Project Definition Report
Duke Energy
Water Redirection Program
East Bend Generation Station

prepared for

September 2016

Project No. 88669

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

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East Bend Generation Station
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1 EXECUTIVE SUMMARY

Duke Energy (Duke or Owner) operates the East Bend Generation Station in Boone County, Kentucky. East Bend Station consists of a single operating coal-fired unit: Unit 2 is a 648 MW pulverized coal fired unit built in 1981.

East Bend Station will be subject to complying with the Environmental Protection Agency's (EPA's) rule for Coal Combustion Residual (CCR) storage and disposal and Effluent Limitation Guidelines (ELGs). Duke has retained Burns & McDonnell (BMcD or Engineer) to assist in developing the scope, design, schedule and cost estimates to bring East Bend Station into compliance with the CCR rule and ELGs. The scope includes the following:

- New Holding basin and repurposing of the existing ash pond as a lined two-part Retention Basin (RB).
- Water Redirects (WR) - Redirecting wastewater and storm water to the respective above facilities.
- New FGD maintenance tank and related facilities.

1.1 PURPOSE

The purpose of this report is to document the design basis and scope established in the project development phase. The report provides the contracting approach, schedule, and cost estimates of the project based on the documents contained herein.

1.2 GENERAL DESIGN

The recommended plant modifications were developed after a review and evaluation of the CCR rule promulgated on April 17, 2015 and the ELG regulations promulgated on November 3, 2015. Additionally, the recommendations were developed in collaboration with Duke Energy project and plant personnel. Recommended modifications include the following:

- RB (Retention Basin): Holding Basin and Retention Basin for collecting low volume wastewater, landfill leachate and contact storm water runoff; and treating for suspended solids removal, pH, oil and grease to meet NPDES permit requirements.
- WR (Water Redirects): Route low volume wastewater, landfill leachate, coal pile runoff, and contact storm water runoff to the retention basin. Water from the new west side landfill shall also be included. The WR scope will also include an 850,000 gallon FGD maintenance tank for holding FGD slurry during outages.

1.3 PROJECT EXECUTION APPROACH

A Certificate of Public Convenience and Necessity (CPCN) is required for this project. The duration of the CPCN permitting process is significant as equipment cannot be purchased and construction cannot commence until the CPCN permit is approved.

The selected contracting strategy for the Project is a multiple prime contract approach. Under this approach, engineered equipment and material will be procured from manufacturers specializing in the specific item. Construction will be performed by a limited number of contractors capable of self-performing most of the work included in the construction scope. Lump sum construction contracts are planned for the project. This approach provides the following benefits:

- Facilitates early award of major equipment procurements to allow detailed design engineering to proceed expeditiously and equipment to be fabricated to meet the Project schedule.
- Minimizes site interface issues by limiting the number of site contractors, while allowing work to be started as soon as engineering is completed and permit approvals are received.
- Offers the greatest flexibility for Duke to be involved in key decisions regarding design.
- Results in cost savings to Duke while minimizing Owner's risks.

In the multiple contract approach, Duke and BMcD work together to procure the construction and major equipment contracts. The procurement of the long lead time equipment such as electrical equipment is necessary early in the project to support detailed design and facilitate timely delivery. The contracting approach includes eleven equipment/material contracts, two furnish and erect contracts, five construction contracts, and five construction services contracts as referenced in Section 4.0 of this Report. The equipment contracts allow engineering to be completed prior to issuing construction drawings to reduce construction costs and schedule durations. Equipment contracts also allow Duke to reduce the cost of subcontractor markup that would be carried in the construction contracts for an alternative approach in which the equipment would be included as subcontracts within those construction contracts. In addition, this approach allows Duke more input into the equipment selection for the project and provides more control of the quality of materials purchased.

Prior to equipment procurement, BMcD will assist Duke in applying for CPCN.

1.4 SCHEDULE

A Level 3 project schedule was prepared and is discussed in Section 5.0 and is included in Appendix J. The project schedule is driven by the need comply with CCR and ELG regulations. The suggested preliminary schedule reflects a detailed engineering start date in early/mid 2016 and substantial completion of the WR in August 2018, and RB in November 2018.

1.5 COST ESTIMATE

The estimated capital cost for the East Bend Water Redirection Project is presented in Appendix K. The estimate is based on the capital cost basis and assumptions described in Section 6.0. Labor was assumed to be union labor for the cost estimate. The project estimate includes 10% project contingency and 5% Owner's contingency. The Appendix K cost estimate was transmitted separate from the PDR report.

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2 INTRODUCTION

2.1 PROJECT BACKGROUND

Duke Energy retained BMcD to develop the project definition report and design the following plant upgrades, as part of Duke's plan to achieve compliance with the new Coal Combustion Residual (CCR) regulations and Effluent Limitation Guidelines (ELGs):

- Wastewater Retention Basin (RB): Holding Basin and Retention Basin for removing suspended solids, pH adjustment, and oil and grease removal in plant low volume wastewater, contact storm water and landfill leachate.
- Water Re-Directs (WR): Add temporary and permanent collection basins, sumps, pumps and piping and re-pipe plant piping systems and contact storm water as required by the final CCR and ELG regulations.
- New 850,000 gallon FGD maintenance tank for Unit 2 absorber slurry and reclaim water.

2.2 PROJECT DEFINITION REPORT (PDR)

The project definition report includes the design basis and scope for the following new facilities based on preliminary evaluations:

- Wastewater retention basin.
- Water redirects.
- FGD maintenance tank and facilities.

The scope for these new facilities was based on the following items:

- Design basis.
- Arrangements.
- Associated site improvements.
- New foundations and structures.
- Mechanical interconnects and systems.
- Power supply and electrical systems.
- Controls integration.

The project definition report also includes the following project controls basis:

- Contracting approach.
- Engineering and construction schedule.
- Preliminary capital cost estimate.

2.3 OBJECTIVES

The Project Definition Report objective is to define the design scopes of major components of the project and provide adequate information to support the following activities:

- Establish design basis for major equipment and technology to be used.
- Establish design configurations.
- Development of a preferred contracting approach.
- Preparation of a preliminary project schedule.
- Project cost estimate.

2.4 TECHNOLOGY ALTERNATIVE SCREENING SUMMARY

Preliminary design and an assessment of the scope of systems and equipment was performed for the following environmental requirements that need to be met for the Project:

2.4.1 Screening Process

A screening process was completed to evaluate potential combinations of technologies that were considered feasible to provide the performance required and that also were in operation at other facilities with sufficient experience to confirm their viability for long term successful operation. Qualifying technologies were screened by performing a differential economic analysis to identify the potential differences in the capital and life cycle costs for each technology.

Several technologies were evaluated for the environmental requirements. The technologies considered included an arrangement that included a primary settling basin and a two part secondary retention basin in place of the ash pond, a two part retention basin with no primary settling basin, and a retention basin of smaller size than the existing ash pond. These alternatives were evaluated without polymer addition, although a polymer system will be included in the scope of the project for excursion events.

2.5 SELECTED ALTERNATIVE

Only the two options listed above that repurpose the entire ash pond area were evaluated to have the capacity to meet the environmental requirements.

A screening level economic analysis of all of the compliance options was performed to determine the differential capital and life cycle cost of each option. The option containing a two part retention basin with no primary settling basin was estimated to have the lowest capital cost of all of the options and was

selected by Duke as the preferred option to proceed with for the project. The selection process and the selected option are discussed in depth in Appendix A.

2.6 LIMITATIONS AND QUALIFICATIONS

Estimates and projections prepared by Burns & McDonnell relating to schedules, performance, construction costs, and operating and maintenance costs are based on our experience, qualifications and judgment as a professional consultant. Since Burns & McDonnell has no control over weather, cost and availability of labor, material and equipment, labor productivity, construction contractor's procedures and methods, unavoidable delays, construction contractor's method of determining prices, economic conditions, government regulations and laws (including interpretation thereof), competitive bidding and market conditions or other factors affecting such estimates or projections, Burns & McDonnell does not guarantee that actual rates, costs, performance, schedules, etc., will not vary from the estimates and projections prepared by Burns & McDonnell.

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3 PROJECT SCOPE & DESIGN INFORMATION

3.1. Retention Basin (RB)

3.1.1. Siting

Refer to Appendix C for the water redirection facility general arrangement. The RB facility will be located in the existing ash pond. This location was selected to utilize the existing NPDES outfall and to minimize interconnecting piping and pumping revisions and costs. New Holding Basin will be located in the southwest corner of the coal pile.

3.1.2. Design Basis

The Design Basis document for the Water Redirects (WR) is included in the Program Design Manual. The design basis document shall be followed except as noted herein.

3.1.3. Scope

The RB facility scope includes the equipment and buildings defined on Appendix C - RB Facility Arrangement and Appendix D - Equipment List.

The RB differs from the design basis as it does not contain a Primary Basin, as described in Appendix A.

Site improvements, foundations and structures, mechanical interconnects and systems, electrical power supply and controls integration scope is defined below.

3.1.4. Arrangement

Refer to Appendix C for the area arrangement and equipment arrangement drawings.

3.1.5. Site Improvements

The basin will be designed to balance cut and fill to the extent possible. Based on soil boring data it is assumed that no rock removal will be required for basin construction.

A new access road will be installed to the new retention basin. Refer to Appendix C.

3.1.6. Foundations and Structures

Foundation design will be based on a site geotechnical report prepared by a geotechnical engineering firm retained by Duke Energy. Light load foundations will be soil supported mat foundations. Heavier load foundations will require pile supported mat foundations.

A modular building will be provided over the chemical feed area located west of the Holding Basin.

3.1.7. Mechanical Interconnect and Systems

Interconnecting piping is based on Appendix F – P&IDs and pipe route plans. Scope will include interconnecting piping as defined below in the Water Redirects (WR) scope.

The basin influent chemical feed building will house a polymer feed system.

3.1.8. Power Supply and Electrical Systems

The power supply for the RB area will be new 480 Volt Motor Control Centers located in the Waste Stabilization Plant (WSP) electrical.

3.1.9. Control Integration

Spare I/O or additional DCS cards or a new cabinet will be installed in the WSP Building to control the equipment in the RB Chemical Feed building. It is estimated that approximately 90 hardwired I/O points will be required.

3.2. Water Redirects (WR)

3.2.1. Siting

Refer to Appendix C for the water redirection equipment general arrangement drawing. The WR will be routed to the facility locations defined within this document. The FGD maintenance tank (850,000 total gallons, 780,000 working gallons) will be located east of the existing absorber building.

3.2.2. Design Basis

The Design Basis document for the Water Redirects (WR) is included in the Program Design Manual. The design basis document shall be followed except as noted herein.

3.2.3. Scope

The WR scope is defined in Appendix F – P&IDs.

A new FGD Maintenance Tank will be added that will accept spent slurry flows from each scrubber module as well as the Absorber Building sump and both North and South Tunnel sump flows. The maintenance tank will have provisions to pump back to any of the 3 absorber modules as well as the Absorber Building sump.

