MWG

Midwest Generation, LLC

Powerton Generating Station

DRAFT

Alternative Composite Liner Design Certification for Retrofitted Ash Surge Basin

Revision 0B

March 24, 2023

Issue Purpose: Public Comment

Project No.: 12661-152

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Sargent & Lundy

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1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(c)
Federal CCR Rule Reference: 40 CFR 257.72(c)

1.1 PURPOSE

The Ash Surge Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is being retrofitted with a new composite liner system and a new leachate collection and removal system (LCRS). As a CCR surface impoundment, the Ash Surge Basin is regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments," which is codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and is referred to herein as the "Illinois CCR Rule." The Ash Surge Basin is also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), which is referred to herein as the "Federal CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.410(c) and 40 CFR 257.72(c), this document demonstrates and provides certification that the design of the new composite liner system for the retrofitted Ash Surge Basin complies with the requirements of 35 Ill. Adm. Code 845.410 and 40 CFR 257.72 for an alternative composite liner.

1.2 SCOPE & APPLICABLE CCR REGULATIONS

Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the retrofitted Ash Surge Basin will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program. The Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval, and so this demonstration and certification has been prepared pursuant to both sets of regulations.

1.2.1 FEDERAL CCR RULE

The following excerpts from the Federal CCR Rule are applicable to the design of an alternative composite liner system for a retrofitted CCR surface impoundment:

- § 257.72(a): New CCR surface impoundments…must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of § 257.70(b) or (c).
- § 257.70(c): If the owner or operator elects to install an alternative composite liner, all of the following requirements must be met:

- An alternative composite liner must consist of two components: the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil.
- The hydraulic conductivity for the two feet of compacted soil used in comparison [to the alternative composite liner's lower component] shall be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods. The liquid flow rate comparison must be made using Equation 1 of [40 CFR 257.70(c)], which is derived from Darcy's Law for gravity flow through porous media.

1.2.2 ILLINOIS CCR RULE

The following excerpts from the Illinois CCR Rule are applicable to the design of an alternative composite liner system for a retrofitted CCR surface impoundment:

- § 845.410(a): New CCR surface impoundments…must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of Section 845.400(b) or (c).
- § 845.400(c)(1): An alternative composite liner must consist of two components: the upper component consisting of, at a minimum, a 30-mil geomembrane liner, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The geomembrane liner components consisting of high-density polyethylene (HDPE) must be at least 60 mil. If the lower component of the alternative liner is compacted soil, the geomembrane liner must be installed in direct and uniform contact with the compacted soil.
- § 845.400(c)(2): The liquid flow rate through the lower component of the alternative composite liner must be no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. The hydraulic conductivity for the two feet of compacted soil used in the comparison must be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods.
- § 845.400(c)(3): The liquid flow rate comparison must be made using the following equation, which is derived from Darcy's Law for gravity flow through porous media.

$Q/A = q = k ((h/t)+1)$

where:

Q = flow rate (cubic centimeters/second)

A = surface area of the liner (squared centimeters)

q = flow rate per unit area (cubic centimeters / second / square centimeter)

k = hydraulic conductivity of the liner (centimeters / second)

h = hydraulic head above the liner (centimeters); and

t = thickness of the liner (centimeters)

2.0 DEMONSTRATION

The alternative composite liner design for the retrofitted Ash Surge Basin at the Powerton Generating Station is compliant with the referenced regulations as demonstrated in the following sections.

2.1 UPPER COMPONENT

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.400(c)(1)
Federal CCR Rule Reference: 40 CFR 257.70(c)(1)

The upper component of the alternative composite liner design for the retrofitted Ash Surge Basin consists of a 60-mil HDPE geomembrane. This complies with 35 Ill. Adm. Code 845.400(c)(1) and 40 CFR 257.70(c)(1).

2.2 LOWER COMPONENT

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.400(c)(2) & 845.400(c)(3)
Federal CCR Rule Reference: 40 CFR 257.70(c)(2)

The lower component of the alternative composite liner design for the retrofitted Ash Surge Basin consists of a geosynthetic clay liner (GCL). To demonstrate the specified GCL complies with 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2), the maximum liquid flow rate allowed by the project construction specifications is compared to the liquid flow rate through two feet of soil with a hydraulic conductivity of 1×10^{-7} cm/sec. Table 1 presents this flow rate comparison. As shown in the table, the maximum allowable hydraulic conductivity specified for the GCL is 1×10^{-9} cm/sec. The GCL's hydraulic conductivity will be determined by ASTM D5887, which is a recognized and generally accepted method for determining the hydraulic conductivity of a GCL.

Per Table 1, the design liquid flow rate through the GCL specified for the lower component of the alternative composite liner for the retrofitted Ash Surge Basin is less than the liquid flow rate through two feet of

compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. This complies with 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2).

Table 1 – Liquid Flow Rate Comparison Between Compacted Soil Liner & GCL for Retrofitted Ash Surge Basin

Parameter	Symbol	Compacted Soil Liner	GCL
Crest Elevation	EL_{crest}	467 feet	
Minimum Elevation of Composite Liner System	EL_{floor}	450.50 feet	
Hydraulic Head on Liner (Omitting Geomembrane Thickness)	$h = EL_{crest} - EL_{floor}$	16.50 feet	
Thickness of Liner Lower Component	t	2 feet	7 mm = 0.023 feet
Hydraulic Gradient Through Liner	$i = h / t$	8.25	717.39
Maximum Hydraulic Conductivity of Liner	k	1.0×10^{-7} cm/sec	1.0×10^{-9} cm/sec
Liquid Flow Rate Through Liner (per Unit Area)	$q = k \times (i + 1)$	9.25×10^{-7} cm^3/sec/cm^2	7.18×10^{-7} cm^3/sec/cm^2

3.0 CERTIFICATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.410(c)

Federal CCR Rule Reference: 40 CFR 257.72(c)

I hereby certify that:

- Per the preceding demonstration and pursuant to 35 Ill. Adm. Code 845.400(c)(2) and 845.400(c)(3) and 40 CFR 257.70(c)(2), the design liquid flow rate through the lower component of the alternative composite liner for the retrofitted Ash Surge Basin is no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec.
- The design of the alternative composite liner for the retrofitted Ash Surge Basin complies with the requirements of 35 Ill. Adm. Code 845.410 and 40 CFR 257.72.
- This pre-construction composite liner design certification was prepared by me or under my direct supervision, and
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: _____ Date: _____

Seal:

CERTIFICATION NOT REQUIRED FOR PUBLIC COMMENT VERSION

4.0 REFERENCES

1. Illinois Pollution Control Board. “Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments.” 35 Ill. Adm. Code 845. Accessed April 15, 2022.
2. U.S. Environmental Protection Agency. “Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.” 40 CFR Part 257 Subpart D. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D. Accessed April 15, 2022.

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Leachate Collection System Design Certification for Retrofitted Ash Surge Basin

Revision 0B

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1.0 PURPOSE & SCOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)

1.1 PURPOSE

The Ash Surge Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is being retrofitted with a new composite liner system and a new leachate collection and removal system (LCRS). As a CCR surface impoundment, the Ash Surge Basin is regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments," which is codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and is referred to herein as the "Illinois CCR Rule."

Pursuant to 35 Ill. Adm. Code 845.420(b), this document demonstrates and provides certification that the design of the new leachate collection and removal system for the retrofitted Ash Surge Basin complies with the requirements of 35 Ill. Adm. Code 845.420.

1.2 APPLICABLE ILLINOIS CCR RULE REGULATIONS

The following excerpts from the Illinois CCR Rule are applicable to the design of an LCRS for a retrofitted CCR surface impoundment:

- § 845.420: A new CCR surface impoundment must be designed, constructed, operated and maintained with a leachate collection and removal system. The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the leachate collection system of the CCR surface impoundment during its active life and post-closure care period.
- § 845.420(a): The leachate collection and removal system must:
    1) Be placed above the liner required by Section 845.410;
    2) Have placed above it a filter layer that has a hydraulic conductivity of at least 1×10^{-5} cm/sec;
    3) Have a bottom slope of three percent or more towards the collections pipes;
    4) Be constructed of:
        A) Granular drainage materials with a hydraulic conductivity of 1×10^{-1} cm/sec or more and a thickness of 24 inches or more above the crown of the collection pipe; or
        B) Synthetic drainage materials with a transmissivity of 6×10^{-4} m^2/sec or more;
    5) Be constructed of materials that are chemically resistant to CCR and any non-CCR waste managed in the CCR surface impoundment and the leachate expected to be

generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste and any waste cover materials and equipment used at the CCR surface impoundment;

6) Be designed, constructed, and operated with collection pipes at the base of the granular material to prevent clogging with fines during the active life and post-closure care period:
7) Have collection pipes
    A) Designed such that leachate is collected at a sump and is pumped or flows out of the CCR surface impoundment;
    B) With slopes that allow flow from all points within the CCR surface impoundment to the sump or drain outlet; and
    C) Large enough to conduct periodic cleaning;
8) Have a protective layer or other means of deflecting the force of CCR pumped into the CCR surface impoundment;
9) Be designed and operated to minimize clogging during the active life and post-closure care period; and
10) At a minimum, the leachate collection and removal system must be operated to remove free liquids from the CCR surface impoundment at the time of closure during post closure care.

2.0 DEMONSTRATION

The LCRS design for the retrofitted Ash Surge Basin at the Powerton Generating Station is compliant with the referenced regulations as demonstrated in the following sections.

2.1 LOCATION ABOVE NEW COMPOSITE LINER SYSTEM

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(1)

The LCRS will be placed above the retrofitted Ash Surge Basin's new composite liner system – a 60-mil high-density polyethylene (HDPE) geomembrane over a geosynthetic clay liner (GCL) – as required by 35 Ill. Adm. Code 845.420(a)(1).

2.2 FILTER LAYER

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(2)

A sand filter layer having a hydraulic conductivity of at least 1×10^{-5} cm/sec will be placed above the LCRS as required by 35 Ill. Adm. Code 845.420(a)(2).

2.3 BOTTOM SLOPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(3)

Natural soil fill material will be placed along the floor of the Ash Surge Basin to establish three percent slopes down towards a leachate collection pipe located in the middle of the basin. The LCRS will also be installed along the inside faces of the Ash Surge Basin's existing dikes, which have interior sideslopes of approximately 3-horiztonal:1-vertical, or 33 percent. This complies with 35 Ill. Adm. Code 845.420(a)(3).

2.4 DRAINAGE MATERIAL

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(4)

The LCRS will be constructed of a drainage geocomposite with a transmissivity of at least 6×10^{-4} m^2/sec. The drainage geocomposite will consist of an HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet core. This complies with 35 Ill. Adm. Code 845.420(a)(4).

2.5 CHEMICAL RESISTANCE, STRENGTH, & THICKNESS

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(5)

The HDPE components (collection pipe, drainage geocomposite) and natural soil components (protective warning layer, sand filter layer, and coarse aggregate bedding layer) of the LCRS are chemically resistant to the CCR and non-CCR waste that will be managed in the retrofitted Ash Surge Basin. The LCRS components have also been designed to have sufficient strength and thickness to prevent collapse under the pressures exerted by the overlying waste, a potential final cover system for the waste, and Station equipment used to perform routine maintenance at the CCR surface impoundment. This complies with 35 Ill. Adm. Code 845.420(a)(5).

2.6 CLOGGING PREVENTION FOR COLLECTION PIPE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(6)

The perforated leachate collection pipe will be surrounded by coarse aggregate bedding material. The perforations in the leachate collection pipe and the gradation of the coarse aggregate bedding material are designed to prevent fines from clogging the pipe during the active life and post-closure care period of the retrofitted Ash Surge Basin. This complies with 35 Ill. Adm. Code 845.420(a)(6).

2.7 COLLECTION PIPE DESIGN

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(7)

A 6-in.-diameter, perforated leachate collection pipe will be installed in a north-south spanning trench in the middle of the retrofitted Ash Surge Basin to collect leachate from the drainage geocomposite component of the LCRS. The leachate collection pipe will be sloped towards the basin's existing drain outlet, a 48-inch-diameter reinforced concrete pipe, to convey leachate out of the basin. The slopes of the retrofitted Ash Surge Basin's LCRS will ensure flow from all points within the retrofitted Ash Surge Basin is directed to the leachate collection pipe and ultimately conveyed to the existing drain outlet. Finally, the 6-in. diameter of the leachate collection pipe is large enough to conduct periodic cleaning. This complies with 35 Ill. Adm. Code 845.420(a)(7).

2.8 PROTECTIVE LAYER

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(8)

Along the retrofitted Ash Surge Basin's floor, a protective warning layer consisting of 6 inches of densely graded aggregate will be installed over the sand filter layer to deflect the force of CCR flowing into the CCR surface impoundment. This layer will also provide a working surface for operators removing CCR from the basin during routine cleanings and will also serve as a means of warning these operators that they have reached the basin floor and to stop excavating. Along the basin's sideslopes, the protective warning layer will consist of riprap on a gravel bedding layer to protect the sand filter layer from erosion. This complies with 35 Ill. Adm. Code 845.420(a)(8).

2.9 CLOGGING PREVENTION FOR DRAINAGE GEOCOMPOSITE

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(9)

The upper non-woven geotextile component of the drainage geocomposite will prevent CCR and non-CCR sediments from intruding into, clogging, and impeding the flow of leachate through the HDPE geonet core during the active life and post-closure care period of the retrofitted Ash Surge Basin. Moreover, the sand filter layer installed above the LCRS will also preclude CCR and non-CCR sediments from clogging the LCRS. This complies with 35 Ill. Adm. Code 845.420(a)(9).

2.10 OPERATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(a)(10)

At a minimum, the LCRS will be operated to remove free liquids from the retrofitted Ash Surge Basin when the basin is closed and during the basin's post-closure care period.

3.0 CERTIFICATION

Illinois CCR Rule Reference: 35 Ill. Adm. Code 845.420(b)

I hereby certify that:

- The design of the leachate collection system for the retrofitted Ash Surge Basin complies with the requirements of 35 Ill. Adm. Code 845.420.
- This pre-construction leachate collection system design certification was prepared by me or under my direct supervision, and
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: _____ Date: _____

Seal:

CERTIFICATION NOT REQUIRED FOR PUBLIC COMMENT VERSION

4.0 REFERENCES

1. Illinois Pollution Control Board. "Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments." 35 Ill. Adm. Code 845. Accessed March 1, 2023.

MWG

Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1802

ASH SURGE BASIN RETROFIT

S&L PROJECT NO.: 12661-152

REVISION 0B

ISSUE PURPOSE: PUBLIC COMMENT

ISSUE DATE: 03-24-2023

Sargent & Lundy

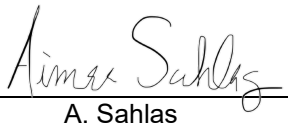
SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-14-2023	All
0B	Public Comment	03-24-2023	All

This is to confirm that this Specification has been prepared, reviewed, and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0407, Specifications and Bills of Materials, which is part of our Quality Management System.

Contributor Summary & Current Revision Signatures

Rev.	Prepared By	Reviewed By	Approved By
0A	A. Sahlas	T. Dehlin	--
0B	 A. Sahlas	T. Dehlin	*Approver signature is not required for comment version.*

SECTION 000107

CERTIFICATION PAGE

Sargent & Lundy (S&L) is registered in the State of Illinois to practice engineering. S&L's Illinois Department of Financial and Professional Regulation registration number is 184-000106.

I certify that this Specification was prepared by me or under my direct supervision and that I am a registered professional engineer under the laws of the State of Illinois.

Certified By: _____ Date: _____

Seal:

CERTIFICATION NOT REQUIRED FOR PUBLIC COMMENT VERSION

SECTION 000110

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END OF SECTION 000110

SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

101. PROJECT INFORMATION

101.1 Owner: Midwest Generation, LLC (MWG)

101.2 Design Engineer: Sargent & Lundy (S&L)

101.3 Project Name: Ash Surge Basin Retrofit

101.4 Project Location: Powerton Generating Station
13082 E. Manito Rd.
Pekin, IL 61554

102. DESCRIPTION OF THE PROJECT AND GENERAL BACKGROUND

102.1 The purpose of this project is to retrofit the Ash Surge Basin at Midwest Generation, LLC's Powerton Generating Station in accordance with the Illinois Pollution Control Board's Coal Combustion Residuals (CCR) Rule, 35 Ill. Adm. Code Part 845, and with the U.S. Environmental Protection Agency's (EPA) CCR Rule, 40 CFR Part 257 Subpart D.

102.2 The Ash Surge Basin will be retrofitted by first removing all CCR and CCR-mixed materials remaining in the basin; removing the basin's existing gravel warning, sand cushion, and riprap layers; and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following material removal and decontamination of the basin facilities remaining in-place, a new composite liner system and new leachate collection and removal system (LCRS) will be installed within the Ash Surge Basin over the basin's existing decontaminated and leak-tested geomembrane liner.

103. SCOPE OF WORK

103.1 In general, this Specification covers the technical requirements for a General Work (GW) Contractor to retrofit the Ash Surge Basin at the Powerton Generating Station. The Work includes the following activities:

a. Furnishing and installing temporary sediment and erosion control best management practices (BMPs) prior to and during all phases of earth disturbance work.

b. Retrofitting the Ash Surge Basin by:

b1. Removing all CCR, gravel warning layer, sand cushion, and riprap layers above the basin's existing geomembrane liner with offsite disposal of dry waste material in a permitted landfill approved by the Owner and disposal of liquid waste in the retrofitted Bypass Basin or as otherwise directed by the Owner.

b2. Decontaminating the basin's existing geomembrane liner and appurtenant structures, for re-use in the retrofitted basin, including conducting and documenting visual inspections and analytical testing to demonstrate the existing liner is no longer contaminated with CCR constituents.

b3. Ensuring all appropriate measures are taken to protect the Ash Surge Basin's existing HDPE geomembrane liner system from damage.

b4. Placing, compacting, and grading Structural Fill to establish the lines and grades for the basin's LCRS as specified on the Design Drawings.

b5. Installing a new composite liner system over the existing, decontaminated geomembrane liner and Structural Fill placed within the basin. The composite liner system consists of an HDPE geomembrane liner over a geosynthetic clay liner (GCL).

b6. Installing a new LCRS over the new composite liner system. The LCRS consists of drainage geocomposite – an HDPE geonet core with a non-woven geotextile heat-laminated to each side of the geonet – over a perforated HDPE collection pipe installed within a pipe bedding layer.

b7. Installing a Sand Filter Layer above the drainage geocomposite.

b8. Installing a Protective Warning Layer above the Sand Filter Layer on the basin floor.

b9. Installing riprap on a gravel bedding layer above the Sand Filter Layer along the basin's side slopes to protect the Sand Filter Layer from erosion.

c. Restoring and cleaning the project site.

d. Developing fueling and maintenance facilities and practices to protect the project site from hydrocarbon spills or other environmental impacts that may impact the project site, adjacent property, or the Illinois River and connected waterways.

103.2 In addition, the Work shall include but not be limited to the following:

a. Engineering and construction services required to perform or install the Work.

b. Surveying to ensure the Work is located as indicated on the Design Drawings.

c. Furnishing all installation equipment and tools including any calibrated instruments required for monitoring and testing.

d. Maintaining the project site in a dry condition that includes dewatering of all areas that collect storm water or groundwater in the area controlled by the GW Contractor, redirecting any surface water as a result of rainfall or water generated by the installation Work. Any groundwater and/or surface water which requires removal from the area of work shall be disposed of in compliance with the Powerton Generating Station's National Pollutant Discharge Elimination System (NPDES) discharge permit in effect at the time of the Work. The methods and proposed place of discharge shall be approved by the Owner prior to disposing of the water.

e. Disposing of excess excavated material and other construction related debris in an off-site permitted landfill approved by the Owner.

f. Maintaining a record of the installation (i.e., as-built drawings) in accordance with the technical requirements of this Specification.

g. Furnishing the services of qualified personnel at the project site to perform the Work.

h. Progress reporting as specified in the Commercial Terms and Conditions.

i. Daily site cleanup and disposal of waste and debris.

j. Participation in the Owner's on-site safety program, including the Owner's CCR Safety and Health Plan Training.

k. GW Contractor shall allow access to all work areas by Owner, Design Engineer, CQA Contractor staff, and other parties as approved by Owner. GW Contractor shall not install, modify, repair or work on any elements of the project that are subject to the CQA testing and inspection services without notifying the CQA Contractor at least 2 workdays in advance. Work on weekends or holidays shall be scheduled as soon as possible with the CQA Contractor. Failure to provide CQA Contractor adequate advanced notice to staff the site shall result in a hold on work until the CQA Contractor staff arrive on site.

103.3 The Work shall conform to the requirements of this Specification and shall be performed and supervised by personnel who are experienced and knowledgeable in the crafts and trades required by the Scope of Work. The Work shall be performed exclusively by the GW Contractor's trained and competent personnel or, where permitted, that of its subcontractor(s); and shall comply with all applicable safety laws, regulations, programs, and practices to ensure the safety of all people located on the work site, including the GW Contractor's personnel (or that of its subcontractor(s)) performing the Work.

103.4 Performance of the Work shall include all the labor, supervision, administration, management, material procurement, tools, installation and testing equipment, miscellaneous material, and consumables to perform the Work specified herein.

103.5 Provide all installation equipment and all incidental items not shown or specified but reasonably implied for successful completion of the Work and in strict accordance with the Design Drawings and this Specification, including inspection, testing and quality standards.

103.6 Provide installation quality assurance and quality control submittals where required.

103.7 Prepare red-lined as-built drawings for review upon completion of the Work to document any variances between the construction issue of the Design Drawings and the actual installation. Finalize as-built drawings after the Owner and the Design Engineer review.

103.8 All other work as indicated on the Design Drawings, as specified herein, or as required to properly complete the Work.

104. DIVISION OF RESPONSIBILITY & CONTRACTOR QUALIFICATIONS

104.1 Owner:

a. MWG is the Owner of the facility and has the authority to accept or reject materials and workmanship of the GW Contractor or reports and recommendations of the CQA Contractor. The Owner will ultimately be responsible for the retrofit construction for the Ash Surge Basin and for assuring the Permitting Authority that the construction meets or exceeds the requirements specified in state regulations, permits, Project Specifications, and the Design Drawings.

104.2 Design Engineer:

a. S&L is the Design Engineer and is responsible for designing the retrofitted features for the Ash Surge Basin.

b. The Design Engineer will assure that the retrofit design meets or exceeds the construction requirements of the Owner and meets or exceeds the requirements of the Permitting Authority.

c. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes to the permitted design shall require approval of the Owner and Design Engineer to ensure that the original design objectives are still maintained. All changes shall meet state regulatory

requirements and the rules promulgated thereunder and may include Permitting Authority-approved variances to the rules.

104.3 Permitting Authority – Illinois EPA:

a. The Illinois EPA is the Permitting Authority and is responsible for reviewing the permit application for retrofitting the Ash Surge Basin to assure compliance with state regulations and for granting the construction permit for the project.

b. The Permitting Authority may review any design revisions during construction and any requests for variance submitted by the Owner. The Permitting Authority has the authority to review and approve all CQA documentation and reports and to confirm the Ash Surge Basin was retrofitted as specified in Project Specifications and the Design Drawings.

104.4 GW Contractor:

a. The GW Contractor is the firm with whom the Owner establishes a contract for the satisfactory performance of the Work.

b. The GW Contractor is responsible for the work, quality, and safety of their staff and all subcontractors and suppliers.

c. The GW Contractor may devise the Work into the following division of responsibilities between an Earthwork Contractor and a Geosynthetics Contractor.

104.5 Earthwork Contractor:

a. The Earthwork Contractor is the contractor responsible for:

a1. Earthwork and sitework.

a2. Removal of existing CCR and protective layers above the Ash Surge Basin's existing geomembrane liner.

a3. Placement of fill material to support the basin's new composite liner system and to establish the lines and grades of the basin's new LCRS.

a4. Placement of fill material over liner run-outs.

a5. Placement of bedding material around and installation of the leachate collection pipe.

a6. Installation of the granular materials above the basin's new LCRS.

b. The GW Contractor may self-perform or subcontract the Earthwork Contractor's scope of work.

104.6 Geosynthetics Contractor:

a. The Geosynthetics Contractor is the contractor responsible for supplying and installing all geosynthetic materials for the project, including geosynthetic clay liner (GCL), high-density polyethylene (HDPE) geomembrane, drainage geocomposite, and non-woven geotextile.

b. The GW Contractor may self-perform or subcontract the Geosynthetics Contractor's scope of work.

c. Qualifications:

c1. The Geosynthetics Contractor shall be approved by the manufacturer(s) of the geosynthetics materials for installing the geosynthetic materials supplied for the project.

c2. The Geosynthetics Contractor shall be approved by the Owner.

c3. The Geosynthetics Contractor shall have a minimum 5-year history of successfully performing similar work.

104.7 Construction Quality Assurance (CQA) Contractor:

a. The CQA Contractor is the firm with whom the Owner establishes a contract to perform all CQA work as specified on the Design Drawings and in Specification P-1803.

b. The CQA Contractor is independent of the GW Contractor and their subcontractors.

105. MATERIAL AND SERVICES FURNISHED BY OTHERS

105.1 The following work has been, or will be, performed and/or provided by Others:

a. Initial dewatering and removal of a significant quantity of CCR from the Ash Surge Basin.

a1. The GW Contractor shall be responsible for dewatering (if necessary) and removing all CCR and CCR-mixed materials remaining in the Ash Surge Basin after the GW Contractor mobilizes to the site.

a2. Estimated quantity of CCR and existing protective layer materials to be removed from the basin will be provided by Owner during the bid period for the Work.

b. Construction Quality Assurance services as detailed in Specification P-1803 will be procured by the Owner.

106. DEFINITIONS

106.1 The term "Design Drawing" means the Design Engineer's drawings indicating the Work to be performed.

106.2 The term "Work" means the material and services furnished to retrofit the Ash Surge Basin as identified on the Design Drawings and as specified herein.

106.3 The term "Owner-approved equal" means an acceptable equivalent to a specified material that has been accepted by the Owner.

107. INTENT OF DOCUMENTS

107.1 The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labor, material, equipment, and transportation necessary for the proper execution of the Work.

107.2 Discrepancies between the Design Drawings and this Specification or errors or omissions, or mis-descriptions in either the Design Drawings or in this Specification, shall be referred to the Design Engineer for interpretation and adjustment prior to beginning the Work. Do not proceed without the Design Engineer’s written acceptance.

108. PERFORMANCE OF THE WORK

108.1 The GW Contractor shall provide materials and employ construction practices that are sustainable to the greatest extent possible, including disposal of waste.

108.2 The GW Contractor shall provide a representative that will input and provide daily force reports and daily production reports.

108.3 The performance of the Work, as specified herein and as indicated on the Design Drawings, shall comply with the current safety and health standards authorized by the U.S. Department of Labor's Occupational Safety and Health Administration, as well as state and local jurisdictional requirements.

108.4 The GW Contractor shall take all appropriate precautions to ensure the safety of all people working on site.

108.5 The GW Contractor shall maintain the necessary skilled and qualified labor force for the Work to ensure the on-time completion of the Work.

108.6 The GW Contractor's personnel shall be competent, capable, qualified, and able to perform the duties required to the satisfaction of the Owner. A supervisor vested with authority to make decisions binding on the GW Contractor shall be assigned to the task to resolve installation problems as they arise so as not to delay completion of the Work.

108.7 The GW Contractor shall be solely responsible for advising the Design Engineer in writing of any conflicts between this Specification and the Design Drawings and the GW Contractor's drawings, including performance and levels of quality. The GW Contractor agrees that its obligations, liabilities, and warranties shall not be diminished or extinguished due to its meeting the requirements of this Specification and the Design Drawings.

109. REGULATORY REQUIREMENTS

109.1 The GW Contractor shall at all times be solely responsible for complying with all applicable laws, ordinances, regulations, and codes, including those relating to safety of all persons, in connection with the Work. No obligation of the Owner or Design Engineer shall impose upon them any duty to review the GW Contractor's compliance with safety measures.

110. PROTECTION OF PROPERTY AND PERSONNEL SAFETY

110.1 The GW Contractor shall take adequate precautions to protect existing structures, fences, pavements, above-ground utilities, and underground utilities and to avoid damage thereto. The GW Contractor shall, at no addition expense to the Owner, repair any damage caused by its operations or by that of its subcontractors.

110.2 The GW Contractor shall conduct safety training of all its personnel (including any subcontractors) in accordance with the Owner's safety requirements, including the Owner’s CCR Safety and Health Plan.

110.3 The GW Contractor shall take adequate precautions to protect the Illinois River, other waterways, and adjacent properties from environmental damage.

111. CLEAN-UP AND DISPOSAL OF DEBRIS

111.1 The GW Contractor shall be responsible for clean-up and disposal of all debris resulting from the installation work. All excess excavated material and other construction related debris shall be properly disposed of (i.e., in an environmentally responsible way) offsite in a permitted landfill approved by the Owner.

111.2 Clean up, disposal, and site restoration, if required, shall be in compliance with the applicable requirements of all access permits. If any additional permits are required for disposal of debris, these shall be the responsibility of the GW Contractor.

111.3 Work areas shall be kept clean and orderly at all times with as little disturbance as possible to existing conditions. Upon completion of work at each site, all tools, equipment, material, and debris shall be completely removed and the area left in a clean condition.

112. EXISTING SITE CONDITIONS

112.1 Prior to performing any Work in any part of the project site, the GW Contractor shall make a thorough field check for the purposes of verifying existing conditions that may affect the Work. The GW Contractor shall include a thorough investigation of the potential interferences and difficulties that it may encounter in the proper and complete execution of the Work, including the field location and identification of underground and overhead utilities within and adjacent to the limits of the Work. The GW Contractor shall advise the Owner immediately of the discovery of any conditions, including the existence of underground and overhead utilities that may affect the timely and safe execution of the Work.

112.2 The GW Contractor shall be responsible for location of underground utilities and obstructions prior to performance of the Work and shall promptly notify Owner of any potential interferences that may impact performance of the Work. Modifications to the design to resolve these interferences shall not be implemented until approved by the Owner.

112.3 The GW Contractor further acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface material and obstacles, including underground or embedded utilities, to be encountered insofar as this information is reasonably ascertainable from:

a. An inspection of the site (including field location and identification of underground utilities).

b. Reference drawings made available by the Owner.

c. Drawings and specifications that are a part of the Contract.

d. The character and extent of existing work within or adjacent thereto.

e. Any other work being performed thereon at the time of the submission of bids.

112.4 Should the GW Contractor fail to perform any of the obligations set forth above, the GW Contractor's later plea of ignorance of existing or foreseeable conditions which create difficulties or hindrances in the execution of the Work will not be considered as an excuse for any failure on the part of the GW Contractor to fulfill in every detail the requirements of the Contract nor will such a plea be acceptable as the basis of a claim for additional compensation or time to complete the work.

113. VERIFICATION OF DIMENSIONS ON DRAWINGS AND MEASUREMENTS AT SITE

113.1 The GW Contractor shall make a thorough field check for the purpose of verifying existing conditions that may affect the Work, such as existing topographic data shown on the Design Drawings, difficulties that might be encountered in the execution of the Work for any reason, and dimensions and other questions relating to interconnection of the Work with the existing Ash Surge Basin construction.

113.2 The GW Contractor shall satisfy itself as to the accuracy of the dimensions of the existing Ash Surge Basin construction as such dimensions relate to the dimensions given on any drawing issued by the Design Engineer. It shall be understood that neither the Design Engineer nor the Owner guarantee the exactness of such dimensions.

113.3 Should the GW Contractor discover any variation in the dimensions of existing conditions and the dimensions given on any drawings issued by the Design Engineer, the GW Contractor shall give immediate notice thereof to the Owner and the GW Contractor shall not proceed with the Work until such variation is resolved.

114. SOIL DATA

114.1 A structural stability and factor of safety assessment for the Ash Surge Basin was prepared in October 2016. Site specific soil data and geotechnical recommendations are provided and referenced therein. The geotechnical information in and referenced by this assessment indicates the general character of the subsurface conditions at the site. This information is made available for the GW Contractor's information and for interpretation of soil and water conditions that may be encountered at the site. The logs and test data that are provided are not to be taken as a complete description of the site soil and water information, but only display what was found in borings at the indicated locations. The Owner and the Design Engineer take no responsibility for the accuracy of this information.

114.2 The GW Contractor may obtain additional subsurface information, as it deems necessary, for installation purposes.

115. LINES AND GRADES

115.1 The GW Contractor shall use the existing benchmarks established at the site, as identified on the survey drawings included in the reference documents for the project, to lay out lines and grades on the project site. The GW Contractor is fully responsible for the correctness of such lines and grades and for proper execution of work to such lines and grades.

115.2 The Owner reserves the right to verify correctness of lines and grades during progress of the Work. Such verification by the Owner will not relieve the GW Contractor of responsibility as herein specified.

115.3 The GW Contractor shall preserve and maintain existing benchmarks and reference points established at the project site. Should the GW Contractor, during execution of the Work, destroy or remove any existing benchmark or reference point, the cost to the Owner for re-establishing the benchmark or reference point will be charged to the GW Contractor.

116. CONTROL AND CHARGE OF CONTRACTOR’S WORK

116.1 The Design Engineer shall have no authority to stop the Work by the GW Contractor for any reason.

116.2 The GW Contractor shall be responsible for the safety of its employees and subcontractors and for maintaining the safety of the job site.

116.3 The GW Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures used in the construction of the Work. The Owner, however, reserves the right to request, and the Contractor shall supply, detailed information regarding the Work such as procedures or work methods.

116.4 Only the Owner (or its authorized representative) has the authority to stop the Work (in accordance with the Commercial Terms and Conditions) if such Work is determined to be not in accordance with this Specification, the Design Drawings, or the Contract documents.

117. DESIGN DRAWINGS

117.1 The Design Drawings prepared by the Design Engineer indicate the physical dimensions of the Work to be installed as defined by the Scope of Work and form a part hereof.

117.2 Refer to Attachment 1 of this Specification for the applicable Design Drawings for this project.

118. REFERENCE DOCUMENTS

118.1 The reference documents assembled by the Design Engineer are for information only.

118.2 Refer to Attachments 2 and 3 of this Specification for applicable reference documents for this project.

END OF SECTION 011100

SECTION 319005

EARTHWORK

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the material and work requirements associated with preparing and placing Structural Fill within the Ash Surge Basin and other tasks associated with installing a new composite liner system for the Ash Surge Basin. The Structural Fill will support the basin's new composite liner system and will establish the lines and grades for the basin's new leachate collection and removal system (LCRS). This work is further defined and depicted on the Design Drawings.

101.2 The work shall include, but not be limited to, the following items:

a. Clearing, grubbing, and topsoil stripping.

b. Excavating the granular protective layers covering the basin's existing liner.

c. Cleaning and decontaminating the existing liner system and basin appurtenances remaining in-place.

d. Placing and compacting Structural Fill.

e. Preparing the Structural Fill surface to be lined with the Ash Surge Basin's new composite liner system.

f. Preparing concrete surfaces that will come into contact with geosynthetic materials.

g. Excavating crest anchor trenches where indicated on the Design Drawings.

h. Placing fill materials over run-outs and in crest anchor trenches for geosynthetic materials.

i. Placing crushed stone to re-surface existing roads on the top of the Ash Surge Basin's dikes where indicated on the Design Drawings.

j. Disposing excess or unsuitable excavated earthen material and debris in an off-site, permitted landfill approved by the Owner.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification P-1802:

a1. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a2. Section 319025 – Geosynthetic Clay Liner.

a3. Section 319050 – Leachate Collection and Removal System.

a3.1 Refer to Section 319050 for material and installation requirements for granular materials associated with the Ash Surge Basin's new LCRS.

b. CQA Specification P-1803:

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local agencies having jurisdiction.

103.2 References to these documents are to the latest issue of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of the Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

b. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

c. D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

d. D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

103.5 IDOT – Illinois Department of Transportation:

a. Standard Specifications for Road and Bridge Construction (Adopted January 1, 2022).

103.6 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

b. 96 Resistance by Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

c. 104 Soundness of Aggregate by Use of Sodium Sulfate

104. SUBMITTALS

104.1 The GW Contractor shall submit drawings and data as specified. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems (as specified by the Owner).

104.2 Submittals with Bid Proposal:

a. Catalog data on all compaction equipment and proofrolling equipment the Earthwork Contractor plans to use on the project.

b. Earthwork Contractor's plan for placing Structural Fill material to meet the requirements specified herein while preventing damage to the Ash Surge Basin's existing geomembrane liner.

104.3 Submittals After Award:

a. Earthwork Equipment:

a1. Earthwork Contractor's demonstration that all earthwork equipment to be used to transport and place Structural Fill material will not exert a ground pressure greater than 8 psi.

b. Structural Fill Material:

b1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Structural Fill material signed by the supplier or a qualified geotechnical engineering consultant that certify the following items comply with or exceed specifications for the material:

Property		Standard(1)	Data Required
b1.1	Sieve Analysis	ASTM C136	Percent Passing Selected Sieves
b1.2	Classification of Material	ASTM D2487	Classification
b1.3	Organic Content	ASTM D2974	Percent of Organic Material
b1.4	Atterberg Limits(2)	ASTM D4318	Liquid Limit and Plasticity Index

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.
(2) Atterberg limits are only required if cohesive/fine grained materials are to be used for Structural Fill.

c. Crushed Stone Surfacing for Roads:

c1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the crushed stone material to be used to re-surface the existing roads on top of the basin dikes, which shall be signed by the supplier or a qualified geotechnical engineering consultant certifying the following items comply with or exceed specifications for the material:

Property		Standard(1)	Data Required
c1.1	Sieve Analysis	ITP 27	Percent Passing Selected Sieves
c1.2	Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
c1.3	Los Angeles Abrasion	ITP 96	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

105. QUALITY ASSURANCE

105.1 Material and construction procedures shall be subject to inspection and testing by the CQA Contractor hired by Owner. Such inspections and tests will not relieve the Earthwork Contractor of responsibility for providing and placing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject material not complying with the specified requirements. The Earthwork Contractor shall correct all deficiencies which inspections, laboratory tests, or field tests have indicated are not in compliance with specified requirements. The Earthwork Contractor shall perform additional tests, at their expense, as may be necessary to reconfirm any noncompliance of the original work, and as may be necessary to show compliance of corrected work.

105.3 The Earthwork Contractor shall promptly correct errors or flaws in the work or material identified during construction and which prevent proper installation. The Earthwork Contractor shall make immediate substitution of the noncomplying material or shall make field changes to make the noncomplying material acceptable. The correction or substitution shall be performed at no cost to the Owner.

105.4 CQA activities shall be performed as described herein and in Specification P-1803.

PART 2 - PRODUCTS

201. MATERIAL FOR STRUCTURAL FILL

201.1 Definitions:

a. Structural Fill is fill placed within the Ash Surge Basin to support the basin's new composite liner system, as identified on the Design Drawings.

201.2 Satisfactory Material:

a. Granular Material:

a1. Granular material for use as Structural Fill shall be rounded and not crushed, with less than one percent organic or other deleterious material, free of excess moisture, and a maximum particle size less than one inch.

a2. Acceptable granular materials are soils which are classified as coarse-grained soils in the Unified Soil Classification System, ASTM D2487. Classifications are GW, GP, GC, SW, SP, or SC, or combinations of these such as SP-SC.

a3. No material with a silt content of greater than 12 percent (i.e., SM or GM) shall be used for Structural Fill.

b. Cohesive Material:

b1. Cohesive material is suitable for use as Structural Fill if it contains not more than two percent organic or other deleterious material, has a maximum particle size of one inch, has a liquid limit of less than 45, and has a plasticity index of less than 25.

b2. Acceptable cohesive materials are soils which are classified as fine-grained soils in the Unified Soil Classification System, ASTM D2487. Classification is CL.

201.3 Unsatisfactory Material:

a. Material unsatisfactory use as Structural Fill is as follows:

a1. Soils classified as silt, silty, or organic soils in the Unified Soil Classification System, ASTM D2487. Classifications are SM, GM, ML, MH, PT, OL and OH.

a2. Clay soils classified as CH in the Unified Soil Classification System, ASTM D2487.

a3. Soils classified as CL-ML (plasticity index of 4 to 7) in the Unified Soil Classification System, ASTM D2487.

a4. Rock material without a soil matrix in which nesting of rocks could occur.

a5. Uncontrolled fill.

a6. Debris.

b. Material Sources:

c. Structural Fill material shall be obtained from an offsite borrow source identified by the Earthwork Contractor and approved by the Owner.

202. RESTRICTIONS ON THE USE OF MATERIAL FOR ANY PURPOSE

202.1 Any material which is frozen is considered unsatisfactory for use as fill.

202.2 Fill and backfill soils placed by previous construction shall be considered unsatisfactory for use as fill unless they meet the requirements for satisfactory material. This specifically includes using any of the existing protective layers below the Ash Surge Basin's new composite liner system or on roads outside of the basin.

203. CRUSHED STONE SURFACING FOR ROADS

203.1 Material Requirements:

a. Crushed stone for re-surfacing existing roads on the top of the basin dikes shall be composed of gravel, crushed gravel, or crushed stone that is processed to meet the following requirements:

a1. The material shall conform to Gradation CA 6 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality shall be Class D or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

203.2 Material Sources:

a. Crushed stone surfacing material shall be obtained from an offsite borrow source identified by the Earthwork Contractor and approved by the Owner.

PART 3 - EXECUTION

301. DEMOLITION, CLEARING, GRUBBING AND STRIPPING

301.1 General:

a. The work required is shown on the Design Drawings. No work shall be performed outside of the designated area without prior written approval of the Owner.

b. All work incidental to excavation or fill work will not be specifically indicated on the Design Drawings but shall be performed as part of the work.

301.2 Demolition:

a. Demolition and removal of minor items which are incidental to the earthwork may be required. The Earthwork Contractor shall identify any such items during their pre-bid walkdown. The Earthwork Contractor shall demolish such items as required as part of the performance of the work.

b. All waste resulting from demolition work shall be disposed of by the Earthwork Contractor in an offsite disposal area.

301.3 Clearing, Grubbing, and Topsoil Stripping:

a. All vegetation within areas to be excavated or to receive fill shall be cleared and grubbed, stripped of topsoil and debris, and shall be inspected and approved by the Owner prior to beginning the earthwork operations.

b. Weeds, small roots, heavy grass, and other vegetation remaining after clearing and grubbing operations shall be removed with the topsoil.

c. Disposal:

c1. Stripped topsoil shall be placed in an onsite stockpile area as directed by Owner. Topsoil may be removed from the stockpile area at a later date and used to cover finished slopes and other designated areas.

c2. If any material remains in the topsoil stockpile area after construction is complete, the stockpile area side slopes shall be graded to a maximum slope of 20 percent (five horizontal to one vertical), the top of the pile shall be sloped to drain properly and provided with devices to control erosion, and the stockpile shall be seeded.

302. EXCAVATION

302.1 All material within the Ash Surge Basin and above the basin's existing liner shall be carefully removed. The limits and specifications for this excavation work are specified on the Design Drawings.

302.2 All material excavated from the Ash Surge Basin shall be disposed of as specified on the Design Drawings.

303. PLACEMENT OF STRUCTURAL FILL

303.1 Acceptable Placement Methods:

a. Acceptable placement methods for Structural Fill include:

a1. Using a conveyor truck to place material from outside of the basin.

a2. Using a crane to place material from outside of the basin.

a3. Transporting material into the basin to the point of dumping using trucks or scrapers, while complying with maximum ground pressure requirements.

a4. Alternate placement method(s) proposed by the Earthwork Contractor and approved by the Owner.

b. Requirements for Transportation of Structural Fill Materials into Basin:

b1. Under no circumstances shall any equipment (wheeled or tracked) traverse the Ash Surge Basin's existing geomembrane liner or new liner when less than 10 inches of earthen material are above the subject liner.

b2. Equipment transporting material into the basin shall use the permanent ramp along the basin's eastern dike.

b3. Only earthmoving equipment with low ground pressure shall be used to transport material inside of the basin. The Earthwork Contractor shall demonstrate that equipment entering the basin will not exert a ground pressure greater than 8 psi. The ground pressure is

influenced by the tread pattern / tire contact area and is not the reading from a tire pressure gauge.

b4. Equipment operating within the basin shall avoid hard braking on ramps and avoid sharp turns or quick stops that could pinch or tear the existing geomembrane liner.

b5. Structural Fill shall be placed by the “dump and spread” method in which lightweight equipment with low ground pressure is used to spread the material.

b6. Material placement over the existing geomembrane liner during periods of warm weather can cause wrinkling and damage to the liner. Placement of the initial lift of Structural Fill shall be halted when the air temperature is greater than 85°F or less than 40°F.

b7. When Structural Fill is being placed, a worker shall safely walk alongside earthmoving equipment spreading the material to spot and remove rocks, stones, roots, and other debris that may be present in the Structural Fill that could cause damage to the existing geomembrane liner.

303.2 Moisture Content of Structural Fill Material:

a. At the time of compaction, the moisture content of Structural Fill material shall be within ±3 percent of optimum moisture content as determined by ASTM D1557.

b. Fill material containing excessive moisture shall not be compacted unless the material has dried and the moisture content is within the specified limits.

c. Fill material that is too dry shall have moisture added and then be blended so that the moisture content is uniform prior to compaction.

d. For granular materials, non-compliance with moisture content shall not be the sole criteria for rejection of the work.

303.3 Lift Thickness:

a. Fill material shall be placed in horizontal layers in thicknesses compatible with the material being placed, equipment being used, and the compaction requirements.

b. Unless otherwise approved by the Owner, the loose thickness shall not exceed the following:

b1. 12 inches maximum loose lift thickness for the lowest lift in contact with the Ash Surge Basin’s existing geomembrane liner.

b2. 8 inches maximum loose lift thickness for compaction by self-propelled equipment.

b3. 4 inches maximum loose lift thickness for compaction by hand-operated equipment.

303.4 Placement Structural Fill:

a. Each layer of fill shall be evenly spread and moistened or aerated as required to achieve the required moisture content.

b. Each lift of Structural Fill in the Ash Surge Basin shall be uniformly placed to cover the entire length and width of the basin prior to compaction or placement of the next lift.

c. As allowed by the design of the LCRS, the top surface of each layer shall be approximately level but shall have sufficient crown or cross fall to provide adequate

drainage of water at all times during the construction period. The crown or crossfall shall be at least 1 in 50 (2 percent) but no greater than 1 in 20 (5 percent).

d. Fill placed on slopes steeper than 20 percent (i.e., 5 horizontal to 1 vertical) shall be overfilled a minimum of 6 inches beyond the face of the slope, measured horizontally, and then cut back and trimmed to the required line and grade to expose a smooth surface uniformly compacted to the required density. Installing the fill slope to lines and grades shown on the Design Drawings and then compacting is not acceptable on the basin side slopes.

e. Prior to placing Structural Fill material on the existing concrete ramp within the Ash Surge Basin, the Earthwork Contractor shall intentionally roughen the existing concrete surfaces receiving Structural Fill to a minimum amplitude of 1/4 inch.

303.5 Compacting Structural Fill:

a. Equipment:

a1. Each layer of fill shall be compacted by tamping, pneumatic-tired roller, or other mechanical means acceptable to the Owner that will produce the specified compaction. Sheepsfoot, modified sheepsfoot, padfoot, or other non-smooth drums shall not be used to compact Structural Fill placed for this work.

a2. At locations where it would be impractical because of inaccessibility to use self-propelled compacting equipment, fill layers shall be compacted using hand directed compaction equipment.

a3. When soils are used that develop a densely packed surface as a result of spreading or compacting equipment, the surface of each layer of fill shall be sufficiently roughened after compaction to ensure bonding of the succeeding layer.

b. Inspection and Testing:

b1. All work is subject to inspection and testing by the CQA Contractor. The CQA Contractor shall have access to the work at all times. Testing shall be in accordance with the Contract. Refer to Specification P-1401 for inspection and testing requirements.

b2. Each layer of compacted fill shall be tested before proceeding with the next layer.

b3. It is the Earthwork Contractor’s responsibility to request inspection prior to proceeding with further work that would make parts of the work inaccessible for inspection.

b4. If the fill material fails to meet the required density, the material shall be removed and replaced or reworked, altering the construction method as necessary to obtain the required density and compaction. Sufficient time shall be allotted between lifts for the necessary testing of the soils.

c. Compaction Density:

c1. Structural Fill shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557.

303.6 Fine Grading:

a. Structural Fill shall be fine graded using equipment with low ground pressure.

303.7 Reporting Damage:

a. If damage occurs to the Ash Surge Basin's existing geomembrane liner while placing Structural Fill material, the Earthwork Contractor shall report the damage(s) to the Owner and Geosynthetics Contractor immediately so that repairs can be performed without delay.

b. Repairs to the existing geomembrane liner shall be made by the Geosynthetics Contractor as specified in Section 319020 at no additional cost to the Owner.

304. REQUIREMENTS FOR PREPARATION AND ACCEPTANCE OF STRUCTURAL FILL SURFACE SUPPORTING COMPOSITE LINER

304.1 Intersections Between Planes:

a. Intersections between planes shall be rounded as specified below to provide a firm bearing for the geosynthetic clay liner (GCL) without abrupt change:

	Intersection of Slope	Radius of Rounding
a1.	Side slope and bottom plane	3 feet minimum
a2.	Side slope and top of dike or grade	6 inch minimum
a3.	Intersection of 2 bottom planes (planes sloped at 10% or less)	Straight line is acceptable

304.2 Earthwork Contractor's Responsibility:

a. The Earthwork Contractor shall be responsible for preparing the surface of the Structural Fill beneath the GCL prior to placement of the GCL.

b. The subgrade is subject to inspection and acceptance by the Owner and the CQA Geosynthetics Inspector prior to installation of the GCL.

304.3 Inspection:

a. The Earthwork Contractor, the Owner, the Geosynthetics Contractor, and the CQA Geosynthetics Contractor shall inspect and document the following:

a1. Lines, grades, and slopes are in conformance with the Design Drawings.

a2. Surface has been graded and rolled such that it is free of irregularities, protrusions, loose soil, and abrupt changes in grade.

a3. The surface is free of debris, clods, stones, roots, and organic material.

a4. That no settlement or erosion has occurred.

a5. That there are no side slope failures.

a6. That there are no moisture seeps, puddling, or ponding.

a7. That there are no soft spots.

304.4 Certification:

a. The Geosynthetics Contractor shall provide written certification that the surface is acceptable. The acceptance shall be recorded and copies of the certification given to both the Earthwork Contractor, the CQA Contractor, and the Owner.

b. Only as much surface as will be lined the following day shall be inspected, certified, and documented as acceptable.

304.5 Geosynthetic Contractor's Responsibility:

a. After the surface for the Ash Surge Basin's new composite liner system has been accepted by the Geosynthetics Contractor, the responsibility for changes or repair work become the Geosynthetics Contractor's.

b. Necessary changes or repairs made to the surface after the surface has been accepted by the Geosynthetics Contractor shall be made at no additional cost to the Owner.

305. PREPARATION OF CONCRETE SURFACES

305.1 All concrete surfaces on which Structural Fill material will be placed shall be intentionally roughened in accordance with Paragraph 303.4e.

305.2 All concrete surfaces that will come in contact with the Ash Surge Basin's new composite liner system shall be free of sharp edges or rough spots that can puncture or abrade the new liner materials. Where necessary, the concrete shall be ground smooth by the Earthwork Contractor. Where specified on the Design Drawings, geotextiles shall be placed between the concrete surface and the new composite liner system components to act as protective cushioning layers for the new liner components.

306. CREST ANCHORAGE OF GEOSYNTHETIC MATERIALS

306.1 Anchor Trench Excavation and Shaping:

a. Where specified on the Design Drawings, anchor trenches shall be excavated by the Earthwork Contractor at the top of the basin slope to the lines and widths shown on the Design Drawings prior to the Geosynthetics Contractor deploying the geosynthetic clay liner component of the Ash Surge Basin's new composite liner system.

b. A slightly rounded corner shall be provided in the trench where the geosynthetic materials adjoin the trench to avoid sharp bends in the geosynthetic materials. The radius of rounding is shown on the Design Drawings. No loose soil shall be allowed to underlie the geosynthetic materials in the anchor trench.

c. Anchor trenches shall be adequately drained to prevent ponding or softening of the adjacent soils while the trenches are open.

306.2 Fill Placement Over Liner Run-Outs and in Anchor Trenches:

a. The Earthwork Contractor shall place fill over liner run-outs or in an anchor trench after all geosynthetic materials are in place and seams are welded.

b. Fill placement over liner run-outs and in anchor trenches shall occur during the morning or during extended periods of overcast skies when the geosynthetic materials are at their most contracted states.

c. The first lift of fill placed above geosynthetic materials in an anchor trench may be 12 inches in thickness.

d. If compacted using hand-operated equipment, backfill shall be placed in lifts not exceeding 4 inches loose thickness and shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557.

e. If compacted using self-propelled equipment, backfill shall be placed in lifts not exceeding 8 inches loose thickness and shall be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557.

307. GRADING TOLERANCES

307.1 The acceptable deviation from lines and grades indicated on the Design Drawings shall be as shown in Table 319005-1.

307.2 Slopes shall be finished in conformance with the lines and grades shown on the Design Drawings. When completed, the average plane of a slope shall conform to the slope indicated on the Design Drawings, and no point on the completed slope shall vary from the designated plane by more than 6 inches measured at right angles to the slope.

