# B.C. COBB GENERATING FACILITY

# BOTTOM ASH POND CLOSURE PLAN

## Muskegon, Michigan

## Pursuant to 40 CFR 257.102

Closure Plan

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

**Submitted By:** Golder Associates Inc.
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Lansing, Michigan 48906

**October 2016** **1652598**

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## CERTIFICATION

### Professional Engineer Certification Statement [40 CFR 257.102(b)(4)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.102 (40 CFR Part 257.102), I attest that this Closure Plan is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.102.

Golder Associates Inc.

Signature

October 14, 2016
Date of Report Certification

Jeffrey R. Piaskowski, PE
Name

6201061033
Professional Engineer Certification Number


10/14/16

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## 1.0 INTRODUCTION

On April 17, 2015, the United States Environmental Protection Agency (EPA) issued the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule") to regulate the beneficial use and disposal of CCR materials generated at coal-fired electrical power generating complexes. In accordance with the CCR RCRA Rule, any CCR surface impoundment or CCR landfill that was actively receiving CCRs on the effective date of the CCR RCRA Rule (October 19, 2015) was deemed to be an "Existing CCR Unit" on that date and subject to self-implementing compliance standards and schedules. Consumers Energy Company (CEC) identified two existing CCR surface impoundments at the B.C. Cobb Generating Facility (BC Cobb):

- Ponds 0-8
- Bottom Ash Pond

BC Cobb is located in Muskegon, Michigan as presented on Figure 1 – Site Location Map. The location of the Bottom Ash Pond is highlighted on Figure 2 – General Site Plan.

This written closure plan is being generated pursuant to 40 CFR 257.102(a) and describes the steps necessary to close the BC Cobb Bottom Ash Pond CCR unit consistent with recognized and generally accepted good engineering practices.

## 2.0 NARRATIVE DESCRIPTION [40 CFR 257.102(b)(1)(i, iii-v)]

The Bottom Ash Pond at BC Cobb will be closed with CCR in place and capped with a final cover system over the CCR surface impoundment area. Prior to construction of the final cover, the Bottom Ash Pond will be dewatered by actively pumping the pond's contents downstream to Pond 4 in a manner that maintains permitted effluent limits. Upon reaching an equilibrium groundwater elevation, active pumping will cease; and the influent and effluent pipes will be capped to prevent subsequent filling of the ponds. Once dewatered, the Bottom Ash Pond will be backfilled to two feet below design grades provided on Figure 3 – Closure Grading Plan. Design grades will be reached with construction of a two-foot-thick final cover system designed with a 2.5 percent slope to meet performance standard requirements per 40 CFR 257.102(d)(3)(ii). Details of the closure construction are provided in the following sections.

## 2.1 Bottom Ash Pond CCR Quantity [40 CFR 257.102(b)(1)(iv-v)]

Golder characterized CCR in the BC Cobb Bottom Ash Pond in October 2015. The sample characterization results were reported in Golder's B.C. Cobb Generating Facility Ash Pond Material Characterization Data Report dated September 2016 (Golder 2016). Through visual observation, characterization sampling determined that the CCR in the Bottom Ash Pond extended to depths that ranged from 16.5 to 19.0 feet below ground surface (bgs) which correlated to 572.4 to 574.0 (NAVD88). The surface area of the Bottom Ash Pond is approximately 0.9 acres as identified on Figure 2 – General Site Plan. The area that includes the exterior dike and access road that surrounds the Bottom Ash Pond is approximately 1.2 acres. Based on the results of the characterization sampling, the largest quantity of CCR estimated in the Bottom Ash Pond was approximately 66,500 cubic yards (cy), which includes the Bottom Ash Pond (26,000 cy) and surrounding dikes (40,500 cy).