A new diversion structure downstream of existing Outfall 010 will discharge to the eastern and western sections of the Lined Ash Pond. The Lined Ash Pond will undergo closure by removal, will be lined and repurposed into the two-sided retention basin. The existing boiler sump (including the settling basin section) will be re-routed to the new RB. The SCR sump, coal conveyor storm water (frog) pond, landfill leachate from cells 15-16, WSP area clean sump, deep well filter waste, sanitary discharge, demineralizer waste and existing east landfill trench will all be routed to the re-lined, two-sided retention basin when completed.

The new bottom ash stack out sump will be directed to the existing Boiler Room Sump ash settling basin. Air heater, ESP and economizer wash water will also go to the existing Boiler Room Sump and then be

pumped to a new Holding Basin before being released to the new RB. Vacuum truck liquid and slurry discharge and haul road runoff will also go to the new primary dewatering basins.

The existing Boiler Room Sump ash settling basin and existing West Landfill Trench (containing cooling tower overboard, coal pile runoff, West Landfill runoff and landfill leachate from Cells 1-14) will go to the new retention basin. A new fixation stack out area sump will be added and routed to the new retention basin.

Site improvements, foundations and structures, mechanical interconnects and systems, electrical power supply and controls integration scope is defined below.

3.2.4. Arrangement

Refer to Appendix C for the area arrangement.

3.2.5. Site Improvements

Existing sump pumps will be reused where possible, but it is assumed that North Tunnel Normal sump pumps, South Tunnel Normal sump pumps, and Absorber Building sump pumps will require replacement in order to have enough head to pump into the new FGD maintenance tank.

3.2.6. Foundations and Structures

Foundation design will be based on a site geotechnical report prepared by a geotechnical engineering firm retained by Duke Energy. Light load foundations will be soil supported mat foundations. Heavier load foundations will require pile supported mat foundations.

Foundations will be required for the FGD maintenance tank and pumps.

3.2.7. Mechanical Interconnect and Systems

Interconnecting piping is based on Appendix F - P&IDs and pipe route plans. Scope will include interconnecting piping between existing, new systems, and the RB.

Instrument air and service water will be taken from the existing systems in the Absorber Building.

3.2.8. Power Supply and Electrical Systems

The power supply to the FGD Maintenance Tank pumps and mixer will be existing 480 Volt Motor Control Centers located in the FGD Building. Refer to Appendix G - Electrical One lines.

3.2.9. Control Integration

Spare I/O or additional DCS cards or a new cabinet will be installed in the Scrubber Building to control the FGD Maintenance tank and equipment. It is estimated that approximately 60 hardwired I/O points will be required.

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4 CONTRACTING APPROACH

4.1 GENERAL APPROACH

The contracting approach used as a basis for the Project cost estimate was a multiple contract approach. As shown in Table 4.1, the contracts were broken into three major categories; Equipment contracts, Furnish and Erect contracts, and Construction contracts. The Equipment contracts were setup in recognition of long lead time items that will need to be ordered early in the project to support the schedule and are not impacted by the selection of other contractors.

To assist the reader in understanding the coordination of work between the multiple contracts, this Section provides detailed information on the coordination of responsibilities for design, fabrication, delivery, receipt & protection, foundations, piping, wiring, erection, commissioning and startup interfaces. Appendix I provides a division of responsibility (DOR) matrix identifying the Duke and BMcD responsible for equipment and construction contracts.

4.2 CONTRACT LIST

The following is the list of contracts that were used as a basis for this cost estimate:

Table 4.1 List of Contracts

Equipment Contracts	
5.2170	Submersible Pumps
5.2190	Miscellaneous Pumps
5.2240	FRP Fabricated Pipe
5.2710	Compressed Air Equipment
5.2711	Compressed Gas
5.3418	Retention Basin Chemical Feed
5.3420	Agitator
5.5330	480V Motor Control Centers
5.6110	DCS
5.6210	pH and Conductivity Instruments
5.6215	TSS Analyzers
Furnish and Erect Contracts	
5.2970	Field Erected Tanks
5.4310	Pre-Engineered Buildings
Construction Contracts	
5.8120	Retention Basin Construction
5.8140	Site Finishing
5.8210	Piling
5.8220	Site Preparation and Foundations
5.8320	Mechanical/Electrical Construction

Construction Services Contracts	
5.9010	Subsurface Investigation
5.9020	Surveying
5.9030	Underground Utility Investigation
5.9210	Civil / Structural Testing
5.9250	Electrical Testing

4.3 INTERFACE SCHEDULE

The following table identifies the interfaces between contracts to identify the responsibilities of each contract to assure equipment foundations, receipt, installation, piping and wiring are properly accounted for on each contract.

Table 4.2 Contracts Interfaces

Contract		Contract Interfaces				
No.	Description	RCVD BY	INST BY	FDNS BY	PIPE BY	WIRE BY
Equipment Contracts						
5.2170	Submersible Pumps	5.8320	5.8320	5.8220	5.8320	5.8320
5.2190	Miscellaneous Pumps	5.8320	5.8320	5.8220	5.8320	5.8320
5.2240	FRP Fabricated Pipe	5.8320	5.8320	5.8220	5.8320	NA
5.2710	Compressed Air Equipment	5.8320	5.8320	5.8220	5.8320	5.8320
5.2711	Compressed Gas	5.8320	5.8320	5.8220	5.8320	5.8320
5.3418	Retention Basin Chemical Feed	5.8320	5.8320	5.8220	5.8320	5.8320
5.3420	Agitator	5.8320	5.8320	NA	5.8320	5.8320
5.5330	480V Motor Control Centers	5.8320	5.8320	5.8220	NA	5.8320
5.6110	DCS	5.8320	5.8320	5.8220	NA	5.8320
5.6210	pH and Conductivity Instruments	5.8320	5.8320	5.8220	5.8320	5.8320
5.6215	TSS Analyzers	5.8320	5.8320	5.8220	5.8320	5.8320
Furnish and Erect Contracts						
5.2970	Field Erected Tank	5.2970	5.2970	5.8220	NA	NA
5.4310	Pre-Engineered Buildings	5.4310	5.4310	5.8220	NA	NA
Construction Contracts						
5.8120	Retention Basin Construction	5.8120	5.8120	5.8120	NA	NA
5.8140	Site Finishing	5.8140	5.8140	NA	NA	NA
5.8210	Piling	5.8210	5.8210	NA	NA	NA
5.8220	Site Preparation and Foundations	5.8220	5.8220	5.8220	NA	NA
5.8320	Mechanical/Electrical Construction	5.8320	5.8320	5.8220	5.8320	5.8320
Construction Services Contracts						
5.9010	Subsurface Investigation	5.9010	5.9010	NA	NA	NA
5.9020	Surveying	5.9020	5.9020	NA	NA	NA
5.9030	Underground Utility Investigation	5.9030	5.9030	NA	NA	NA
5.9210	Civil / Structural Testing	5.9210	5.9210	NA	NA	NA

5.9250	Electrical Testing	5.9250	5.9250	NA	NA	NA

Legend:
RCVD BY – Receiving Contractor
INST BY – Installation Contractor
FDNS BY – Foundations Contractor
PIPE BY – Piping Installation Contractor
WIRE BY – Electrical Construction Contractor

4.4 CONTRACT SCOPES

4.4.1 General

The following scope descriptions itemize the general content of the contracts that are currently contemplated. The "Contract Interfaces" identify responsibilities for site work, foundations, receipt of equipment and materials, construction/erection, and special interfaces to assist the reader in understanding the coordination of work. Assumptions have been made in preparing the scope description listing of items.

The Engineer will prepare drawings and specifications for use as the technical portion of the work package documents for equipment and construction packages. Work packages are indicated as the deliverables and will be issued to the constructor. General guidelines are as follows:

4.4.2 Underground Utilities

The scope of the contracts is based on an engineering sequence to permit design and construction of underground utilities early in the construction sequence. This approach allows completion of trenching and excavation activities earlier to permit better access and coordination of contractors or construction crafts. Storm water drains, underground electrical utilities, and grounding will be included in Contract 5.8220 – Site Preparation and Foundations. Contract 5.9030 – Underground Utility Investigation, will be issued to positively locate underground obstructions entering the perimeter of each work location prior to underground utility construction.

4.4.3 Piping and Instrumentation

Mechanical equipment, piping, and instrumentation furnished by equipment contracts will be received and installed by Contract 5.8320 – Mechanical/Electrical Construction. Contract 5.8320 – Mechanical/Electrical Construction will furnish and install piping, valves, and pipe supports not supplied under the equipment contracts.

4.4.4 Wiring

Electrical equipment furnished by equipment contracts will be erected and installed by Contract 5.8320 – Mechanical/Electrical Construction. The supply and installation of electrical commodities including cable tray, conduit, cable, etc. are included in Contract 5.8320 – Mechanical/Electrical Construction.

Wiring for lighting/convenience outlets, HVAC and communication system is also included in the Contract 5.8320 – Mechanical/Electrical Construction.

4.4.5 DCS

The Engineer will prepare I/O lists, drawings, specifications for the technical portion of the DCS. The DCS technical documents will be used to purchase the DCS from Emerson. Engineer will coordinate with the DCS supplier and Duke to integrate the new control system components into the plant DCS.

4.4.6 Instrument Calibration

All instruments will be factory calibrated, unless otherwise noted. Contract 5.9250 – Electrical Testing will perform subsequent calibration if required. In general, instruments will be provided with equipment contracts with the exception of balance of plant instrumentation which will be purchased separately.

4.4.7 Electrical Testing

Contract 5.8320 – Mechanical/Electrical Construction will perform specified testing for electrical equipment and wire testing. Contract 5.9250 – Electrical Testing will perform additional testing including phase rotation checks, programming and checkout of protective relays, and pre-energization equipment checks. Manufacturer's field services procured through equipment contracts will provide technical direction for equipment testing. Contract 5.8320 will provide support labor for use during testing activities.

4.4.8 Start-Up

Owner and Engineer will provide start-up coordination with Owner providing operating personnel. Contractors provide the construction labor and superintendents required to place equipment and systems into operation. Manufacturer's field services are furnished through equipment contracts to provide technical direction for equipment start-up.

4.5 CONTRACT SCOPE SUMMARIES

A description of each equipment contract, furnish and erect contract, and construction contract is included in Appendix H. This appendix contains detailed descriptions of each contract along with an itemized list of the scope in each contract. The project specific acceptable suppliers list will be developed prior to the start of procurement activities.

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5 SCHEDULE

5.1 CRITICAL MILESTONES

The current schedule is based on a full notice to proceed on engineering for the East Bend Station CCR/ELG Project in October 2015, with the new FGD Maintenance Tank complete in May 2018, WR complete in August 2018, and RB complete in November 2018. Several key Project milestones will need to be accomplished to meet the overall schedule for the project. A list of suggested important milestones as indicated on the Level 3 project schedule included with this report are listed in Table 5.1.