308. CLEAN-UP

308.1 All waste, excess materials, and debris shall be disposed of in an offsite disposal area approved by the Owner.

TABLE 319005-1
ACCEPTABLE DEVIATIONS FROM DESIGN LINES AND GRADES

Type of Installation (Excavation or Fill)	Maximum Acceptable Deviation from Line (feet)	Maximum Acceptable Deviation from Grade[1] (feet)
General Earthwork		
Top of Structural Fill	±0.3	+0.1 to -0.0
Roads		
Road Embankment	±0.2	+0.1 to -0.0
Leachate Collection & Removal System		
Leachate Collection Pipe Trench	±0.3	+0.1 to -0.0

Note:

(1) After initial settlement has taken place. Initial settlement is that settlement that will occur up to the time of determination and acceptance of final grade elevation as approved by the Owner.

END OF SECTION 319005

SECTION 319020

HIGH-DENSITY POLYETHYLENE GEOMEMBRANE LINER WITH GEOCOMPOSITE

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for the high-density polyethylene (HDPE) geomembrane liner to be used as the upper component of the retrofitted Ash Surge Basin's new composite liner system, and the minimum material and installation requirements for the drainage geocomposite to be used in the retrofitted Ash Surge Basin's new leachate collection and removal system (LCRS), all in accordance with the Design Drawings and as specified herein.

101.2 The Work shall include, but not be limited to, the following items:

a. Manufacture, shipping, handling, and storage of HDPE geomembrane and drainage geocomposite materials.

b. Preparation and inspection of surfaces to be lined.

c. Placement and seaming of geomembrane.

d. Placement and joining drainage geocomposite.

e. Crest anchorage of geomembrane and drainage geocomposite using liner run-outs or anchor trenches as specified on the Design Drawings.

f. Attachment of the geomembrane to concrete structures and existing marker posts.

g. Non-destructive field testing of geomembrane seams.

h. Removal of samples of geomembrane seams and transportation to an independent third-party laboratory for destructive testing.

i. Repair of defective geomembrane seams.

j. Repair of defects in the geomembrane and at locations where samples were taken.

k. Visual inspection of the completed geomembrane liner.

101.3 Definitions and Qualifications:

a. The following definitions of terms shall apply throughout this section:

a1. CQA Geosynthetics Inspector: An inspector who works for the CQA Contractor and is responsible for inspection of the Geosynthetics Contractor's work.

a2. GM/GC Manufacturer: The manufacturer who is responsible for manufacturing and transporting the HDPE geomembrane liner and drainage geocomposite materials to the site.

b. Qualifications:

b1. The GM/GC Manufacturer shall be approved by the Owner. Owner's considerations when approving the GM/GC Manufacturer may include, but are not limited to, financial, safety, and prior performance aspects of the manufacturer.

b2. The GM/GC Manufacturer shall have an internal QA/QC program to ensure and to verify the manufactured products consistently meet or exceed the requirements of this section.

b3. The GM/GC Manufacturer shall have at least 10 years manufacturing products similar to those required for this Work.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification P-1802:

a1. Section 319005 – Earthwork.

a2. Section 319025 – Geosynthetic Clay Liner.

a3. Section 319050 – Leachate Collection and Removal System.

b. CQA Specification P-1803:

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes, and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local agencies having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM –- ASTM International:

a. A276 Specification for Stainless and Heat Resisting Steel Bars and Shapes.

b. B633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

c. D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

d. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

e. D1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

f. D1505 Test Method for Density of Plastics by the Density-Gradient Technique.

g. D1603 Standard Test Method for Carbon Black Content in Olefin Plastics.

h. D4218 Standard Test Method for Determination of Carbon Black Content of Polyethylene Compounds by the Muffle-Furnace Technique.

i. D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus.

j. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

k. D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

l. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

m. D4716 Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

n. D4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

o. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

p. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

q. D5261 Test Method for Measuring Mass per Unit Area of Geotextiles.

r. D5397 Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.

s. D5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

t. D5641 Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

u. D5721 Standard Practice for Air-Oven Aging of Polyolefin Geomembranes.

v. D5820 Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.

w. D5885 Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Colorimetry.

x. D5994 Test Method for Measuring Core Thickness of Textured Geotextile.

y. D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

z. D6364 Standard Test Method for Determining Short-Term Compression Behavior of Geosynthetics.

aa. D6392 Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-fusion Methods.

bb. D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

cc. D7179 Standard Test Method for Determining Geonet Breaking Force

dd. D7466 Standard Test Method for Measuring Asperity Height of Textured Geomembranes

ee. D8117 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by Differential Scanning Calorimetry.

103.5 Geosynthetic Research Institute (GRI):

a. GM6 Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembrane.

b. GM9 Cold Weather Seaming of Geomembranes

c. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet.

d. GM13 Standard Specification for Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

e. GM14 Standard Guide for Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes.

f. GM19a Standard Specification for Seam Strength and Related Properties of Thermally Bonded Homogenous Polyolefin Geomembranes/Barriers.

103.6 Industrial Fabrics Association International (IFAI):

a. Field Sewing of Geotextiles by V. Diaz and B. Myles, 1989.

104. SUBMITTALS

104.1 The GW Contractor shall submit the following drawings and data as specified. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems (as specified by the Owner).

104.2 Submittals with the Bid Proposal:

a. Geosynthetics Contractor:

a1. Geosynthetics Contractor's name, address, and telephone number.

a2. Geosynthetics Contractor's qualifications, including letter or certificate from the GM/GC Manufacturer documenting the manufacturer's approval of the Geosynthetics Contractor (or subcontracted Installer) to install the geomembrane and drainage geocomposite materials supplied for the project.

a3. Installer's qualifications if the Geosynthetics Contractor is proposing to subcontract the geomembrane and/or drainage geocomposite installation work.

b. HDPE Geomembrane and Drainage Geocomposite Materials:

b1. Certification of Compliance from the GM/GC Manufacturer , signed by its authorized representative, indicating that the materials meet the criteria specified herein and that those requirements are guaranteed by the manufacturer.

b2. One representative sample of each type of geosynthetic material.

b3. GM/GC Manufacturer's Quality Control and Quality Assurance Policies and Procedures for the geomembrane and drainage geocomposite materials being supplied for the project.

c. Warranty:

c1. Written warranties from the GM/GC Manufacturer and the Geosynthetics Contractor covering the quality of the material and workmanship as applicable.

c1.1 The minimum period of warranty for materials shall be 20 years with first year non-prorated.

c1.2 The minimum period of warranty for installation shall be 5 years with the first year non-prorated.

c2. Warranty conditions proposed, including limits of liability, will be evaluated by the Owner in approving the GM/GC Manufacturer and the Geosynthetics Contractor.

104.3 Submittals After Award:

a. Geomembrane Resin:

a1. Certification signed by the GM/GC Manufacturer's authorized representative stating that the resin meets the criteria specified herein.

a2. Certification signed by the GM/GC Manufacturer's authorized representative stating the origin of the resin and that all resin is from the same supplier (including resin supplier's name, identification brand name, and number).

a3. Copies of GM/GC Manufacturer's and resin supplier's QA/QC certificates. Certificates shall include a summary report of test results conducted to verify the quality of the resin used in each batch used to manufacture geomembrane for this project. As a minimum, the report shall include tests on specific gravity, melt flow index and percent carbon black.

b. Geomembrane Sheeting:

b1. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the geomembrane to be shipped to the site, along with chain of custody and certification that the samples submitted are from the geomembrane material to be delivered to the site. The number of samples shall be determined in accordance with the number of CQA conformance tests specified in Specification P-1803.

b2. Signed certification that the properties of the manufactured sheeting meet the criteria specified herein and are guaranteed by the GM/GC Manufacturer.

b3. Statement certifying that no post consumer resin (PCR) has been added to the formulation.

b4. Statement certifying that the manufactured sheeting is free of per- and polyfluoroalkyl substances (PFAS).

b5. Copies of all of the GM/GC Manufacturer's QA/QC certificates. The certificates shall include documents of test results.

c. Drainage Geocomposite:

c1. Copy of the raw material producers' certificates describing the origin and identification of the raw materials.

c2. Copy of the raw material producers' QC certificates.

c3. Statement certifying that the manufactured drainage geocomposite is free of per- and polyfluoroalkyl substances (PFAS).

c4. Copy of the GM/GC Manufacturer's QA/QC certificates on tests performed on the geonet core, geotextile cap and carrier, and double-sided laminated geocomposite as specified in Table 319020-2 and a summary of the results of the tests.

c5. Certification that the properties of the manufactured material meet the criteria specified herein and are guaranteed by the GM/GC Manufacturer.

d. Extrudate Resins or Rod for Seaming Geomembranes:

d1. Certification that all extrudate is the same resin type as the geomembrane and was obtained from the same resin supplier as the resin used to manufacture the geomembrane.

e. Installation Data:

e1. GM/GC Manufacturer's proposed geomembrane panel layout for each installation.

e2. GM/GC Manufacturer's recommended procedures for making and testing seams if different from those specified herein.

e3. GM/GC Manufacturer's recommended procedures for repairing damaged geomembrane sections and seams if different from those specified herein.

e4. GM/GC Manufacturer's details of geomembrane liner anchorage and attachment to structures if different from those specified herein and from the details shown on the Design Drawings.

104.4 Submittals After Installation is Complete:

a. Geosynthetics Contractor:

a1. As-built panel layout.

a2. Drawing showing locations of repairs and types of repairs made.

a3. Locations of destructive tests.

a4. Results of destructive tests.

a5. Results of non-destructive tests.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Geosynthetics Contractor of the responsibility for providing materials and installation in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Geosynthetics Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1803.

PART 2 - PRODUCTS

201. HIGH-DENSITY POLYETHYLENE GEOMEMBRANE

201.1 Manufacturers of HDPE Geomembrane Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. AGRU America, 500 Garrison Road, Georgetown, SC 29440.

a2. Solmax, 19103 Gundle Road, Houston, TX 77073.

a3. Others as approved by the Owner.

201.2 General Requirements:

a. All HDPE geomembrane shall be textured on both sides and meet the requirements of Table 319020-1.

b. The top surface of the HDPE geomembrane shall be white.

c. Textured surfaces shall be manufactured using a co-extrusion process, have uniform texturing appearance, and be free from agglomerated texturing material and such defects that would affect the specified properties of the HDPE geomembrane.

d. Each roll of HDPE geomembrane shall have 6-inch wide (minimum) smooth edges to provide suitable seaming surfaces. Textured HDPE geomembrane without smooth edges may be provided if approved by the Owner.

e. The HDPE geomembrane shall be manufactured from first quality, virgin resin. Blending of resins shall not be allowed. No recycled or reworked geomembrane may be used except edge trim generated during the manufacturing process, which shall be limited to at most 10%. No post-consumer resin (PCR) of any type shall be added to the formulation.

f. The resin used to produce the HDPE geomembrane shall be formulated to be resistant to chemical and ultraviolet degradation.

g. The HDPE geomembrane shall be free of plasticizers, leachable additives, and per- and polyfluoroalkyl substances (PFAS).

h. During manufacture, each roll of HDPE geomembrane shall be continuously monitored across the width to assure uniformity of thickness. Thickness measurements shall meet the requirements of Table 319020-1.

i. The HDPE geomembrane shall be free of factory seams.

j. The HDPE geomembrane shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, blisters, pits, tears, holes, pores, pinholes, voids, undispersed raw material, any sign of contamination or other defects that may affect serviceability, and shall be uniform in color, thickness, and surface texture.

k. Panels of HDPE geomembrane shall be capable of being seamed in the field to yield seams that are as resistant to waste liquids as the sheeting.

l. The HDPE geomembrane shall be manufactured in the United States or Canada.

TABLE 319020-1

HIGH-DENSITY POLYETHYLENE TEXTURED GEOMEMBRANE REQUIREMENTS[1]

Property	ASTM Test Method	Polyethylene Base Compound	Geomembrane	Testing Frequency
Nominal Thickness (mil)	--	--	60	--
Resin Properties				
Density of Base Resin, g/cc (min.)	D1505 / D792	0.932		5,000 lbs. of Resin
Oxidative Induction Time (OIT) (min. ave.)				
a. Standard OIT (minutes)	D8117	100	--	5,000 lbs. of Resin
– or –				
b. High Pressure OIT (minutes)	D5885	400	--	5,000 lbs. of Resin
Oven Aging at 85°C	D5721	--	--	
a. Standard OIT (min. ave.), % retained after 90 days	D8117	55	--	One per Formulation
– or –				
b. High Pressure OIT (min. ave.), % retained after 90 days	D5885	80	--	One per Formulation
UV Resistance				
High Pressure OIT (min. ave.), % retained after 1600 hrs.	D5885	50	--	One per Formulation
Analytical Properties				
Formulated Density, g/cc (min.)	D1505 / D792	--	0.940	5,000 lbs. of Resin
Carbon Black Content, % (range)	D4218	2.0 – 3.0	--	5,000 lbs. of Resin
Carbon Black Dispersion for 10 Different Views	D5596	Note (2)	--	5,000 lbs. of Resin
Mechanical Properties				
Thickness, mils	D5994	--	--	One per Roll
Minimum Average			57	
Lowest Individual for 8 out of 10 Values			54	
Lowest Individual for 10 out of 10 Values			51	
Asperity Height, mils (min. ave.)	D7466	--	16	Every Second Roll[3]
Tensile Properties in Each Direction (min. ave.)	D6693 (Type IV Specimen at 2 ipm)			5,000 lbs. of Resin
Tensile Stress at Yield, ppi (min.)		--	126	
Elongation at Yield, % (min.)		--	12	
Tensile Stress at Break, ppi (min.)		--	90	
Elongation at Break, % (min. 2" gage length)		--	100	
Tear Resistance, lbs. (min. ave.)	D1004		42	5,000 lbs. of Resin
Puncture Resistance, lbs. (min. ave.)	D4833		90	5,000 lbs. of Resin
Bonded Seam Strength[4]	D6392	--	--	
Shear Strength, ppi		--	120	
Peel Adhesion (Hot Wedge), ppi		--	91	
Peel Adhesion (Extrusion Fillet), ppi		--	78	
Environmental Aging Effect on Properties				
Stress Crack Resistance, hours (min.)	D5397	--	500	Per GRI GM10

Notes:
(1) Requirements shown in this table meet the minimum requirements of GRI Standard GM13, Revision 16 (March 17, 2021) except for bonded seam strength.
(2) Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3.
(3) Alternate measurement side for double-sided textured sheet.
(4) Seam strength requirements shown in this table meet the minimum requirements of GRI Standard GM19a, Revision 10 (March 18, 2021).

201.3 Panel Layout:

a. Prior to manufacture of the geomembrane, a panel layout of the surface to be lined shall be made. Each panel to be used for the installation shall be given a numeric or alphanumeric identification number.

b. Each panel identification number shall be related in writing to the manufacturing roll number that identifies the resin type, batch number, and date of manufacturer.

c. The panel layout shall be made considering the following requirements:

c1. Panel lengths shall include slope gain and run-out distance / anchorage.

c2. Perpendicular tie-ins shall be made a minimum of 5 feet beyond the toe of the slope.

c3. A minimum 6-inch overlap shall be allowed at double fusion welded seams.

c4. All field seams on slopes shall be oriented parallel to the slope (oriented along, not across the slope).

c5. The number of seams in corners or odd shaped geometric locations shall be minimized.

201.4 Packaging and Shipping:

a. All HDPE geomembrane liner material shall be shipped to the project site in rolls. No HDPE geomembrane liner material shall be folded.

b. Packaging and transportation of all HDPE geomembrane liner materials to the project site shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility of the material until the material is accepted at the site. The Geosynthetics Contractor shall be responsible for unloading the HDPE geomembrane liner material at the project site.

c. A label shall be attached or adhered to each roll of the HDPE geomembrane. The label shall identify the following:

c1. Name of GM/GC Manufacturer.

c2. Product identification (e.g., brand name, product code), which can be traced back to the origin of the base material (resin supplier's name, resin production plant, resin brand name type, and production date of the resin).

c3. Order number.

c4. Date of manufacture.

c5. Manufacturing lot number.

c6. Geomembrane thickness and type.

c7. Roll identification number.

c8. Roll dimensions (length and width) and weight.

c9. Panel number, which shall be referenced to the proposed HDPE geomembrane liner panel layout drawing prepared by the GM/GC Manufacturer.

202. DRAINAGE GEOCOMPOSITE

202.1 Manufacturers of Drainage Geocomposite Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. AGRU America, 500 Garrison Road, Georgetown, SC 29440.

a2. Solmax, 19103 Gundle Road, Houston, TX 77073.

a3. Others as approved by the Owner.

202.2 General Requirements:

a. The drainage geocomposite shall consist of a HDPE geonet core with a non-woven geotextile layer heat-laminated to each side of the geonet.

b. HDPE Geonet:

b1. The geonet shall be a profiled geonet manufactured by extruding two sets of polyethylene strands to form a three-dimensional structure in a diamond shape to provide planar water flow.

b2. The HDPE geonet formulation shall consist of a minimum of 97 percent of polyethylene resin, with the balance being carbon black and antioxidants for protection during extrusion and long-term service performance. No fillers, extenders, or other materials shall be mixed into the formulation.

b3. Regrind or reworked polymer which is previously processed HDPE geonet in chip form is acceptable if:

b3.1 It is the same formulation as the geonet being produced.

b3.2 No more than 25% rework material is used in the formulation.

b4. No PCR of any type shall be added to the formulation.

c. Non-Woven Geotextiles:

c1. The geotextiles shall be non-woven, spun bonded fabric manufactured from long chain polymeric filaments, yarns, staple fibers, or other structural components of polyester or polypropylene formed into a stable network (mesh).

c2. The nominal weight of each geotextile shall be 8 oz/sy.

202.3 Material Requirements:

a. The drainage geocomposite shall meet the requirements of Table 319020-2.

TABLE 319020-2
DRAINAGE GEOCOMPOSITE MATERIAL REQUIREMENTS

Property	Value	ASTM Test Method	Test Frequency
Geonet Core (Before Lamination)			
Thickness(1)	300 mil (min. ave.)	D5199	Per 50,000 lb.
Density of Formulated Material(2)	0.95 g/cm^3 (min. ave.)	D1505 / D792	Per 50,000 lb.
Carbon Black Content	1.5% to 3.0%	D1603 / D4218	Per 100,000 lb.
Tensile Strength	75 lb/in. (min. ave.)(3)	D7179	Per 50,000 lb.
Compressive Strength	120 psi (min. ave.)	D6364(4)	Per 100,000 lb.
Geotextile Cap and Carrier (Before Lamination)			
Mass per Unit Area	8 oz/sy (Min. ARV)	D5261	Varies(5)
Grab Strength	200 lb (Min. ARV)	D4632	
Grab Elongation	50% (Min. ARV)	D4632	
Tear Strength	80 lb (Min. ARV)	D4533	
Puncture Strength	430 lb (Min. ARV)	D6241	
Permittivity	0.2 sec^{-1} (Min. ARV)	D4491	
AOS	0.25 (Max. ARV)	D4751	
UV Stability	50% Retained (500 hr)	D4355	
Double-Sided Laminated Composite			
Flow Rate / Width Hydraulic Gradient Pressure Seating Dwell Time	0.42 gpm / ft (min. ave.) 0.03 2,000 psf 15 min.	D4716(6)	Per 200,000 lb.
Ply Adhesion	1.0 lb/in. (min. ave.)(7)	D7005	Per 100,000 lb.

Notes:

(1) The diameter of the presser foot shall be 2.22 in. and the pressure shall be 2.9 psi.

(2) The density of the base resin will be slightly lower than the density of the formulated material.

(3) This is the average peak value for five equally spaced machine direction tests across the roll width.

(4) Test shall be conducted using ASTM D6364 Section 6.3, the movable plate method.

(5) Because the specified geotextile properties are based on average roll values (ARV), the statistics needed to obtain such values will dictate the frequency of testing.

(6) Geocomposite shall be tested for ASTM D4716 flow rate per unit width between rigid end plates. Test values are for machine direction only.

(7) This is the average of five equally spaced machine direction tests across the roll width. Both sides of the geocomposite shall be tested for ply adhesion.

202.4 Packing and Shipping:

a. The drainage geocomposite shall be shipped to the project site in rolls. No material shall be folded.

b. Packaging and transportation of all drainage geocomposite materials to the project site shall be the responsibility of the GM/GC Manufacturer, who shall retain responsibility until the drainage geocomposite is accepted at the site. The Geosynthetics Contractor shall be responsible for unloading the drainage geocomposite material at the project site.

c. A label shall be attached or adhered to each roll of the drainage geocomposite. The label shall identify the following:

c1.1 Name of GM/GC Manufacturer.

c1.2 Product identification (e.g., brand name, product code).

c1.3 Order number.

c1.4 Date of manufacture.

c1.5 Manufacturing lot number.

c1.6 Drainage geocomposite thickness and type.

c1.7 Roll identification number.

c1.8 Roll dimensions (length and width) and weight.

c1.9 Panel number.

203. MATERIALS FOR ATTACHMENT OF GEOMEMBRANE TO CONCRETE

203.1 Batten Strip:

a. Batten strip material shall be hot rolled, annealed, and pickled Type 316L stainless steel in accordance with ASTM A276.

b. Strips shall be 1/4 inch thick by 2 inches wide. Random lengths are acceptable.

203.2 Expansion Anchors:

a. Expansion anchors shall be stud type with a single piece three section wedge and zinc plated in accordance with ASTM B633. Wedges shall be manufactured from ANSI Type 304 stainless steel. Hilti Kwik Bolt 3 Expansion Anchors, or equal, are acceptable.

b. Wedge-type anchors shall have a minimum yield strength of 60,000 psi. Stud-type anchors shall have a minimum tensile strength of 65,000 psi.

c. Anchors shall be 3/8-inch diameter by 3 1/2-inches long.

d. Washers for anchors shall be Type 18-8 stainless steel flat washers for 3/8-inch diameter bolt size.

203.3 Neoprene Gaskets for Batten Strips:

a. Neoprene gaskets shall be ¼-inch thick by 2-inches wide, closed cell neoprene sponge sealing strips. Operating temperature range of neoprene shall be -40°F to +220°F.

b. Neoprene gaskets placed against concrete shall have a pressure sensitive adhesive on the side of the gasket placed against the concrete.

PART 3 - EXECUTION

301. ONSITE HANDLING AND STORAGE

301.1 Unloading:

a. Handling and unloading of materials shall be responsibility of the Geosynthetics Contractor.

b. Upon arrival at the site, the rolls of geomembrane liner and drainage geocomposite shall be carefully unloaded by the Geosynthetics Contractor in accordance with the GM/GC Manufacturer's recommendations and in a manner to ensure that the material is not damaged.

301.2 Inspection:

a. Upon delivery of the material to the project site, the Geosynthetics Contractor shall conduct a visual inspection of all rolls of geomembrane and drainage geocomposite for damage or defects. This inspection shall be done without unrolling any rolls unless damage to the inside of a roll is found or suspected.

b. Any damage or defects shall be noted and immediately reported to the Owner, the GM/GC Manufacturer, and the carrier that transported the material. Any roll or portion thereof, which, in the judgement of the Owner (or their authorized representative), is seriously damaged, shall be removed from the project site and replaced with complying material at no additional cost to the Owner.

301.3 Storage:

a. The Owner will provide on-site, outdoor storage space in a location near the area to be lined.

b. The Geosynthetics Contractor shall store and stage the rolls such that on-site transportation and handling are minimized.

c. The Geosynthetics Contractor shall be responsible for protecting the rolls of geomembrane liner and drainage geocomposite from damage, moisture, theft, and vandalism.

d. The rolls of geomembrane and drainage geocomposite shall be placed on a smooth surface free of rocks and standing water.

302. PREPARATION OF SURFACES TO BE LINED

302.1 Geosynthetic Clay Liner:

a. See Section 319025 regarding installation, inspection, and acceptance of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner.

302.2 Preparation of Concrete Surfaces:

a. All concrete surfaces that will come in contact with a geomembrane shall be free of sharp edges or rough spots that can puncture or abrade the geomembrane. Where necessary, the concrete shall be ground smooth by the Earthwork Contractor.

b. Where specified on the Design Drawings, one or more layers of geomembrane scuff strips shall be placed between the concrete and the geomembrane liner to act as a protective layer for the geomembrane liner.

303. INSTALLATION OF HDPE GEOMEMBRANE LINER

303.1 Weather:

a. Geomembrane shall not be placed when the air temperature is above 104°F or below 41°F unless it can be demonstrated to the approval of the Owner by trial welds that acceptable welds can be made at the prevailing temperature. Trial welds shall be as described in Paragraph 303.7c. Under no circumstances shall geomembrane be deployed when the air temperature is below 5°F.

a1. If the air temperature is above 32°F, trial welds shall be as described in Paragraph 303.6c.

a2. If the air temperature is at or below 32°F, trial welds and field seaming shall be as described in GRI Test Method GM9.

b. Geomembrane shall not be deployed or placed in any of the following conditions:

b1. During any rainfall or snowfall.

b2. In ponded water.

b3. During high winds.

b4. In the presence of excessive moisture due to fog or dew.

b5. On frozen subgrade.

303.2 Precautions to Prevent Wind Damage:

a. If possible, work shall be oriented in the direction of the prevailing wind.

b. To prevent uplift of the geomembrane by wind, the Geosynthetics Contractor shall provide adequate temporary loading and/or anchoring of the edges of the exposed sheets using sandbags, tires, or other means which will not damage the geomembrane.

303.3 Other Precautions to Prevent Damage:

a. Protection of the geomembrane from damage due to foot traffic on the slopes shall be provided.

b. Provisions of facilities for safe entrance and egress of employees from sloped depressions shall be provided.

303.4 Panel Layout:

a. The panels shall be placed in accordance with the GM/GC Manufacturer’s panel layout drawing to ensure that they are placed in the proper direction for seaming.

b. If panels are installed in a location other than indicated on the panel layout drawing, the revised location shall be indicated on an "as-built" layout drawing. The “as-built” record drawing shall be submitted to the Owner and the CQA Contractor after all of the geomembrane has been placed and seamed.

303.5 Panel Deployment:

a. Only the panels that can be anchored and seamed together in one shift shall be unrolled.

b. Unroll and layout panels in as close to the final position as possible. Pulling geomembrane panels should be minimized to reduce the chance of permanent tension.

c. The methods and equipment used to deploy the panels shall not damage the geomembrane or the supporting surface.

d. Wrinkles and folds shall be minimized. However, enough slack shall be provided in both directions so that there will be no tension in the geomembrane at the lowest expected operating temperature.

303.6 Replacement of Damaged Geomembrane:

a. Any area of a panel which, in the judgement of the Owner and/or the CQA Contractor, becomes seriously damaged (torn, twisted, or crimped permanently) shall be replaced at no additional cost to the Owner.

303.7 Field Seaming:

a. Method of Seaming:

a1. The primary welding procedure for seams shall be double wedge fusion welding.

a2. Extrusion welding shall be used only for repairs, detail work, and for seaming where double wedge fusion welding is not possible.

a3. The rods used for extrusion welding shall be the same type of resin as the geomembrane, unless otherwise approved by the Owner.

a4. The use of solvents or adhesives is not permitted.

b. General Requirements for Seaming:

b1. On slopes steeper than 10 horizontal to 1 vertical, seams shall be oriented parallel to the line of maximum slope (oriented up and down, not across the slope) when possible. No seams oriented across the slope shall be used unless approved by the Owner.

b2. Seams parallel to the toe of the slope shall be located a minimum of 5 feet from the toe.

b3. Seams parallel to the crest of the slope shall be located a minimum of 2 feet from the crest.

b4. Seams at the bottom of a slope shall be overlapped so that the upslope sheet is positioned above the downslope sheet.

b5. Seaming shall extend to the outside edge of panels to be covered with fill material or to be placed in an anchor trench. Seams at sheet corners of three or four sheets shall be completed with a patch having a minimum dimension of 24 inches, extrusion welded to the parent sheets.

b6. All cross seams between the two rows of seamed panels shall be welded during the coolest time of the day to allow for contraction of geomembrane.

c. Trial Welds Prior to Beginning Seaming:

c1. Trial welds are required for pre-qualification of personnel, equipment, and procedures for making seams on identical geomembrane material under the same climatic conditions as the actual field production seams will be made.

c2. Trial welds shall be made as follows:

c2.1 Prior to each seaming period.

c2.2 Every 4 to 5 hours (i.e., at the beginning of the work shift and after the lunch break).

c2.3 Whenever personnel or equipment are changed.

c2.4 When climatic conditions result in wide changes in geomembrane temperature.

c2.5 When requested by CQA Geosynthetics Inspector for any seaming crew or piece of welding equipment if problems are suspected.

c3. Once qualified by passing a trial weld, welding technicians shall not change parameters without performing another trial weld.

c4. Trial welds shall be made on both double wedge fusion welds and on extrusion welds.

c5. A test strip shall be prepared by joining two pieces of geomembrane, each piece shall be at least 6 inches wide. The length of double wedge fusion welded seams shall be a minimum of 10 feet long. The length of an extrusion welded seam shall be a minimum of 4 feet long. The CQA Geosynthetics Inspector shall witness the fabrication of each test strip.

c6. All test welds shall be tested by destructive testing. Testing can be done as soon as the seam cools.

c7. A minimum of three 1-inch wide sample strips shall be cut from each test strip, one from each end and one from the middle. The location of each sample shall be selected by the CQA Geosynthetics Inspector. The test strips shall be tested in peel at 2 inches per minute using a field tensiometer. The CQA Geosynthetics Inspector shall witness all tests.

c8. If any of the test specimens fail, a new test strip shall be fabricated and the tests repeated for the new strip. If additional specimens fail, the seaming apparatus and the seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and successful trial welds have been achieved.

c9. The trial weld is considered acceptable if, when tested for peel adhesion using the field tensiometer, all three specimens meet the criteria specified in Table 319020-1 for both peel and shear under Bonded Seam Strength, or the three specimens exhibit Film Tear Bond (FTB) (yielding of the parent material before seam failure). In the case of a double wedge fusion welded seam, both welds must pass in order to be considered acceptable.

c10. If the specimens pass the tests, production seaming operations can begin.

c11. The Geosynthetics Contractor shall document all data on each trial weld, including:

c11.1 Date.

c11.2 Time.

c11.3 Operator.

c11.4 Machine number.

c11.5 Ambient temperature.

c11.6 Operating temperature.

c11.7 Speed setting.

c11.8 Pass/Fail designation.

d. Preparation for Seaming:

d1. Prior to seaming, the surface of the geomembrane shall be wiped with a clean cloth to ensure that it is clean and free from moisture, grease, dust, dirt, and debris of any kind before seam welding is started.

d2. The panels shall be adjusted so that the seams are aligned to eliminate wrinkles and fish mouths. Where necessary, fish mouths and wrinkles shall be cut to achieve flat overlap.

e. Seaming:

e1. Seaming shall be performed in accordance with the GM/GC Manufacturer's accepted procedure.

e2. Double Wedge Fusion Welds:

e2.1 The panels shall be overlapped a minimum of 4 inches prior to welding.

e2.2 A vehicle-mounted automated hot wedge welding apparatus shall be used to make each seam.

e3. Extrusion Fillet Welding:

e3.1 Geomembrane overlap shall be a minimum of 3 inches for extrusion welding.

e3.2 Geomembrane panels shall be temporarily bonded using a hot air device prior to extrusion welding.

e3.3 The edge of the geomembrane to be fillet welded shall be pre-beveled before heat-tacking the seam in place.

e3.4 The seam overlap shall be ground (abraded) no more than one hour prior to welding.

e3.5 Grinding shall be performed in accordance with the GM/GC Manufacturer’s instructions in a manner that does not damage the geomembrane.

e3.6 Grinding shall not extend more than 1/4 inch past the area to be covered with extrudate during welding.

e3.7 All grind marks shall be covered with extrudate.

303.8 Non-Destructive Field Testing

a. General:

a1. All non-destructive field testing shall be performed and documented by the Geosynthetics Contractor.

a2. The CQA Geosynthetics Inspector shall observe all non-destructive test procedures.

a3. One hundred (100) percent of the seam length shall be tested using non-destructive procedures to check the continuity of the field seams. Non-destructive testing is not meant to qualify seam strength.

a4. Air pressure testing shall be performed in accordance with ASTM D5820 and GRI GM6.

a5. Vacuum box testing shall be performed in accordance with ASTM D5641 and as specified herein.

a6. Continuity testing shall be performed as seaming progresses or as soon as a suitable length of seam is available, not at the completion of all field seaming.

b. Double Wedge Fusion Welded Seams:

b1. Double wedge fusion welded seams shall be tested using air pressure testing.

b2. The procedure for testing shall be as specified in GRI GM6 for the type and thickness of geomembrane in use.

b3. The following pressures are applicable to all HDPE geomembrane. After an initial 2-minute pressure stabilization period, the pressure shall be maintained between 27 and 30 psi for 60 mil HDPE geomembrane. The pressure shall be sustained for a minimum of 5 minutes. The loss of pressure shall not exceed a maximum of 3 psi in 5 minutes. If the pressure does not stabilize in the first two minutes or the pressure loss exceeds the loss specified, the seam test shall be considered a failure.

b4. For every seam that fails a seam test:

b4.1 The leak or suspected leak shall be located and repaired.

b4.2 The repaired seam shall be re-tested as required until all leaks are identified and repaired and the seam passes a subsequent air pressure test.

b5. When the geometry of a double wedge fusion weld makes air testing impossible or impractical, vacuum testing may be used to test the seam.

c. Extrusion Welded Seams:

c1. Extrusion welded seams shall be tested using vacuum chamber testing in accordance with ASTM D5641.

c2. The completed seam shall exhibit no leakage when tested between 4 and 8 psi minimum vacuum for approximately 10 seconds.

c3. If leaks are discovered during vacuum box testing, they shall be located, marked, and repaired.

c4. The repaired area shall be re-tested and exhibit no leakage.

d. Inaccessible Seams:

d1. Where extrusion welded seam locations make use of vacuum box testing impractical, then the electric wire method of testing shall be used or the seam shall be cap stripped as approved by the Owner.

d2. If cap stripping is approved by the Owner, the seams shall be cap stripped as described in Paragraph 303.11d with strips of the same type and thickness of geomembrane being installed. The cap stripping shall be performed in the presence of the CQA Geosynthetics Inspector and the Owner's representative.

d3. The electric wire test method shall consist of placing a 24-gauge copper wire 1/8 inch beneath the top sheet overlap of the two sheets prior to welding with the extruder. The wire shall be embedded in the seam. After welding, a holiday spark detector, operating at 20,000 volts, shall be connected to one end of the wire, and slowly moved over the length of the seam. A seam defect between the probe and the embedded wire shall result in an audible alarm indicating where the defect is located.

e. Test Reports:

e1. Test reports for all air pressure tests shall contain all data specified in ASTM D5820 and GRI GM6.

e2. Test reports for vacuum box testing shall contain all of the data specified in ASTM D5641.

e3. Test reports for other types of non-destructive tests shall contain the following data for each test as a minimum:

e3.1 Location.

e3.2 Type of test.

e3.3 Test parameters.

e3.4 Test data.

e3.5 Test number.

e3.6 Name of tester.

e3.7 Outcome of the test.

303.9 Destructive Testing

a. Testing:

a1. Destructive testing shall be performed by an independent third-party laboratory employed by the CQA Contractor on samples cut from production welds in the field by the Geosynthetics Contractor.

a2. Samples shall be taken by the Geosynthetics Contractor to the third-party laboratory and tested for shear strength and peel adhesion. For double wedge seam samples, both welds shall be tested for peel adhesion.

b. Location and Frequency:

b1. Test locations shall be determined after seaming. The location where the test samples shall be taken shall be marked by the CQA Geosynthetics Inspector. Locations may be prompted by the appearance of excessive heating, contaminations, offset welds, or a suspected defect. Destructive test samples shall be taken at a minimum average frequency of one per every 500 linear feet of seam length.

b2. The Method of Attributes described in GRI GM14 may be exercised to minimize the number of test samples taken if more than 100 destructive seam samples will be required based on the sampling strategy given in Paragraph 303.9b1.

b3. Each sample location shall be numbered and marked with permanent identification, and every sample location shall be indicated on a plan drawing prepared and maintained by the Geosynthetics Contractor. The following shall be recorded for each sample:

b3.1 Date and time.

b3.2 Ambient temperature.

b3.3 Seam number and location.

b3.4 Welding apparatus used.

b3.5 Name of Master Geomembrane Seamer.

b3.6 Reason for taking the sample.

b3.7 Size of sample.

b3.8 Test results.

b3.9 Name of tester.

b4. Samples shall be cut by the Geosynthetics Contractor in the presence of the CQA Geosynthetics Inspector.

b5. Test samples shall be cut every shift and taken by the CQA Geosynthetics Inspector to the third-party laboratory the same day that the sample is prepared.

c. Sample Size:

c1. The minimum sample size shall be 12-inches wide with a seam 16-inches long centered length wise in the sample.

c2. As agreed to with the Owner, a sample may be increased in size to accommodate the requirements of the third-party testing laboratory.

d. Field Testing:

d1. A one-inch wide specimen shall be cut from each end of each sample for field testing.

d2. Each one-inch wide specimen shall be tested with a field tensiometer for peel adhesion.

d3. The CQA Geosynthetics Inspector shall witness each field test.

d4. A test is considered acceptable if a specimen meets the criteria specified in Table 319020-1 for both peel and shear under Bonded Seam Strength, or exhibits Film Tear Bond (FTB). For double wedge fusion welds, both welds must pass the test. If either sample fails the field test, it shall be assumed that the seam will not pass the specified laboratory testing and the sample shall be given a fail designation.

e. Laboratory Testing:

e1. Samples shall be tested for shear strength and peel adhesion in accordance with ASTM D6392. Five specimens shall be tested for each test method.

e2. All samples shall meet minimum requirements for shear strength and peel adhesion given in Table 319020-1 under Bonded Seam Strength.

f. Test Results:

f1. In accordance with CQA Specification P-1803, verbal laboratory test results will be given by the CQA Contractor to the Geosynthetics Contractor within 24 hours of receipt of the samples. Written results will follow within one week.

f2. All test locations shall be marked with a pass/fail designation on the liner and on the drawings maintained by the Geosynthetics Contractor for submittal to the Owner after the geomembrane liner is installed.

g. Re-Testing if Failure Occurs:

g1. If a seam fails testing, one additional sample shall be taken 10 feet on each side of the location of the failed test. Additional samples shall continue to be taken at 10-foot intervals until tests show that seam strength is adequate and the zone in which the seam requires reconstruction is identified. Additional field and laboratory tests required to determine failed seams and any necessary patching and rework shall be performed at no additional cost to the Owner.

g2. All passing seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken.

g3. The entire seam length failing strength tests shall be reconstructed at no additional cost to the Owner.

g4. If the length of reconstructed seam exceeds 150 feet, a sample shall be taken of the reconstructed seam every 150 feet and shall pass destructive testing.

303.10 Inspection:

a. After seaming is complete, the Geosynthetics Contractor and the CQA Geosynthetics Inspector shall conduct a detailed walk-down to visually check all seams and non-seam areas of the HDPE geomembrane liner.

b. All defects, holes, blisters, tears, signs of damage during installation, areas of undispersed carbon, and holes from destructive or non-destructive testing shall be marked and repaired.

303.11 Repair of Defects and Seams

a. Patching:

a1. Patching shall be used to repair large holes, tears, and destructive sample locations.

a2. All patches shall be round or oval or shall have rounded corners.

a3. All patches shall be made of the base HDPE geomembrane material and shall extend a minimum of 3 inches beyond the edges of the defect.

a4. Patches shall be extrusion welded to the base sheet.

b. Grinding and Welding:

b1. Grinding and welding shall be used to repair sections of extruded fillet seams with small defects.

c. Spot Welding:

c1. Spot welding shall be used to repair small tears, pinholes, or other minor localized flaws.

d. Capping:

d1. Capping shall be used to repair lengths of extrusion welded seams with large defects and to repair double wedge fusion welded seams.

d2. Cap strips shall be made with strips of the same type and thickness of geomembrane being installed. Strips shall extend a minimum of 6 inches beyond the weld, and shall have rounded corners.

d3. Cap strips shall be extrusion welded to the base sheet.

e. Cut Out and Replacement:

e1. When approved by the Owner, a length of defective seam may be cut out and replaced with a strip of new material seamed into place.

f. Verification of Repairs:

f1. All repairs shall be non-destructive tested using one of the procedures described in Paragraph 303.8.

f2. Repairs passing non-destructive testing shall be deemed acceptable.

f3. Repairs of a seam in excess of 150 feet in length shall have one destructive seam test per 150 feet in length.

304. INSTALLATION OF DRAINAGE GECOMPOSITE

304.1 General Requirements:

a. In the presence of wind, all drainage geocomposite shall be weighted with sand bags or the equivalent. Weights shall be installed during deployment and shall remain in place until deployment of the cover material.

b. The drainage geocomposite shall not be welded to the geomembrane liner.

c. All necessary precautions shall be taken to prevent damage to underlying geomembrane during placement of the drainage geocomposite.

d. During placement of the drainage geocomposite, care shall be taken not to entrap dirt or excessive dust that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the drainage geocomposite, it shall be cleaned and all dirt removed prior to placement of the cover material. Care shall be taken in the handling of sand bags to prevent rupture or damage of the sand bag.

304.2 Placement of Drainage Geocomposite:

a. On slopes, the drainage geocomposite shall be secured with temporary ballasting material (e.g., sand bags) at the top of the slope or, as specified in the Design Drawings, in an anchor trench and then rolled down the slope in such a manner as to continuously keep the drainage geocomposite in tension. If necessary, the drainage geocomposite shall be positioned by hand after unrolling to minimize wrinkles and folds.

b. The drainage geocomposite shall be placed on side slopes with no horizontal seams along the slope and so that the long dimension is parallel to the slope.

c. No horizontal seam shall be located within 5 feet of the toe of a slope.

d. The drainage geocomposite shall be positioned on both the slopes and the bottom so that the geonet core overlaps by a minimum of 4 inches.

e. Drainage geocomposite placed in the corners of the side slope shall be cut to eliminate excessive overlap of material.

e1. The drainage geocomposite shall only be cut using scissors or other cutting tools approved by the GM/GC Manufacturer that will not damage the underlying geomembrane.

e2. Cutting tools shall not be left on the drainage geocomposite.

304.3 Joining Geonet Cores:

a. The geonet cores between adjacent drainage geocomposite panels shall be joined using white or yellow self-locking straps. Metal fastening devices are not permitted and shall not be used.

b. Adjacent panels on slopes shall be joined on 5-foot centers.

c. Adjacent panels on the basin floor shall be joined on 10-foot centers.

d. End seams on the basin floor shall be joined on 1-foot centers.

e. Horizontal and end seams in anchor trenches shall be joined on 1-foot centers.

304.4 Joining Geotextile Caps:

a. Sewing on Basin Floor:

a1. On the basin floor and interior slopes flatter than 10H:1V (i.e., 10%), the geotextile caps between adjacent drainage geocomposite panels shall be continuously sewn or continuously heat bonded in accordance with the GM/GC Manufacturer's recommendations.

a2. Spot seaming is not allowed.

b. Sewing on Basin Slopes:

b1. On basin slopes greater than 10H:1V (i.e., 10%), the geotextile caps between adjacent drainage geocomposite panels shall be continuously sewn. All seams shall be vertical (i.e., parallel with the slope). No horizontal seams (i.e., across the slope) shall be permitted on basin slopes greater than 10H:1V (i.e., 10%).

b2. Spot seaming and heat bonding are not allowed.

c. Sewing Requirements:

c1. Sewing shall be done using polyester or heat-set UV stabilized polypropylene sewing thread with chemical and ultraviolet light resistance properties equal to or exceeding the values specified in Table 319020-2. The thread color shall contrast with the color of the geotextile cap to assist in inspection of the seam. Tex size or denier number of the thread shall be specified by the Geosynthetics Contractor.

c2. Seams shall be “prayer” or “flat” seams. Seams shall be formed by mating the edge of the geotextile caps and sewing the caps together with continuous stitches located a minimum of four inches from the mated edges.

c3. Sewing procedures shall conform to the latest procedures recommended by the GM/GC Manufacturer.

c4. Stitching:

c4.1 For drainage geocomposites placed on the interior slopes of the basin, stitching shall be two rows (SSa-2) of stitching using a 01 two-thread locking chain stitch as described in the IFAI with 6 to 10 stitches per inch. Thread strength shall be such field seam strength will be a minimum of 90 percent of the tensile strength of the geotextile cap.

c4.2 For drainage geocomposites used elsewhere in the basin, stitching shall be one row (SSa-1) of stitching using a Type 401 two-thread locking chain stitch as described in the IFAI with a minimum of 5 stitches per inch, or the seam shall be heat bonded. Thread strength shall be selected by the Geosynthetics Contractor.

c5. Seam Inspections:

c5.1 Visual examinations shall be conducted to ensure that 100 percent of the seams are sewn or heat bonded as required.

c5.2 Seam sampling and testing are not required.

304.5 Protection of HDPE Geomembrane:

a. The Geosynthetics Contractor shall be responsible for protection of the HDPE geomembrane liner during installation of the drainage geocomposite and shall be responsible for repair of any damage caused to the liner by installation of the drainage geocomposite.

304.6 Repair of Holes or Tears:

a. All holes or tears in the drainage geocomposite shall be repaired by placing a patch of drainage geocomposite over the hole or tear. The patch shall extend 2 feet beyond the edges of the hole or tear. If the hole or tear width across the role is more than 50% of the width of the roll, the damaged drainage geocomposite shall be removed and replaced.

b. A patch’s geonet core shall be secured to the original geonet core by tying every 12 inches.

c. A patch’s geotextile cap shall be sewn into place by hand or machine so as the patch will not accidentally shift out of position or be moved when it is covered. The thread shall be the same as specified for sewing seams.

305. CREST ANCHORAGE

305.1 At the top of a slope, the HDPE geomembrane liner and the drainage geocomposite shall extend to the run-out distance indicated on the Design Drawings or, if otherwise indicated on the Design Drawings, shall be anchored in an anchor trench.

305.2 Prior to the placement of the geosynthetic clay liner (GCL) underlying the HDPE geomembrane liner, and if indicated on the Design Drawings, the Earthwork Contractor shall excavate the crest anchor trench to the lines and widths shown on the Design Drawings and in accordance with the excavation and shaping requirements specified in Section 319005.

305.3 After installation of the LCRS in accordance with Section 319050, the Earthwork Contractor shall place fill over the geosynthetic materials along the specified run-out distance or in the anchor trench as shown on the Design Drawings.

306. ATTACHMENT TO CONCRETE

306.1 Geomembrane shall be attached to concrete using batten strips in accordance with details on the Design Drawings.

307. ATTACHMENT TO PIPE PENETRATIONS

307.1 Geomembrane shall be attached to pipe penetrations through the lining in accordance with details on the Design Drawings.

307.2 Prefabricated or field fabricated HDPE sleeves (pipe boots) used for attaching the geomembrane to the pipe shall be supplied by the GM/GC Manufacturer.

END OF SECTION 319020

SECTION 319025

GEOSYNTHETIC CLAY LINER

PART 1 – GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for a geosynthetic clay liner (GCL) to be used as the lower component of the retrofitted Ash Surge Basin's new composite liner system, all in accordance with the Design Drawings and as specified herein.

101.2 The work shall include, but not be limited to, the following items:

a. Manufacturing, shipping, handling, and storage of GCL.

b. Preparation and inspection of surfaces to be lined.

c. Placement and seaming of GCL.

d. Crest anchorage of GCL using liner run-outs or anchor trenches as specified on the Design Drawings.

e. Sealing GCL around existing marker posts and on existing concrete surfaces.

f. Visual inspection of the completed GCL.

g. Patching and repairs as necessary.

101.3 Definitions and Qualifications:

a. The following definitions of terms shall apply throughout this section:

a1. CQA Geosynthetics Inspector: An inspector who works for the CQA Contractor and is responsible for inspection of the Geosynthetics Contractor's work.

a2. GCL Manufacturer: The manufacturer who is responsible for manufacturing and transporting GCL materials to the site.

b. Qualifications:

b1. The GCL Manufacturer shall be approved by the Owner. Owner's considerations when approving the GCL Manufacturer may include, but are not limited to, financial, safety, and prior performance aspects of the manufacturer.

b2. The GCL Manufacturer shall have an internal QA/QC program to ensure and to verify the manufactured products consistently meet or exceed the requirements of this section.

b3. The GCL Manufacturer shall have at least 10 years of experience manufacturing products similar to those required for this Work.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification P-1802:

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a3. Section 319050 – Leachate Collection and Removal System.

b. CQA Specification P-1803:

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes, and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents, in addition to federal, state, or local agencies having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D4643 Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.

b. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

c. D5887 Standard Test Method for Measurement of Index Flux through Saturated Geosynthetic Clay Liner Specimens using a Flexible Wall Permeameter.

d. D5889 Standard Practice for Quality Control of Geosynthetic Clay Liners.

e. D5890 Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

f. D5891 Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

g. D5993 Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.

h. D6243 Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by Direct Shear Method.

i. D6496 Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners

j. D6768 Standard Test Method for Tensile Strength of Geosynthetic Clay Liners

104. SUBMITTALS

104.1 The GW Contractor shall submit the following drawings and data as specified. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems (as specified by the Owner).

104.2 Submittals with Bid Proposal:

a. Geosynthetics Contractor:

a1. Geosynthetics Contractor's name, address, and telephone number.

a2. Geosynthetics Contractor's qualifications, including letter or certificate from GCL Manufacturer documenting the manufacturer's approval of the Geosynthetics Contractor (or subcontracted Installer) to install the GCL materials supplied by the GCL Manufacturer.

a3. Installer's qualifications if the Geosynthetics Contractor is proposing to subcontract the GCL installation work.

b. GCL Material:

b1. Copies of the GCL Manufacturer's catalog data describing the GCL material proposed for use on this project.

b2. Copies of GCL Manufacturer's QA certificates on tests performed on the material and a summary of results after the tests.

b3. Certification of Compliance from the GCL Manufacturer, signed by its authorized representative, stating that the GCL material meets the specification requirements and that those requirements are guaranteed by the GCL Manufacturer.

b4. GCL Manufacturer's Quality Control and Quality Assurance Policies and Procedures.

c. Warranty:

c1. Written warranties from the GCL Manufacturer and the Geosynthetics Contractor covering the quality of the material and workmanship as applicable.

c2. Warranty conditions proposed, including limits of liability, will be evaluated by the Owner in approving the GCL Manufacturer and the Geosynthetics Contractor.

104.3 Submittals After Award:

a. Installation Data:

a1. GCL Manufacturer's proposed GCL panel layout for each installation.

a2. GCL Manufacturer's recommended procedures for making seams if different from those specified herein.

a3. GCL Manufacturer's recommended procedures for repairing damaged GCL sections and seams if different from those specified herein.

a4. GCL Manufacturer's details of GCL anchorage and attachment to structures and penetrations if different from those specified herein and from the details shown on the Design Drawings.

104.4 Submittals Upon Shipment:

a. Two representative samples of each GCL material to be used for the project.

b. GCL Manufacturer's QA/QC certificates with each shipment of GCL. The QA/QC certificates shall include:

b1. GCL lot and roll numbers with corresponding shipping information.

b2. GCL Manufacturer's test data for the geotextile materials used in GCL production including, at a minimum, mass per unit area data and tensile test data.

b3. Certificates of analyses for the bentonite clay used in GCL production including, at a minimum, test data for the properties shown in Table 319025-1.

b4. GCL Manufacturer's test data for the finished GCL product including, at a minimum, test data for the properties shown in Table 319025-2.

104.5 Submittals After Installation is Complete:

a. As-built panel layout.

b. Plan drawing showing locations of repairs and types of repairs made.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Geosynthetics Contractor of the responsibility for providing and installing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Geosynthetics Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1803.

PART 2 - PRODUCTS

201. GEOSYNTHETIC CLAY LINER (GCL)

201.1 Approved GCL Products:

a. The products of the following manufacturers meeting the requirements herein are acceptable:

a1. CETCO BENTOMAT® DN.

a2. Solmax BentoLiner® NW.

a3. AGRU America GeoClay® N66.

a4. Owner-approved alternative(s) meeting the requirements herein.

201.2 General Requirements:

a. The GCL shall be a needle punched GCL. The GCL shall be manufactured by placing a uniform layer of high-swell sodium bentonite encapsulated between two geotextiles and

then needle punching through both layers of the geotextile and the bentonite to push fibers from the geotextile cap through the bentonite layer and embed them in the geotextile carrier on the other side.

b. The upper and lower support materials shall protect the bentonite but shall be sufficiently porous to allow bentonite flow-through to create a positive bentonite-to-bentonite seal at the seams.

c. The support materials used in the manufacturing shall not interfere with the swelling, self-healing, or low permeability characteristics of the GCL.

d. The GCL shall be fabricated such that bentonite will not be displaced when the liner is cut.

e. Six-inch and nine- or twelve-inch overlap marks shall be marked longitudinally on both edges of the geotextile cap by the GCL Manufacturer to assist in obtaining the proper overlap. The lines shall be printed in easily visible, non-toxic ink.

f. The minimum period of warranty for GCL materials shall be 5 years.