## 2.2 Closure Construction Sequence

### *2.2.1 Drainage and Stabilization of CCR Surface Impoundments Prior to Closure [40 CFR 257.102(b)(1)(i) and 40 CFR 257.102(d)(2)]*

CCR sluicing into the Bottom Ash Pond has ceased since the commencement of the decommissioning activities on April 15, 2016; however, non-CCR waste (contact water) continues to be collected and infiltrated from the unit. Before the final cover is installed, the Bottom Ash Pond will be dewatered by actively pumping ponded water through the permitted National Pollutant Discharge Elimination System (NPDES) outfall in a manner that maintains permitted limits. Upon reaching an equilibrium groundwater elevation in the Bottom Ash Pond, active pumping will cease, and the influent and effluent pipe will be permanently capped to prevent subsequent filling of the pond. Golder's October 2015 investigation indicated that poorly graded, fine to medium sand underlies the Bottom Ash Pond, which is expected to readily allow any stormwater received in the pond to infiltrate with limited storage.

#### 2.2.1.1 Inundated CCR Stabilization

Excavation of CCR from the Bottom Ash Pond may lower the pond bottom below the static groundwater elevation. In the event the pond bottom elevation is below the static groundwater elevation, the Michigan Department of Transportation (MDOT) "Treatment of Peat Marshes" (Method A-1) will be utilized to stabilize the CCR before constructing the final cover system. MDOT "Treatment of Peat Marshes" (Method A-1) utilizes sand placed with a rolling surcharge that is equal to two times the depth of the backfill.

#### 2.2.1.2 Dry CCR Stabilization

Once dewatered and the free liquids are removed, CCR within the Bottom Ash Pond will be evaluated to determine whether the CCR materials have sufficient strength properties to accommodate and support the proposed closure grades. If the existing CCR materials above the static groundwater elevation do not have the strength to accommodate earthwork equipment and/or fill material required to meet the closure grades, then the CCR material will be stabilized as required prior to closure construction. Once filling begins, Golder anticipates some elastic settlement of the CCR will occur; but most of the settlement will occur immediately during closure construction (due to the granular nature of the CCR and fill materials), thus, limiting long term subsidence. Soft clay is present beneath the Bottom Ash Pond at a depth of approximately 40 feet bgs (elevation 550 feet NAVD88). The clay is not expected to be a concern, because the surcharge from the nominal fill heights should not create sufficient stress to consolidate and create post-closure settlement concerns or areas of ponded water when utilizing 2.5 percent design slopes.

### *2.2.2 Final Cover System [40 CFR 257.102(b)(1)(iii) and 40 CFR 257.102(d)(3)]*

#### 2.2.2.1 Final Cover Design and Performance

The final cover system will be two-feet-thick and consist of a 40 mil linear low-density polyethylene (LLDPE) textured geomembrane (infiltration layer) overlain with an 8 ounce per square yard nonwoven geotextile (cushion). The cushion will be overlain with an 18-inch-thick layer of fine to medium grained, well sorted sand (protective cover). The protective cover will be overlain with a six-inch-thick erosion layer. The erosion layer consists of topsoil, seed, fertilizer, and mulch in accordance with MDOT Standard Specification 816 – Turf Establishment. A typical detail of the final cover system is provided below in Figure 3.1 – Final Cover System.

Together, the final cover system is designed to:

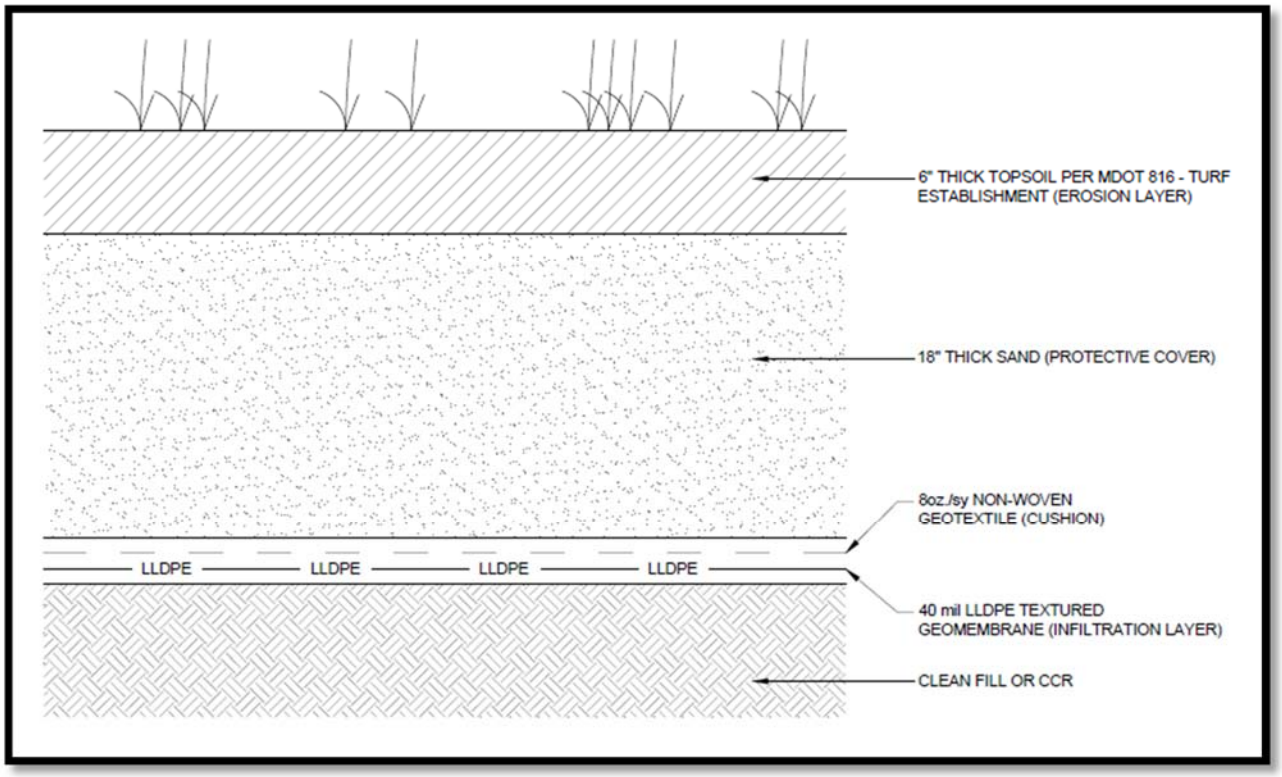
- Provide a final cover permeability less than $1.0 \times 10^{-5}$ centimeter per second (cm/sec)
- Control contaminated runoff
- Minimize the need for maintenance
- Control, minimize, or eliminate post-closure infiltration of liquids
- Minimize releases of CCR and leachate into ground and surface waters or the atmosphere

- Prevent the sloughing or movement of the liner

The system is designed with a minimum 2.5 percent slope to:

- Prevent/limit the future impoundment of water, sediment, and slurry
- Minimize erosion
- Prevent/control the release of waste
- Limit the effects of settlement/subsidence

**Figure 3.1 - Final Cover System**




### 2.2.2.2 Final Cover Construction

The Bottom Ash Pond will be filled to planned grade with readily available certified clean fill material. The certified clean fill material will be placed in areas above the static groundwater elevation in 12-inch-thick loose lifts compacted to at least 95 percent of the maximum dry density achieved by the Standard Proctor (ASTM D698). The certified clean fill material will be placed approximately two feet below the grades presented on Figure 3 – Closure Grading Plan, which allows the final cover system described in Section 2.2.2.1 to meet the grades as shown. Once the certified clean fill material has been placed to its design grades, the final cover system will be constructed and tested to confirm it meets the requirements of the designed final cover.

# 3.0 SCHEDULE [40 CFR 257.102(b)(1)(vi)]

## 3.1 Introduction

CEC will initiate closure by providing notification pursuant to 40 CFR 257.102(e) by October 1, 2018. In accordance with 40 CFR 257.102(f)(1)(ii), closure activities are expected to be completed within five years of the notification of intent to initiate closure (by October 2023).

## 3.2 Closure Construction

The Bottom Ash Pond will be closed simultaneously with Ponds 0-8. The volumes, areas, and timeframes presented in this section are representative of the Bottom Ash Pond and Ponds 0-8 at BC Cobb.