Table 5.1 Suggested Project Key Milestone Dates

Milestone	Date
Engineering Full Notice to Proceed	October 2015
Begin Detailed Design	February 2016
Issue Project Definition Report	April 2016
CPCN Permit Application Submittal	September 2016
CPCN Permit Approval	March 2017
Field Erected Tank Contract FNTP	March 2017
Pre-Engineered Building Contract FNTP	March 2017
Start Piling & Foundation in FGD Area	May 2017
Start Ash Pond Closure by Removal - West Half (by Others)	May 2017
Mechanical/Electrical Construction Contract Award	June 2017
Ash Pond Closure by Removal and Inspection – West Half Complete	August 2017
Start New Retention Basin Construction – West Half	August 2017
Holding Basin Complete	April 2018
FGD Maintenance Tank in Service	May 2018
New Retention Basin Complete	November 2018

The schedule is dependent on project approvals and a variety of other influences, in particular the Certificate of Public Convenience and Necessity (CPCN) permit approval. Equipment may not be purchased and construction cannot begin until the CPCN permit approval is received.

5.2 PROJECT SCHEDULE

A Level 3 project schedule is included in Appendix J.

The schedules are based on early procurement of the long lead major plant equipment which includes but is not limited to the electrical equipment. Vendor submittals are required from each equipment contractor which will support the detailed design of infrastructure (foundations, piping, wiring, instrumentation, etc.) required for installation of this equipment. Sufficient time has been included in the schedule for the RB and WR construction to allow Engineer to perform the detailed design to obtain competitive, lump sum bids for mechanical/electrical construction.

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6 COST ESTIMATE

6.1 GENERAL

An initial capital cost estimate for the proposed East Bend Station Water Redirection Project has been completed and will be issued in a separate submittal.

6.2 BASIS AND ASSUMPTIONS

The following describes the methodology used in the development of the East Bend Station Water Redirection Project cost estimate.

- The estimate is based on the assumptions and scope of supply indicated in this document and the project assumptions in Section 3.0. An electrical load study has not been developed for the Project. An instrument air study has not been developed for the project, but it is assumed that sufficient instrument air exists in the existing plant air system to support the new facilities. Design parameters and scope typically defined by these studies are estimated based on information provided by Duke, preliminary calculations, and BMcD experience.
- Balance of Plant Equipment: BMcD utilized in-house information from similar projects to develop the estimate.
- Construction Estimates: BMcD used recent in-house pricing information and industry standard pricing for construction commodities and indirect costs.
- Labor rates: Labor rates and productivity factors were developed based on BMcD in-house information and contractor budgetary bids.

6.2.1 Capital Cost Estimate Scope

A project scope description for the cost estimate is included in Section 3.0. These descriptions along with the drawings and lists included in the Appendices define the scope included in the cost estimate.

6.2.2 Major Capital Cost Estimate Assumptions

Several major assumptions were used in developing the capital cost estimate. These assumptions include the following:

- Commercial operation of the equipment is assumed to be the dates defined in Table 5-1.
- Labor is assumed union labor and available without excessive hourly incentives or incentive packages.
- A 15% mark-up (overhead and fee) is included on both materials and labor for subcontracted work.
- Escalation is assumed to average 3% per year for materials and 3% per year for labor.

- Contingency is included at 10% for project definition contingency and 5% for Owner contingency.
- Cost for Builder's Risk Insurance was based on 0.45% of the direct costs.
- No sales tax was included.
- No financing fees or interest during construction was included.

6.2.3 Major Commercial Terms

The following lists the major commercial terms assumed in developing the cost estimates. Minor assumptions are either self-evident in the data or have an insignificant effect on the estimated project capital costs.

- Project is assumed to be performed with multiple prime contracts for the construction work as defined in Section 4.0 – Contracting Approach. Major equipment identified in Section 3.0 and minor equipment items (piping specialties, small-bore piping, wiring and other construction commodities) are expected to be included in the construction contracts.
- Project will include multiple equipment procurement contracts as defined in Section 4.0 – Contracting Approach.
- Project will be executed with durations similar to those shown on the project schedule with the objective of achieving the project milestone dates. It is assumed the project will be executed with a schedule sufficient to minimize overtime. A 50-hour workweek was assumed as a means of providing an incentive to attract labor. This includes 40 hours of straight time and 10 hours of overtime for all normal construction periods. A 60-hour workweek was assumed during commissioning and start-up. No additional overtime is included to accommodate a compressed work schedule. Estimate assumes suitable area for Contractor laydown, trailers and parking is available on site.
- A performance bond is included for all subcontract work at the rate of 1.0% of the estimated project direct costs (100% bond).
- Sales tax on permanent materials and equipment supply is not included.

6.3 ECONOMIC CONDITIONS CONSIDERATIONS

An estimate for escalation of project costs has been included in the capital cost estimate. Escalation of construction labor, materials, and indirects was estimated based on 3% annually throughout the project. This estimate of escalation is based upon the average increase in craft labor costs for the United States. Escalation of equipment and materials was included in the project estimate at a rate of 3% per year.

6.4 CONTINGENCY

A project estimate contingency of 10% of the overall project costs is included in the project cost. It is included to cover accuracy of pricing and commodity estimates for the defined project scope. This contingency is not intended to cover changes in the general project scope (i.e. addition of buildings, addition of redundant equipment, addition of systems, etc.) nor major shifts in market conditions that could result in significant increases in contractor margins, major shortages of qualified labor, significant increases in escalation, or major changes in the cost of money (interest rate on loans).

On top of this, an additional project definition contingency or Owner contingency should be added to cover general project scope additions required for the final CCR/ELG regulations. Based upon the amount of preliminary design and project definition completed, BMcD recommends a 5% contingency to cover such potential changes.

The overall level of contingency is expected to be adequate to cover normal deviations in pricing and normal deviations in the assumptions used to develop the project costs; however, the contingency is likely not adequate to cover significant deviations from the project assumptions or major changes in market conditions. Deviations that may cause the project costs to exceed the estimated costs inclusive of contingency include excessive inflation (>3%), extreme shortage of qualified labor, extreme shortage of qualified construction contractors, change in contracting approach, and other similar changes. Such changes may be reflective of a moderate to high amount of new power plant or industrial plant construction or plant environmental retrofits.

6.5 SUMMARY COST ESTIMATE

The capital cost estimate developed for the East Bend Water Redirection Project is contained in Appendix K.

6.6 SUMMARY COST ITEM DESCRIPTION

The cost estimate is based on the multiple contracting approach defined in Section 4.0 – Contracting Approach. Additional mark up costs have been included for equipment, labor and material assumed subcontracted.

The contracting approach was developed concurrently with the cost estimate.

6.6.1 Mechanical & Electrical Equipment

The equipment supply includes the procurement of all major equipment. The equipment installation includes the receiving, initial inspection, and erection of all equipment. Installation of vendor pipe supplied with the equipment is included with the equipment scope.

6.6.2 Civil

The civil scope of work includes site preparation along with construction laydown areas and craft parking. The civil scope of work also includes digging the trenches for all underground piping and electrical duct bank. Site finishes such as stone and asphalt are included. Estimate assumes waste spoils disposed on-site.

6.6.3 Deep Foundations, Concrete

The foundation scope of work includes piling, structural excavation and backfill as well as concrete work. The quantities include concrete for all equipment foundations, building slabs, stair and door pads, stoops etc. This scope also includes the structural excavation and backfill required for foundation installation.

6.6.4 Structural Steel & Misc. Metals

The structural steel scope of work includes structural supporting steel and pipe rack steel. Pre-engineered building steel is included in the architectural scope. Miscellaneous metals such as platforming, grating and handrail are included.

6.6.5 Architectural & HVAC

The architectural scope of work includes the supply and installation of pre-engineered buildings and siding/roofing of miscellaneous structures. This also includes the supply and installation of primary and secondary framing, walls, plumbing, building insulation, windows, doors, flashing, gutters, and building finishes. HVAC equipment supply and installation is included as necessary. Fire Protection/detection is included. Enclosure and building power, lighting, and communication are included in this scope section of the estimate.

6.6.6 Painting & Coatings

The painting scope of work currently includes touch up painting as well as chemical resistant coatings. The painting and interior finishes of the buildings are included in the architectural scope and shall be per Duke Standards. All structural steel is estimated to be galvanized. Pipe is to be supplied shop primed with costs included for field touchup and labeling.

6.6.7 Piping

The piping scope of work includes underground and above ground piping supply and installation. The piping scope covers purchase of pipe, fittings, flanges, valves, specials, bolt-up kits, supports and pre-fabricated pipe not furnished by equipment suppliers. The piping scope of work does not include underground pipe trenches (civil scope), heat trace (electrical scope), insulation (insulation scope), and

cathodic protection (mechanical scope), touch up painting (painting) or pipe labeling (painting). The piping scope of work does include hydro-testing and applicable non-destructive evaluation (NDE).

6.6.8 Insulation

The insulation scope of work includes furnish and installation of thermal, personnel protection, and freeze protection insulation and cladding. This includes purchased or vendor provided equipment and piping insulation required. The insulation scope does not include any soundproofing insulation or building insulation. Building insulation is included with the architectural scope.

6.6.9 Electrical

The electrical scope of work includes the supply and installation of underground and above ground wiring, conduit, cable, and tray. The electrical scope also includes the supply and installation of the smaller transformers, panelboards, heat trace, security systems, communications systems, lightning protection, and grounding. Temporary construction power system installation is included in the electrical scope as well. Duct bank excavation, concrete, and backfill construction is included in the civil scope of work.

6.6.10 Instrumentation & Controls

The instrumentation scope of work includes supply of equipment non-vendor supplied instruments and installation of all loose shipped instruments as well as stands, tubing, calibration costs. Installation utilizes a mixed crew mix of electrical and mechanical craft. DCS equipment included in the major equipment section.

6.6.11 Miscellaneous Direct Scope

There are many miscellaneous scope items included as well. These include underground investigation, pilot trenching, survey, construction testing, heavy construction equipment, heavy haul, and craft startup support labor. Scaffolding costs are included in the wage rate buildup by craft.

6.6.12 Indirect Scope

Indirect scope includes construction management, engineering, startup & commissioning as well as escalation, warranty, bond, and insurance costs. The construction management estimate is based on a preliminary staffing plan and project execution schedule. The engineering estimate is based on a labored task item buildup of required design information to support the project. The startup estimate is based on the execution schedule as well as estimated costs for tasks such as first fills, plant checkout and training support. Warranty costs have been included for the implementation and coordination of warranty claims.

Bonds for applicable subcontractors and vendors have been included. No costs have been included for additional BWM project securities such as LOC (letter of credit) or parent guarantees.

6.6.13 Owner Costs

Owner costs include preliminary geotechnical reporting and pile testing performed during the project development stage. Owner contingency is included.

6.7 LIMITATIONS AND QUALIFICATIONS

Estimates and projections prepared by Burns & McDonnell relating to schedules, performance, construction costs, and operating and maintenance costs are based on our experience, qualifications, and judgment as a professional consultant. Since Burns & McDonnell has no control over weather, cost and availability of labor, material and equipment, labor productivity, construction contractor's procedures and methods, unavoidable delays, construction contractor's method of determining prices, economic conditions, government regulations and laws (including interpretation thereof), competitive bidding and market conditions or other factors affecting such estimates or projections, Burns & McDonnell does not guarantee that actual rates, costs, performance, schedules, etc., will not vary from the estimates and projections prepared by Burns & McDonnell.