201.3 GCL Material Specifications:

a. Sodium Bentonite. The bentonite utilized in the manufacture of the GCL, as well as any accessory bentonite provided for seaming and detail work, shall be Wyoming-grade sodium bentonite with the properties listed in Table 319025-1.

TABLE 319025-1
PROPERTIES OF BASE BENTONITE IN GCL MATERIALS

Property(1)	ASTM Test Method	Value	Min. Testing Frequency(2)
Free Swell	D5890	24 mL / 2g min.	1/100,000 lb
Fluid Loss	D5891	18 mL max.	1/100,000 lb
Moisture Content	D4643	12% max.	1/100,000 lb

Notes:

(1) Properties of the base bentonite prior to incorporation into the finished GCL product.
(2) Minimum testing frequencies are per ASTM D5889. One test per 50 tonnes is also acceptable.

b. Geosynthetic Clay Liner. The finished GCL shall have the properties listed in Table 319025-2.

TABLE 319025-2
PROPERTIES OF FINISHED GCL MATERIALS

Property	ASTM Test Method	Value	Min Testing Frequency(1)
Geotextile Properties			
Non-Woven Cap	D5261	6.0 oz/yd^2 min.	1/20,000 SF
Non-Woven Carrier	D5261	6.0 oz/yd^2 min.	1/20,000 SF
Finished GCL Properties			
Bentonite Mass/Area	D5993	0.75 lb/ft^2 min. at 0% moisture content	1/20,000 SF
Moisture Content	D5993	35% max.	1/20,000 SF
Hydrated Internal Shear Strength	D6243	500 psf min.(2)	1/20,000 SF
Tensile Strength(3)	D6768	45 lb/in. min.	1/20,000 SF
Peel Strength	D6496	3.5 lb/in. min.	1/20,000 SF
Index Flux(4)	D5887	2x10^{-9} m^3/m^2/sec max.	1/20,000 SF
Hydraulic Conductivity(4)(5)	D5887	1x10^{-9} cm/sec max.	1/20,000 SF

Notes:

(1) Minimum testing frequencies listed are in accordance with ASTM D5889.
(2) Typical peak value for specimen sheared under a 200 psf normal stress.
(3) Machine (warp) direction of primary backing.
(4) Index flux and hydraulic conductivity measured at 5 psi effective confining stress and 2 psi head.
(5) Hydraulic conductivity based on 7-mm-thick bentonite layer.

201.4 Packing and Shipping:

a. All GCL material shall be shipped to the project site in rolls. No GCL material shall be folded.

b. Transportation of GCL materials to the project site shall be the responsibility of the GCL Manufacturer who shall retain responsibility of the material until the material is accepted at the project site. The Geosynthetics Contractor will be responsible for unloading the GCL material at the project site.

c. The finished GCL shall be completely wrapped and adequately secured with a durable polyethylene protective cover in order to provide protection from ultraviolet degradation of the Primary Backing Material (PBM) and excessive loss of moisture during shipping and storage.

d. A label shall be attached or adhered to each roll of the GCL. The label shall identify the following:

d1. Name of GCL Manufacturer.

d2. Product identification (brand name, product code).

d3. Order number.

d4. Date of manufacture.

d5. Manufacturing lot number.

d6. GCL thickness.

d7. Roll identification number.

d8. Roll dimensions (i.e., length and width) and weight.

d9. Panel number, which shall be referenced to the proposed GCL panel layout drawing prepared by the GCL Manufacturer.

e. The GCL shall be stenciled throughout each roll with the product name and name of the GCL Manufacturer, which can be cross-referenced to the roll number marked on the label and to the production and quality control data sheets.

202. BENTONITE SEALING COMPOUND (BSC) AND GRANULAR BENTONITE (GB)

202.1 The BSC and GB shall be supplied by the GCL Manufacturer and shall be comprised of the same bentonite used in the manufacturing of the GCL. The BSC shall be a mixture of non-aqueous liquid suspension agents which creates a paste-like texture.

202.2 The suspension agents used in the manufacture of the BSC shall be non-toxic, water-soluble and shall not restrict the bentonite's ability to swell and absorb water upon hydration.

PART 3 - EXECUTION

301. ONSITE HANDLING AND STORAGE

301.1 Unloading:

a. Handling and unloading shall be the responsibility of the Geosynthetics Contractor.

b. Upon arrival at the site, the rolls of the GCL shall be carefully unloaded by the Geosynthetics Contractor in accordance with the GCL Manufacturer's recommendations and in a manner to ensure the material is not damaged.

301.2 Inspection:

a. Upon delivery of the material to the project site, the Geosynthetics Contractor shall conduct a visual inspection of all rolls of GCL for damage (rips, tears, etc.). Any protective sleeve damage shall be repaired immediately with tape or additional plastic sheeting.

b. Any damage to a roll of GCL or its protective sleeve shall be noted and immediately reported to the Owner, the GCL Manufacturer, and the carrier that transported the material. Any roll or portion thereof, which, in the judgement of the Owner, is seriously damaged, shall be removed from the project site and replaced with complying material at no additional cost to the Owner.

301.3 Storage:

a. The Owner will provide on-site, outdoor storage space in a location near the area to be lined.

b. The Geosynthetics Contractor shall store and stage the GCL rolls such that on-site transportation and handling are minimized.

c. The Geosynthetics Contractor shall be responsible for protecting the GCL rolls from damage, moisture, theft, and vandalism.

d. Rolls of GCL shall be:

d1. Stored horizontally in their original, unopened, wrapped cover in a clean, dry area.

d2. Stored off the ground on pallets or plywood in small stacks not to exceed five rolls in height. Rolls shall be stacked in a manner recommended by the GCL Manufacturer that prevents them from sliding or rolling.

d3. Covered with a heavy, protective tarpaulin or plastic sheeting.

e. The Geosynthetics Contractor shall keep the GCL clean and free from debris prior to installation.

f. Any rolls that come in contact with moisture while in storage shall be set aside by the Geosynthetics Contractor to await examination by the Owner. Damaged rolls shall also be set aside and inspected to determine suitability of the material for use.

302. PREPARATION OF SURFACE TO BE LINED

302.1 The Earthwork Contractor shall be responsible for the initial preparation and maintenance of the surfaces to be lined as specified in the Section 319005 prior to placement of the GCL.

302.2 The Geosynthetics Contractor shall provide written certification to both the Earthwork Contractor and the Owner that the surface on which the GCL is to be installed is acceptable. The surface then becomes the responsibility of the Geosynthetics Contractor.

302.3 The surface upon which the GCL is to be placed shall be free of standing water and maintained in a firm, clean, and smooth condition during liner installation.

303. GENERAL INSTALLATION REQUIREMENTS

303.1 Weather:

a. GCL shall not be deployed or placed in the following conditions:

a1. During any rainfall or snowfall.

a2. In ponded water.

a3. During high winds.

a4. In the presence of excessive moisture due to fog or dew.

a5. On frozen subgrade.

b. GCL shall not be deployed when the air temperature is above 104°F or below 41°F unless it can be demonstrated to the approval of the Owner by trial welds the overlying HDPE geomembrane liner sheets can be welded at the prevailing temperature in accordance with the field seaming requirements specified in Section 319020. Under no circumstances shall GCL be deployed when the air temperature is below 5°F.

303.2 Precautions to Prevent Wind Damage

a. If possible, work shall be oriented in the direction of the prevailing wind.

b. To prevent uplift of the GCL by wind, the Geosynthetics Contractor shall provide adequate temporary loading and/or anchoring of the edges of the exposed sheets using sandbags, tires, or other means which will not damage the GCL.

303.3 Other Precautions to Prevent Damage

a. Protection of the GCL from damage due to foot traffic on the slopes shall be provided.

b. Provisions of facilities for safe entrance and egress of employees from sloped depressions shall be provided.

303.4 Panel Layout:

a. Horizontal panel seams are not allowed on slopes, except as required at the intersection of two slopes (valley). All panel seams on slopes shall be parallel to the flow line down the slope.

b. The panels shall be placed in accordance with the GCL Manufacturer's panel layout drawing to ensure that they are placed in the proper direction for overlapping.

c. If panels are installed in a location other than indicated on the panel layout drawing, the revised location shall be indicated on an "as-built" layout drawing prepared by the Geosynthetics Contractor. The as-built record drawing of the panel layout shall be submitted to the Owner and the CQA Contractor after all of the GCL has been placed and seamed.

304. PANEL DEPLOYMENT

304.1 Deploy only as much GCL as can be covered with the HDPE geomembrane liner (in accordance with section 319020) by the end of the day or in a reasonably short time in the event of precipitation.

304.2 Any rutting of the subgrade (i.e., Structural Fill) shall be smoothed and leveled prior to covering that area with GCL.

304.3 Where required by the Design Drawings, the anchor trench for the area to be lined shall be excavated before installation of the GCL begins.

304.4 Rolls of GCL shall be brought to the area to be lined with a front-end loader and support pipes set up such that the GCL roll is fully supported across its length, is freely suspended, and can unroll freely. The core bar and spreader bar shall not flex or bend excessively when a full roll is lifted.

304.5 The cap material shall face upwards toward the installer. The GCL shall be placed over the prepared surface in such a manner as to assure minimum handling.

304.6 Installation shall begin at a high elevation and proceed to a low elevation.

304.7 Pulling GCL panels shall be minimized to reduce the chance of permanent tension.

304.8 Wrinkles and folds shall be minimized. However, enough slack shall be provided in both directions so that there will be no tension in the GCL at the lowest expected operating temperature.

305. FIELD SEAMING

305.1 General Requirements for Seaming:

a. Horizontal seams shall be located at least 5 feet from the toe of a slope.

b. On slopes, all runs shall be continuous with the long dimension of all panels oriented parallel to the slope.

c. Panels placed on the basin floor require no particular orientation.

d. Once the first run has been laid, adjoining runs shall be laid with a 6 inch minimum overlap on the longitudinal seams and 24 inch minimum overlap on end seams. If the GCL Manufacturer recommends larger overlap seams, then the GCL Manufacturer's recommendations shall be followed.

e. The edges of GCL panels shall be adjusted to smooth out wrinkles, creases, or "fishmouths" in order to maximize contact with the underlying panel.

f. If the air temperature is higher than 85°F and the humidity is low, contraction may occur soon after placement when no confining stress has been placed over the GCL. To allow for the possibility of contraction under these conditions, the minimum seam overlap shall be increased to a minimum of 12 inches on longitudinal seams and 36 inches on end seams, or to 4% of the distance to the next parallel seam, whichever is greater.

305.2 Seaming:

a. Seaming shall be performed in accordance with the GCL Manufacturer's written recommended procedures.

b. All seams shall be formed by executing a bentonite-enhanced overlap to ensure that a continuous seal is achieved.

c. The side of the overlying panel shall be pulled back to expose and examine the overlap areas. Seam overlap areas shall be clean and free from moisture, free from dust and debris of any kind before seaming is started. Any contamination shall be removed.

d. A fillet of dry granular bentonite shall be poured in a continuous manner along the overlap zone (between the edge of the panel and the six-inch line) at a rate of at least one-quarter pound per linear foot. All dry granular bentonite used shall be that provided by the GCL Manufacturer.

e. Seam overlap on the bottom of a slope shall be placed such that the direction of flow is from the top sheet to the bottom sheet to form a shingle effect and prevent flow into the seam.

306. SEALING AROUND AND AGAINST EXISTING STRUCTURES

306.1 The GCL shall be sealed to existing structures within the Ash Surge Basin.

306.2 A wedge of GB shall be installed at the point of intersection of an existing structure and the basin floor or sideslope. This GB wedge shall be placed between the existing liner and the new GCL and shall be at least 1.0 lbs per foot.

306.3 At the intersection of the GCL and an existing structure, the GCL shall extend higher on the structure than the termination point for the existing geomembrane liner.

306.4 If the attachment hardware for the existing geomembrane liner are sharp or protrude to the extent that they could damage the GCL, a supplement HDPE geomembrane rub sheet shall be installed between the GCL and existing attachment hardware.

306.5 Vertical GCL shall be anchored to an existing structure at an elevation higher than the existing HDPE geomembrane liner and lower than the new HDPE geomembrane liner as shown on the Design Drawings. As an alternate, the Geosynthetics Contractor may propose a self-adhering GCL product that demonstrates similar properties to the base GCL in accordance with GCL Manufacturer's written recommendations.

307. INSPECTION

307.1 After seaming is complete, the Geosynthetics Contractor and the CQA Geosynthetics Inspector shall conduct a detailed walkdown to visually check all seams and non-seam areas of the GCL.

307.2 All defects, holes, blisters, tears, and signs of damage during installation shall be marked for repair.

308. PATCHING AND REPAIRS

308.1 Patching shall be used to repair small defects, blisters, holes, and tears.

308.2 All dirt and debris present in the patched area shall be removed.

308.3 All patches shall be round or oval or shall have rounded corners.

308.4 All patches shall be made of the base GCL and shall extend a minimum of 12 inches beyond the edges of the defect. Accessory bentonite shall be placed around the perimeter of the affected area at a rate of one-quarter pound per lineal foot prior to placing the patch. Adhesive, such as wood glue, may be used if necessary to secure the patch.

309. CREST ANCHORAGE

309.1 At the top of a slope, the GCL shall extend to the run-out distance indicated on the Design Drawings or, if otherwise indicated on the Design Drawings, shall be anchored in an anchor trench.

309.2 Prior to the placement of the GCL and if indicated on the Design Drawings, the Earthwork Contractor shall excavate the crest anchor trench to the lines and widths shown on the Design Drawings and in accordance with the excavation and shaping requirements specified in Section 319005.

309.3 After installation of the LCRS in accordance with Section 319050, the Earthwork Contractor shall place fill over the geosynthetic materials along the specified run-out distance or in the anchor trench as shown on the Design Drawings.

310. PROTECTIVE COVER

310.1 The GCL shall be covered the same day with the HDPE geomembrane liner as shown on the Design Drawings in accordance with Section 319020. Precautions shall be taken to prevent damage to the GCL by restricting heavy equipment traffic.

310.2 To prevent premature hydration or contraction, only the amount of GCL that can be installed, inspected, repaired, and covered in the same day shall be installed.

310.3 Any leading edge or panels of GCL left unprotected shall be covered with a heavy, waterproofing tarp which is adequately secured and protected with sand bags or other ballast.

311. CORRECTIVE MEASURES FOR PREMATURE HYDRATION OF GCL

311.1 If the GCL is prematurely hydrated, becomes saturated, etc., then the following corrective action program shall be implemented:

a. The affected panels shall be identified, documented, and exposed so that they can dry. Traffic over the impacted area shall be kept to a minimum during the drying process.

b. Once the affected panels have had enough time to dry, the Geosynthetics Contractor, the CQA Geosynthetics Inspector, and the Owner shall evaluate the impacted area for damage.

c. Following evaluation of the impacted area, the Geosynthetics Contractor shall recommend to either leave the GCL in place or to replace the GCL. The Geosynthetics Contractor's recommendation shall be made in writing, submitted with photographs documenting the evaluated area, and based on the extent of damage (or lack thereof).

c1. If the Geosynthetics Contractor's recommendation is to replace the affected GCL panels, then they shall be replaced at no additional cost to the Owner.

c2. If the Geosynthetics Contractor's recommendation is to leave the affected GCL panels in-place, and if the Owner or CQA Geosynthetics Inspector disagree with that recommendation, then the Owner will contact the GCL Manufacturer for their recommendation.

c2.1 If the GCL Manufacturer's recommendation is to replace the affected GCL panels, then they shall be replaced at no additional cost to the Owner.

c2.2 If the GCL Manufacturer's recommendation is to leave the affected GCL panels in-place, and if either the Owner or CQA Geosynthetics Inspector disagree with that recommendation, then the GCL panels shall be removed in accordance with a negotiated agreement between the Owner and the GW Contractor.

END OF SECTION 319025

SECTION 319050

LEACHATE COLLECTION AND REMOVAL SYSTEM

PART 1 - GENERAL

101. EXTENT

101.1 This section defines the minimum material and installation requirements for the components of the Ash Surge Basin's new leachate collection and removal system (LCRS) including high-density polyethylene (HDPE) leachate collection and sideslope riser pipes, Coarse Aggregate Bedding Material, Sand Filter Layer material, Protective Warning Layer material, Riprap Bedding Layer material, and riprap, all in accordance with the Design Drawings and as specified herein.

101.2 The components and dimensions of the LCRS are shown on the Design Drawings. The division of work shall include, but not be limited to, the following items:

a. The following items shall be furnished and installed by the Earthwork Contractor:

a1. Coarse Aggregate Bedding Material.

a2. Sand Filter Layer.

a3. Protective Warning Layer.

a4. Perforated leachate collection pipe.

a5. Solid sideslope riser pipe and cover.

b. The following items shall be furnished and installed by the Geosynthetics Contractor in accordance with Sections 319020 and 319025:

b1. HDPE geomembrane.

b2. HDPE scruff strips.

b3. Drainage geocomposite.

b4. Geotextiles.

b5. Geosynthetic clay liner (GCL).

c. The following items will be furnished and installed by Others:

c1. Wheeled submersible pump with flexible hose.

c2. Flowmeters.

c3. Control station for pumps and meters.

c4. Electrical and instrument conduit.

101.3 Definitions:

a. The following definitions of terms shall apply throughout this section:

a1. Pipe Manufacturer: The manufacturer who is responsible for manufacture of LCRS pipe materials and fittings and for transporting these materials to the site.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS AND SPECIFICATIONS

102.1 The work specified in this section shall be coordinated with work specified in the following related sections and specifications:

a. GW Specification P-1802:

a1. Section 319005 – Earthwork.

a2. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

a3. Section 319025 – Geosynthetic Clay Liner.

b. CQA Specification P-1803:

b1. Section 014362 – Quality Assurance for Fill, Liner, and Leachate Collection Materials.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment, and materials specified herein shall comply with the specified and applicable portions of the referenced documents in addition to federal, state, or local agencies having jurisdiction.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D2434 Standard Test Method for Permeability of Granular Soils (Constant Head)

b. D2487 Standard Practice for Classification of Soils for Engineering Purposes.

c. D2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

d. D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

e. D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

f. D6473 Standard Test Method for Specific Gravity and Absorption of Rock for Erosion Control

g. D6825 Standard Guide for Placement of Riprap Revetments

h. F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

103.5 IDOT – Illinois Department of Transportation:

a. Standard Specifications for Road and Bridge Construction (Adopted January 1, 2022).

103.6 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

b. 96 Resistance by Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

c. 104 Soundness of Aggregate by Use of Sodium Sulfate

d. 203 Deleterious Particles in Coarse Aggregate

103.7 NSF – National Sanitation Foundation International:

a. NSF Listings: Plastics and Plumbing System Components.

104. SUBMITTALS

104.1 The GW Contractor shall submit drawings and data at least 30 days prior to use. The GW Contractor's drawings and data shall be submitted via electronic medium in a format compatible for importing into the Owner's information systems specified by the Owner.

104.2 Submittals with Bid Proposal:

a. HDPE Pipe:

a1. Pipe Manufacturer's name, address, and telephone number.

a2. Pipe Manufacturer's literature providing specifications of the pipes that will be supplied for the project.

a3. Pipe Manufacturer's signed certification that the pipes that will be supplied comply with the requirements of this Specification.

a4. Pipe Manufacturer's signed certification that no reclaimed polymer has been added to the resin.

104.3 Submittals After Award:

a. Coarse Aggregate Bedding Material:

a1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Coarse Aggregate Bedding Material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
a1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
a1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
a1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.
a1.4 Deleterious Materials	ITP 203	Shale, Percent Max. Clay Lumps, Percent Max. Soft & Unsound Fragments, Percent Max. Other Deleterious, Percent Max. Total Deleterious, Percent Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

b. Sand Filter Layer Material:

b1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Sand Filter Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
b1.1 Classification of Material	ASTM D2487	Classification
b1.2 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
b1.3 Hydraulic Conductivity	ASTM D2434	Hydraulic Conductivity

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

c. Protective Warning Layer Material:

c1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Protective Warning Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
c1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
c1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
c1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

d. Riprap Bedding Layer Material:

d1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the Riprap Bedding Layer material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
d1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
d1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.
d1.3 Los Angeles Abrasion	ITP 96	Percent Loss Max.
d1.4 Deleterious Materials	ITP 203	Shale, Percent Max. Clay Lumps, Percent Max. Soft & Unsound Fragments, Percent Max. Other Deleterious, Percent Max. Total Deleterious, Percent Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

e. Riprap:

e1. At least 30 days prior to scheduled delivery, the Earthwork Contractor shall submit certificates for the riprap material signed by the supplier or a qualified geotechnical engineering consultant certifying that the following items comply with or exceed specifications for the material:

Property	Standard(1)	Data Required
e1.1 Sieve Analysis	ITP 27	Percent Passing Selected Sieves
e1.2 Na_2SO_4 Soundness 5 Cycle	ITP 104	Percent Loss Max.

Note:

(1) Test results shall be provided on two random samples taken from each borrow area. If processing of borrow area material is required to meet material specifications, the tests shall be performed on the process material.

104.4 Submittals Upon Shipment:

a. HDPE Pipe:

a1. Copies of Pipe Manufacturer's QA/QC certificates on tests performed during fabrication.

104.5 Submittals After Construction is Complete:

a. HDPE Pipe:

a1. Logs indicating the location of each joint that did not pass visual examination and the work done to correct improper fusion weld.

105. QUALITY ASSURANCE

105.1 Materials and construction procedures shall be subject to inspection and testing by the CQA Contractor employed by the Owner. Such inspections and tests will not relieve the Earthwork Contractor of the responsibility of providing and placing materials in compliance with specified requirements.

105.2 The Owner reserves the right, at any time before final acceptance, to reject materials or workmanship not complying with specified requirements. The Earthwork Contractor shall correct the deficiencies which the inspections and tests have indicated are not in compliance with specified requirements.

105.3 CQA activities shall be performed as described herein and in Specification P-1803.

PART 2 - PRODUCTS

201. PIPE

201.1 Pipe Materials:

a. Leachate Collection Pipe and Sideslope Riser shall meet the general and material requirements presented in Table 319050-1.

201.2 Pipe Requirements:

a. Gravity leachate collection piping shall be single wall piping.

201.3 Fittings:

a. All fittings shall be prefabricated and manufactured by the same manufacturer as the pipe.

TABLE 319050-1
MATERIAL REQUIREMENTS FOR LEACHATE COLLECTION PIPE

General Requirements for Leachate Collection Pipes & Fittings		
Item	Leachate Collection Pipe	
Service	Leachate Collection	
Location	Leachate Collection Trench	
Material	Perforated High-Density Polyethylene, Thermal Butt Fusion Welded Joints(1)	
Listing	NSF Listed and Approved	
Rating	Maximum Working Temperature:	Ambient
	Maximum Working Pressure:	Atmospheric

Material Requirements for Leachate Collection Pipes & Fittings			
Item	**ASTM Test Method**	**Size (in.)**	**Remarks**
Pipe(1)	ASTM F714, Pipe Grade PE4710 Resin	6	SDR 11
Joints	Not Applicable	All	Thermal Butt Fusion Welded
Fittings(2): 30°, 45°, 60°, and 90° Bends	ASTM D2513 and ASTM D3261	6	SDR 11 (reduced pressure) Injection molded butt fittings from same resins as pipe.
Fittings(2): Tees, Wyes, and Reducers	Not Applicable	6	SDR 11 (reduced pressure) Mitered fittings fabricated from angular cut sections of pipe.
Cleanout	Not Applicable	6	Lockable Cap

Approved Manufacturers of Leachate Collection Pipes and Fittings		
Manufacturer	**Trade Name**	**Size Range (in.)**
Chevron Phillips Chemical Company	Performance Pipe DriscoPlex® 4100	6
KWH Pipe	Sclairpipe	6
JM Eagle	HDPE Water Sewer C906	6
Others as Approved by the Owner	--	--

Notes:

(1) Solid or perforated pipe shall be provided as specified on the Design Drawings. Perforated pipe shall be perforated in accordance with the details shown on the Design Drawings.
(2) Fittings are reduced pressure rating fittings.

202. COARSE AGGREGATE BEDDING MATERIAL:

a. The bedding material for the leachate collection pipe shall be washed gravel or washed crushed coarse aggregate. Crushed slag or Portland cement concrete shall not be used.

b. The gradation for Coarse Aggregate Bedding Material shall conform to Gradation CA 7 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

c. The material quality for Coarse Aggregate Bedding Material shall be Class B or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

203. SAND FILTER LAYER MATERIAL:

a. The “Sand Filter Layer” placed on top of the HDPE geonet and geotextile shall be composed of washed sand imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that is processed to meet the following requirements:

a1. The material shall be classified as SP, SM, or SP-SM in the Unified Soil Classification System, ASTM D2487.

a2. The material shall conform to Gradations FA 1 or FA 2 in accordance with Paragraph 1003.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a3. The material shall have a permeability of greater than 1×10^{-5} cm/sec when tested in accordance with ASTM D2434.

a4. The material shall be free from all organic material and deleterious material.

a5. Fine aggregate produced by crushing slag or Portland cement concrete is not acceptable.

204. PROTECTIVE WARNING LAYER MATERIAL:

a. The “Protective Warning Layer” placed on top of the Sand Filter Layer along the basin floor shall be composed of gravel, crushed gravel, or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that is processed to meet the following requirements:

a1. The material shall conform to Gradation CA 6 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality for Protective Warning Layer material shall be Class D or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

205. RIPRAP BEDDING LAYER MATERIAL

a. The “Riprap Bedding Layer” placed on top of the Sand Filter Layer along the basin side slopes shall be composed of gravel, crushed gravel, or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that meets the following requirements:

a1. The material shall conform to Gradation CA 16 in accordance with Paragraph 1004.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a2. The material quality for Riprap Bedding Layer material shall be Class B or better in accordance with Paragraph 1004.01(b) of the IDOT Standard Specifications for Road and Bridge Construction.

206. RIPRAP

a. Riprap placed along the basin side slopes shall consist of quarried or crushed stone imported from an offsite borrow source, which shall be identified by the Earthwork Contractor and approved by the Owner, that meets the following requirements:

a1. Riprap stones shall have 100% of all faces angular or crushed and shall be free from structural defects, laminations, seams, weak cleavage planes, and undesirable effects of weathering. Stone containing shale, unsound sandstone, or any other material which will readily disintegrate under handling and placing or under weathering shall not be used. All riprap material shall be clean and free from deleterious material and impurities, including but not limited to earth, clay, and refuse.

a2. Riprap material shall conform to Gradation RR 2 in accordance with Paragraph 1005.01(c) of the IDOT Standard Specifications for Road and Bridge Construction.

a3. Riprap material shall meet Quality A requirements in accordance with Paragraph 1005.01(b) of the IDOT Standard Specifications for Road and Bridge Construction, except that the bulk specific gravity of the riprap shall not be less than 2.55 per ASTM D6473 (approximate unit weight of 160 pounds per cubic foot).

a4. Riprap color shall be gray unless otherwise approved by the Owner.

PART 3 - EXECUTION

301. LEACHATE COLLECTION AND SIDESLOPE RISER PIPE INSTALLATION

301.1 The perforated leachate collection pipe and solid wall sideslope riser pipe shall be installed according to the elevations and locations indicated on the Design Drawings.

301.2 The maximum vertical variation from the correct profile and section shall not exceed ±0.1 ft. The slope of each pipeline shall not vary from the specified slopes by more than ±0.1%. The Earthwork Contractor shall regrade any area which does not meet the specified tolerances.

301.3 The perforated leachate collection pipe shall have two rows of 1/2-inch diameter perforations spaced 6 inches apart along the length of the pipe. The perforations shall face down in the collection and cleanout trenches.

301.4 All PE pipes shall be joined by the thermal butt-fusion process described in Article 302. The inside of the pipe shall be ground smooth so that it will not impede the sliding of the pumps.

301.5 The Earthwork Contractor shall provide hydraulic jet cleaning of all pipelines following installation. The jet cleaning shall verify that each pipe is intact and unobstructed. Defects in any pipeline identified by the cleaning process shall be repaired by the Earthwork Contractor.

302. WELDING AND TESTING OF HDPE PIPE JOINTS

302.1 Joints for HDPE Pipe:

a. HDPE pipe shall be joined together by the thermal butt fusion method in accordance with ASTM D2657 Procedure 2. Fittings shall be fabricated to provide a smooth inside surface. The hot plate butt fusion procedure shall be performed using apparatus recommended by the Pipe Manufacturer and which complies with ASTM D2657.

302.2 Bent Strap Test

a. Test Requirements:

a1. A bent strap test shall be made on each diameter of pipe prior to the start of joint welding procedures. A test joint shall be made and a specimen cut from the joint and destructively tested to confirm fusion joint integrity, operator procedure, and fusion machine settings, including temperature and pressure.

a2. Additional bent strap tests may be required by the Owner and/or CQA Contractor during the joint welding process if it is found that the joints of unacceptable quality are being made. These tests shall be used to adjust fusion machine settings and/or operator procedures as required. Test joints shall be prepared at no additional cost to the Owner.

b. Test Procedure:

b1. Using waste pieces of pipe, a joint specimen shall be prepared and then butt fusion welded and allowed to cool to ambient temperature.

b2. A test strap shall be cut from the specimen:

b2.1 The width of the strap shall be 1-1/2 times the pipe wall thickness, but not less than one inch.

b2.2 The length of the strap on each side of the fusion weld shall be 15 times the pipe wall thickness, but not less than six inches.

b3. The cut shall be bent so that the ends of the strap touch. If any separation, cracks or voids are observed, the fusion is unacceptable and indicates poor fusion quality.

b4. If failure occurs, fusion procedures and/or machine settings shall be changed, and a new trial fusion weld and new bent strap specimen shall be prepared and tested.

b5. The CQA Contractor shall witness all bent strap tests.

b6. Field fusion of pipe shall not proceed until a test joint has passed the bent strap test and visual inspection indicates that the fusion beads and “V” groove are the correct size.

303. VISUAL INSPECTION OF HDPE PIPE DURING INSTALLATION

303.1 General:

a. The Earthwork Contractor shall visually inspect all pipes during installation for:

a1. Verification that all perforated pipe has been placed with the perforations facing down.

a2. Surface damage.

a3. Weld quality.

303.2 Surface Damage:

a. Surface damage to a pipe that occurs during handling or installation shall be minimized. The maximum acceptable depth of damage is 10 percent of wall thickness of the pipe. If excessive damage occurs, the damaged portions of pipe shall be cut out and replaced. Deep, sharp notches may be filled with extudite and dressed smooth.

b. Butt fuse on misalignment shall not exceed 10 percent of the pipe wall thicknesses. Misaligned butt fusions shall be cut out and redone.

303.3 Butt-Fusion Joint Weld Quality:

a. All butt fusion welded joints shall be visually inspected to ensure joint quality. The size and shape of the fusion beads shall be used as an indicator of joint quality. Specifically:

a1. The double bead width shall be 2 to 2-1/2 times the height of the bead measured from the pipe surface.

a2. Both beads shall be uniform in size and shape around the joint.

a3. The depth of the "V" between the two beads shall not be more than half the bead height.

b. If the "V" groove is too deep a "cold" fusion may have occurred (uneven heating or insufficient heating time, or excessive pressure during heating or during joining). A non-uniform bead shape around the pipe indicates uneven heating.

c. A joint with cold fusion or a non-uniform bead is a poor quality joint that shall be removed (i.e., cut-out) and remade.

d. The Earthwork Contractor shall prepare and maintain logs of pipe joints indicating, at a minimum:

d1. Locations with corresponding pipe markings.

d2. Visual inspection results.

d3. For each joint that did not pass visual inspection, the work done to correct the improper fusion weld.

304. INSTALLATION OF GRANULAR AND RIPRAP MATERIALS

304.1 "Granular Materials" in this article include Coarse Aggregate Bedding Material, Sand Filter Layer material, Protective Warning Layer material, and Riprap Bedding Layer material.

304.2 Acceptable Placement Methods:

a. Acceptable placement methods for Granular Materials include:

a1. Using a conveyor truck to place material from outside of the basin.

a2. Using a crane to place material from outside of the basin.

a3. Transporting material into the basin to the point of dumping using trucks or scrapers.

a4. Alternate placement method(s) proposed by the Earthwork Contractor and approved by the Owner.

b. Requirements for Transportation of Granular and Riprap Materials into Basin:

b1. Under no circumstances shall there be direct equipment travel over any geosynthetic material (GCL, geomembrane, geotextile, geonet, etc.).

b2. Equipment transporting material into the basin shall use the permanent ramp along the basin's east dike. Structural Fill shall be installed above the existing HDPE geomembrane liner along the ramp surface as detailed on the Design Drawings and as specified in Section 319005 before any equipment uses the ramp to access the basin floor.

b3. Only earthmoving equipment with low ground pressure shall be used to transport material inside of the basin. The Earthwork Contractor shall demonstrate that equipment entering the

basin will not exert a ground pressure greater than 8 psi. The ground pressure is influenced by the tread pattern / tire contact area and is not the reading from a tire pressure gauge.

b4. Equipment operating within the basin shall avoid hard braking on ramps and avoid sharp turns or quick stops that could pinch or tear the geosynthetic materials.

b5. The Sand Filter Layer, Protective Warning Layer, and Riprap Bedding Layer Materials shall be placed by the “dump and spread” method in which appropriate lightweight equipment with low ground pressure are used to spread the material.

b6. No travel over piping shall be allowed without sufficient protection of the piping.

b7. Material placement over geosynthetic materials during periods of warm weather can cause wrinkling in the geosynthetic materials. The wrinkling effect can cause damage to the geosynthetic materials. Placement of Granular Materials shall be halted when the air temperature is greater than 85°F or less than 40°F.

b8. When Sand Filter Layer, Protective Warning Layer, or Riprap Bedding Layer materials are being placed, a worker shall walk alongside earthmoving equipment spreading the material to spot and remove all rocks, stones, roots, and other debris that may be remaining in the materials that could cause damage to a geosynthetic material.

b9. Placement of Granular Materials and riprap on the basin’s side slopes shall begin at the toe of the slope and proceed up the slope.

304.3 Placement of Coarse Aggregate Bedding Material:

a. Coarse Aggregate Bedding Material shall be placed under and around the leachate collection and sideslope riser pipes to the thicknesses shown on the Design Drawings.

b. All piping shall be installed over an initial layer of Coarse Aggregate Bedding Material. After a pipe is installed, Coarse Aggregate Bedding Material shall be placed by hand beneath the haunches and above the pipe and compacted to ensure complete and uniform support of the pipe.

304.4 Placement of Sand Filter Layer Material:

a. Installation of the Sand Filter Layer shall not begin until Geosynthetics Contractor has finished installing the non-woven geotextile and HDPE geonet components of the LCRS, the CQA Contractor has finished inspecting those geosynthetic components of the LCRS, and the area has been released to the Earthwork Contractor in writing to proceed.

b. Sand Filter Layer material shall be placed in a single layer to the thickness shown on the Design Drawings without compaction or working of the material that could cause intrusion through the non-woven geotextile into the underlying HDPE geonet.

c. The Sand Filter Layer shall be fine graded using low ground pressure equipment.

304.5 Placement of Protective Warning Layer Material:

a. Protective Warning Layer materials shall be placed to the thickness shown on the Design Drawings.

b. Compaction:

b1. Protective Warning Layer materials shall be placed and maintained to a uniform thickness, free of ruts and irregularities.

b2. The Protective Warning Layer shall be compacted by a minimum of four passes in each direction (perpendicular to each other) by the equipment spreading the material. The upper surface shall then be compacted with a minimum of four passes each way by a vibratory drum roller with a minimum static weight of 13 tons.

b3. Acceptance of the fill shall be based on ruts less than 1 inch between the last successive passes. Compaction testing is not required.

c. The Protective Warning Layer shall be fine graded using low ground pressure equipment.

304.6 Placement of Riprap Bedding Layer Material:

a. Riprap Bedding Layer materials shall be placed to the full thickness shown on the Design Drawings in one operation using methods which will not cause segregation of particle sizes.

b. Riprap Bedding Layer materials shall not be dropped onto the underlying Sand Filter Layer from a height exceeding 3 feet.

c. Compaction of the Riprap Bedding Layer is not required; however, the surface shall be reasonably even and free from mounds or windrows.

d. The Riprap Bedding Layer shall be fine graded using low ground pressure equipment.

304.7 Placement of Riprap:

a. Riprap shall be placed in general accordance with the methods described in ASTM D6825 in designated areas to the lines, grades, and thickness specified on the Design Drawings. Riprap shall be placed to the full thickness in one operation.

b. Riprap placement operations – including handling, stockpiling, and transporting – shall be accomplished in such a manner as to produce a reasonably well graded mass of rock with minimum percentage of voids, free from objectionable pockets of small stone and clusters of large stones. The larger stones shall be well distributed and the entire mass of stones in their final positions shall be roughly graded to conform to the gradation specified.

c. Riprap shall be placed by dragline, clamshell, appropriately-sized excavators, or similar equipment, which shall be operated so as to place each load of material in approximately its final position without reworking and without excessive height drop (i.e., more than 12 inches).

d. Placing riprap in layers is not permitted.

e. Placing stones by dumping into chutes or other methods, which cause segregation of various stone sizes, is not permitted.

304.8 Grading Tolerances:

a. Horizontal and vertical tolerances for the Sand Filter Layer and Protective Warning Layer shall be as specified in Table 319050-2.

b. Thickness determination of riprap and Riprap Bedding Layer materials will be made at points selected by the CQA Contractor. When the average constructed thickness is less than the thickness specified on the Design Drawings, additional material shall be added to obtain the specified thickness at no additional cost to the Owner.

304.9 Reporting Damage:

a. If damage occurs (or is suspected to have occurred) to any portion of the LCRS, composite liner system, or existing HDPE geomembrane liner under the composite liner system while placing Granular Materials, the Earthwork Contractor shall report the damage(s) to the Owner immediately so that repairs can be performed without delay.

b. Repairs to a geosynthetic material shall be made as specified in the Section 319020. The Geosynthetics Contractor shall perform all geosynthetic repair work at no additional cost to the Owner.

c. Repairs to components of the LCRS shall be repaired as specified herein. The Earthwork Contractor shall perform all LCRS repair work at no additional cost to the Owner.

TABLE 319050-2
ACCEPTABLE DEVIATIONS FROM DESIGN LINES AND GRADES

Type of Installation (Excavation or Fill)	Maximum Acceptable Deviation from Line (feet)	Maximum Acceptable Deviation from Grade[1] (feet)
Granular Materials		
Top of Sand Filter Layer	±0.3	+0.1 to -0.0
Top of Protective Warning Layer		
Top of Riprap Bedding Layer		

END OF SECTION 319050

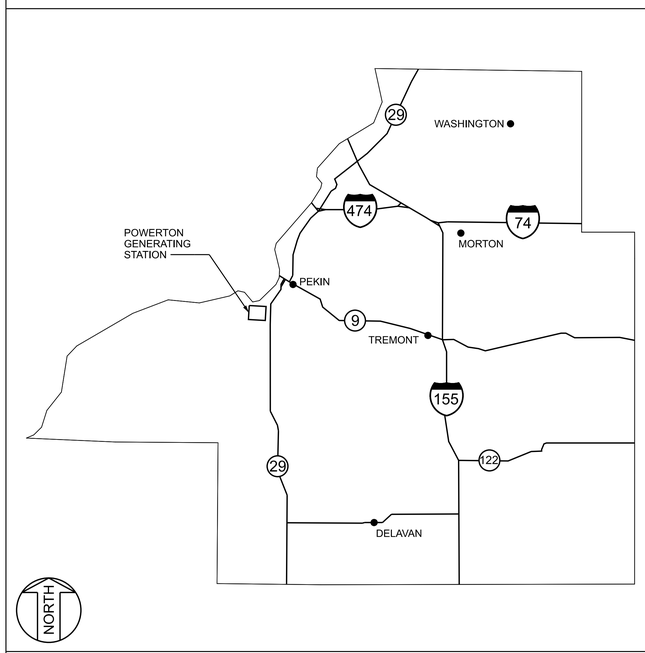
ATTACHMENT 1

DESIGN DRAWINGS

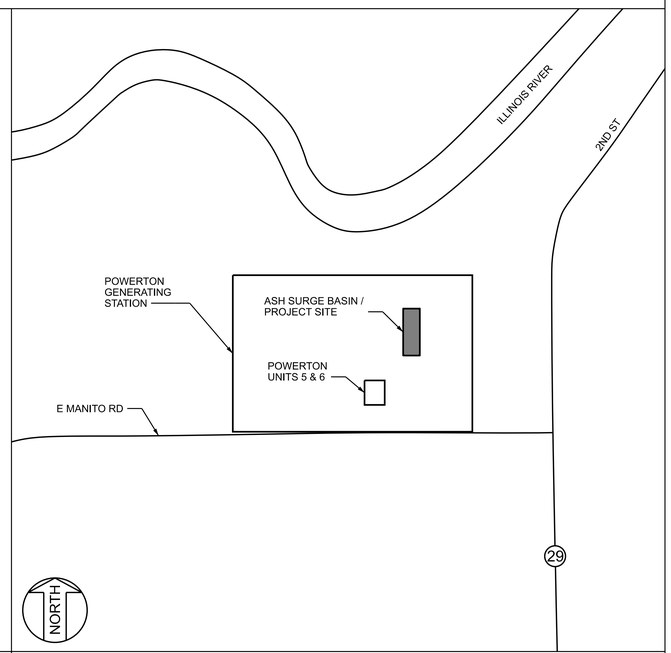
DRAWING NO.	REV.	TITLE
POW-ASB-CSK-001	0B	COVER SHEET
POW-ASB-CSK-002	0B	GENERAL NOTES
POW-ASB-CSK-003	0B	EXISTING CONDITIONS
POW-ASB-CSK-004	0B	EXCAVATION PLAN
POW-ASB-CSK-005	0B	EXCAVATION SECTIONS & DETAILS
POW-ASB-CSK-006	0B	STRUCTURAL FILL GRADING PLAN
POW-ASB-CSK-007	0B	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-ASB-CSK-008	0B	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS – SHEET 1
POW-ASB-CSK-009	0B	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS – SHEET 2

MIDWEST GENERATION, LLC
POWERTON GENERATING STATION
ASH SURGE BASIN RETROFIT PROJECT

VICINITY MAP



TAZEWELL COUNTY MAP (N.T.S)



SITE LOCATION ENLARGED PLAN (N.T.S)

PREPARED FOR:
MIDWEST GENERATION, LLC
POWERTON GENERATING STATION
13082 E. MANITO RD.
PEKIN, IL 61554

PREPARED BY:
SARGENT & LUNDY
55 E. MONROE ST.
CHICAGO, IL 60603

POWERTON ASH SURGE BASIN RETROFIT PROJECT DRAWING LIST	
DWG NO.	DRAWING TITLE
POW-ASB-CSK-001	COVER SHEET
POW-ASB-CSK-002	GENERAL NOTES
POW-ASB-CSK-003	EXISTING CONDITIONS
POW-ASB-CSK-004	EXCAVATION PLAN
POW-ASB-CSK-005	EXCAVATION SECTIONS & DETAILS
POW-ASB-CSK-006	STRUCTURAL FILL GRADING PLAN
POW-ASB-CSK-007	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN
POW-ASB-CSK-008	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS - SHEET 1
POW-ASB-CSK-009	COMPOSITE LINER & LEACHATE COLLECTION SYSTEM SECTIONS & DETAILS - SHEET 2

PRELIMINARY
NOT FOR CONSTRUCTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152
CAD FILE NAME:	POW-ASB-CSK-001.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

Sargent & Lundy LLC
SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

COVER SHEET

DRAWING NUMBER	REVISION
POW-ASB-CSK-001	0B
SHEET 1 OF 1	

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PL:12793/0M1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-001.dgn
Form GDG-0401-01-06, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED BY A GENERAL WORK (GW) CONTRACTOR ACCORDING TO THE REQUIREMENTS OF SPECIFICATION P-1802 UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS.
2. THE GW CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND HAVE CONTROL AND CHARGE OF CONSTRUCTION MEANS, METHODS, TECHNIQUES, WORK SEQUENCING, AND PROCEDURES IN CONNECTION WITH THE WORK. THE GW CONTRACTOR SHALL CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, COMPOSED OF THE DESIGN DRAWINGS AND SPECIFICATIONS.
3. ALL WORK DONE BY GW CONTRACTOR PURSUANT TO THESE DRAWINGS SHALL: (A) CONFORM TO THE GOVERNING CONTRACT DOCUMENTS; (B) BE PERFORMED EXCLUSIVELY BY ITS TRAINED, COMPETENT PERSONNEL OR, WHERE PERMITTED, THAT OF ITS SUBCONTRACTOR(S); AND (C) COMPLY WITH ALL APPLICABLE SAFETY LAWS, REGULATIONS, PROGRAMS AND PRACTICES TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING THE GW CONTRACTOR'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.
4. THE GW CONTRACTOR SHALL PERFORM INSTALLATION AND REMOVAL WORK IN A NEAT AND SKILLFUL MANNER, CAREFULLY TERMINATING WORK NEAR MATERIAL TO REMAIN IN PLACE. PRECAUTIONS SHALL BE TAKEN NOT TO DAMAGE OR DEFACE WORK, EXISTING FACILITIES, AND/OR MATERIAL TO REMAIN IN PLACE. THE GW CONTRACTOR SHALL BE RESPONSIBLE FOR ANY SUCH DAMAGE OR REPAIR THEREOF.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF FEDERAL, STATE, OR LOCAL CODES, STANDARDS, AND SPECIFICATIONS.
6. ANY WORK FOUND DEFECTIVE OR NOT IN COMPLIANCE WITH THE REQUIREMENTS OF THE PROJECT SPECIFICATIONS OR THE DESIGN DRAWINGS SHALL BE REPLACED/FIXED AT NO ADDITIONAL COST TO THE OWNER.
7. COMPACTION:

   SEE SPECIFICATION P-1802 FOR COMPACTION AND EARTHWORK REQUIREMENTS.
8. SOIL EROSION AND SEDIMENTATION CONTROL:

   PROPER SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED TO MEET THE APPLICABLE REGULATORY CODES AND THE PERMIT REQUIREMENTS.
9. CONSTRUCTION QUALITY ASSURANCE:
   - A. MATERIALS AND CONSTRUCTION PROCEDURES WILL BE SUBJECT TO INSPECTION AND TESTING BY A CONSTRUCTION QUALITY ASSURANCE (CQA) CONTRACTOR EMPLOYED BY THE OWNER. SUCH INSPECTIONS AND TESTS WILL NOT RELIEVE THE GW CONTRACTOR OF THE RESPONSIBILITY FOR PROVIDING MATERIALS AND INSTALLATION IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.
   - B. THE OWNER RESERVES THE RIGHT, AT ANY TIME BEFORE FINAL ACCEPTANCE, TO REJECT MATERIALS OR WORKMANSHIP NOT COMPLYING WITH SPECIFIED REQUIREMENTS. THE GW CONTRACTOR SHALL CORRECT THE DEFICIENCIES WHICH THE INSPECTIONS AND TESTS HAVE INDICATED ARE NOT IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.
   - C. CQA ACTIVITIES WILL BE PERFORMED AS DESCRIBED ON THE DESIGN DRAWINGS AND IN SPECIFICATION P-1802.
10. TOPOGRAPHIC MAP & COORDINATES:
    - A. EXISTING TOPOGRAPHY FOR THE PROJECT SITE SHOWN ON THE DESIGN DRAWINGS WAS PREPARED IN 2022 BY RUETTIGER, TONELLI & ASSOCIATES, INC.
    - B. THE PLANT COORDINATE SYSTEM SHOWN ON THE DESIGN DRAWINGS IS BASED ON THE ILLINOIS STATE PLANE, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (2011) (NAD 83/2011), U.S. SURVEY FEET.
11. HORIZONTAL AND VERTICAL CONTROL:
    - A. THE BASIS FOR HORIZONTAL CONTROL IS AS DESCRIBED IN NOTE 10.
    - B. THE BASIS FOR VERTICAL CONTROL IS THE LOCAL PLANT DATUM.
    - C. THE FOLLOWING PERMANENT BENCHMARKS FOR HORIZONTAL AND VERTICAL CONTROL HAVE BEEN ESTABLISHED AT THE PROJECT SITE. THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY DISCREPANCIES IN EXISTING BENCHMARK LOCATIONS AND/OR ELEVATIONS.

