

CLOSURE PLAN

POND 6, JR WHITING PLANT
ERIE, MICHIGAN

NOVEMBER 20, 2017

PREPARED FOR:

CONSUMERS ENERGY COMPANY



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List of Exhibits and Engineering Drawings

- | | |
|-----------------------------------|------------------------|
| Site Location Plan | |
| Drawing No. 8-400-4019-010 Rev. C | Ash Grading Plan |
| Drawing No. 8-400-4019-011 Rev. G | Final Cap Grading Plan |

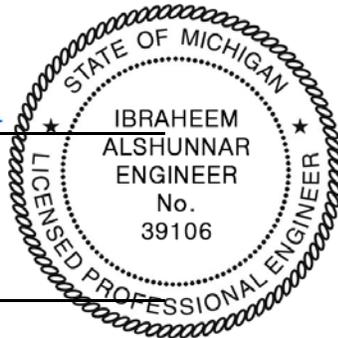
CERTIFICATION

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 the Federal Code of Regulations for Disposal of Coal Combustion Residuals (CCR) 40 CFR 257.100 (e) (6) (i), 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(b).

The Mannik Smith Group, Inc.

Ibraheem Shunnar
Signature



November 20, 2017
Date of Report Certification

Ibraheem Shunnar, PE
Name

6201039106
Professional Engineer Certification Number

1.0 INTRODUCTION

This document presents a closure plan for Consumers Energy Company (CEC) Pond 6 of the JR Whiting Facility located in Erie, Michigan that meets the requirements of the Coal Combustion Residuals (CCR) Resource Conservation and Recovery Act (RCRA) Rules (40 CFR 257 Subpart D) ("CCR RCRA Rules"). The RCRA Rules did not require a closure plan for inactive surface impoundments until August 2016, more than half way through the completion of closure of Pond 6. Closure was conducted under a Michigan Department of Environmental Quality reviewed and approved closure plan that met or exceeded the final cover requirements of 40 CFR 257. This plan is being generated now to include RCRA required elements such as a narrative statement and the maximum inventory of ash so that closure can be certified pursuant to 40 CFR 257. Specifically, the plan was prepared to meet the requirements of 40 CFR Rule 257.102(b). Background information and details of the closure plan are presented below.

JR Whiting Generating Facility (JR Whiting) formerly operated coal-burning baseload units but ceased electrical generation in April 2016. Pond 6 received fly ash from facility operations. A site plan depicting The JR Whiting Facility including Pond 6 is attached as Figure 1, Site Plan. CEC has declared Pond 6 an "inactive surface impoundment" and materials placed in the pond after October 19, 2015 are considered as beneficial reuse of ash materials as these materials were used to raise existing ash grades to target grades and to provide slope to promote drainage. Rule 257.100 (e) (6) (i) requires that CEC prepare an initial written closure plan as set forth in Rule 257.102(b) of the CCR RCRA Rules.

This closure plan is being generated pursuant to 40 CFR 257.100(e)(6) (i), meets the requirements of Rule 257.102(b), and describes the steps necessary to close the pond consistent with recognized and generally accepted good engineering practices.

2.0 PROJECT DOCUMENTS

This closure plan has been prepared based on the following project documents which have been approved by the Michigan Department of Environmental Quality.

1. Final Cover System for Ash Pond 6 Report, prepared by Black and Veatch and include:
 - Final Cover System for Ash Pond 6 Report, dated March 17, 2008, and
 - Construction Quality Assurance Plan for Ash Pond 6, dated May 14, 2008.

These reports include specification for the closure of the pond as well as engineering plans and quality assurance procedure and are incorporated by reference in the JR Whiting Solid Waste Disposal Area License Number 9403.

2. Revised Grading Plans Report, Ash Pond 6, J.R. Whiting Plant, prepared by the Mannik Smith Group and dated June 24, 2016. This report presented updated ash and final cover grading plans that are lower than originally permitted to match available ash volumes.
3. Nonwoven Geotextile Protection Layer Report, Ash Pond 6 Final Cap, J. R. Whiting Plant, prepared by the Mannik Smith Group and dated August 23, 2016. This report called for adding a geotextile protection layer below the geomembrane.
4. Stability Evaluation for Revised Grading Plan Report, Ash Pond 6, J.R. Whiting Plant, prepared by the Mannik Smith Group and dated May 11, 2017. This report provides revised grading along the south side of the pond to accommodate existing fly ash volumes.