* * * * *

Appendices

Appendix A
Technology Assessment

Memorandum

BURNS McDONNELL

Date: July 25, 2016

To: Joseph Potts, Dan Hartmann, and Adam Deller, Duke Energy

From: Karen Burchardt, Burns & McDonnell

Subject: Duke East Bend – Evaluation of Retention Basin Design Options

The program-wide design for the Duke Water Redirection Project includes a primary retention basin followed by secondary retention basin. Per Duke Energy's (Duke's) request, Burns & McDonnell (BMcD) has evaluated three scenarios for the East Bend retention basins:

- The program design of the primary basin and the volume of the entire secondary basin
- Eliminating the primary basin
- Optimizing the secondary basin

For each scenario, BMcD looked at two design cases: (A) Design process flows and total suspended solids (TSS), and (B) a 25-year rain event. In each case, the target TSS at the effluent of the secondary basin (Outfall 001) is 80% of the permit limit (0.80 * 30 mg/L), or 24 mg/L.

BMcD updated the particle settling model to reflect the secondary settling basin sizing shown in the 60% design drawings. The model was also updated to reflect recent information provided by United Conveyor Corp (UCC) on the submerged flight conveyor (SFC) overflow volume and TSS. Initial data from UCC indicated that the SFC overflow was 200 gpm and 110 mg/L TSS. More recent data from UCC estimates that this stream will be 400 gpm and 1,000 mg/L TSS. Lastly, the model was updated to reflect elimination of the primary basin.

RESULTS

Two flow cases were evaluated. The model inputs for Case A included a retention basin inlet flow of 4,813 gpm and inlet TSS of 247 mg/L, which reflect the combined design/peak process flows to the new retention basin. The model results for Case A are summarized in Table 1.

Table 1. Peak Process Flows and Peak TSS

	Inlet Flow Rate (MGD)	Total Solids Entering System (tpd)	TSS at Secondary Discharge (mg/L)	Solids Removal Primary (tpd)	Solids Removal Secondary (tpd)	Total Solids Removal (tpd)	Solids Discharged (tpd)
Program Primary Design + Entire Secondary	6.93	7.15	34.5	1.93	4.22	6.15	1.00
No Primary + Entire Secondary	6.93	7.15	34.5	N/A	6.15	6.15	1.00
No Primary + Optimize Secondary for 24mg/L TSS	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The model inputs for Case B included a retention basin inlet flow of 5,124 gpm and inlet TSS of 254 mg/L, which reflect the combined design/peak process flows to the new retention basin, plus the estimated flows and TSS from a 25-year, 24-hour rain event. The model results for Case B are summarized in Table 2.

Table 2. Peak Process Flows, 25-year Rain Event and Peak TSS

	Inlet Flow Rate (MGD)	Total Solids Entering System (tpd)	TSS at Secondary Discharge (mg/L)	Solids Removal Primary (tpd)	Solids Removal Secondary (tpd)	Total Solids Removal (tpd)	Solids Discharged (tpd)
Program Primary Design + Entire Secondary	7.38	7.81	37.2	2.03	4.63	6.66	1.15
No Primary + Entire Secondary	7.38	7.81	37.2	N/A	6.66	6.66	1.15
No Primary + Optimize Secondary for 24mg/L TSS	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The increase in discharge TSS compared to results presented in the Water Redirect Design Basis memorandum (Revision C dated June 7, 2016) is due to the updated flow and TSS associated with the SFC quench water. This updated information was recently provided by UCC. Note that for both Case A and B, polymer will be required to reduce outlet TSS below the 24 mg/L target.

Note that in both Case A and B, elimination of the primary basin had no effect on overall solids removal. The TSS at Outfall 001 does not change due to elimination of the secondary basin. Removing the primary basin from the design does increase the rate of solids buildup in the secondary basin. If the primary basin is removed from the design, the time frame for 2 feet of sludge to accumulate in the bottom of the secondary basin decreases from 14.6 years to 10.1 years.

As the target TSS cannot be achieved in any case evaluated (with or without a primary retention basin, Case A or Case B, with or without storm water flows), BMcD did not evaluate the performance of a smaller secondary retention basin.

Memorandum *(cont'd)*

BURNS McDONNELL

CONCLUSIONS

Based on the results of the analyses described above, BMcD recommends Duke consider deviating from the program approach and remove the primary basin at the East Bend Station. This is a feasible option if Duke is comfortable with the faster accumulation of solids in the secondary basin. Retaining the primary basin in the design approach does not aid the overall TSS removal and would not mitigate the polymer requirement. The secondary settling basin will have a working depth of approximately 20', so the basin is not limited to 2' of solids buildup. BMcD believes it could be difficult to justify the additional capital and operation and maintenance (O&M) expenses of the primary basin in the Certificate of Public Convenience and Necessity (CPCN) review.

Additionally, BMcD's modeling shows that there is not enough margin to optimize the secondary settling basin footprint. The model results estimate that the TSS target of 24 mg/L at Outfall 001 will be exceeded for both Case A (design process flow and TSS) and Case B (25-year rain event). For both of these cases, the entire footprint of the secondary settling basin aids with settling and polymer will still be required to reduce outlet TSS below 24 mg/L.

Note that the SFC quench water is modeled to be a significant source of fines going to the holding basin/retention basin system. Further investigation into treating this stream could be made. However, these fines have always gone to the existing Ash Pond as they are part of the bottom ash sluice water. Enough of these fines are currently settling out so that the TSS limit is not exceeded. The settling model discussed in this report is a design tool, and is therefore conservative. Also note that the SFC quench water flow rate and TSS loading provided by UCC is a worst-case estimate.

Based on this analysis, BMcD recommends that Duke proceed with eliminating the primary basin from the East Bend design and maintain a secondary basin size of 36.5 acres.

Please let me know if you have any questions or comments on the design of the East Bend settling basin.

KEB/keb

cc: John Wentz, Power Engineers
Rick Samuelson, Burns & McDonnell
John Leach, Burns & McDonnell
Douglas Randall, Burns & McDonnell
Lars Ellingson, Burns & McDonnell

Appendix B
Design Basis

BURNS McDONNELL

Water Redirects Design Basis

DUKE ENERGY

Duke Energy

CCR/ELG Project
Project No. 88667 thru 88680

Rev C
June 7, 2016

Water Redirects Design Basis

Prepared for

Duke Energy
CCR/ELG Project
Charlotte, NC

Project No. 88667 thru 88680

Rev C
June 7, 2016

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, MO

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EXHIBITS

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BMcD	Burns & McDonnell
CCR	Coal Combustion Residual
GCL	Geosynthetic Clay Liner
HB	Holding Basin
RB	Retention Basin
SFC	Submerged Flight Conveyor (Bottom Ash)
TSS	Total Suspended Solids
WR	Water Redirects
WWT	Waste Water Treatment

I. EXECUTIVE SUMMARY

This document provides the design basis for the water redirects associated with ash pond closures at the Duke Energy coal-fired facilities in Indiana, Kentucky, and North Carolina. The function of the ash pond for non-ash sluice water flow processing will be replaced with a combination of a retention basin and a holding basin. The retention basin will treat normal process flow and industrial rainwater runoff, except for coal yard runoff. The holding basin will treat coal pile runoff and periodic outage maintenance flows.

The retention basin will be designed for continuous flow through. The retention basin will consist of two primary basins for settling larger solids (greater than approximately 20 micron) and one secondary basin for settling of smaller solids. The primary basin will have an inlet chemical feed system for adjusting influent pH and adding polymer for enhancing settling of suspended solids. An outlet chemical feed system will be provided for adjusting effluent pH to meet permit discharge parameters. The need to chemical feed will be a function of influent water quality. It is anticipated that chemical feed may not be required under normal influent condition, but will be required during high flow, high total solids or high small particle size influent events. Although instrumentation will be provided to automate the chemical feed system, it is anticipated that optimizing chemical feed will require operating experience.

The holding basin will be designed for batch processing of high volume flows. It will be designed to hold coal pile runoff from the 25-year 24-hour rainfall event or maintenance flows (air heater and economizer washes). The basin will not be size for holding the combined rainfall and maintenance volumes, as it is not anticipate that both event would occur simultaneously and sizing for both would approximately double the basin size. The holding basin will have a chemical feed system for adjusting pH and adding polymer to enhance settling. It is anticipated that rainfall and maintenance volumes will need to be held in the holding basin one to two weeks for treatment before being evacuated at a slow rate over an approximately 3 day period to the retention basin inlet.

Process wastewater flow rates, suspended solids concentrations, and solids particle size distribution were determined using existing plant water balances, field investigations, literature search, and sampling. The data across all sites were used to characterize the suspended solids concentrations for plant drain streams, and a common design basis was used for all sites for common plant drains process wastewater. Site specific criteria was used to adjust the program solids characteristics where applicable. Various storm events were considered in sizing the retention basin.

Retention basin inlet and outlet structure design features and the holding basin floating suction conceptual design have been developed and included in the design basis document. The retention and holding basin chemical feed system conceptual designs have also been included in the document.

A mathematical model was developed to size the retention basin and holding basins using the process flows, storm water flows, and solids characteristics described above. Multiple cases were run for each project site. The design basis for the retention basin and holding basin and the recommended basin sizes are summarized in the following tables.

Table I-1 Retention Basin Design Summary

Stream	Allen	Marshall	Rogers	Roxboro	Belews Creek	Mayo	Cayuga	East Bend	Gibson
Design Process Flow (gpm)	2,500	4,400	6,700	5,900	4,600	2,500	2,600	4,700	5,500
Inlet TSS (ppm)	118	125	170	104	107	143	149	176	180
Primary Basin Size (acres)	0.70	0.70	0.70	0.92	0.92	0.92	1.10	0.92	2.12
Secondary Basin Size (acres)	7.5	7	7.0	10	10	5	11.5	36.4	40.0
Estimated Basin Outlet TSS (ppm)	26	37	71	28	23	30	27	26	30
Natural Settling in Primary, days to fill 2 feet of sludge	565	350	317	380	486	544	560	496	500
All Solids Settled in Primary, days to fill 2 feet of sludge*	317	182	107	207	244	357	353	134	261
Natural Settling in Secondary, years to fill 2 feet of sludge	21	10	4.4	14	15	16	27	20	28

* This case represents the impact of polymer and assumes all solids are collected in the primary basin.

Table I-2 Holding Basin Design Summary

Stream	Allen	Marshall	Rogers	Roxboro	Belews Creek	Mayo	Cayuga	East Bend
Total wash volume, total Mgal*	2.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Wash duration, hours	16	16	16	16	16	16	16	16
Process flow volume captured with washes, Mgal	1.2	2.2	3.2	2.8	2.2	0.5	1.4	1.0
Process + Wash, Mgal	3.7	5.7	6.7	6.3	5.7	4.0	4.9	4.5
Coal Pile Runoff, Mgal	2.3	4.5	4.3	0.0	6.6	3.5	2.7	3.4
Holding Basin Size (greater of two + 5% margin), Mgal	3.8	6.0	7.0	6.6	6.9	4.2	5.1	4.7
% of holding basin due to process flows	31.7%	38.6%	47.7%	44.4%	0.0%**	12.1%	28.0%	21.7%

* Wash volume includes air heater wash, boiler wash and economizer wash. This excludes a precipitator wash.