ID #	NORTHING	EASTING	ELEVATION
528	1,412,067.47	2,432,531.82	465.02
1193	1,412,960.21	2,432,343.81	459.51

    - D. GW CONTRACTOR IS RESPONSIBLE FOR SETTING ADDITIONAL MONUMENTS AND CONTROL POINTS THAT THEY DEEM NECESSARY FOR COMPLETION OF THE WORK.
12. GEOTECHNICAL WORK:

    A STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT FOR THE ASH SURGE AND BYPASS BASINS WAS PREPARED BY GEOSYNTEC CONSULTANTS IN OCTOBER 2016. SITE SPECIFIC SOIL DATA AND GEOTECHNICAL RECOMMENDATIONS ARE PROVIDED AND REFERENCED THEREIN.
13. EXISTING CONDITIONS:
    - A. DIMENSIONS OF EXISTING WORK SHALL BE VERIFIED BY THE GW CONTRACTOR PRIOR TO THE START OF WORK IN ACCORDANCE WITH THE SPECIFICATION AS FIELD CONDITIONS MAY VARY FROM INFORMATION SHOWN ON THE DESIGN DRAWINGS. DIMENSIONS NOTED FOR REFERENCE (REF) INDICATE NOMINAL DIMENSIONS FOR THE EXISTING STRUCTURE, UTILITY, ETC. NEW WORK SHALL NOT BE LOCATED BASED ON THE REFERENCE DIMENSIONS.
    - B. PRIOR TO COMMENCING THE WORK, THE CONTRACTOR SHALL EXAMINE THE AREAS AND CONDITIONS UNDER WHICH THE RETROFIT WORK IS TO TAKE PLACE, AND NOTIFY THE OWNER IN WRITING OF CONDITIONS WHICH MAY IMPACT THE PROPER AND TIMELY COMPLETION OF THE WORK.
    - C. UNDERGROUND OR EMBEDDED UTILITIES MAY EXIST WITHIN THE AREA OF AND ADJACENT TO THE LIMITS OF THE WORK. THE LOCATION OR IDENTIFICATION OF SUCH UTILITIES HAS NOT BEEN VERIFIED BY THE OWNER OR BY S&L. GW CONTRACTOR IS RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING UNDERGROUND OR EMBEDDED UTILITIES AND ANY OTHER UNDERGROUND OR EMBEDDED UTILITY DIMENSIONS.
    - D. REFERENCES USED HAVE BEEN IDENTIFIED ON EXCAVATION/FOUNDATION/DEMOLITION DRAWINGS AND HAVE BEEN PROVIDED TO ASSIST THE GW CONTRACTOR IN THE FIELD LOCATING EXISTING UTILITIES AND OTHER POTENTIAL UNDERGROUND OR EMBEDDED INTERFERENCES. THESE REFERENCES ONLY SHOW THE APPROXIMATE LOCATION OF POTENTIAL UNDERGROUND OR EMBEDDED UTILITIES AND MAY NOT INDICATE OR REFLECT ALL EXISTING UNDERGROUND OR EMBEDDED UTILITIES OR THEIR ACTUAL LOCATIONS.
    - E. REFERENCES IDENTIFIED SHALL NOT SUBSTITUTE FOR THE GW CONTRACTOR'S OBLIGATION TO FIELD LOCATE ANY UNDERGROUND OR EMBEDDED UTILITIES OR INTERFERENCES THAT MAY AFFECT THE WORK.
    - F. DUE CAUTION SHALL BE TAKEN DURING ANY EXCAVATION/FOUNDATION/DEMOLITION WORK WITHIN THE AREA OF, AND ADJACENT TO THE LIMITS OF THE WORK DUE TO POSSIBLE INTERFERENCES THAT MAY NOT BE REFLECTED ON THE REFERENCES IDENTIFIED.
    - G. THE GW CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION AND RESTORATION OF THE EXISTING UTILITIES IF DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

ABBREVIATIONS

ROAD AND GRADING

T/RD	TOP OF ROAD ELEVATION
EL OR ELEV	GRADE ELEVATION
INV	INVERT ELEVATION
HP	HIGH POINT
LP	LOW POINT
HPFS	HIGH POINT FINISH SURFACING
BC	BEGINNING OF CURVE (HORIZONTAL CURVE)
EC	END OF CURVE (HORIZONTAL CURVE)
PI	POINT OF INTERSECTION (HORIZONTAL CURVE)
PT	POINT OF TANGENT
PC	POINT OF CURVE
STA	STATION
VC	VERTICAL CURVE
BVC	BEGINNING OF VERTICAL CURVE
EVC	END OF VERTICAL CURVE
PIVC	POINT OF INTERSECTION OF VERT. CURVE
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
R	RADIUS
T	TANGENT
L	LENGTH OF CURVE
D	DEGREE OF CURVE
I	INTERIOR/DEFLECTION ANGLE OF CURVE
UN	UNLESS NOTED
ROW	RIGHT OF WAY
OHL	OVERHEAD LINE
OC	ON CENTER
WL	WATER LEVEL
HWL	HIGH WATER LEVEL
YR	YEAR
DS	DOWNSTREAM
US	UPSTREAM
CL	CENTERLINE
AC	ACRE
N.T.S.	NOT TO SCALE
LWL	LOW WATER LEVEL

SYMBOLS

	CENTERLINE OF NATURAL DRAINAGE PATTERN
	VALLEY LINE OR "V" DITCH
	SWALE
	CENTERLINE OF TRAPEZOIDAL DRAINAGE
	TRAPEZOIDAL DRAINAGE DITCH WITH BOTTOM WIDTH GREATER THAN 2'. BOTTOM WIDTH AND SIDE SLOPE SHOWN ON PLAN OR DETAIL
	RIPRAP EROSION PROTECTION
C-1	PIPE CULVERT CULVERT NUMBER SHOWN
DOWN	TOP OF EMBANKMENT SLOPE OR DITCH SIDE SLOPE AND DIRECTION OF SLOPE
3:1	HORIZONTAL TO VERTICAL SLOPE WHEN SLOPE IS CONSTANT
SLOPE VARIES	SLOPE IS NOT CONSTANT
1%	DIRECTION OF ROAD OR AREA SLOPE. PERCENT OF SLOPE SHOWN WHERE APPLICABLE
	TOP OF DIKE
R=50'	RADIUS OF CURVATURE
1	SECTION NUMBER (FIRST NUMBER=DRAWING SECOND NUMBER=SECTION NUMBER)
	CHAIN LINK FENCE
PLAN SECTION	WATER LINE
G G	BURIED GAS LINE
E E	BURIED ELECTRICAL CABLE
	INDEX CONTOUR
	INTERMEDIATE CONTOUR
405	ELEVATION CONTOUR
	EXISTING DEPRESSION
x 408.8	SPOT ELEVATION
	VERTICAL CONTROL POINT
	HORIZONTAL CONTROL POINT
	EXISTING FIRE HYDRANT
	EXISTING UTILITY POLE
	EXISTING UTILITY POLE WITH GUY
	WOOD OR BRUSH OUTLINE
	GRATING
	SINGLE SIGN ON POST
	DOUBLE SIGN ON POST
	GUARD POST

SYMBOLS & ABBREVIATIONS

EROSION CONTROL SYMBOLS

S	SILT FENCE
IP	INLET PROTECTION
	ROCK CHECK

SEWERS AND UNDERGROUND PIPE

CB	CATCH BASIN
C0	CLEANOUT
MH	MANHOLE
RE	RIM ELEVATION
℄	CENTERLINE
S	SLOPE
BOP	BOTTOM OF PIPE
PVC	POLY VINYL CHLORIDE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE
CISP	CAST IRON SOIL PIPE
DIWP	DUCTILE IRON WATER PIPE
STL	CARBON STEEL PIPE
IP	IN PLACE
SWS	STORM WATER SEWER
OWS	OILY WATER SEWER
SAN	SANITARY SEWER
PWS	PROCESS WASTE SEWER
C.S.	CARBON STEEL

ROAD, PAVEMENT AND SURFACING SYMBOLS

	ASPHALT OR CONCRETE PAVED ROAD. OUTER LINES SHOW OVERALL WIDTH. INTERIOR LINES SHOW EDGES OF PAVEMENT.
	ROCK SURFACED ROAD
I	ISOLATION JOINT
IT	THICKENED EDGE ISOLATION JOINT
TE	THICKENED EDGE EXPANSION JOINT
T	PAVEMENT THICKENED EDGE
C	CONTRACTION JOINT
	CONCRETE PAVING
	CRUSHED ROCK SURFACING
	ASPHALT PAVEMENT
	6" THICK CRUSHED STONE GROUND COVER SURFACING
	4" THICK SEEDED TOPSOIL

PRELIMINARY
NOT FOR CONSTRUCTION

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REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152

CAD FILE NAME:	POW-ASB-CSK-002.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

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MWG
Midwest Generation, LLC

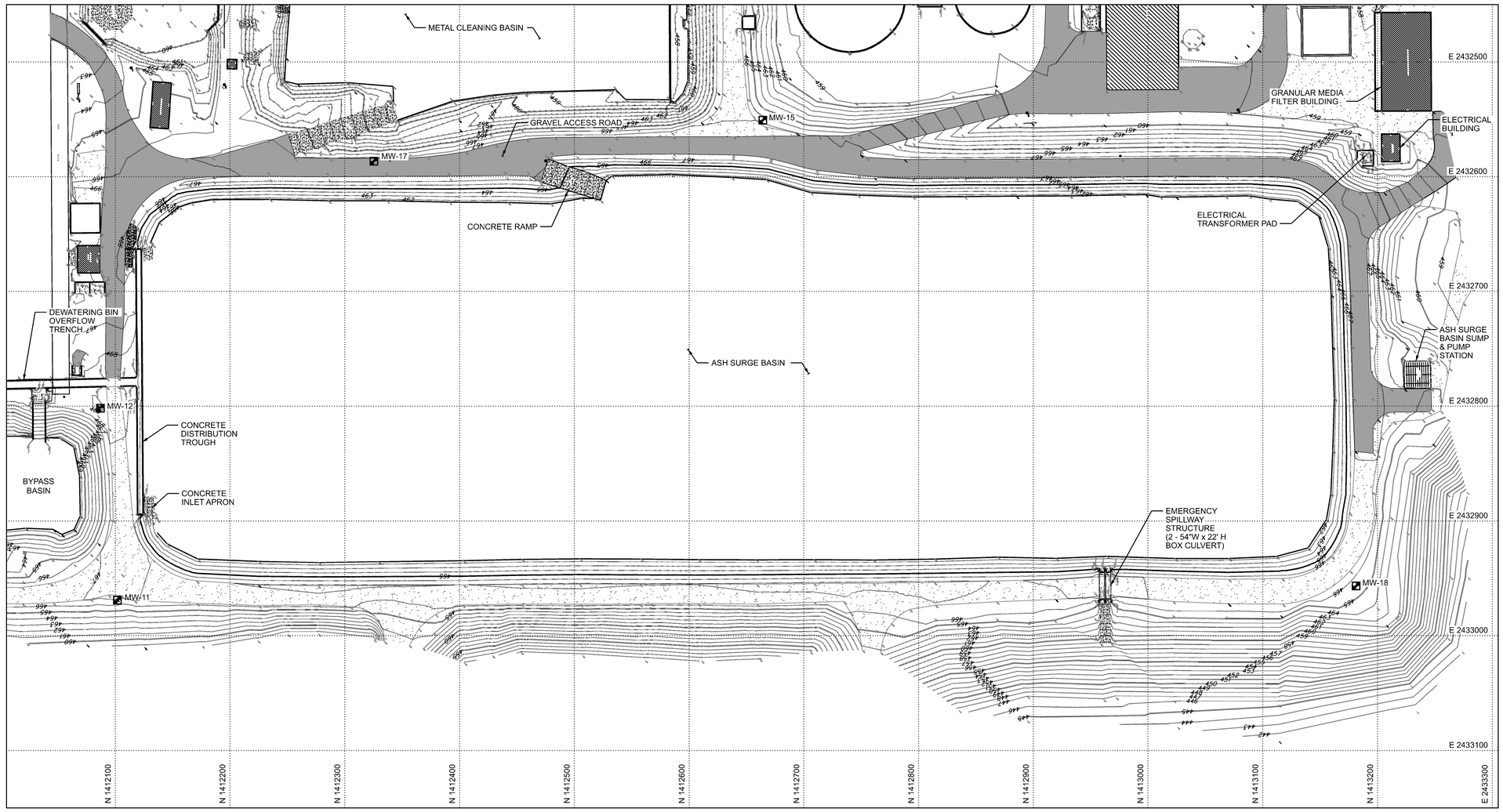
PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

GENERAL NOTES

DRAWING NUMBER	REVISION
POW-ASB-CSK-002	0B
SHEET 1 OF 1	



NOTES	REFERENCE DRAWINGS	LEGEND
1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1802 UNLESS NOTED OTHERWISE. 2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-ASB-CSK-002. 3. GW CONTRACTOR SHALL TAKE ADEQUATE PRECAUTIONS TO PROTECT AND AVOID DAMAGE TO THE EXISTING MONITORING WELLS. GW CONTRACTOR SHALL REPAIR ANY DAMAGE TO THE EXISTING MONITORING WELLS CAUSED BY ITS OPERATIONS AT NO ADDITIONAL COST TO THE OWNER.		MW-17 MONITORING WELL

NORTH

40' 0' 40' 80'

GRAPHIC SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152
CAD FILE NAME:	POW-ASB-CSK-003.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

EXISTING CONDITIONS

DRAWING NUMBER	REVISION
POW-ASB-CSK-003	0B
SHEET 1 OF 1	

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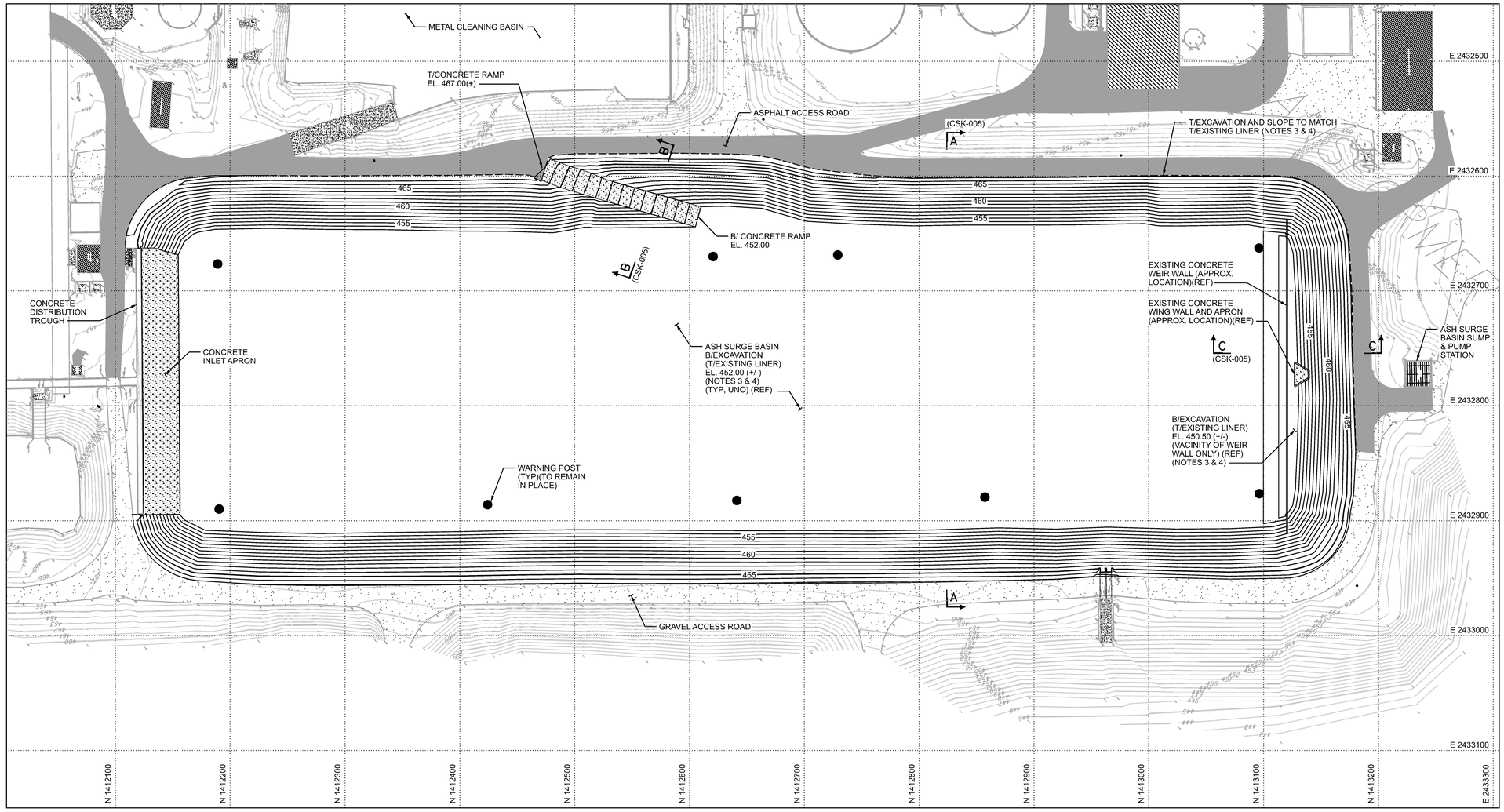
Form GDC-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010
3/23/2023 3:15:43 PM ...\POW-ASB-CSK-003.dgn



NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1802 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-ASB-CSK-002.
3. MATERIAL REMOVAL / EXCAVATION:
   - A. ALL MATERIAL ABOVE THE EXISTING GEOMEMBRANE LINER SHALL BE REMOVED. BOTTOM-OF-EXCAVATION (I.E., TOP-OF-EXISTING LINER SURFACE) SHOWN ON THIS DRAWING IS APPROXIMATE.
   - B. DURING REMOVAL OF MATERIAL FROM THE ASH SURGE BASIN, GW CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO AVOID DAMAGING THE BASIN'S EXISTING GEOMEMBRANE LINER. GW CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY BALLASTING AS NECESSARY TO PREVENT UPLIFT OF THE GEOMEMBRANE BY WIND BY THE USE OF SANDBAGS AND/OR OTHER MEANS WHICH WILL NOT DAMAGE THE GEOMEMBRANE. FOR ALL AREAS OF EXISTING LINER THAT ARE DAMAGED, THE GW CONTRACTOR SHALL:
     - I. TAKE APPROPRIATE MEASURES TO PREVENT ANY FLUID OR SOLID MATERIALS FROM ENTERING THE SUBGRADE BELOW THE LINER.
     - II. NOTIFY THE OWNER IMMEDIATELY.
     - III. INSPECT THE EXPOSED SOILS BELOW THE LINER TO DETERMINE WHETHER ANY FLUIDS, CCR CONSTITUENTS, OR CCR-MIXED SOILS HAVE BEEN RELEASED INTO THE BASIN SUBGRADE. IF SUCH MATERIAL HAS BEEN RELEASED INTO THE BASIN SUBGRADE, THE GW CONTRACTOR SHALL REMOVE THE IMPACTED SOILS UNTIL THE AFFECTED AREA HAS BEEN DECONTAMINATED. CONTAMINATED SOILS REMOVED FROM THE BASIN SUBGRADE SHALL BE REPLACED WITH STRUCTURAL FILL IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
     - IV. REPAIR THE DAMAGED GEOMEMBRANE LINER AREA IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
   - C. MATERIAL REMOVED FROM THE ASH SURGE BASIN AREA SHALL BE DISPOSED OF AS FOLLOWS:
     - I. ALL DRY WASTE SHALL BE DISPOSED OF IN AN OFF-SITE DISPOSAL FACILITY PERMITTED TO RECEIVE CCR WASTE. ALL OFF SITE TRANSPORTATION OF MATERIAL REMOVED FROM THE BYPASS BASIN SHALL BE PERFORMED IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(1).
     - II. ALL LIQUID WASTE SHALL BE DISPOSED OF IN THE BYPASS BASIN.
   - D. GW CONTRACTOR SHALL DEVELOP AND IMPLEMENT FUGITIVE DUST CONTROLS DURING MATERIAL REMOVAL FROM THE BYPASS BASIN AREA IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(2).
   - E. GW CONTRACTOR SHALL DEVELOP AND IMPLEMENT MEASURES TO PREVENT CONTAMINATION OF SURFACE WATER, GROUNDWATER, SOIL, AND SEDIMENTS DURING MATERIAL REMOVAL FROM THE ASH SURGE BASIN AREA IN ACCORDANCE WITH 35 ILL. ADM. CODE 845.740(C)(4).
   - F. AT THE END OF EACH MONTH DURING WHICH MATERIAL REMOVAL FROM THE ASH SURGE BASIN AREA, GW CONTRACTOR SHALL PREPARE A REPORT DOCUMENTING THE GW CONTRACTOR'S PROGRESS IN REMOVING CCR AND CCR-MIXED SOILS FROM THE AREA. THE MONTHLY REPORT SHALL BE PREPARED IN ACCORDANCE WITH THE RECORDKEEPING REQUIREMENTS STIPULATED IN 35 ILL. ADM. CODE 845.740(D).
4. LINER & CONCRETE DECONTAMINATION :
   - A. AFTER REMOVAL OF MATERIAL ABOVE THE EXISTING GEOMEMBRANE LINER AND REPAIR OF ANY DAMAGED AREAS, THE GW CONTRACTOR SHALL DECONTAMINATE THE LINER AND POND APPURTENANT STRUCTURES. AT A MINIMUM, THE EXPOSED GEOMEMBRANE SHALL BE PRESSURE WASHED IN A SYSTEMATIC MANNER TO REMOVE ALL CCR AND RESIDUALS OF CCR. WASH AND RINSE WATER SHALL BE COLLECTED AND DISPOSED OF IN THE BYPASS BASIN OR AS OTHERWISE DIRECTED BY THE OWNER.
   - B. AS AN AREA WITHIN THE ASH SURGE BASIN IS DECONTAMINATED, THE GW CONTRACTOR AND CQA CONTRACTOR (P-1803) SHALL VISUALLY INSPECT THE SUBJECT AREA WITH THE OWNER'S REPRESENTATIVE(S) TO ENSURE THE AREA IS NO LONGER CONTAMINATED WITH CCR CONSTITUENTS AND REMAINS COMPETENT FOR RE-USE (I.E., NO REPAIRS ARE REQUIRED).
   - C. UPON COMPLETION OF DECONTAMINATION ACTIVITIES FOR A GIVEN AREA OF EXISTING GEOMEMBRANE LINER BY THE GW CONTRACTOR, THE CQA CONTRACTOR (P-1803) SHALL:
     - I. PERFORM AN ELECTRICAL LEAK LOCATION SURVEY OVER THE DECONTAMINATED LINER AREA IN ACCORDANCE WITH ASTM D7953. IF THE SURVEY LOCATES A BREACH (HOLE, PUNCTURE, TEAR, DEFECT, ETC.) IN THE GEOMEMBRANE, THE CQA CONTRACTOR SHALL NOTIFY THE OWNER AND GW CONTRACTOR IMMEDIATELY, AND THE GW CONTRACTOR SHALL ADDRESS THE BREACH IN ACCORDANCE WITH NOTE 3.B.
     - II. CUT-OUT AND REMOVE A MINIMUM OF ONE SAMPLE PER ACRE OF THE DECONTAMINATED GEOMEMBRANE LINER. THE GW CONTRACTOR SHALL REPAIR THE GEOMEMBRANE LINER AT ALL SAMPLE LOCATIONS IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
     - III. ALL SAMPLES SHALL BE ANALYZED BY A CERTIFIED LABORATORY IN ACCORDANCE WITH EPA SW-846 TEST METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE. IF THE CONCENTRATIONS OF CCR CONSTITUENTS MEASURED BY THIS TEST METHOD MEET THE GROUNDWATER PROTECTION STANDARDS SPECIFIED IN THE OPERATING PERMIT ISSUED BY THE ILLINOIS EPA FOR THE ASH SURGE BASIN, THEN THE AREA OF EXISTING GEOMEMBRANE LINER REPRESENTATED BY THAT SAMPLE IS CONSIDERED TO BE DECONTAMINATED. OTHERWISE, THAT AREA OF EXISTING GEOMEMBRANE LINER IS NOT CONSIDERED TO BE DECONTAMINATED.
   - D. GW CONTRACTOR SHALL RECLEAN ANY AREAS THAT ANALYTICAL TESTING INDICATES ARE NOT DECONTAMINATED (I.E., ANALYTICAL TESTING OF A COLLECTED SAMPLE DETECTS AT LEAST ONE CCR CONSTITUENT EXCEEDS THE CONSTITUENT'S GROUNDWATER PROTECTION STANDARD LISTED IN IN THE OPERATING PERMIT ISSUED BY THE ILLINOIS EPA FOR THE ASH SURGE BASIN). AFTER RECLEANING A GIVEN AREA, THE CQA CONTRACTOR (P-1803) SHALL COLLECT AND TEST ONE ADDITIONAL SAMPLE FROM THE AREA PER NOTE 4.C.
   - E. LINER DECONTAMINATION IS CONSIDERED COMPLETE WHEN ALL COLLECTED LINER SAMPLES MEET THE DECONTAMINATION CRITERIA IN NOTE 4.C.III.

REFERENCE DRAWINGS

CSK-005	EXCAVATION SECTIONS & DETAILS
D21132C020-03	ASH SURGE BASIN LINER REPLACEMENT LINER SUBGRADE PREPARATION

PRELIMINARY
NOT FOR CONSTRUCTION

NORTH
40' 0' 40' 80'
GRAPHIC SCALE

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152
CAD FILE NAME:	POW-ASB-CSK-004.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

EXCAVATION PLAN

DRAWING NUMBER	REVISION
POW-ASB-CSK-004	0B
SHEET 1 OF 1	

3/23/2023 3:18:23 PM
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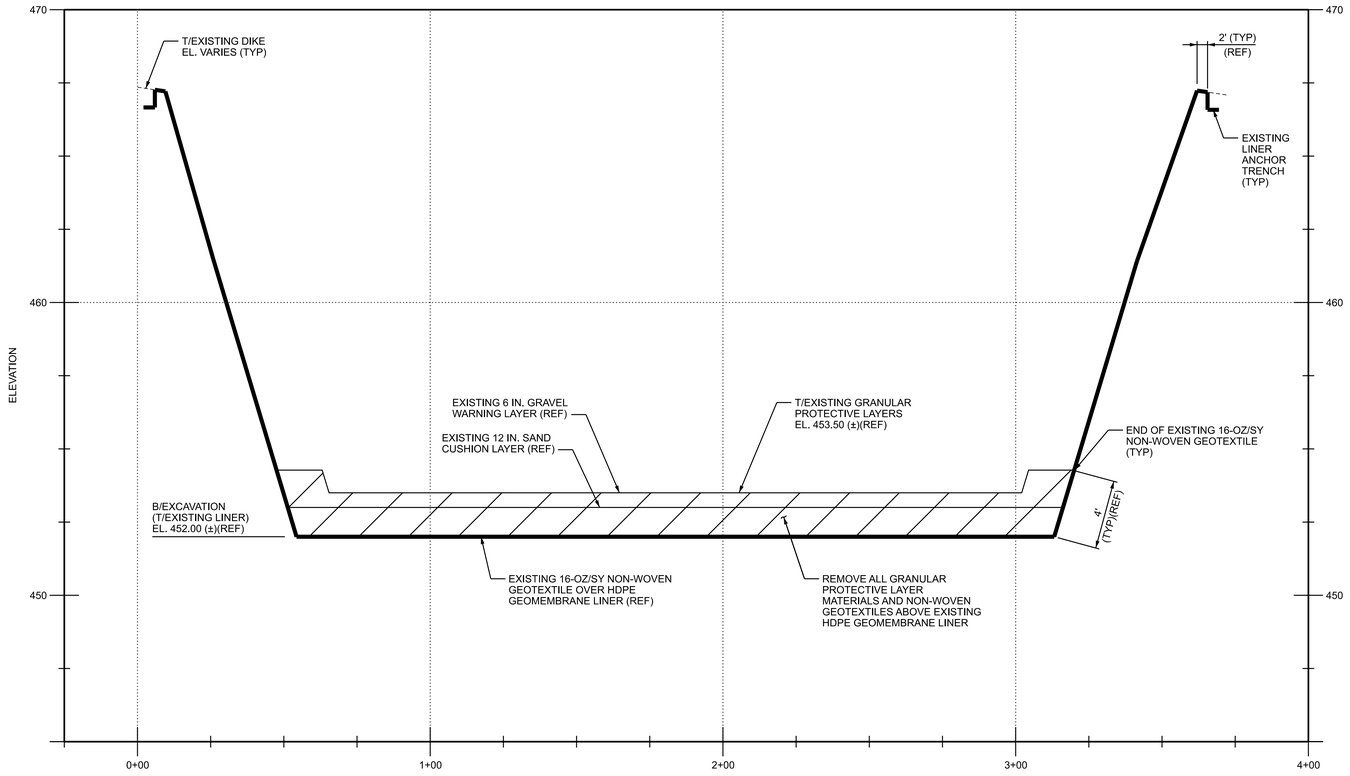
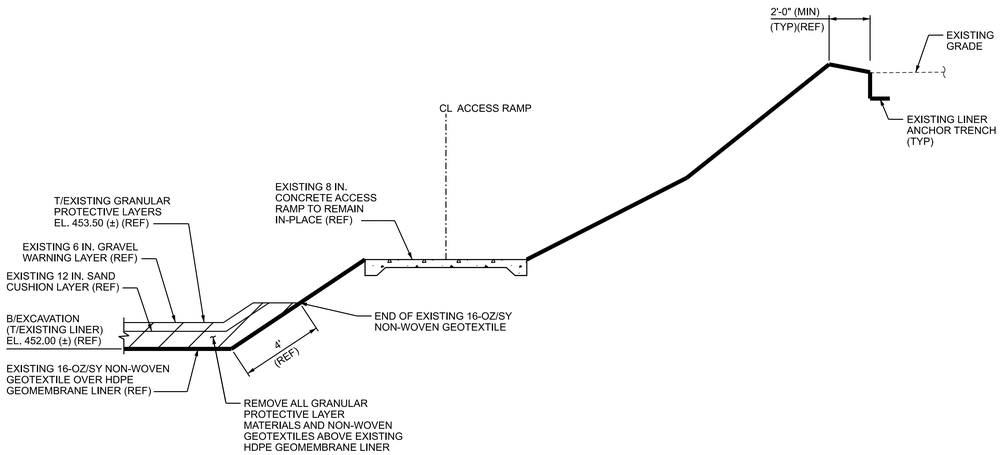
PL:\27930M1864\E:\Shared\INFO CENTER\DISC\PLINE REF MATER\ALC\IVILDESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-004.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



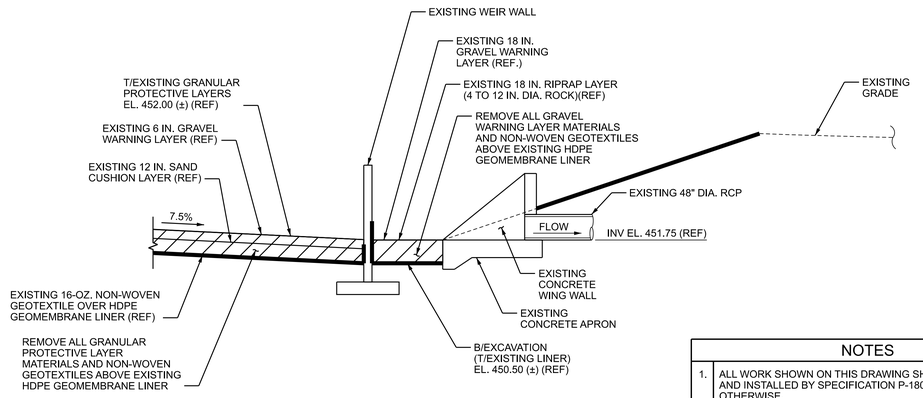
SECTION A

HORIZONTIAL SCALE 1"=20'
VERTICAL SCALE 1"=2'
(CSK-004)



SECTION B

SCALE: N.T.S.
(CSK-004)



SECTION C

SCALE: N.T.S.
(CSK-004)

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1802 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-ASB-CSK-002.

REFERENCE DRAWINGS

CSK-004	ASH SURGE BASIN EXCAVATION PLAN
D211320C31-03	ASH SURGE BASIN LINER REPLACEMENT DETAILS AND SECTIONS
D211320C32-04	ASH SURGE BASIN LINER REPLACEMENT DETAILS AND SECTIONS
3B-0-2093	WASTE WATER TREATMENT FACILITY WING WALL PLANS, SECTIONS & DETAILS

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PRELIMINARY
NOT FOR CONSTRUCTION

HOLD INFORMATION	
NO.	DESCRIPTION

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RELEASE INFORMATION		
REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152

CAD FILE NAME:	POW-ASB-CSK-005.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

EXCAVATION SECTIONS & DETAILS

DRAWING NUMBER	REVISION
POW-ASB-CSK-005	0B
SHEET 1 OF 1	

PL:12793\0M1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-005.dgn
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Revision 11A, Revision Date: 04-30-2010
3/23/2023 2:13:45 PM
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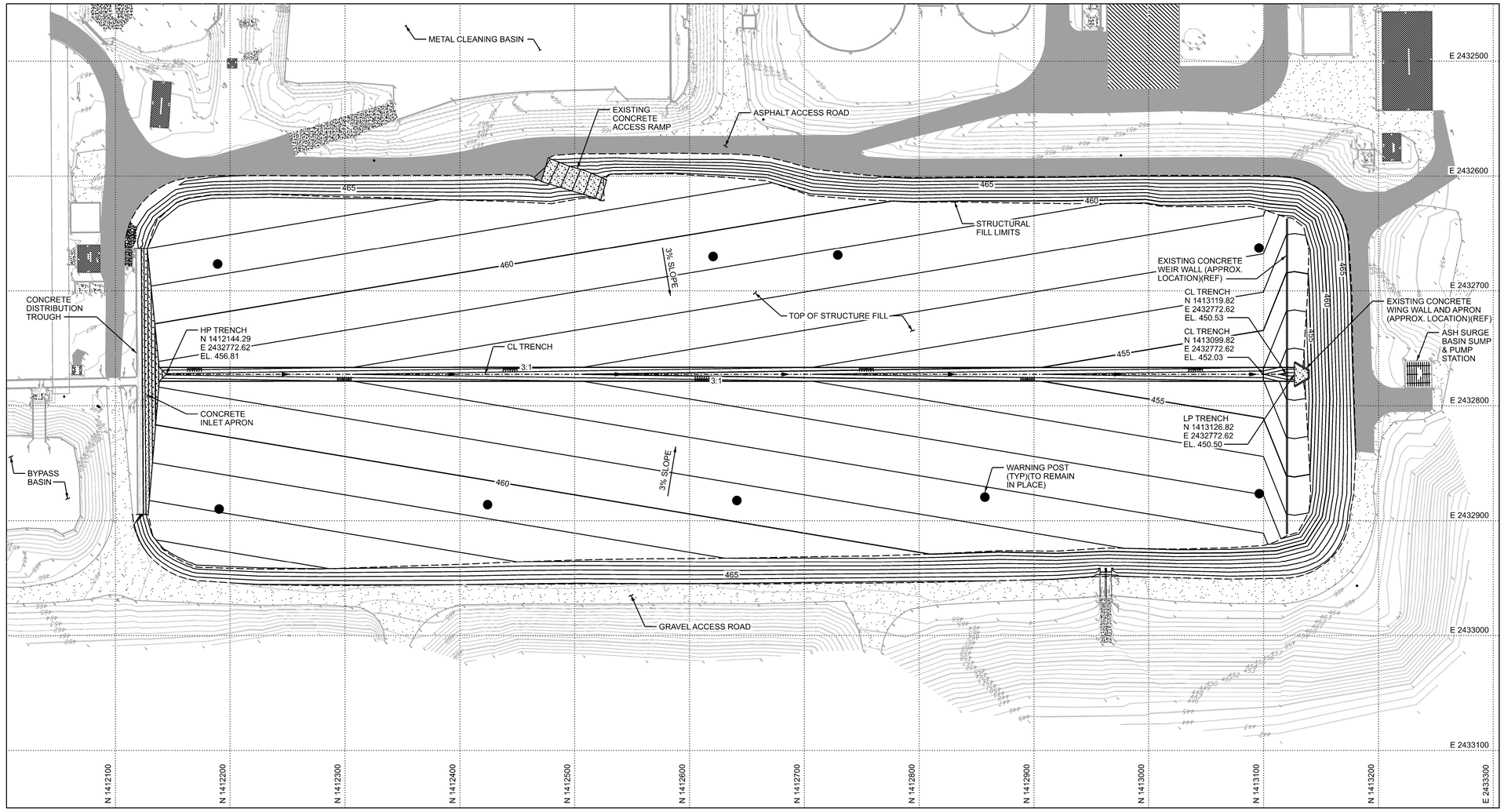

LEGEND

460 — MAJOR CONTOUR

459 — MINOR CONTOUR

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1802 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-ASB-CSK-002.

REFERENCE DRAWINGS

CSK-004	EXCAVATION PLAN

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

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PRELIMINARY
NOT FOR CONSTRUCTION

NORTH

40' 0' 40' 80'
GRAPHIC SCALE

HOLD INFORMATION	
NO.	DESCRIPTION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152
CAD FILE NAME:	POW-ASB-CSK-006.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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Sargent & Lundy LLC

SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

STRUCTURAL FILL GRADING PLAN

DRAWING NUMBER	REVISION
POW-ASB-CSK-006	0B
SHEET 1 OF 1	

3/23/2023 3:23:57 PM
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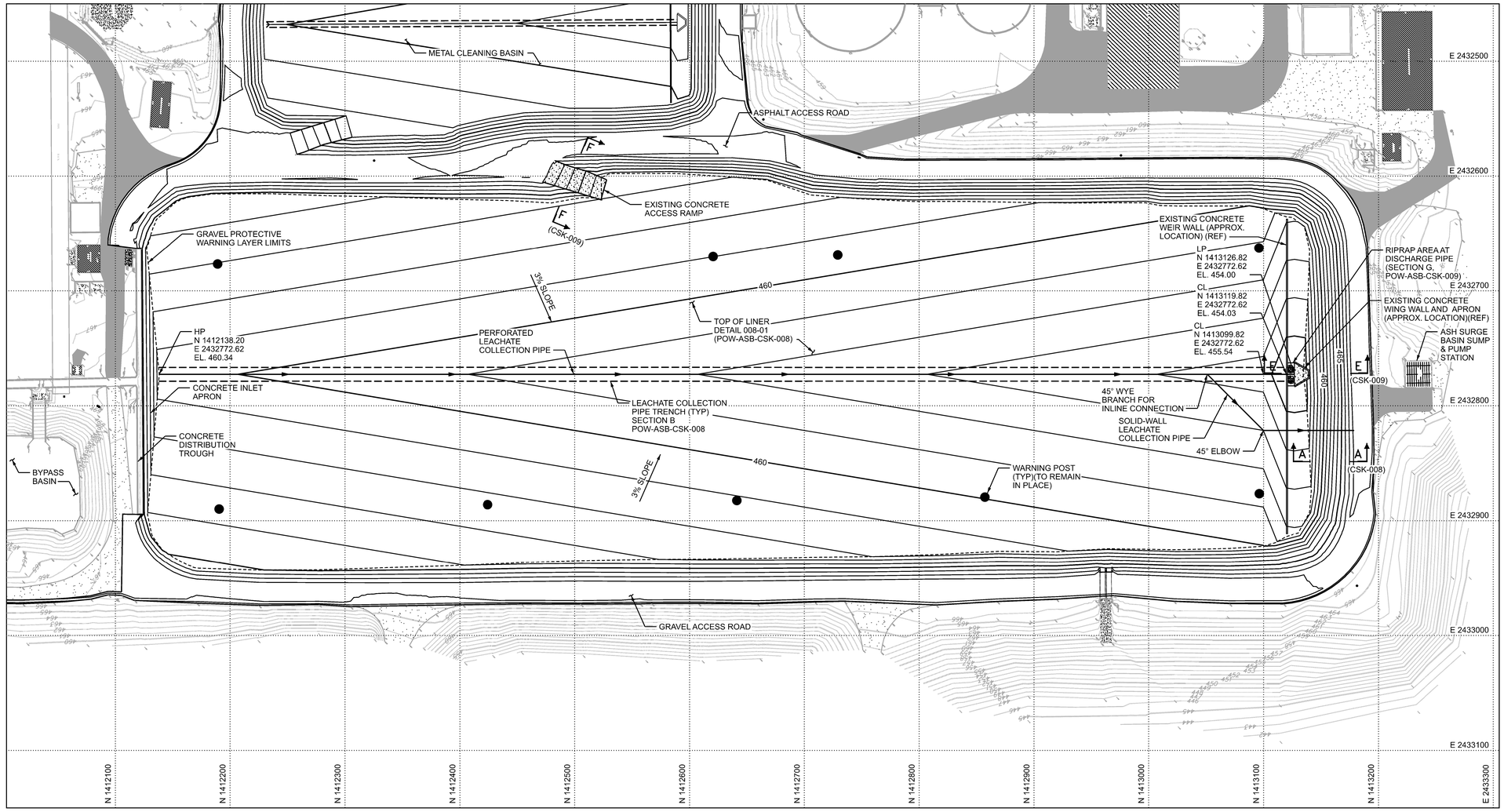
PL:12793\0M1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-006.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



LEGEND

460 MAJOR CONTOUR
459 MINOR CONTOUR

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION P-1802 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING POW-ASB-CSK-002.

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PRELIMINARY
NOT FOR CONSTRUCTION

NORTH

40' 0' 40' 80'
GRAPHIC SCALE

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SPECIFICATION:	P-1802
PROJECT NO.:	12661-152
CAD FILE NAME:	POW-ASB-CSK-006.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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Sargent & Lundy LLC

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55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

COMPOSITE LINER & LEACHATE COLLECTION SYSTEM PLAN

DRAWING NUMBER	REVISION
POW-ASB-CSK-007	0B

SHEET 1 OF 1

PL:12793\0M1864E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-007.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010
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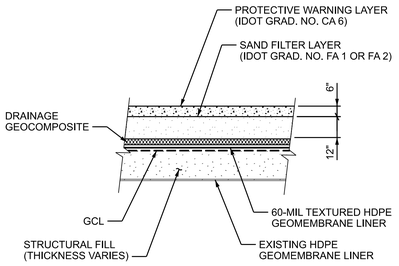
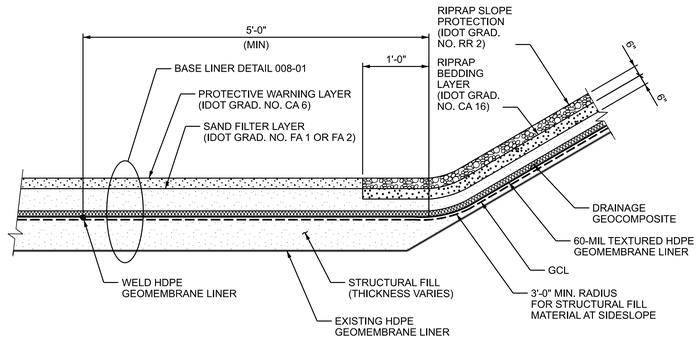
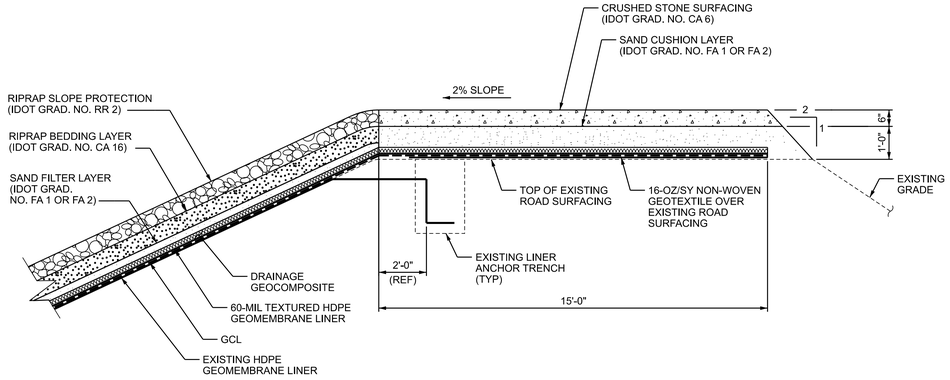


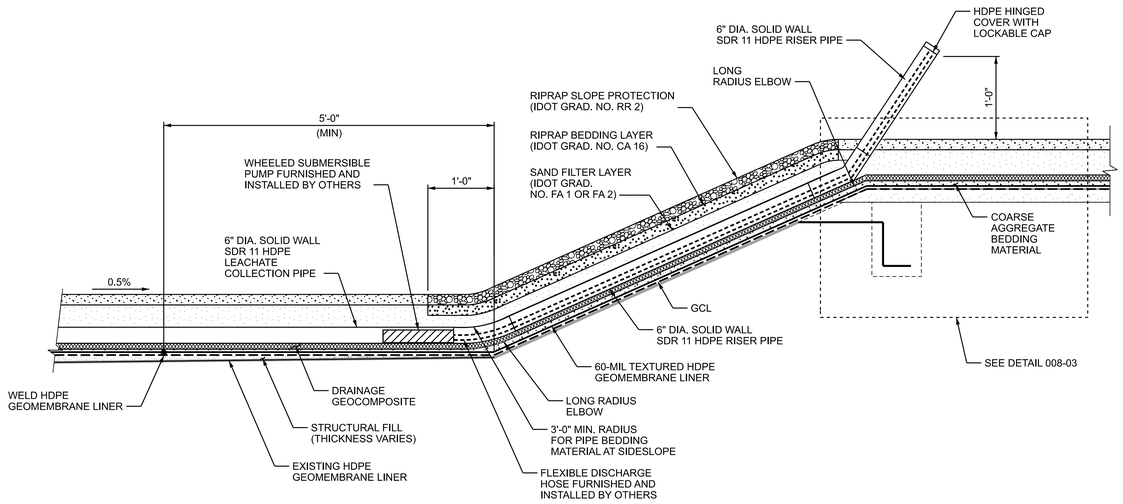
TYPICAL LINER BASE DETAIL
DETAIL 008-01
N.T.S.



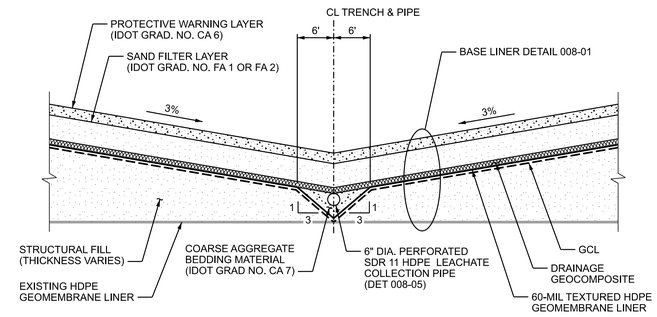
TYPICAL SLOPE TRANSITION DETAIL
DETAIL 008-02
N.T.S.



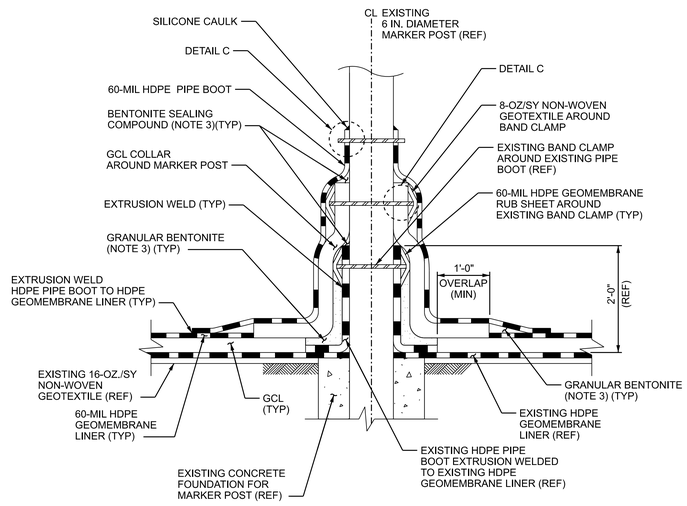
TYPICAL ANCHOR LINER RUN-OUT DETAIL AT DIKE CREST
DETAIL 008-03
N.T.S.



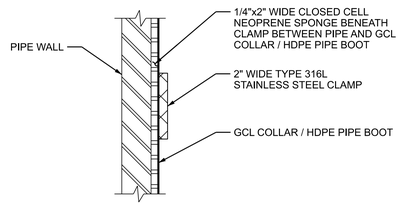
SECTION AT LEACHATE COLLECTION SUMP PUMP
SECTION A
N.T.S.



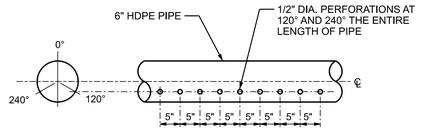
TYPICAL SECTION AT LEACHATE COLLECTION TRENCH
SECTION B
N.T.S.



LINER CONNECTION AT EXISTING MARKER POST
DETAIL 008-04
N.T.S.
NOTE: PROTECTIVE WARNING LAYER, SAND FILTER LAYER, AND DRAINAGE GEOCOMPOSITE ARE NOT SHOWN FOR CLARITY



DETAIL C
N.T.S.



6" DIAMETER PERFORATED
HDPE LEACHATE COLLECTION PIPE

TYPICAL PERFORATED PIPE DETAIL
DETAIL 008-05
N.T.S.

NOTES

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3. GW CONTRACTOR SHALL APPLY GRANULAR BENTONITE AND BENTONITE SEALING COMPOUND IN BETWEEN EXISTING HDPE GEOMEMBRANE LINER AND GCL AS SPECIFIED AT A MINIMUM RATE OF 1 LB PER LINEAR FOOT.

REFERENCE DRAWINGS

D21132C031-03	ASH SURGE BASIN LINER REPLACEMENT DETAILS AND SECTIONS

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0A	03-21-2023	FOR CLIENT COMMENT
0B	03-24-2023	FOR PUBLIC COMMENT

ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152

CAD FILE NAME:	POW-ASB-CSK-008.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	-

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MWG
Midwest Generation, LLC

PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

COMPOSITE LINER & LEACHATE
COLLECTION SYSTEM
SECTIONS & DETAILS - SHEET 1

DRAWING NUMBER	REVISION
POW-ASB-CSK-008	0B
SHEET 1 OF 1	

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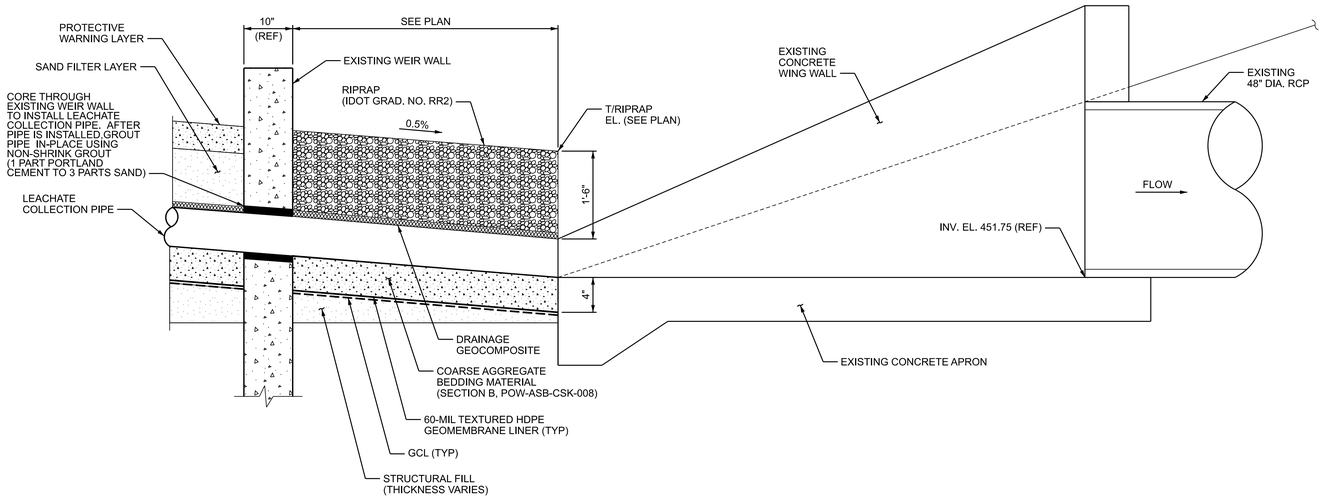
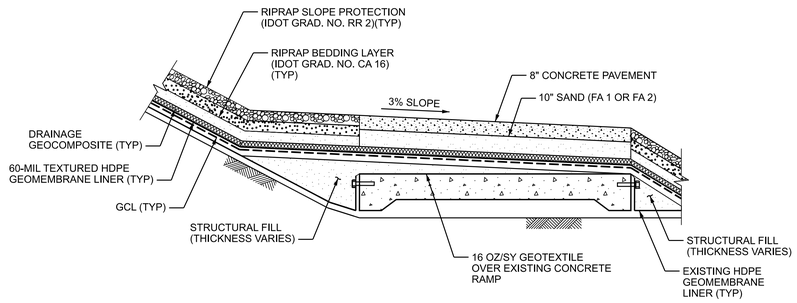
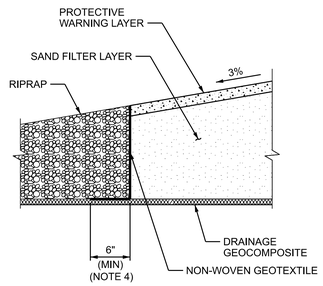
PL:12793\0M1864\E:\Shared\INFO CENTER\DISCIPLINE REF MATERIAL\CIVIL\DESIGN\2-Powerton - CCR\Ash Surge Basin Closure Drawings\POW-ASB-CSK-008.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010



SECTION E
N.T.S.



CONCRETE RAMP SECTION
SECTION F
N.T.S.



SECTION G
N.T.S.

PRELIMINARY
NOT FOR CONSTRUCTION

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4. NON-WOVEN GEOTEXTILE SHALL BE CONTINUOUSLY SEWN OR HEAT-BONDED TO GEOTEXTILE CAP OF UNDERLYING DRAINAGE GEOCOMPOSITE IN ACCORDANCE WITH GEOTEXTILE MANUFACTURER'S RECOMMENDATIONS.

