  
DIRECTOR

October 16, 2018

Ms. Michelle Marion  
Consumers Energy-Energy Services Department  
1945 West Parnell Road  
Jackson, Michigan 49201

Dear Ms. Marion:

**SUBJECT** BC Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan,  
Consumers Energy former BC Cobb Electrical Generating Site, Muskegon  
County

Staff of the Department of Environmental Quality (DEQ) have reviewed the BC Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan, which was submitted on May 31, 2018, and clarified on August 13, 2018. The work plan was developed to request an agreement from the DEQ that the workplan would be able to remove regulated solid wastes (e.g., coal combustion residuals from Ponds 0-8 and the Bottom Ash Pond) from the site. The wastes are being removed as part of a plan to close Ponds 0-8 and the Bottom Ash Pond adjacent to the former BC Cobb power plant by removal of coal combustion residuals (CCR) in accordance with the self-implementing requirements of the Resource Conservation and Recovery Act (RCRA) CCR Rule.

The DEQ has reviewed the workplan, which calls for dewatering of the pond area, excavation of CCR from the area utilizing visual standards for cleanup, documentation of excavation grades at all grid points (spacing of 50 feet), photographic documentation of 50 percent of the grid nodes, and a colorimetric confirmation according to ASTM E1347 on at least 25 percent of the grid nodes. The DEQ concurs that the workplan would be capable of removing the darker CCR overlying the medium/light brown native sand materials. The workplan includes multiple lines of evidence to be utilized to ensure that all regulated waste materials will be removed.

This concurrence with the workplan is simply for removal of the CCR that are a regulated solid waste under Part 115-Solid Waste Management of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This concurrence does not in any way constitute an approval under RCRA CCR Rule. The DEQ expects submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities.



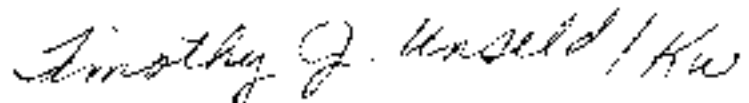
Ms. Michelle Marion

Page 2

October 16, 2018

If you have any questions, please contact me at 616-356-0228.

Sincerely,

Handwritten signature of Timothy J. Unseld in cursive script.

Timothy J. Unseld, Environmental Engineer  
Grand Rapids District Office  
Waste Management and  
Radiological Protection Division

TU:kw

cc: Mr. Brad Runkel; Consumers Energy  
Ms. Margie Ring, DEQ (via e-mail)  
Mr. Duane Roskoskey, DEQ (via e-mail)  
Mr. Fred Sellers, DEQ (via e-mail)  
Mr. Kent Walters, DEQ (via e-mail)

August 13, 2018

Mr. Tim Unseld and Mr. Kent Walters  
MDEQ, Office of Waste Management and Radiological Protection  
Grand Rapids District  
350 Ottawa Avenue NW, Unit 10  
Grand Rapids, MI 49503-2341

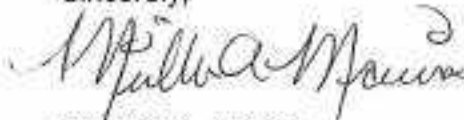
Subject: B.C. Cobb Ash Pond Closure Work Plan Closure Boundaries Memorandum  
Muskegon, MI

Dear Messrs. Unseld and Walters,

As a follow-up to our June 21, 2018 teleconference regarding the B.C. Cobb Ponds 0-8 and Bottom Ash Closure Work Plan, please find attached a Technical Memorandum prepared by Golder Associates Inc. to distinguish pre-1979 vs post-1979 ash used as structural fill and assure the ash placed during operational sluicing activities is removed from the ponds.

The Memorandum is intended to supplement the May 31, 2018 work plan that was submitted to request agreement on Consumers Energy's plan to close Ponds 0-8 and the Bottom Ash Pond adjacent to the former BC Cobb power plant by removal of coal combustion residuals (CCR) in accordance with the self-implementing requirements of the Resource Conservation and Recovery Act (RCRA) CCR Rule that was promulgated on April 17, 2015 and codified in 40 CFR 257. As a result of further investigating this, we are planning to adjust the CCR removal geometry somewhat, primarily on the eastern perimeter berm, to provide some assurance that the CCR accumulated in the ponds after 1979 are removed. If you have any other questions or would like to discuss this further, please contact me at the phone number or e-mail address below.

Sincerely,



Michelle A. Marion  
Sr. Environmental Engineer  
Phone: (517) 788-5824  
Email: [michelle.marion@cmsenergy.com](mailto:michelle.marion@cmsenergy.com)

cc Mr. Fred Sellers, MDEQ

## TECHNICAL MEMORANDUM

**DATE** August 6, 2018

**Project No.** 18101309

**TO** Brad Runkel  
Consumers Energy Company

**CC** Andrew Baird, Aaron Davis, George McKenzie, Michelle Marion, Matt Wachholz

**FROM** Jeff Piaskowski, Mark Bergeon

### **B.C. COBB PONDS 0-8 AND BOTTOM ASH POND CLOSURE WORK PLAN CLOSURE BOUNDARIES**

#### **1.0 INTRODUCTION AND PURPOSE**

During a June 21, 2018 teleconference, Tim Unseld of the Michigan Department of Environmental Quality (MDEQ) requested clarification of the B.C. Cobb Generating Facility (BC Cobb) Ponds 0-8 and Bottom Ash Pond closure boundaries. During the teleconference, it was understood that the MDEQ was generally in agreement with the lines of physical evidence that were proposed to support closure in the BC Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan dated May 30, 2018. Although generally in agreement, the MDEQ noted that the lines of physical evidence would not be applicable to a section that exists along the eastern perimeter berms of Pond 0 and Pond 5 where the proposed coal combustion residuals (CCR) removal geometry was not inclusive of CCR that could have been deposited after January 11, 1979.

It should be noted that January 11, 1979 is an important date, as it is when the State of Michigan enacted Act 641 "Solid Waste Management Act." It is our understanding from the June 21, 2018 teleconference that the existing CCR materials that were placed prior to January 11, 1979 will be treated separately from the Ponds 0-8 and Bottom Ash Pond closure and therefore not required to be removed to demonstrate removal of regulated waste material. Additionally, those materials were placed as structural fill to construct the ponds.

The locations of the Pond 0 and Pond 5 perimeter berms referenced above is highlighted in Figure 1 – Site Plan. A cross section that illustrates the existing conditions and previously proposed excavation is provided on Figure 2 – Cross Section A-A'. Our understanding of the pre-1979 CCR placed as structural fill and our adjusted CCR removal geometry is provided on Figure 3 – Adjusted CCR Removal Section. The purpose of this memo and the following sections is to provide clarification and basis for adjusting the CCR removal geometry to comply with CCR removal requirements prescribed in 40 CFR 257.102.c and provide some assurance that the CCR accumulated in the ponds after 1979 are removed.



## 2.0 ESTABLISHING LIMITS OF PRE-1979 CCR PLACED AS STRUCTURAL FILL

The B.C. Cobb Generating Facility Ash Pond Material Characterization Report (Golder 2016) suggests that the perimeter berms that surround BC Cobb Ponds 0-8 and the Bottom Ash Pond were constructed with CCR. Through review of aerial photographs, we understand that the perimeter berms were constructed prior to 1979, as they are present on a US Geological Survey (USGS) Muskegon aerial photograph dated July 25, 1968. The 1968 aerial photograph is provided as Figure 4 – 1968 Muskegon Aerial.

The 1968 USGS Muskegon aerial illustrates the existence of the perimeter berms that surround Ponds 0-8 and the Bottom Ash Pond. In an attempt to determine the design or as-built perimeter berm geometry, Consumers Energy Company (CEC) performed a search of their records, but the document search was unsuccessful. In the absence of design and/or as-built plans for the perimeter berms, the following was considered to establish a reasonable pre-1979 perimeter berm geometry so closure limits could be established:

- 1968 USGS Muskegon aerial
- Existing site topography and bathymetry (2015)
- Soil mechanics and engineering judgement

### 2.1 1968 USGS Muskegon Aerial

Golder used the 1968 USGS Muskegon aerial to compare the perimeter berm locations in 1968 to the current berm locations. The resolution on the 1968 aerial provides enough detail to suggest general alignment between the 1968 Muskegon aerial and current berm locations.

### 2.2 Existing Site Topography and Bathymetry (2015)

Golder reviewed the existing site topography and bathymetry that was obtained in 2015 as part of the B.C. Cobb Generating Facility Ash Pond Material Characterization Report (Golder 2016). The interior of the perimeter slope of the eastern berm generally ranges in steepness from 1.3H:1V to 2.5H:1V. It is reasonable to assume that varying slope geometry is due to pond maintenance and routine cleanout activities while the plant was operated. Based on the existing topography and bathymetry, it is presumed that the perimeter berms were constructed at an approximate 2H:1V slope. The varying slope measurements along the northern and eastern perimeter berms are provided on Figure 5 – Perimeter Berm Slope Measurements.

### 2.3 Soil Mechanics and Engineering Judgement

Golder generated the Ponds 0-8 Structural Stability and Safety Factor Assessment Report (Golder 2016) for CEC to comply with the CCR Resource Conservation and Recovery Act (RCRA) Rule. The factor of safety assessment reported a drained  $\phi$  (phi) angle of 32 degrees to model and assess the factor of safety of the CCR in the perimeter berms. The reported strength property of the CCR was used to back calculate a factor of safety for various slope geometries using a planar failure analyses where  $FOS = \frac{\tan \phi'}{\tan \alpha}$ . The following are the reported factors of safety for the various slopes given a 32 degree drained  $\phi$  (phi) angle.

**Table 2.3.1: Planar Failure Analysis Factor of Safety Results**

Slope (H:V)	Slope [degrees ( $\alpha$ )]	Factor of Safety
1:1	45.0	0.62
1.5:1	33.7	0.94
2:1	26.6	1.25
2.5:1	21.8	1.56

Given the material properties of the CCR and the factors of safety reported above, it is reasonable to assume that the berms were constructed with a 2H:1V slope geometry. If the perimeter berms were constructed with steeper slopes, the berms would have required repeated maintenance and buttressing to limit continuous unraveling of surficial CCR on the side slope of the berms.

### 3.0 PROPOSED CCR REMOVAL GEOMETRY

The 1968 Muskegon aerial, existing site topography and bathymetry, and soil mechanics suggest that the perimeter berms that surround Ponds 0-8 and the Bottom Ash Pond were constructed prior to January 11, 1979 with side slopes no steeper than 2H:1V.

During maintenance and pond cleanout activities, the perimeter berm slope geometry was slightly revised and, in some areas, produced existing side slope grades steeper than 1.5H:1V. As a result, the previously proposed 2H:1V CCR removal geometry must be revised to match the existing geometry to provide some assurance that post-1979 ponded CCR has been removed. In an attempt to assure that post-1979 CCR is removed during closure of Ponds 0-8 and the Bottom Ash Pond, Golder Associates Inc. (Golder) proposes to adjust the CCR removal geometry to match the existing topography and bathymetry while offsetting the CCR removal surface 12 inches to remove possible accumulation of post-1979 CCR on the side slopes of the perimeter berms where steeper than 2H:1V slope geometry exists. The adjusted CCR removal geometry and our understanding of the pre-1979 CCR placed as structural fill is provided on Figure 3 – Adjusted CCR Removal Section.

Although there is no way to assure that all post-1979 CCR will be removed from the side slopes of the perimeter berms, it is reasonable to assume that less than 12 inches of post-1979 CCR have been deposited in these areas. Given this, we understand that removal of 12 inches of CCR from the existing perimeter side slopes will be a sufficient amount to provide assurance that post-1979 CCR have been removed. The previously proposed lines of physical evidence will be used to quantify removal of CCR, where the CCR removal surface extends to the native sand layer that exists beneath the ponds.

### 4.0 REFERENCES

Golder Associates Inc. 2016. B.C. Cobb Generating Facility Ash Pond Material Characterization Report.  
Golder Associates Inc. 2016. Ponds 0-8 Structural Stability and Safety Factor Assessment Report.

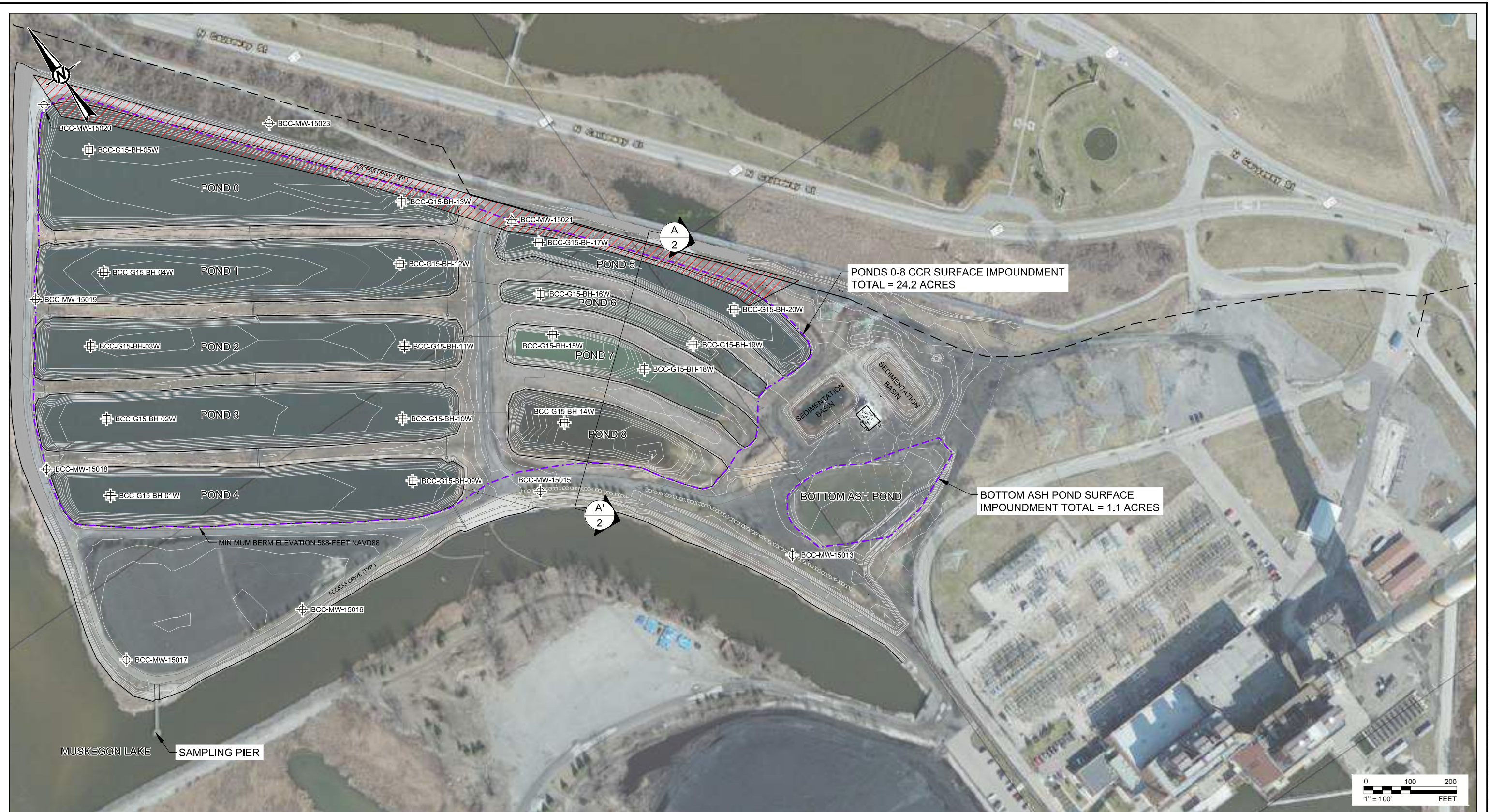
**Attachments**

- Figure 1 - Site Plan
- Figure 2 - Cross Section A-A'
- Figure 3 - Adjusted CCR Removal Section
- Figure 4 - 1968 Muskegon Aerial
- Figure 5 - Perimeter Berm Slope Measurements














## Figures





## LEGEND

- |   |  |   |                 |
|---|--|---|-----------------|
|  | POND 0-8 SAMPLING LOCATION                           |  | CONCRETE VAULT  |
|  | EXTERIOR BERM SAMPLING LOCATION                      |  | TREE LINE       |
|  | INTERIOR SLOPE OF EXTERIOR BERM SAMPLING LOCATION    |  | AREA OF CONCERN |
|  | EXISTING MAJOR AND MINOR TOPOGRAPHIC CONTOUR         |   |                 |
|  | SURFACE IMPOUNDMENTS                                 |   |                 |
|  | POWER LINE AND TOWER STRUCTURE                       |   |                 |
|  | 20-INCH DUCTILE IRON SANITARY PIPE (SEE REFERENCE 5) |   |                 |
|  | 20-INCH DUCTILE IRON SANITARY PIPE (SEE REFERENCE 6) |   |                 |

## REFERENCE(S)

1. TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015.
2. DASHED PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE FROM GIS SHAPEFILE WASTEWATER\_PRESSURIZED\_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.
3. SOLID PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE LOCATED BY GOLDER FIELD PERSONNEL USING GPS UNIT ON JULY 24, 2018.
4. BOREHOLE LOCATIONS FROM GOLDER FIELD PERSONNEL (BCCOBB\_GPS\_20170522.XLSX AND BC COBB PONDS 0-8 2017 BORING LOCATIONS.XLSX).
5. DASHED PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE FROM GIS SHAPEFILE WASTEWATER\_PRESSURIZED\_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.
6. SOLID PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE LOCATED BY GOLDER FIELD PERSONNEL USING GPS UNIT ON JULY 24, 2018.

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT



YYYY-MM-DD	2018-08-06
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 CLOSURE  
MUSKEGON, MI 49445

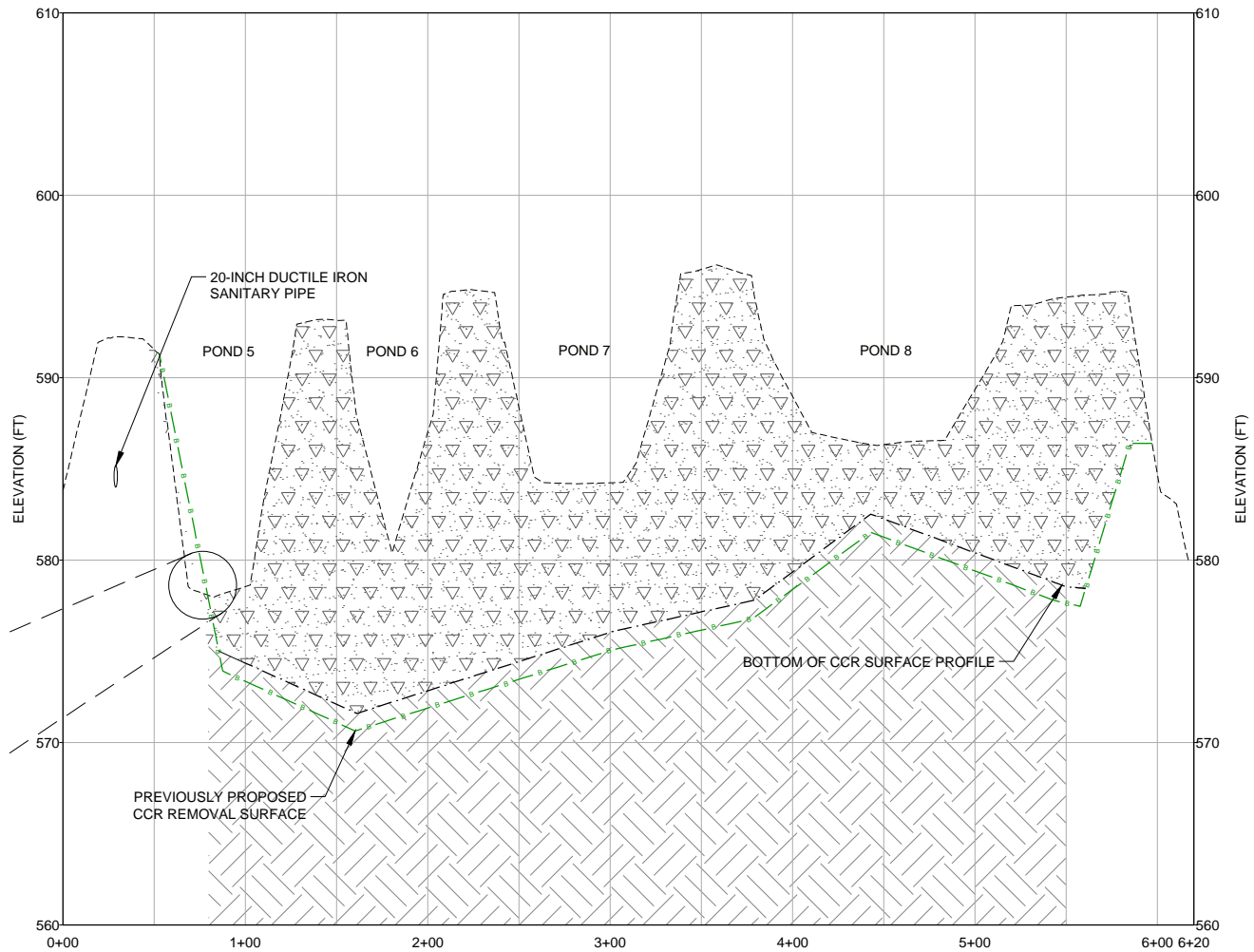
TITLE  
**SITE PLAN**

PROJECT NO.	CONTROL	REV.	FIGURE
18101309	0004-002	0	1



Path: \\mibauread\Project\ConsumerEnergyCompany\BCCobbl99\_PROD\ECTS\18101309\004\_MDEQMemo02\_PROD\TONDWG\_1 File Name: 18101309-004-004.dwg

POTENTIAL POST 1979 CCR



LEGEND

- CCR MATERIAL
- NATIVE MATERIAL
- EXISTING GROUND
- BOTTOM OF CCR SURFACE PROFILE
- PROPOSED EXCAVATION SURFACE PROFILE

NOTES

- EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN.
- CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING STORMWATER MANAGEMENT AND EROSION CONTROL PLANS CONSISTENT WITH THE SITE SWPPP.
- CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ADHERENCE TO CONSUMERS ENERGY COMPANY'S HEALTH AND SAFETY PROCEDURES AS WELL AS ANY STATE AND FEDERAL HEALTH AND SAFETY REQUIREMENTS.
- CONSTRUCTION MATERIALS, SUBCONTRACTORS, AND STOCKPILE LOCATIONS SHALL BE SUBJECT TO APPROVAL BY CONSUMERS ENERGY COMPANY OR ITS DESIGNATED REPRESENTATIVE.
- TEMPORARY ROADS FOR SITE ACCESS AND STOCKPILE ACCESS TO BE APPROVED BY CONSUMERS ENERGY COMPANY OR ITS DESIGNATED REPRESENTATIVE.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS PRIOR TO STARTING WORK AND SHALL NOTIFY THE ENGINEER IF CONFLICTS EXIST ON THE DRAWINGS.
- CONTRACTOR IS RESPONSIBLE FOR SURVEY CONTROL AND COORDINATION WITH OWNER'S SURVEYOR TO ACQUIRE INFORMATION NECESSARY TO PRODUCE AS-BUILT DRAWINGS.
- CONTRACTOR SHALL PERFORM HOUSEKEEPING DUTIES ON A DAILY BASIS TO KEEP WORK AREAS CLEAN. HOUSEKEEPING SHALL BE PERFORMED AT THE COMPLETION OF THE WORK TO THE SATISFACTION OF THE OWNER.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIALS REQUIRED TO FULLY CONSTRUCT THE SYSTEM ACCORDING TO THE DESIGNS IN THESE DRAWINGS.
- EXCAVATIONS SHALL CONFORM TO CONSUMERS ENERGY COMPANY AND MIOSHA REQUIREMENTS.
- BOTTOM OF CCR SURFACE DEVELOPED FROM 2015-2017 SITE INVESTIGATIONS.