** The coal pile runoff is the driver of the holding basin size.

II. INTRODUCTION

To facilitate the closure of existing ash ponds at their coal-fired facilities in Indiana, Kentucky, and North Carolina, Duke Energy (Duke) proposes to redirect current process wastewater and industrial storm water to a new retention basin to be constructed at each site unless site specific conditions dictate the use of another method to collect and treat wastewater prior to discharge. To provide a consistent program design basis key Water Redirects (WR) and Retention Basin (RB) design parameters need to be established. This document summarizes these design parameters and associated recommendations.

A. Background

The closure of existing ash ponds will require industrial storm water and process flows to be re-routed to a new RB at each of the Program sites. Comprehensive site water balance studies have been completed by Duke for the North Carolina sites and have been developed by Burns & McDonnell (BMcD) for the Kentucky and Indiana sites. The water balances provide flow information for the WR. Duke and BMcD have conducted meetings to discuss wastewater streams to be routed to the RB, pretreatment needs and the RB facility design concept. The intent, to the extent possible, is to develop a consistent design approach across the Duke fleet. Some variances may be required on a plant by plant basis, based on site specific constraints or special requirements. This document establishes the WR design basis.

The flow basis for the WR and RB design is based on the most current plant water balances which quantify the plant maximum process water and storm water streams. Maximum process water flows have been confirmed by Duke personnel and used as the design basis, except where short term infrequent maintenance flows have been identified in which case average flows were used.

Non-contact storm water which currently flows to existing surface runoff and outfall(s) will not be collected and re-directed to the new RB. Non-contact storm water will gravity drain as it does currently to existing site drainage. Where it is not practical to separate non-contract storm water from process wastewater or industrial storm water, it will be redirected to the new RB.

Flows such as the coal pile runoff and air heater wash flows will be directed to a separate holding basin (HB) for pH neutralization and solids settling prior to transfer into the RB. If other industrial storm water runoff flows can be conveniently directed to the HB, these flows will be directed to the HB, otherwise they are directed to the new RB.

III. WATER REDIRECT DESIGN PARAMETERS

A. General

An analysis of the various process wastewater flows and industrial storm water flows was performed to determine alternatives for treatment prior to discharge. Table II-1 lists the various process wastewater and industrial storm water flows and generally characterizes the types of contaminants that are likely to be present in the various streams.

Table II-1 Process Wastewater Streams

Stream	Potential Contaminants						Notes
	Coal Fines	Ash	Lime-stone	Gypsum/ FGD Solids	Oil & Grease	Other	
Plant drains	X	X			X	X	
Cooling tower blowdown						X	
Raw water treatment plant drains						X	High TDS, high TSS
FGD wastewater treatment plant effluent						X	High TDS, high TSS
Sanitary treatment plant effluent						X	
Air heater wash		X					Potentially low pH, high TSS, small average particle size, and includes trace metals*
Boiler fire side wash		X					Includes trace metals*
Coal pile runoff	X						Potentially low pH, high TSS, and small average particle size
Limestone pile runoff			X				High TSS, and small average particle size
Gypsum stack out runoff				X			High TSS, small average particle size, and includes trace metals*
Fly ash silo runoff		X					High TSS, small average particle size, and includes trace metals*
Landfill leachate						X	Includes trace metals*
Landfill runoff						X	

*Trace metals are noted for reference. The basins are not designed to remove trace metals.

B. Solids Characteristics

Particle density and particle size are critical parameters for predicting settling characteristics for solids. A review of public information, EPRI reports, and plant data was performed to establish solids density design criteria for the program, which are presented in Table II-2.

Table II-2 Solids Specific Gravities

Parameter	Specific Gravity
Coal Fines	1.4
Fly Ash	2.0
Bottom Ash	2.0
Gypsum	2.0
Limestone	2.0
Other	2.0

There is limited total suspended solids (TSS) and particle size distribution (PSD) information on power plant solids. A sampling program was implemented to obtain information on solids concentration in the various waste streams and to determine particle size distribution of the solids. Multiple rounds of wastewater sampling were performed at Cayuga, Gibson, and East Bend. In addition, sampling has been performed at the Carolina project sites. A summary of Burns & McDonnell conclusions is provided below in Table II-3. Refer to Exhibit A for a summary of the results of the TSS and PSD studies.

Table II-3 Total Suspended Solids and Particle Size Distribution

Parameter	TSS (mg/l)	PSD (% less than 5 micron)
Coal Pile Runoff (1 yr)	400	60
Fly Ash Runoff (1 yr)	135	20
Gypsum/Fixation Runoff (1 yr)	4000	50
Limestone Runoff (1 yr)	4000	50
Non-Contact Storm Water (1 yr)	155	20
General Plant Drains	150	30
Cooling Tower Blowdown (River Water Makeup)	210	45
Cooling Tower Blowdown (Lake Water Makeup)	50 (Note 1)	45
Air Heater Wash (Low Volume)	1200	45
Air Heater Wash (High Volume)	500	45

Note 1 – Industry standard for film fill cooling tower, the TSS of the one actual test was approximately 8 mg/l

C. Retention Basin Inflow

A mathematical model was developed to estimate the process wastewater characteristics that require treatment in the RB. The various process wastewater streams and corresponding total suspended solids

concentrations are combined in the model to estimate the consolidated process wastewater stream that is expected to be directed to the RB. Using the consolidated process wastewater stream and the design criteria established above, preliminary RB sizes were estimated.

It was determined that the sizes of the RBs were being significantly impacted by the coal pile runoff and the air heater washes, because these streams tend to have the smallest particles and the greatest concentration of total suspended solids. When coal pile runoff and air heater wash wastewater are removed from the RB consolidated process wastewater influent, the RB sizes can be significantly reduced. Based on the initial RB sizing results, it was determined that the coal pile runoff and air heater wash wastewater should be segregated from the balance of the process wastewater flow. A holding basin is recommended to store coal pile runoff and other process waste streams that may be difficult to treat in the RB. The holding basin will be designed to allow additional time to settle solids. Holding basin effluent would then be directed to the RB after suspended solids have had time to settle. In addition to solids settling, the holding basin will allow for a more controlled chemical treatment process, as coal pile runoff and air heater wash may require significant quantities of neutralization chemicals to maintain acceptable pH conditions.

Where site conditions allow, a primary basin could be utilized as a holding basin. In this circumstance, the primary/holding basin may be larger than the other primary basin to store the necessary volume. The primary/holding basin would only be intended to be utilized as a primary basin when the other primary basin needs to be cleaned out and maintenance washes or storms are not expected. Further design criteria for the holding basin is described in Section IV.

IV. RETENTION BASIN

The RBs will be designed to handle both normal plant flows and the range of anticipated flows (minimum and maximum flows). Refer to Exhibit F for details on the flow basis. The RB will provide treatment to adjust the water pH, as well as remove suspended solids to acceptable levels prior to discharging to a new RB outfall. The RB outfall will be either an internal or external located outfall, and the location of the outfall will be determined specifically for each project. Unusual flows from periodic plant maintenance activities, which can contain solids that cannot be effectively treated in the RB, will be directed to a holding basin to remove these constituents prior to discharge to the RB. This section addresses the design basis and features of the RB system. Requirements for special streams identified as requiring pretreatment are addressed in Section VII.

A. Retention Basin Design Criteria

The Program design for the RB includes two 100% primary settling basins for the removal of larger suspended solids. From the primary settling basins, the water will overflow to a secondary settling basin to provide for additional settling of finer suspended solids. Water pH adjustment will be accomplished by mixing the appropriate caustic with the incoming water to the RB. Provisions will be included in the design to allow polymer addition to enhance suspended solids settling, if required. Additional chemical feed capabilities will be provided upstream of the RB effluent outfall to provide for final pH adjustment of the discharge (acid and caustic), if necessary. Effluent from the RB will be monitored to verify permit discharge limits are being met.

1. Retention Basin Design Criteria

a. The basins will be sized based on the following influent:
   1) Flow: Three hour maximum flow for process (non-storm related)
   2) The standard primary basin will be based on the following criteria under design process flow conditions:
      - Allow for loader and truck access for solids removal.
      - Settling of particles 10-20 microns and larger.
      - Achieve approximately 2 hours residence time.
      - Allow for 2 feet of solids accumulation prior to cleaning.
   3) The secondary basin sizing will be based on achieving the following targets in order of priority:
      - Priority 1 – Stay within available footprint space.

- Priority 2 – Achieve a minimum of 6 hours residence time during a 25-year storm to allow effective settling with polymer, if required.
- Priority 3 – Allow for 2 feet of solids to settle across the basin over at least 10 years and preferably, 20 years.
- Priority 4 – Achieve current permit TSS limits without polymer addition with only design process flows (based on influent characteristics defined in this document).
- Priority 5 – Achieve current permit TSS limits without polymer assuming a 1-year storm and design process flows (based on influent characteristics defined in this document).
- Priority 6 – Achieve current permit TSS limits without polymer assuming a 25-year storm and design process flows.

4) Design temperature for solids settling determination: 33°F

b. Assumed basin effluent limits are as follows. Plant specific requirements are listed in Exhibit B.
   1) TSS – less than 30 ppm monthly average, except where noted otherwise in Exhibit B.
   2) pH – 6 to 9
   3) The RB relies on upstream oil water separators to remove oil from plant drains collected in oil contaminated areas. An oil skimmer will be provided to prevent floating oil from entering the secondary basin.