On average, it is anticipated that 5,000 cy of fill can be hauled, placed, and compacted each day. This yields 56 working days or 12 weeks. Once the grading is complete, the 40 mil LLDPE geomembrane will be installed. It is assumed that two crews will be utilized for this project. Each crew can place approximately 45,000 square feet per day and; therefore, a daily production of 90,000 square feet is expected. Based on these assumptions, it is expected that it will take 15 working days or approximately three weeks to complete the geosynthetics installation.

Once the geosynthetics are installed, the protective cover can be placed over the nonwoven geotextile cushion. The protective cover will require placement of approximately 75,000 cy. Assuming a placement rate of 5,000 cy per day yields 15 working days or three weeks. The erosion layer will overlay the protective cover. Approximately 25,000 cy of erosion layer is required. Assuming a placement rate of 5,000 cubic yards per day yields five working days or one week.

The erosion layer will require seed, fertilizer, and mulch and should be planted in mid-August so the seed can be established and cut before winter. With proper equipment, the closed area can be seeded, fertilized, and mulched in less than one week. A breakdown of the schedule is provided below in Table 3.2.1 – Closure Schedule Production Estimate.

**Table 3.2.1 – Closure Schedule Production Estimate**

| Closure Component | Quantity | Units | Construction Rate | Rate Units | Required Time in Days |
|---|---|---|---|---|---|
| Grading layer fill | 280,000 | cubic yards | 5,000 | cubic yards per day | 56 |
| 40-mil LLDPE geomembrane (infiltration layer) | 1.35 million | square feet | 90,000 | square feet per day | 15 |
| 18-inch-thick sand layer (protective cover) | 75,000 | cubic yards | 5,000 | cubic yards per day | 15 |
| 6-inch-thick topsoil (erosion layer) | 25,000 | cubic yards | 5,000 | cubic yards per day | 5 |
| Seed, fertilizer, mulch (erosion layer) | 1.35 million | square feet | 300,000 | square feet per day | 5 |
| | | | | **Workdays Required =** | **96** |

It is anticipated that closure construction will begin on or before April 1, 2023 in order to comply with the closure schedule. Conservatively assuming a start to finish construction schedule, the final cover construction will take approximately 20 weeks. Using these assumptions results in completion of the final cover construction on August 11, 2023, which complies with the October 1, 2023 closure deadline. Table 3.2.2 – Conceptual Final Cover Construction Schedule Milestones contains a list of milestone dates that were developed as part of the closure construction schedule to demonstrate that closure will be completed within the self-implementing closure schedule per 40 CFR 257.102(f)(1)(ii).

**Table 3.2.2 – Conceptual Final Cover Construction Schedule Milestones**

| Closure Component | Start Date | End Date |
|---|---|---|
| Monitor groundwater | January 1, 2016 | October 1, 2023 |
| Notification of closure | NA | October 1, 2018 |
| Grading layer fill | April 3, 2023 | June 16, 2023 |
| 40-mil LLDPE geomembrane (infiltration layer) | June 19, 2023 | July 7, 2023 |
| 18-inch-thick sand layer (protective cover) | July 10, 2023 | July 28, 2023 |
| 6-inch-thick topsoil (erosion layer) | July 31, 2023 | August 4, 2023 |
| Seed, fertilizer, mulch (erosion layer) | August 7, 2023 | August 11, 2023 |
| Closure activities complete | NA | October 1, 2023 |
| Certified closure report | NA | December 31, 2023 |
| Post-closure care period | January 1, 2024 | December 31, 2053 |