REFERENCE DRAWINGS

D21132C031-03	ASH SURGE BASIN LINER REPLACEMENT DETAILS AND SECTIONS
3B-0-2093	WASTE WATER TREATMENT FACILITY WING WALL PLANS, SECTIONS & DETAILS

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ISSUE PURPOSE:	PUBLIC COMMENT
SPECIFICATION:	P-1802
PROJECT NO.:	12661-152

CAD FILE NAME:	POW-ASB-CSK-009.DGN
PREPARED BY:	M. KARNIA / J. CHAVEZ
REVIEWED BY:	T. DEHLIN
APPROVED BY:	--

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MWG
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PROJECT

POWERTON
GENERATING STATION
ASH SURGE BASIN RETROFIT

DRAWING TITLE

COMPOSITE LINER & LEACHATE COLLECTION SYSTEM
SECTIONS & DETAILS - SHEET 2

DRAWING NUMBER	REVISION
POW-ASB-CSK-009	0B
SHEET 1 OF 1	

3/23/2023 9:17:47 AM
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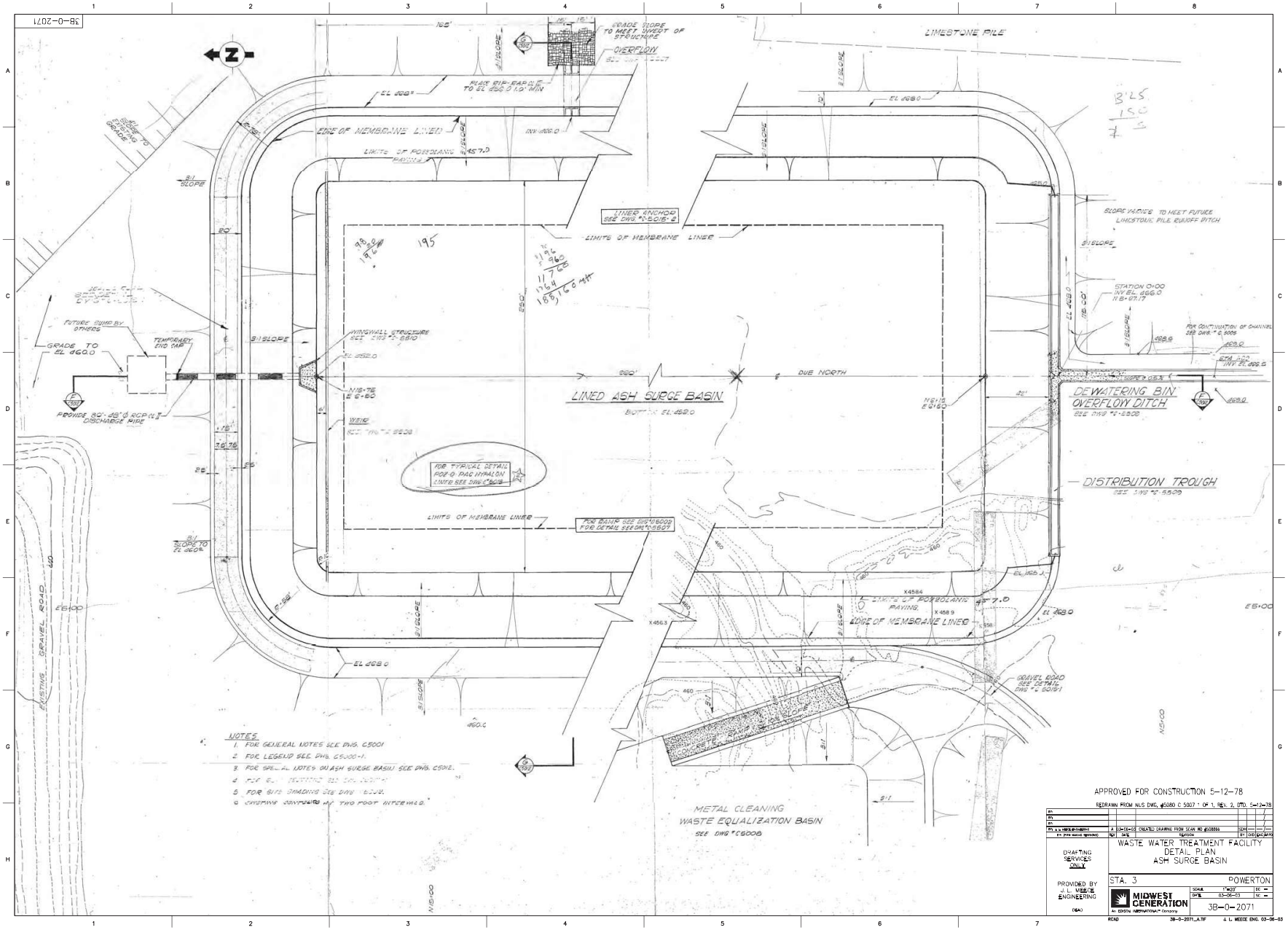
ATTACHMENT 2

REFERENCE DRAWINGS

ATTACHMENT 2-1

1978 CONSTRUCTION DRAWINGS

DRAWING NO.	TITLE
3B-0-2071	DETAIL PLAN, ASH SURGE BASIN
3B-0-2075	ASH SURGE BASIN, SECTIONS & DETAILS
5080-C-5015	MISCELLANEOUS SECTIONS & DETAILS
3B-0-2089	SLUDGE WEIRS, SECTIONS & DETAILS
3B-0-2090	RAMPS & ASH SURGE BASIN OVERFLOW STRUCTURE
3B-0-2092	ASH SURGE BASIN & LIMESTONE BASIN DIST. TROUGHS – SECTIONS & DET.
3B-0-2093	WING WALL PLANS, SECTIONS & DETAILS
3B-0-2094	DEWATERING BIN OVERFLOW CHANNEL SECTIONS & DETAILS
3B-0-2106	ASH SURGE BASIN, SUMP – SOIL PROFILE
3B-0-2067	SITE PLAN, EAST ROOF & YARD RUNOFF BASIN



APPROVED FOR CONSTRUCTION 5-12-78

REDRAWN FROM NUS DWG. #50B0 C 5007 1 OF 1, REV. 2, DTD. 5-12-78

3				
2				
1				
0	A	03-06-03	CREATED DRAWING FROM SCAN NO #50886	SDH
REVISIONS	NO.	DATE	REMARKS	BY CHK'D APP'D

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEEKS ENGINEERING (E&A)

WASTE WATER TREATMENT FACILITY
DETAIL PLAN
ASH SURGE BASIN

STA. 3 POWERTON

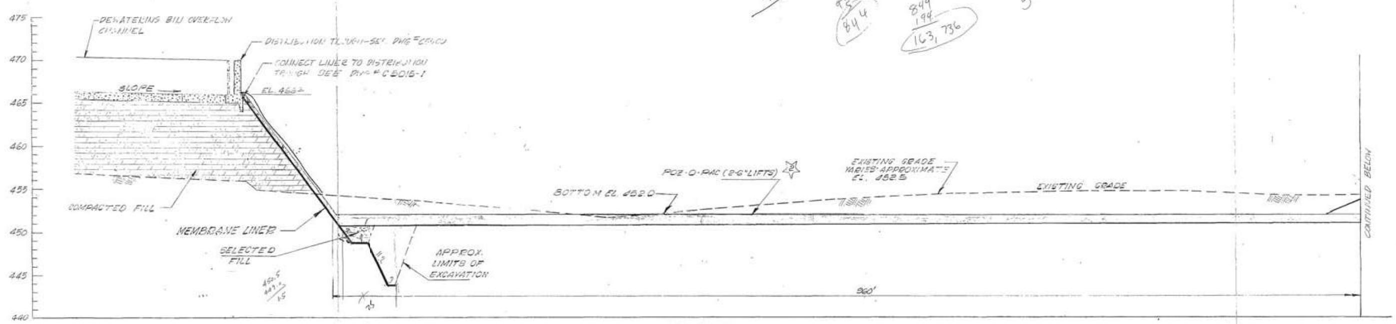
MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE 1"=20' DC —
DATE 03-06-03 SC —

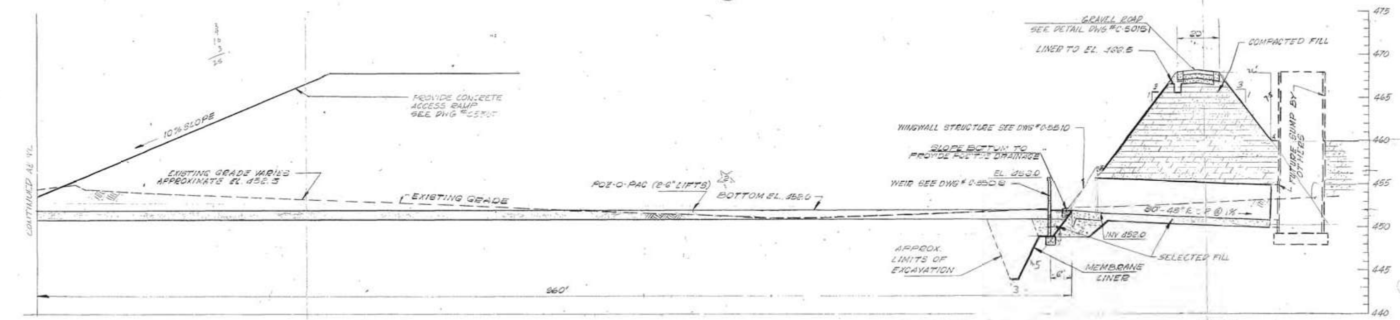
3B-0-2071

RCAD 3B-0-2071_A.TIF J. L. MEEKS ENG. 03-06-03

3B-0-2075



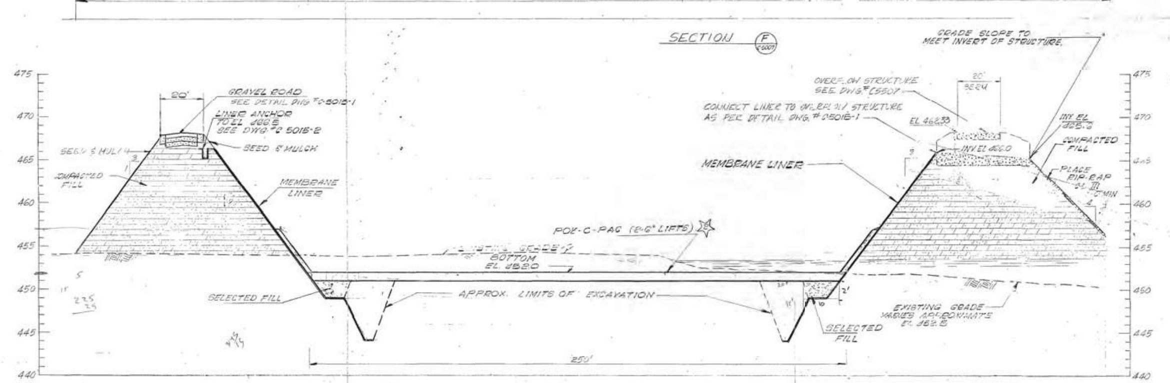
SECTION F/C5007



SECTION F/C5007

NOTES

1. [illegible] NOTES SEE DWG. C5001.
2. FOR LEGEND SEE DWG. C5002-1.
3. CONTRACTOR TO DEWATER CONSTRUCTION AREA TO EL. 443.0 BY APPROVED METHOD(S) PRIOR TO BASIN CONSTRUCTION.
4. FOR ROAD SECTIONS SEE DWG. #C5015-1
5. FOR SITE GRADING SEE DWG# C5002.



FOR TYPICAL DETAIL POZ-O-PAC HYPALON LINER SEE DWG #C5018

SECTION G/C5007

SCALE: HOR. 1"=20' VERT. 1"=5'

APPROVED FOR CONSTRUCTION 5-12-78

REDRAWN FROM NUS DWG. #5080 C 5012 1 OF 1, REV. 2, DTD. 5-12-78

BY:	REV	DATE	REVISION	BY	CKD	ENG/APPD
BY:						/
BY:						/
BY:						/
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--/--
BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG/APPD

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
ASH SURGE BASIN
SECTIONS & DETAILS

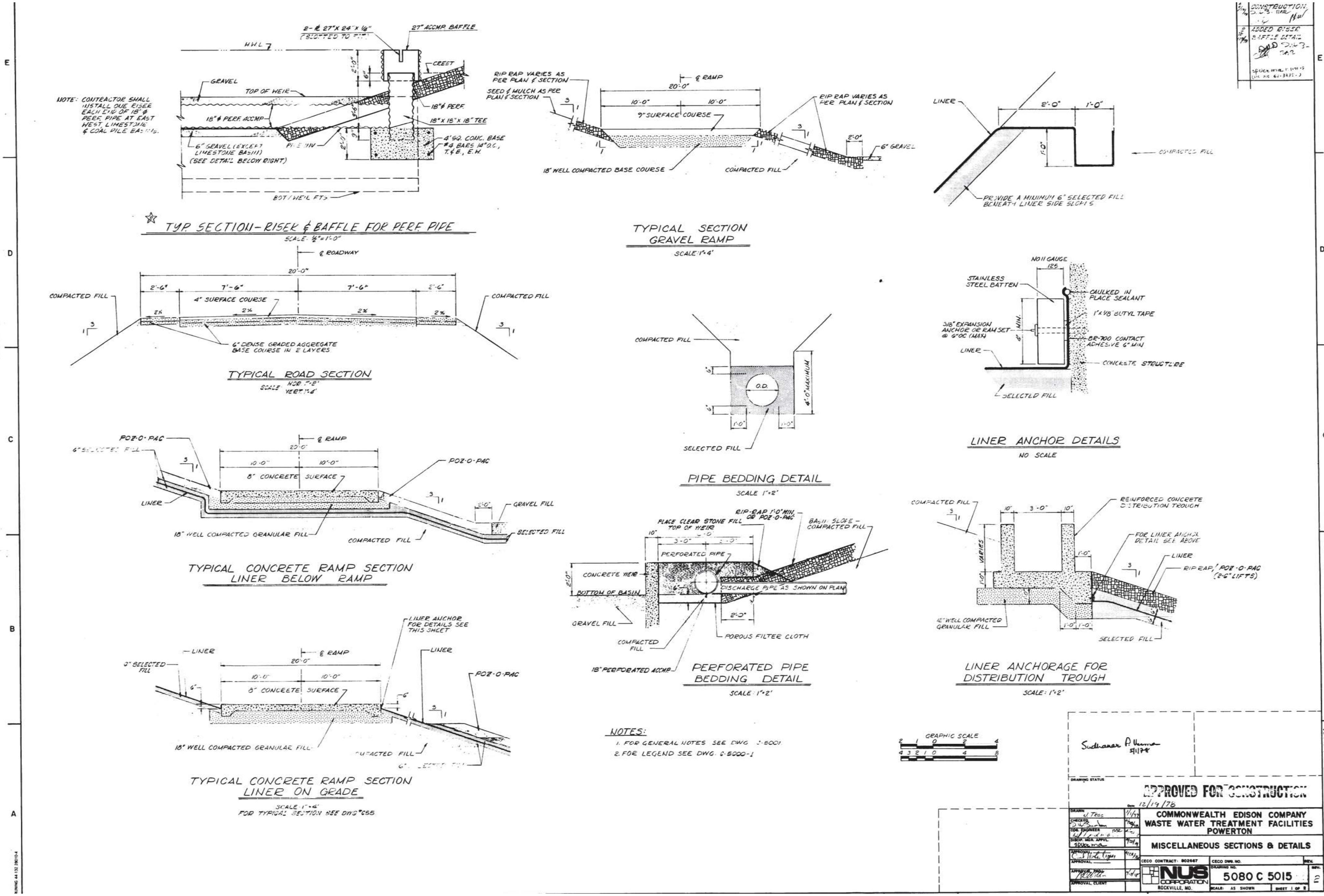
STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE AS SHOWN DC -
DATE 03-06-03 SC -

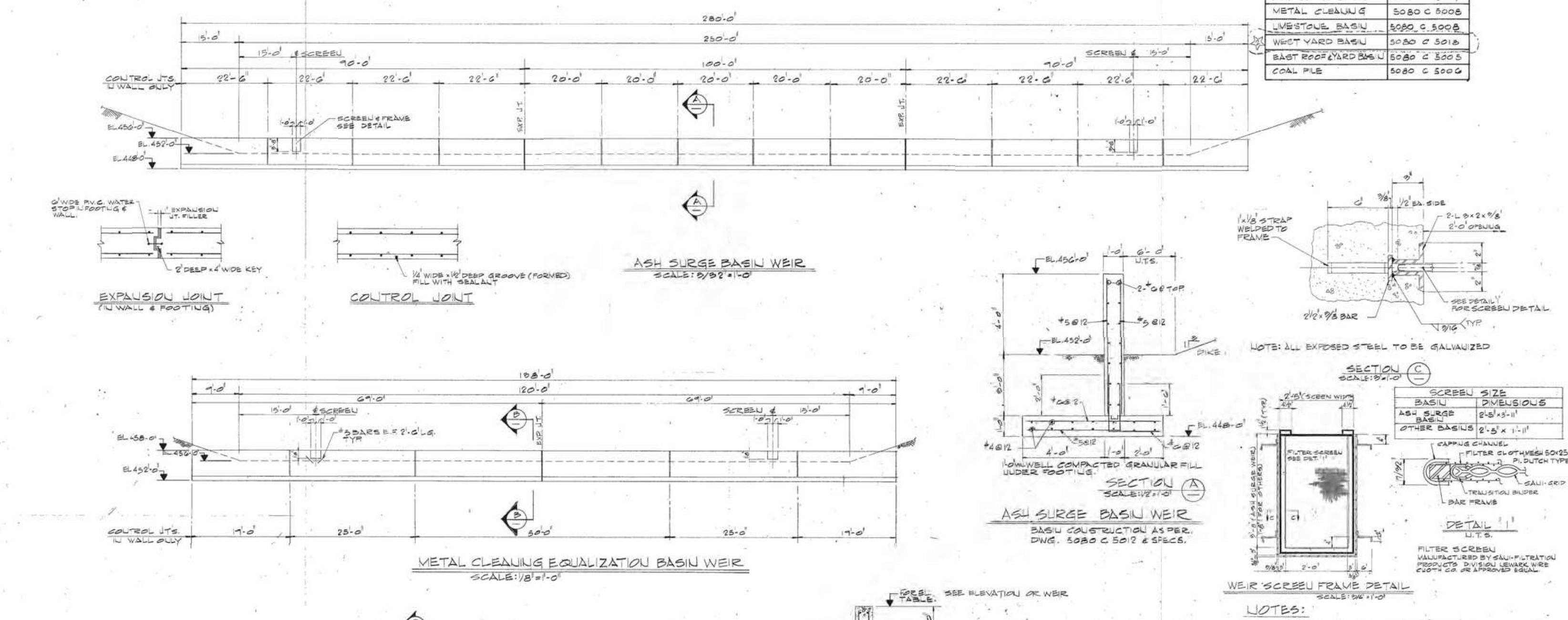
3B-0-2075

RCAD 3B-0-2075_A.TIF J. L. MEECE ENG. 03-06-03



2-PL 27"X 24"X 1/4" (SLOTTED TO FIT)
27" ACCMP BAFFLE
HWL
CREST
GRAVEL
TOP OF WEIR
18"Φ PERF.
18"Φ PERF. ACCMP
18"X 18"X 18" TEE
NOTE: CONTRACTOR SHALL INSTALL ONE RISER EACH END OF 18"Φ PERF. PIPE AT EAST WEST, LIMESTONE & COAL PILE BASINS.
6" GRAVEL (EXCEPT LIMESTONE BASIN) (SEE DETAIL BELOW RIGHT)
4'SQ. CONC. BASE #4 BARS 12" O.C., T.&B., E.W.
BOT/WEIR FTG
TYP. SECTION-RISER & BAFFLE FOR PERF. PIPE
SCALE: 1/2"=1'-0"
RIP RAP VARIES AS PER PLAN & SECTION
SEED & MULCH AS PER PLAN & SECTION
℄ RAMP
20'-0"
10'-0"
10'-0"
9" SURFACE COURSE
RIP RAP VARIES AS PER PLAN & SECTION
2'-0"
6" GRAVEL
18" WELL COMPACTED BASE COURSE
COMPACTED FILL
TYPICAL SECTION GRAVEL RAMP
SCALE: 1"=4'
LINER
2'-0"
1'-0"
1'-0"
COMPACTED FILL
PROVIDE A MINIMUM 6" SELECTED FILL BENEATH LINER SIDE SLOPES
℄ ROADWAY
20'-0"
2'-6"
7'-6"
7'-6"
2'-6"
COMPACTED FILL
4" SURFACE COURSE
2%
6" DENSE GRADED AGGREGATE BASE COURSE IN 2 LAYERS
TYPICAL ROAD SECTION
SCALE: HOR. 1"=8' VERT. 1"=4'
COMPACTED FILL
O.D.
4'-0" MAXIMUM
SELECTED FILL
PIPE BEDDING DETAIL
SCALE 1"=2'
NO 11 GAUGE .125
STAINLESS STEEL BATTEN
CAULKED IN PLACE SEALANT
1"X1/8" BUTYL TAPE
3/8" EXPANSION ANCHOR OR RAM SET @ 6" OC (MAX)
BR-700 CONTACT ADHESIVE 6" MIN
LINER
CONCRETE STRUCTURE
SELECTED FILL
LINER ANCHOR DETAILS
NO SCALE
POZ-O-PAC
6" SELECTED FILL
℄ RAMP
20'-0"
10'-0"
10'-0"
8" CONCRETE SURFACE
LINER
GRAVEL FILL
SELECTED FILL
18" WELL COMPACTED GRANULAR FILL
COMPACTED FILL
TYPICAL CONCRETE RAMP SECTION LINER BELOW RAMP
RIP-RAP 1'-0" MIN. OR POZ-O-PAC
PLACE CLEAR STONE FILL TOP OF WEIR
BASIN SLOPE - COMPACTED FILL
PERFORATED PIPE
CONCRETE WEIR
BOTTOM OF BASIN
DISCHARGE PIPE AS SHOWN ON PLAN
GRAVEL FILL
COMPACTED FILL
POROUS FILTER CLOTH
18" PERFORATED ACCMP
PERFORATED PIPE BEDDING DETAIL
SCALE: 1"=2'
COMPACTED FILL
REINFORCED CONCRETE DISTRIBUTION TROUGH
FOR LINER ANCHOR DETAIL SEE ABOVE
LINER
RIP RAP, POZ-O-PAC (2'-6" LIFTS)
12" WELL COMPACTED GRANULAR FILL
SELECTED FILL
LINER ANCHORAGE FOR DISTRIBUTION TROUGH
SCALE: 1"=2'
LINER ANCHOR FOR DETAILS SEE THIS SHEET
LINER
℄ RAMP
6" SELECTED FILL
20'-0"
10'-0"
10'-0"
8" CONCRETE SURFACE
POZ-O-PAC
18" WELL COMPACTED GRANULAR FILL
COMPACTED FILL
TYPICAL CONCRETE RAMP SECTION LINER ON GRADE
SCALE: 1"=4'
FOR TYPICAL SECTION SEE DWG #C55
NOTES:
1. FOR GENERAL NOTES SEE DWG C-5001
2. FOR LEGEND SEE DWG C-5000-1
GRAPHIC SCALE
CONSTRUCTION
ADDED RISER BAFFLE DETAIL
APPROVED FOR CONSTRUCTION
12/14/78
COMMONWEALTH EDISON COMPANY
WASTE WATER TREATMENT FACILITIES
POWERTON
MISCELLANEOUS SECTIONS & DETAILS
CECO CONTRACT: 802467
NUS CORPORATION
ROCKVILLE, MD.
5080 C 5015
SCALE: AS SHOWN

3B-0-2089



REFERENCE DRAWINGS	
WEIR LOCATION	CIVIL DWG. NO.
ASH SURGE BASIN	5080 C 5007
METAL CLEANING	5080 C 5008
LIMESTONE BASIN	5080 C 5008
WEST YARD BASIN	5080 C 5018
EAST ROOF & YARD BASIN	5080 C 5005
COAL PILE	5080 C 5006

SCREEN SIZE	
BASIN	DIMENSIONS
ASH SURGE BASIN	2'-5" x 3'-11"
OTHER BASINS	2'-5" x 1'-11"

WEIR TABLE						
NAME OF BASIN	L-1	L-2	L-3	EL.1	EL.2	EL.3
WEST YARD BASIN	268'	9'-0"	250'	449'	443'	447'
EAST YARD BASIN	198'	9'-0"	180	447'	441'	445'
COAL PILE BASIN	232'	13'-0"	206'	445'	439'	443'

DRAWING STATUS
APPROVED FOR CONSTRUCTION
4/19/78 Date

REDRAWN FROM NUS DWG. #5080 C 5506 1 OF 1, REV. 2, DTD. 6-7-78

BY	REV	DATE	REVISION	BY	CKD	ENG/APPD
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--/--

BY: (FIRM MAKING REVISIONS)

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
SLUDGE WEIRS
SECTIONS & DETAILS

STA. 3 POWERTON

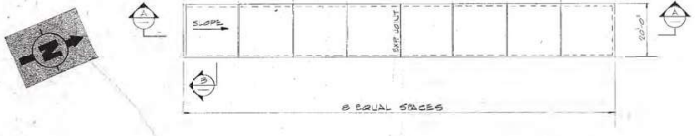
MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE: AS SHOWN DC -
DATE: 03-06-03 SC -

3B-0-2089

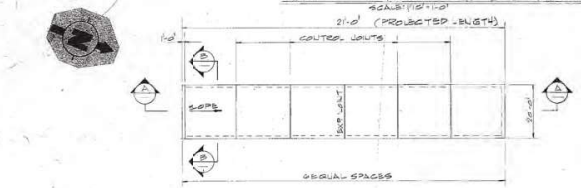
RCAD 3B-0-2089_A.TIF J. L. MEECE ENG. 03-06-03

3B-0-2090



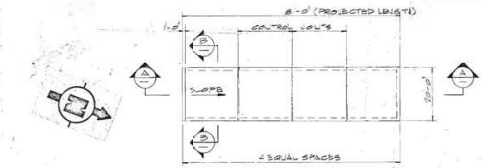
PLAN

RAMP FOR ASH SURGE BASIN (REF DWG 5080 C 5002)
SCALE: 1/16"=1'-0"



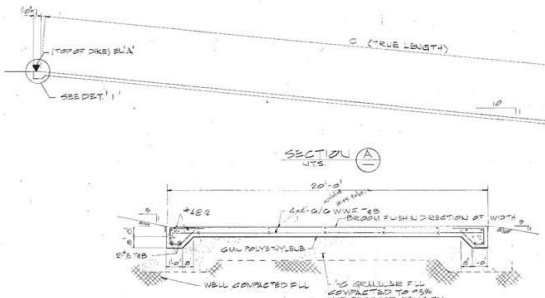
PLAN

RAMP FOR METAL CLEANING BASIN (REF DWG 5080 C 5007)
SCALE: 1/16"=1'-0"



PLAN

RAMP FOR LIMESTONE BASIN (REF DWG. 5080 C 5008)
SCALE: 1/16"=1'-0"



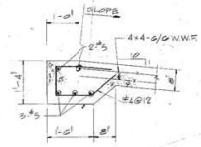
SECTION (A)
SCALE: 1/16"=1'-0"

SECTION (B)
SCALE: 1/16"=1'-0"

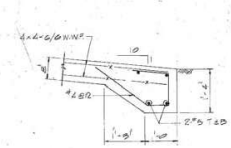
TYPICAL RAMP
(FOR LINER DETAILS SEE DWG. C 5015 SHT. 1)

RAMP DATA

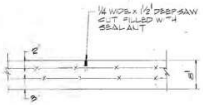
LOCATION OF BASIN	EL. 'A'	EL. 'B'	C	REMARKS
LIMESTONE BASIN	460'-0"	452'-0"	80'-8"	
METAL CLEANING BASIN	468'-0"	456'-0"	120'-7"	
ASH SURGE BASIN	468'-0"	452'-0"	160'-9"	



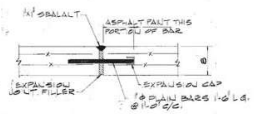
DETAIL '1'
SCALE: 3/4"=1'-0"



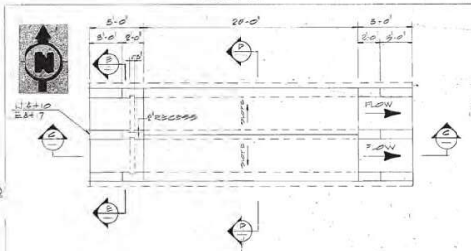
DETAIL '2'
SCALE: 3/4"=1'-0"



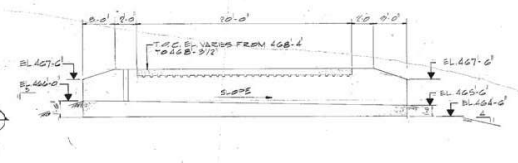
CONTROL JOINT
SCALE: 1"=1'-0"



EXPANSION JOINT
SCALE: 1"=1'-0"

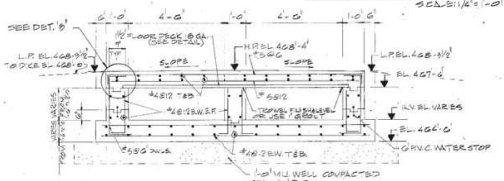


PLAN

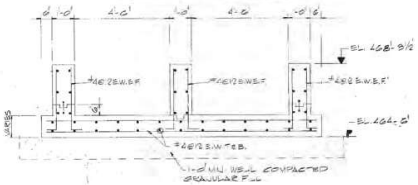


SECTION (C)
SCALE: 1/4"=1'-0"

ASH SURGE BASIN OVERFLOW STRUCTURE (REF DWG 5080 C 5007)
SCALE: 1 1/2"=1'-0"

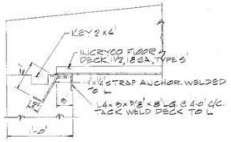


SECTION (D)
SCALE: 1/2"=1'-0"



SECTION (E)
SCALE: 1/2"=1'-0"

NOTES:
1. FOR GENERAL NOTES SEE DWG. C 5501



DETAIL '3'
SCALE: 1 1/2"=1'-0"

DRAWING STATUS
APPROVED FOR CONSTRUCTION
4/19/78

REDRAWN FROM NUS DWG. #5080 C 5507 1 OF 1, REV. 1, DTD. 4-19-78

BY	DATE	REVISION	BY	CHK	APP
BY J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN NO #000866	SDH	—	—

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING (J&A)

WASTE WATER TREATMENT FACILITY
RAMPS & ASH SURGE BASIN
OVERFLOW STRUCTURE

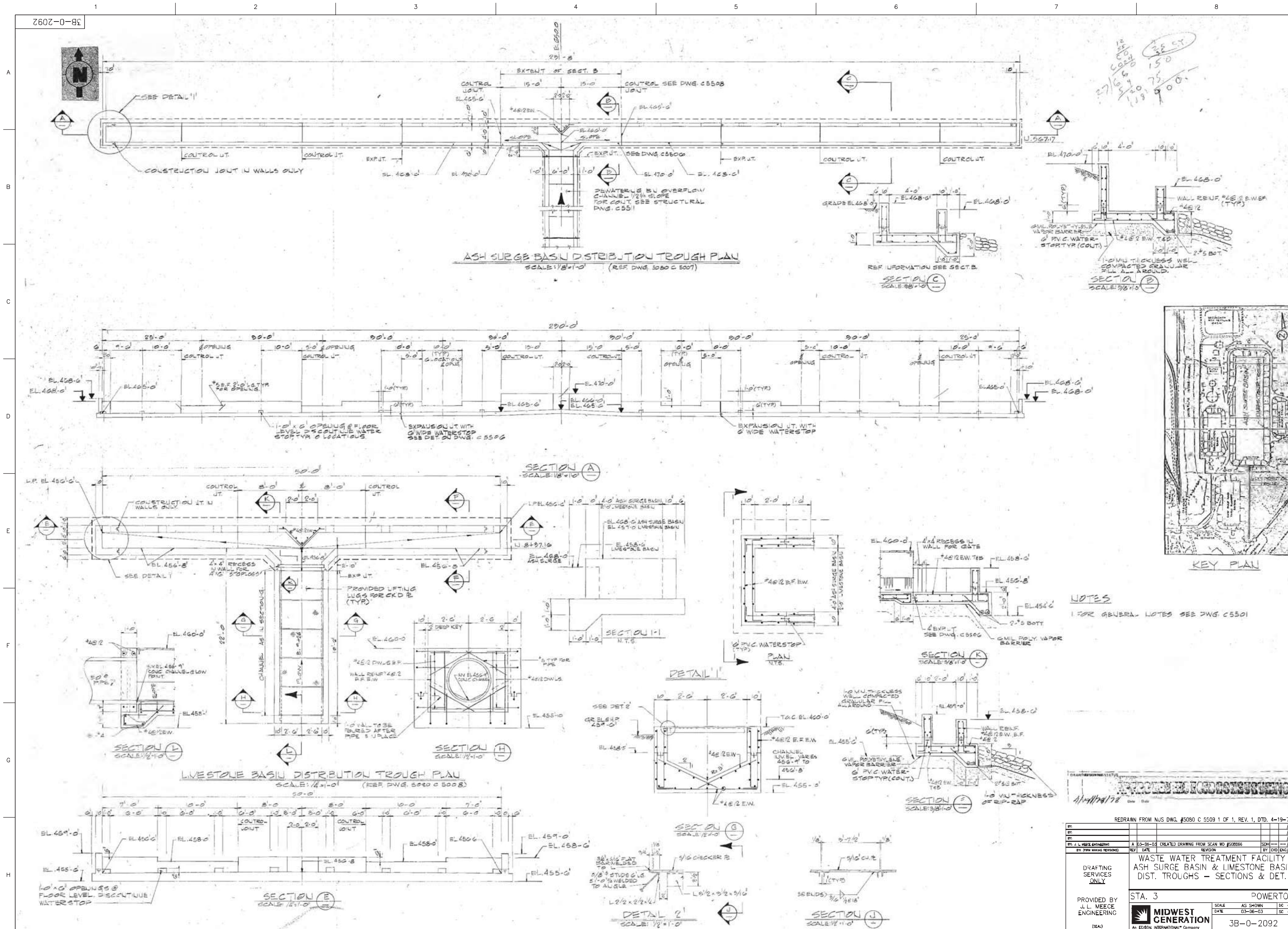
STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE: AS SHOWN SIZE: —
DATE: 03-06-03 SIZE: —

3B-0-2090

RCAD 3B-0-2090_A.TIF J. L. MEECE ENG. 03-06-03



REDRAWN FROM NUS DWG. #5080 C 5509 1 OF 1, REV. 1, DTD. 4-19-78

BY:	REV	DATE	REVISION	BY	CKD	ENG/APPD
BY:						/
BY:						/
BY:						/
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--/--
BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG/APPD

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
ASH SURGE BASIN & LIMESTONE BASIN
DIST. TROUGHS – SECTIONS & DET.

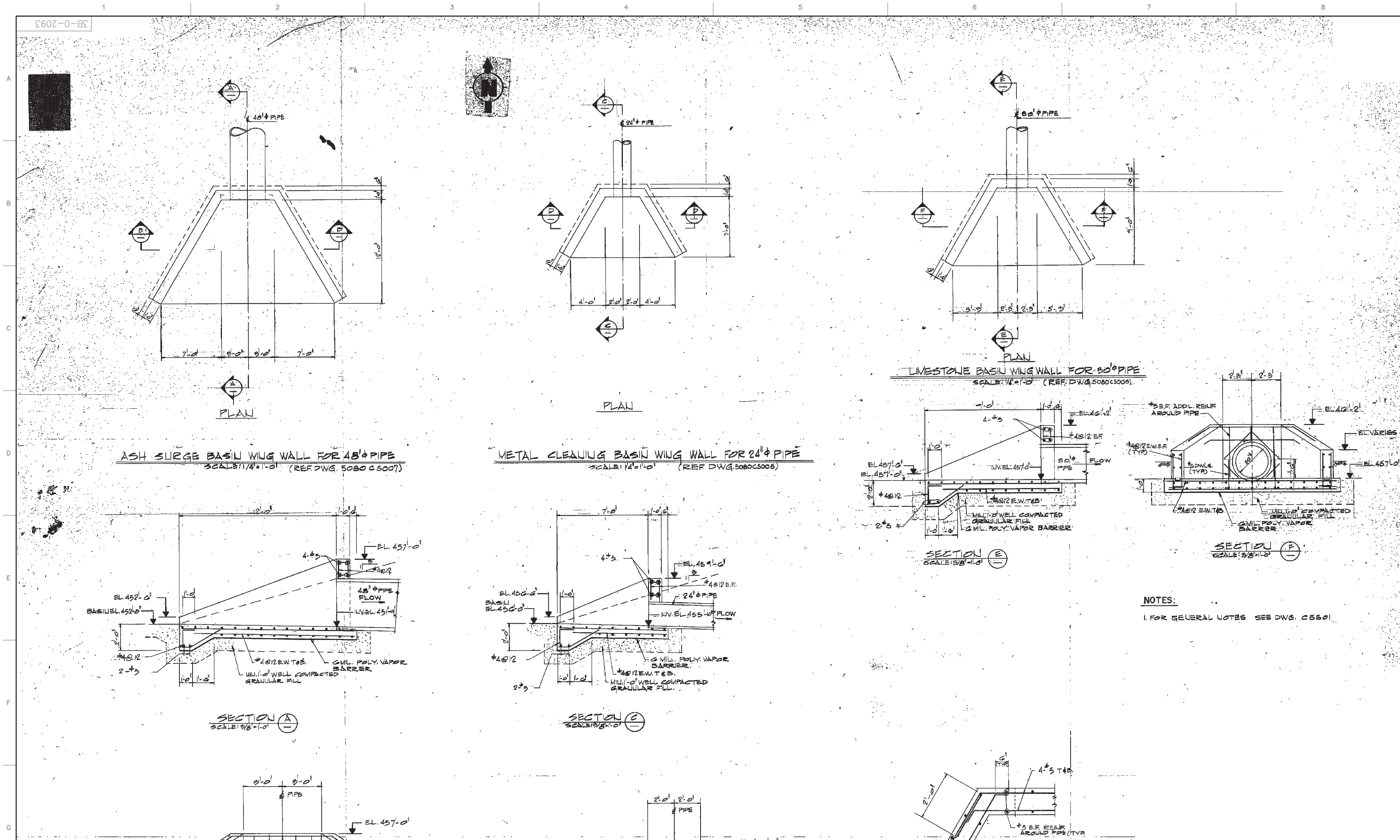
STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL℠ Company

SCALE	AS SHOWN	DC	–
DATE	03-06-03	SC	–

3B-0-2092

RCAD 3B-0-2092_A.TIF J. L. MEECE ENG. 03-06-03



NOTES:

1. FOR GENERAL NOTES SEE DWG. C5501

DRAWING STATUS

APPROVED FOR CONSTRUCTION

4/19/78 Date

REDRAWN FROM NUS DWG. #5080 C 5510 1 OF 1, REV. 1, DTD. 4-19-78

BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG	APPD
BY:							
BY:							
BY:							
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08868	SDH	--	--	--

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
WING WALL PLANS.
SECTIONS & DETAILS

STA. 3 POWERTON

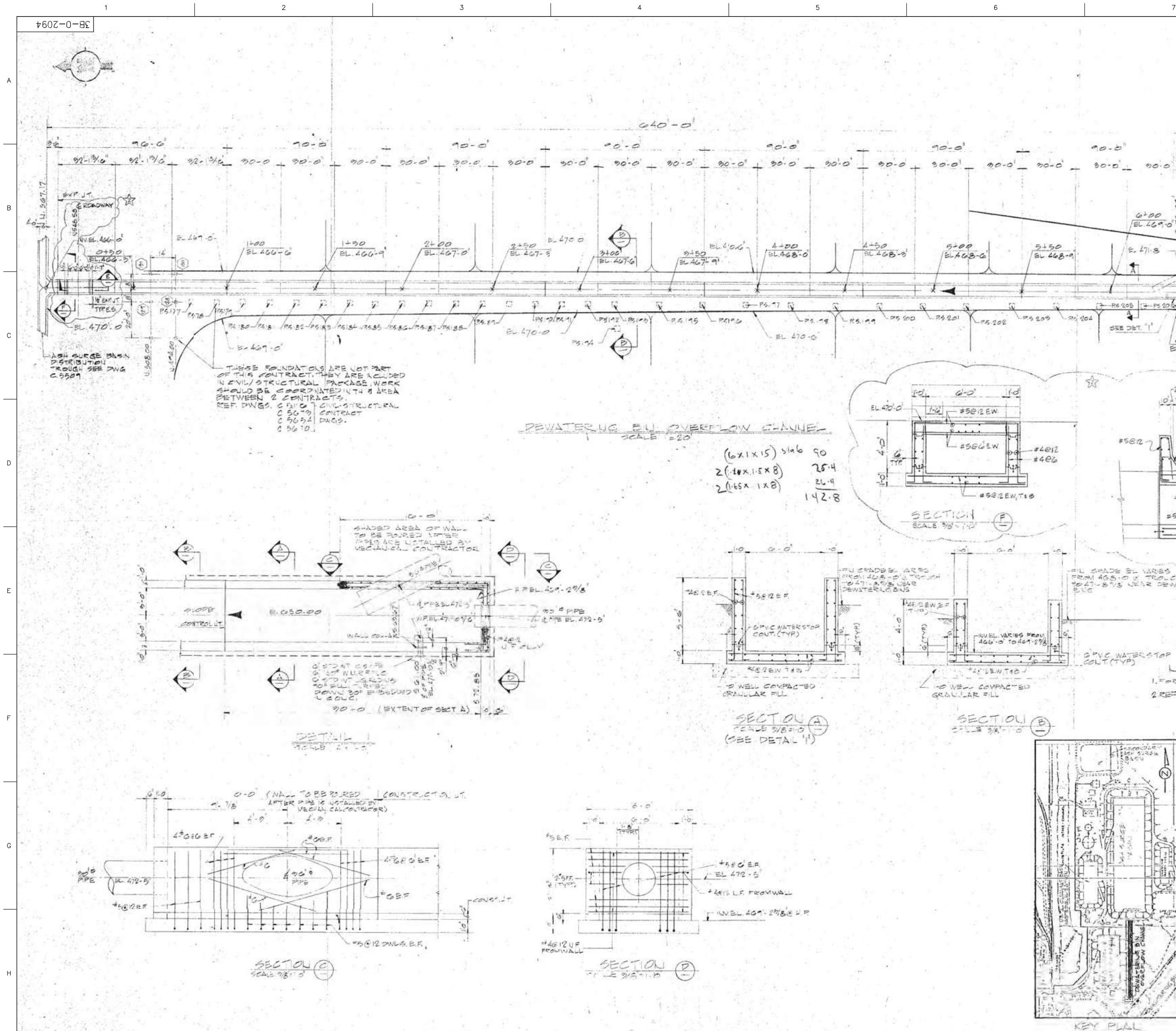
MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE	AS SHOWN	DC -
DATE	03-06-03	SC -

3B-0-2093

RCAD 3B-0-2093_A.TIF J. L. MEECE ENG. 03-06-03

3B-0-2094



STICK

FB 27

DRAWING STATUS

APPROVED FOR CONSTRUCTION

Date 7/11/79

REDRAWN FROM NUS DWG. #5080 C 5511 1 OF 1, REV. 2, DTD. 7-17-78

BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG/APPD
BY:						/
BY:						/
BY:						/
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--/--

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
DEWATERING BIN OVERFLOW CHANNEL
SECTIONS & DETAILS

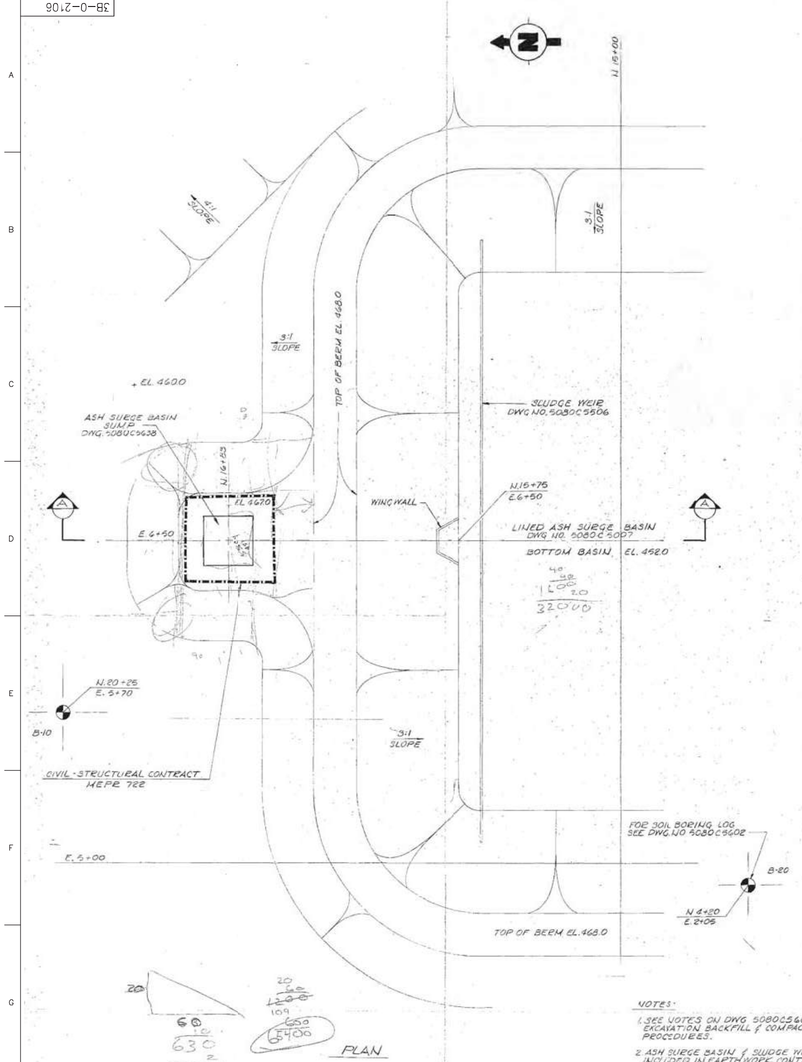
STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE	AS SHOWN	DC	–
DATE	03-06-03	SC	–

3B-0-2094

RCAD 3B-0-2094_A.TIF J. L. MEECE ENG. 03-06-03



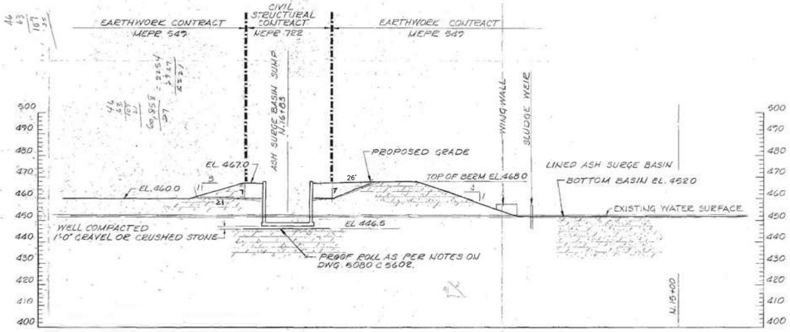
PLAN

SOIL BORING

B-10

ELEV	DESCRIPTION	DEPTH	SAMPLE	N	Qu	W	REMARKS
460.6	SURFACE						
	Brown, fine to coarse, silty SAND, some cinders, FILL		1 AU		-	9	
458.6	Very stiff brown silty CLAY some fine to coarse sand and gravel, FILL		2-SS	19	2 7	13	
455.6	Black fine to coarse SAND some gravel and cinders, FILL	5	3-ST			12	γd=126 pcf
			4-SS	34		8	
451.1	Very stiff gray silty CLAY, some cinders FILL	10	5-SS	17	2 0	14	
448.6	Black cinders (fine to coarse sand size), FILL		6-SS	16		16	
		15	7-SS	7		26	
440.1	Soft gray silty CLAY to CLAY	20	8-SS	5	0 7*	37	
437.1	Stiff to very stiff gray silty CLAY to CLAY trace fine to coarse sand and gravel	25	9-SS	6	1 0*	40	
		30	10-SS	12	3 2	16	LL=35 PI=21
426.6	Medium light brown, fine to coarse silty SAND and GRAVEL	35	11-SS	18	-	11	
424.6	End of Boring	40					

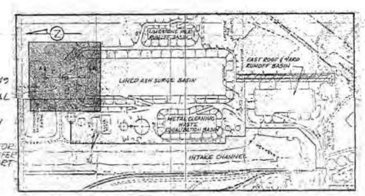
Penetrometer Value, TSF



SECTION A

NOTES:

1. SEE NOTES ON DWG 5080C5602 FOR EXCAVATION BACKFILL & COMPACTION PROCEDURES.
2. ASH SURGE BASIN & SLUDGE WEIR IS INCLUDED IN EARTHWORK CONTRACT MEPE549 WORK TO BE COORDINATED BETWEEN EARTHWORK CONTRACT & CIVIL-STRUCTURAL CONTRACT.
3. SOIL BORING DATA B-10 IS FURNISHED BY A&H ENGINEERING COMPANY, DOWNERS GROVE, CHICAGO, ILL AS A PART OF THEIR SOIL INVESTIGATION WORK THIS DATA IS SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR. REFER SOIL INVESTIGATION REPORT FOR DETAIL REPORT



KEY PLAN

DRAWING STATUS

Date 6/13/78

REDRAWN FROM NUS DWG. #5080 C 5586 1 OF 1, REV. 1, DTD. 6-13-78

BY:	REV	DATE	REVISION	BY	CKD	ENG/APPD
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #508866	SDH	--	--/--

BY: (FIRM MAKING REVISIONS)

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
ASH SURGE BASIN
SUMP – SOIL PROFILE

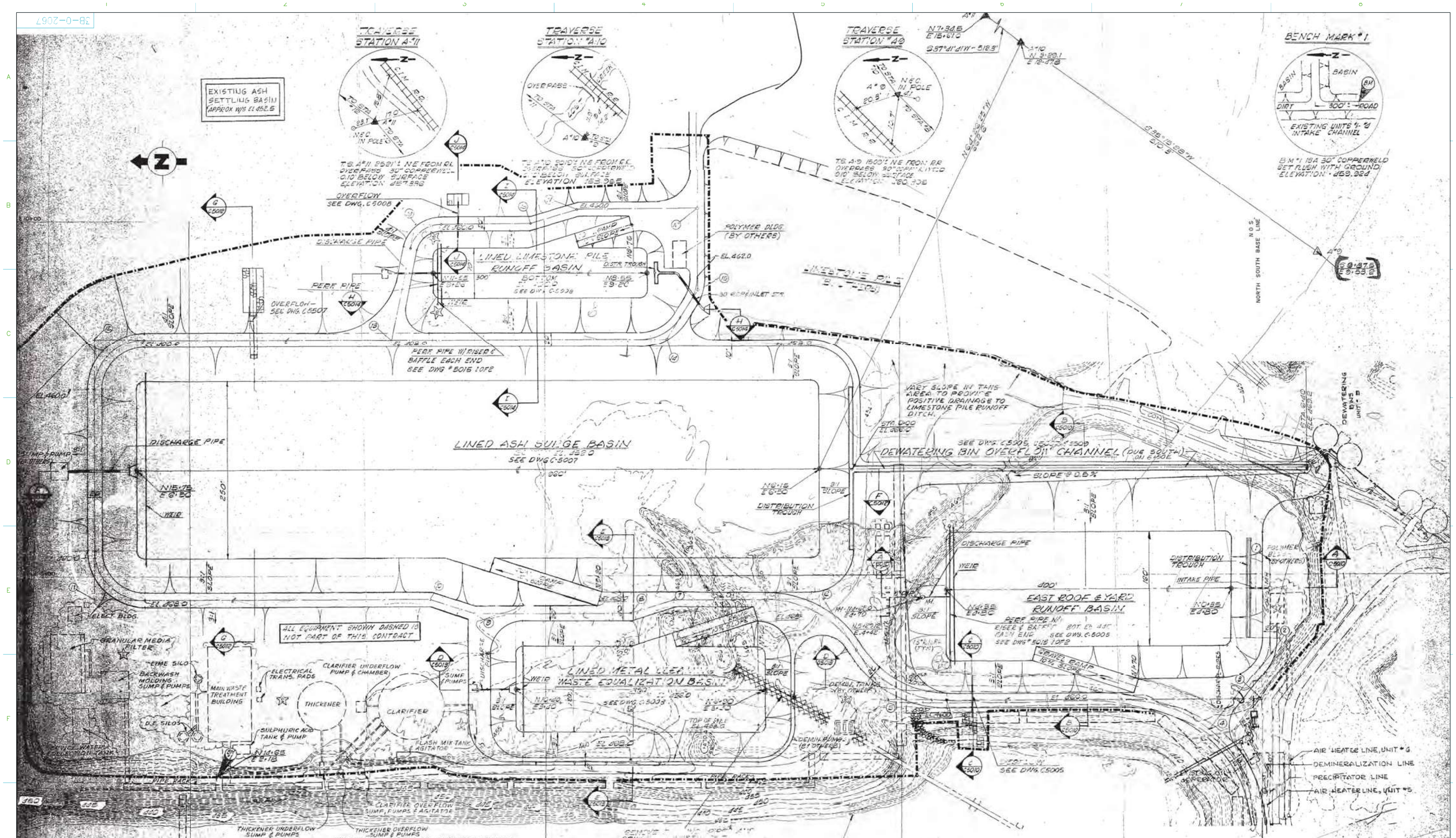
STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE 1"=20' DC –
DATE 03-06-03 SC –

3B-0-2106

RCAD 3B-0-2106_A.TIF J. L. MEECE ENG. 03-06-03



NOTES:

1. FOR GENERAL NOTES SEE DWG. C5001
2. PROVIDE 3:1 SLOPE TO MEET EXISTING GRADE, UNLESS OTHERWISE NOTED ON DWGS.
3. FOR ROAD & RAMP SECTIONS SEE DWG. C5015, SHT. 1 OF 2.