The following engineering plans for Pond 6 incorporating the original design by Black and Veatch and the updates described above are attached to this report.

- Drawing No. 8-400-4019-010 Rev. C Ash Grading Plan
- Drawing No. 8-400-4019-011 Rev. G Final Cap Grading Plan

3.0 NARRATIVE DESCRIPTION OF CLOSURE ACTIVITIES [40 CFR 257.102(B) (1)(I)]

Pursuant to 40 CFR 257.102 (b) (1) (i), this report includes a narrative description of how Pond 6 will be closed leaving CCR in place. Pond 6 is underlain by clay soils and contained by a compacted clay perimeter dike which has, generally, a 20-foot wide crest and a crest elevation of about 591.0 feet (NVAD88).

The pond will be closed with CCR in place and capped with a final cover system over the CCR surface impoundment area. Closure activities will be completed in accordance with the project documents presented in Section 2.0. These reports have been approved by the Michigan Department of Environmental Quality (MDEQ).

In general, pre-closure activities will be completed in a manner consistent with the requirements of 40 CFR 257.102 (d) (2). Prior to installing the final cover system, all free liquids will be eliminated by a combination of dewatering and stabilization with fly ash. Any remaining wastes will be stabilized sufficiently to support the final cover system. Once stabilized, the existing subgrade will be graded to the grades shown in Drawing No. 8-400-4019-010 Rev. C entitled "Ash Grading Plan." As shown, minimum slope of the ash grades is 4 percent.

Ash materials will be compacted in accordance of project specification to provide a structural base for the final cover system. Project specifications call for the compaction of the fly ash placed above elevation 591 feet to a minimum of 90 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D 698.) The CCR subgrade will be prepared to provide stable base capable of receiving the proposed cover system. The subgrade will be tested and certified to assure that proper preparation has been completed. The project specifications also include requirements for temporary cover.

Following the completion of ash grading operations, the final cover cap will be placed and tested to confirm it meets the requirements of the designed final cover. The final cap grades and details are shown on Drawing No. 8-400-4019-011 Rev. G entitled "Final Cap Grading Plan." As shown, the cover system meets the requirements of 40 CFR 257.100 (d)(3)(i) and consists of the following layers from the bottom up:

1. A protection 10 ounce nonwoven geotextile;
2. 40 mil High Density Polyethylene (HDPE) geomembrane that exhibits maximum permeabilities less than 1×10^{-9} cm/sec which is more protective than the requirements of 40 CFR 257.102 (d)(3)(i) (A),
3. 24-inch thick infiltration layer (protection layer) that exceeds the requirements of 40 CRF 257.102 (d)(3)(i)(B), and
4. 6-inch thick erosion layer (top soil) that meets the requirements of 40 CFR 257.100(b)(3)(i)(C).

The final cover will be founded on a compacted base that will reduce the potential for settlement. In addition, the final cover slopes are relatively flat (4 to 8 percent slope) which minimizes the need for future maintenance.

Following the preparation of the ash subgrade, the 10 ounce non-woven protective geotextile will be installed. Thereafter, the textured geomembrane will be installed, seamed and tested. Following the placement of the geotextile and the overlying geomembrane, the 24 inch thick earthen infiltration layer will be placed using low-pressure equipment. The erosion layer will be placed after the placement of the infiltration layer. Thereafter, the surface will be seeded mulched and fertilized to promote vegetative cover growth.