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

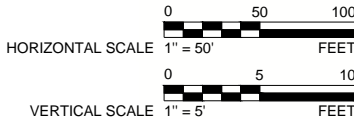


YYYY-MM-DD	2018-08-06
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 CLOSURE  
MUSKEGON, MI 49445

TITLE  
SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
18101309	0004-004	0	2

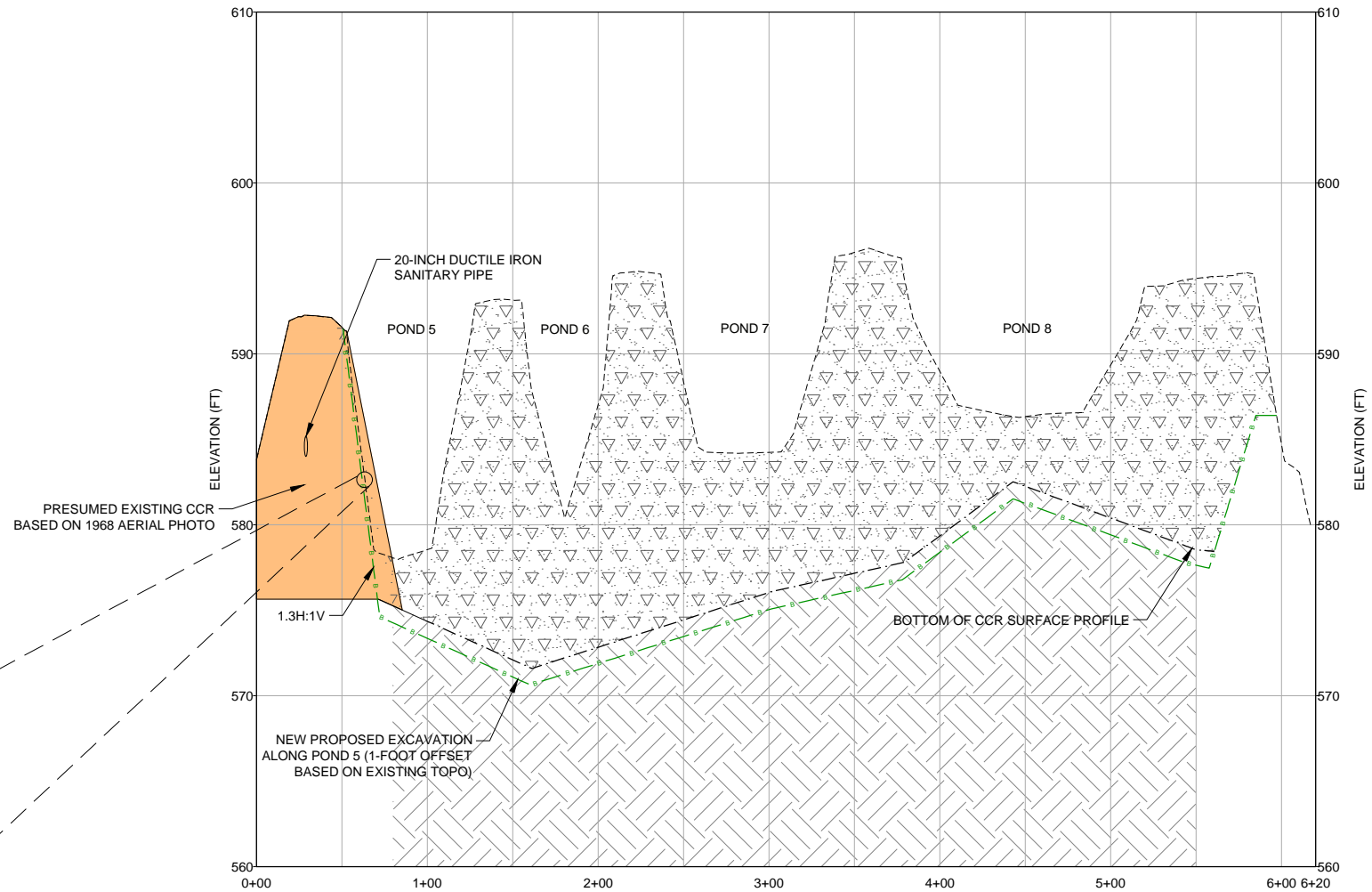


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN THE SHEET SIZE HAS BEEN MODIFIED FROM A3S D



Path: \\mibauread\Project\ConsumerEnergyCompany\BCCobbl\99\_PROD\ECTS\18101309\004\_MDEMem02\_PROD\TONDWG\_1 File Name: 18101309-004-007.dwg

1-FOOT OFFSET DETAIL



LEGEND

	CCR MATERIAL		NATIVE MATERIAL
	EXISTING GROUND		
	BOTTOM OF CCR SURFACE PROFILE		
	PROPOSED EXCAVATION SURFACE PROFILE		

NOTES

- EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN.
- CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING STORMWATER MANAGEMENT AND EROSION CONTROL PLANS CONSISTENT WITH THE SITE SWPPP.
- CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ADHERENCE TO CONSUMERS ENERGY COMPANY'S HEALTH AND SAFETY PROCEDURES AS WELL AS ANY STATE AND FEDERAL HEALTH AND SAFETY REQUIREMENTS.
- CONSTRUCTION MATERIALS, SUBCONTRACTORS, AND STOCKPILE LOCATIONS SHALL BE SUBJECT TO APPROVAL BY CONSUMERS ENERGY COMPANY OR ITS DESIGNATED REPRESENTATIVE.
- TEMPORARY ROADS FOR SITE ACCESS AND STOCKPILE ACCESS TO BE APPROVED BY CONSUMERS ENERGY COMPANY OR ITS DESIGNATED REPRESENTATIVE.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS PRIOR TO STARTING WORK AND SHALL NOTIFY THE ENGINEER IF CONFLICTS EXIST ON THE DRAWINGS.
- CONTRACTOR IS RESPONSIBLE FOR SURVEY CONTROL AND COORDINATION WITH OWNER'S SURVEYOR TO ACQUIRE INFORMATION NECESSARY TO PRODUCE AS-BUILT DRAWINGS.
- CONTRACTOR SHALL PERFORM HOUSEKEEPING DUTIES ON A DAILY BASIS TO KEEP WORK AREAS CLEAN. HOUSEKEEPING SHALL BE PERFORMED AT THE COMPLETION OF THE WORK TO THE SATISFACTION OF THE OWNER.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIALS REQUIRED TO FULLY CONSTRUCT THE SYSTEM ACCORDING TO THE DESIGNS IN THESE DRAWINGS.
- EXCAVATIONS SHALL CONFORM TO CONSUMERS ENERGY COMPANY AND MIOSHA REQUIREMENTS.
- BOTTOM OF CCR SURFACE DEVELOPED FROM 2015-2017 SITE INVESTIGATIONS.

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

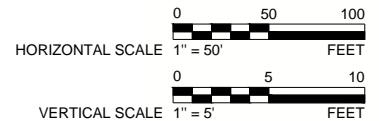


YYYY-MM-DD	2018-08-06
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 CLOSURE  
MUSKEGON, MI 49445

TITLE  
**ADJUSTED CCR REMOVAL SECTION**

PROJECT NO.	CONTROL	REV.	FIGURE
18101309	0004-007	0	3



1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN THE SHEET SIZE HAS BEEN MODIFIED FROM A3 AND D



REFERENCE(S)

1. AERIAL FROM USGS DATED 1968.

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

YYYY-MM-DD 2018-08-06

DESIGNED MAB

PREPARED AM

REVIEWED JRP

APPROVED MAB



PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 CLOSURE  
MUSKEGON, MI 49445

TITLE  
**1968 MUSKEGON AERIAL**

PROJECT NO.  
18101309

CONTROL  
0004-003

REV.  
0

FIGURE  
**4**





May 31, 2018

Mr. Tim Unseld, District Engineer  
Michigan Department of Environmental Quality  
Office of Waste Management and Radiological Protection  
State Office Building, 5<sup>th</sup> Floor  
350 Ottawa Avenue NW, Unit 10  
Grand Rapids, Michigan 49503-2341

Mr. Kent Walters, District Geologist  
Michigan Department of Environmental Quality  
Office of Waste Management and Radiological Protection  
State Office Building, 5<sup>th</sup> Floor  
350 Ottawa Avenue NW, Unit 10  
Grand Rapids, Michigan 49503-2341

Subject: BC Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan  
Muskegon, Michigan

Dear Messrs. Unseld and Walters:

Consumers Energy appreciated the opportunity to discuss managing and closing Coal Combustion Residual (CCR) Surface Impoundments at the former BC Cobb electrical generating site (BC Cobb) during our meeting on April 30, 2018. These requirements are necessitated under the self-implementing 42-month compliance schedule of the Resource Conservation and Recovery Act (RCRA) CCR Rules promulgated on April 17, 2015 and codified in 40 CFR 257. Based on that discussion, please find enclosed the Closure Work Plan for Cobb Ponds 0-8 and the Bottom Ash Pond.

This work plan is being submitted to request agreement from the Michigan Department of Environmental Quality (MDEQ) on Consumers Energy's plan to close Ponds 0-8 and the Bottom Ash Pond adjacent to the former BC Cobb power plant by removal of CCR in accordance with the self-implementing requirements of the CCR Rule. There is local community support for this closure by removal approach as documented in the attached letters of support from the West Michigan Regional Shoreline Development Commission and the Muskegon Lake Watershed Partnership.

Consumers Energy is requesting MDEQ approval of the enclosed work plan by July 15, 2018 so environmental enhancements can be implemented and compliance with the RCRA CCR Rule can be maintained. Please feel free to contact me with any questions regarding the enclosed work plan.



Sincerely,

A handwritten signature in cursive script, appearing to read "Michelle Marion".

Michelle Marion

Sr. Engineer, Landfill Operations Compliance

Phone: (517) 788-5824

Email: [michelle.marion@cmsenergy.com](mailto:michelle.marion@cmsenergy.com)

cc: Mr. Fred Sellers, MDEQ Grand Rapids District

# WMSRDC

WEST MICHIGAN SHORELINE  
REGIONAL DEVELOPMENT COMMISSION

April 9, 2018

Michelle Marion  
Consumers Energy

Dear Ms. Marion

The West Michigan Shoreline Regional Development Commission (WMSRDC) is a multi-county, regional planning organization with programs in economic development, homeland security, local government services and transportation and environmental planning. The WMSRDC offices are located in Muskegon, Michigan. Our website can be found at [www.wmsrdc.org](http://www.wmsrdc.org).

As part of Consumers Energy's community transition, and the closing of the B.C. Cobb power generation plant, WMSRDC had the opportunity to collaborate with Consumers Energy on a number of projects. Collaboration focused on the Port of Muskegon, including an economic development study that assessed the existing conditions of port infrastructure and related transportation needs. WMSRDC completed the study, with support from Consumers Energy and the U.S. Department of Commerce Economic Development Administration. The purpose of the study was to advance commercial use of the Port of Muskegon.

Another collaborative effort included Consumers Energy's support for a preliminary design to restore wetlands and fish passage along the Muskegon River at Veterans Memorial Park. The park is located immediately upstream from the B.C. Cobb property on the Causeway in the cities of Muskegon and North Muskegon. The \$10,000 contribution that Consumers Energy provided to WMSRDC helped to leverage a \$2.5 million fish and wildlife habitat restoration grant to WMSRDC from the National Oceanic and Atmospheric Administration and the Great Lakes Restoration Initiative. The successful restoration of the Muskegon River at Veterans Memorial Park began in early 2017 and will be completed in 2018.

The B.C. Cobb plant is located at the east end of Muskegon Lake at the mouth of the Muskegon River. The continued restoration of the river's former floodplain wetlands and connectivity between wetlands and the river continue to be priorities for WMSRDC and the community organizations who are involved with the cleanup, restoration and delisting of the Muskegon Lake Area of Concern (AOC).

The WMSRDC is supportive of Consumers Energy's plans for a full clean out of the bottom ash ponds, located along the mouth of the Muskegon River on Muskegon Lake. A clean out, rather than a capping, will allow the potential for WMSRDC to leverage future grant investments for wetland restoration of the ponds and for enhanced connectivity with the river. The beneficial re-use of the bottom ash could also be a benefit to the local economy and the Muskegon Lake/Muskegon River ecosystem.

Sincerely,



Erin Kuhn  
Executive Director

316 Morris Avenue - Suite 340 - Muskegon, MI 49440  
Telephone: 231/722-7878 - Fax: 231/722-9362  
[www.wmsrdc.org](http://www.wmsrdc.org)



April 5, 2018

Ms. Michelle Marion  
Consumers Energy

Dear Ms. Marion

The Muskegon Lake Watershed Partnership (MLWP) is a Muskegon, Michigan-based, watershed organization that advises state and federal agencies on the cleanup and restoration of the Muskegon Lake Area of Concern (AOC). As one of the Great Lakes AOC Public Advisory Councils (PAC), the MLWP works with the public, stakeholder groups, Michigan Department of Environmental Quality and the U.S. Environmental Protection Agency to set goals and to develop restoration projects for the removal of the AOC's Beneficial Use Impairments. This work will ultimately lead to the de-listing of Muskegon Lake as an AOC.

As part of Consumers Energy B.C. Cobb community transition process, the MLWP partnered with Consumers Energy and the West Michigan Shoreline Regional Development Commission on a preliminary design to restore wetlands and fish passage along the Muskegon River at Veterans Memorial Park. The park is located immediately upstream from the B.C. Cobb property on the Causeway in the cities of Muskegon and North Muskegon. Consumers Energy provided a \$10,000 contribution that helped leverage a \$2.5 million dollar, NOAA, Great Lakes Restoration Initiative fish and wildlife habitat restoration grant project. The successful restoration project of the Muskegon River at Veterans Memorial Park began in early 2017 and will be completed in 2018.

The B.C. Cobb plant is located at the east end of Muskegon Lake at the mouth of the Muskegon River. The continued restoration of the river's former floodplain wetlands and connectivity between wetlands and the river continue to be priorities for the MLWP and the community organizations who are involved with the cleanup, restoration and delisting of the Muskegon Lake AOC and the surrounding watershed.

The MLWP is supportive of Consumers Energy's plans for a full clean out of the bottom ash ponds, located on the south side of Muskegon River, west of Veterans Memorial Park on the Causeway. A full clean out, rather than capping in place, will provide long-term protection for the sensitive river mouth ecosystem. A clean out of the coal ash ponds also provides the potential for the MLWP to seek future partnership projects and to work with Consumers Energy to further restore wetlands and connectivity with the Muskegon River. The removal of the bottom ash, with beneficial re-use, may also prevent the need to extract natural resources for capping, save landfill space, prevent the potential for a future catastrophic failure of a coal ash impoundment, and protect groundwater and surface water from the threat of future contamination.

Sincerely,

A handwritten signature in black ink, appearing to read "Dennis A. Kirksey", is written over the typed name.

Dennis A. Kirksey, Chair





# Bottom Ash Pond and Ponds 0-8 Closure Work Plan

## B.C. COBB GENERATING FACILITY

## BOTTOM ASH POND AND PONDS 0-8 CLOSURE WORK PLAN

Muskegon, Michigan



**Submitted To:** Consumer Energy Company  
1945 W. Parnall Road  
Jackson, Michigan 49201

**Submitted By:** Golder Associates Inc.  
15851 South US 27, Suite 50  
Lansing, Michigan 48906

**May 30, 2018**

**1667572**





## Table of Contents

1.0	CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES .....	1
2.0	FACILITY BACKGROUND.....	2
3.0	REGULATORY BACKGROUND.....	3
4.0	SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR .....	4
4.1	Narrative Summary of Closure.....	4
4.2	CCR Removal and Documentation – Phase I.....	5
4.2.1	CCR Excavation and Documentation Summary.....	5
4.2.1.1	Removal Criteria Background .....	6
4.2.2	Documentation of CCR Removal Overview.....	8
4.2.2.1	Documentation of Excavation Grades – First Line of Evidence .....	8
4.2.2.2	Photographic Documentation – Second Line of Evidence.....	9
4.2.2.3	Colorimetric Confirmation – Third Line of Evidence .....	9
4.2.2.4	Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence ....	10
4.3	Post-Excavation Monitoring – Phase II .....	10
5.0	SUMMARY .....	12
6.0	CLOSING .....	13
7.0	REFERENCES.....	14

## List of Tables

Table 1 RCRA CCR Constituents from Appendix III and Appendix IV

## List of Figures

Figure 1	General Site Plan
Figure 2	B.C. Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule
Figure 3	Bottom Ash Pond and Ponds 0-8 Excavation Plan
Figure 4	Boron Concentrations in CCR and Native Soils
Figure 5	Colorimetry Results for CCR and Native Soils
Figure 6	Site-Specific Calibration Curve for Colorimetric Analysis

## List of Appendices

Appendix A	Site Boring Photographs
Appendix B	Soil Boring Logs



## 1.0 CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES

This closure work plan has been prepared to request agreement from the Michigan Department of Environmental Quality (MDEQ) with Consumers Energy Company's (CEC) plan to close the Bottom Ash Pond and Ponds 0-8 at its B.C. Cobb Generating Facility (BC Cobb) located in Muskegon, Michigan. Specifically, these ponds are "existing CCR surface impoundments" which will be closed by removal of CCR in accordance with self-implementing requirements of the CCR Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule").

This document provides a general description of the following:

- Plans for removal of waste
- Multiple lines of evidence to document waste removal including the basis for an objective waste removal standard to address potential long-term sources of groundwater impacts
- Schedule for implementing the work
- Performance monitoring after waste removal in accordance with the CCR RCRA Rule

CEC provided the Notification of Intent to Initiate Closure of the Bottom Ash Pond and Ponds 0-8 to the Michigan Department of Environmental Quality on March 30, 2018, per 40 CFR 257.102(g). CEC plans to initiate construction work for closure of the Bottom Ash Pond and Ponds 0-8 by May 1, 2019. To comply with closure timeframe requirements of the CCR RCRA Rule and maintain project schedule and procurement of a closure construction contract, CEC requests MDEQ approval of this closure work plan by July 15, 2018.

CEC is proposing the same CCR removal method and similar documentation procedures that were previously approved by the MDEQ and implemented for closing and documenting removal of CCR for Bottom Ash Pond 3N at the J.H. Campbell Generating Facility (JH Campbell) in West Olive, Michigan (JHC Bottom Ash Pond 3N). CCR was removed from JHC Bottom Ash Pond 3N from March 2017 through June 2017. The removal was documented in the *J.H. Campbell Generating Facility Bottom Ash Pond 3N CCR Removal Documentation Interim Report* (JHC Bottom Ash Pond 3N Closure Report; Golder, 2017), which was submitted to the MDEQ on June 20, 2017 and approved on July 18, 2017.