## 3.3 Closure Deadline Extension [40 CFR 257.102(f)(2)]

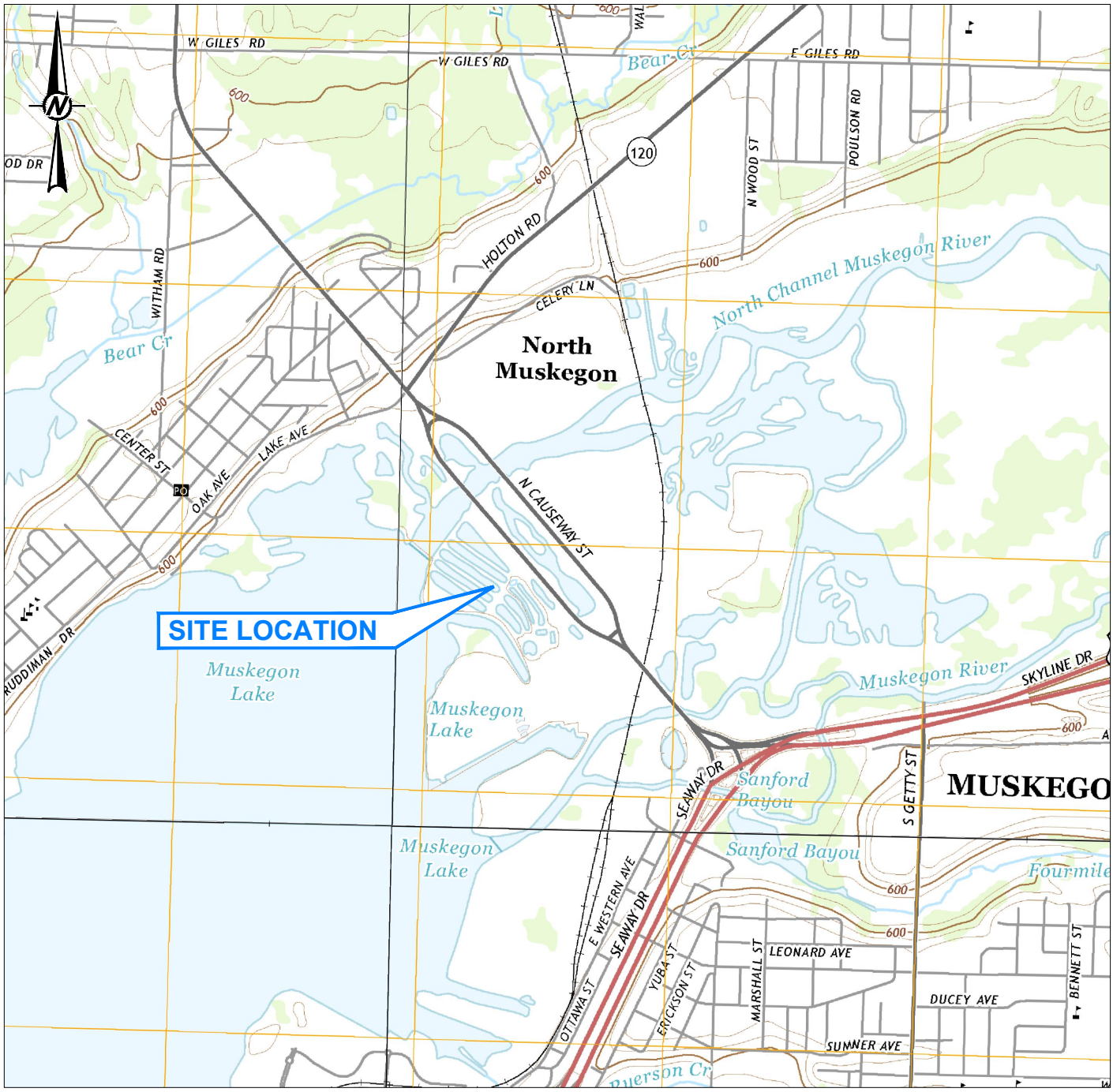
As previously indicated in Section 3.1, closure of existing CCR surface impoundments must be completed within five years of initiating closure in accordance with 40 CFR 257.102(f)(1)(ii). A deadline extension can be obtained as outlined in 40 CFR 257.102(f)(2) if completion of closure is not feasible within five years (e.g., shortened construction season, significant weather delays during construction, time required for dewatering CCR, delays due to state or local permitting or approval, etc.). An extension must include a narrative description that demonstrates closure is not feasible in the required timeframe in accordance with 40 CFR 257.102(f)(2)(i, iii). The closure deadline for the Bottom Ash Pond may be extended up to two years per 40 CFR 257.102(f)(2)(ii)(A).