4.0 FINAL COVER PERFORMANCE STANDARDS [40 CFR 257.102 (B)(1)(III) AND (D)]

4.1 Final Cover Criteria [40 Cfr 257.102 (B)(1)(Iii) And (D)(1)]

The closure will be completed in a manner consistent with the requirements of 40 CFR 257.102 (d) (1) as described below:

- The final cover will include a geomembrane with low permeability that will minimize infiltration of liquids into the waste ash. Furthermore, it will include infiltration and erosion layers and will slope in a manner that will promote stormwater drainage which will further reduce the potential for infiltration. The CCR materials will be contained within clay dikes and final cover system that will minimize any releases of CCR, leachate, or contaminated run-off to groundwater, surface water, and the atmosphere.
- The final cover will have a minimum slope of 4 percent to preclude the probability of future impoundment of water, sediment, or slurry. In addition, ash below the final cover will be compacted to reduce the potential for ponding due to localized settlement.
- To enhance stability of the final cover system, free liquids will be removed prior to placement of the final cover and a compacted base will be placed below the final cover in accordance with project specifications to prevent the sloughing or movement of the final cover system. In addition, textured geomembrane will be used in the final cover. Engineering evaluations completed demonstrate that the design has adequate major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care periods.
- The final cover will be founded on a compacted base that will reduce the potential for settlement. In addition, the final cover slopes are relatively flat (4 to 8 percent slope) which minimizes the need for future maintenance.
- As described in Section 6 of the closure plan, Pond 6, due to its size, will be closed over two construction seasons consistent with current practices.

4.2 Drainage and Stabilization Prior To Closure [40 CFR 257.102 (b)(1)(i) and (d)(2)]

Prior to installing the final cover system, all free liquids will be eliminated by a combination of dewatering and stabilization with fly ash. In general and based on historic experience at this site, fly ash can be converted to fly ash structural fills via the dredge, stack, and compaction process. Project specifications state that the entire foundation surface must be examined for soft spots. All soft spots are stabilized using a maximum of 3 feet of uncompacted fly ash. The bridging fly ash prepares the subgrade for haul vehicles and compaction equipment.

Any remaining wastes will be stabilized sufficiently to support the final cover system. Once stabilized, the existing subgrade will be graded to the grades shown in Drawing No. 8-400-4019-010 Rev. C entitled "Ash Grading Plan." As shown, minimum slope of the ash grades is 4 percent.

Ash materials will be compacted in accordance with project specification to provide a structural base for the final cover system. Project specifications call for the compaction of the fly ash placed above elevation 591 feet to a minimum of 90 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D 698.) The CCR subgrade will be prepared to provide stable base capable of receiving the proposed cover system. The subgrade will be tested and certified to assure that proper preparation has been completed.

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

The Pond 6 final cover system meets the requirements of 40 CFR 257.100 (b)(3)(i). The final cover system consists of the following layers from bottom up:

1. A 10 ounce nonwoven geotextile protection layer;
2. 40 mil High Density Polyethylene (HDPE) textured geomembrane that exhibits maximum permeabilities less than 1×10^{-9} cm/sec which exceeds the requirements of 40 CFR 257.102 (d)(3)(i)(A),
3. 24-inch thick infiltration layer that exceeds the requirements of 40 CRF 257.102 (d)(3)(i)(B), and
4. 6-inch thick erosion layer that meets the requirements of 40 CFR 257.102(d)(3)(i)(C).

In addition, to meet the requirements of 40 CFR 257.102 (d)(3)(i)(D), the ash fills placed below the final cover system will be compacted to reduce settling and subsidence in order to minimize the disruption of the final cover system.

5.0 POND 6 CCR INVENTORY AND AREA [40 CFR 257.102 (B)(1)(IV) AND (V)]

We completed an estimate of the maximum volume of CCR inventory in Pond 6. The volume estimation was completed using the following drawings:

1. Drawing No. 8-400-4019-010 (Revision C) – This drawing depicted the final ash grades and was used to estimate the ash volumes above Elevation 591 feet.
2. Drawing No. 8-400-4019-005 (Revision D) Drawing No. 8-400-4019-006 (Revision C) – These drawings depicted bottom of Pond 6 configurations and was used to estimate ash volumes below Elevation 591 feet.

Based on our estimation, the maximum inventory of ash in Pond 6 is about 915,815 cubic yards. This is an estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit. The total surface area of Pond 6 is approximately 31.37 acres and was estimated using Drawing No. 8-400-4019-010 (Revision C) which depicted the limits of the ash. This is the largest area ever requiring a final cover.