## 2.0 FACILITY BACKGROUND

BC Cobb was a coal-fueled power generating facility located in Muskegon, Michigan. The plant operated five coal-burning units (Units 1 through 5) and later converted three to natural gas peaking units (Units 1 through 3). Beginning with plant operation in the 1940s, CCR produced by the coal-fired power generation units (fly ash and bottom ash) was disposed in the area currently occupied by the Bottom Ash Pond and Ponds 0-8. Based on a review of historical documentation, the exterior berm surrounding the area currently occupied by the Bottom Ash Pond and Ponds 0-8 was constructed prior to July 1968. Ponds 0, 1, 2, 3, and 4 were also constructed prior to July 1968. Ponds 5, 6, 7, and 8 were constructed prior to April 1977. As of 1984, CCR was deposited exclusively in the Bottom Ash Pond and Ponds 0-8 by wet sluicing methods. The locations of the Bottom Ash Pond and Ponds 0-8 are provided on Figure 1 – General Site Plan. Electrical generation at BC Cobb ceased on April 15, 2016.

While receiving CCR, the Bottom Ash Pond and Ponds 0-8 water surface elevations were maintained at an approximate elevation of 588 feet NAVD88. Currently, the Bottom Ash Pond and Ponds 0-8 water surface elevations are at an approximate elevation 580 of feet NAVD88.



### 3.0 REGULATORY BACKGROUND

CEC has identified the Bottom Ash Pond and Ponds 0-8 at BC Cobb as “existing CCR surface impoundments” under the CCR RCRA Rule, as they were directly receiving and storing commingled CCR and low volume miscellaneous wastewaters as of the effective date (October 19, 2015) of the CCR RCRA Rule. As such, there are specific criteria and schedules under the CCR RCRA Rule for CEC to conduct closure.

The BC Cobb Bottom Ash Pond and Ponds 0-8 were not licensed as units for waste disposal under the Michigan Natural Resources and Environmental Protection Act (NREPA) Part 115. Instead, the Bottom Ash Pond and Ponds 0-8 were permitted under Michigan’s NREPA Part 31 as part of the National Pollution Discharge Elimination System (NPDES). A solid waste disposal area construction permit authorizing conditions for storage and/or disposal was not issued for the ponds pursuant to solid waste authorities, since the wastewaters containing CCR discharging into the Bottom Ash Pond and Ponds 0-8 were “other wastes regulated by statute”, as defined in Rule 110 of the Part 115 Solid Waste Rules. This regulatory exception to authorize activity only under the NPDES permit is limited in scope and application with respect to the disposal and end of life considerations of CCR from these units; and the NPDES permit was terminated shortly following cessation of electric generation and elimination of wastewater treatment and discharges from the site. Furthermore, CEC has regularly removed CCR from these ponds for beneficial use markets or disposal in the JH Campbell ash landfill.



## 4.0 SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR

CEC intends to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR in accordance with self-implementing requirements under the CCR RCRA Rule. Upon approval of the closure work plan, CEC intends for this document to serve as an agreement with MDEQ on applicable elements of its self-implementing plan to achieve closure in accordance with the CCR RCRA Rule. Documentation and certifications necessary under the CCR RCRA Rule will be provided to MDEQ as part of the notification requirements to the relevant State Director detailed in 40 CFR 257.106. Additionally, the applicable certifications and documents will be posted to the CCR Rule Compliance Data and Information publicly-available website pursuant to 40 CFR 257.107.

As part of closure self-implementation, the United States Environmental Protection Agency (EPA) required an initial closure plan certified by a qualified professional engineer to be placed in the operating record and posted on a publicly-accessible internet site for existing CCR surface impoundments by October 17, 2016, which has been completed. The initial closure plan indicated that the Bottom Ash Pond and Ponds 0-8 would be closed with CCR in place. However, CEC determined it is likely feasible to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR as described herein, assuming it is feasible to dewater as necessary to verify CCR removal. Therefore, the RCRA Closure Plan for the Bottom Ash Pond and Ponds 0-8 was revised on February 28, 2018, placed in the CCR unit operating record, and posted on CEC's publicly-accessible internet site.

### 4.1 Narrative Summary of Closure

The Bottom Ash Pond and Ponds 0-8 will be closed by removal of visible CCR. This plan is consistent with the clearly visible interface between CCR and underlying substrate materials observed at the base of the Bottom Ash Pond and Ponds 0-8 in sonic core and borehole soil samples recovered from site investigations, as shown in photographs provided in Appendix A – Site Boring Photographs. Removal of all visible CCR is also in accordance with 40 CFR 257.102(c), which states “CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 257.95(h).” The CCR RCRA Rule also prescribes the closure timeframe for existing CCR surface impoundments as five years from the commencement of closure activities [40 CFR 257.102(f)(1)(ii)].

The Bottom Ash Pond and Ponds 0-8 will be closed in compliance with the CCR RCRA Rule using a phased approach that will include: 1) physical removal of CCR for purposes of removing regulated waste and sources of potential long-term groundwater contamination, and 2) use of the balance of the five-year closure timeframe provided for in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV





constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h). This compliance monitoring schedule is provided in Figure 2.

The horizontal excavation limits of CCR in the Bottom Ash Pond and Ponds 0-8 will extend to the wetted pond boundary on the northern and western exterior perimeter berms but may be adjusted after a geotechnical assessment is completed to confirm adequate factors of safety can be maintained. The eastern excavation limits of CCR extend to the wetted pond boundary but may be adjusted as needed to avoid undercutting an existing sanitary sewer. Similarly, CCR removal limits will be adjusted around existing transmission pole foundations and a substation to the south. Interior berms that separate the individual ponds will be removed. The lateral extent of the Bottom Ash Pond and Ponds 0-8 excavation limits is shown on Figure 1.

The excavation will reach approximate depths of 3 to 30 feet below the existing grade. Proposed excavation contours are provided in Figure 3 – Bottom Ash Pond and Ponds 0-8 Excavation Plan. CEC does not plan to regrade and/or backfill the ponds once the CCR is removed.

## 4.2 CCR Removal and Documentation – Phase I

The first phase of closure activities will be CCR removal and documentation. Descriptions of activities to remove CCR and document adequate removal are provided in this section, along with the basis for the various lines of evidence.

### 4.2.1 CCR Excavation and Documentation Summary

This section provides a list of the tasks to be completed during excavation and documentation and includes more details regarding method development and rationale. Excavation will be performed to remove CCR to elevations identified during site investigations; visual observations and field analyses will be made to confirm the CCR removal objective is met. Documentation of CCR removal will then be performed to provide lines of evidence that validate the extent of the excavation and visual observations made in the field. During CCR removal and documentation, the following tasks will be completed:

#### ■ Excavation

- The Bottom Ash Pond and Ponds 0-8 will be dewatered by actively pumping in accordance with the state of Michigan construction dewatering best management practices or in a manner to maintain NPDES permitted effluent limits if a NPDES permit is required.
  - CEC is currently pursuing a NPDES permit to discharge construction dewatering effluent.
- Hydraulic structures will be abandoned in-place or removed
- CCR removal will be complete when the following are achieved:
  - The contractor meets horizontal and vertical excavation limits determined from previous site investigations, and,



- Visual observations determine that the CCR removal objective has been met
- Documentation and final certification
  - Final excavation grades will be compared to the elevations of known CCR at the base of the Bottom Ash Pond and Ponds 0-8 developed from previous site investigations
  - Photographs will be taken to document CCR removal in excavated areas
  - Quantitative colorimetric analysis will be completed to confirm CCR removal meets objective limits:
    - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content, as described in the Pond 3N Closure Report (Golder, 2017), will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site-specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

Results will be documented in a BC Cobb Bottom Ash Pond and Ponds 0-8 CCR removal documentation report. Detailed descriptions and supporting information to describe the activities proposed to document CCR removal are included in the subsequent sections.

#### 4.2.1.1 Removal Criteria Background

CEC is proposing to implement the same methodology for documenting removal of CCR at BC Cobb Bottom Ash Pond and Ponds 0-8 that was developed for closing JH Campbell Bottom Ash Pond 3N. Various characteristics of CCR were evaluated to determine the feasibility of different methods to document CCR removal including color, density, particle size, and particle shape. Based on evaluation of the material characteristics, color, as determined by visual inspection and confirmed by digital quantitative colorimetric analysis, was determined to be superior to other documentation methods such as centrifuge separation, petrography via microscope, or scanning electron microscopy with electron dispersive X-ray spectroscopy (SEM/EDX) because CCR is significantly darker than the native sand material at the BC Cobb site. The visually-apparent transition from CCR to underlying native materials at the Bottom Ash Pond and Ponds 0-8 is similar to the conditions observed at JHC Bottom Ash Pond 3N/S, which is to be expected since BC Cobb is located approximately 25 miles north of JH Campbell. The density of the CCR and native sands is too similar for centrifugal separation; sieving is not practical due to the overlapping range of particle sizes for the different materials; and SEM/EDX is a different visual/color analysis, which requires complex equipment that cannot be readily mobilized to the field and specific personnel to operate it. Colorimetry allows evaluation of larger sample sizes and is easily adapted for use in the field; thus, it also has the potential for additional sampling to verify reproducibility of results. Therefore, colorimetry was selected as the final and preferred line of evidence to identify and quantify the amount of CCR present in samples collected from the Bottom Ash Pond and Ponds 0-8 excavation footprint.



Some color variability may exist in native soils at the base of the excavation footprint due to their deposition in a fluvial system, and therefore an adaptive testing method has been developed. Based on colorimetric and microscopic evaluation of bottom ash, fly ash, and native soils, Golder found that darker color variations are more likely to occur, which have the effect of causing an over-estimation of the CCR content in the sample (i.e. 'false positive' results) when compared to the typical color of the sand grains that comprise most native soils at BC Cobb (typically the lightest in color of all materials present). If native soil color variability is encountered at one of the grid nodes identified for colorimetric testing, field microscopic quantification of CCR content will be utilized to confirm the CCR removal objective was met.

The composition of CCR and underlying soil samples collected from the Bottom Ash Pond and Ponds 0-8 by drilling (64 samples of CCR and 48 samples of underlying soils) were compared to the MDEQ Cleanup Criteria Requirements for Response Activity, R 299.48 Generic Soil Cleanup Criteria for Non-residential Category Groundwater and Surface Water Interaction (GSI) protection and drinking water protection criteria to determine which constituents could be used as indicators of potential groundwater impacts.

A site-specific threshold for CCR removal was selected as a ratio of CCR and underlying soil that would reduce the boron concentration of the mixed materials to less than the respective non-residential drinking water protection criteria for soil. This quantitative threshold for boron is shown on the graph in Figure 4 – Boron Concentrations in CCR and Native Soils by reading the x-axis value where the trend line between the average (mean) boron concentrations measured in the CCR and the underlying soils intercepts the non-residential drinking water criteria. Based on Figure 4, the threshold for boron is between 5 percent and 10 percent CCR. Therefore, to be conservative, an initial threshold of 5 percent CCR was selected based on the non-residential drinking water protection criteria for boron. The selected threshold of 5 percent CCR is consistent with the threshold established for JHC Ponds 3N/S, which was demonstrated to be achievable during construction.

Cobalt, lithium, mercury, molybdenum, and selenium also occur in samples of CCR from the Bottom Ash Pond and Ponds 0-8 at concentrations that may exceed the GSI or non-residential drinking water protection criteria, but require less removal of CCR than boron to meet the respective criteria. Barium, beryllium, cadmium, chromium (III), copper, fluoride, lead, thallium, and zinc are not included as indicator constituents in this assessment because they were not detected in CCR or they exist in native soils at concentrations greater than their respective GSI protection or drinking water protection criteria. Antimony and silver were not considered, because they were not detected in CCR at concentrations above their respective method detection limits. Arsenic was removed from the list of potential indicator constituents because the state background level exceeds GSI and non-residential drinking water protection criteria and even with complete removal of CCR, any material tested has the potential to exceed the GSI protection criteria for arsenic.





#### 4.2.2 Documentation of CCR Removal Overview

An objective standard of 95 percent CCR removal (i.e. 95 percent sand and 5 percent CCR in the soil mixture at the base of the excavation) has been established. Although the purpose of this work plan is to define methods for removal of CCR as a regulated waste, the 95 percent removal criteria is based on chemical analyses that have shown the criteria to be protective of groundwater based on non-residential drinking water criteria.

Verification of CCR removal will be documented based on the following three lines of evidence:

- First line of evidence – comparison of interim excavation termination grades to known elevations of CCR from previous site characterizations and engineering records
- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes
- Third line of evidence – quantitative colorimetric analysis at random grid nodes to confirm CCR removal
  - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

This multiple lines of evidence approach provides a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The basis for this approach relies on laboratory analyses that demonstrate how the criteria are protective of groundwater. The approach takes advantage of the visible demarcation between CCR and the underlying soil at the base of the Bottom Ash Pond and Ponds 0-8 observed during previous removal activities and in soil borings, and uses these material characteristics to identify and quantify CCR.

##### 4.2.2.1 Documentation of Excavation Grades – First Line of Evidence

The first line of evidence to assess CCR removal activities will be to confirm that excavations are complete to at least the elevation established as the base of CCR from existing information. The elevation of the base of CCR was established based on historical facility information and drilling and sampling completed in the Bottom Ash Pond and Ponds 0-8 in October 2015, May 2017, and November and December 2017. Descriptions of sample materials were used to prepare boring logs for each boring. The boring logs are included in Appendix B – Soil Boring Logs. The boring logs identified CCR up to a depth of 23.2 feet below ground surface in the Bottom Ash Pond [elevation 575 feet (NAVD 88)] and 22.1 feet (12.5 foot of CCR submerged below 9.6 feet of water) in Ponds 0-8 [elevation 565.2 feet (NAVD88)].

Once the excavation has met the horizontal and vertical limits shown in Figure 3, visual observations for the presence of CCR will be completed. Excavated areas that do not meet the CCR removal objective



based on visual inspections within the horizontal CCR removal limits will be excavated further until the CCR removal objective is met.

#### 4.2.2.2 Photographic Documentation – Second Line of Evidence

Consistent with MDEQ guidance, Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM); a 50-foot grid will be established across the excavation area for assessment, and the grid nodes to be sampled will be selected using a random number generator (the outer extent of the grid depends on the materials encountered during excavation). Photographic documentation will be completed on 50 percent of the nodes followed by hand sampling and colorimetric analysis at 50 percent of the photographed nodes.

The excavation surface will be inspected visually to identify residual CCR materials that are present on the exposed surface of the excavation. If CCR is still visible, additional material will be removed.

When no or only minor visible signs of CCR are observed, photographs and written descriptions will be taken at 50 percent of the grid nodes to document the material left in place. The photography procedure will be standardized such that it includes the following elements:

- Photographs will be taken of the general area-wide excavation
- Photographs will be taken of a representative sample measuring approximately one-square-foot area of surficial materials present at the base of the excavation at each grid node
- Photographs will be taken from a standardized height (approximately 2.5 feet) to ensure the same area and level of detail is obtained by each photograph
  - The camera will be positioned directly over the excavated surfaced facing downwards with as little tilt as possible
  - Photographs will have a pixel resolution of 4608 x 3456 (i.e., 15.9 megapixels)

#### 4.2.2.3 Colorimetric Confirmation – Third Line of Evidence

A colorimetric analysis method that utilizes a digital colorimeter instrument to precisely measure the color of a soil sample will be used to verify CCR removal. The analysis will be conducted in general accordance with ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry. The method involves measuring color values of a field sample and converting these values with a color-concentration calibration curve to determine the amount of CCR in the sample.

Colorimetry testing was performed on 14 samples of CCR and 9 samples of native soil obtained from the November and December 2017 investigation to establish end member color values for the different types of material that will be encountered during excavation. Results of the colorimetry analysis used to support the development of a color threshold value are provided in Figure 5. A combination of darker (lower RGB integer value) native soil samples and lighter (higher RGB integer value) CCR samples were selected to



create mixtures of 1%, 2%, 3%, and 5% CCR to develop a series of conservative site-specific color-concentration curves. To be further conservative, the ultimate color threshold, which is included as Figure 6, is based on a series of fly ash and native soil mixtures that produced the lightest color values of the laboratory-prepared mixtures. While a fly ash-native soil contact may only occur in a limited number of locations, a darker contrast is anticipated when bottom ash is in contact with native soil, which is more easily detected. The repeatability of the color-concentration curve at estimating the CCR content and identifying materials that contain more than 5 percent CCR, was validated in the laboratory using blind testing of “unknown” mixtures of low concentrations of CCR (less than 10 percent) prepared by one chemist and analyzed by a different chemist.

The colorimetry method described herein is easily adapted for use in the field and can be performed on replicate samples (three to five readings are typical), which increases the reproducibility of the analysis and allows for rapid response if the readings yield inconsistent results. Because the method has been validated in the laboratory, it does not rely solely on a field expert’s judgement when examining CCR.

Soil samples will be collected from the base of the excavation at randomly-selected locations using the same grid node methodology developed for the photographic documentation. Fifty percent of the photographed grid nodes will be randomly selected for CCR quantification by colorimetry. The samples will be tested in the field to evaluate the presence of CCR materials. These samples will only be collected from grid nodes after the excavation has reached a depth such that there are no visible signs of CCR present in the material on the excavation base and walls.

#### 4.2.2.4 Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence

As previously discussed, color determined by visual inspection and confirmed by colorimetric analysis was determined to be superior to other documentation methods because CCR is significantly darker than the underlying native sand material at BC Cobb. However, our experience documenting CCR removal at JHC Bottom Ash Pond 3N demonstrated that some color variability can exist in certain soils at the base of the excavation footprint and cannot be identified in every instance prior to excavation. If similar conditions exist at the Bottom Ash Pond and Ponds 0-8, field microscopic quantification of CCR content will be utilized to confirm the CCR removal objective was met as an alternative line of physical evidence.

### **4.3 Post-Excavation Monitoring – Phase II**

After removal of the CCR in Phase I, CEC will use the balance of the five-year closure timeframe provided in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h) for two consecutive sampling events.





The current RCRA CCR groundwater monitoring system for BC Cobb Bottom Ash Pond and Ponds 0-8 consists of 23 monitoring wells that are depicted in Figure 1. These monitoring wells were installed during the fourth quarter of 2015 to commence a compliance program pursuant to 40 CFR 257.91(e)(1). This monitoring well network is anticipated to be used to determine compliance with groundwater protection standards and achievement with the standard of clean closure pursuant to 40 CFR 257.102(c).

The initial Annual Groundwater Monitoring and Corrective Action Report for the BC Cobb site was certified by January 31, 2018 with notifications to the State Director and public posting to the CCR Rule Compliance Data and Information website by March 2, 2018. A schedule for the groundwater implementation program is provided in Figure 2. If the groundwater-based standard cannot be achieved following removal and verification that CCR has been removed to the 5 percent threshold standard, then the necessary technical requirements are in place to implement an assessment monitoring program and corrective actions, if necessary.

Groundwater samples collected at BC Cobb are submitted for the analyses specified in 40 CFR 257, Appendix III and IV. The analytical methods and reporting limits for each constituent are summarized in Table 1 - RCRA CCR Constituents from Appendix III and Appendix IV.

There are differences between the CCR RCRA Rule monitoring requirements and MDEQ requirements (e.g. field-filtering). Therefore, a more detailed groundwater monitoring program will be provided to MDEQ upon excavation and verification of CCR removal that will include a Sampling and Analysis Plan (SAP), definition of groundwater monitoring system, and coordination with groundwater sampling protocols and analyses pursuant to State groundwater monitoring requirements. It is anticipated that the existing groundwater monitoring well network will be utilized to collect a subset of field-filtered samples utilizing the analyte list from Rules 450, 451, and 452.



## 5.0 SUMMARY

The intent of this closure work plan is to communicate and achieve agreement with the MDEQ on CEC's plans to self-implement closure by removal of CCR from the Bottom Ash Pond and Ponds 0-8 at BC Cobb in conformance with the CCR RCRA Rule 40 CFR 257.102(c). CEC provided the Notification of Intent to Initiate Closure on March 30, 2018. CEC anticipates obtaining certified closure of the Bottom Ash Pond and Ponds 0-8 by March 2023. To maintain project schedule and procurement of a closure construction contract, CEC requests MDEQ approval of this closure work plan by July 15, 2018.



## 6.0 CLOSING

This closure work plan is respectfully submitted to CEC. If you have questions or require additional information, please contact Mark Bergeon at (920) 491-2500.

Sincerely,

**GOLDER ASSOCIATES INC.**

A handwritten signature in black ink, appearing to read 'H. Davies', with a long horizontal stroke extending to the right.

Hugh Davies  
Senior Geochemist

A handwritten signature in black ink, appearing to read 'Mark Bergeon', with a stylized, cursive script.

Mark Bergeon, PG  
Program Leader, Associate

A handwritten signature in black ink, appearing to read 'Jeff Piaskowski', with a stylized, cursive script.

Jeff Piaskowski, PE  
Senior Project Engineer





## 7.0 REFERENCES

Golder, 2017, J.H. Campbell Bottom Ash Pond 3 N CCR Removal Documentation Interim Report, June 2017.

"Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," Title 40 – Protection of the Environment Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates Inc.**  
**15851 South US 27, Suite 50**  
**Lansing, MI 48906 USA**  
**Tel: (517) 482-2262**  
**Fax: (517) 482-2460**



**Engineering Earth's Development, Preserving Earth's Integrity**

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

## TABLES



**Table 1 – RCRA CCR Constituents from Appendix III and Appendix IV**

**Appendix III to Part 257—Constituents**

Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Boron	EPA 6020B	HNO <sub>3</sub> , pH <2	180	20
Calcium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1,000
Chloride	EPA 300.0	None, <6°C	28	1,000
Fluoride <sup>#</sup>	EPA 300.0	None	28	1,000
pH	Stabilized field measurement	NA	NA	0.1 standard units
Sulfate	EPA 300.0	None, <6°C	28	2,000
Total Dissolved Solids	SM 2540C	None, <6°C	7	1,000

HNO<sub>3</sub> – Nitric acid

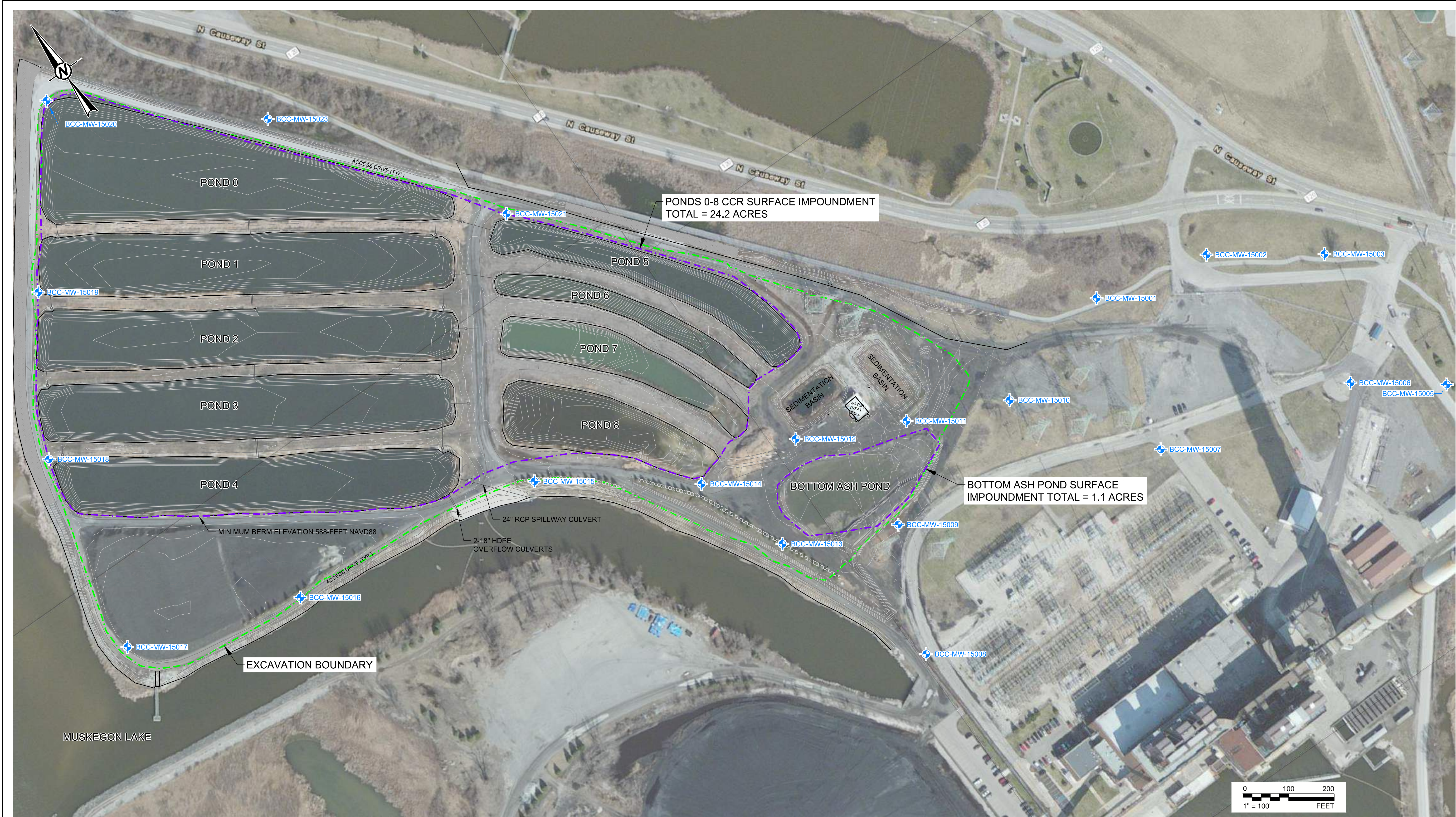
NA – Not applicable

**Appendix IV to Part 257—Constituents**

Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Antimony	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Arsenic	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Barium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	5
Beryllium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Cadmium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	0.2
Chromium, total	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Cobalt	EPA 6020B	HNO <sub>3</sub> , pH <2	180	15
Fluoride <sup>#</sup>	EPA 300	None, <6°C	28	1,000
Lead	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Lithium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	10
Mercury	EPA 7470A	HNO <sub>3</sub> , pH <2	28	0.2
Molybdenum	EPA 6020B	HNO <sub>3</sub> , pH <2	180	5
Selenium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	1
Thallium	EPA 6020B	HNO <sub>3</sub> , pH <2	180	2
Radium 226 and 228 combined <sup>^</sup>	EPA 903.1/904.0	HNO <sub>3</sub> , pH <2	None	1 picocurie per liter

## FIGURES





**LEGEND**

- GROUNDWATER MONITORING WELL
- EXCAVATION BOUNDARY
- SURFACE IMPOUNDMENTS

**REFERENCE(S)**

- TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015.

CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

YYYY-MM-DD	2018-02-27
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN  
MUSKEGON, MI 49445

TITLE  
**GENERAL SITE PLAN**

PROJECT NO. 1667572	CONTROL B013	REV. 0	FIGURE <b>1</b>
------------------------	-----------------	-----------	--------------------

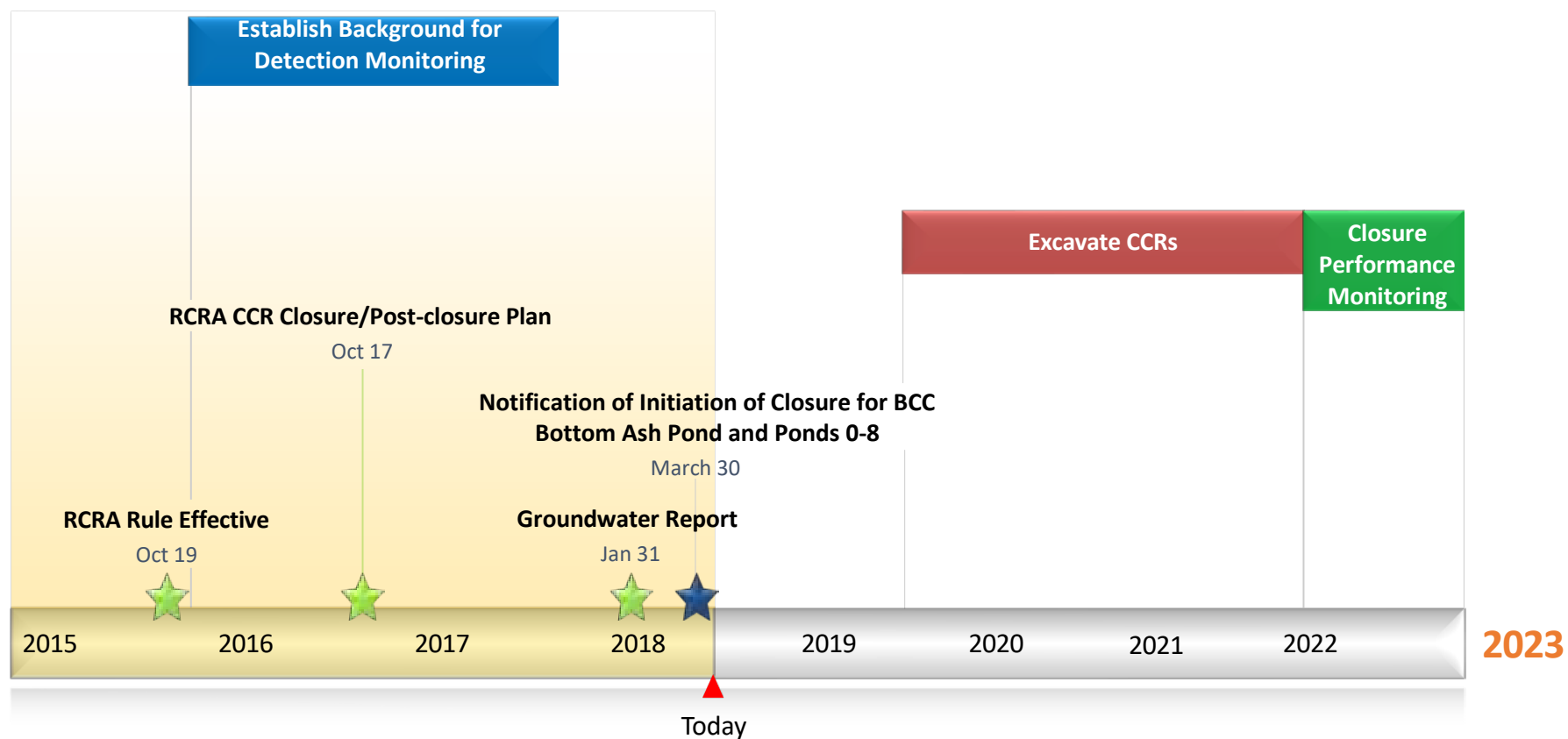
Path: \\uniba\p\cadd\Project\2016\1667572 - Consumers - BC Cobb\PRODUCT\ONB - Closure Strategies | File Name: 1667572B013.dwg

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D





Figure 2 – BC Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule







**BOTTOM OF POND EXCAVATION  
MATCHES 1 FT BELOW BOTTOM  
OF CCR SURFACE (TYP, NOTE 2)**

**INTERIOR POND EXCAVATION SLOPES  
MODELLED AS 2H:1V DOWN TO 1 FT  
BELOW BOTTOM OF CCR SURFACE**

**LEGEND**  
- - - - - EXCAVATION BOUNDARY

- NOTES**
1. BOTTOM OF CCR SURFACE DEVELOPED FROM 2015-2017 SITE INVESTIGATIONS.
  2. 1 FT BELOW BOTTOM OF CCR SURFACE WAS DEVELOPED BY LOWERING THE BOTTOM OF CCR SURFACE VERTICALLY 1 FT.

**CUT VOLUME = 643,910 C.Y.**

CLIENT  
**CONSUMERS ENERGY COMPANY**  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT



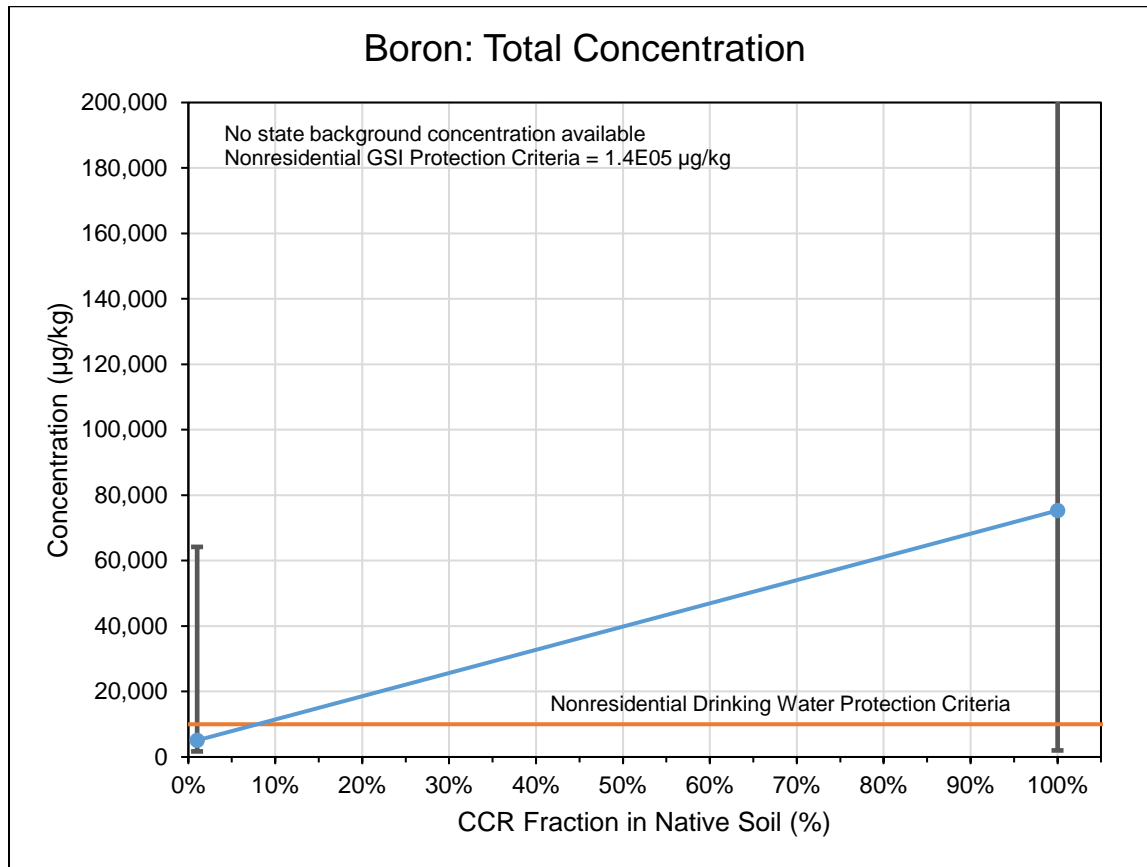
YYYY-MM-DD	2018-02-27
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT  
**B.C. COBB PLANT**  
**BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN**  
MUSKEGON, MI 49445

TITLE  
**BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN**

PROJECT NO. 1667572	CONTROL B014	REV. 1	FIGURE 3
------------------------	-----------------	-----------	-------------



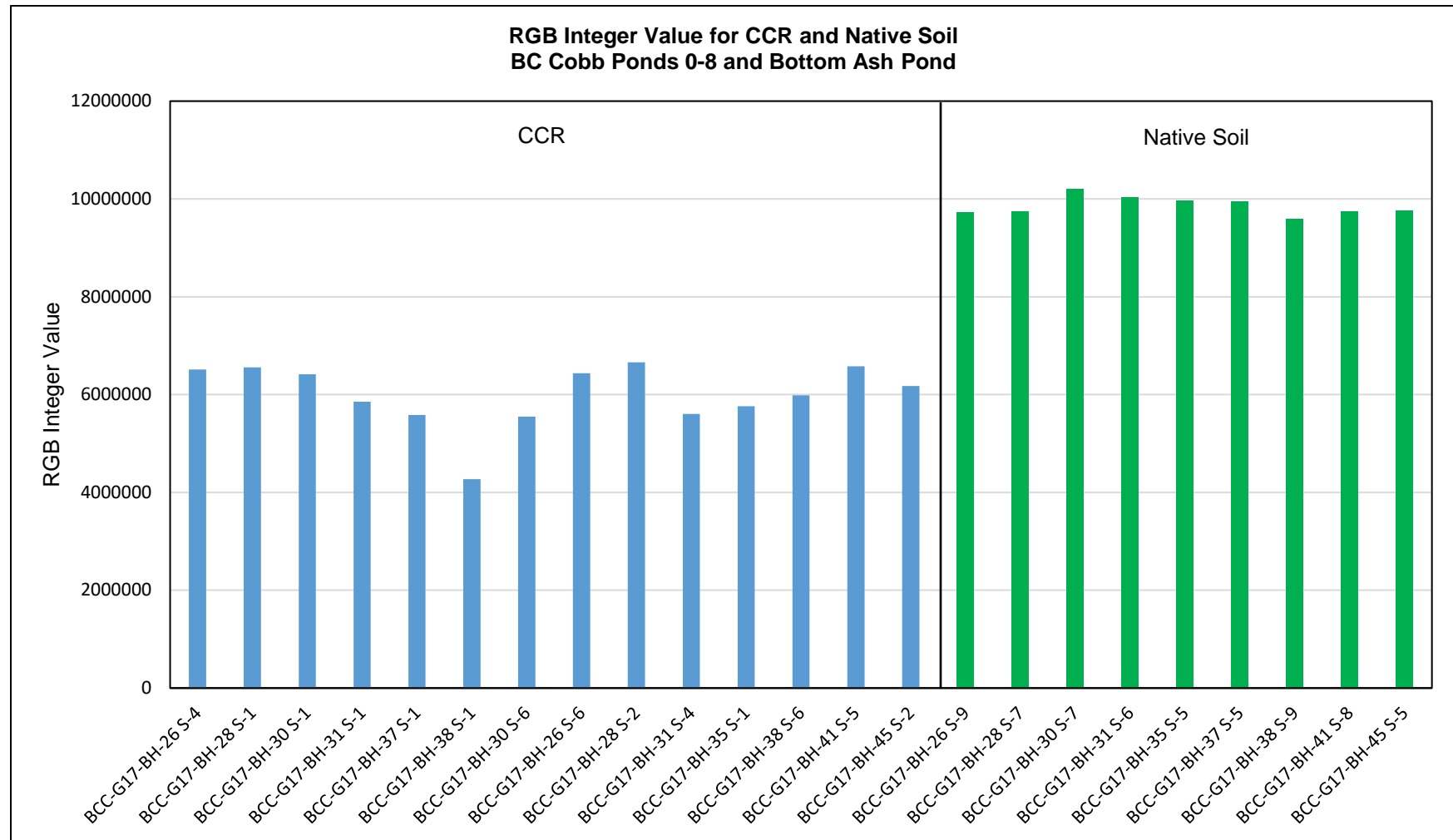
**Figure 4 – Boron Concentrations in CCR and Native Soils****Notes:**

Orange line shows Nonresidential Drinking Water Protection criteria for boron in soil (10,000 µg/kg).  
Blue line shows average metals concentrations in CCR and native soil connected by a trend line to allow comparison.  
Error bars show maximum and minimum concentrations measured in all 64 CCR and 48 underlying native soil samples.



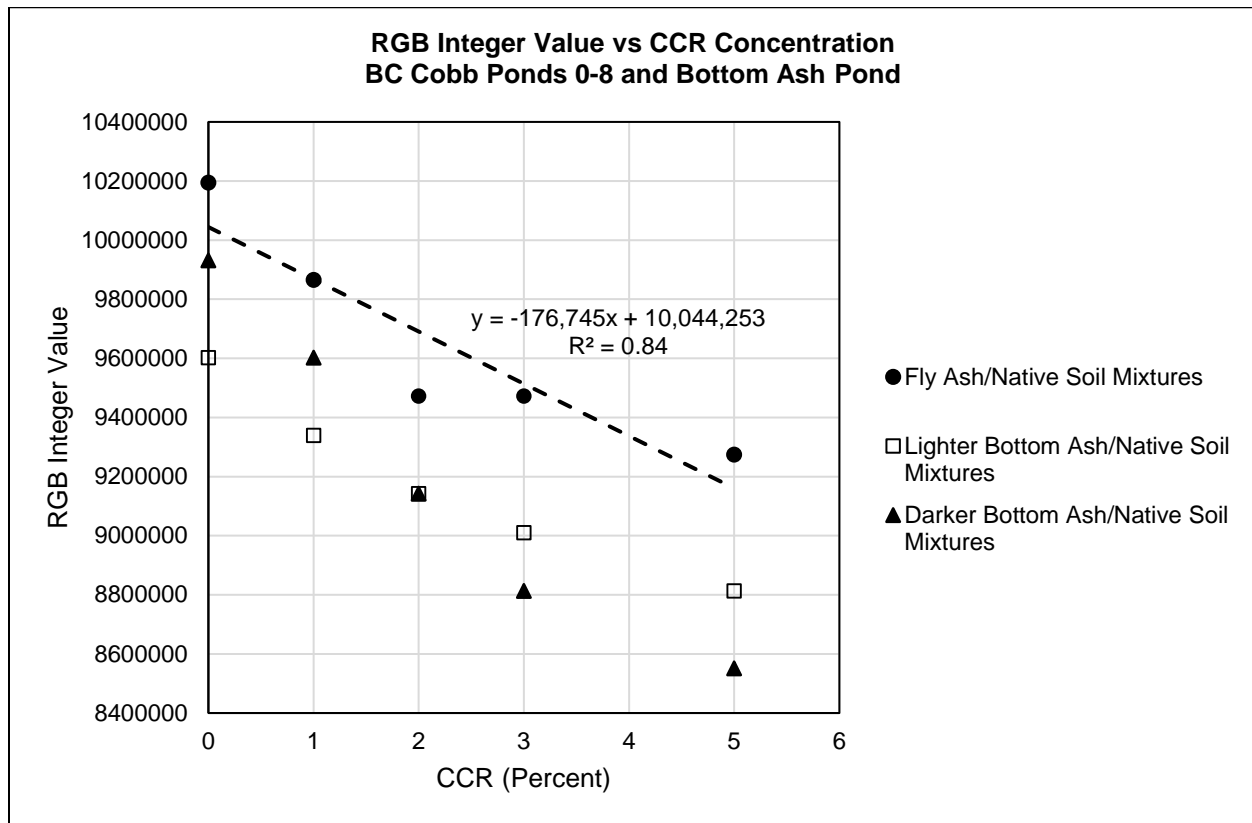


**Figure 5 – Colorimetry Results of CCR and Native Soil**





**Figure 6 – Site-Specific Calibration Curve for Colorimetric Analysis**



**APPENDIX A**  
**SITE BORING PHOTOGRAPHS**



**PHOTOGRAPH 1**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
5.0 – 10.0 ft

**PHOTOGRAPH 2**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
10.0 – 15.0 ft



**PHOTOGRAPH 3**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
14.0 – 15.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 4**