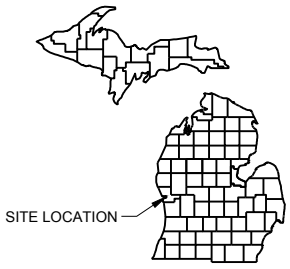
## 4.0 REFERENCES

Golder Associates Inc., B.C. Cobb Generating Facility Ash Pond Material Characterization Data Report. September 2016.

"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.

# FIGURES




MICHIGAN COUNTIES
NOT TO SCALE

**REFERENCE(S)**

1. BASE MAP TAKEN FROM 7.5 MINUTE U.S.G.S. QUADRANGLES OF DALTON, TWIN LAKE, MUSKEGON EAST, AND MUSKEGON WEST, MICHIGAN, DATED 2014.

0 1000 2000
1" = 2000' FEET

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

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-06-14 |
| DESIGNED | JRP |
| PREPARED | AM |
| REVIEWED | JRP |
| APPROVED | MAB |

PROJECT
B.C. COBB PLANT
BOTTOM ASH POND CONCEPTUAL CLOSURE PLAN
MUSKEGON, MI 49445

TITLE
**SITE LOCATION MAP**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1652598 | B001 | 0 | 1 |

Path: \\mtlaurel\cadd\Projects\2016\16525988 Consumers - BC Cobb\PRODUCTION\B - Ponds 0-8 Closure Plan\ | File Name: 16525988B001 - SITE LOCATION MAP.dwg

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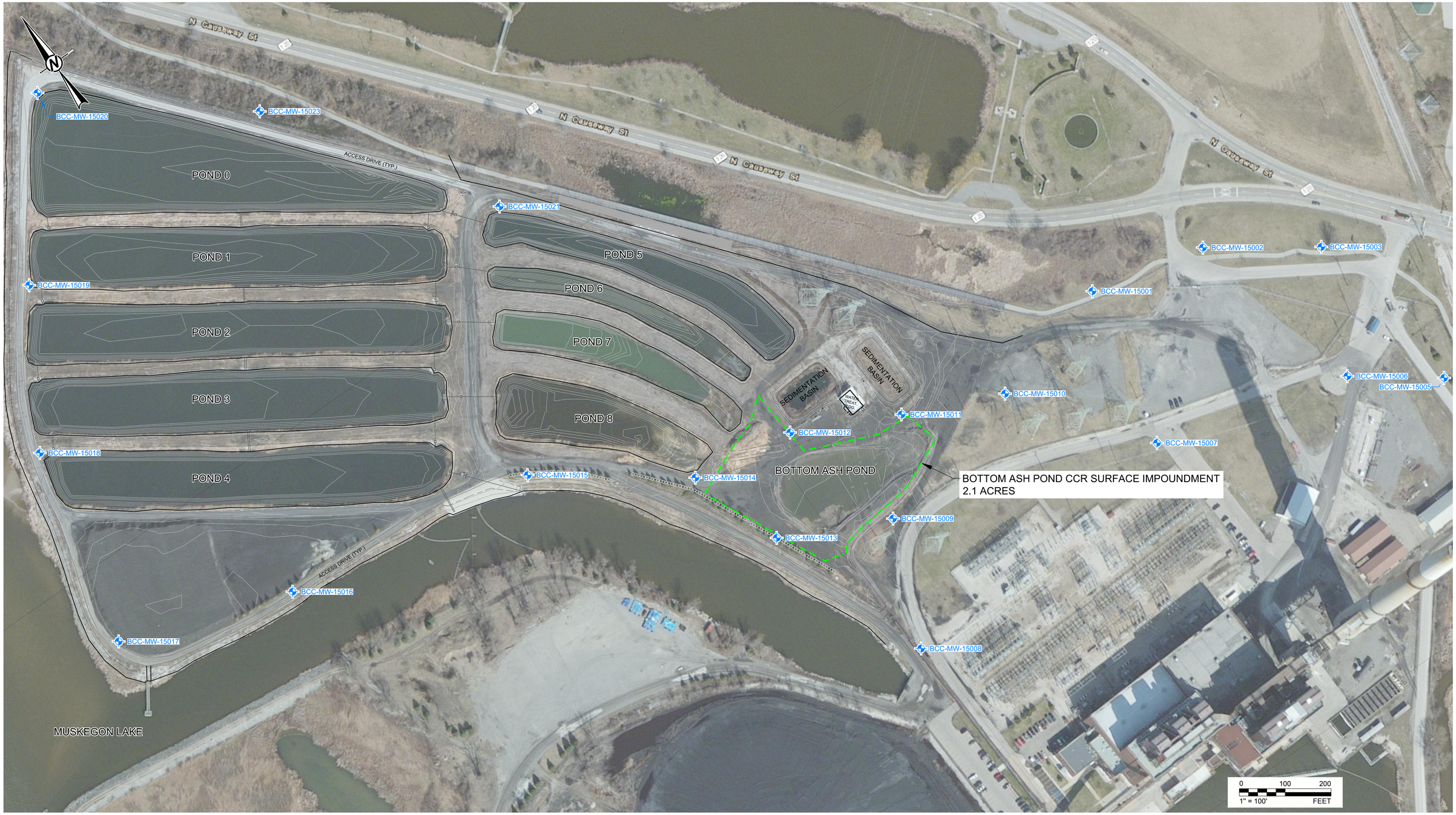
0 1in