6.0 SCHEDULE [40 CFR 257.102(B)(1)(VI)]

CEC elected to complete the closure by April 2018 as presented in the “Intent to Initiate Closure” dated December 14, 2015 and as described below:

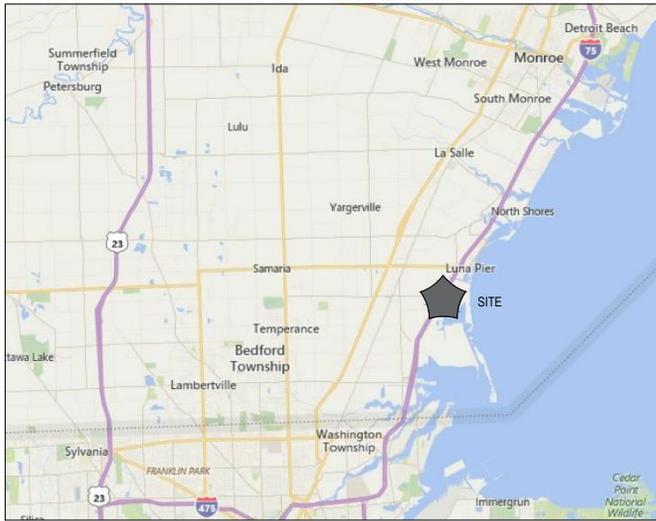
The Pond 6 closure schedule is based on working 10-hour days, 5-days a week. The basis and an outline of the proposed schedule are presented below. Closure activities are expected to include the following:

1. Placement of about 400,000 cubic yards of beneficial reuse materials to provide the required closure grades consistent with the approved MDEQ closure plans. Based on our onsite experience during prior closures, contractors in average place about 4,000 cubic yards per day. On that basis, a total of **100 days** will be required for this activity.
2. Placement of about 34 acres of geomembrane. Based on our onsite experience during prior closures, contractors in average place about one acre per day. On that basis, a total of **34 days** will be required for this activity.
3. Placement of about 110,000 cubic yards of infiltration layer. Based our onsite experience during prior closures, contractors in average place about 4,000 cubic yards per day. On that basis, a total of **27.5 days** will be required for this activity.
4. Placement of about 27,500 cubic yards of erosion layer. Based on our onsite experience during prior closures, contractors in average place about 2,500 cubic yards per day. On that basis, a total of **11 days** will be required for this activity.
5. Seeding mulching and fertilizing of about 35 acres. Based on our experience, contractors can seed mulch and fertilize about one acre per day. On that basis, a total of **35 days** will be required for this activity.