B.C. Cobb  
Bottom Ash Pond  
BCC-G17-BH-10:  
15.0 – 20.0 ft





**PHOTOGRAPH 5**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
0.0 – 2.0 ft

**PHOTOGRAPH 6**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
2.0 – 3.0 ft





**PHOTOGRAPH 7**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
3.0 – 4.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 8**

B.C. Cobb  
Ponds 0-8  
BCC-G15-BH-17:  
4.0 – 5.0 ft



**PHOTOGRAPH 9**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
0.0 – 5.0 ft

**PHOTOGRAPH 10**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
5.0 – 10.0 ft





**PHOTOGRAPH 11**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
6.0 – 7.0 ft  
(CCR-Native Soil  
Contact)

**PHOTOGRAPH 12**

B.C. Cobb  
Interior Berm  
BCC-G17-BH-34:  
10.0 – 15.0 ft





**PHOTOGRAPH 13**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
5.0 – 10.0 ft

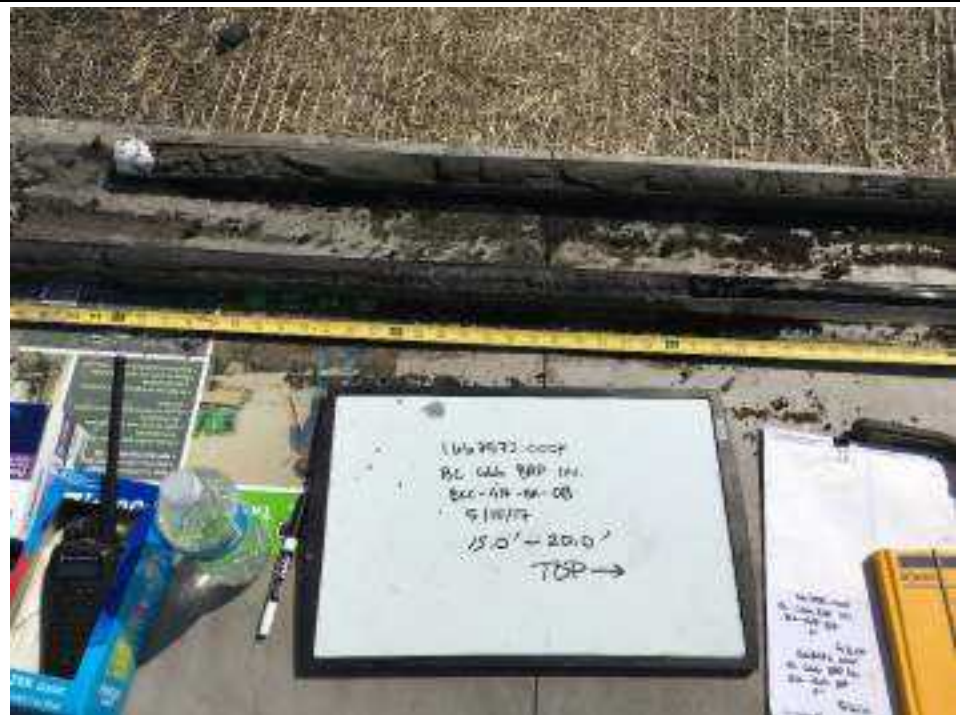
**PHOTOGRAPH 14**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
10.0 – 15.0 ft



**PHOTOGRAPH 15**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
15.0 – 20.0 ft

**PHOTOGRAPH 16**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
20.0 – 25.0 ft





**PHOTOGRAPH 17**

B.C. Cobb  
Exterior Berm  
BCC-G17-BH-08:  
22.0 – 23.0 ft  
(CCR-Native Soil  
Contact)





**APPENDIX B**  
**SOIL BORING LOGS**

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 4  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-01W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-12-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646664.2, E 12622260

SHEET 1 of 1

GS ELEVATION (ft): 585.8  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company												
DRILL NO.: 0010												
INVESTIGATION DATE: 06/06/2012, E 12022200												
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)	
0	Sonic	VEGETATION:										
		0.0 - 8.5 WATER.										
5												
		8.5 - 16.8 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			577.3							
10					8.5	1	3.10 5.00	1	SONIC	●	●	
								2	SONIC	●	●	
15						2	5.00 5.00	3A 3B	SONIC SONIC	● ●	● ●	
		16.8 - 18.5 ORGANICS, some fine sand, brown, wood debris, wet.			569.0 16.8							
					567.3							
20			18.5 - 26.4 (SP) SAND, poorly graded, fine, brown, wood debris and decomposing organics, non-cohesive, wet.	SP	18.5	3	5.00 5.00	4	SONIC	●	●	
25												
		26.4 - 31.8 (OL) ORGANIC SANDY SILT, trace to some clay, trace sand, brown, cohesive, wet, firm.	OL	559.4 26.4	4	5.00 5.00	5	SONIC	●	●		
30												
		31.8 - 33.5 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP	554.0 31.8	5	5.00 5.00						
35		Boring completed at 33.5 ft.		552.3								
		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.5 feet.										
40												

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 3  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-02W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-12-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646804.4, E 12622348

SHEET 1 of 1

GS ELEVATION (ft): 586.7  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company												
DRILL NO.: SONIC												
INVESTIGATION DATE: 06/06/2014, LOCATION: N 3400047, E 12622046												
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)	
0	Sonic	0.0 - 8.3 WATER.										
5												
10		8.3 - 17.3 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wood debris, wet, soft to firm.			578.4 8.3	1	3.80 4.00	1	SONIC			
15						2	2.10 5.00					
20		17.3 - 18.9 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		569.4 17.3			2	SONIC			
		18.9 - 19.7 ORGANICS, decomposing, brown, wood debris, wet.			567.8 18.9 567.0	3	5.00 5.00	3	SONIC			
		19.7 - 27.3 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		19.7			4	SONIC			
25						4	5.00 5.00					
30		27.3 - 28.8 ORGANICS, decomposing, brown, peat-like wood debris, wet.			559.4 27.3			5	SONIC			
		28.8 - 32.3 (SM) SILTY SAND, some clay, trace organics, brown, cohesive, wet, firm.	SM		557.9 28.8	5	5.00 5.00					
35		Boring completed at 32.3 ft.										
40		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.3 feet.										

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 2  
 CLIENT: Consumers Energy Company






# RECORD OF BOREHOLE BCC-G15-BH-03W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-12-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646952.5, E 12622410

SHEET 1 of 1

GS ELEVATION (ft): 587.2  
 TOC ELEVATION: ---

PROJECT: Consumers Energy Company													
DRILL NO.: SONIC													
WIDOW HILL DRIVE CROOKED: N 64002.0; E 120224.0													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 8.1 WATER.											
5													
10		8.1 - 10.6 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			579.1 8.1	1	3.60 4.00	1A 1	SONIC SONIC		●	●	
15		10.6 - 17.1 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		576.6 10.6	2	2.50 3.00	1B 2	SONIC SONIC		● ●	● ●	
20		17.1 - 18.1 ORGANICS, decomposing, brown, wood debris, wet.			570.1 17.1	3	5.00 5.00	3	SONIC		●	●	
25		18.1 - 24.8 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		569.1 18.1	4	5.00 5.00						
30		24.8 - 30.1 (SM) SILTY SAND, fine, trace to some clay, brown to black, cohesive, wet, stiff.	SM		562.4 24.8	5	5.00 5.00	4 5	SONIC SONIC		● ●	● ●	
35		Boring completed at 30.1 ft.			557.1								
40		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.1 feet.											

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 1  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-04W


DRILLING METHOD: Sonic  
 DRILLING DATE: 10-6-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 647066.6, E 12622525

SHEET 1 of 1

GS ELEVATION (ft): 587.3  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 9.6 WATER.											
5													
10		9.6 - 14.6 (CCR) COAL COMBUSTION RESIDUALS, some silt, dark gray to brown, wood debris, wet, soft to firm.			577.7 9.6	1	4.50 5.00	1	SONIC	●	●		
								2	SONIC	●	●		
15		14.6 - 19.6 No recovery, assumed to be CCR.			572.7 14.6	2	0.00 5.00						
20		19.6 - 22.1 (CCR) COAL COMBUSTION RESIDUALS, some silt, dark gray to brown, wood debris, wet, soft to firm.			567.7 19.6	3	4.20 5.00	3	SONIC	●	●		
25		22.1 - 26.6 (SP) SAND, poorly graded, fine, trace silt, brown, wood debris, non-cohesive, wet.	SP		565.2 22.1								
		26.6 - 28.1 (SP) SAND, poorly graded, coarse, trace gravel, brown, non-cohesive, wet.	SP		560.7 26.6	4	5.00 5.00						
30		28.1 - 29.6 (SP) SAND, poorly graded, fine, trace silt, brown, non-cohesive, wet.	SP		559.2 28.1			4	SONIC	●	●		
		29.6 - 31.6 (OL) ORGANIC SILTY SAND, brown, wood debris, cohesive, wet.	OL		557.7 29.6			5	SONIC	●	●		
35		31.6 - 34.6 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP	555.7 31.6	5	5.00 5.00							
		Boring completed at 34.6 ft.		552.7									
40		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 9.6 feet.											



DEPTH SCALE: 1 in to 5 ft  
DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
DRILLER: Jim / Dave

LOGGED: MMJ  
CHECKED: JRP  
DATE: 11/18/2015

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 0  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-05W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-6-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 647293.5, E 12622650

SHEET 1 of 1

GS ELEVATION (ft): 587.3  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	VEGETATION:											
		0.0 - 9.8 WATER.											
5													
10		9.8 - 10.8 (OL) ORGANIC SILT, trace sand, brown, wood debris, cohesive, wet.	OL		577.5 9.8 576.5 10.8			1	SONIC	●	●		
		10.8 - 17.8 (SP) SAND, poorly graded, medium, brown, non-cohesive, wet.	SP			1	4.50 5.00						
15							2	3.00 3.00	2	SONIC	●	●	
		Boring completed at 17.8 ft.			569.5								
20		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 9.8 feet.											
25													
30													
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS					
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION				
					DEPTH (ft)												
0	Sonic	0.0 - 20.0 (CCR) COAL COMBUSTION RESIDUALS, trace fine sand, dark gray, wood debris, moist to wet, soft to firm.															
		1											0.00 8.00	1	GRAB		
		2											1.50 2.00	2	SONIC		
		3											2.00 10.00	3	SONIC		
		4											5.00 5.00	4	SONIC		
		5											5.00 5.00	5			
20		20.0 - 24.5 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		567.6 20.0												
25		24.5 - 25.0 (SM) SILTY SAND, fine, brown, non-cohesive, wet.	SM		563.1 562.6 25.0	5	5.00 5.00										
		25.0 - 28.0 ORGANICS, some fine sand, brown, peat-like wood debris, organic smell, wet.			559.6 28.0 558.6 29.0 557.6												
		28.0 - 29.0 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP														
30		29.0 - 30.0 (OL) ORGANIC SILTY SAND, fine, brown, wet.	OL														
		Boring completed at 30.0 ft. NOTES: 1. Air vacuumed to 8 feet bgs to confirm no utilities.															

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Interior Berm  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-07

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-22-15  
 DRILL RIG: Geo 8140DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646707.3, E 12622618

SHEET 1 of 1

GS ELEVATION (ft): 589.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Hand Auger	0.0 - 3.0 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, red to brown, partially cemented, moist.			586.0	1	5.00 5.00	1	AUGER	●	●	4-inch-thick layer of poorly graded, fine sand	
		3.0 - 9.5 (CCR) COAL COMBUSTION RESIDUALS, fine, dark gray, wet, soft to firm.			3.0					●	●		
5	Sonic					2	4.80 5.00	2	SONIC	●	●		
		9.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS, with fine to medium sand, dark gray, wet, soft.			579.5								
10					9.5	3	2.50 5.00	3	SONIC	●	●		
		15.0 - 26.0 (SP) SAND, poorly graded, fine, brown to gray, wood debris, non-cohesive, wet.			574.0								
15					15.0	4	4.80 5.00	4	SONIC	●	●		
20			SP			5	5.00 5.00						
25					563.0								
		26.0 - 30.0 (OL) ORGANIC SANDY SILT, fine, brown, wood debris, wet, firm.			26.0	6	5.00 5.00			●	●		
30			OL		559.0								
		Boring completed at 30.0 ft.											
		NOTES: 1. Hand augered to 5 feet bgs to confirm no utilities.											
35													
40													



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Dan M

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Interior Berm  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-08

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-22-15  
 DRILL RIG: Geo 8140DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646976.8, E 12622792

SHEET 1 of 1

GS ELEVATION (ft): 590.1  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Hand Auger	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, fine to medium, black, moist.				1	5.00 5.00	1	AUGER		●	●	Bottom foot of CCR mixed with wood debris  <

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Dan M

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 4  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-09W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-12-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646316.5, E 12622812

SHEET 1 of 1

GS ELEVATION (ft): 585.8  
 TOC ELEVATION: ---

SOIL PROFILE													RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS
DEPTH (ft)	BORING METHOD	DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER	TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)	GRAIN SIZE DISTRIBUTION									
					DEPTH (ft)															
0	Sonic	0.0 - 8.5 WATER.																		
5																				
10		8.5 - 11.0 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			577.3 8.5	1	2.50 2.50	1	SONIC											
15		11.0 - 22.3 (SP) SAND, poorly graded, fine to medium, trace to some silt, dark gray to brown, wood debris, organic smell, non-cohesive, wet.	SP		574.8 11.0	2	5.00 5.00	2	SONIC											
20						3	5.00 5.00	3	SONIC											
25						5	SONIC													
30		22.3 - 23.5 ORGANICS, decomposing, brown, wood debris, wet.			563.5 22.3	4	5.00 5.00	4												
35		23.5 - 26.0 (SP) SAND, poorly graded, fine, trace organics, brown, non-cohesive, wet.	SP		562.3 23.5															
40					559.8															
45		Boring completed at 26.0 ft.																		
50		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.5 feet.																		

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 3  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-10W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-12-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646439.2, E 12622871

SHEET 1 of 1

GS ELEVATION (ft): 586.7  
 TOC ELEVATION: ---

CELESTITY - Consumers Energy Company												
DRILL LOG - SONIC												
W 400 W 17 E 111 S 00												

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 2  
 CLIENT: Consumers Energy Company






# RECORD OF BOREHOLE BCC-G15-BH-11W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-13-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646564.7, E 12622964

SHEET 1 of 1

GS ELEVATION (ft): 587.2  
 TOC ELEVATION: ---

CONSUMERS ENERGY COMPANY DRILLING: SONIC WIDENING DRIVE CROSSING: N 6400477, E 12022004														
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS		
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION	
					DEPTH (ft)									
0	Sonic	0.0 - 7.3 WATER.												
5														
		7.3 - 10.1 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			579.9 7.3	1	3.40 3.50	1	SONIC		●	●		
10					577.1 10.1			2	SONIC		●	●		
		10.1 - 23.8 (SP) SAND, poorly graded, fine, brown, wood debris, wet.	SP			2	5.00 5.00	3	SONIC		●	●		
15														
20					3	5.00 5.00	4	SONIC		●	●			
25		23.8 - 25.8 (CL) CLAY, assumed (see NOTES below).	CL		563.4 23.8	4	1.50 5.00	5	SONIC		●	●		
					561.4									
		Boring completed at 25.8 ft.												
		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 7.3 feet. 3. At 23.8 feet, drillers noticed a change in material consistency while sampling (more difficult to drive sampler). The drillers suspected organic silt/clay. The sample was lost during recovery.												
30														
35														
40														

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 1  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-12W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-6-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646715.7, E 12623058

SHEET 1 of 1

GS ELEVATION (ft): 587.3  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 6.4 WATER.											
5													
		6.4 - 15.9 (CCR) COAL COMBUSTION RESIDUALS, some organics, dark gray, wet, soft to firm.			580.9 6.4	1	2.00 5.00	1	SONIC	●	●		
10						2	5.00 5.00	2	SONIC	●	●		
15													
		15.9 - 27.9 (SP) SAND, poorly graded, fine, trace organics, dark greenish gray, non-cohesive, wet.	SP		571.4 15.9	3	4.00 5.00	3	SONIC	●	●		
20													
25													
		27.9 - 31.4 (OL) ORGANIC SILTY SAND, brown, wood debris, cohesive, wet.	OL		559.4 27.9	5	5.00 5.00	4	SONIC	●	●		
30													
		Boring completed at 31.4 ft.											
		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 6.4 feet.											
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 0  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-13W


DRILLING METHOD: Sonic  
 DRILLING DATE: 10-5-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646823.3, E 12623138

SHEET 1 of 1

GS ELEVATION (ft): 587.3  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 10.7 WATER.											
5													
10													
10.7		10.7 - 13.7 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, firm.		△ △ △ △ △	576.6 10.7	1	4.20 5.00	1	SONIC	●	●		
13.7		13.7 - 15.7 (CCR) COAL COMBUSTION RESIDUALS, mixed with fine sand, dark gray, wood debris, organic smell, wet.		△ △ △ △ △	573.6 13.7								1A
15		15.7 - 22.7 (SP) SAND, poorly graded, fine, trace silt, dark gray to brown, wood debris, organic smell, non-cohesive, wet.	SP	△ △ △ △ △	571.6 15.7	2	5.00 5.00	2	SONIC	●	●		
20													
22.7	22.7 - 24.7 (OL) ORGANIC SANDY SILT, dark brown, trace wood debris, organic smell, cohesive, wet, soft.	OL	△ △ △ △ △	564.6 22.7	3	5.00 5.00	3	SONIC	●	●			
24.7	24.7 - 25.7 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP	△ △ △ △ △	562.6 24.7 561.6									
25	Boring completed at 25.7 ft.												
	NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 10.7 feet.												
30													
35													
40													



DEPTH SCALE: 1 in to 5 ft  
DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
DRILLER: Jim / Dave

LOGGED: JRP  
CHECKED: JRP  
DATE: 11/18/2015

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: JRP  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 8  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-14W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-9-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646232.4, E 12623151

SHEET 1 of 1

GS ELEVATION (ft): 592.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 5.8 WATER.											
5		5.8 - 14.7 (CCR) COAL COMBUSTION RESIDUALS, some sand, light gray to dark gray, partially cemented, wood debris at bottom, wet. Drillers observed increased difficulty driving sampler into material.			586.2	1	4.50 5.00	1	SONIC				
					5.8							2	SONIC
10					2		4.70 5.00		3			SONIC	
15		14.7 - 25.8 (SP) SAND, poorly graded, fine, brown, wet.	SP		577.3	3	5.00 5.00	4	SONIC				
					14.7							4	3.00 5.00
20													
25					566.2								
			Boring completed at 25.8 ft.										
		NOTES: 1. Auger refusal at 25.8 feet. 2. Drilled from a barge. 3. Mud line at 5.8 feet.											
30													
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 7  
 CLIENT: Consumers Energy Company

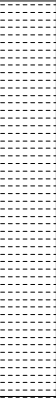


# RECORD OF BOREHOLE BCC-G15-BH-15W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-8-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646401.7, E 12623240

SHEET 1 of 1

GS ELEVATION (ft): 592.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 10.3 WATER.											
5													
10		10.3 - 17.3 (CCR) COAL COMBUSTION RESIDUALS, dark gray, behaves as a slurry in upper 5 feet, wet, soft.			581.7 10.3	1	4.80 5.00	1	SONIC	●	●		
15								4	SONIC	●	●		
20		17.3 - 30.3 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		574.7 17.3	2	3.00 5.00	2	SONIC		●		
25							3	4.80 5.00	3	SONIC	●	●	
30							4	4.60 5.00					
30						561.7							
35			Boring completed at 30.3 ft.  NOTES: 1. Auger refusal at 30.3 feet. 2. Drilled from a barge. 3. Mud line at 10.3 feet.										
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 6  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-16W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-8-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646488.6, E 12623269

SHEET 1 of 1

GS ELEVATION (ft): 588.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 8.1 WATER.											
5													
10		8.1 - 15.2 (CCR) COAL COMBUSTION RESIDUALS, dark gray, behaves as a slurry in upper 5 feet, wet, very soft.			579.9 8.1	1	0.00 5.00	1	SONIC		●		
15					572.8 15.2	2	4.10 5.00	2	SONIC		●	●	
20		15.2 - 27.1 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP			3	5.00 5.00	3	SONIC		●	●	
25						4	5.00 5.00	4	SONIC			●	
30			27.1 - 28.1 (ML-SM) SANDY SILT, brown, wood debris, organic smell, cohesive, wet, firm.	ML-SM									
		Boring completed at 28.1 ft.											
		NOTES: 1. Drilled from a barge. 2. Mud line at 8.1 feet.											
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 5  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-17W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-7-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646582, E 12623329

SHEET 1 of 1

GS ELEVATION (ft): 587.5  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													DRILL NO.: SONIC													NAD83 WIT LINE COORDS: N 640062, E 1262062												
DEPTH (ft)	BORING METHOD	SOIL PROFILE				RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS																									
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER	TYPE		ENVIRONMENTAL (SPL & TOTAL METALS)	GRAIN SIZE DISTRIBUTION																										
					DEPTH (ft)																																	
0	Sonic	0.0 - 10.2 WATER.																																				
5																																						
10		10.2 - 13.7 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.		△ △ △ △ △ △	577.3 10.2	1	4.50 5.00	1	SONIC		●	●																										
15		13.7 - 20.2 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		573.8 13.7	2	5.00 5.00	1A 4	SONIC SONIC		●	●																										
20		20.2 - 23.7 (SM) SILTY SAND, brown, cohesive, wet, stiff.	SM		567.3 20.2	3	5.00 5.00	2	SONIC		●	●																										
25		23.7 - 30.2 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		563.8 23.7	4	6.00 6.00																															
30		30.2 - 31.2 (SM) SILTY SAND, fine, trace clay, brown, cohesive, wet, stiff.	SM		557.3 30.2 556.3			3	SONIC		●	●																										
35		Boring completed at 31.2 ft.																																				
40	NOTES: 1. Drilled from a barge. 2. Mud line at 10.2 feet.																																					