**LEGEND**

GROUNDWATER MONITORING WELL

**REFERENCE(S)**

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

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MUSKEGON, MI 49445

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| | |
|---|---|
| YYYY-MM-DD | 2016-06-14 |
| DESIGNED | JRP |
| PREPARED | AM |
| REVIEWED | JRP |
| APPROVED | MAB |

PROJECT
B.C. COBB PLANT
BOTTOM ASH POND CONCEPTUAL CLOSURE PLAN
MUSKEGON, MI 49445

TITLE
**GENERAL SITE PLAN**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
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Path: \\mtfaurel\cadd\Projects\2016\16525986 Consumers - BC Cobb\PRODUCTION\B - Ponds 0-8 Closure Plan\ | File Name: 16525986C002 - GENERAL SITE PLAN.dwg

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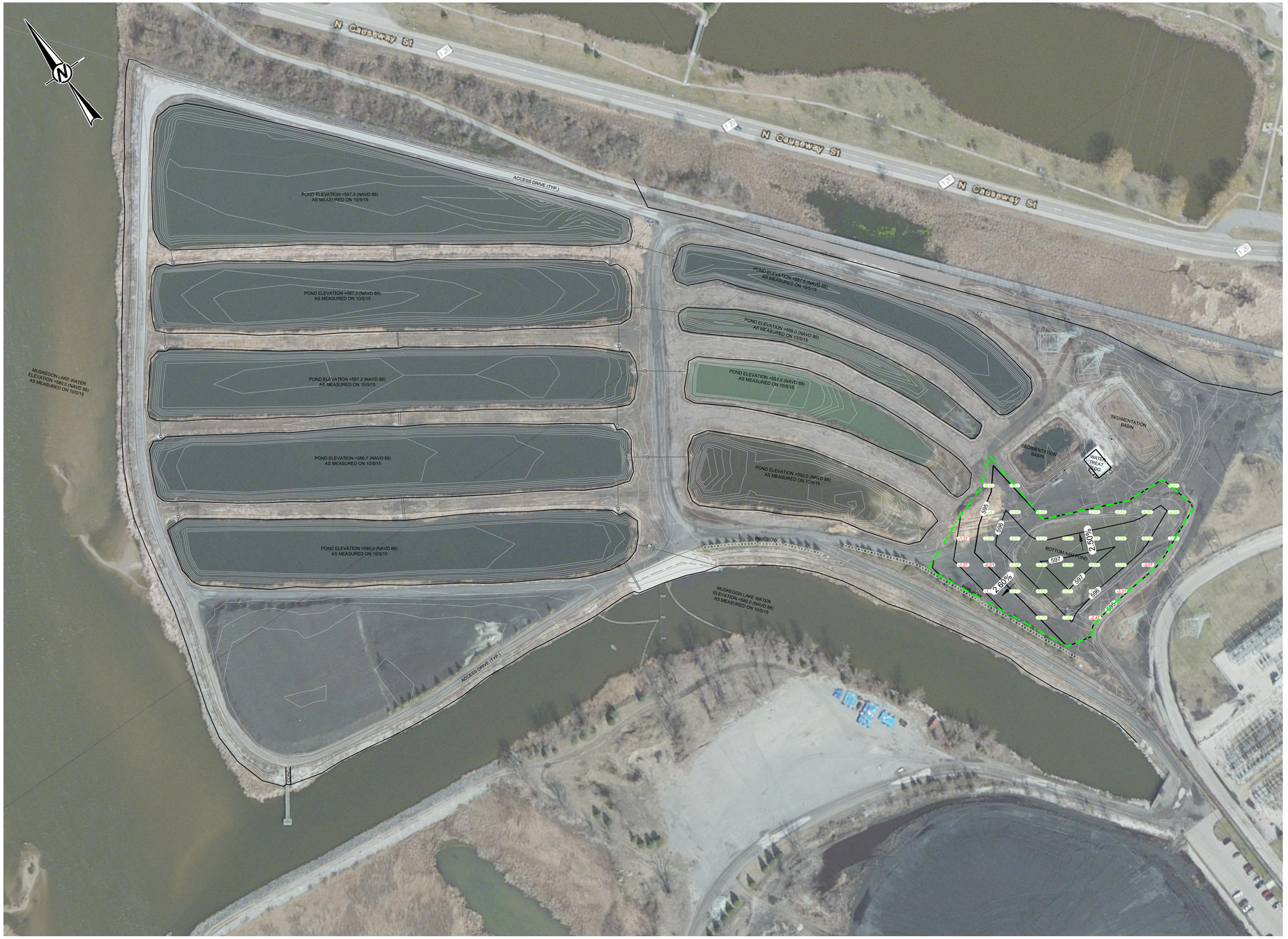


## LEGEND

- POND CLOSURE BOUNDARY (APPROXIMATE)
- 595 PROPOSED FINAL GRADE MAJOR CONTOUR
- 596 PROPOSED FINAL GRADE MINOR CONTOUR

## NOTE(S)

1. BOTTOM OF CCR SURFACE DEVELOPED FROM 2015 GEOTECHNICAL INVESTIGATION.