Design criteria for each of the above features/requirements is described below and depicted on the attached Exhibit C:

2. Primary Settling Basins

a. Two equally-sized primary settling basins or cells, will be provided.
b. The primary settling basin is expected to settle out particles greater than approximately 20 micron and provide access for maintenance equipment to remove the accumulated solids.
c. The primary settling basins will not be a CCR impoundment per Duke Energy's direction. The primary settling basin features outlined in this document have been developed in collaboration with Duke.
d. Flow to the primary settling basins will be directed by an inlet box with two discharge sluice gates (refer to SKC-018 in Exhibit C). The sluice gates will be capable of channeling the flow to either of the primary basins.

e. A ramp accessible for a front end loader, dump truck or vacuum truck will be provided into each primary settling basin.

f. A partition berm will separate the primary and secondary basins. Weir elevations will be set to maintain normal pool elevations in the primary basin (refer to SKC-017 in Exhibit C).

g. Floating and fixed surface oil skimmers will be incorporated in the outlet weir structure design of each primary settling cell to minimize the potential for any oil in the primary basins from entering the secondary basins. The floating skimmers can incorporate an oil absorbent boom. The fixed skimmer will consist of an under flow wall (refer to SKC-017 in Exhibit C). Floating oil can also be removed by temporary oil removal equipment.

h. The basin will have a Geosynthetic Clay Liner (GCL) for leak prevention along with a granular protective cover over the liner system. Multiple layers of geosynthetic fabric will be utilized to protect the liner. Reinforced concrete pavement will be placed over the protective cover of the GCL. A 3 feet high stem wall will be installed at the base on the interior dike to prevent damage to the dike liner from cleaning operations. Refer to SKC-017 in Exhibit C.

i. The side slopes will have riprap protection from wave action.

j. The following general basin geometry criteria will be used:

   1) Space for settled sludge: 2 feet (may vary by site)
   2) Minimum liquid depth above solids: 4 feet
   3) Free board
      - Wave action: 2.5 feet
      - Rainfall: 0.5 feet
      - Surge volume: 1-3 feet (varies based on site runoff surge requirements)

k. Provisions for temporary pumps to dewater for periodic solids removal will be provided in each cell. The inactive cell will be dewatered into the active cell. Based on the expected inlet solids loading, it is anticipated that solids removal will be required once every six months to two years per primary basin. The solids removal frequency will vary from site based on inlet solids loading and if polymer is typically used.

l. Characteristics of the solids are assumed to be 20% solids. The wet settled solids are not expected to meet the paint filter test or TCLP standards. Once the selected primary basin is removed from service and the water in the basin is directed to the second operating primary basin via temporary dewatering pump, the solids will likely need to be piled to facilitate drying. Once the solids are allowed to dry over a few days, the solids are expected to pass a paint filter test and TCLP standards. Testing during the initial basin solids removal activities should provide operating personnel with information to make the final determination

regarding the paint test and TCLP standards. Refer to Primary Basin Cleaning Process - Exhibit D for a description of the dewatering and solids removal process.

3. Secondary Settling Basin

a. The secondary settling basin will be a single cell and designed to minimize recirculation allowing positive directional flow through the basin channel. The basin geometry will be designed to maximize fine particle settling. If site and design configuration allows, the inlet and outlet may be located at the same end of the basin. This will allow common inlet and outlet chemical feed systems.

b. The secondary basin will not be a CCR impoundment and will have a GCL liner for leak prevention along with a granular protective cover over the liner system. Multiple layers of geosynthetic fabric will be utilized to protect the liner. Flexible geomembrane liner such as High Density Polyethylene (HDPE) liner is not recommended because it is susceptible to puncturing, resulting in leaks. Bottom of basin will not have concrete for access.

c. The following general basin geometry criteria will be used:
   1) Space for settled sludge: 2 feet (may vary by site)
   2) Minimum liquid depth above solids: 4 feet
   3) Free board
      - Wave action: 2.5 feet
      - Rainfall: 0.5 feet
      - Surge volume: 1-3 feet (varies based on site runoff surge requirements)
      - Spillway: 1.0 foot

d. Characteristics of the solids are assumed to be 20% solids. Based on the secondary basin inlet solids loading, the secondary basins are expected to store solids for a minimum of 10 years before removal of the solids is required.

e. Width: will not exceed 250 feet to prevent short circuiting.

4. Inlet and Outlet Chemical Treatment and Monitoring Capabilities

a. The following primary basin inlet monitoring will be provided
   1) Flow
   2) pH/Temperature
   3) In process Total Suspended Solids

b. The following secondary basin outlet monitoring will be provided:
   1) Flow

2) pH/Temperature
3) In process Total Suspended Solids.

c. All monitoring will be transmitted to the plant DCS. All chemical feed controls will be from the plant DCS.

d. The following primary basin inlet chemical treatment facilities will be provided.
1) Polymer, to assist in the settling of solids
2) Caustic, for pH control
3) Spare for a future chemical feed system.

e. The following secondary basin outlet chemical feed systems will be provided:
1) Acid, for pH control
2) Caustic, for pH control

5. Secondary Basin Discharge

a. Outlet structure:
1) The concrete outlet structure in the secondary basin will incorporate a fixed weir to maintain the basin water level. Effluent in the outlet structure will be monitored as described above.
2) Chemical feed system may also be incorporated at this location.

b. Outlet Discharge:
1) Gravity drainage from the basin outlet structure will be used where feasible. The gravity discharge pipe will be sized based on the design inflow, pipe hydraulics, and throttled with a motor operated butterfly valve as required to support required residence time during storm events.
2) If pumped discharge is required, then 3 x 50% constant speed pumps will be provided based on the basin design inflow, pipe hydraulics and throttled with a motor operated butterfly valve as required to support required residence time during storm events.

c. Emergency Overflow Spillway:
1) An emergency overflow spillway will be incorporated along the basin outlet side of the berm to pass flows beyond the 25-year, 24-hour design storm. The spillway will appear as a depression notch at the top of the berm. Overflow from the spillway structure will convey to the existing natural drainage way. The spillway crest will be set about 1-foot below top of the berm. This will allow the basin spillway to pass 100-year, 24-hour storm. The spillway will be constructed of concrete at the top of the berm and riprap on the outside of the berm. Refer to SKC-017 in Exhibit C for additional details.

V. HOLDING BASIN

The holding basins will be designed to collect coal pile runoff and outage maintenance process wastewaters, allow for extended pH adjustment and solids settling time. The holding basin contents will be pumped to the RB for final treatment and discharge. The following provides general guidelines for holding basin designs. However, each site will consider specific needs and include a site specific design.

A. Holding Basin Design Criteria

The holding basin will allow wastewaters with fine solid particles to be collected for extended retention to facilitate solids settling to reduce solids loading on the RB. It will also incorporate means to adjust pH.

1. Holding Basin Influent:

a. Volume: the greater of 25-year storm event for the coal pile runoff or the maximum expected maintenance wash volume and simultaneous process flow, plus 5 percent margin. See Section VI-B for additional details.

b. Minimum freeboard for the holding basin is 3 feet from the top of berm to normal operating water level.

c. Minimum solids storage in bottom of basin is 2 feet.

d. The holding basin will include two vacuum truck unloading structures (refer to SKC-017 in Exhibit C).

2. Holding Basin Treatment:

A hydrated lime system and a polymer system at the holding basin are recommended. If the holding basin is near the primary basin the source of polymer may be a common system with the primary basin. These systems are recommended to reduce the cost of pH adjustment, provide the flexibility to potentially control iron and copper in the holding basin, and to decrease the time required to settle solids in the holding basin.

a. A hydrated lime feed system is recommended to adjust the pH of the holding basin contents. This system would be comprised of a hydrated lime silo, and an agitated reaction tank with at least 15 minutes of residence time. The holding basin effluent pumps will be used to circulate the holding basin contents from one end of the basin to the other. Lime will be

combined with circulated water in a reaction tank which will gravity discharge back into the holding basin.

b. Polymer addition is recommended to decrease the settling time required in the holding basin. Ideally, the polymer system would allow for introduction of polymer either in the reaction tank or at the holding basin pump discharge. Injecting polymer in the reaction tank would optimize the effectiveness of the polymer by allowing for pH adjustment prior to injection and polymerizing both the pumped solids and created solids from the lime reaction in a single pass through the reaction tank. The secondary polymer injection location at the pump discharge is recommended if the contents of the holding basin need to be transferred to the primary basin before all of the solids have settled. Injecting the polymer at the holding basin pump discharge will maximize the potential polymer effectiveness under these conditions and reduce the risk of basin upset conditions.

3. Holding Basin Construction:

a. The holding basins will not be CCR impoundments.

b. A ramp accessible for a front end loader, dump truck or vacuum truck will be provided into each settling basin.

c. The basin will have a Geosynthetic Clay Liner (GCL) for leak prevention along with a granular protective cover over the liner system. Multiple layers of geosynthetic fabric will be utilized to protect the liner. Reinforced concrete pavement will be placed over the protective cover of the GCL liner. A 3 feet high stem wall will be installed at the base on the interior dike to prevent damage to the dike liner from cleaning operations

4. Holding Basin Discharge

a. Wastewater from the holding basin will be transferred to the primary settling basin using an effluent pumping system with a floating suction to allow the basin to be evacuated from the top down as solids settle, refer to SKC-018 in Exhibit C.

b. Two 100% pumps located on the basin dike will allow effluent to be either directed to the primary basin inlet or recycled back to the holding basin if supplemental chemical treatment is required.

c. Where practical the basin will be provided with a gravity overflow to the primary basin.

5. Vacuum Truck Structure

a. The vacuum truck unloading structure will be located at the top of the holding basin berm.

b. The structure will be sized for two single-tank, tandem-axle vacuum trucks. The volume of this structure is to be determined based on site requirements for truck unloading during outages.

c. The structure will have a sloped bottom and walls on two sides. Refer to SKC-017 in Exhibit C.

VI. RETENTION AND HOLDING BASIN SIZING

A. Retention Basin Sizing

Burns & McDonnell evaluated multiple scenarios to estimate the retention basin size for each site. All scenarios include the design process flows. Additional scenarios included reviewing the impact of a 25-year, 24-hour storm; a 1-year, 24-hour storm; including wash streams (air heater, boiler, etc); including coal pile runoff; post basin blend of FGD effluent or cooling tower blowdown. These scenarios were evaluated to estimate the basin size necessary to achieve the site specific current permit TSS limits (with and without margin).

Based on these results the following are determined to be generally applicable across all sites.

1) Outage maintenance wash streams and coal-pile runoff will not naturally settle to acceptable TSS discharge rates within the maximum allowable basin at any site. The particle density and size of coal pile runoff solids make it difficult to settle even with polymer, and chemical neutralization would require high volumes of caustic. The small particle size and high TSS of outage maintenance wash water would require polymer for settling and increase risk for solids carry over in addition to requiring high volumes of caustic for neutralization.

2) During significant storm events, very few sites will achieve acceptable TSS discharge rates within the maximum allowable basin at any site (Priority 5 & 6). Rain sensing instrumentation with polymer addition will be required to meet current permit TSS limits.

3) The Midwest East Bend and Gibson sites that plan to build up to the required basin size in phases will likely require continuous polymer addition until the final basin phase is fully developed.

1. Primary Basin

The general principal is to include 2x100% primary basins that are approximately 0.92 acres (80' x 500'). This size has been selected not only to achieve primary settling, but to also provide necessary space to allow effective clean out. At sites where a holding basin could fit at the inlet of the secondary basin, a single primary could be utilized with a larger combined primary/holding basin. To determine settling and solids build up in the basin, evaluations are based on a single primary basin in-service. Table VI-1 through Table VI-3 summarize the recommended primary basin for each site including (under design

process conditions): size, estimated composite inlet TSS, the tons per day of solids accumulation, and the retention time.

Table VI-1 Carolina West Primary Basins

Parameter	Allen	Marshall	Rogers
Primary Basin Size (acres)	0.70	0.70	0.70
Design Process Flow (gpm)	2,500	4,400	6,700
Inlet TSS (ppm)	118	125	170
Solids Accumulation (tpd)	0.8	1.2	1.3
Retention Time (hrs)	6.3	3.5	2.3

Due to site space constraints, the primary basins in the Carolina West region are slightly smaller (80'x400') than the ideal preferred primary basin design (80'x500').