LAYOUT CONTROL FOR ROADS

NO.	N-S	E-W	RADIUS	TANS
1	S 0+20	E5+20	—	—
2	S 0+20	E3+86	68'	24'
3	S0+00	E3+25	200'	200'
4	N0+63	E2+81	—	—
5	N 5+18	E3+25	150'	62.3'
6	N 6+07	E4+67	150'	62.3'
7	N 8+88	E4+67	—	—
8	N8+00	E6+46	—	—
9	N11+00	E4+46	100'	15'
10	N11+67	E4+67	100'	16'
11	N12+33	E4+67	68'	68'
12	N12+33	E6+33	68'	68'
13	N12+3	E6+33	—	—
14	N3+07	E3+33	38'	57.7'
15	N7+35	E3+10	68'	18.5'
16	[illegible]	[illegible]	—	—
17	N3+35	E5+05	100'	15'
18	[illegible]	[illegible]	100'	12'
19	N11+82	E3+85	45'	37'

APPROVED FOR CONSTRUCTION 12-19-78

REDRAWN FROM NUS DWG. #5080 C 5002 1 OF 1, REV. 2, DTD. 12-19-78

BY	REV	DATE	REVISION	BY	CKD	ENG	APPD
BY:							
BY:							
BY:							
BY: J. L. MEECE ENGINEERING	A	03-06-03	CREATED DRAWING FROM SCAN WO #S08866	SDH	--	--	--
BY: (FIRM MAKING REVISIONS)	REV	DATE	REVISION	BY	CKD	ENG	APPD

DRAFTING SERVICES ONLY

PROVIDED BY J. L. MEECE ENGINEERING

(SEAL)

WASTE WATER TREATMENT FACILITY
SITE PLAN
EAST ROOF & YARD RUNOFF BASIN

STA. 3 POWERTON

MIDWEST GENERATION
An EDISON INTERNATIONAL Company

SCALE 1"=50' DC –
DATE 03-06-03 SC –

3B-0-2067

RCAD 3B-0-2067_A.TIF J. L. MEECE ENG. 03-06-

ATTACHMENT 2-2

2013 LINER REPLACEMENT DRAWINGS

DRAWING NO.	TITLE
D21132TS-03	TITLE SHEET
D21132C010-03	PRE-CONSTRUCTION SITE CONDITIONS
D21132C020-03	LINER SUBGRADE PREPARATION
D21132C021-00	GEOMEMBRANE PANEL LAYOUT
D21132C030-03	WARNING LAYER PLAN
D21132C031-03	DETAILS AND SECTIONS
D21132C032-04	DETAILS AND SECTIONS

ASH SURGE BASIN LINER REPLACEMENT
MIDWEST GENERATION
POWERTON GENERATING STATION
PEKIN, ILLINOIS

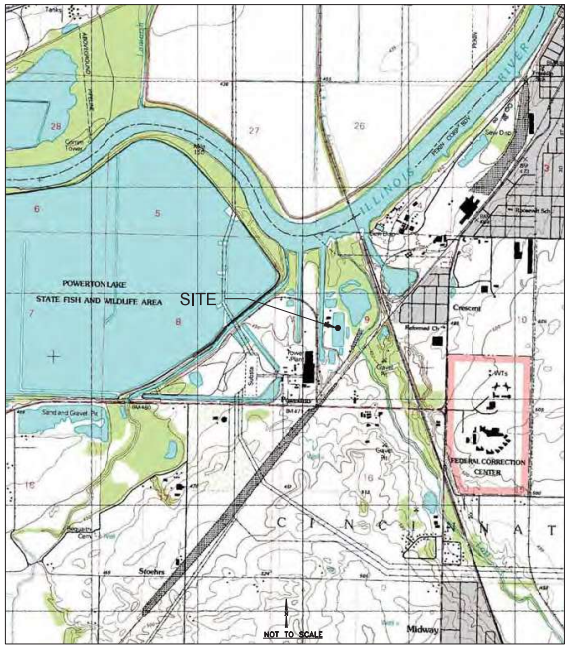
LIST OF DRAWINGS

SHEET NO.	TITLE	DRAWING NO.
TS	TITLE SHEET	D21132TS-03
C010	PRE-CONSTRUCTION SITE CONDITIONS	D21132C010-03
C020	LINER SUBGRADE PREPARATION	D21132C020-03
C021	GEOMEMBRANE PANEL LAYOUT	D21132C021-00
C030	WARNING LAYER PLAN	D21132C030-03
C031	DETAILS AND SECTIONS	D21132C031-03
C032	DETAILS AND SECTIONS	D21132C032-03

RECORD DRAWING LEGEND

~~PROPOSED~~	CROSSED OUT TEXT INDICATES CHANGES FROM THE FINAL DESIGN TO RECORD CONSTRUCTION
PRE-CONSTRUCTION	UNDERLINED TEXT INDICATES ADDED NOTES OR COMMENTS, AND DOCUMENTS CHANGES FROM THE FINAL DESIGN TO RECORD CONSTRUCTION
	"CLOUDS" DOCUMENT ADDITIONS AND/OR CHANGES FROM THE FINAL DESIGN TO RECORD CONSTRUCTION
	"CROSS OUTS" DOCUMENT OBJECTS REMOVED FROM THE FINAL DESIGN TO RECORD CONSTRUCTION

ILLINOIS



SITE LOCATION

PREPARED FOR:
MIDWEST GENERATION, LLC
13082 EAST MANITO RAOD
PEKIN, IL 61554

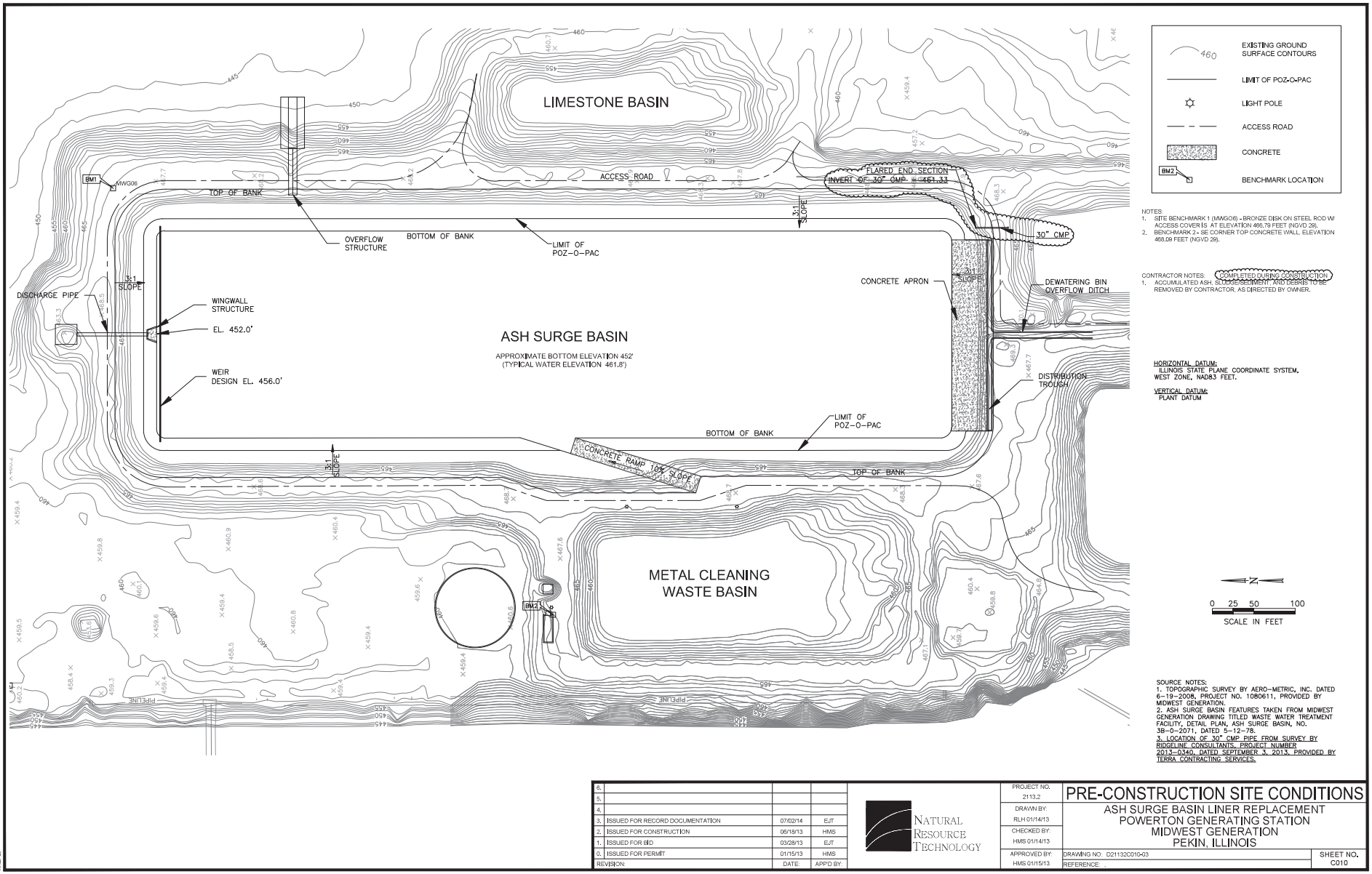
JULY 2014

NO.	REVISION:	DATE:	APP'D BY:
6.			
5.			
4.			
3.	ISSUED FOR RECORD DOCUMENTATION	07/02/14	EJT
2.	ISSUED FOR CONSTRUCTION	06/25/13	HMS
1.	ISSUED FOR BID	03/28/13	EJT
0.	ISSUED FOR PERMIT	01/15/13	HMS

TITLE SHEET
ASH SURGE BASIN LINER REPLACEMENT DOCUMENTATION
MIDWEST GENERATION
POWERTON GENERATING STATION
PEKIN, ILLINOIS

PROJECT NO. 2113.02POWERBD
DRAWN BY: RLH 01/14/13
CHECKED BY: HMS 01/14/13
APPROVED BY: HMS 01/15/13
DRAWING NO. D21132TS-03
REFERENCE:
SHEET NO. TS

NATURAL RESOURCE TECHNOLOGY



NOTES:
1. SITE BENCHMARK 1 (MWG06) - BRONZE DISK ON STEEL ROD W/ ACCESS COVER IS AT ELEVATION 466.79 FEET (NGVD 29).
2. BENCHMARK 2 - SE CORNER TOP CONCRETE WALL, ELEVATION 468.09 FEET (NGVD 29).

CONTRACTOR NOTES: (COMPLETED DURING CONSTRUCTION)
1. ACCUMULATED ASH, SLUDGE/SEDIMENT, AND DEBRIS TO BE REMOVED BY CONTRACTOR, AS DIRECTED BY OWNER.

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83 FEET.

VERTICAL DATUM:
PLANT DATUM

N

0 25 50 100
SCALE IN FEET

SOURCE NOTES:
1. TOPOGRAPHIC SURVEY BY AERO-METRIC, INC. DATED 6-19-2008, PROJECT NO. 1080611, PROVIDED BY MIDWEST GENERATION.
2. ASH SURGE BASIN FEATURES TAKEN FROM MIDWEST GENERATION DRAWING TITLED WASTE WATER TREATMENT FACILITY, DETAIL PLAN, ASH SURGE BASIN, NO. 3B-0-2071, DATED 5-12-78.
3. LOCATION OF 30" CMP PIPE FROM SURVEY BY RIDGELINE CONSULTANTS, PROJECT NUMBER 2013-0340, DATED SEPTEMBER 3, 2013, PROVIDED BY TERRA CONTRACTING SERVICES.

REVISION:	DATE:	APPD BY:
6.		
5.		
4.		
3. ISSUED FOR RECORD DOCUMENTATION	07/02/14	EJT
2. ISSUED FOR CONSTRUCTION	06/18/13	HMS
1. ISSUED FOR BID	03/28/13	EJT
0. ISSUED FOR PERMIT	01/15/13	HMS

NATURAL RESOURCE TECHNOLOGY

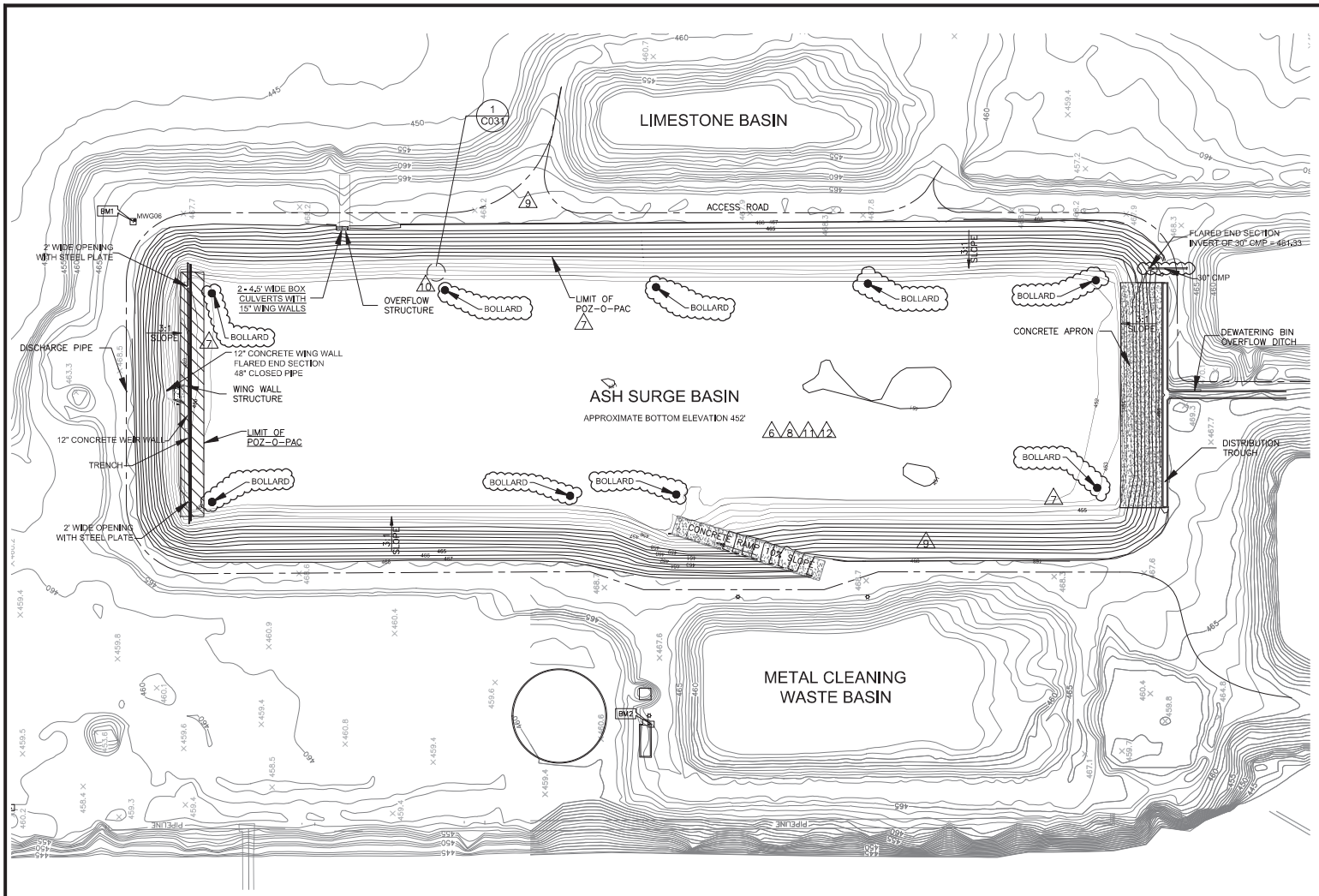
PROJECT NO.	2113.2
DRAWN BY:	RLH 01/14/13
CHECKED BY:	HMS 01/14/13
APPROVED BY:	HMS 01/15/13

PRE-CONSTRUCTION SITE CONDITIONS

ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS

DRAWING NO: D21132C010-03
REFERENCE: .

SHEET NO. C010



EXISTING PREVIOUS GROUND SURFACE CONTOURS
SUBGRADE SURFACE CONTOUR
LIMIT OF POZ-O-PAC
LIGHT POLE
ACCESS ROAD
MARKER POST LOCATION
POZ-O-PAC REMOVAL AREA
CONCRETE
BENCHMARK LOCATION

NOTES:
1. SITE BENCHMARK 1 (MWG06) - BRONZE DISK ON STEEL ROD W/ ACCESS COVER IS AT ELEVATION 466.79 FEET (NGVD 29).
2. BENCHMARK 2 - SE CORNER TOP CONCRETE WALL, ELEVATION 488.09 FEET (NGVD 29).

CONTRACTOR NOTES: △ COMPLETED DURING CONSTRUCTION

1. CONTRACTOR SHALL FIELD VERIFY LOCATION OF UNDERGROUND PIPES WITH ASSISTANCE OF OWNER'S UTILITY LOCATOR.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION OF CONCRETE APRON, CONCRETE STRUCTURES, AND ABOVE GROUND PIPING.
3. CLEAR AND GRUB ALL BRUSH ALONG TOP OF SLOPE OF BASIN.
4. CONTRACTOR SHALL STORE ALL GEOSYNTHETICS AND SUBGRADE MATERIALS IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
5. CONTRACTOR SHALL STORE AND STAGE EQUIPMENT AT LOCATION APPROVED BY OWNER.
6. PROTECT ALL CONCRETE AND UTILITY STRUCTURES THROUGHOUT PROJECT DURATION.
7. ~~REMOVE EXISTING 12-INCH POZ-O-PAC LAYER ALONG SIDE SLOPES.~~ POZ-O-PAC LAYER AT BASE OF BASIN TO REMAIN IN PLACE, EXCEPT NORTH OF WEIR AND 20 FOOT SECTION SOUTH OF WEIR, AS SHOWN. CONTRACTOR SHALL REMOVE AN ADDITIONAL 6 INCHES OF SUBGRADE MATERIAL LOCATED BETWEEN THE WEIR AND THE WING WALL STRUCTURE ALONG THE NORTH TOE OF SLOPE, AS SHOWN ON SHEET C032. REMOVE AT LEAST 18 INCHES OF POZ-O-PAC LAYER AND SUBGRADE MATERIAL AT BASE OF WEIR TO THE SOUTH AND GRADE AT A ~~1%~~ 7.5% SLOPE. REFER TO SHEET C032.
8. CONTRACTOR SHALL REMOVE ALL VEGETATION, ROCKS, AND OTHER DEBRIS FROM EXISTING LINER AND DISPOSE OF IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
9. CONTRACTOR SHALL RESHAPE SIDE SLOPES AS NECESSARY TO MAINTAIN 3:1 SIDE SLOPES, AND REMOVE "SOFT" SUBGRADE MATERIAL AS DIRECTED BY OWNER AND/OR ENGINEER. BACKFILL AREAS WITH FILL IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. EXISTING HYPALON GEOMEMBRANE MAY REMAIN IN PLACE ALONG THE SIDE SLOPES, EXCEPT IN SOFT OR LOW/HIGH (RELATIVE TO GEOMEMBRANE SUBGRADE) AREAS, AS DIRECTED BY ENGINEER AND/OR OWNER.
10. CONTRACTOR SHALL INSTALL MARKER POSTS ALONG THE TOE OF SLOPE AS SHOWN AND IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND DETAIL 1 ON SHEET C031.
11. SUBGRADE MUST BE APPROVED BY OWNER AND/OR ENGINEER PRIOR TO INSTALLATION OF GEOMEMBRANE.
12. CONTRACTOR SHALL PROVIDE MEANS TO PROTECT SUBGRADE LAYER FROM EROSION, STORM WATER, AND HEAVY EQUIPMENT TRAFFIC. DAMAGE TO SUBGRADE LAYER SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83 FEET.

VERTICAL DATUM:
PLANT DATUM

N

0 25 50 100
SCALE IN FEET

SOURCE NOTES:
1. TOPOGRAPHIC SURVEY BY AERO-METRIC, INC. DATED 6-19-2008, PROJECT NO. 1080611, PROVIDED BY MIDWEST GENERATION.
2. ASH SURGE BASIN FEATURES TAKEN FROM MIDWEST GENERATION DRAWING TITLED WASTE WATER TREATMENT FACILITY, DETAIL PLAN, ASH SURGE BASIN, NO. 3B-0-2071, DATED 5-12-78.
3. SUBGRADE CONTOURS AND FEATURE LOCATIONS FROM SURVEY BY RIDGELINE CONSULTANTS, PROJECT NUMBER 2013-0340, DATED SEPTEMBER 3, 2013, PROVIDED BY TERRA CONTRACTING SERVICES.

REVISION:	DATE:	APPD BY:
6.		
5.		
4.		
3. ISSUED FOR RECORD DOCUMENTATION	07/18/14	EJT
2. ISSUED FOR CONSTRUCTION	06/18/13	HMS
1. ISSUED FOR BID	03/28/13	EJT
0. ISSUED FOR PERMIT	01/15/13	HMS

NATURAL RESOURCE TECHNOLOGY

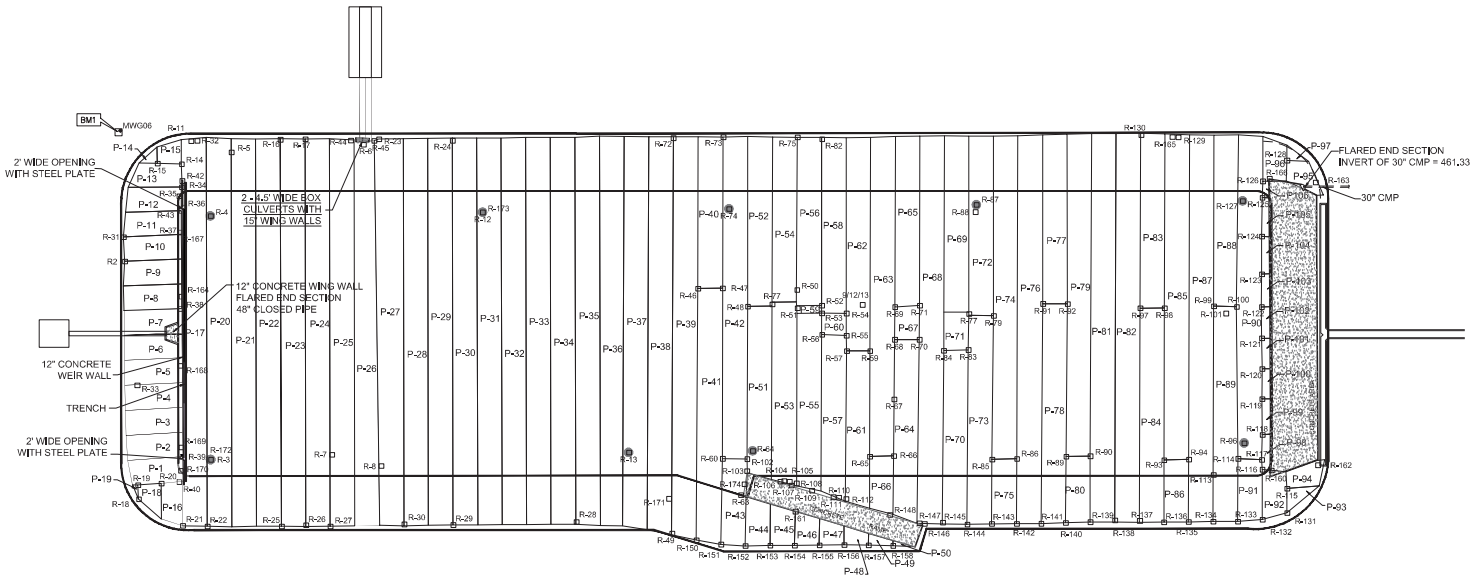
PROJECT NO. 2113.2
DRAWN BY: RLH 01/14/13
CHECKED BY: HMS 01/14/13
APPROVED BY: HMS 01/15/13

LINER SUBGRADE PREPARATION

ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS

DRAWING NO: D2113200020-03
REFERENCE: .
SHEET NO. C020

Jul 18, 2014 - 12:27pm PLOTTED BY: ddodo SAVED BY: ddodo
Y:\ACADdata\Projects\21\2113\2132_Powerton\ASH SURGE BASIN\RECORD DWGS\Record 070214\D2113200020-03.dwg C020
IMAGES:
XREFS:



GEOMEMBRANE PANEL SEAM

P23 GEOMEMBRANE PANEL AND PANEL NUMBER

R87 GEOMEMBRANE REPAIR LOCATION (NOT TO SCALE)

BM2 BENCHMARK LOCATION

MARKER POST LOCATION

NOTES:
1. SITE BENCHMARK 1 (MWG06) - BRONZE DISK ON STEEL ROD W/ ACCESS COVER IS AT ELEVATION 466.70 FEET (NGVD 29).
2. BENCHMARK 2 - SE CORNER TOP CONCRETE WALL, ELEVATION 468.09 FEET (NGVD 29).

N

0 25 50 100

SCALE IN FEET

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83 FEET.

VERTICAL DATUM:
PLANT DATUM

SOURCE NOTES:

1. THIS DRAWING WAS DEVELOPED FROM SURVEY DATA BY RIDGELINE CONSULTANTS, PROJECT NUMBER 2013-0340, DATED SEPTEMBER 3, 2013, PROVIDED BY TERRA CONTRACTING SERVICES.

REVISION:	DATE:	APPD BY:
0. ISSUED FOR RECORD DOCUMENTATION	07/17/14	EJT
1.		
2.		
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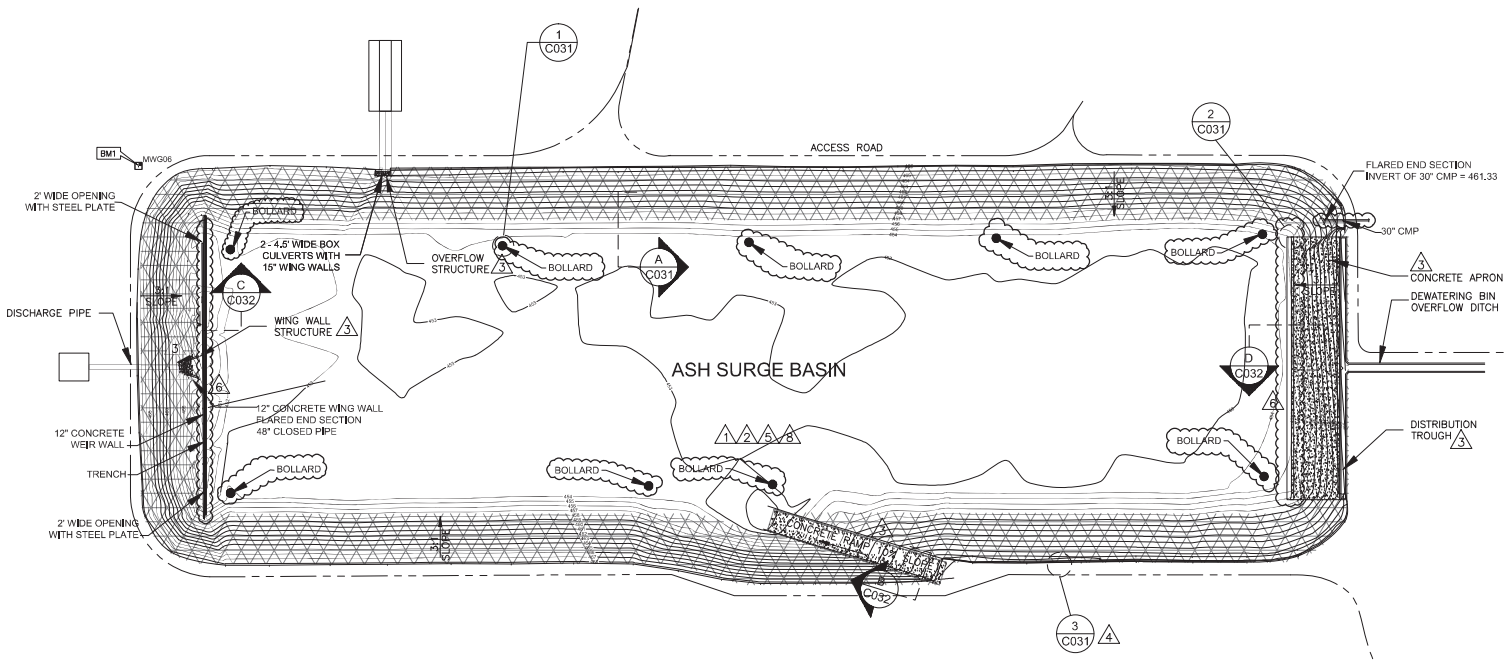
6.		

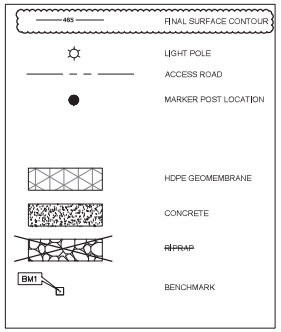
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.	2113.2
DRAWN BY:	RLH 03/06/14
CHECKED BY:	JRR 03/06/14
APPROVED BY:	EJT 07/17/14
DRAWING NO:	D21132C021-00
REFERENCE:	.
SHEET NO.	C021

GEOMEMBRANE PANEL LAYOUT

ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS





CONTRACTOR NOTES: △ COMPLETED DURING CONSTRUCTION

1. CONTRACTOR SHALL PLACE 15-OZ. NON-WOVEN GEOTEXTILE OVER THE SUBGRADE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS
2. CONTRACTOR SHALL INSTALL 60 MIL HDPE, WHITE, TEXTURED GEOMEMBRANE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION PRIOR TO PLACEMENT OF THE WARNING LAYER. CONTRACTOR SHALL PROVIDE AND FOLLOW AN APPROVED GEOMEMBRANE LAYOUT PLAN.
3. CONTRACTOR SHALL ATTACH GEOMEMBRANE TO STRUCTURES, CONCRETE RAMP, AND APRON, IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION AND DETAILS ON SHEET C031 AND C032.
4. GEOMEMBRANE SHALL BE ANCHORED INTO 2.5 FEET DEEP TRENCHES ALONG TOP OF BANK, AS SHOWN IN DETAIL 3 ON SHEET C031. CONTRACTOR SHALL ADVISE OWNER AND/OR ENGINEER IF PROPOSED LOCATION FOR ANCHOR TRENCH IS NOT FEASIBLE.
5. CONTRACTOR SHALL PLACE 15-OZ. NON-WOVEN GEOTEXTILE, CUSHION MATERIAL AND WARNING LAYER MATERIAL OVER THE GEOMEMBRANE AT BASE AND 4 FEET ON SIDE SLOPES (SEE SECTION A SHEET C031), FOLLOWING ENGINEER APPROVAL AND PASSING QUALITY CONTROL RESULTS IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
6. CONTRACTOR SHALL PLACE AN 18-INCH LAYER OF ~~4 TO 12-INCH DIAMETER RIPRAP~~ WARNING LAYER MATERIAL BETWEEN WEIR AND WING WALL STRUCTURE ALONG THE NORTH TOE OF SLOPE AND AT TOE OF CONCRETE APRON AS DIRECTED BY ENGINEER. REFER TO DETAILS ON SHEET C032.
7. CONTRACTOR SHALL PROVIDE SURVEY DOCUMENTATION OF THE ITEMS LISTED IN THE TECHNICAL SPECIFICATIONS.
8. CONTRACTOR SHALL PERFORM A LEAK LOCATION SURVEY IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
9. RESTORE AREAS DISTURBED BY EQUIPMENT AND MATERIAL LAYDOWN.

HORIZONTAL DATUM:
ILLINOIS STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD83 FEET.

VERTICAL DATUM:
PLANT DATUM

N

0 25 50 100
SCALE IN FEET

SOURCE NOTES:
1. TOPOGRAPHIC SURVEY BY AERO-METRIC, INC. DATED 6-19-2008, PROJECT NO. 1080611, PROVIDED BY MIDWEST GENERATION.
2. ASH SURGE BASIN FEATURES TAKEN FROM MIDWEST GENERATION DRAWING TITLED WASTE WATER TREATMENT FACILITY, DETAIL PLAN, ASH SURGE BASIN, NO. 3B-0-2071, DATED 5-12-78.
3. FINAL SURFACE CONTOURS AND FEATURE LOCATIONS FROM SURVEY BY RIDGELINE CONSULTANTS, PROJECT NUMBER 2013-0340, DATED OCTOBER 8, 2013, PROVIDED BY TERRA CONTRACTING SERVICES.

REVISION:	DATE:	APPD BY:
6.		
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3. ISSUED FOR RECORD DOCUMENTATION	07/18/14	EJT
2. ISSUED FOR CONSTRUCTION	06/18/13	HMS
1. ISSUED FOR BID	03/28/13	EJT
0. ISSUED FOR PERMIT	01/15/13	HMS

NATURAL RESOURCE TECHNOLOGY

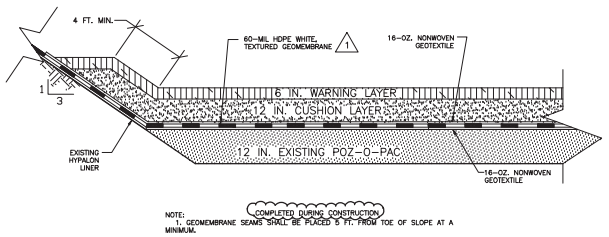
PROJECT NO.	2113.2/POWER/CON
DRAWN BY:	RLH 01/15/13
CHECKED BY:	HMS 01/15/13
APPROVED BY:	HMS 01/16/13

WARNING LAYER PLAN

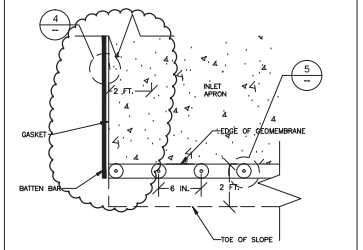
ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS

DRAWING NO: D2113ZC030-03
REFERENCE: .

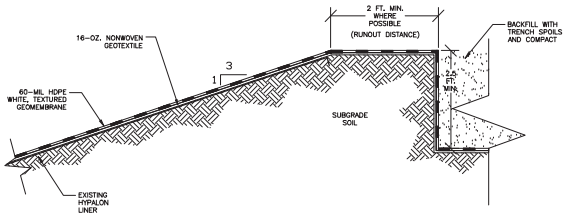
SHEET NO. C030



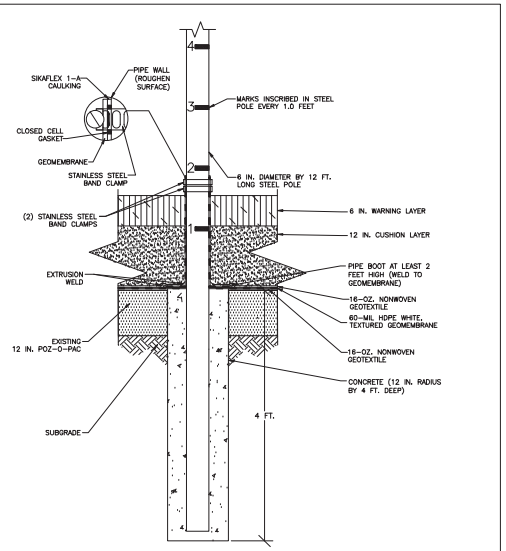
A / C030 SLOPE TRANSITION SECTION
NOT TO SCALE



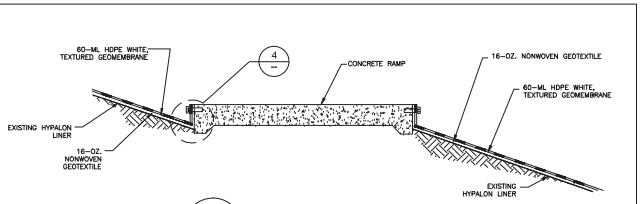
2 / C030 INLET APRON DETAIL PLAN
NOT TO SCALE



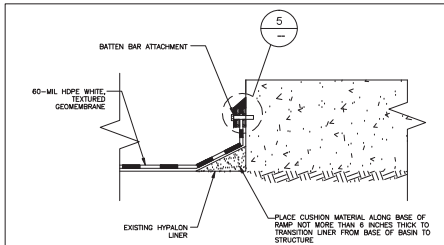
3 / C030 ANCHOR TRENCH DETAIL
NOT TO SCALE



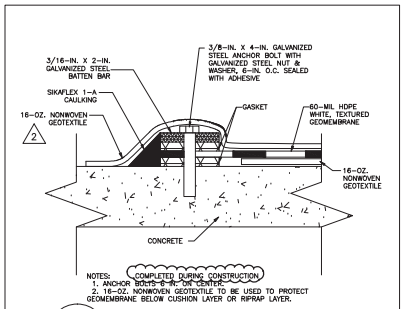
1 / C020 C030 MARKER POST DETAIL
NOT TO SCALE



B / C030 CONCRETE RAMP SECTION
NOT TO SCALE



4 / -- VERTICAL CONNECTION DETAIL
NOT TO SCALE



5 / --- BATTEN BAR ATTACHMENT
NOT TO SCALE

6.			
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3.	ISSUED FOR RECORD DOCUMENTATION	07/17/14	EJT
2.	ISSUED FOR CONSTRUCTION	06/25/13	HMS
1.	ISSUED FOR BID	03/28/13	EJT
0.	ISSUED FOR PERMIT	01/15/13	HMS
REVISION:		DATE:	APPD BY:

NATURAL RESOURCE TECHNOLOGY

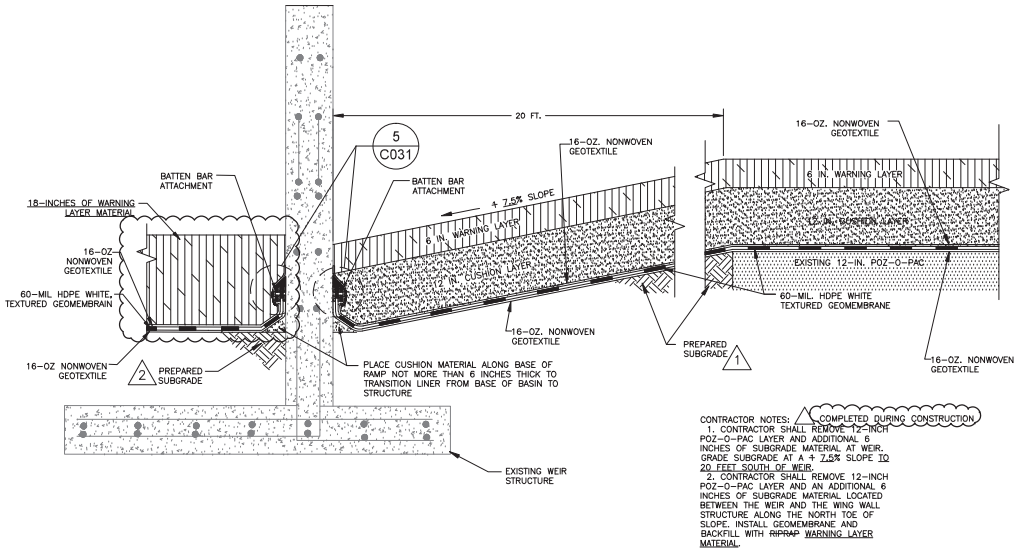
PROJECT NO.	2113.2/POWER/CON
DRAWN BY:	RLH 01/14/13
CHECKED BY:	HMS 01/14/13
APPROVED BY:	HMS 01/15/13

DETAILS AND SECTIONS

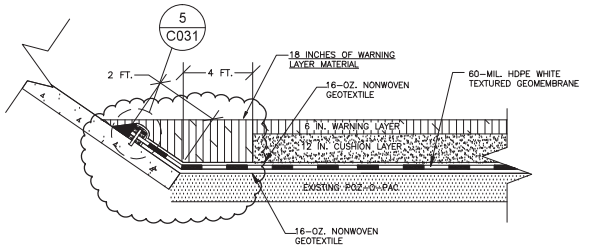
ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS

DRAWING NO: D21132C031-03
REFERENCE: .

SHEET NO. C031



C / C030 CONCRETE WEIR SECTION
NOT TO SCALE



D / C030 INLET APRON SECTION
NOT TO SCALE

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3.	ISSUED FOR RECORD DOCUMENTATION	07/17/14	EJT
2.	ISSUED FOR CONSTRUCTION	06/25/13	HMS
1.	ISSUED FOR BID	03/28/13	EJT
0.	ISSUED FOR PERMIT	01/15/13	HMS
REVISION:		DATE:	APP'D BY:

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.	2113.2/POWER/CON
DRAWN BY:	RLH 01/14/13
CHECKED BY:	HMS 01/14/13
APPROVED BY:	HMS 01/15/13

DETAILS AND SECTIONS

ASH SURGE BASIN LINER REPLACEMENT
POWERTON GENERATING STATION
MIDWEST GENERATION
PEKIN, ILLINOIS

DRAWING NO: D2113C032-04
REFERENCE: .

SHEET NO. C032

ATTACHMENT 3

2016 STRUCTURAL STABILITY & FACTOR OF SAFETY ASSESSMENT

Geosyntec consultants

16644 West Bernardo Drive, Suite 301
San Diego, CA 92127
Phone: 858.674.6559
Fax: 858.674.6586
www.geosyntec.com

STRUCTURAL STABILITY AND FACTOR OF SAFETY ASSESSMENT
ASH SURGE BASIN AND BYPASS BASIN
POWERTON STATION
OCTOBER 2016

This report presents documentation of the initial periodic structural stability and initial safety factor assessments for the Ash Surge Basin and Bypass Basins (the Basins) at the Powerton Station (Site) in Pekin, Illinois (Figure 1). This report addresses the initial structural stability and safety factor assessment requirements of the Coal Combustion Residuals (CCR) regulations, Code of Federal Regulations Title 40, Part 257, Subpart D (referred to as the CCR Rule). These regulations were published in the Federal Register on 17 April 2015 and became effective on 19 October 2015. The Powerton Station is owned and operated by Midwest Generation, LLC (Midwest Generation). Based on the results provided in this report, the Ash Surge Basin and Bypass Basin meet the requirements of §257.73(d) and §257.73(e) of the CCR Rule.

The work presented in this report was performed under the direction of Ms. Jane Soule, P.E., of Geosyntec Consultants Inc. (Geosyntec) in accordance with §257.73(d) and §257.73(e). Mr. Robert White reviewed this report in accordance with Geosyntec's senior review policy.

1. Regulation Requirements - §257.73

Structural integrity criteria for existing CCR impoundments is described in §257.73 and includes structural stability and factor of safety assessments. The Ash Surge Basin and Bypass Basin meet the minimum size and capacity criteria under §257.73(b) and are subject to the structural stability and safety factor assessments required.

2. Site Conditions

The Ash Surge Basin is located east of the Main Wastewater Building, the cylindrical concrete clarifier and thickener structures, and the Metal Cleaning Basin, west of the inactive Limestone Basin, north of the Bypass Basin and East Roof and Yard Runoff (ERYR) Basin. The Ash Surge Basin is approximately 1,050 feet by 335 feet in plan dimensions (total plan area of approximately 8.1 acres). The surface impoundment is surrounded by a paved and a gravel perimeter access road around the western and eastern half of the impoundment, respectively.

The Bypass Basin is located east of the ERYR Basin and south of the southeast corner of the Ash Surge Basin. The Bypass Basin is approximately 160 feet by 255 feet in plan dimensions (total plan area of approximately 0.9 acres). A gravel perimeter access road is located along the northern and eastern boundaries of the Bypass Basin. A concrete-lined dewatering bin overflow

channel is located along the crest of the berm between the Bypass Basin and the ERYR Basin. A temporary construction staging area is located south of the surface impoundment.

The Ash Surge Basin and the Bypass Basin are both lined with a 60-mil high density polyethylene (HDPE) geomembrane.

Based on available documentation and discussions with site personnel, the Basins, in their current configuration, were constructed in the late 1970s and early 1980s. A history of construction for the basins was prepared in accordance with §257.73(c) and describes the design of the basins and their construction (Geosyntec, 2016a).

3. Structural Stability Assessment

The following subsections address the components of §257.73(d)(1).

3.1 Foundations and Abutments – §257.73(d)(1)(i)

The Ash Surge Basin and the Bypass Basin consist of embankments on all sides. Because no formational materials provide lateral structural support for the embankments, the Basins do not include abutments. The remainder of this section addresses the foundation materials for the Basins.

Previous subsurface investigations performed at the Site indicate foundation materials underlying the embankments for the Ash Surge Basin and Bypass Basin generally consists of approximately 17 to 28 feet of fat and lean clay overlying approximately 35 to 40 feet of loose to very dense poorly graded sand and silty sand with some gravel associated with the Henry Formation (Geosyntec, 2016b).

Elastic settlement of the clay and sand layers underlying the embankments likely occurred very soon after construction in the late 1970s and early 1980s. Because of the age of the embankments (approximately 35 years old), the majority of consolidation and secondary compression settlement of the clay layer has likely already occurred. The initial annual inspection performed for the Basins in accordance with §257.83(b) did not identify any adverse effects on the Basins or their appurtenant structures resulting from settlement that may have occurred since construction (Geosyntec, 2016c). There are no proposed changes in operation which would increase loading conditions on the foundation materials; therefore, no significant settlement of the foundation materials underlying the embankments is anticipated to occur in the future. Further, the embankments of the Basins were not constructed with abutments or separate engineered zones that would be most susceptible to the adverse effects of differential settlement. Therefore, potential settlement of the foundation is not anticipated to impact the integrity of the impoundment embankments.

A factor of safety against the triggering of liquefaction was calculated for saturated foundation materials underlying the Ash Surge Basin and Bypass Basin embankments. The factor of safety was calculated based methods outlined in Idriss and Boulanger (2008) using information obtained from field explorations, including borings, Cone Penetration Test (CPT) soundings, laboratory data (Geosyntec, 2016b) and seismic data (Geosyntec, 2016g). Overall, the foundation materials underlying the Ash Surge Basin and Bypass Basin have a low susceptibility to liquefaction and liquefaction-induced strength loss (Geosyntec, 2016d).

3.2 Upstream Slope Protection – §257.73(d)(1)(ii)

The Ash Surge Basin and Bypass Basin are lined with a 60-mil HDPE geomembrane that protects the interior basin slopes from erosion, the effects of wave action, and mitigates potential effects of rapid drawdown.

3.3 Dike Compaction – §257.73(d)(1)(iii)

Documentation of as-built construction conditions for the Ash Surge Basin and Bypass Basin embankments was not available at the time of this report. Samples of embankment fill materials obtained during Geosyntec's geotechnical investigations at the Site indicate that the Ash Surge Basin embankments are compacted to relative densities on the order of 95 percent based on Standard Proctor testing (Geosyntec, 2016b). No quantitative evaluation of the degree of compaction of the embankments for the Bypass Basin was performed for the embankments in their current state. Slope stability analyses show that the embankments for the Ash Surge Basin and Bypass Basin are sufficient to withstand the range of loading conditions in the CCR units (Geosyntec, 2016e).

3.4 Downstream Slope Vegetation – §257.73(d)(1)(iv)

Downstream slopes of the Ash Surge Basin and Bypass Basin have erosion protection from either vegetation or geomembrane liners located on the interior slopes of adjacent basins.

3.5 Spillway – §257.73(d)(1)(v)

The Ash Surge Basin and the Bypass Basin both contain emergency spillway structures. A description of these structures and the design storm event identified for the Basins is included in the Inflow Design Flood Control System Plan (IDFCSP) prepared for the site in accordance with §257.82(c) (Geosyntec, 2016f). The IDFCSP identifies the design event for the Site as the 1,000 year flood. Because the Ash Surge Basin and Bypass Basin do not impound water from a natural stream and do not impound stormwater flows, except for direct precipitation that falls on the embankment crest or within the Basins, the IDFCSP identifies the design event as the 24-hour, 1,000-year precipitation event. When the operating freeboard for the Basins is taken

into account, the water levels in the Basins estimated after the design precipitation event are estimated to be lower than the invert elevations of the emergency spillways and no discharge from the Basins is anticipated (Geosyntec, 2016f). Therefore, the hydraulic capacity of the spillways was not calculated.

3.6 Structural Integrity of Hydraulic Structures – §257.73(d)(1)(vi)

Hydraulic structures passing through or beneath the embankments of the Bypass Basin and Ash Surge Basin consist of several pipes and conveyance structures associated with the inlet and outlet structures of the Basins. These structures and pipes were inspected periodically between 10 May 2016 and 24 May 2016 by a company specializing in video camera pipe inspections. The inspected structures and pipes related to the Basins included are presented on Figure 2. The video inspections did not identify significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that would negatively affect operation of the pipes was observed.

3.7 Downstream Slopes Adjacent to Water Bodies – §257.73(d)(1)(vii)

Ponds or water bodies near downstream slopes of the Ash Surge Basin and Bypass Basin are identified on Figure 3 and include:

- The Metal Cleaning Basin located west of the Ash Surge Basin. This basin is lined with an HDPE geomembrane.
- The ERYR Basin located west of the Bypass Basin and south of the Ash Surge Basin;
- The inactive Limestone Basin located east of the Ash Surge Basin; and
- The FAB located northeast of the Ash Surge Basin.

For stability analyses performed, a "low pool" condition where the modeled groundwater depth is lowered so there is little or no stabilizing force present on the downstream slope of the Ash Surge Basin or Bypass Basin embankments was evaluated for the water bodies presented above (Geosyntec, 2016e).

Stability during rapid drawdown was also evaluated for the embankments affected by the ERYR Basin and the FAB. Rapid drawdown was not evaluated for the embankments affected by the Metal Cleaning Basin because its HDPE geomembrane minimizes potential inundation of the slopes and mitigates effects of rapid drawdown. Similarly, embankments affected by the inactive Limestone Basin were not evaluated for rapid drawdown because the volume of water in this basin is anticipated to be minimal (inflow is limited to direct precipitation) and there is no outlet structure associated with this basin that could create a rapid drawdown condition for the adjacent Ash Surge Basin embankment.

Slope stability analyses show that the embankments are designed and constructed to maintain structural stability during "low pool" and rapid drawdown conditions (Geosyntec, 2016e).

3.8 Structural Stability Assessment Deficiencies - §257.73(d)(2)

No structural stability deficiencies associated with the Ash Surge Basin and Bypass Basin were identified in this initial structural stability assessment and no corrective measures are required.

3.9 Annual Inspection Requirement - §257.83(b)(4)(ii)

In accordance with §257.83(b)(4)(ii), submittal of this structural stability assessment precludes the requirement of an annual inspection under §257.83(b) for the Ash Surge Basin and Bypass Basin during the 2016 calendar year. One deficiency identified in the initial annual inspection (Geosyntec, 2016c) for the Bypass Basin was corrected as documented in the Notice of Remedy prepared in response to the initial annual inspection.

4. Safety Factor Assessment

This section describes the initial safety factor assessment for the Ash Surge Basin and Bypass Basin and the methodology used to perform the assessment in accordance with §257.73(e)(1). This assessment includes slope stability analyses of the critical embankment cross-section for each basin, shown in Figure 3.

4.1 Slope Stability Methodology

Limit equilibrium slope stability analyses were performed to evaluate the stability of the embankments for the Ash Surge Basin and Bypass Basin. The process involved performing two-dimensional analyses on the critical cross-section for each basin using Spencer's Method as coded in the computer program SLOPE/W (Version 8.15.4.11512, www.geoslope.com) which satisfies vertical and horizontal force equilibrium and moment equilibrium. For each cross section analyzed, the program searches for the sliding surface that produces the lowest factor of safety (FS). Factor of safety is defined as the ratio of the shear forces/moments resisting movement along a sliding surface to the forces/moments driving the instability.

Subsurface stratigraphy, groundwater conditions, and engineering parameters for the embankment and foundation materials were developed based on previous subsurface investigations performed at the Site (Geosyntec, 2016b and Geosyntec, 2016e).

4.2 Slope Stability Analyses

Four cases were analyzed to satisfy the safety factor assessment requirements in §257.73(e) (Geosyntec, 2016e).

4.2.1 Static, Long-Term Maximum Storage Pool Loading – §257.73(e)(1)(i)

Pursuant to §257.73(e)(1)(i) a static, long-term condition with the maximum operating pool loading on the embankments was evaluated. For the Ash Surge Basin and Bypass Basin, this condition included a pool elevation at 465 feet MSL[1] for the Ash Surge Basin and 465.5 feet MSL for the Bypass Basin, and a groundwater elevation of 451.8 feet MSL (Geosyntec, 2016e).

4.2.2 Static, Maximum Storage Pool Loading – §257.73(e)(1)(ii)

The conditions for §257.73(e)(1)(ii) are identical to §257.73(e)(1)(i) with the exception of the pool elevation, which is set at the lowest points of the embankment crest (Geosyntec, 2016e).

4.2.3 Seismic – §257.73(e)(1)(iii)

Pursuant to §257.73(e)(1)(iii), a seismic condition for Ash Surge Basin and Bypass Basin was also analyzed. Seismic stability was evaluated with a pseudostatic analysis that uses constant horizontal accelerations to represent the effects of earthquake shaking. The horizontal accelerations are represented in SLOPE/W by a horizontal seismic coefficient. The horizontal seismic coefficient used for analysis was based on a peak ground acceleration with a 2 percent probability of exceedance in 50 years (Geosyntec, 2016g).

4.2.4 Liquefaction – §257.73(e)(1)(iv)

The majority of the embankment soils for the Ash Surge Basin and Bypass Basin are not considered susceptible to liquefaction because saturation of the embankment soils is unlikely based on the presence of a geomembrane liner system. Based on the design phreatic surface discussed in Geosyntec (2016b), a limited portion of the bottom of the embankments may become saturated from groundwater. Liquefaction triggering analyses of these saturated embankment soils show that liquefaction and associated post-liquefaction shear strength loss is unlikely for the seismic design event (Geosyntec, 2016d). Because the likelihood of liquefaction and associated shear strength loss of the embankment soils is very low, post-liquefaction conditions are represented by the static factor of safety analyses.

4.3 Results

The results of the slope stability analysis for the critical cross sections of the Ash Surge Basin and Bypass Basin embankments are summarized in Table 1 below and presented in Figures 4 through 9 (Geosyntec 2016e).

[1] Mean Sea Level based on local plant vertical datum.

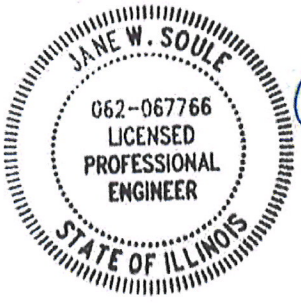
Table 1: Safety Factor Results

Section	Safety Factor			
	257.73(e)(1)(i)	257.73(e)(1)(ii)	257.73(e)(1)(iii)	257.73(e)(1)(iv)
1	≥1.50	≥1.40	≥1.00	≥1.20
2	≥1.50	≥1.40	≥1.00	≥1.20

These results meet the factor of safety requirements presented in §257.73(e)(1)(i) through §257.73(e)(1)(iv).

5. Limitations and Certification

This initial periodic structural stability and safety factor assessment meets the requirements of §257.73(d) and §257.73(e) of the Code of Federal Regulations Title 40, Part 257, Subpart D, and was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.



Jane W. Soule, P.E.
Illinois Professional Engineer No. 062-067766
Expiration Date: 11/30/2017

6. References

Das, 2007. "Principles of Foundation Engineering," Sixth edition. Thomson Canada Limited.

Geosyntec, 2016a. History of Construction Report, Ash Surge Basin and Bypass Basin, Powerton Station, October.

Geosyntec, 2016b. Ash Surge Basin and Bypass Basin – Soil Properties Calculation, Powerton Station, October.

Geosyntec, 2016c. Annual Inspection Report, Ash Surge Basin and Bypass Basin, Powerton Station, 18 January 2016.

Geosyntec, 2016d. Ash Surge Basin and Bypass Basin – Liquefaction Calculations, Powerton Station, October.

Geosyntec, 2016e. Ash Surge Basin and Bypass Basin – Slope Stability Calculations, Powerton Station, October.