2. PROPOSED FINAL GRADE CONTOURS REPRESENT TOP OF FINAL COVER (TOP OF EROSION LAYER).

## REFERENCE(S)

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

0 100 200
1" = 100' FEET

## Cut/Fill Summary

| Name | Cut Factor | Fill Factor | 2d Area | Cut | Fill | Net |
|---|---|---|---|---|---|---|
| VOL-4 | 1.000 | 1.000 | 90679.93 Sq. Ft. | 1178.66 Cu. Yd. | 9387.00 Cu. Yd. | 8208.34 Cu. Yd.<Fill> |
| Totals | | | 90679.93 Sq. Ft. | 1178.66 Cu. Yd. | 9387.00 Cu. Yd. | 8208.34 Cu. Yd.<Fill> |

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| YYYY-MM-DD | 2016-06-14 |
| DESIGNED | JRP |
| PREPARED | AM |
| REVIEWED | JRP |
| APPROVED | MAB |

PROJECT
B.C. COBB PLANT
BOTTOM ASH POND CONCEPTUAL CLOSURE PLAN
MUSKEGON, MI 49445

TITLE
**CLOSURE GRADING PLAN**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1652598 | C003 | 0 | 3 |

Path: \\mitaurefcadd\Projects\2016\1652598B Consumers - BC Cobb\PRODUCTION\B - Ponds 0-8 Closure Plan\ | File Name: 1652598BC003 - CLOSURE PLAN.dwg

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Golder Associates

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