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 7  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-18W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-9-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646227.8, E 12623359

SHEET 1 of 1

GS ELEVATION (ft): 592.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 4.7 WATER.											
5		4.7 - 16.5 (CCR) COAL COMBUSTION RESIDUALS, some organics, dark gray, layer of wood debris at base, wet, soft.			587.3 4.7	1	5.00 5.00	1	SONIC				
10						2	2.90 5.00	2	SONIC				
15								3	SONIC				
20						3	3.90 5.00	4	SONIC				
25		16.5 - 29.7 (SP) SAND, poorly graded, fine to medium, dark gray to brown, non-cohesive, wet.	SP										
30													
35													
40													

NOTES:  
 1. Drilled from a barge.  
 2. Mud line at 4.7 feet.

DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 6  
 CLIENT: Consumers Energy Company






# RECORD OF BOREHOLE BCC-G15-BH-19W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-8-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646210.6, E 12623476

SHEET 1 of 1

GS ELEVATION (ft): 588.0  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 5.0 WATER.											
5		5.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			583.0 5.0	1	4.80 5.00	1	SONIC	●	●		
								2	SONIC	●	●		
10		10.0 - 20.0 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet, compact to dense.	SP		578.0 10.0	2	5.00 5.00	3	SONIC		●		
									4	SONIC		●	
15													
20		Boring completed at 20.0 ft.			568.0								
		NOTES: 1. Auger refusal at 20.0 feet. 2. Drilled from a barge. 3. Mud line at 5.0 feet.											
25													
30													
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: Pond 5  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-20W


DRILLING METHOD: Sonic  
 DRILLING DATE: 10-7-15  
 DRILL RIG: Sonic

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646222.6, E 12623590

SHEET 1 of 1

GS ELEVATION (ft): 587.5  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLER: SONIC													
ADDRESS: 14500 W. LANE C CORDO: N 640222.0; E 1262933.0													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SP) & TOTAL METALS		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 8.6 WATER.											
5													
10		8.6 - 11.6 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			578.9 8.6			1	SONIC		●	●	
15		11.6 - 23.6 (SP) SAND, poorly graded, fine, trace silt, brown, wood debris, non-cohesive, wet, dense.	SP		575.9 11.6	1	5.00 5.00	1A	SONIC		●		
20						2	5.00 5.00	2	SONIC		●	●	
25						3	4.50 5.00	3	SONIC			●	
30		Boring completed at 23.6 ft.											
35		NOTES: 1. Auger refusal at 23.6 feet. 2. Drilled from a barge. 3. Mud line at 8.6 feet.											
40													



DEPTH SCALE:1 in to 5 ft

DRILLING CONTRACTOR: Ann Arbor Tech Serv.

DRILLER: Jim / Dave

LOGGED: MMJ

CHECKED: JRP

DATE: 11/18/2015

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Ann Arbor Tech Serv.  
 DRILLER: Jim / Dave

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015



PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: EQ Basin  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-21W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-22-15  
 DRILL RIG: Geo 8140DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645691.3, E 12623547

SHEET 1 of 1

GS ELEVATION (ft): 591.4  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	0.0 - 4.5 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, gray to brown, partially cemented, wet.			586.9	1	4.00 5.00	1	SONIC				
5		4.5 - 19.0 (CCR) COAL COMBUSTION RESIDUALS, fine, trace gravel and slag, dark gray, wet, firm.			4.5	2	3.50 5.00	2	SONIC				
10						3	4.50 5.00	3	SONIC				
15						4	1.00 5.00						
20		19.0 - 19.5 (OL) ORGANIC SILT, brown, peat-like wood debris, wet. 19.5 - 25.0 (SP) SAND, poorly graded, fine to medium, trace to some organic silt, brown, wood debris, non-cohesive, wet.	OL  SP		572.4 571.9 19.5	5	5.00 5.00	4	SONIC				
25	Boring completed at 25.0 ft.												
30	NOTES: 1. Basin drained immediately prior to drilling.												
35													
40													

NOTES:  
 1. Basin drained immediately prior to drilling.

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Dan/John

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb Ash Pond  
 PROJECT NUMBER: 1540973  
 LOCATION: EQ Basin  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G15-BH-22W

DRILLING METHOD: Sonic  
 DRILLING DATE: 10-22-15  
 DRILL RIG: Geo 8140DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645718.3, E 12623643

SHEET 1 of 1

GS ELEVATION (ft): 590.5  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Sonic	VEGETATION:											
		0.0 - 4.5 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, gray to brown, parially cemented, wet.			586.0	1	2.80 5.00	1	SONIC		●	●	
					4.5								
5		4.5 - 7.5 (CCR) COAL COMBUSTION RESIDUALS, medium to fine, trace gravel and slag, reddish brown, wet.			583.0	2	4.60 5.00	2	SONIC		●	●	
					7.5								
		7.5 - 16.5 (CCR) COAL COMBUSTION RESIDUALS, fine, dark gray, wet, firm to soft.											
10						3	4.70 5.00	3	SONIC		●	●	
15													
					574.0								
		16.5 - 17.5 ORGANICS, brown, peat-like wood debris, wet.		16.5									
		17.5 - 24.5 (SP) SAND, poorly graded, fine, brown, wood debris, wet.		573.0	4	4.50 5.00	4	SONIC		●	●		
20				17.5									
							5	4.80 5.00					
25		24.5 - 25.0 (OL) ORGANIC SILT, with peat, brown, wood debris, organic smell, wet.	OL		566.0								
		Boring completed at 25.0 ft.		565.5									
		<u>NOTES:</u> 1. Basin drained immediately prior to drilling.											
30													
35													
40													

DUL BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16



DEPTH SCALE: 1 in to 5 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Dan/John

LOGGED: MMJ  
 CHECKED: JRP  
 DATE: 11/18/2015

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Storage Area  
 CLIENT: Consumers Energy Company













# RECORD OF BOREHOLE BCC-G17-BH-01


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646509.5, E 12622232.1

SHEET 1 of 1

GS ELEVATION (ft): 586  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 00207													
NAD83 METER LINE-3 COORDS: N 44309.3, E 1202232.7													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPR & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry, compact.			584.0	1	5.00 5.00	1	GP			6 ft   5.5' soft woody debris	
		2.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, stiff.			2.0			2	GP				
5						3	GP						
						4	GP						
10		10.0 - 13.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet, soft.			576.0 10.0	3	5.00 5.00	5	GP				
					572.9			6	GP				
15		13.2 - 13.4 (OL) ORGANIC SILT, low plasticity black, decomposing odor, cohesive, wet, soft.	OL		13.4	4	2.60 5.00	7	GP				
		13.4 - 15.0 (SP) SAND and CCR - Fly Ash, poorly graded, fine, gray, trace woody debris, wet.	SP		571.0 15.0			8	GP				
		15.0 - 18.0 (SP) SAND, poorly graded, medium to fine, gray, trace organics, wet.	SP		568.0			9	GP				
		18.0 - 18.8 (OL) ORGANIC SILT, brown, with wood debris, cohesive, wet.	OL		567.3 18.8			10	GP				
20		18.8 - 20.0 (SP) SAND, poorly graded, medium to fine, brown, trace organics, wet.	SP		566.0								
		Boring completed at 20.0 ft.											
25													
30													
35													
40													
45													



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Storage Area  
 CLIENT: Consumers Energy Company







# RECORD OF BOREHOLE BCC-G17-BH-02

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646352.6, E 12622180.3

SHEET 1 of 1

GS ELEVATION (ft): 584.1  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 0020D1													
NAD83 METER LINE-3 COORDS: N 493332.0, E 12022100.0													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, dry, compact.				1	4.50 5.00	1	GP				
5		5.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, dark gray, dry to wet.			579.1 5.0	2	4.50 5.00	3	GP			6 ft 	
10						3	5.00 5.00	5	GP				
15		14.2 - 15.0 (OL) ORGANIC SILT, low plasticity, black, cohesive, wet, soft.	OL		569.9 15.0	4	3.50 5.00	8	GP			16' woody debris	
		15.0 - 18.0 (SP) SAND, poorly graded, fine, gray, wet.	SP		566.1 18.0								
		18.0 - 20.0 (OL) ORGANIC SILT, brown, with wood debris, cohesive, wet.	OL		564.1								
20		Boring completed at 20.0 ft.					9	GP			18'-20' wood debris throughout		
25													
30													
35													
40													
45													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Storage Area  
 CLIENT: Consumers Energy Company









# RECORD OF BOREHOLE BCC-G17-BH-03

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646372.1, E 12622334.5

SHEET 1 of 1

GS ELEVATION (ft): 584.4  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company														
DRILLING: GCS 002021														
NAD83 METER LINE-3 COORDS: N 44372.1, E 12022304.3														
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS		
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION	
					DEPTH (ft)									
0	Geoprobe	VEGETATION:												
		0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, contains unburnt coal, dry.				1	4.50 5.00	1 2 3	GP GP GP			6 ft 		
		2.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, dark gray, dry, soft.												
		2.5 - 3.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry, compact.												
		3.0 - 6.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, soft.				2	5.00 5.00	4 5 6	GP GP GP					
		6.5 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, wet.												
		8.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet.												
		13.0 - 15.0 (SP) SAND, poorly graded, medium to fine, gray, trace wood debris, wet.	SP			3	4.50 5.00	7 8	GP GP					
15			Boring completed at 15.0 ft.						9	GP				15' layer of black organic silt
20														
25														
30														
35														
40														
45														

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Storage Area  
 CLIENT: Consumers Energy Company




# RECORD OF BOREHOLE BCC-G17-BH-04


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646323.1, E 12622481.6

SHEET 1 of 1

GS ELEVATION (ft): 585.3  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company																	
DRILLING: Geo 002001																	
NAD83 METER LINE-3 COORDS: N 443025.1, E 12022401.0																	
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS					
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION				
					DEPTH (ft)												
0	Geoprobe	0.0 - 1.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry.			583.8	1	5.00 5.00	1	GP			5 ft 					
1.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, soft.				1.5	2 3								GP GP				
					2	5.00 5.00	4	GP									
									5	GP							
											6		GP				
					7	GP											
							8	GP									
5												8.7'-10' contains trace sand					
10												13' interbedded woody debris throughout, black organic silt					
15		13.0 - 15.0 (SP) SAND, medium to fine, gray, decomposing odor, wet.	SP		572.3 13.0 570.3	3	5.00 5.00	9	GP								
		Boring completed at 15.0 ft.															
20																	
25																	
30																	
35																	
40																	
45																	



Golder

Associates

DEPTH SCALE:1 in to 5.6 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: JTT

CHECKED: MMJ

DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Storage Area  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-05

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646272.5, E 12622618.1

SHEET 1 of 1

GS ELEVATION (ft): 586.5  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: CEC 002007													
NAD83 METER LINE-3 COORDS: N 49272.3, E 12022010.7													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	VEGETATION:											
		0.0 - 3.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, trace slag, dry.				1	4.30 5.00	1	GP			5.5 ft    ▼	
		3.0 - 4.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry.		△ △	583.5 3.0 582.5								
					4.0								
		4.0 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, moist.			581.0	2	5.00 5.00	3	GP	GP			
				△ △	5.5								
		5.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet, soft.		△ △<									

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-06

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645781.7, E 12623379.4

SHEET 1 of 1

GS ELEVATION (ft): 594.7  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 0020D1													
NAD83 METER LINE-3 COORDS: N 43701.7, E 12023379.4													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 12.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, dark gray to black, trace slag.					1	5.00	1	GRAB			
5									2	GRAB			
	Geoprobe					2	5.00 5.00	3	GP				
								4	GP				
10						3	3.80 5.00	5	GP				
								6	GP				
								7	GP				
								8	GP				
15								9	GP				
								10	GP				
		12.8 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			581.9 581.4								
		13.3 - 13.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.			580.2 579.7								
		13.6 - 14.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			15.0								
		14.0 - 14.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			577.7 17.0								
		14.0 - 14.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.			575.7 575.2								
20		OL						12	GP				
								13	GP				
	14.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			19.5				14	GP				
	15.0 - 17.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.												
		SP											
	17.0 - 19.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.												
25				569.7									
						</							

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Jo

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-07


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-18-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645619.6, E 12623449.8

SHEET 1 of 1

GS ELEVATION (ft): 595.1  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 00207													
NAD83 METER LINE-3 COORDS: N 43019.0, E 1202349.0													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 7.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, dark gray to red brown, some oxidation, dry.				1	5.00	1	GRAB				
5									2	GRAB			
	Geoprobe	7.5 - 9.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, dark gray to red brown, oxidized, dry.		△ △ △ △ △ △	587.6 7.5	2	4.50 5.00	3	GP				
		9.5 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black to red brown, trace oxidation, wet.			585.6 9.5			4 5	GP GP				
10						3	3.50 5.00		6	GP		9.5 ft ▼	
		13.3 - 20.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet.		△ △ △ △ △ △ △ △ △ △ △ △ △ △	581.8 13.3				7	GP			
15						4	5.00 5.00		8	GP			
		20.0 - 22.0 (OL) ORGANIC SILT, low plasticity, black to dark brown, trace organics, cohesive, wet, soft.	OL	— — — — — —	575.1 20.0				9	GP			
20		22.0 - 29.2 (SP) SAND, poorly graded, medium to fine, gray, trace organics, wet.			573.1 22.0	5	5.00 5.00		10	GP			
			SP						11	GP			
25						6	4.50 5.00					20'-35' contains decomposing odor	
		29.2 - 30.0 (OL) ORGANIC SILT, low plasticity, brown, some wood chips, cohesive, wet, soft.	OL	— —	565.9 565.1 30.0				12 13	GP GP			
30	30.0 - 40.0 (SP) SAND, poorly graded, medium to fine, gray, wet.				7	2.50 5.00							
		SP						14	GP				
35					8	3.00 5.00							
40		Boring completed at 40.0 ft.						15	GP				
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
45													



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Joe/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION GPJ DUL GOLDER GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Joe/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-08

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645685.8, E 12623414

SHEET 1 of 1

GS ELEVATION (ft): 594.9  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													DRILLING: CEC 002007		NAD83 METER LINE-3 COORDS: N 436653.0, E 120234.74	
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS				
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION			
					DEPTH (ft)											
0	Air Vacuum	0.0 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black to gray, some slag, dry, compact.				1	5.00	1	GRAB							
5						2		2	GRAB							
	Geoprobe					2	<u>4.00</u> 5.00	3	GP			5'-8' yellow, red-brown, oxidized CCR				
								4	GP							
10						3	<u>4.50</u> 5.00	5	GP			10'-13.3' gray to red-brown oxidized CCR				
		13.3 - 14.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, dry to moist, soft.		△ △ △ △	581.6 13.3 580.3 14.6			6	GP							
15		14.6 - 17.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry, compact.						7	GP							
					577.5											
		17.5 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, moist to wet, soft.		△ △ △ △	576.7 18.3		4	<u>3.00</u> 5.00	8 9 10	GP GP GP			17.75 ft    ▼			
		17.8 - 18.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, gray, wet.		△ △ △ △ △ △					11	GP						
20		18.3 - 21.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, wet, soft.	OL	△ △ △ △	573.3 572.6				12	GP						
		21.6 - 22.3 (OL) ORGANIC SILT, low plasticity, black, slight decomposing odor, some wood chips, cohesive, wet.	SP		22.3		5	<u>4.00</u> 5.00	13	GP						
25		22.3 - 25.0 (SP) SAND, poorly graded, medium to fine, gray, slight decomposing odor, wet.			569.9				14	GP						
			Boring completed at 25.0 ft.													
			NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.													
30																
35																
40																
45																

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-09


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645643.5, E 12623509.5

SHEET 1 of 1

GS ELEVATION (ft): 598.2  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo Probe													
NAD83 METER LINE-3 COORDS: N 43049.3, E 12023309.3													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, yellow/red-brown oxidation throughout, dry.				1	5.00	1	GRAB				
5									2	GRAB			
	Geoprobe					2	4.00 5.00	3	GP				
								4	GP				
10						3	4.00 5.00	5	GP				
								6	GP				
15						4	4.00 5.00	7	GP				
		17.8 - 18.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.		△ · △	579.6			8	GP				
					579.0			9	GP				
20		18.6 - 19.2 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black.		△ · △	578.2			10	GP				
					20.0								
		19.2 - 20.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.		△ · △	576.4			11	GP				
					21.8								
		20.0 - 21.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black.		△ · △	575.0			12	GP				
			OL	—	574.2			13	GP				
25		21.8 - 23.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.			24.0								
	23.2 - 24.0 (OL) ORGANIC SILT, low plasticity, dark brown, with wood debris, cohesive.												
	24.0 - 30.0 (SP) SAND, poorly graded, medium to fine grain, gray, some decomposing odor.	SP					14	GP					
30				568.2			15	GP					
		Boring completed at 30.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.											
35													
40													
45													



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/Joe

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-10


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645742.8, E 12623479.2

SHEET 1 of 1

GS ELEVATION (ft): 590.5  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS				
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION			
					DEPTH (ft)											
				VEGETATION:												
0	Air Vacuum	0.0 - 8.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black, dry, compact.				1	5.00	1	GRAB							
5													2	GRAB		
	Geoprobe	8.6 - 9.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, moist.			581.9	2	5.00 5.00	3	GP							
					581.3								4	GP		
					9.2										5	GP
		9.2 - 12.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some CCR slag, moist.			578.5	3	4.00 5.00	6	GP							
		12.0			7								GP			
														8	GP	
15	14.0 - 15.0 (OL) ORGANIC SILT, low plasticity, gray to brown, some sand, cohesive, wet.	OL		576.5	4	3.50 5.00	9	GP								
	15.0 - 20.0 (SP) SAND, poorly graded, medium to fine, gray, wet.	SP		14.0 575.5								10	GP			
20				570.5												
		Boring completed at 20.0 ft.														
		<p>NOTES:</p> <p>1. Air vacuumed to 5 feet bgs to confirm no utilities.</p> <p>2. No water level observed during sampling.</p>														
25																
30																
35																
40																
45																



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-11

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-18-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645788.7, E 12623456.9

SHEET 1 of 1

GS ELEVATION (ft): 594.9  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: GCS 00207													
NAD83 METER LINE COORDS: N 43° 00.7' E 12023430.9													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, gray, dry, soft.			592.4	1	5.00	1	GRAB				
		2.5 - 7.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash and cemented Fly Ash, coarse, dark gray to black, dry, compact.			2.5			2	GRAB				
5													
		7.5 - 8.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, some cementation, dark gray to light brown, dry.			587.4 586.9 8.0	2	3.50 5.00	3	GP				
	Geoprobe	8.0 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, redish brown to black, dry.				3	3.50 5.00	4	GP				
10							5 6	GP GP					
		15.0 - 18.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, some cementation, dark gray, dry to moist.			579.9 15.0	4	4.00 5.00	7	GP				
15							8	GP					
		18.5 - 35.0 (SP) SAND, poorly graded, fine to coarse, gray to brown, moist to wet.			576.4 18.5			9 10	GP GP			19' some organics/wood debris	
20						5	3.00 5.00	11	GP			20 ft	
								12	GP			19.5'-20' brown organic silt layer	
25						6	3.50 5.00	13	GP			18.5-35' strong decomposing odor - gradual change to no odor with depth	
								14	GP				
30						7	3.50 5.00	15	GP			34' organics and woody debris at	
35			Boring completed at 35.0 ft.			559.9			16	GP			
			NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.										
40													
45													

DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Joe/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Joe/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-12

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645870.7, E 12623424.8

SHEET 1 of 1

GS ELEVATION (ft): 594.4  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLER: Golder Associates													
ADDRESS: 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL GOLDBER GDT 6/12/17													
NAD83 METER LINE-3 COORDS: N 493070.7, E 1202342.0													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
0	Air Vacuum	0.0 - 12.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, black to dark gray, some unburnt coal, some slag, dry to moist.				1	5.00	1	GRAB				
5								2	GRAB				
						2	3.50 5.00	3	GP				
								4	GP				
								5	GP				
						3	4.30 5.00	6	GP				
								7	GP				
								8	GP				
						4	3.50 5.00	9	GP				
								10	GP				
10													
15	Geoprobe	12.6 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black to gray, moist to wet.		△ △ △ △ △ △ △ △ △ △ △ △ △ △	581.8 12.6								

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-13


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-18-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645927.7, E 12623370.6