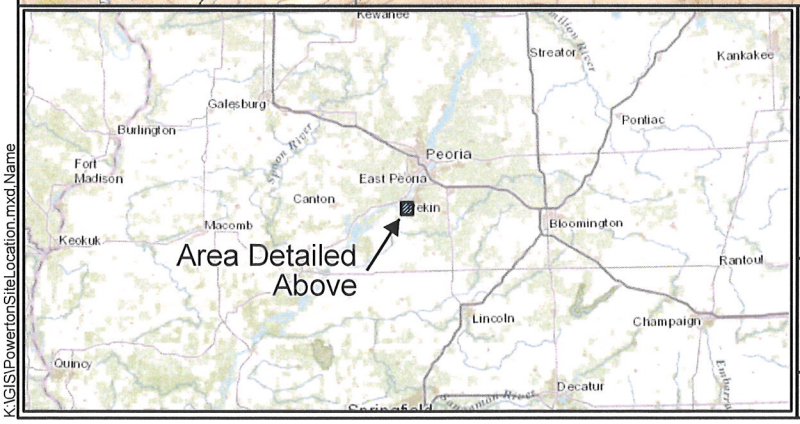
Geosyntec, 2016f. Inflow Design Flood Control System Plan, Ash Surge Basin and Bypass Basin, Powerton Generating Station, October.

Geosyntec, 2016g. Ash Surge Basin and Bypass Basin – Seismic Coefficient Calculations, Powerton Station, October.

Idriss and Boulanger, 2008. "Soil Liquefaction During Earthquakes". Earthquake Engineering Research Institute, MNO-12.

Attachments

Figure 1 – Site Location
Figure 2 – Hydraulic Structure Locations
Figure 3 – Stability Sections
Figure 4 – Slope Stability Output, Section 1 - 257.73(e)(1)(i)
Figure 5 – Slope Stability Output, Section 1 - 257.73(e)(1)(ii)
Figure 6 – Slope Stability Output, Section 1 - 257.73(e)(1)(iii)
Figure 7 – Slope Stability Output, Section 2 - 257.73(e)(1)(i)
Figure 8 – Slope Stability Output, Section 2 - 257.73(e)(1)(ii)
Figure 9 – Slope Stability Output, Section 2 - 257.73(e)(1)(iii)



2,000 1,000 0 2,000 Feet

Site Location

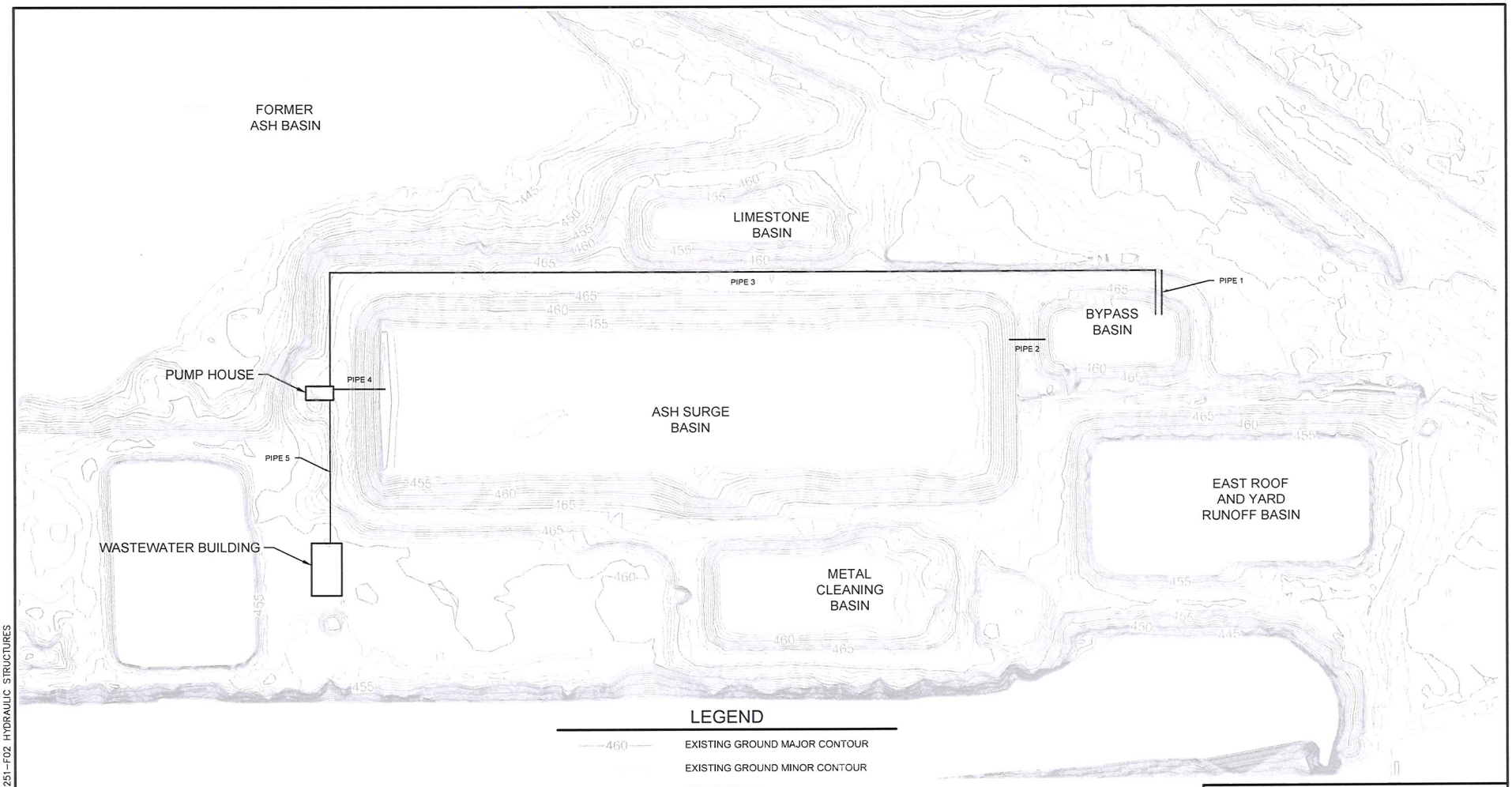
Ash Surge and Bypass Basins
Powerton Station
Pekin, Illinois

Geosyntec consultants

San Diego | October 2016

Figure 1

K:\GIS\PowertonSiteLocation.mxd Name



SOURCE OF SURVEY:
TOPOGRAPHY WITHIN THE ASH SURGE AND BYPASS BASINS IS BASED ON TOP OF LINER TOPOGRAPHY FOR LINER REPLACEMENT PROJECTS (NRT, 2011 AND 2013). TOPOGRAPHY OUTSIDE THE LINER LIMIT OF THE BASINS IS AEROMETRIC, INC. PROJECT NUMBER 1080611, DATED 6-19-2008.

HORIZONTAL DATUM: NAD83 IL SPC WEST

VERTICAL DATUM: LOCAL PLANT DATUM

NOTES:
1. ALL PIPE LOCATIONS ARE APPROXIMATE.

HYDRAULIC STRUCTURE LOCATIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
PEKIN, ILLINOIS

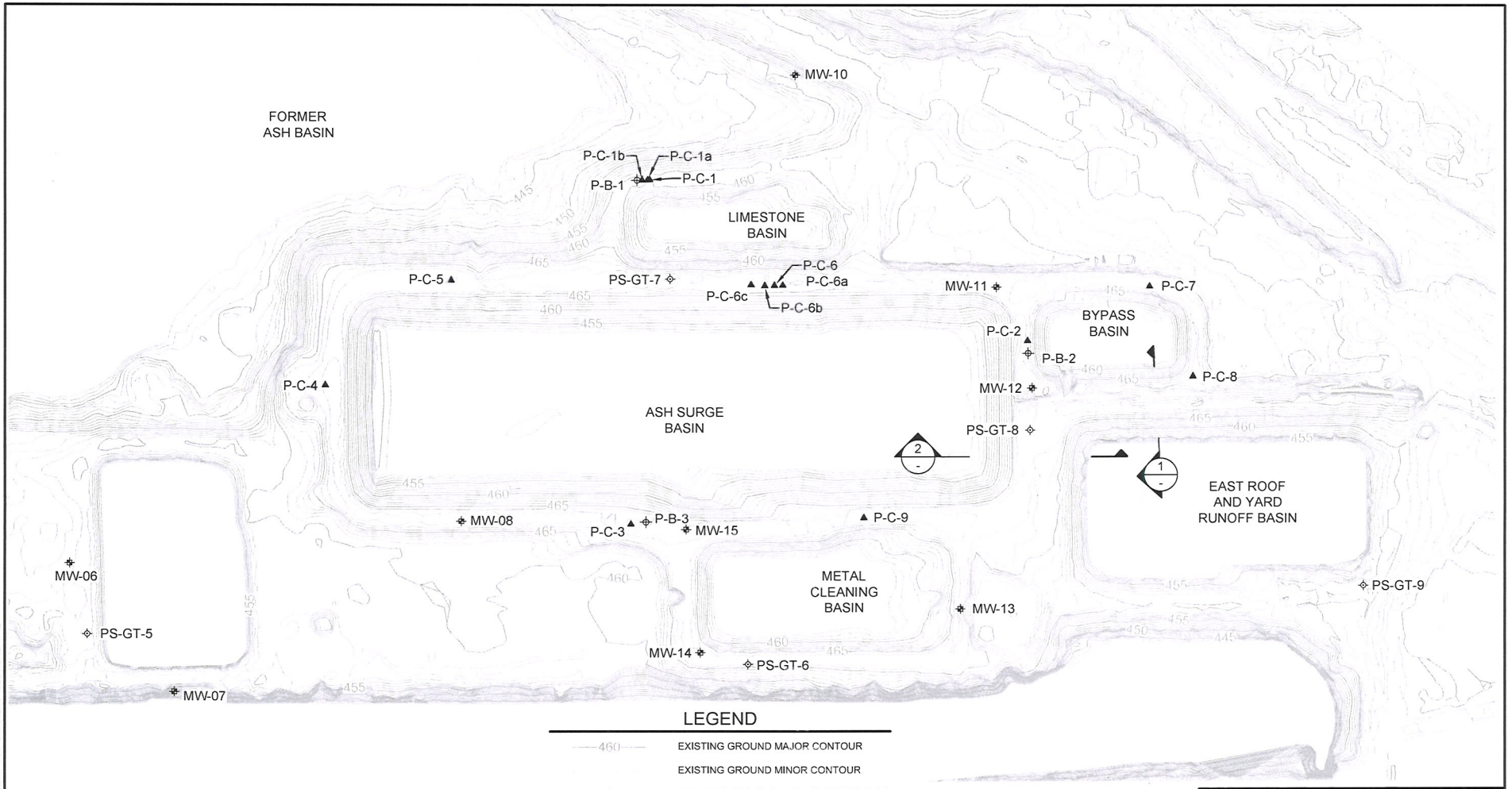
Geosyntec consultants

PROJECT NO: SW0251-07

OCTOBER 2016

FIGURE 2

Z:\CADD\FIGURES\POWERTON\SW0251-F02 HYDRAULIC STRUCTURES



LEGEND

- EXISTING GROUND MAJOR CONTOUR (460)
- EXISTING GROUND MINOR CONTOUR
- MW-03 MONITORING WELL (PATRICK, 2011)
- P-B-1 BORING (GEOSYNTEC, 2016)
- P-C-1 CPT SOUNDING (GEOSYNTEC, 2016)
- PS-GT-5 BORING (KPRG, 2005)
- 1 - CROSS SECTION LOCATION

NOTES:
1. ALL EXPLORATION LOCATIONS ARE APPROXIMATE.

SOURCE OF SURVEY:
TOPOGRAPHY WITHIN THE ASH SURGE AND BYPASS BASINS IS BASED ON TOP OF LINER TOPOGRAPHY FOR LINER REPLACEMENT PROJECTS (NRT, 2011 AND 2013). TOPOGRAPHY OUTSIDE THE LINER LIMIT OF THE BASINS IS AEROMETRIC, INC. PROJECT NUMBER 1080611, DATED 6-19-2008.

HORIZONTAL DATUM: NAD83 IL SPC WEST

VERTICAL DATUM: LOCAL PLANT DATUM

N

0 150' 300'

SCALE IN FEET

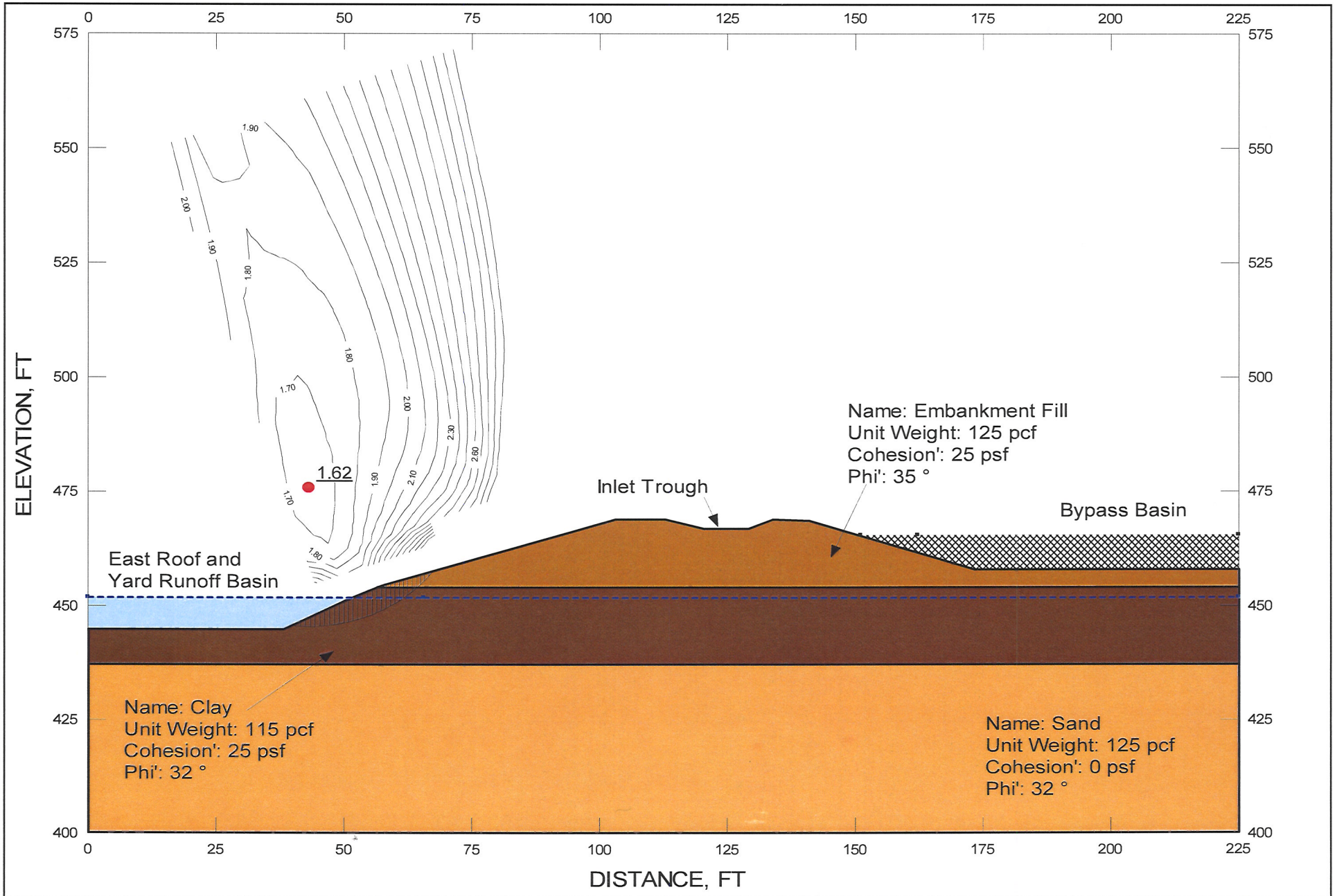
STABILITY SECTIONS
ASH SURGE AND BYPASS BASINS
POWERTON STATION
PEKIN, ILLINOIS

Geosyntec consultants

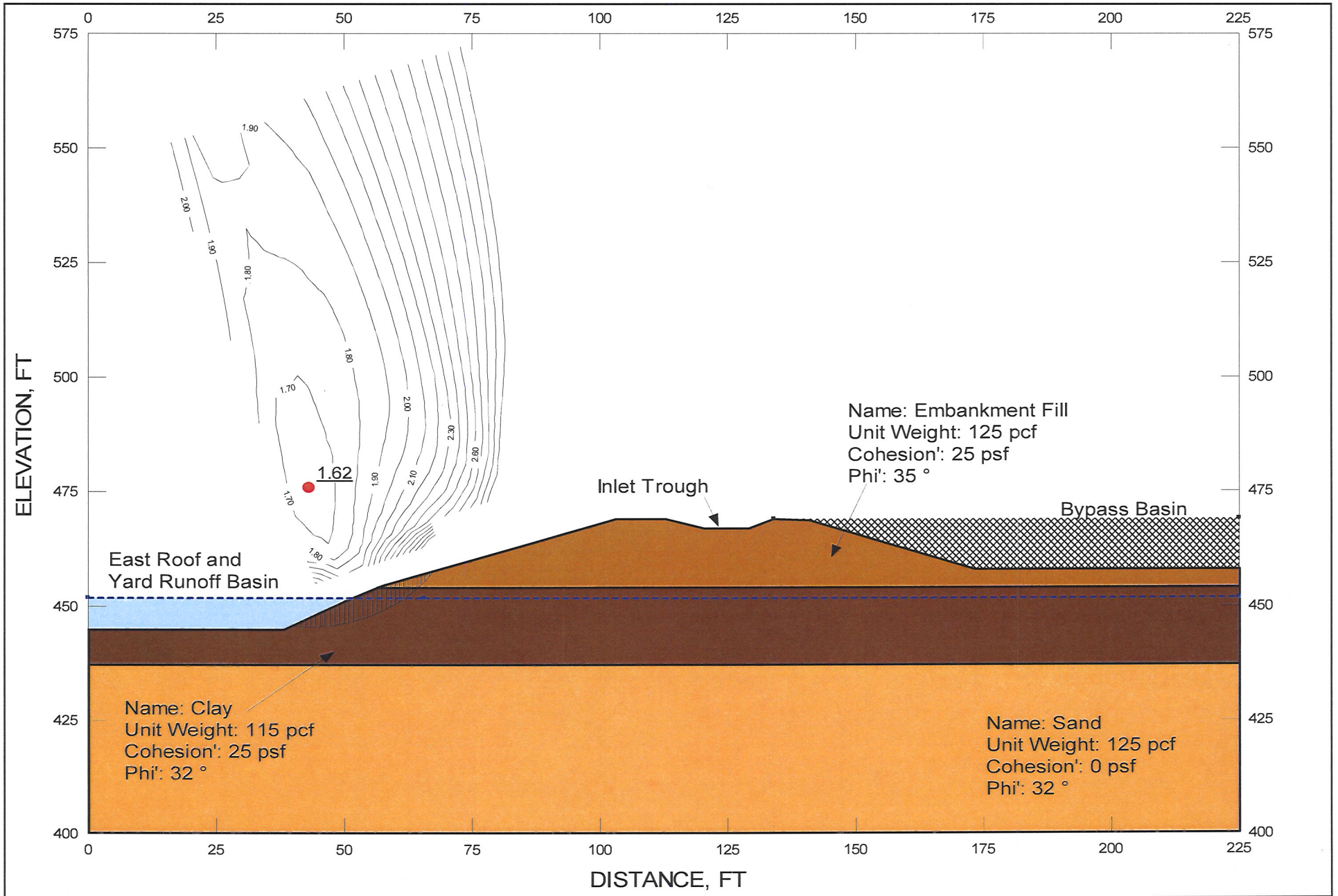
PROJECT NO: SW0251-07 | OCTOBER 2016

FIGURE 3

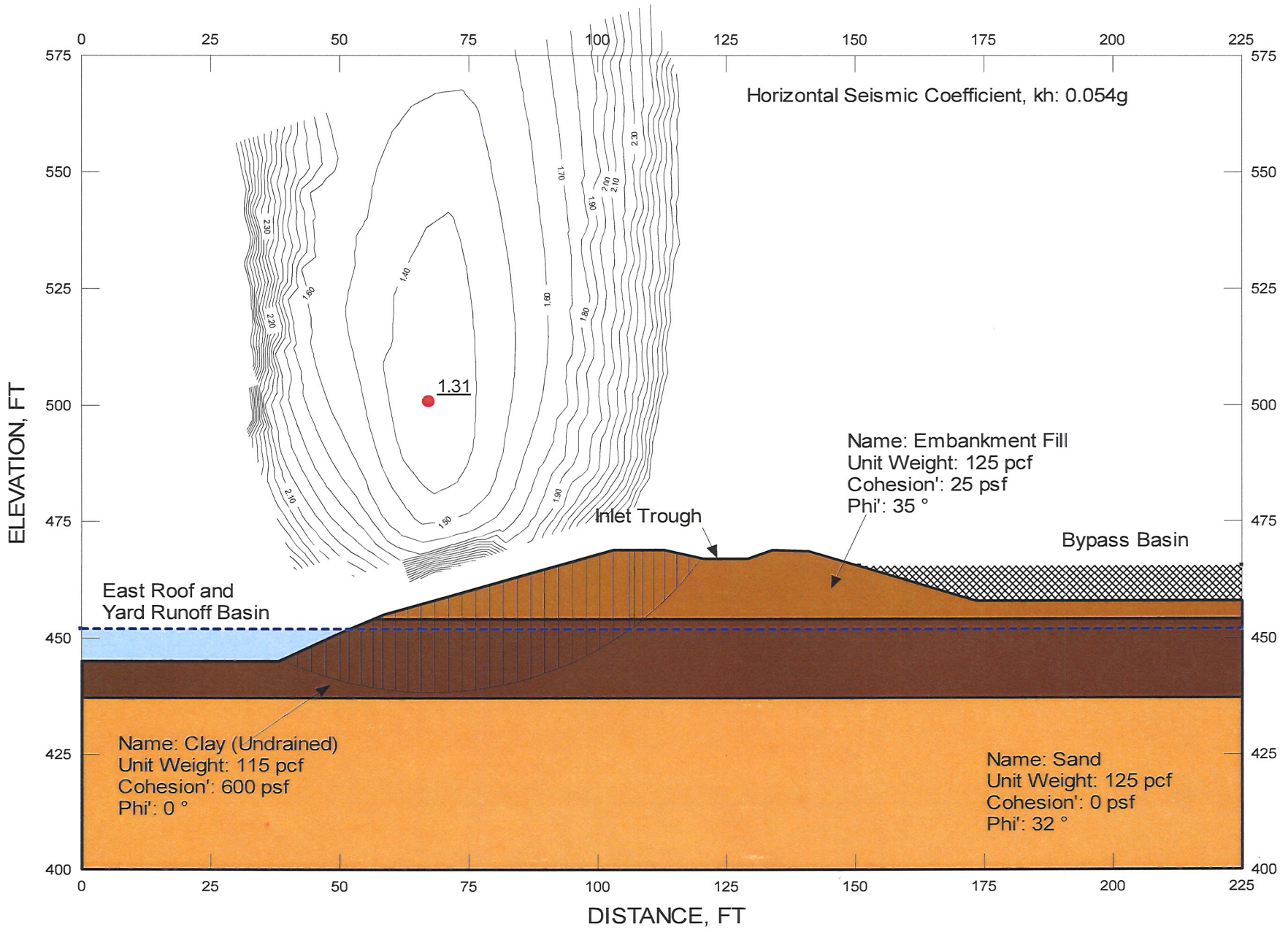
Z:\CADD\FIGURES\POWERTON\SW0251-F01 STABILITY SECTIONS 1-2



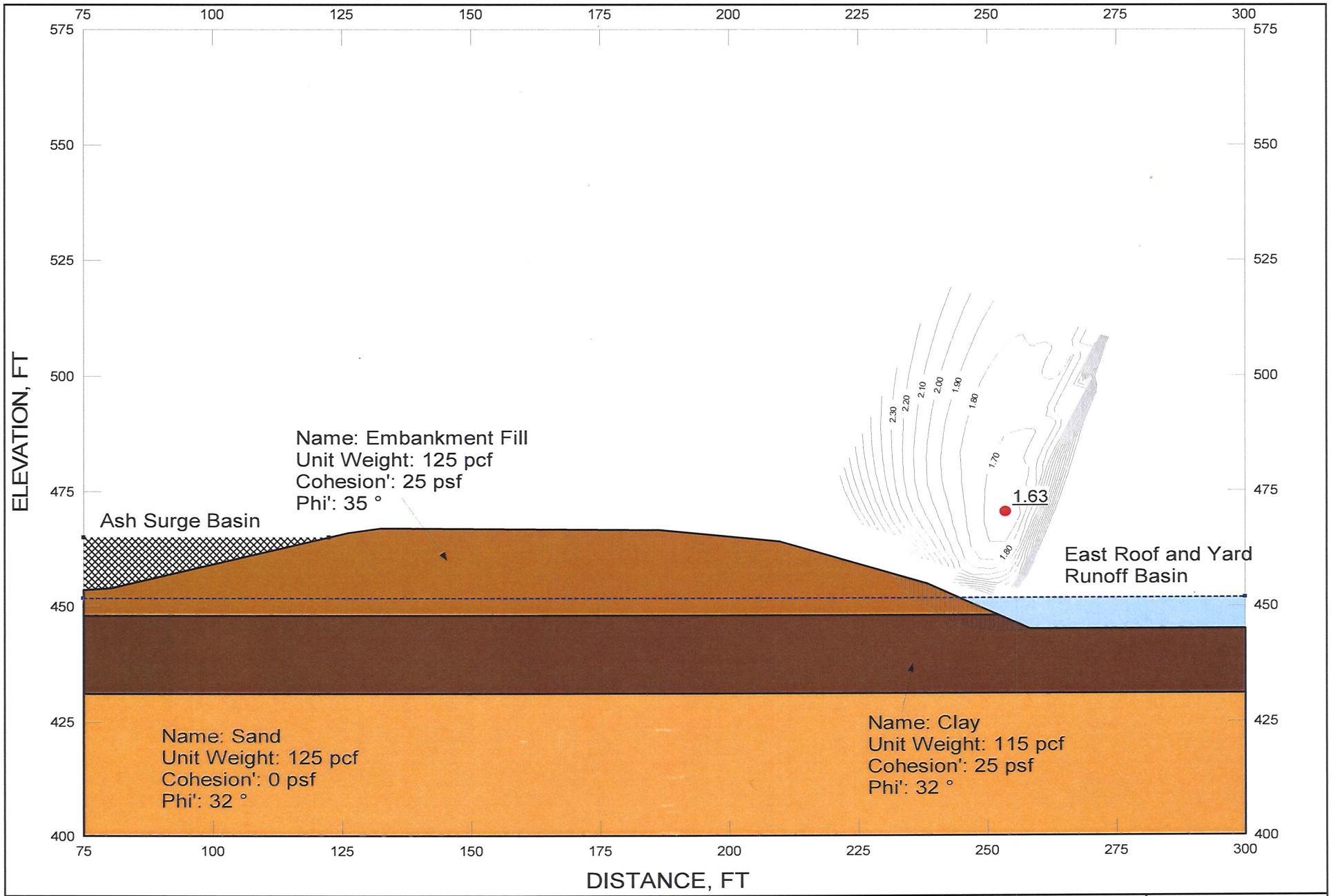
Geosyntec consultants	Analysis: Section 1 - §257.73(e)(1)(i): Long Term, Maximum Storage Pool Loading		FIGURE 4
	Project: Powerton Ash Surge and Bypass Basins	Analysis By: Cory Russell	
	File Name: Powerton Section 1.gsz	Date: October 2016	



Geosyntec consultants	Analysis: Section 1 - §257.73(e)(1)(ii): Maximum Surcharge Pool Loading		FIGURE 5
	Project: Powerton Ash Surge and Bypass Basins	Analysis By: Cory Russell	
	File Name: Powerton Section 1.gsz	Date: October 2016	



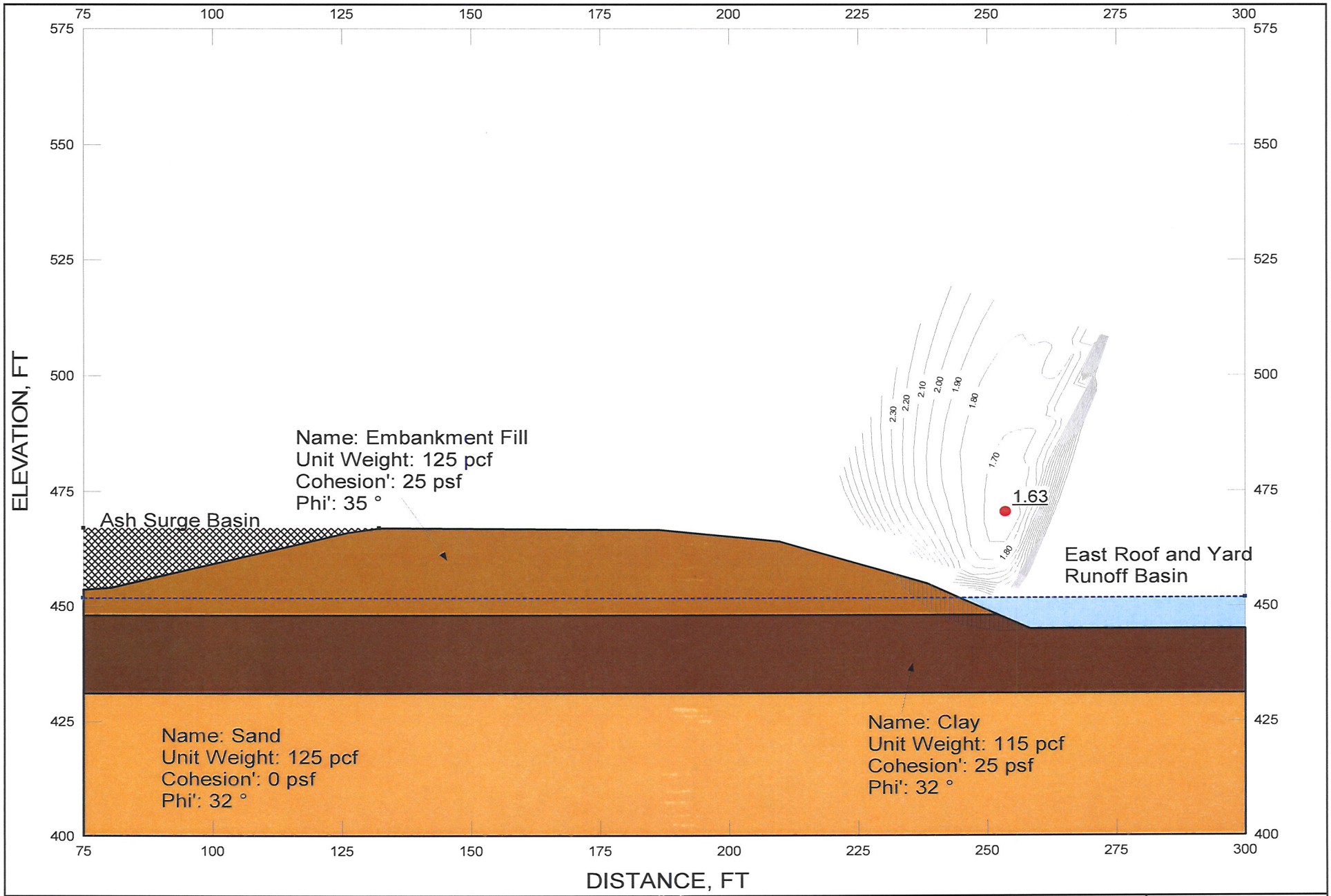
Geosyntec consultants	Analysis: Section 1 - §257.73(e)(1)(iii): Long Term, Maximum Storage Pool Loading with Seismic (Undrained Conditions)		FIGURE 6
	Project: Powerton Ash Surge and Bypass Basins	Analysis By: Cory Russell	
	File Name: Powerton Section 7.gsz	Date: October 2016	



Geosyntec consultants

Analysis	Section 2 - §257.73(e)(1)(i): Long Term, Maximum Storage Pool Loading		
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell
File Name	Powerton Section 2.gsz	Date	October 2016

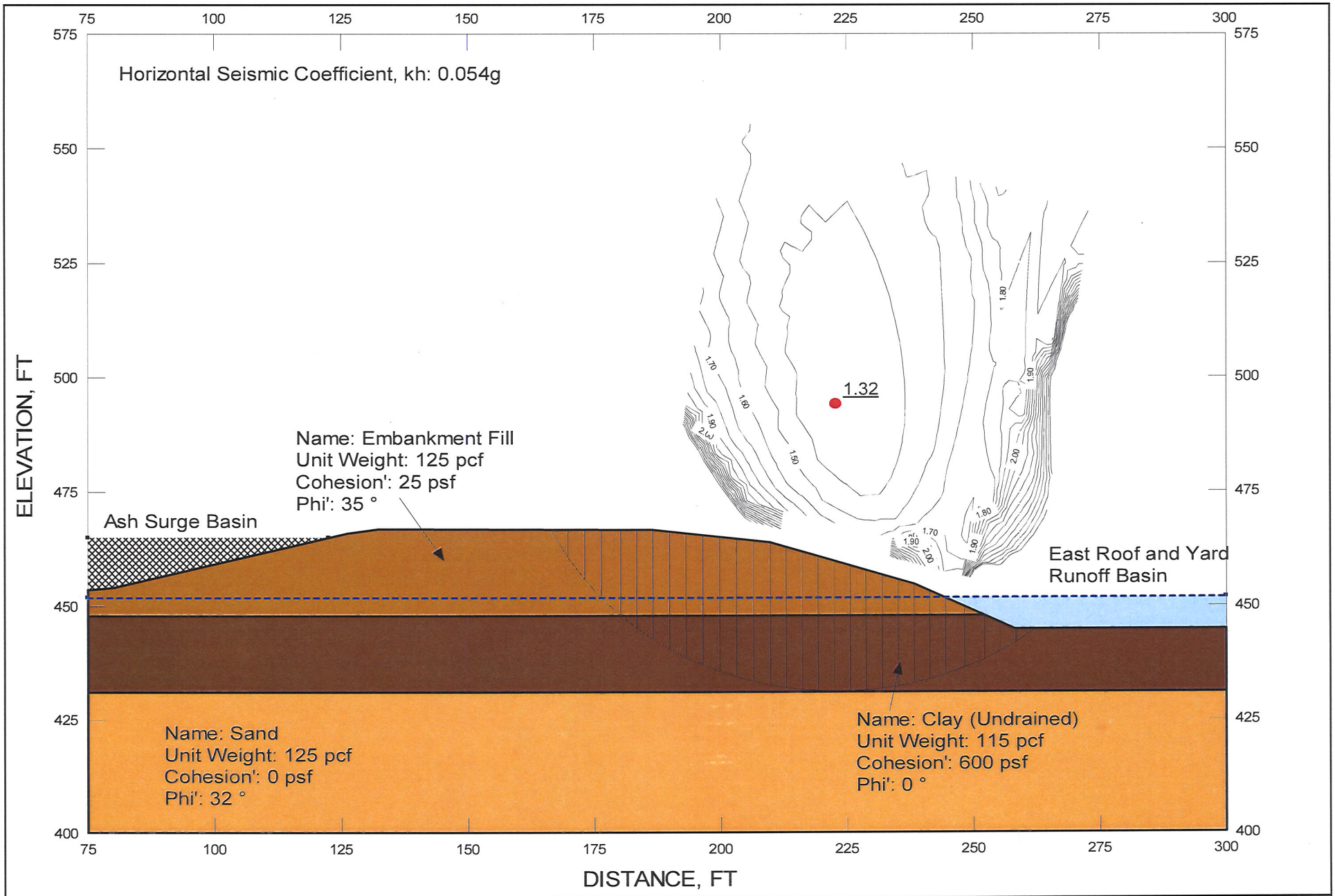
FIGURE 7



Geosyntec consultants

Analysis	Section 2 - §257.73(e)(1)(ii): Maximum Surcharge Pool Loading		
Project	Powerton Ash Surge and Bypass Basins	Analysis By	Cory Russell
File Name	Powerton Section 2.gsz	Date	October 2016

FIGURE
8



Geosyntec consultants	Analysis: Section 2 - §257.73(e)(1)(iii): Long Term, Maximum Storage Pool Loading with Seismic (Undrained Conditions)		FIGURE 9
	Project: Powerton Ash Surge and Bypass Basins	Analysis By: Cory Russell	
	File Name: Powerton Section 2.gsz	Date: October 2016	

MWG

Midwest Generation, LLC

POWERTON GENERATING STATION

SPECIFICATION P-1803

CONSTRUCTION QUALITY ASSURANCE FOR ASH SURGE BASIN RETROFIT

S&L PROJECT NO.: 12661-152

REVISION 0B

ISSUE PURPOSE: PUBLIC COMMENT

ISSUE DATE: 03-24-2023

Sargent & Lundy

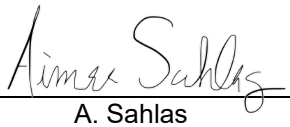
SECTION 000106

ISSUE SUMMARY AND APPROVAL PAGE

Rev.	Purpose of Issue	Date	Sections Affected
0A	Client Comment	03-14-2023	All
0B	Public Comment	03-24-2023	All

This is to confirm that this Specification has been prepared, reviewed, and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0407, Specifications and Bills of Materials, which is part of our Quality Management System.

Contributor Summary & Current Revision Signatures

Rev.	Prepared By	Reviewed By	Approved By
0A	A. Sahlas	T. Dehlin	--
0B	 A. Sahlas	T. Dehlin	*Approver signature not required for comment version.*

SECTION 000107

CERTIFICATION PAGE

Sargent & Lundy (S&L) is registered in the State of Illinois to practice engineering. S&L's Illinois Department of Financial and Professional Regulation registration number is 184-000106.

I certify that this Specification was prepared by me or under my direct supervision and that I am a registered professional engineer under the laws of the State of Illinois.

Certified By: _____ Date: _____

Seal:

CERTIFICATION NOT REQUIRED FOR PUBLIC COMMENT VERSION

SECTION 000110

TABLE OF CONTENTS

END OF SECTION 000110

SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

101. PROJECT INFORMATION

101.1 Owner: Midwest Generation, LLC (MWG)

101.2 Design Engineer: Sargent & Lundy (S&L)

101.3 Project Name: Construction Quality Assurance for Ash Surge Basin Retrofit

101.4 Project Location: Powerton Generating Station
13082 E. Manito Rd.
Pekin, IL 61554

102. DESCRIPTION OF THE PROJECT AND GENERAL BACKGROUND

102.1 The purpose of this project is to retrofit the Ash Surge Basin at Midwest Generation, LLC's Powerton Generating Station in accordance with the Illinois Pollution Control Board's Coal Combustion Residuals (CCR) Rule, 35 Ill. Adm. Code Part 845, and with the U.S. Environmental Protection Agency's (EPA) CCR Rule, 40 CFR Part 257 Subpart D.

102.2 The Ash Surge Basin will be retrofitted by first removing all CCR and CCR-mixed materials remaining in the basin; removing the basin's existing gravel warning, sand cushion, and riprap layers; and decontaminating the basin's existing geomembrane liner and appurtenant structures, which will remain in place. Following material removal and decontamination of the basin facilities remaining in-place, a new composite liner system and a new leachate collection and removal system (LCRS) will be installed within the Ash Surge Basin over the basin's existing decontaminated and leak-tested geomembrane liner.

103. SCOPE OF WORK

103.1 In general, this Specification covers the field and laboratory activities for a Construction Quality Assurance (CQA) Contractor to provide assurance and documentation that the Ash Surge Basin at the Powerton Generating Station is retrofitted in accordance with the General Work (GW) Specification (P-1802), the Design Drawings, and permit requirements.

103.2 The CQA Work shall include, but not be limited, to the following activities:

a. Prepare a CQA Plan that provides a detailed description of the activities that will be performed by the CQA Contractor in accordance with the Design Drawings and this Specification.

b. Verify and document that all appropriate measures are taken by the GW Contractor to protect the Ash Surge Basin's existing geomembrane liner from damage during material removal and liner decontamination activities at the basin.

c. Verify and document decontamination of the Ash Surge Basin's existing geomembrane liner as specified in Section 014362 following material removal and liner decontamination activities performed by the GW Contractor.

d. Perform earthwork inspection and testing work specified in Section 014362 to:

d1. Verify compliance of materials with the GW Specification and Design Drawings.

d2. Perform specified field material and installation tests.

d3. Obtain samples and perform laboratory tests and/or contract an independent, third-party testing laboratory to have laboratory tests performed and audit laboratory test results.

d4. Perform inspections during construction as specified.

e. Perform geosynthetics inspection and testing work specified in Section 014362 to:

e1. Verify compliance of materials with the GW Specification and Design Drawings.

e2. Perform field material and installation tests.

e3. Obtain samples and perform laboratory tests and/or contract an independent, third-party testing laboratory to have laboratory tests performed and audit laboratory test results.

e4. Witness field testing and audit field test results as specified.

e5. Perform inspections during construction.

f. Identify non-conforming work.

g. Meetings, Documentation, and Reports:

g1. Participate in project meetings.

g2. Prepare CQA records and documents.

g3. Prepare CQA reports, including:

g3.1 Preparing an Index Report listing all CQA reports prepared throughout the project.

g3.2 Preparing and certifying Weekly Summary Reports until the end of the project.

g3.3 Preparing and certifying a Final Report at the end of the project.

103.3 The CQA Work shall conform to the requirements of this Specification and shall be performed and supervised by personnel who are experienced and knowledgeable in the crafts and trades required by the Scope of Work. The CQA Work shall be performed exclusively by the CQA Contractor's trained and competent personnel or, where permitted, that of its subcontractor(s); and shall comply with all applicable safety laws, regulations, programs, and practices to ensure the safety of those located on the work site and associated laboratories, including the CQA Contractor's personnel (or that of its subcontractor(s)) performing the CQA Work.

103.4 Performance of the CQA Work shall include all the labor, supervision, administration, management, tools, testing equipment, and consumables to execute the CQA Work identified herein.

103.5 Inspection and tests specified in this Specification shall be performed by personnel qualified to perform such inspections and tests.

104. RESPONSIBILITY AND AUTHORITY

104.1 The responsibilities and authority are described below for the organizations that will be involved in the design, permitting, and construction activities associated with the project.

a. Permitting Authority – Illinois EPA:

a1. The Illinois EPA is the Permitting Authority and is responsible for reviewing the permit application for retrofitting the Ash Surge Basin to assure compliance with state regulations and for granting the construction permit for the project.

a2. The Permitting Authority may review any design revisions during construction and any requests for variance submitted by the Owner. The Permitting Authority has the authority to review and approve all CQA documentation and reports and to confirm the Ash Surge Basin was retrofitted as specified in Project Specifications and the Design Drawings.

b. Owner:

b1. MWG is the Owner of the facility and has the authority to accept or reject materials and workmanship of the GW Contractor or reports and recommendations of the CQA Contractor.

b2. The Owner will ultimately be responsible for the retrofit construction for the Ash Surge Basin and for assuring the Permitting Authority that the construction meets or exceeds the requirements specified in state regulations, permits, Project Specifications, and the Design Drawings. The Owner will accomplish this by retaining a CQA Contractor for the project.

c. Design Engineer:

c1. S&L is the Design Engineer and is responsible for designing the retrofitted features for the Ash Surge Basin.

c2. The Design Engineer will assure that the retrofit design meets or exceeds the construction and operational requirements of the Owner and meets or exceeds the requirements of the Permitting Authority.

c3. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes to the permitted design shall require approval of the Owner and Design Engineer to ensure that the original design objectives are still maintained. All changes shall meet state regulatory requirements and the rules promulgated thereunder and may include Permitting Authority-approved variances to the rules.

d. GW Contractor:

d1. The GW Contractor shall be responsible for constructing the facility in accordance with the GW Specification (P-1802) and the Design Drawings and shall implement additional quality control and quality assurance procedures and techniques as necessary during construction.

d2. The GW Contractor will consist of an Earthwork Contractor performing the earthwork and a Geosynthetics Contractor installing the geosynthetic materials for the Ash Surge Basin’s new composite liner system and new leachate collection and removal system. The GW Contractor may self-perform or subcontract the duties of the Earthwork Contractor and/or Geosynthetics Contractor.

e. CQA Contractor:

e1. The CQA Contractor shall be the company employed by the Owner who is responsible for performing the CQA Work. The CQA Contractor shall be objective, competent, and independent from the GW Contractor whose work is being inspected. The CQA Contractor shall remain independent throughout the duration of the project.

e2. The CQA Contractor's team shall include the CQA Officer and two or more CQA Inspectors.

f. CQA Officer:

f1. The CQA Officer shall be a professional engineer licensed in the State of Illinois who shall be responsible for implementation of the CQA Work. The CQA Officer shall be responsible to the Owner.

f2. The CQA Officer shall be responsible for the performance of activities specified herein such as auditing, inspecting, sampling, testing, documenting, and for preparing and certifying the Final Report. In addition, the CQA Officer and/or its inspectors shall have the responsibility of daily coordination with CQA Inspectors, the GW Contractor and its subcontractors, and the Owner to discuss daily progress, review completed work, plan for upcoming work, perform visual inspections, review test results, and discuss and assist in resolving any current or potential construction problems.

f3. Except as provided by Paragraph 104.1f4, the CQA Officer shall be present to provide supervision and assume responsibility for performing all inspections of the following activities, when applicable:

f3.1 Compaction of subgrade materials.

f3.2 Installation of the new composite liner system.

f4. If the CQA Officer is unable to be present as required by Paragraph 104.1f3, the CQA Officer shall provide the following in writing:

f4.1 The reasons for the CQA Officer's absence.

f4.2 A designation of a person who must exercise professional judgment in carrying out the duties of the CQA Officer-in-Absentia.

f4.3 A signed statement that the CQA Officer assumes full responsibility for all inspections performed and reports prepared by the designated CQA Officer-in-Absentia during the absence of the CQA Officer.

g. CQA Inspectors:

g1. The CQA Inspectors shall be responsible for performing visual examinations and for performing or obtaining field and laboratory tests. The CQA Inspectors shall be under the direct supervision of the CQA Officer.

g2. The CQA Inspectors shall be responsible for reporting to the CQA Officer and the Owner's representative the results of any inspections or tests indicating materials or installed work are of unacceptable quality or do not meet specified design requirements.

g3. Throughout the project, at least one CQA inspector for earthwork (CQA Earthwork Inspector) and at least one CQA inspector for geosynthetics work (CQA Geosynthetics Inspector), each with specialized knowledge and training, shall be present at the site throughout the project. However, each inspector only needs to be present at the project

site if the GW Contractor is conducting work associated with their scope of responsibility (e.g., the CQA Geosynthetics Contractor only needs to be present when the Geosynthetics Contractor is performing work).

105. QUALIFICATIONS

105.1 CQA Officer:

a. The CQA Officer shall be a registered professional engineer in the State of Illinois with at least 10 years of experience in design/construction/permitting/licensing, at least 5 years of which is CQA experience as a certifying engineer on landfills or ponds with geomembrane liner systems.

b. The CQA Officer shall be qualified by education, technical knowledge, and experience to complete the technical certifications required by this Specification.

105.2 CQA Inspectors:

a. The CQA Inspectors shall have adequate formal academic training and sufficient practical and technical experience needed to execute and record auditing and inspection activities conducted at the site and perform all required laboratory and field testing. This includes a demonstrated knowledge of the various aspects of the type of work being conducted.

b. As required, different CQA Inspectors, each with specialized knowledge and experience, shall be employed for different portions of the work.

c. CQA Earthwork Inspectors:

c1. The lead CQA field inspector for earthwork (Lead CQA Earthwork Inspector) shall have at least 5 years of experience as an earthwork inspector.

c2. All CQA Earthwork Inspectors shall be knowledgeable in:

c2.1 Field practices relating to construction techniques used for the type of earthwork being performed.

c2.2 Construction and compaction equipment.

c2.3 All codes and regulations concerning material installation.

c2.4 Observation procedures for earthwork construction.

c2.5 Sampling and earthwork testing procedures.

c2.6 Testing equipment.

c2.7 Documentation procedures.

c2.8 Site safety.

d. CQA Geosynthetics Inspectors:

d1. The lead CQA field inspector for geosynthetics (Lead CQA Geosynthetics Inspector) shall have at least 5 years of CQA experience as a field inspector on projects with a geomembrane lining system including two years as a CQA inspector.

d2. All CQA Geosynthetics Inspectors shall be knowledgeable in:

d2.1 Field practice relating to techniques used for the installation of geosynthetic clay liners (GCLs), high-density polyethylene (HDPE) geomembranes, pipes, HDPE geonets, and non-woven geotextiles.

d2.2 Correct procedures for seaming GCL.

d2.3 HDPE geomembrane welding equipment and the correct operating procedures for seaming HDPE geomembranes, including but not limited to:

d2.3.1 Non-destructive seam testing procedures and failure criteria.

d2.3.2 Sampling for destructive testing of samples of seams and laboratory testing procedures.

d2.3.3 Laboratory testing equipment.

d2.4 Geotextile seaming equipment and the correct procedures for splicing geotextiles and joining HDPE geonets.

d2.5 All codes and regulations concerning material installation.

d2.6 Documentation procedures for field and laboratory tests.

d2.7 Site safety.

106. DEFINITIONS

106.1 The term "Design Drawing" means the Design Engineer's drawings indicating the Work to be performed.

106.2 The term "Work" means the services furnished to complete the CQA activities specified herein.

106.3 The term "Owner-approved equal" means an acceptable equivalent to a specified material or equipment that has been accepted by the Owner.

107. PROJECT MEETINGS

107.1 Project meetings will be held on a periodic basis during the lifetime of the project. The meetings will include:

a. A preconstruction meeting.

b. Progress meetings.

c. Additional meetings as required to discuss problems or work deficiencies.

107.2 Preconstruction Meeting:

a. The preconstruction meeting will be organized by the Owner. In addition to the Owner, the Design Engineer, the GW Contractor (including representatives of the Earthwork Contractor and Geosynthetics Contractor), the CQA Officer (or CQA Officer-in-Absentia), the Lead CQA Inspectors, and any other interested party designated by the Owner shall attend the preconstruction meeting.

b. The preconstruction meeting shall be used to discuss:

b1. Site specific safety requirements.

b2. Requirements of the Design Drawings, GW Specification, and CQA Specification.

b3. The CQA Contractor's CQA Plan and the responsibilities of each party.

b4. The lines of authority and communication.

b5. Procedure for submittal of manufacturer QA/QC documents for audit.

b6. Procedures for examination of materials delivered to the site.

b7. Location of material storage area(s).

b8. Field and laboratory test requirements and sample sizes.

b9. Procedures for observance of field tests.

b10. Coordination between each contractor and the CQA Inspector to obtain timely field samples and tests.

b11. Procedure for handling construction deficiencies, repairs, and retesting.

b12. Work area security and safety protocol.

b13. Work days and work hours.

b14. Coordination with other contractors or trades.

b15. Site visits.

107.3 Weekly Progress Meetings:

a. Weekly progress meetings will be scheduled by the Owner. In addition to the Owner, the meetings shall be attended by the Design Engineer, the GW Contractor (including representatives of the Earthwork Contractor and the Geosynthetics Contractor), the CQA Officer (or CQA Officer-in-Absentia), and the Lead CQA Inspectors.

b. If needed, daily meetings shall be held each day to review the work schedule, work completed, results of tests, and to discuss potential construction problems.

c. The Owner or its designee will document each meeting and distribute copies of meeting minutes to all responsible parties.

107.4 Additional Meetings:

a. Additional meetings between one or more contractors, the Lead CQA Inspector(s), and the CQA Officer (or the CQA Officer-in-Absentia) shall be held immediately after a work deficiency is identified or a problem arises. These meetings shall be used to define and resolve the problem.

b. Any supervisor/superintendent can request such a meeting through their line of authority.

c. Possible solutions to the problem shall be discussed, and an acceptable solution shall be selected. This solution shall be implemented provided it does not conflict with or require a change to the Design Drawings, in which case the solution shall be submitted to the Design Engineer for review.

d. The Design Engineer shall resolve unexpected conditions or unanticipated problems during construction, which may require changes to the permitted design. Changes from the permitted design shall require approval by the Owner and Design Engineer to ensure

that the original design objectives are maintained. All changes shall meet the requirements of the Permitting Authority and may include regulations approved by the Permitting Authority.

e. The CQA Contractor shall document each special meeting and distribute copies of minutes to all responsible parties.

108. PERFORMANCE AUDITS AND CQA DOCUMENTATION

108.1 As a minimum, the CQA Officer shall conduct the following reviews and performance audits:

a. Full review and audit of results of preconstruction testing or GW Contractor's material certificates used to qualify earthwork materials for construction use.

b. Full review and audit of manufacturer certificates that qualify composite liner system and LCRS materials for construction use.

c. Weekly audit of reports and test data sheets during and after construction of the earthwork until completion of work.

d. Weekly audit of reports and test data sheets during and after installation of composite liner system materials until completion of the work.

e. Weekly audit of reports and test data sheets during and after installation of LCRS materials until completion of the work.

108.2 CQA documentation shall be well-documented and include at least the following:

a. Daily records, which shall include:

a1. Inspection data sheets.

a2. Data sheets listing the number and types of construction equipment used by the GW Contractor, including applicable construction equipment data.

a3. Problem identification reports and corrective action reports. Problem identification reports and corrective action reports shall include detailed descriptions of materials and/or workmanship that do not meet a specified design and shall be cross-referenced to specific inspection data sheets where the problem was identified and corrected.

b. Testing records, which shall include:

b1. Material shipping and manufacturer QA/QC data sheets.

b2. Data sheets describing field samples taken.

b3. Laboratory data sheets.

b4. Field test data sheets.

b5. Notes, charts, drawings, or sketches identifying the location and elevation of field tests, location of failures and repairs or retests, and where samples were obtained.

b6. Non-destructive test reports including location of failures, records of repairs, and results of retests.

c. Photographic records, which shall include:

c1. Digital photographs, each with a unique identifying number.

c2. Figure indicating the location from which each photograph was taken.

c3. Summary list giving the date and time of each photograph.