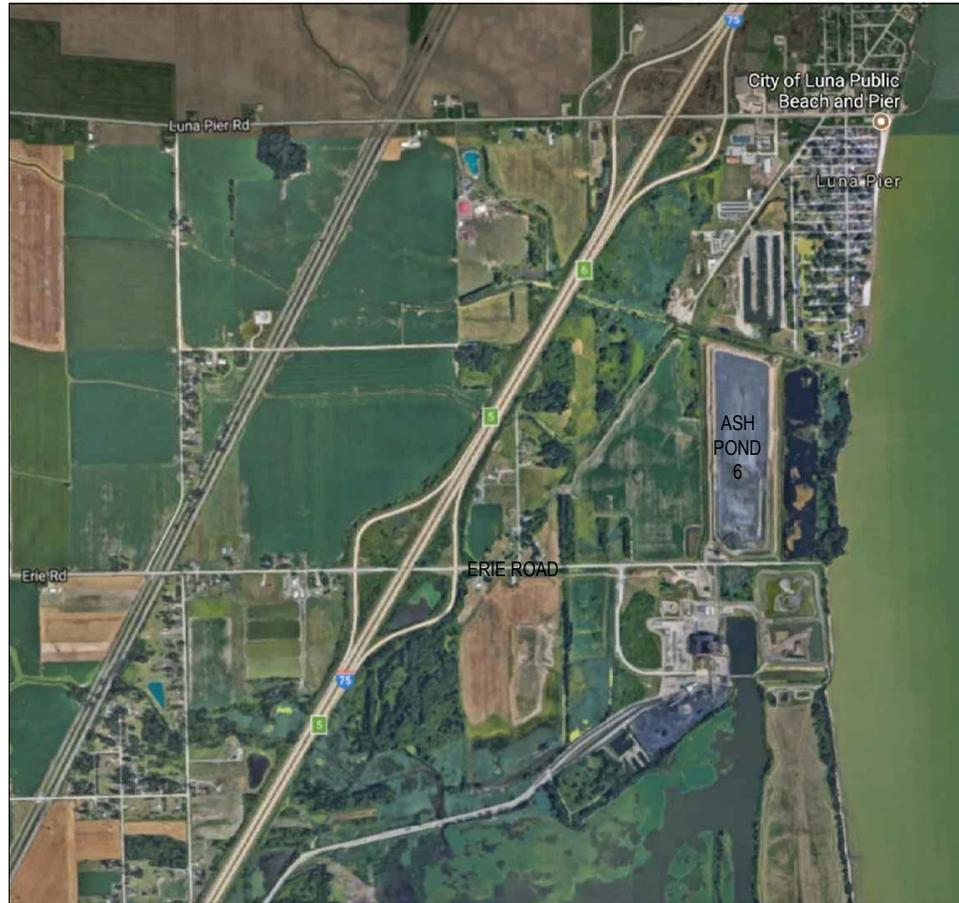
As detailed above, Pond 6 closure activities, when taken sequentially, will require about 207.5 days which are about **41.5 weeks**. Assuming that construction activities will occur between March and November of 2016 and 2017, a total of **68 weeks** is available, which is in excess of the required 41.5 weeks. Please note that a 5 day week was assumed to allow working 6 day weeks to compensate for potential weather delays. On that basis, as required by 40 CFR 257.102(e)(2)(i), the closure will be completed within the self-implementing closure schedule of April 2018.

EXHIBITS AND ENGINEERING DRAWINGS

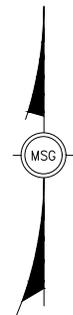




LOCATION MAP



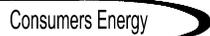
AREA MAP



PREPARED BY:



PREPARED FOR:

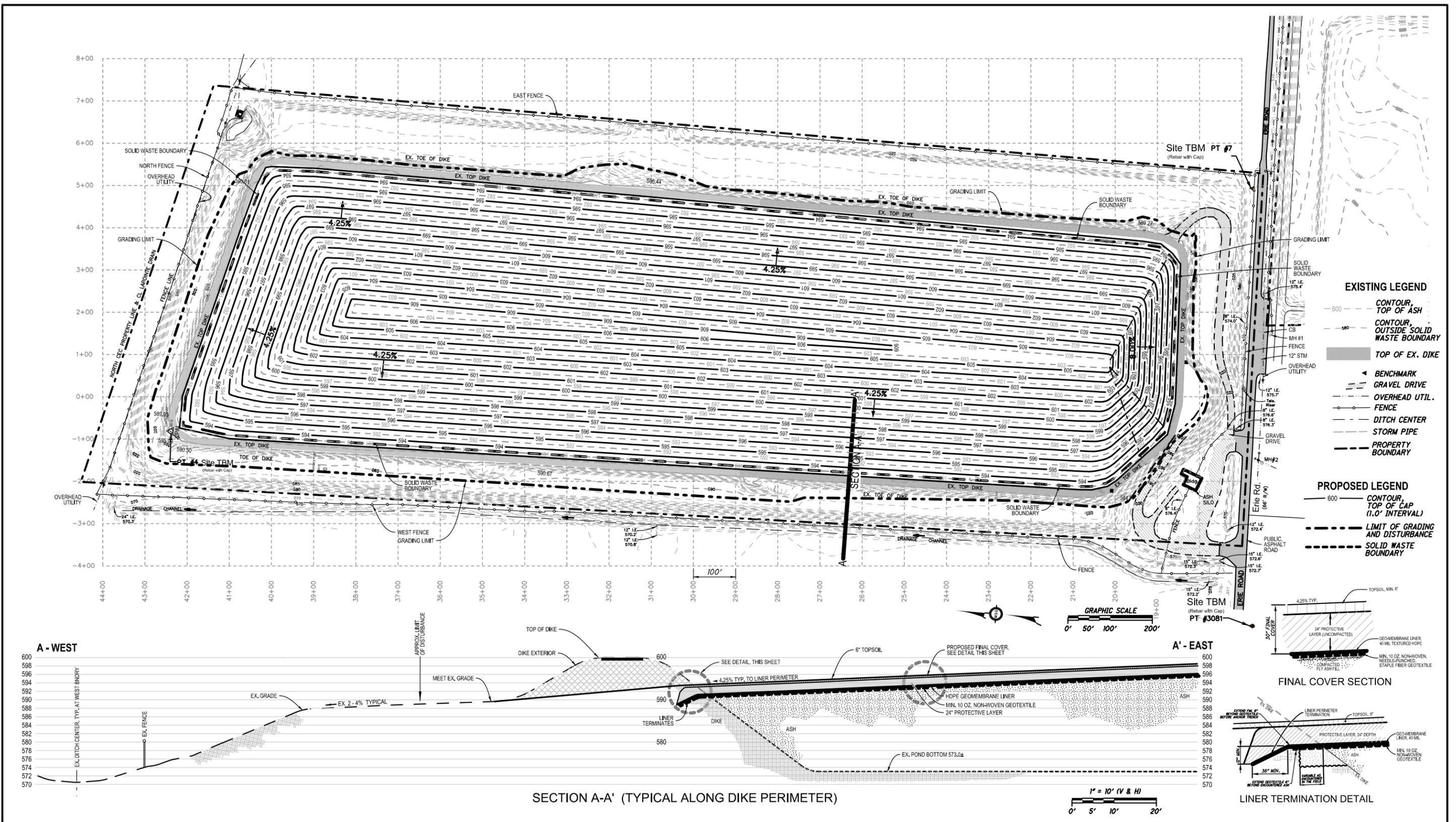


SITE LOCATION PLAN
POND 6-JR WHITING PLANT
ERIE, MICHIGAN

DATE: 11/17/2017
PROJ. NO.: C1790023
DRAWN BY: QSH
REVISION: 1

W:\Projects\Projects A\E\1790023\CADD\BASE\20171116_Exhibit A.dwg - Last printed: 11/17/2017 9:25 AM

5/9/2017 11:28:41 AM
 W:\Projects\Projects-A-EC\1790019\CADD\BASE\Slope Change Evaluation\C1790017_2017_Final Cap Grading Plan.dgn



SECTION A-A' (TYPICAL ALONG DIKE PERIMETER)

DRAWING NO.	REFERENCE DRAWINGS	REV. DATE	DESCRIPTION	BY	APP.	REV. DATE	DESCRIPTION	BY	APP.	DATE
		G 5/3/2017	FINAL CAP GRADING AT 8%	JZ	ISS	D 6/15/2016	CLIENT REVIEW	BPC	ISS	DR. P.JM/BPC 04-01-16
		F 9/8/2016	LINER TERMINATION DETAIL UPDATE	SJO	ISS	C 4/27/2016	CLIENT REVIEW	BPC	ISS	
		E 8/24/2016	CLIENT REVIEW/USE	BPC	ISS	A 4/8/2016	CLIENT USE	BPC	ISS	
				BPC	ISS		DRAFT REVIEW TO CLIENT	BPC	ISS	

DRAWING NO.		REFERENCE DRAWINGS		REV. DATE	DESCRIPTION	BY	APP.	REV. DATE	DESCRIPTION	BY	APP.	DATE
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				PLANS PREPARED BY:		2365 HAGGERTY ROAD CANTON, MI 48188 TEL: 734-397-3100 FAX: 734-397-3131	
J. R. Whiting Plant-Pond 6 FINAL CAP GRADING PLAN				SCALE: 1" = 100' CE FILENAME: C1790017_FINAL_CAP MSG FILENAME: C1790017_FINAL_CAP	DRAWING NO. 8-400-4019-011 SHEET 2 REV. G		