Table VI-2 Carolina East Primary Basins

Parameter	Belews Creek	Mayo*	Roxboro**
Primary Basin Size (acres)	0.92	0.92	0.92
Design Process Flow (gpm)	4,600	2,500	5,900
Inlet TSS (ppm)	107	143	104
Solids Accumulation (tpd)	1.1	1.0	1.5
Retention Time (hrs)	4.4	8.0	3.4

* Mayo assumes the cooling tower blowdown flow blends with the basin effluent.
** Roxboro assumes the FGD WWT cooling water is not directed to the basin.

The Mayo cooling tower flow is assumed to have a TSS of less than 30 ppm and, it is assumed that the cooling tower blowdown will blend with the basin effluent. One data point provided indicates a cooling tower blowdown TSS of 8 ppm. Blending the cooling tower blowdown with the basin effluent significantly reduces the secondary basin size.

The Roxboro FGD cooling stream flow is assumed to have a TSS of less than 30 ppm and, it is assumed that the cooling stream will not be directed to the retention basin.

Table VI-3 Midwest Primary Basins

Parameter	Cayuga	East Bend*	Gibson
Primary Basin Size (acres)	1.10	0.92	2.12
Design Process Flow (gpm)	2,600	4,700	5,500
Inlet TSS (ppm)	149	176	180
Solids Accumulation (tpd)	1.2	1.1	2.6
Retention Time (hrs)	16.3	4.3	0.8

*East Bend assumes the SFC quench water is service water from a heat exchanger or is otherwise treated for solids prior to the basin.

The SFC quench water at East Bend is assumed to be 200 gpm containing 5,400 ppm of coal fines related TSS. The flow rate is based on Burns & McDonnell previous experience with similar applications and the 5,400 ppm TSS is based on a single sample collected at East Bend. This stream, if real, represents 60% of the solids directed to the basin. It is assumed this stream would be pre-treated in a small tank based system as this step would allow a reasonably sized primary basin (additional details under item 3 in this section).

2. Secondary Basin

The secondary basins at each site are uniquely sized to achieve the maximum number of design priorities given the existing space limitations. The design priorities are listed under Section IV-A.1. Table VI-4 indicates which priorities are achieved at each site.

Table VI-4 Secondary Basin Achieved Design Priorities

Plant	Achieved Design Priority	Description
Allen	1-4	Utilized all available footprint and should be able to achieve solids settling under design process conditions without polymer.
Marshall	1-3	Utilized all available footprint but will probably require polymer under design process and storm conditions.
Rogers	Need to Discuss Options	Utilizing all available space, but will still probably still requires polymer. Site configuration is not conducive to polymer introduction during storm events.
Belews Creek	1-6	Utilize less than the available space, and should be able to achieve acceptable TSS under design process, 1-year and 25-year storm conditions.
Mayo	1-6	Utilize less than the available space, and should be able to achieve acceptable TSS under design process, 1-year and 25-year storm conditions.
Roxboro	1-6	Utilize less than the available space, and should be able to achieve acceptable TSS under design process, 1-year and 25-year storm conditions.
Cayuga	1-4	Utilized all available footprint and should be able to achieve solids settling under design process conditions without polymer.
East Bend	1-4	Utilized all available footprint and should be able to achieve solids settling under design process conditions without polymer.
Gibson	1-4	Utilized all available footprint and should be able to achieve solids settling under design process conditions without polymer.

Table VI- 5, Table VI-7, and Table VI-8 summarizes the recommended secondary basin size for each site including (under design process conditions): size, composite inlet TSS, tons per day of solids accumulation.

Table VI- 5 Carolina West Secondary Basins

Parameter	Allen	Marshall	Rogers
Secondary Basin Size (acres)	7.5*	7*	7.0*
Estimated Basin Outlet TSS (ppm)	26	37	71
Solids Accumulation (tpd)	0.6	1.1	2.6
Basin Retention Time (hrs)	68	35	23

*Estimated maximum wet basin space available, to be confirmed during detailed design.

Allen

The available space at Allen is not sufficient to settle solids during storm conditions. This will require the use of polymer under storm conditions. The maximum available space is utilized to provide the greatest flexibility and margin going forward to minimize the impact of future storms.

Marshall
The available space at Marshall is not sufficient to settle solids to acceptable rates under either process or storm flow conditions. This will require the use of polymer under design process conditions or storm conditions. The recommend size is one acre less than the available size, assuming the remaining acre could be used for a potential tank based tertiary treatment system. Options for pre and post treatment of streams at Marshall are currently being investigated.

Rogers
The identified space for the Retention Basin at Rogers is not sufficient to settle solids to acceptable rates under either process or storm flow conditions. The Retention Basin would require the use of polymer under design process conditions or storm conditions. Storm water at Rogers is currently gravity drained to a collection basin and pumped to the existing ash basin. If gravity drained to the Retention Basin, the practicality of mixing polymer into the storm stream reliably is a concern. The following discussion covers issues and potential options for the Rogers facility.

Storm water and process drains are currently routed to a holding basin (known as P5 area), from which the water is pumped to the existing ash basin. Duke is currently constructing a 12 million gallon holding basin and redirecting the flow streams currently going to the P5 area to this new basin. The basin will be fitted with pumps to pump the collected water to the existing ash basin. The P5 area is also being cleaned out to make space for the new Retention Basin.

Unit 5 process drains are routed to the P5 area via the Unit 5 storm water system. Unit 6 process drains are routed to the P5 area separately from the storm water system except for the Unit 6 cooling tower blowdown which is comingled with area storm water drains.

Unit 6 cooling tower blowdown could be segregated from the Unit 6 storm water system, leaving only storm water going to the new holding basin currently being constructed. This storm water could be pumped to the new Retention Basin at a controlled flow rate from the holding basin. Duke has identified this storm water as industrial storm water needing to go to the Retention Basin to settle solids prior to discharge. It is recommended that storm water be re-evaluated to confirm this is the case.

Estimated storm water flows for Rogers are as provided in Table VI-6.

Plans are to construct a coal pile storm water runoff holding basin in the P5 area as part of the Water Redirects project for settling of solids upstream of the RB. This basin would treat to control pH and settle solids prior to being released to the new RB. The coal pile runoff basin would be pumped to the new RB

at a controlled flow rate. Routing of Unit 5 and 6 maintenance wash water flows would be directed to this holding basin (to be confirmed) for settling and pH adjustment prior to be released to the Retention Basin.

Table VI-6 Rogers 25-year Storm Volumes

Area	25-year, 24-hour storm event (million gallons)	Notes
Unit 6 Area Storm Water	6.6	Unit 6 cooling tower blowdown comingled with storm water
Coal Pile Runoff	4.3	Install coal pile runoff settling basin, treat with caustic to control pH upstream of retention basin
Limestone/Gypsum Area	2.0	
Unit 5 Area Storm Water	7.5	Unit 5 process drains are comingled with Unit 5 storm drains
FGD WWT Area and Misc. Area Storm Water	2	Misc. area is area east of gypsum/limestone stack out areas

The Unit 5 storm water volume is of concern since it gravity drains to the new Retention Basin area. A means to measure flow (approximately 140,000 gpm peak flow) and add/mix polymer are needed to treat this stream upstream of the Retention Basin. One option is to allow it to drain to the holding basin currently being constructed and pump it to the new Retention Basin. An issue with this option is that Unit 5 process drains are comingled with the Unit 5 storm water. It needs to be determined if this comingled flow stream can go to the holding basin currently being constructed. Otherwise, segregation of Unit 5 process drains from the Unit 5 storm water system may be required.

Limestone/gypsum storm water runoff is currently planned to be routed to the holding basin currently being constructed. The ability to re-route this storm water flow to the coal pile run off basin needs to be determined. Limestone runoff would help with pH adjustment in the coal pile runoff basin.

FGD WWT Area and Misc. Area Storm Water flows could be taken to the holding basin currently being installed and then pumped to the Retention Basin. These areas are likely to be non-contact storm water areas, potential to discharge to natural water ways should be considered.

If all the storm water is taken to the holding basin currently being constructed, the total storm water volume would exceed the holding basin capacity. Pumps are required to remove excess water during the 25-year, 24-hour storm event. Estimate pump size would be on the order of 10,000 gpm to prevent over filling the holding basin during the storm surge. Ideally, the best approach would not direct this amount

of flow to the Retention Basin and/or treatment system. If considered non-contact storm water, flow from this basin could be directed to river for discharge.

If process drains can be segregated from storm water, with storm water either going to the currently constructed holding basin or to natural discharge, the Retention Basin would be sized for the process design flow indicated in Table VI-1.

With the P5 area being the preferred location of the holding basin, there is very limited space remaining in the P5 area for further storm surge. The majority of the remaining P5 area would be consumed by the primary basins. To provide for a secondary basin, the discharge from the primary basins would need to be pumped to a new secondary basin in the existing contractor parking area. An approximately 7 acre secondary basin could be installed in this location. This 7 acre basin would still require the use of polymer under design process conditions and require frequent cleanout (see Table VI-9).

If the 7 acre basin in the contractor parking area is not feasible, the other option is to install primary basins in the P5 area with the discharge from the primary basin(s) treated using mechanical treatment. This option would eliminate the secondary basin and the issues with frequent cleanout of the basin. However mechanical equipment would be required.

Burns & McDonnell also investigated the option of utilizing a high rate clarification system upstream of the Rogers Retention Basin on the Unit 6 sump with Unit 6 cooling tower blowdown redirected to the Unit 6 sump, and on the Unit 5 cooling tower blowdown. Models indicate that clarification (assumed 15 ppm TSS effluent) of the Unit 6 streams is not sufficient to eliminate polymer use during design process conditions given the size limitations of the Rogers basin. If Unit 5 cooling tower blowdown is also clarified, the available lower basin is sufficiently sized to avoid polymer use during design process conditions. However, this does not address either the storm conditions or the challenges of adding chemicals during storm conditions.

In summary, Rogers needs further review and reconsideration of the need to treat storm water flows in the Retention Basin.

Table VI-7 Carolina East Secondary Basins

Parameter	Belews Creek	Mayo*	Roxboro**
Secondary Basin Size (acres)	10	5	10
Basin Outlet TSS (ppm)	23	30	28
Solids Accumulation (tpd)	1.1	0.5	1.2
Basin Retention Time (hrs)	48	43	37

* Mayo assumes the cooling tower blowdown flow blends with the basin effluent.
** Roxboro assumes the FGD WWT cooling water is not directed to the basin.

All of the Carolina East sites can maintain the desired TSS outlet rates during design process and storm conditions. However, it is still recommended that a polymer system be included at each of these basins to address significant rainfall events and as a backup based on the limited influent water quality data used to evaluate retention basin suspended solids settling performance.

Mayo
The cooling tower flow is blended with the basin effluent as the only testing data indicates the TSS is below the required TSS target of the basin. If the TSS of the cooling tower is assumed to be a typical cooling tower maximum (50 ppm), the recommended basin size would increase by approximately three acres.