SHEET 1 of 1

GS ELEVATION (ft): 597.1  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS			
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION		
					DEPTH (ft)										
0	Air Vacuum	0.0 - 12.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, dry to wet, compact.				1	5.00	1	GRAB			2.5'-7.5' some yellow precipitate			
5						2		2	GRAB						
	Geoprobe	12.0 - 19.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark to light gray, wet.			585.1 12.0	2	3.50 5.00	3	GP			7.5'-9.25' CCR is red/brown, highly oxidize, pH ~ 3.3			
10						4		4	GP						
						5		5	GP						
						6		6	GP						
						7		7	GP						
						8		8	GP						
15			19.0 - 35.0 (SP) SAND, poorly graded, medium to fine, gray, wet.	SP		578.1 19.0	3	4.50 5.00	9	GP			19', some woody debris/ organics		
		4						10	GP						
20		5					3.50 5.00	11	GP						
		6					3.50 5.00	12	GP						
25								13	GP						
								14	GP						
30								7	4.50 5.00						29'-30', silty sand, organics, soft
										15				GP	32' slight decomposing odor
35									562.1					16	GP
		Boring completed at 35.0 ft.													
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.													
40															
45															



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Joe/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION GPJ DUL GOLDR GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Joe/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-14

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-18-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645938, E 12623473.2

SHEET 1 of 1

GS ELEVATION (ft): 594.4  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 0020D1													
NAD83 METER LINE-3 COORDS: N 493300, E 1202047.3.2													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 12.4 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium, black to red-brown, some slag, mm-scale laminations, dry.				1	5.00	1	GRAB				
5									2	GRAB			
	Geoprobe					2	3.50 5.00	3 4	GP GP				
								5	GP				
10								6	GP				
		12.4 - 18.6 (CCR) COAL COMBUSTION RESIDUALS -Fly Ash, fine to medium, dark gray to red-brown, dry.			582.0 12.4	3	3.50 5.00		7	GP			
20		18.6 - 19.2 (OL) ORGANIC SILT, low plasticity, black/brown, some woody debris, cohesive, moist. 19.2 - 35.0 (SP) SAND, poorly graded, medium to fine, gray, moist to wet.	OL	575.8 575.2 19.2				8 9 10	GP GP GP				
25													
30													



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Joe/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION GPJ DUL GOLDR GDT 6/12/17

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-15

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645874.7, E 12623513

SHEET 1 of 1

GS ELEVATION (ft): 596.9  
 TOC ELEVATION: ---

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

CLIENT: Consumers Energy Company													
DRILL RIG: Geo 002001													
ADDRESS: 14000 W. LANE-3 COORDS: N 433074.7, E 12623313													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 12.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry.				1	5.00	1 2 3	GRAB GRAB GRAB				
5					2	3.50 5.00	4 5 6 7	GP GP GP GP			5'-10', red/brown, some oxidation		
10					3	3.00 5.00	8 9	GP GP			8.8'-9.2', Layer of CCR - Bottom Ash		
15		12.3 - 18.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.		△ △ △ △ △ △ △ △ △ △ △ △	584.6 12.3	4	5.00	10 11	GP GP			1" layer of organic silt between CCR and sand, decomposing odor	
20		18.0 - 25.0 (SP) SAND, poorly graded, medium to fine, gray.	SP		578.9 18.0	5	3.50 5.00	12	GP			22' Decomposing odors	
25	Geoprobe			571.9				13	GP				
30		Boring completed at 25.0 ft.											
35		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.											
40													
45													



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-16

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645799.7, E 12623535.8

SHEET 1 of 1

GS ELEVATION (ft): 590.1  
 TOC ELEVATION: ---

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

CLIENT: Consumers Energy Company																		
DRILL RIG: Geo 00204																		
ADDRESS: 17000 E. 120th Ave., N 43rd St., E 120th Ave.																		
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS						
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION					
					DEPTH (ft)													
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, dry.		△ △ △ △ △ △	587.6	1	5.00	1	GRAB									
		2.5 - 9.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry, compact.			2.5													
5	Geoprobe					2	5.00 5.00	3	GP									
						3	3.50 5.00	4	GP									
10			9.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist, soft.		△ △ △ △ △ △ △ △ △ △ △ △ △ △	581.1 9.0			5	GP			10'-10.5' layer of CCR - Bottom Ash, black, moist					
									6	GP								
									7	GP								
								8	GP									
15		14.2 - 15.0 (OL) ORGANIC SILT, low plasticity, black, some woody debris, cohesive, moist, soft.	OL	— —	575.9 575.1	4	3.00 5.00	9	GP									
		15.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, moist.	SP		15.0										10	GP		
20		Boring completed at 20.0 ft.			570.1													
25		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.																
30																		
35																		
40																		
45																		



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-17

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-16-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645750.6, E 12623557

SHEET 1 of 1

GS ELEVATION (ft): 588.6  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: GCS 002007													
NAD83 METER LINE-3 COORDS: N 437 00.0, E 12020007													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 7.9 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry.				1	5.00	1	GRAB				
5									2	GRAB			
	Geoprobe				580.7	2	4.50 5.00	3	GP				
					579.9			4	GP				
		7.9 - 8.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist.		△ △	8.7	5	GP						
		8.2 - 8.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, moist.		△ △		6	GP						
		8.7 - 13.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist, soft.		△ △		3	3.00 5.00	7	GP				
				△ △				8	GP				
				△ △				9	GP				
			13.6 - 14.3 (OL) ORGANIC SILT, low plasticity, black to brown, some wood debris, cohesive, moist.	OL	—								
15			14.3 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, trace organics, moist.	SP		4	3.00 5.00	10	GP				
									11	GP			
20		Boring completed at 20.0 ft.			568.6								
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.											
25													
30													
35													
40													
45													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-18


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645653, E 12623697

SHEET 1 of 1

GS ELEVATION (ft): 596.5  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 002007													
NAD83 METER LINE-3 COORDS: N 443000, E 12020007													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 6.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black to red-brown, some unburnt coal/slag, dry, compact.				1	5.00	1	GRAB				
5									2	GRAB			
	Geoprobe	6.7 - 9.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, trace unburnt coal, moist.		△ △ △ △ △ △	589.8 6.7	2	4.00 5.00	3	GP				
								4	GP				
								5	GP				
								6	GP				
10		9.8 - 10.0 (OL) ORGANIC SILT, low plasticity, black, cohesive, moist, soft.	OL		586.7			7	GP			8.45'-8.9' layer of CCR - Bottom Ash, coarse, black, moist	
		10.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, some woody debris and organics, moist.			10.0	3	2.00 5.00						
								8	GP				
15			SP					9	GP				
												17', 1" seam or organic silt/sand, brown, some woody debris	
20							4	4.00 5.00	10	GP			
					576.5			11	GP			19', 2" seam of organic silt, brown	
		Boring completed at 20.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.											
25													
30													
35													
40													
45													



DEPTH SCALE:1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company





# RECORD OF BOREHOLE BCC-G17-BH-19

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-17-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645812, E 12623616.5

SHEET 1 of 1

GS ELEVATION (ft): 595.2  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: CEC 002007													
NAD83 METER LINE-3 COORDS: N 43512, E 12023010.3													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 11.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some oxidation, partially cemented, dry to moist.			584.2	1	5.00	1A 1B	GRAB GRAB				
5					11.0	2	3.90 5.00	1 2	GP GP				
10	Geoprobe	11.0 - 18.7 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black to gray, wet.		576.5	3	5.00 5.00	5	GP				10 ft 	
15				11.0	4	1.50 5.00	6	GP					
20				SP		18.7	7 8	GP GP			20', 2" seam of organic silt		
						5	5.00	9	GP				
25						570.2	10	GP			24.5', 3" seam of organic silt		
		Boring completed at 25.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
30													
35													
40													
45													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT NUMBER: 1667572.0004

DRILLING METHOD: GeoProbe

DATUM: NAVD88

GS ELEVATION (ft): 593.6

LOCATION: Bottom Ash Pond

DRILLING DATE: 05-16-17

AZIMUTH: ---

TOC ELEVATION: ---

CLIENT: Consumers Energy Company

DRILL RIG: Geo 6620DT

NAD83 MI PLANE-S COORDS: N 645854, E 12623594

[illegible]

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-21


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-15-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645765, E 12623717

SHEET 1 of 1

GS ELEVATION (ft): 592.3  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 002001													
NAD83 METER LINE COORDS: N 945700, E 1202017													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	VEGETATION:											
		0.0 - 7.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, dark brown to yellow-brown, some pebbles, partially cemented, moist.				1	5.00	1	GRAB				
5	Geoprobe							2	GRAB				
		7.3 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, black to red-brown, trace slag, some oxidation, moist to wet.			585.0 7.3	2	4.00 5.00	3	GP				
								4	GP				
10								5	GP			10 ft ▼	
						3	5.00 5.00	6	GP				
								7	GP				
15													
		17.8 - 19.0 (OL) ORGANIC SILT, low plasticity, dark brown, some sand, cohesive, wet.	OL		574.5 17.8	4	3.50 5.00	8	GP				
		19.0 - 25.0 (SP) SAND, poorly graded, medium to coarse, grayish brown, wet, compact.			573.3			9	GP				
20			SP		19.0			10	GP			18.8', 2" layer with wood debris	
						5	5.00 5.00	11	GP				
25				567.3			12	GP					
		Boring completed at 25.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
30													
35													
40													
45													



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/Joe




LOGGED: DAF  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: DAF  
 CHECKED: MMJ  
 DATE: 6/9/2017

CLIENT: Consumers Energy Company      DRILL NO: GE0002051      NAD83 UNIT: ENGINE COORDS: N 643714.7, E 12023749.8													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 9.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, trace unburnt coal, moist to wet.				1	5.00	1A	GRAB				
5								1B	GRAB				
	Geoprobe	9.2 - 10.5 (OL) ORGANIC SILT, low plasticity, brown, some sand, some wood debris, cohesive, wet.	OL		582.7 9.2 581.4	2	5.00 5.00	1	GP			Sand content increases with depth  Decomposing odor  18", 1" layer of organic silt with sand	
10		10.5 - 20.0 (SP) SAND, poorly graded, medium to coarse, gray, wet, compact.	SP		10.5	3	5.00 5.00	2 3 4	GP GP GP				
15						5	GP						
						4	4.00 5.00	7	GP				
20		Boring completed at 20.0 ft.			571.9			10	GP			19.5", 1" layer of organic silt with sand	
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
25													
30													
35													
40													
45													



PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company






# RECORD OF BOREHOLE BCC-G17-BH-23

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-15-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645724.7, E 12623794.5

SHEET 1 of 1

GS ELEVATION (ft): 590.1  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: CES 00207													
NAD83 METER LINE-3 COORDS: N 43° 24.7', E 12020794.3													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, some unburnt coal, dry.				1	5.00	1A	GRAB				
5		5.0 - 9.7 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, gray, wet.			585.1 5.0	2	3.50 5.00	1B	GRAB			5 ft 	
10	Geoprobe	9.7 - 11.5 (OL) ORGANIC SILT, low plasticity, brown, some sand, some wood debris, cohesive, wet.	OL		580.4 9.7			2	GP			9.8' Decomposing odor  12.3', 2" layer of silty sand with organics 13.7', 3" layer of silty sand with organics  18', 6" layer of silty sand	
		11.5 - 20.0 (SP) SAND, medium to coarse, grayish brown, wet, compact.	SP		578.6 11.5	3	5.00 5.00	4	GP				
15							5	GP					
							6	GP					
20		Boring completed at 20.0 ft.			570.1			7	GP				
25		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
30													
35													
40													
45													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: DAF  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-24


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-18-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645748.9, E 12623872.7

SHEET 1 of 1

GS ELEVATION (ft): 585.6  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 002001													
NAD83 METER LINE-3 COORDS: N 943746.9, E 12923072.7													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black to dark gray, dry.			583.1	1	5.00	1	GRAB				
		2.5 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, black to dark gray, moist, loose.			2.5								
5	Geoprobe					2	2.50 5.00	2	GRAB				
						3	3.80 5.00	3	GP				
						4	4.50 5.00	4	GP				
10			8.5 - 9.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, moist.	OL		577.1	3	3.80 5.00	3	GP			
			9.3 - 10.0 (OL) ORGANIC SILT, low plasticity, black, trace wood chips, cohesive, moist, soft.			576.3							
		10.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, some brown silt, trace organics, wet.			575.6								
			SP		10.0	3	3.80 5.00	6	GP				
15						4	4.50 5.00	7	GP				
						4	4.50 5.00	8	GP				
20					565.6	4	4.50 5.00	8	GP				
		Boring completed at 20.0 ft.						9	GP			18.75', black organics/wood	
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
25													
30													
35													
40													
45													



DEPTH SCALE: 1 in to 5.6 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Joe/John

LOGGED: JTT  
CHECKED: MMJ  
DATE: 6/9/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Joe/John

LOGGED: JTT  
 CHECKED: MMJ  
 DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: Bottom Ash Pond  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-25

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 05-15-17  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 645783.2, E 12623873.3

SHEET 1 of 1

GS ELEVATION (ft): 586.9  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: GCS 002001													
NAD83 METER LINE-3 COORDS: N 43700.2, E 12023073.3													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some unburnt coal, dry.			584.4	1	5.00	1A	GRAB				
		2.5 - 11.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, moist to wet.			2.5								
5	Geoprobe			△ △<									

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17



DEPTH SCALE: 1 in to 5.6 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Joe

LOGGED: MMJ  
 CHECKED: MMJ  
 DATE: 6/9/2017



PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: N end of Ponds 3 and 4 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-26**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---


NAD83 MI PLANE-S COORDS: N 646765.66, E 12622228.2

SHEET 1 of 1

GS ELEVATION (ft): 586.3

TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
				DEPTH (ft)									
0	Geoprobe	0.0 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse grain, black to brown, non-cohesive, moist.				1	3.80 5.00	1	GP			8.6 ft 11/29/2017 15:27  Organics and wood debris  Organics and wood debris	
		2.8 - 3.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.			583.5 2.8 583.0			2	GP				
		3.3 - 5.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), orange to tan, non-cohesive, wet.	SP		3.3			3	GP				
5			5.0 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, wet.			581.3 5.0 580.8	2	3.40 5.00	4	GP			
			5.5 - 7.7 (SP) SAND, poorly graded, medium to fine grain, with CCR (fly ash), orange to tan, non-cohesive, wet.	SP		5.5			5	GP			
			7.7 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			578.6 7.7 577.8			6	GP			
			8.5 - 9.0 (SP) SAND, poorly graded, medium to fine grain, with CCR (fly ash), tan, non-cohesive, wet.	SP		8.5 577.3 9.0	3	5.00 5.00	7	GP			
10			9.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			576.3 10.0							
			10.0 - 10.8 (SP) SAND, poorly graded, fine to medium grain, orange to tan, non-cohesive, wet.			575.5 10.8							
			10.8 - 11.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			574.5 11.8							
			11.8 - 18.5 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP					9	GP			
15			18.5 - 20.0 ORGANICS, wood debris, brown, non-cohesive, wet.			567.8 18.5	4	5.00 5.00	10	GP			
			Boring completed at 20.0 ft.			566.3							
20													
25													



DEPTH SCALE: 1 in to 3.1 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/John

LOGGED: HD  
CHECKED: MMJ  
DATE: 12/13/2017

DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017



DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: Middle of Ponds 3 and 4 interior berm

CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-27

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---












NAD83 MI PLANE-S COORDS: N 646562.81, E 12622524

SHEET 1 of 1

GS ELEVATION (ft): 588.9

TOC ELEVATION: ---

NAD83 MI PLANE-S COORDS: N 646562.81, E 12622524

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS		
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION	
				DEPTH (ft)										
0	Geoprobe	VEGETATION:				1	3.50 5.00	1	GP				10.3 ft 11/29/17 16:40 	
		0.0 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.			586.1									
		2.8 - 6.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			2.8		2	GP						
5						2	4.20 5.00	3	GP					
		6.0 - 6.8 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.	SP		582.9 6.0			4	GP					
		6.8 - 7.1 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.	SP		582.1			5	GP					
		7.1 - 8.8 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.			581.8 7.1			6	GP					
		8.8 - 10.0 ORGANICS and wood debris, reddish brown, non-cohesive, wet.			580.1 8.8									
10		10.0 - 11.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			578.9 10.0			3	2.80 10.00	7	GP			
		11.8 - 12.1 ORGANICS and wood debris, reddish brown, non-cohesive, wet.	SP		577.1 12.1	8	GP							
		12.1 - 15.0 (SP) SAND, poorly graded, with CCR (fly ash), tan to gray, non-cohesive, wet.			576.8									
15			15.0 - 16.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, wet.			573.9 15.0	4	3.10 5.00	9	GP				
		16.0 - 20.9 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		572.9 16.0	10			GP					Organic woody debris at 16.2', 16.4', and 16.5'
20		20.9 - 22.2 ORGANICS and wood debris, reddish brown, non-cohesive, wet.			568.0 20.9	4	3.10 5.00	11	GP					
	22.2 - 25.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		566.7 22.2	12			GP						
25		Boring completed at 25.0 ft.			563.9									

10.3 ft  
11/29/17  
16:40

DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: S end of Ponds 3 and 4 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-28**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/30/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88









































AZIMUTH: ---

NAD83 MI PLANE-S COORDS: N 646375.91, E 12622823.7

SHEET 1 of 1

GS ELEVATION (ft): 588.9

TOC ELEVATION: ---

SOIL PROFILE				RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS	
DEPTH (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV.  DEPTH (ft)	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
0	VEGETATION:											
	0.0 - 0.4 ORGANICS with wood debris, brown, non-cohesive, moist.			588.5								
	0.4 - 1.9 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to brown, non-cohesive, moist.			0.4			1	GP				
	1.9 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, black organics throughout, non-cohesive, moist.			587.0								
				1.9	1	3.70 5.00		2	GP			
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												
												



PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: N end of Ponds 2 and 3 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-29**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---


NAD83 MI PLANE-S COORDS: N 646805.16, E 12622449.9

SHEET 1 of 1

GS ELEVATION (ft): 585.7

TOC ELEVATION: ---

DRILLING LOG - GEO 00204													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	VEGETATION:											
		0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to brown, non-cohesive, moist.			583.2	1	3.60 5.00	1	GP				
		2.5 - 5.4 (SP) SAND, poorly graded, fine to medium grain, orange to tan, non-cohesive, moist.	SP		2.5			2	GP				
5					580.3	2	3.20 5.00						
		5.4 - 6.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash and Fly Ash, gray to black, non-cohesive, moist.			5.4 579.7			3	GP				
		6.0 - 7.8 (SP) SAND, poorly graded, fine to medium grain, tan, lenses of CCR (fly ash) at 6.6', 7.0', and 7.2', non-cohesive, moist.	SP		6.0			4	GP				
		7.8 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, with poorly graded sand, gray, non-cohesive, wet.			577.9 7.8			5	GP				
10			10.0 - 10.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.	SP				6	GP				
			10.2 - 11.0 (SP) SAND, poorly graded, fine to medium grain,, non-cohesive, wet.					7	GP				
			11.0 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.				3	4.70 5.00					
			13.0 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP				8	GP			Organics and wood debris	
15			15.0 - 15.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, gray, with organics and wood debris, non-cohesive, wet.										
		15.2 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP			4	3.80 5.00	9	GP		Organics and wood debris at 16.5', 17.2', and 17.4' 0.5-1" layer of organics and wood debris at 17.6' and 18.6'		
20		Boring completed at 20.0 ft.											
25													



DEPTH SCALE: 1 in to 3.1 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/John

LOGGED: HD  
CHECKED: MMJ  
DATE: 12/13/2017

8.5 ft  
11/29/2017  
14:50

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: S end of Ponds 2 and 3 interior berm

CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-30

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---











NAD83 MI PLANE-S COORDS: N 646581.28, E 12622794

SHEET 1 of 1

GS ELEVATION (ft): 585.0

TOC ELEVATION: ---

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS						
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION					
					DEPTH (ft)													
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to reddish brown, non-cohesive, dry.			583.0	1	3.60 5.00	1	GP			10.3 ft 11/29/2017 14:13 						
		2.0 - 5.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, gray, non-cohesive, dry.			2.0			2	GP									
5		5.2 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium grain, black to brown, non-cohesive, moist.			579.8 579.5	2	3.80 5.00	3	GP									
		5.5 - 10.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, wet.			5.5													
10		10.5 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan, trace organics and wood debris, non-cohesive, wet.	SP		574.5 10.5								3	1.30 5.00	4	GP		
		15.0 - 15.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash and Bottom Ash, fine to medium grain, gray, non-cohesive, wet.	SP		570.0 569.6													
		15.4 - 15.6 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			15.6 568.7	7	GP											
		15.6 - 16.3 ORGANICS with wood debris, reddish brown, non-cohesive, wet.			16.3													
		16.3 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		565.0													
20			Boring completed at 20.0 ft.															
25																		

 10.3 ft  
 11/29/2017  
 14:13


DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: N end of Ponds 1 and 2 interior berm

CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-31

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2107

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---








NAD83 MI PLANE-S COORDS: N 647036.9, E 12622399.3

SHEET 1 of 1

GS ELEVATION (ft): 587.3

TOC ELEVATION: ---

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, moist.			585.3	1	3.30 5.00	1	GP			Organics and wood debris	
		2.0 - 5.4 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.	SP		2.0			2	GP				
5					581.9	2	3.00 5.00						
		5.4 - 5.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium grain, black, non-cohesive, moist.	SP		581.6			3	GP				
		5.7 - 7.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.			580.3			4	GP				
		7.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.			7.0								
10		10.0 - 11.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, mixed with poorly graded, fine to medium grain sand, non-cohesive, moist.			577.3	5	GP						
		11.2 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, moist.	SP		576.1	3	3.20 5.00	6	GP				
15					572.3								
			Boring completed at 15.0 ft.										
		NOTES: 1. No water level observed during sampling.											
20													
25													



DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017



PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: Middle of Ponds 1 and 2 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-32**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---

NAD83 MI PLANE-S COORDS: N 646823.08, E 12622705.1

SHEET 1 of 1

GS ELEVATION (ft): 587.0

TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo Probe													
NAD83 METER LINE COORDS: N 44025.00, E 120227.00													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
0	Geoprobe	VEGETATION:											
		0.0 - 0.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, moist.			586.3	1	<u>3.50</u> 5.00	1	GP			Organics and wood debris	
				0.7	2			GP					
		0.7 - 1.9 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.		585.1	1.9			3	GP				
		1.9 - 6.5 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), light brown, non-cohesive, moist.	SP										
5													
		6.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			580.5	2	<u>4.20</u> 5.00	4	GP			Organics and wood debris	
				6.5									
10													
					3	<u>4.40</u> 5.00	5	GP			10 ft 11/29/2017 11:40		
	13.0 - 15.0 ORGANICS with wood debris, reddish brown, non-cohesive, wet.			574.0			13.0	6	GP				
15		15.0 - 15.5 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), gray, non-cohesive, wet.	SP										
		15.5 - 20.0 (SP) SAND, poorly graded, fine to medium grain, gray, non-cohesive, wet.	SP		4	<u>3.70</u> 5.00							
20		Boring completed at 15.0 ft.											
25													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

LOGGED: HD  
CHECKED: MMJ  
DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: N end of Ponds 0 and 1 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-34**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---

NAD83 MI PLANE-S COORDS: N 647106.01, E 12622586.6

SHEET 1 of 1

GS ELEVATION (ft): 586.4

TOC ELEVATION: ---

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	VEGETATION:											
		0.0 - 0.8 (SP) SAND, poorly graded, reddish brown, trace organics, non-cohesive, dry.	SP		585.6	1	3.00 5.00	1	GP				
		0.8 - 1.1 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.	SP		585.3			2	GP				
					585.0								
					584.6								
					584.2								
		1.1 - 1.4 (SP) SAND, poorly graded, fine to medium grain, light brown, non-cohesive, moist.			2.2					3	GP		
		1.4 - 1.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.											
		1.8 - 2.2 (SP) SAND, poorly graded, fine to medium grain, light brown, non-cohesive, moist.											
		2.2 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.			580.9	2	3.60 5.00						
					580.6			4	GP				
		5.5 - 5.8 ORGANICS with wood debris, reddish brown, non-cohesive, moist.			580.1			5	GP				
		5.8 - 6.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			6.3								
					579.1			6	GP				
					7.3								
		6.3 - 7.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, mixed with poorly graded, fine to medium grain sand, non-cohesive, moist.			578.0	3	2.40 5.00						
		7.3 - 8.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.	SP		8.4								
		8.4 - 11.0 (SP) SAND, poorly graded, fine to medium grain, mixed with CCR (fly ash), tan to gray, non-cohesive, moist to wet.	SP		575.4			7	GP				
					11.0			8	GP				
		11.0 - 11.8 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			574.6								
					11.8								
		11.8 - 15.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), brown, non-cohesive, wet.	SP			4	4.70 5.00	9	GP				
					571.4								
		15.0 - 15.5 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		15.0								
			OL		570.9			10	GP				
		15.5 - 15.7 (OL) ORGANIC SILT with sand, fine grain, low plasticity, brown, trace organics and wood debris, cohesive, wet.			15.7								
		15.7 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP					11	GP				
20			Boring completed at 20.0 ft.										
25													

 11.1 ft  
 11/29/2017  
 10:06


DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017



PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: S end of Ponds 0 and 1 interior berm

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-35**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

DATUM: NAVD88

AZIMUTH: ---

NAD83 MI PLANE-S COORDS: N 646841.63, E 12622967.4

SHEET 1 of 1

GS ELEVATION (ft): 586.0

TOC ELEVATION: ---

CLIENT: Consumers Energy Company																
DRILLING: Geo 00267																
NAD83 METER LINE-3 COORDS: N 946041.00, E 1262297.4																
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft <sup>2</sup> )	LAB TESTS		NOTES WATER LEVELS				
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION			
														DEPTH (ft)		
0	Geoprobe	0.0 - 2.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.				1	<u>3.10</u> 5.00	1	GP			0.5" pocket of poorly graded sand				
		2.4 - 2.6 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, moist.	SP		583.6											
		2.6 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.	SP		2.8											
		2.8 - 5.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, moist.	SP		581.0	2	<u>3.20</u> 5.00	3	GP							
5		5.0 - 5.5 (SP) SAND, poorly graded, fine to medium grain, mixed with CCR (fly ash), tan, non-cohesive, moist.	SP		580.5											
		5.5 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			5.5											
		10.0 - 10.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, mixed with poorly graded sand, non-cohesive, wet.	SP		576.0 10.0 575.5 10.5 574.8	3	<u>2.00</u> 5.00	4	GP							
		10.5 - 11.2 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			11.4											
		11.2 - 11.4 ORGANICS with wood debris brown, non-cohesive, wet.														
		11.4 - 20.0 (SP) SAND, poorly graded,, non-cohesive, wet.				4	<u>3.50</u> 5.00	5	GP							
15			SP													
20			Boring completed at 20.0 ft.													
			NOTES: 1. No water level observed during sampling.													
25																

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/John

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: S end of Pond 5  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-37

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 11/27/2017  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646263.25, E 12623544

SHEET 1 of 1

GS ELEVATION (ft): 578.8  
 TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS
		DESCRIPTION	USCS	GRAPHIC LOG	NUMBER	REC / ATT	NUMBER	TYPE		ENVIRONMENTAL (SP & TOTAL METALS)	GRAIN SIZE DISTRIBUTION	
				ELEV. DEPTH (ft)								
0	Geoprobe	VEGETATION:										
		0.0 - 14.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.			1	3.90 5.00	1	GP				
5					2	2.80 5.00	2	GP				
10					3	5.00	3	GP				
15		14.5 - 15.0 (SP) SAND, poorly graded, fine to medium grain, traces of CCR (fly ash), light brown, non-cohesive, dry. 15.0 - 20.0 (SP) SAND, poorly graded, fine to medium grain, light gray to tan, non-cohesive, wet.	SP		564.3 14.5 563.8 15.0	4	4.20 5.00	4	GP			
20		Boring completed at 20.0 ft.										
25												

14 ft

11/27/2017

10:50

DEPTH SCALE:1 in to 3.1 ft

DRILLING CONTRACTOR: Mateco

DRILLER: Steve/Alex

LOGGED: HD

CHECKED: MMJ

DATE: 12/13/2017

14 ft  
 11/27/2017  
 10:50



DEPTH SCALE: 1 in to 3.1 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Alex

LOGGED: HD  
 CHECKED: MMJ  
 DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: W end of Pond 5 berm  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-38


DRILLING METHOD: GeoProbe  
 DRILLING DATE: 11/27/2017  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646362.72, E 12623414.9

SHEET 1 of 1

GS ELEVATION (ft): 587.8  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Geo 00207													
NAD83 METER LINE-3 COORDS: N 49302.72, E 12023414.9													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 1.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.	OL		586.8	1	3.80 5.00	1	GP				
				586.4	2			GP					
		1.0 - 1.4 (OL) ORGANIC SILT, low plasticity, light brown, cohesive, w~PL, hard.		1.4	3			GP					
		1.4 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, trace sand, gray, non-cohesive, dry.											
5		5.0 - 5.5 (SP) SAND, poorly graded, fine to medium grain, trace CCR (fly ash), dark brown, non-cohesive, moist.	SP		582.8 5.0 582.3 5.5	2	3.30 5.00	4	GP				
		5.5 - 16.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, trace sand, gray, non-cohesive, moist to wet.			5			GP					
10						3	5.00	6	GP				
15		16.2 - 16.8 ORGANICS with wood debris, black, non-cohesive, wet.			571.6 16.2 571.0 16.8	4	4.50 5.00	7	GP				
	16.8 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP			8			GP					
				9	GP								
20					567.8 20.0								
25		Boring completed at 25.0 ft.											



DEPTH SCALE: 1 in to 3.1 ft  
DRILLING CONTRACTOR: Mateco  
DRILLER: Steve/Alex

LOGGED: HD  
CHECKED: MMJ  
DATE: 12/13/2017

15 ft  
11/27/2017  
11:46

15 ft  
 11/27/2017  
 11:46



DEPTH SCALE: 1 in to 3.1 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Alex

LOGGED: HD  
 CHECKED: MMJ  
 DATE: 12/13/2017



PROJECT: BC Cobb Pond 0-8 Invest.  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: S end of Pond 7  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-41

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 11/27/2017  
 DRILL RIG: Geo 6620DT

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646140.08, E 12623386

SHEET 1 of 1

GS ELEVATION (ft): 591.6  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILL NO. 00000001													
NAD83 METER LINE-3 COORDS. N 645 746.00, E 12023300													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, black to gray, non-cohesive, moist to wet.			586.6	1	1.30 5.00	1	GP				
5		5.0 - 8.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, cohesive, wet.			582.8	2	4.80 5.00	2	GP				
		8.8 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, black to gray, cohesive, wet.			581.6			3	GP				
10		10.0 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet.			578.6	3	4.80 5.00	4	GP				
		13.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, laminated, non-cohesive, wet.			577.4			5	GP				
		14.2 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet.			576.6			6	GP				
15		15.0 - 15.9 ORGANICS with wood debris, reddish brown, non-cohesive, wet.			575.7			7	GP				
		15.9 - 20.0 (SP) SAND, poorly graded, fine to medium grain, gray to tan, non-cohesive, moist.	SP		571.6	4	3.50 5.00	8	GP				
20		Boring completed at 20.0 ft.											
25													

12 ft

11/27/2017

13:57

12 ft  
 11/27/2017  
 13:57

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/Alex

LOGGED: HD  
 CHECKED: MMJ  
 DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: N end of Pond 7  
 CLIENT: Consumers Energy Company






# RECORD OF BOREHOLE BCC-G17-BH-42

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 11/28/2017  
 DRILL RIG: Marsh Master

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646326.87, E 12623245.1

SHEET 1 of 1

GS ELEVATION (ft): 581.8  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company      DRILL RIG: Marsh Master      HADSS M/V: LANE-3 COORDS: N 440326.07, E 12023243.1													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPLP & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	VEGETATION:											
		0.0 - 1.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, cohesive, wet.				1	2.90 5.00	1	GP				
		1.8 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, trace slag, cohesive, wet.						2	GP				
		2.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			2.0			3	GP				
5		5.0 - 5.2 ORGANICS with wood debris, brown, non-cohesive, wet.			576.8			4	GP				
		5.2 - 10.0 (SP) SAND, poorly graded, fine to medium grain, gray to tan, non-cohesive, wet.	SP			2	3.00 5.00	5	GP				
10		Boring completed at 10.0 ft.			571.8								
	</												

2.7 ft  
 11/27/2017  
 11:23

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: HD  
 CHECKED: MMJ  
 DATE: 12/13/2017

PROJECT: BC Cobb Pond 0-8 Invest.

PROJECT NUMBER: 1667572.0004

LOCATION: Interior berm between Ponds 7 and 8

CLIENT: Consumers Energy Company

# **RECORD OF BOREHOLE BCC-G17-BH-43**

DRILLING METHOD: GeoProbe

DRILLING DATE: 11/29/2017

DRILL RIG: Geo 6620DT

SHEET 1 of 1









































DATUM: NAVD88

AZIMUTH: ---

NAD83 MI PLANE-S COORDS: N 646223.47, E 12623248

GS ELEVATION (ft): 594.8

TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SP, P & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH								
					(ft)								
0	Geoprobe	VEGETATION:											
0.0 - 0.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, dry.				594.5	1	3.20 5.00	1	GP					
0.3 - 0.6 ORGANICS with wood debris, reddish brown, non-cohesive, moist.				594.2			2	GP					
0.6 - 2.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to gray, non-cohesive, moist.				592.5			3	GP					
2.3 - 8.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray to brown, laminated, non-cohesive, moist.				2.3			4	GP					
5													
													
													
													
													
													
													
													
													
													
													
													
													
10			8.4 - 10.0 (SP) SAND, poorly graded, fine to medium grain, dark brown, trace organics, non-cohesive, moist.	SP		586.4							
						8.4	2	4.40 5.00	5	GP			
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													
													



PROJECT NUMBER: 1667572.0004

DRILLING METHOD: GeoProbe

DATUM: NAVD88

GS ELEVATION (ft): 586.8

LOCATION: N end of Pond 8

DRILLING DATE: 11/28/2017

AZIMUTH: ---

TOC ELEVATION: ---

CLIENT: Consumers Energy Company

DRILL RIG: Marsh Master

NAD83 MI PLANE-S COORDS: N 646222.61, E 12623179.1

[illegible]

PROJECT: BC Cobb Pond 0-8 Invest.  
 PROJECT NUMBER: 1667572.0004  
 LOCATION: S end of Pond 8  
 CLIENT: Consumers Energy Company

# RECORD OF BOREHOLE BCC-G17-BH-45

DRILLING METHOD: GeoProbe  
 DRILLING DATE: 11/28/2017  
 DRILL RIG: Marsh Master

DATUM: NAVD88  
 AZIMUTH: ---  
 NAD83 MI PLANE-S COORDS: N 646075.85, E 12623251

SHEET 1 of 1

GS ELEVATION (ft): 584.6  
 TOC ELEVATION: ---

CLIENT: Consumers Energy Company													
DRILLING: Marsh Master													
NAD83 METER LINE-3 COORDS: N 44079.05, E 120232.1													
DEPTH (ft)	BORING METHOD	SOIL PROFILE			RUN		SAMPLES		POCKET PENETROMETER (tons/ft²)	LAB TESTS		NOTES WATER LEVELS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	REC / ATT	NUMBER		TYPE	ENVIRONMENTAL (SPL & TOTAL METALS)		GRAIN SIZE DISTRIBUTION
					DEPTH (ft)								
0	Geoprobe	0.0 - 8.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet, very soft.				1	4.10 5.00	1	GP			Partially cemented layer of CCR (fly ash)	
5													5.1 ft 11/28/2017 13:24
		8.0 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.			576.6 8.0	2	4.50 5.00	2 3	GP GP			Organics and wood debris 2" layer of organics and wood debris	
10			SP									Organics and wood debris	
						3	3.70 5.00	5	GP			2" layer of medium to coarse grain sand	
15		Boring completed at 15.0 ft.			569.6								
20													
25													

DUL BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17



DEPTH SCALE: 1 in to 3.1 ft  
 DRILLING CONTRACTOR: Mateco  
 DRILLER: Steve/John

LOGGED: HD  
 CHECKED: MMJ  
 DATE: 12/13/2017

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

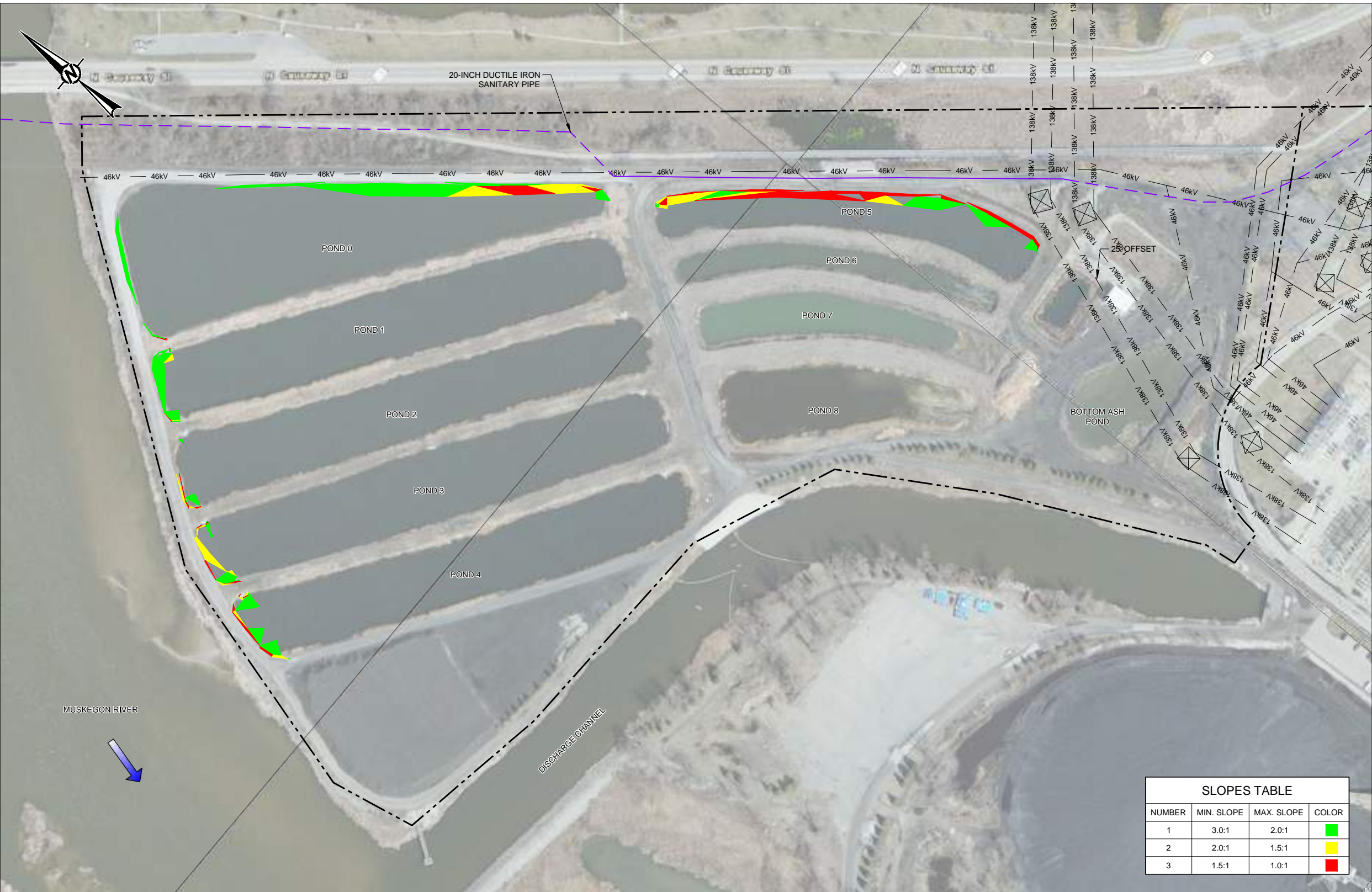
**Golder Associates Inc.**  
**15851 South US 27, Suite 50**  
**Lansing, MI 48906 USA**  
**Tel: (517) 482-2262**  
**Fax: (517) 482-2460**



**Engineering Earth's Development, Preserving Earth's Integrity**

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation





SLOPES TABLE			
NUMBER	MIN. SLOPE	MAX. SLOPE	COLOR
1	3.0:1	2.0:1	Green
2	2.0:1	1.5:1	Yellow
3	1.5:1	1.0:1	Red

- LEGEND**
- PROPERTY BOUNDARY
  - EXISTING GROUND TOPOGRAPHY
  - 20-INCH DUCTILE IRON SANITARY PIPE (SEE REFERENCE 4)
  - 20-INCH DUCTILE IRON SANITARY PIPE (SEE REFERENCE 5)

- REFERENCES**
- TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015. STONE SLOPE REGRADE (AREA NORTHEAST OF POND 5) AND BOTTOM ASH POND REGRADE PROVIDED BY ENGINEERING AND ENVIRONMENTAL SOLUTIONS, LLC DATED OCTOBER 4, 2016.
  - PROPERTY BOUNDARY FROM CAD FILE 22396BASE.DWG, PREPARED BY WILLIAMS & WORKS
  - 20-INCH DUCTILE IRON SANITARY PIPE FROM GIS SHAPEFILE WASTEWATER\_PRESSURIZED\_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.
  - DASHED PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE FROM GIS SHAPEFILE WASTEWATER\_PRESSURIZED\_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.
  - SOLID PORTION OF 20-INCH DUCTILE IRON SANITARY PIPE LOCATED BY GOLDBER FIELD PERSONNEL USING GPS UNIT ON JULY 24, 2018.



CLIENT  
CONSUMERS ENERGY COMPANY  
151 N. CAUSEWAY  
MUSKEGON, MI 49445

CONSULTANT

YYYY-MM-DD 2018-08-06

DESIGNED JRP

PREPARED AM

REVIEWED JRP

APPROVED MAB



PROJECT  
B.C. COBB PLANT  
BOTTOM ASH POND AND PONDS 0-8 CLOSURE  
MUSKEGON, MI 49445

TITLE  
**PERIMETER BERM SLOPE MEASUREMENTS**

PROJECT NO.  
18101309

CONTROL  
0004-006

REV.  
0

FIGURE  
5

**ATTACHMENT J**  
**AERIAL PHOTOGRAPHS**







