108.3 All records shall, at a minimum, bear the following:

a. Unique identifying sheet number.

b. The date.

c. Project name, project number, and location.

d. Descriptive remarks.

e. Data sheets for tests.

f. Written text descriptions for visual observations

g. Signature of the preparer of designated authority.

END OF SECTION 011100

SECTION 014362

QUALITY ASSURANCE FOR FILL, LINER, AND LEACHATE COLLECTION MATERIALS

PART 1 – GENERAL

101. EXTENT

101.1 The intent of this section is to define the requirements for Construction Quality Assurance (CQA) activities to ensure that the quality of materials and installation procedures used to retrofit the Ash Surge Basin are in accordance with the General Work (GW) Specification P-1802, Design Drawings, permit requirements, and as specified herein.

101.2 The Work specified within this Specification is the responsibility of the CQA Contractor and shall include, but not be limited to, the following items:

a. Attend project meetings and site visits scheduled by the Owner or GW Contractor for coordination between the Owner, GW Contractor, subcontractors, and CQA Contractor.

b. Perform pre-construction material certification activities to ensure materials meet or exceed GW Specification requirements that include but are not limited to:

b1. Testing for suitability of material prior to use.

b2. Perform pre-construction audits of material certifications prior to material use.

c. Perform CQA activities during construction to ensure materials meet or exceed GW Specification requirements that include but are not limited to:

c1. Audits of material certifications.

c2. Perform field observations, inspections, and tests.

c3. Perform laboratory tests and reviews of test results.

c4. Material sampling.

d. Documentation of all observations, findings, and testing, and of conformance of work to the GW Specification to be submitted by the Owner to the Permitting Authority.

e. Preparation of an Index Report, Weekly Summary Reports, and a Retrofit Completion Report

f. Submit a draft version of the Retrofit Completion Report to the Owner and Design Engineer for their review and comment. Upon resolution of all comments, submit a final version of the Retrofit Completion Report, sealed and certified by the CQA Officer, to the Owner and Design Engineer.

101.3 Definitions:

a. The following definitions of terms shall apply throughout this section:

a1. GCL Manufacturer: The manufacturer who is, pursuant to Specification P-1802, responsible for manufacturing and transporting GCL materials to the site.

a2. GM/GC Manufacturer: The manufacturer who is, pursuant to Specification P-1802, responsible for manufacturing and transporting geomembrane and drainage geocomposite materials to the site.

a3. Pipe Manufacturer: The manufacturer who is, pursuant to Specification P-1802, responsible for manufacturing and transporting LCRS pipe materials and fittings to the site.

102. RELATED WORK SPECIFIED IN OTHER SECTIONS

102.1 CQA Specification P-1803:

a. Section 011100 – Summary of Work.

102.2 GW Specification P-1802:

a. Section 319005 – Earthwork.

b. Section 319020 – High-Density Polyethylene Geomembrane Liner with Geocomposite.

c. Section 319025 – Geosynthetic Clay Liner (GCL).

d. Section 319050 – Leachate Collection and Removal System.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein.

103.2 References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the latest additions, addenda, amendments, supplements, etc., thereto, in effect as of the date of Contract for the Work.

103.3 Abbreviations listed indicate the form used to identify the reference documents cited in this section.

103.4 ASTM – ASTM International:

a. D422 Standard Test Method for Particle-Size Analysis of Soils.

b. D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

c. D1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

d. D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique.

e. D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

f. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

g. D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

h. D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

i. D2434 Standard Test Method for Permeability of Granular Soils (Constant Head).

j.	D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
k.	D2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).
l.	D4218	Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
m.	D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
n.	D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating.
o.	D4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
p.	D4833	Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
q.	D4959	Standard Test Method for Determination of Water Content of Soil By Direct Heating.
r.	D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
s.	D5261	Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
t.	D5596	Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
u.	D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
v.	D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual-Seamed Geomembranes.
w.	D5887	Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
x.	D5890	Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
y.	D5891	Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.
z.	D5993	Standard Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners.
aa.	D5994	Standard Test Method for Measuring Core Thickness of Textured Geomembranes.
bb.	D6243	Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
cc.	D6496	Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.

dd. D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

ee. D6768 Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

ff. D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

gg. D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

103.5 GRI – Geosynthetic Research Institute:

a. GM6 Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembrane.

103.6 ITP – Illinois Test Procedure:

a. 27 Sieve Analysis of Fine and Coarse Aggregates

104. SUBMITTALS

104.1 Submittals with Bid Proposal:

a. Documentation to substantiate that the CQA Contractor's and its laboratory's Accreditation Certifications are current.

b. Detailed resumes on all CQA laboratory and field personnel proposed for the Work, including:

b1. A complete description of their qualifications and previous experience in the same type of work.

b2. Documentation of certification to perform required testing.

104.2 Submittals During the Course of the Work:

a. Certifications and submittals as specified herein.

b. An Index Report, Weekly Summary Reports, and a Retrofit Completion Report as described below shall be prepared.

b1. Index Report:

b1.1 An Index Report shall be prepared listing all records and reports.

b1.2 The Index Report shall be assembled in chronological framework for recording and identifying all reports.

b2. Weekly Summary Reports:

b2.1 At the end of each week of construction, until construction is complete, a Weekly Summary Report must be prepared by either the CQA Officer or under the supervision of the CQA Officer and submitted to the Owner and the Design Engineer. The CQA Officer must review and approve each Weekly Summary Report.

b2.2 The Weekly Summary Report shall contain descriptions of the weather, locations where construction occurred during the previous week, materials used, results of testing, inspection reports, and procedures used to perform inspections.

b3. Retrofit Completion Report:

b3.1 After the GW Contractor completes retrofit construction activities, the CQA Officer shall prepare a Retrofit Completion Report that demonstrates the Ash Surge Basin was retrofitted in conformance with Project Specifications, the Design Drawings, and permit requirements. At a minimum, this report shall include:

b3.1.1 All data sheets, testing records, manufacturer data sheets, and reports concerning items that were installed and tested.

b3.1.2 Photographs of the liner system and leachate collection system and any other photographs relied upon to document construction activities. All photographs shall include time, date, and location information.

b3.1.3 Any designations of CQA officers-in-absentia in accordance with Section 011100, Paragraph 104.1f4.

b3.1.4 Certification that the GW Contractor's work is in compliance with Project Specifications, the Design Drawings, and permit requirements.

b3.1.5 Certifications that:

b.3.1.5.1 Pipe bedding material contains no undesirable objects.

b.3.1.5.2 The anchor trench and backfill are constructed to prevent damage to a geosynthetic membrane.

b.3.1.5.3 All tears, rips, punctures, and other damage to geosynthetic materials are repaired.

b.3.1.5.4 All geomembrane seams are properly constructed and tested in accordance with the manufacturer's specifications.

b.3.1.5.5 Proper filter material consisting of uniform granular fill, to avoid clogging, is used in construction.

b.3.1.5.6 The filter material, as placed, possesses structural strength adequate to support the maximum loads imposed by the overlying materials and equipment used at the facility.

b3.2 The first draft version of the Retrofit Completion Report shall be submitted within one week after completion of CQA Work to the Owner and Design Engineer for their review and comment.

b3.3 Within one week of resolving all comments, the final version of the Retrofit Completion Report shall be sealed and certified by the CQA Officer and submitted to the Owner and Design Engineer.

105. CONSTRUCTION QUALITY ASSURANCE REQUIREMENTS

105.1 Organizations Involved:

a. The organizations involved in the design, permitting, and construction activities associated with the Ash Surge Basin Retrofit project are defined in Section 011100.

b. The responsibilities and authorities of the organizations and personnel associated with the Ash Surge Basin Retrofit project are described in Section 011100.

105.2 Qualifications:

a. The qualifications of the CQA Contractor personnel are described in Section 011100.

105.3 Project Meetings:

a. The requirements for project meetings and audits are described in Section 011100.

105.4 Performance Audits, CQA Documentation, and CQA Reports:

a. The requirements for performance audits and CQA documentation are described in Section 011100.

b. The requirements for CQA reports are described in Paragraph 104.2 of this section.

PART 2 – PRODUCTS

201. PRODUCTS

201.1 The requirements for the various products used for retrofitting the Ash Surge Basin are specified in their respective technical specification sections in the GW Specification.

201.2 All permanent materials to be used in the Ash Surge Basin Retrofit project will be supplied by the GW Contractor. The CQA Contractor shall coordinate with the GW Contractor on obtaining material certifications and samples for performing the audits and tests required by this Specification.

PART 3 – EXECUTION

301. GENERAL CQA TESTING AND INSPECTION REQUIREMENTS

301.1 Record daily weather conditions.

301.2 Field tests shall document the elevation and coordinate location for each test. The locations may be determined by survey, taping, or pacing off distances unless otherwise noted.

301.3 Material Source Testing: Material source testing activities include visual observations and laboratory and field testing at the material source to control material quality and material preparation prior to transport of the material to the project site.

302. CQA TESTING AND INSPECTION REQUIREMENTS FOR EXISTING LINER DECONTAMINATION ACTIVITITES

302.1 Testing During Construction:

a. CQA activities during removal of material from and decontamination of the Ash Surge Basin's existing geomembrane liner shall include visual observations and field testing to verify the liner has been decontaminated in accordance with the Design Drawings.

b. Visual Observations:

b1. Observe and record method(s) of material removal and decontamination.

b2. Verify and document that the GW Contractor is taking necessary precautions to avoid damaging the geomembrane liner. Identify any locations where damage to the existing geomembrane liner has occurred and record the method(s) used to repair such damage.

b3. Verify and document that the GW Contractor has developed and is implementing fugitive dust controls in accordance with 35 Ill. Adm. Code 845.740(c)(2), which must include:

b3.1 A water spray or other commercial dust suppressant to suppress dust in CCR handling areas and haul roads.

b3.2 Handling of CCR to minimize airborne particulates and offsite particulate movement during any weather event or condition.

b4. Verify and document that the GW Contractor has developed and is implementing measures to prevent contamination of surface water, groundwater, soil, and sediments in accordance with 35 Ill. Adm. Code 845.740(c)(4).

b4.1 If CCR and CCR-impacted material removed from the Ash Surge Basin is temporarily stored, verify and document the material is stored in a lined landfill, CCR surface impoundment, enclosed structure, or CCR storage pile.

b4.2 If CCR and/or CCR-impacted material are temporarily stored in a CCR storage pile, verify and document the pile is:

b4.2.1 Tarped or constructed with wind barriers to suppress dust and to limit stormwater contact with the pile.

b4.2.2 Is periodically wetted and/or has periodic application of dust suppressants.

b4.2.3 Has a storage pad or a geomembrane liner that:

b.4.2.3.1 Has a hydraulic conductivity no greater than 1×10^{-7} cm/sec.

b.4.2.3.2 Is properly sloped to allow appropriate drainage.

b4.2.4 Is tarped over the edge of the storage pad where possible.

b4.2.5 Is constructed with fixed and/or mobile berms, where appropriate, to reduce run-on and run-off of stormwater to and from the storage pile, and minimize stormwater-CCR contact.

b4.2.6 Is located within the groundwater monitoring system in-place for the Ash Surge Basin, Bypass Basin, and/or Metal Cleaning Basin.

b5. Verify and document that all material removal and decontamination work is performed in a systematic manner to remove all ash and ash residuals from the liner surface.

b6. Verify and document that the GW Contractor is providing adequate temporary ballasting on exposed liner areas to prevent uplift of the geomembrane by wind by the use of sandbags and/or other means which will not damage the geomembrane.

b7. For areas of geomembrane that are damaged, verify and document that the GW Contractor addresses and repairs the damaged areas as specified on the Design Drawings.

b8. Verify and document that the GW Contractor repairs all locations of the geomembrane from which samples are obtained for verification of decontamination.

c. Laboratory and Field Tests:

c1. Perform an electrical leak location survey over decontaminated liner areas as specified on the Design Drawings.

c2. Collect samples of the existing geomembrane liner for verification of decontamination by laboratory testing as specified on the Design Drawings.

c3. Perform laboratory testing of existing geomembrane liner samples as specified on the Design Drawings.

d. Test Acceptance Criteria:

d1. Laboratory and field test acceptance criteria shall be as specified on the Design Drawings.

d2. If the results from any of the laboratory and field tests do meet the respective pass/fail thresholds, then the CQA Officer shall reject all existing geomembrane liner areas corresponding to the failed test(s) as decontaminated.

303. CQA TESTING AND INSPECTION REQUIREMENTS FOR STRUCTURAL FILL MATERIAL

303.1 Initial Material Certification:

a. Prior to shipment of any Structural Fill material, the CQA Contractor shall assemble, document the receipt of, and audit the material supplier's test results and certifications that the properties of the material meet GW Specification requirements.

303.2 Inspections and Testing During Construction:

a. CQA activities during placement of Structural Fill shall include visual observations and laboratory and field testing to ensure that Structural Fill is installed in accordance with GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-1 and the following paragraphs.

b. Visual Observation of the Material Source for Structural Fill Material During Construction:

b1. Inspect materials to ensure that they are uniform.

b2. Visually inspect the material in accordance with ASTM D2488.

b3. Inspect to ensure that only suitable material is transported to the site, observe segregation operations if unsuitable materials are present, and observe (if necessary) the removal of organic soils, roots, stumps, and stones.

b4. Observe changes in color or texture that can be indicative of a change in material type or moisture content.

b5. Observe moisture conditioning activities to ensure that any required substantial changes in moisture content are made at the source.

c. Visual Observation of Fill Placement:

c1. Record the placement method(s) the GW Contractor is utilizing for installing the Structural Fill.

c2. In instances where the GW Contractor is transporting material into the basin, the CQA Contractor shall:

c2.1 Verify no equipment (wheeled or tracked) is traversing the Ash Surge Basin area when less than 10 inches of earthen material are above the basin's existing geomembrane liner.

c2.2 Document the receipt of and audit the GW Contractor's demonstration(s) that equipment entering the basin will not exert a ground pressure greater than 8 psi.

c2.3 Verify equipment operating within the basin does not hard brake on the ramp, make sharp turns, nor make quick stops that could pinch or tear the Ash Surge Basin's existing geomembrane liner.

c3. Record type and size of compaction equipment in use:

c3.1 For rubber-tired rollers, record the tire inflation pressure, spacing of tires, and empty and ballasted wheel loads.

c3.2 For hand tampers, record make, model number, size, and compactive effort.

c3.3 Observe and record compactive effort, uniformity of compaction, and scarification and connection between compacted lifts. Record number of passes of a roller by type, size, and weight of roller.

c3.4 For proofrolling, record the type, size, and weight of compaction equipment or other vehicles used for proofrolling.

c4. Observe removal of roots, rocks, rubbish, or out-of-specification soil from the borrow material.

c5. Observe and record changes in soil characteristics necessitating a change in construction procedures.

c6. Observe fill placement and procedures for proper lift thickness.

c7. Observe procedures to be followed to adjust the soil moisture content to obtain uniform moisture content.

c8. Observe and record final finishing procedures.

c9. Observe and record that final grade is consistent with the design grade specified on the Design Drawings.

d. Laboratory and Field Tests:

d1. Laboratory and field testing shall be performed in accordance with the requirements specified in Table 014362-1.

e. Test Acceptance Criteria:

e1. Acceptance criteria shall be as specified in GW Specification Section 319005.

304. CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOSYNTHETIC CLAY LINER COMPONENT OF COMPOSITE LINER SYSTEM

304.1 Initial Material Certification:

a. Prior to shipment of any geosynthetic clay liner (GCL) materials, the CQA Contractor shall assemble, document the receipt of, and audit the GCL Manufacturer's submittals listed below for conformance with the GW Specification.

a1. Certificates describing the origin and identification of the raw materials.

a2. Copy of the GCL Manufacturer's QA/QC certificates on tests performed on the material and a summary of results of the tests.

a3. Certification and guarantee by the GCL Manufacturer that the properties of the manufactured material meet GW Specification requirements.

a4. Certification that the GCL was continuously inspected during the manufacturing process for, as a minimum, the following:

a4.1 Lack of uniformity.

a4.2 Damage.

a4.3 Imperfections.

a4.4 Holes.

a4.5 Tears.

a4.6 Thin spots.

a4.7 Foreign materials.

b. GCL Panel Layout:

b1. Document receipt of the GCL Manufacturer's proposed GCL panel layout.

304.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of GCL.

a2. Document that each roll is labeled and that each label identifies the following information:

a2.1 Name of GCL Manufacturer.

a2.2 Product identification (brand name, product code).

a2.3 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 GCL thickness.

a2.7 Roll identification number.

a2.8 Roll dimensions (i.e., length and width) and weight.

a2.9 Panel number, which shall be referenced to the proposed GCL panel layout drawing prepared by the GCL Manufacturer.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

304.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GCL Manufacturer shall submit to the CQA Contractor representative samples of the GCL materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the GCL materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing of the received GCL samples in accordance with Table 014362-3. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-3.

b. Test acceptance criteria shall be as specified in GW Specification Section 319025. If the results from any of the tests in Table 014362-3 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all GCL material for which the failed test(s) represent(s) for use in the project.

304.4 Inspections During Construction:

a. CQA activities during placement of the GCL component of the Ash Surge Basin's new composite liner system shall include visual observations and field testing to ensure that the GCL is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-3 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (e.g., temperature, precipitation, and wind) to ensure that they are appropriate for GCL placement. The GW Specification describes acceptable weather conditions.

b2. If the weather becomes unacceptable for installation of GCL, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. GCL Placement:

c1. Supporting Surface:

c1.1 Prior to placement of the GCL, visually inspect the Structural Fill surface to ensure that it meets the requirements of the GW Specification. Confirm that it is compacted and is free from clods of soil, rocks larger than specified, roots, sudden or sharp changes in grade, and standing water. Field observations shall be performed in accordance with the requirements specified in Table 014362-4.

c1.2 Provide documentation of daily inspection of the Structural Fill surface for the area of GCL to be placed that day.

c2. Panel Deployment, Seams, and Repairs:

c2.1 As each panel is unrolled, visually inspect the GCL to ensure there are no flaws or damage. The CQA Geosynthetics Inspector shall traverse the panels in such a way that the entire surface is inspected. Any defects shall be documented on a drawing and marked on the GCL for repair.

c2.2 Document that the location of the seams meet the general requirements for seaming contained in GW Specification Section 319025.

c2.3 At the time of placement, make measurements to confirm that required overlap of adjacent GCL panels has been achieved, that proper temporary anchorage is being used (e.g., sand bags or tires), and that the GCL is being placed in a relaxed (nonstressed) state.

c2.4 Document any liner damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Any damage shall be documented on a drawing and marked on the GCL for repair.

c2.5 Document improper GCL panel placement and, as a result, inadequate coverage with the available materials or an excess number of field seams.

c2.6 Document inadequate sheet overlap resulting in poor quality seams.

c2.7 Document unseamed or cut panels.

c2.8 Document repair of damage. Documentation shall include location, type, and method of repair.

305. CQA TESTING AND INSPECTION REQUIREMENTS FOR GEOMEMBRANE COMPONENT OF COMPOSITE LINER SYSTEM

305.1 Initial Material Certification and Inspection of Installation Plans:

a. Prior to shipment of any geomembrane materials, the CQA Contractor shall assemble, document the receipt of, and audit the GM/GC Manufacturer submittals listed below for conformance with the GW Specification.

a1. Geomembrane Resin:

a1.1 Certificate that the resin meets GW Specification requirements.

a1.2 Certificate of the origin of the resin and that all resin is from the same supplier (including resin supplier's name, identification brand name, and number).

a1.3 Copies of the GM/GC Manufacturer's and resin supplier's QA/QC certificates. Certificates shall include a summary report of test results conducted to verify the quality of the resin used in each batch to manufacture geomembrane for this project. As a minimum, the report shall include tests on specific gravity, melt flow index, and percent carbon black.

a2. Geomembrane Sheeting:

a2.1 Certification that the properties of the manufactured sheeting meet GW Specification requirements and are guaranteed by the GM/GC Manufacturer.

a2.2 Statement certifying that no reclaimed polymer has been added to the resin. Note: Polymer recycled during the manufacturing process may be permitted provided that it does not exceed 10% by weight.

a2.3 Statement certifying that the manufactured sheeting is free of per- and polyfluoroalkyl substances (PFAS).

a2.4 Copies of all of the GM/GC Manufacturer's QA/QC certificates for the geomembrane sheeting. The certificates shall include test results.

a3. Extrudate Resins or Rod for Seaming Geomembrane:

a3.1 Certification from the GM/GC Manufacturer that all extrudate is the same resin type as the geomembrane and was obtained from the same resin supplier as the resin used to manufacture the geomembrane.

b. Review of GW Contractor's Installation Plans

b1. Geomembrane Field Installation Quality Assurance Plan:

b1.1 Document receipt of the GW Contractor's QA plan for installing geomembrane.

b1.2 Review the plan for compliance with the GW Specification and document where the plan is not in compliance.

b2. Geomembrane Panel Layout:

b2.1 Document receipt of the GW Contractor's panel layout for geomembrane.

305.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of geomembrane.

a2. Document that each roll is labeled and that each label identifies the following information:

a2.1 Name of GM/GC Manufacturer.

a2.2 Product identification (e.g., brand name, product code), which can be traced back to the origin of the base material (resin supplier's name, resin production plant, resin brand name type, and production date of the resin).

a2.3 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 Geomembrane thickness and type.

a2.7 Roll identification number.

a2.8 Roll dimensions (i.e., length and width) and weight.

a2.9 Panel number, which shall be referenced to the proposed HDPE geomembrane liner panel layout drawing prepared by the GM/GC Manufacturer.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

305.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the geomembrane materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the geomembrane materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing in accordance with Table 014362-6. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-6.

b. Test acceptance criteria shall be as specified in GW Specification Section 319020. If the results from any of the tests in Table 014362-6 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all geomembrane material from the resin batch corresponding to the failed test(s) for use in the project.

305.4 Inspections and Testing During Construction:

a. CQA activities during placement of the geomembrane component of the Ash Surge Basin's new composite liner system shall include visual observations and field testing to ensure that the geomembrane is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-6 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (e.g., temperature, precipitation, and wind) to ensure that they are acceptable for geomembrane placement and seaming. The GW Specification describes acceptable weather conditions.

b2. If the weather becomes unacceptable for installation of the geomembrane liner, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. Geomembrane Placement:

c1. Prior to placement of the geomembrane liner, the GCL component of the composite liner system in the area to be lined shall have been installed, seamed, and inspected and all necessary repairs made in accordance with GW Specification Section 319025.

c2. Observe and document that the GW Contractor's geomembrane placement plan is being followed. Note where the plan is not being followed and document the GW Contractor's reasons for not following the plan. As each panel is placed, visually inspect the geomembrane for tears, punctures, and thin spots. The CQA Geosynthetics Inspector shall traverse the panels in such a way that the entire surface is inspected. Any defects shall be documented on a drawing and marked on the geomembrane for repair.

c3. Document that the location of the seams meet the general requirements for seaming specified in GW Specification Section 319020.

c4. At the time of placement, make measurements to confirm that required overlap of adjacent geomembrane sheets has been achieved, that proper temporary anchorage is being used (e.g., sand bags or tires), and that the geomembrane is being placed in a relaxed (nonstressed) state.

c5. Document any liner damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Mark the location of damage on the geomembrane for repair and on a drawing.

c6. Document improper liner placement (if the GW Contractor's geomembrane placement plan is not followed) and, as a result, inadequate coverage with the available materials or an excess number of field seams.

c7. Document inadequate sheet overlap resulting in poor quality seams.

c8. Document nonwelded or cut panels.

c9. Document repair of damage. Documentation shall include location, type, and method of repair.

d. Geomembrane Seaming and Seam Repair:

d1. Trial Welds Prior to Beginning Seaming:

d1.1 Observe that trial welds are being made at the frequency specified in GW Specification Section 319020.

d1.2 Observe fabrication of test strips and note that test strips are fabricated correctly.

d1.3 Specify where samples are to be cut from the test strips and witness all destructive tests.

d1.4 Observe documentation of results of the destructive tests by the GW Contractor.

d1.5 Audit documentation of each trial weld received from the GW Contractor.

d2. Seaming and Seam Repair. Activities that shall be documented during field seaming operations include:

d2.1 Observe that the geomembrane is free from dirt, dust, and moisture.

d2.2 Observe that the seaming materials and seam welding equipment are as specified.

d2.3 Observe that a firm surface is available for seaming.

d2.4 Observe that geomembrane overlap and panel adjustment are correct prior to seaming.

d2.5 For extrusion welding, observe that the geomembrane is pre-beveled and the geomembrane is properly abraded and that the panels are temporarily bonded.

d2.6 Observe that grind marks are covered with extrudite.

d2.7 Observe weather conditions (e.g., temperature, precipitation, wind) to ensure that they are acceptable for seaming.

d2.8 Record measurements of temperatures, pressures, and speeds of seaming to ensure that they are as specified. Gages and dials on seaming equipment shall be checked and readings recorded.

d2.9 Observe that the geomembrane is not damaged by equipment or personnel during the seaming process.

d2.10 Observe that no solvents or adhesives are used.

e. Anchorage at Existing Penetrations and Concrete Structures:

e1. Where shown on the Design Drawings, CQA Geosynthetics Inspectors shall ensure that the seals around existing penetrations and the anchorage to existing concrete structures are of sufficient strength and are impermeable.

e2. Specific inspections that shall be made on all seals and anchors include:

e2.1 Observations and tests to ensure that the sealing systems (i.e., pipe boots) have been installed as specified (are leak free) and in the proper location(s).

e2.2 Observations to ensure that all objects that are placed adjacent to the geomembrane (i.e., batten bars) are smooth and free of objects or conditions that may damage the geomembrane.

e2.3 Observations to ensure that all seals and anchors are complete:

e2.3.1 Batten bars of the specified material, width, and thickness and prepunched at the specified spacing.

e2.3.2 Anchor bolts of the specified size and material.

e2.3.3 Anchor bolts spaced as specified.

e2.4 Observations to confirm that all geomembrane liner penetrations and connections are installed as specified. Liner penetrations shall be verified for appropriate clamp and caulking use, for appropriate material, for good seaming, and for good housekeeping practices. No sharp bends on concrete surfaces shall be allowed.

f. Geomembrane Production Seam Testing:

f1. Non-Destructive Field Testing. Activities to be observed and documented include the following:

f1.1 Observe that 100 percent of the seam lengths are tested using non-destructive procedures.

f1.2 Observe that testing is performed as seaming progresses.

f1.3 Observe that the correct procedures are used for testing each type of seam.

f1.4 Observe all non-destructive test procedures.

f1.5 For air pressure testing, observe that the equipment, procedures, and air pressure meet specified requirements. Observe that all testing is properly documented.

f1.6 For vacuum box testing, observe that testing is being performed correctly.

f1.7 For inaccessible seams, observe that a procedure acceptable to the Owner is used to test the seams.

f1.8 Observe that all leaks are marked, recorded as to location, and repaired.

f1.9 Observe that repairs are made in accordance with approved techniques.

f1.10 Observe that all repairs are re-tested and that no leakage is present.

f1.11 Review leakage data for possible patterns. Make suggestions to the GW Contractor if data shows a consistent pattern of failure of a particular machine or crew.

f1.12 Audit documentation of testing prepared by the GW Contractor to make sure that the location of leaks is identified on the drawings.

f2. Destructive Testing:

f2.1 Destructive seam testing shall be performed at the frequencies specified in GW Specification Section 319020.

f2.2 The CQA Inspector shall specify the location where each sample shall be taken and record data for each sample.

f2.3 The CQA Inspector shall designate any additional test locations that may be necessary. These locations may be based on the suspicion of contamination by dirt or moisture, change in seaming materials, increase in failed nondestructive tests, and other causes that could result in unacceptable seams.

f2.4 Laboratory testing shall be performed in accordance with GW Specification Section 319020. Predetermined pass/fail values are specified in that section. Verbal laboratory test results shall be given to the Geosynthetics Contractor within 24 hours of receipt of the test samples. Written results shall follow within one week.

f2.5 Audit and document the results of laboratory testing on seam samples. Note any sample that does not pass and identify the location on the geomembrane liner for repair in the field and on the drawings.

f3. Repair of Failed Seams:

f3.1 For field seams that fail, the seam can either be reconstructed between the failed and any previous passed seam location, or the installer can go on either side of the failed seam location (10-foot minimum), take another sample, and test it. If that sample passes, reconstruct the seam between the two locations. If it fails, the process shall be continued. In all cases, acceptable seams must be bounded by two passed test locations. The CQA Geosynthetics Inspector shall document the procedure used and results of tests.

f3.2 Document that repairs are made. Documentation shall include location, type, and method of repair.

306. CQA TESTING AND INSPECTION REQUIREMENTS FOR DRAINAGE GEOCOMPOSITE OF LEACHATE COLLECTION AND REMOVAL SYSTEM

306.1 Initial Material Certification:

a. Prior to shipment of any drainage geocomposite materials, the CQA Contractor shall assemble, document the receipt of, and audit the GM/GC Manufacturer submittals listed below for conformance with the GW Specification.

a1. Copies of the raw material producers' certificates describing the origin and identification of the raw materials.

a2. Copies of the raw material producers' QC certificates.

a3. Statement certifying that the manufactured drainage geocomposite is free of per- and polyfluoroalkyl substances (PFAS).

a4. Copies of the GM/GC Manufacturer's QC certificates on tests performed on the geonet core, the geotextile cap and carrier, and the finished drainage geocomposite as specified in Specification P-1802 Section 319020 and a summary of the test results.

a5. Certification that the properties of the manufactured drainage geocomposite material meets GW Specification requirements and are guaranteed by the GM/GC Manufacturer.

306.2 Transportation, Handling, and Storage:

a. Documentation of Delivery:

a1. Document arrival of rolls of drainage geocomposite.

a2. Document that each roll is marked with the following information:

a2.1 Name of GM/GC Manufacturer.

a2.2 Product identification (e.g., brand name, product code).

a2.3 Order number.

a2.4 Date of manufacture.

a2.5 Manufacturing lot number.

a2.6 Drainage geocomposite thickness and type.

a2.7 Roll identification number.

a2.8 Roll dimensions (length and width) and weight.

a2.9 Panel number.

a3. Check the Quality Control certificates on each roll to verify that the rolls received onsite meet the GW Specification. Take the identifying labels from each roll or pallet and save them for future reference.

a4. Recommend rejection of rolls which do not have the required documentation and ensure that those rolls are removed from the site.

b. Inspection of Manufactured Rolls:

b1. Inspect all manufactured rolls upon delivery to the site.

b2. Ensure that packaging is secure and that no damage has occurred.

b3. If damage to packaging has occurred, inspect exposed roll surfaces, and note and identify any damage or repairable flaws. Note: This visual observation shall be conducted without unrolling rolls unless the extent of surface damage indicates that internal damage may be present.

b4. If damage to just the packaging has occurred, document repair of the packaging.

b5. If damage to the product has occurred, document that the damage or flaws are repaired or that the damaged material is wasted and removed from the site.

b6. Report all damage to the Owner.

c. Handling:

c1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

c2. Inspect the handling of materials by installing personnel to ensure that care is used.

d. Storage:

d1. Inspect the storage facility.

d2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

d3. Document unsafe or improper storage conditions, and report conditions to the Owner.

306.3 Preconstruction Testing:

a. Prior to material shipment to the site, the GM/GC Manufacturer shall submit to the CQA Contractor representative samples of the drainage geocomposite materials to be shipped to the site, along with a chain of custody and a certification that the samples submitted are from the drainage geocomposite materials to be delivered to the site. The CQA Geosynthetics Inspector shall perform conformance testing in accordance with Table 014362-7. The laboratory tests shall be performed at least at the corresponding minimum frequencies specified in Table 014362-7.

b. Test acceptance criteria shall be as specified in GW Specification Section 319020. If the results from any of the tests in Table 014362-7 do not meet the respective pass/fail thresholds, then the CQA Officer shall reject all drainage geocomposite materials for which the failed test(s) represent(s) for use in the project.

306.4 Inspections During Construction:

a. CQA activities during placement of the drainage geocomposite component of the Ash Surge Basin's new LCRS shall include visual observations and field testing to ensure that the drainage geocomposite is installed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-7 and the following paragraphs.

b. Weather Conditions for Placement:

b1. Observe and document the weather conditions (e.g., temperature, precipitation, and wind) to ensure they are acceptable for placement. The GW Specification describes correct weather conditions.

b2. If the weather becomes unacceptable for installation of the drainage geocomposite, recommend stopping the installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

c. Drainage Geocomposite Placement:

c1. Prior to placement of the drainage geocomposite, the HDPE geomembrane component of the composite liner system in the area to be lined shall have been installed, seamed, and inspected and all necessary repairs made in accordance with GW Specification Section 319020.

c2. Inspect all materials as they are unrolled to ensure that there are no flaws or damage.

c3. Observe and document that drainage geocomposite coverage is as specified on the Design Drawings, that joining of the geonet cores is as specified in GW Specification Section 319020, and that sewing of the geotextile caps is as specified in GW Specification Section 319020.

c4. Make measurements to ensure that the specified material overlap is achieved.

c5. Observe and document that all materials are free from wrinkles and folds.

c6. Observe and document that the material is not damaged during the installation process.

c7. Document any material damage from adverse weather conditions, equipment, inadequate temporary anchoring, or rough handling. Mark the location of damage on the drainage geocomposite for repair and on a drawing.

c8. Document repair of damage. Documentation shall include location, type, and method of repair.

307. CQA TESTING AND INSPECTION REQUIREMENTS FOR COARSE AGGREGATE BEDDING, SAND FILTER LAYER, PROTECTIVE WARNING LAYER, RIPRAP BEDDING LAYER, AND RIPRAP MATERIALS

307.1 Initial Material Certification:

a. Prior to shipment of any Coarse Aggregate Bedding, Sand Filter Layer, Protective Warning Layer, Riprap Bedding Layer, or riprap materials, the CQA Contractor shall assemble, document the receipt of, and audit the material suppliers' test results and certifications that the properties of the materials meet GW Specification requirements.

307.2 Inspections and Testing During Construction:

a. CQA activities during the placement of Coarse Aggregate Bedding, Sand Filter Layer, Protective Warning Layer, Riprap Bedding Layer, and riprap materials shall include visual observations and laboratory and field testing to ensure that the materials are installed in accordance with GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-2 and the following paragraphs.

b. Visual Observations of Material Placement:

b1. Upon delivery of the material to the site, inspect the material to ensure that it has not been contaminated during transportation and handling. Observe and document rejection of contaminated materials and replacement of suitable materials.

b2. Record the placement method(s) the GW Contractor is utilizing for installing the material.

b3. In instances where the GW Contractor is transporting material into the basin, then the CQA Contractor shall:

b3.1 Verify no equipment (wheeled or tracked) is traversing the Ash Surge Basin area when less than 10 inches of earthen material are above geosynthetic materials (i.e., drainage geocomposite, geomembrane liner, GCL).

b3.2 Document the receipt of and audit the GW Contractor's demonstration(s) that equipment entering the basin will not exert a ground pressure greater than 8 psi.

b3.3 Verify equipment operating within the basin does not hard brake on the ramp, make sharp turns, nor make quick stops that could pinch or tear geosynthetic materials.

b4. Observe placement procedures to provide proper thickness.

b5. Observe placement procedures to prevent segregation and degradation of material.

b6. Observe placement procedures to:

b6.1 Ensure pipes and underlying geosynthetic materials are not damaged during the installation process (Note: Side slope cover installation must be observed at all times to assure appropriate placement technique and equipment are used and to detect any damage to geosynthetic materials).

b6.2 Ensure that placement of the Coarse Aggregate Bedding material did not damage or displace the leachate collection pipe.

c. With the use of the GW Contractor's surveyor, make thickness measurements not more than 50 feet on a grid pattern to ensure that the thickness and coverage of each material is in compliance with the Design Drawings.

d. Audit surveys of each completed layer to ensure that specified slopes and elevations specified on the Design Drawings are obtained.

e. Laboratory and Field Tests:

e1. Laboratory and field testing shall be performed in accordance with the requirements specified in Table 014362-2.

f. Test Acceptance Criteria:

f1. Acceptance criteria shall be as specified in GW Specification Section 319050.

308. CQA TESTING AND INSPECTION REQUIREMENTS FOR LEACHATE COLLECTION PIPING AND SIDESLOPE RISERS

308.1 Initial Material Certification:

a. Prior to shipment of any HDPE piping, the CQA Contractor shall assemble, document the receipt of, and audit the Pipe Manufacturer's submittals listed below for conformance with the GW Specification:

a1. Certification that the manufactured pipe meets the requirements of the GW Specification.

a2. Statement that no reclaimed polymer has been added to the resin.

a3. Copies of the Pipe Manufacturer's QA/QC certificates on tests performed during fabrication.

308.2 Transportation, Handling, and Storage:

a. Documentation of Delivery and Inspection of HDPE Pipe:

a1. Document the arrival of pipe.

a2. Check the Quality Control certificates and marking on each pipe to verify that the pipe received meets the GW Specification requirements.

a3. Document that each length of pipe is marked with the following information:

a3.1 Name of Pipe Manufacturer.

a3.2 Pipe type (ASTM designation).

a3.3 Pipe size (diameter).

a3.4 Standard Dimension Ratio (SDR).

a4. Document that all fittings are fabricated and manufactured by the same manufacturer.

a5. Measure and document the spacing and diameter of perforations for perforated pipe and that perforations are predrilled prior to shipment.

a6. Recommended rejection of pipe that does not have the required documentation; that is of the incorrect size, type, or strength; or that is incorrectly fabricated. Ensure that rejected pipes are removed from the site.

b. Handling:

b1. Inspect the onsite handling equipment being used to move materials to ensure that it is adequate to minimize the risk of damage to materials.

b2. Inspect the handling of materials by installing personnel to ensure that care is used.

c. Storage:

c1. Inspect the storage facility.

c2. Inspect the ground surface to ensure that it is dry, relatively level, smooth, and free of rocks, holes, and debris.

c3. Document unsafe or improper storage conditions, and report conditions to the Owner.

308.3 Preconstruction Testing:

a. Observe and document that the pipes are of the specified size and strength and are constructed of the specified material.

b. Observe and document that pipe perforations for perforated pipe are as specified.

c. Observe and document that the material is not damaged during the installation process and that underlying geosynthetic materials are not damaged.

308.4 Inspections and Testing During Construction:

a. Inspection activities that shall be performed during pipe placement and joining include:

a1. Location:

a1.1 Observations and measurements to ensure that the specified pipe sizes are placed at the specified locations.

a1.2 Observations to ensure that perforated pipe is placed correctly.

a1.3 Measurements to ensure that the horizontal and vertical position and slope are within tolerances required by the GW Specification.

a1.4 Document the as-built locations of all pipes.

a2. Pipe Joining:

a2.1 Observations to ensure that the pipe is joined by using the hot plate thermal butt fusion method as required by the GW Specification and that the equipment used for welding is as recommended by the Pipe Manufacturer.

a2.2 Observations to ensure that the joining method described in the GW Specification is followed.

a3. Joint Quality Control:

a3.1 Observations and documentation that the test joints required by the GW Specification are made.

a3.2 Observations and documentation that the quality of the test joints meet the GW Specification.

a4. Miscellaneous:

a4.1 Observations to ensure that cleanouts are installed as specified.

a4.2 Observations to ensure that the placement of the Coarse Aggregate Bedding material under, around, and over the pipe is as specified on the Design Drawings.

a4.3 Observations to ensure that the pipe network is not damaged during backfilling.

a5. Cleaning:

a5.1 Observe that all the pipes are cleaned by jet cleaning after installation is complete and document that all pipes are intact and not obstructed.

a5.2 Document the location of defective or clogged pipe.

a5.3 Document repair by the GW Contractor and re-cleaning.

a6. Testing:

a6.1 Observe and document that visual observations on pipe joints have been performed and the results of observations documented.

a6.2 Document the location of failed joints.

a6.3 Document the repair and retesting of failed joints by the GW Contractor and the results of testing.

309. CQA TESTING AND INSPECTION REQUIREMENTS FOR CREST ANCHOR TRENCH

309.1 Inspections and Testing During Construction:

a. CQA activities during excavation, formation, and backfilling of crest anchor trenches for the retrofitted Ash Surge Basin's geosynthetic materials shall include visual observations and field testing to ensure that, where specified on the Design Drawings, crest anchor trenches are constructed in accordance with the GW Specification requirements. Field observations and tests shall be performed in accordance with the requirements specified in Table 014362-5 and the following paragraphs.

b. Measurements:

b1. Perform measurements of the crest anchor trench to ensure that the trench width, depth, and location are as specified on the Design Drawings.

c. Observations:

c1. Observe that the trench corners are rounded as specified.

c2. Observe that good housekeeping practices are followed in the trenching operation by not allowing soil to fall back into the trench or down the slope and not allowing water to pond in the trench.

c3. Observe that the trench is backfilled as soon as possible after the geosynthetic materials being anchored are installed and compacted in a manner that does not damage the geosynthetic materials.

310. SAMPLING PATTERN

310.1 The CQA Officer shall establish a completely random sampling pattern for determining the choice of sampling points for field tests. Each block of work shall be subdivided into a sampling grid with at least 10 times as many grids as samples or tests to be taken or as directed by the Owner. The grid shall have a numeric identification system devised to distinguish each set of tests for a specific area from all other sets of tests. Each lift shall have a separate grid.

310.2 Sampling points shall be chosen by a random number generator or other acceptable method to obtain uniform coverage. Tests shall be numbered beginning with test number one (1) and no numbers shall be skipped. In areas where a test of any type fails to meet specification criteria and a retest is performed, the retest shall have the same test number as the original test except that an “R” shall follow the test designation.

311. VERIFICATION AND CALIBRATION

311.1 Verification of Selected Field Tests:

a. The following tests shall be verified at the following frequency:

Test Requiring Verification	Frequency of Verification Test
Nuclear In-Place Density and Nuclear In-Place Moisture Content, ASTM D6938	Note 1
“Quick” Moisture Content Test Using Microwave, (ASTM D4643) or Gas Stove, Frying Pan, or Infrared Oven, (ASTM D4959), etc.	One standard oven-dry moisture content (ASTM D2216) test per 20 quick tests.
Lift Thickness Measured Using a Shaft or Shovel	One lift thickness verified by measurement every two acre-lifts.

Notes:

1 – A standard block test as required by ASTM D6938 shall be performed at the start of each day on each Nuclear apparatus that will be used that day. At the start of earthwork construction, a series of five Nuclear tests and five sand cone or rubber balloon tests shall be performed in the borrow area, or area to be excavated, on a compacted test strip to calibrate the Nuclear apparatus. During construction, one of the last Nuclear readings performed at the end of each day shall be verified using a sand cone (ASTM D1556) or rubber balloon (ASTM D2167) density and moisture content test for each apparatus used that day. The average wet density and moisture content for each apparatus shall be computed for every ten tests. If variations greater than those permitted by the ASTMs occur, corrections shall be applied to all future tests for the apparatus until the next set of 10 tests is performed.

311.2 Calibration:

a. Procedures for calibration of field and laboratory testing equipment shall be submitted by the CQA Contractor prior to the start of testing. These procedures shall meet ASTM requirements.

312. CORRECTIVE ACTION PROCEDURES

312.1 Failure of Material Quality Tests:

a. The GW Contractor and the Owner shall be notified immediately if gradation or Atterberg limits tests do not meet GW Specification acceptance criteria. Failure to meet acceptance criteria of one or more of these groups of tests may indicate problems with the quality of soil materials. The GW Contractor shall cease all construction activities until the source of the problem or “out-of-specification” materials are identified. Construction shall not begin again until materials and installation procedures meeting GW Specification acceptance criteria are identified for use.

312.2 Failure of Field Density or Moisture Content Tests:

a. If the results of field density or moisture content tests fail to meet GW Specification acceptance criteria, those tests shall be re-run after recompaction. Judgment shall be used to select re-test locations suspected of having lower than specified density or moisture content. If the results of the re-test meet GW Specification requirements, the compaction can be considered acceptable. If the results of the re-tests show out-of-specification densities or moisture contents, the CQA Officer shall immediately inform the Owner of the extent of the defective area. The defective area shall be removed and reconstructed or recompacted by the GW Contractor.

TABLE 014362-1

CQA FOR STRUCTURAL FILL MATERIAL

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	In-Situ Moisture Content	Laboratory Moisture Content	ASTM D2216	One per 500 cubic yards, and for each moisture density curve sample.
2	Moisture Density Curve	Proctor	ASTM D1557	One per 500 cubic yards, and for all changes in material.
3	Soil Index Properties	Atterberg Limits	ASTM D4318	One per 500 cubic yards, and for each moisture density curve sample.
4	Soil Index Properties	Grain Size	ASTM D422	One per 500 cubic yards, and for each moisture density curve sample.
5	Soil Classification	Unified Soil Classification System	ASTM D2487	One per 500 cubic yards, and for each moisture density curve sample.
6	Field Density / Soil Compaction	Nuclear Density Gauge, Sand Cone or Rubber Balloon Method	ASTM D6938(1), ASTM D2167, or ASTM D1556	Four per lift. One per 500 cubic yards.
7	Field Moisture Content	Nuclear Density Gauge or Direct Heat Method	ASTM D6938(1) or ASTM D4959	At each field density test location.
8	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per acre per lift.
9	Surface Lines and Grades	Surveying		One per 50-foot grid and at grade breaks (i.e., toe and top of slopes).

Notes:

(1) ASTM D6938 Procedure B (backscatter) shall be used to measure the as-compacted density of Structural Fill material.

TABLE 014362-2

CQA FOR COARSE AGGREGATE BEDDING, SAND FILTER LAYER, PROTECTIVE WARNING LAYER, RIPRAP BEDDING, AND RIPRAP MATERIALS

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
Coarse Aggregate Bedding, Protective Warning Layer, Road Surfacing, Riprap Bedding, and Riprap Materials				
1	Soil Index Properties	Grain Size	ITP 27	One per 500 cubic yards.
2	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per lift. One per 250 linear feet of road for material to be used as road surfacing.
3	Certification of Final Thickness and Grade	Surveying		One per 50-foot grid spacing.
Sand Filter Layer Material				
1	Hydraulic Conductivity	Hydraulic Conductivity	ASTM D2434	One per 500 cubic yards.
2	Soil Index Properties	Grain Size	ITP 27	One per 500 cubic yards.
3	Uncompacted and Compacted Thickness of Each Lift	Direct Measurement		Four per lift. One per 250 linear feet of road for material to be used as road subgrade.
4	Certification of Final Thickness and Grade	Surveying		One per 50-foot grid spacing.

TABLE 014362-3

CQA FOR GEOSYNTHETIC CLAY LINER

No.	Characteristic to be Monitored	Test	
		Test Method Reference	Minimum Test Frequency
1	Swell Potential	ASTM D5890	One test prior to material delivery for each type of material, and one test per material per 20,000 SF
2	Fluid Loss Properties	ASTM D5891	
3	Moisture Content	ASTM D4643	
4	Nonwoven Cap and Nonwoven Carrier Mass / Area	ASTM D5261	
5	Bentonite Mass / Area	ASTM D5993	
6	Hydraulic Conductivity	ASTM 5084	
7	Index Flux	ASTM D5887	
8	Tensile Strength	ASTM D6768	
9	Peel Strength	ASTM D6496	
10	Hydrated Internal Shear Strength	ASTM D6243	

TABLE 014362-4

CQA FOR AREAS TO RECEIVE GEOSYNTHETIC MATERIALS

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Certification of Surface Elevation Prior to Geomembrane	Surveying		One per 50-foot grid and at grade breaks (toe and top of slopes).
2	Subgrade Firm and Unyielding	Observe and Document Proofroll		Continuous on Structural Fill surface.
3	Subgrade Free of Deleterious Conditions	Observe and document exposed subgrade is free from • Irregularities • Protrusions • Loose soil or soft spots • Abrupt changes in grade • Debris • Clods • Stones • Roots • Organic material • Moisture seeps, puddling, or ponding • Frozen material		Continuous

TABLE 014362-5

CQA FOR ANCHOR TRENCHES

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Trench Geometry	Measurement		2 locations per trench 1 location per 100 ft of trench
2	Trench Condition	Observe and Document • Trench free of sloughed material • Trench free from ponded water • Absence of loose material below geosynthetics		Continuous
3	Trench Backfill	Observe and document prompt backfill of trenches		Continuous
4	Field Density / Soil Compaction	Nuclear Density Gauge, Sand Cone or Rubber Balloon Method	ASTM D6938, ASTM D2167, or ASTM D1556	Two per lift One per 200 ft of trench per lift

TABLE 014362-6

CQA FOR HDPE GEOMEMBRANE

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Receipt of Delivery	Observe and document: • Name of GM/GC Manufacturer • Product identification • Date of manufacture of the geomembrane • Roll identification number • Geomembrane thickness and type • Physical dimensions (length, width) • Manufacturing lot number • Panel number and weight • Order number	Visual	Each Roll
2	Inspection of Rolls	Lack of uniformity	Visual	Each Roll
		Damage, Tears, Punctures	Visual	Each Roll
		Imperfections, Blisters, Excessive Folding	Visual	Each Roll
3	Geomembrane Properties	Thickness	ASTM D5994	5 per roll of geomembrane delivered at locations evenly distributed throughout roll
		Density	ASTM D1505 / D792	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Tensile properties (strength and elongation at yield and at break)	ASTM D6693	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Tear resistance	ASTM D1004	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Puncture resistance	ASTM D4833	Per resin batch, but not less than once per 20,000 SF of geomembrane

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
		Carbon black content	ASTM D4218	Per resin batch, but not less than once per 20,000 SF of geomembrane
		Carbon black dispersion	ASTM D5596	Per resin batch, but not less than once per 20,000 SF of geomembrane
4	Weather and Site Conditions at Time of HDPE Geomembrane Deployment and Seaming	Observe and document weather and site conditions		Continuous
5	Panel Deployment	Observe and document: • Relaxed deployment • Damage prevention • Wrinkles minimized • Temporary anchorage • Protected from damage • Proper overlap • Seam location	Visual	Continuous
6	Trial Welds	Observe and document Geosynthetics Contractor staff performing and testing trial welds		• Prior to each seaming period. • Every 4 hours of continuous seaming. • Whenever personnel or equipment are changed. • When climatic conditions result in wide changes in geomembrane temperature. • When requested by the CQA Geosynthetics Inspector(s) for any seaming crew or piece of welding equipment if problems are suspected.

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
7	Preparation for Seaming	Observe and document: • HDPE geomembrane is clean • Minimum wrinkles and fish mouths • Fish mouths cut as necessary to lay flat • Film surface for seaming	Visual	Continuous
8	Seaming	Observe and document: • Materials • Equipment • Staff • Acceptable procedures • Weather • Pressure • Speed • Damage • Absence of solvents	Visual	Continuous
9	Non-Destructive Seam Tests	Observe and document: • Equipment • Methods • Pressures • Leaks marked • Repairs made • Repairs retested	Double-Wedge Fusion Welds: ASTM D5820 and GRI GM6 Extrusion Welds: ASTM D5641 Inaccessible Seams: Electric Wire Testing	100 percent of seam lengths shall be tested.

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
10	Destructive Seam Samples and Testing	Observe and document • Removal of all destructive test samples • Repair of sampled areas • Testing of repairs Label all samples Ship all samples to CQA Contractor's testing laboratory	Shear strength and peel adhesion	• One test per every 500 linear feet of seam length if the seam is welded with a fusion weld. • One test per every 400 linear feet of seam length if the seam is welded with an extrusion weld. • One test for each seaming machine

TABLE 014362-7

CQA FOR DRAINAGE GEOCOMPOSITE

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
1	Receipt of Delivery	Observe and document: • Name of GM/GC Manufacturer • Product identification • Roll identification number • Product thickness or composition • Manufacturing batch code or lot code • Date of manufacture • Order number • Roll dimensions (i.e., length, width, and total weight)	Visual	Each Roll
2	Inspection of Rolls	Lack of uniformity	Visual	Each Roll
		Damage, Tears, Punctures	Visual	Each Roll
		Imperfections,	Visual	Each Roll
3	Drainage Geocomposite Properties	Flow rate per width	ASTM D4716	Once per 20,000 SF of drainage geocomposite
		Ply Adhesion	ASTM D7005	Once per 20,000 SF of drainage geocomposite
4	Weather and Site Conditions at Time of Deployment and Seaming	Observe and document weather and site conditions.		Continuous

No.	Characteristic to be Monitored	Test		
		Monitoring / Testing Method	Test Method Reference	Minimum Test Frequency
5	Panel Deployment	Observe and document: • No debris or rocks below geotextile or geonet • Anchorage • Cutting • Damage prevention • Proper overlap and seaming	Visual	Continuous
6	Seaming	Observe and document: • Seam orientation • Seaming method • Thread material • Stitching type • Stitch length • Sweep for broken needles	Visual	Continuous
7	Repair Areas	Identify areas to be patched Document patching method and location	Visual	Continuous

END OF SECTION 014362