Table VI-8 Midwest Secondary Basins

Parameter	Cayuga	East Bend*	Gibson
Secondary Basin Size (acres)	11.5	36.4	40.0
Basin Outlet TSS (ppm)	27	26	30
Solids Accumulation (tpd)	0.7	3.0	2.4
Basin Retention Time (hrs)	98	858	159

*East bend assumes the SFC quench water is clarified service water from a heat exchanger or is otherwise treated to remove solids prior to discharge to the basin.

Cayuga
The secondary basin at Cayuga utilizes all of the available space to minimize carryover risk and to support schedule and bidding. The retention basin will require the use of polymer under rainfall events.

East Bend
The secondary basin identified represents the final stage of construction. Initial stages will utilize smaller basin sizes and require the use of polymer. The final stage utilizes the maximum available basin space as this was the most cost effective manner to retrofit the existing basin. The final retention basin will require the use of polymer under rainfall events.

Gibson
The secondary basin identified represents the final stage of construction. Initial stages will utilize smaller basin sizes and require the use of polymer. The final stage utilizes the maximum available basin space to minimize maximize the effectiveness of the basins prior to entrance into the cooling lake. The final retention basin will require the use of polymer under rainfall events.

3. Solids Accumulation

Table VI-9 through Table VI-11 summarize the sludge build up rates in the primary and secondary basins described in the preceding sections. The tables indicate the estimated quantity of sludge to be introduced into the primary and secondary basins under design process flows assuming natural settling. In instances where polymer would be required for basin operation, it is assumed that all solids will settle in the primary. The accumulation of sludge in each basin is estimated at 100% capacity factor and at an assumed reduced capacity factor.

As the number of storms vary greatly by season, the size of storms occurring during any season can vary by year, and the impact of back to back storms would not have the same impact as individually spaced storm events. The impact of storms to sludge build up has not been included in the estimated days of build up to achieve 2 feet of sludge. Utilizing such an average impact would be misleading. Instead, the tables present the impact of a 1-year or 25-year storm in terms of how many normal design process flow days would produce the same amount of solids. This approach was chosen as practical method of indicating the relatively small impact each storm has on the overall sludge loading. For reference, assuming the average annual rain fall was entirely comprised of 1-year or 25-year storms, the total number of storms events would be 15 and 7 events, respectively.

The basin sludge is assumed to be comprised of 20% solids (solids density of 125 lb/cuft) with a bulk sludge density of 69.3 lb/cuft. All sludge build rates assume 24 hour a day, 7 days a week operation at the design process flow.

Table VI-9 Carolina West Solids Accumulation

Parameter	Allen	Marshall	Rogers
Primary/Secondary sludge, cuft/day	108 / 84	174 / 161	192 / 378
Capacity factor 1 (Capacity factor 2)	100% (20%)	100% (80%)	100% (80%)
Natural Settling in Primary, days to fill 2 feet of sludge	565 (2825)	350 (438)	317 (397)
All Solids Settled in Primary, days to fill 2 feet of sludge**	317 (1584)	182 (227)	107 (134)
Natural Settling in Secondary, years to fill 2 feet of sludge	21 (105)	10 (13)	4.4 (5.5)
25-Year Storm, Number of Process only days to settle the same amount of sludge	8	17	18
1-Year Storm, Number of Process only days to settle the same amount of sludge	4	7	5

* Located in contractor parking lot
** This case represents the impact of polymer and assumes all solids are collected in the primary basin.

Marshall
As the available basin requires the use of polymer, the years to fill two feet of sludge in the secondary is conservatively short as most solids will remain in the primary when polymer is utilized.

Rogers
As the available basin requires the use of polymer, the time to fill two feet of sludge in the secondary could be conservatively short as most solids could remain in the primary if polymer is utilized upstream of the primary basin for process flows. However, a secondary polymer addition point would be necessary to treat the effluent from the primary basin. Other options to mitigate the maintenance issue of short basin clean out cycles is the addition of pretreatment equipment to reduce the solids entering the basin. Assuming natural settling and the addition of clarification (actiflow or other) to Unit 6 sump and Unit 6 cooling tower blowdown the secondary basin clean out cycle would increase to approximately eight years. If the Unit 5 cooling tower blowdown was also clarified, the time frame would increase to approximately sixteen years.

Table VI-10 Carolina East Solids Accumulation

Parameter	Belews Creek	Mayo*	Roxboro**
Primary/Secondary sludge, cuft/day	165 / 163	147 / 77	211 / 176
Capacity factor 1 (Capacity factor 2)	100% (80%)	100% (15%)	100% (80%)
Natural Settling in Primary, days to fill 2 feet of sludge	486 (608)	544 (3625)	380 (475)
All Solids Settled in Primary, days to fill 2 feet of sludge***	244 (305)	357 (2382)	207 (259)
Natural Settling in Secondary, years to fill 2 feet of sludge	15 (18)	16 (103)	14 (17)
25-Year Storm, Number of Process only days to settle the same amount of sludge	3	N/A	0.2
1-Year Storm, Number of Process only days to settle the same amount of sludge	1	N/A	0.1

* Mayo assumes the cooling tower blowdown flow blends with the basin effluent.
** Roxboro assumes the FGD WWT cooling water is not directed to the basin.
*** This case represents the impact of polymer and assumes all solids are collected in the primary basin.

Table VI-11 Midwest Solids Accumulation

Parameter	Cayuga	East Bend*	Gibson
Primary/Secondary sludge, cuft/day	172 / 101	161 / 437	370 / 340
Capacity factor 1 (Capacity factor 2)	100% (65%)	100% (65%)	100% (65%)
Natural Settling in Primary, days to fill 2 feet of sludge	560 (862)	496 (763)	500 (769)
All Solids Settled in Primary, days to fill 2 feet of sludge**	353 (543)	134 (206)	261 (401)
Natural Settling in Secondary, years to fill 2 feet of sludge	27 (42)	20 (31)	28 (43)
25-Year Storm, Number of Process only days to settle the same amount of sludge	4	1	8
1-Year Storm, Number of Process only days to settle the same amount of sludge	2	0.2	2

*East bend assumes the SFC quench water is service water from a heat exchanger or is otherwise treated for solids prior to the basin.
** This case represents the impact of polymer and assumes all solids are collected in the primary basin.

East Bend

If the SFC quench water stream (200 gpm with 5,400 ppm TSS) is correct and not pretreated the sludge buildup rate increases by a factor of approximately 6 for the naturally settling rate and 2.5 for the

polymer (all solids settling) rate. The resulting primary clean out rates are 85 days and 54 days for natural and polymer settling, respectively.

B. Holding Basin Sizing

The information available on air heater, economizer and boiler fireside washes are limited and vary significantly from site to site. Discussions with Duke have indicated many of the existing wash plans are based on historical practices at each site. These practices are not necessarily based on conservation of water or wash time nor have they all been coordinated based on experiences at other sites. Duke agrees that practices at some sites are going to need to change going forward to minimize wash and possibly manage the resulting pH of the wash water.

The recommended holding basins are based on assumed modifications to plant practices resulting in greater uniformity across the fleet in the total volume of wash water for certain practices as well as uniformity in total wash duration. The latter is an important aspect to consider as almost all sites do not have a practical method separating the wash flows from the process flows, requiring the capture of process flows for the duration of the wash period. Exhibit E includes the currently known information regarding washes and assumed future conditions. The results in the following tables are based on the assumed future conditions.

The holding basins are sized based on the larger of either the coal pile runoff volume associated with a 25-year 24-hour storm or the total volume of the wash water plus the process flows during the wash. Table VI-12 through Table VI-14 indicate the key factors that combine into these two volumes. The volume that is dictating the holding basin is noted in bold. The recommended holding basin volume is noted including a 5% margin from the basis volume and the fraction of the volume that is due to process flows is provided.

Table VI-12 Carolina West Holding Basin Sizing

Stream	Allen	Marshall	Rogers
Total wash volume, total Mgal	2.5	3.5	3.5
Wash duration, hours	16	16	16
Process flow volume captured with washes, Mgal	1.2	2.2	3.2
Process + Wash, Mgal	3.7	5.7	6.7
Coal Pile Runoff, Mgal	2.3	4.5	4.3
Holding Basin Size (greater of two + 5% margin), Mgal	**3.8**	**6.0**	**7.0**
% of holding basin due to process flows	31.7%	38.6%	47.7%

The Allen total wash volume is assumed to be smaller due to site limitations to capture the wash and process volume. If the smaller volume is not feasible, the approach to washes will need to be modified to allow for treatment of a partial wash in the holding basin prior to competing the wash.

Table VI-13 Carolina East Holding Basin Sizing

Stream	Roxboro	Belews Creek	Mayo
Total wash volume, total Mgal	3.5	3.5	3.5
Wash duration, hours	16	16	16
Process flow volume captured with washes, Mgal	2.8	2.2	0.5
Process + Wash, Mgal	6.3	5.7	4.0
Coal Pile Runoff, Mgal	0.0	6.6	3.5
Holding Basin Size (greater of two + 5% margin), Mgal	**6.6**	**6.9**	**4.2**
% of holding basin due to process flows	44.4%	0.0%*	12.1%

* The coal pile runoff is the driver of the holding basin size.

Table VI-14 Midwest Holding Basin Sizing

Stream	Cayuga	East Bend	Gibson
Total wash volume, total Mgal	3.5	3.5	N/A
Wash duration, hours	16	16	N/A
Process flow volume captured with washes, Mgal	1.4	1.0	N/A
Process + Wash, Mgal	4.9	4.5	N/A
Coal Pile Runoff, Mgal	2.7	3.4	N/A
Holding Basin Size (greater of two + 5% margin), Mgal	**5.1**	**4.7**	**N/A**
% of holding basin due to process flows	28.0%	21.7%	N/A

Per Duke Energy's direction, Gibson will not have a holding basin. All flows at Gibson are directed to the west ditch and into the secondary basin.

VII. INFLUENT PRETREATMENT

A. Process Water Pretreatment

1. Oil and Grease Contaminated

a. It is assumed that all oil contaminated process wastewater will be pre-treated in an oil water separator prior to comingling with other plant process wastewater.

b. Water balances indicate that not all plants currently have oil water separators. If plants don't have existing oil water separators, new oil water separators will be provided where requested by Duke.

c. New oil water separators will be parallel-plate type.

d. Treated effluent will be conveyed to the RB by 2 x 100% submersible pumps.

2. Sanitary Drains

a. Sewage treatment effluent that currently discharge to the ash pond will be redirected to the new RB. Sanitary drain flows will continue to be pretreated in a mechanical sewage treatment plant prior to discharge to the RB.

3. Periodic Air Heater, Economizer or Boiler Wash Water

a. Wash water will be conveyed to the holding basin thru the existing plant drain system.

b. During washes RB influent flows will be diverted from the primary RB to the holding basin.

c. The holding basin will be sized to store the wash flow and either 20% or 50% of the design process flow for a total of 16 hours of wash. 20% is utilized for single unit plants and 50% is utilized for all multiple unit plants.

d. Refer to above holding basin section for additional detail.

e. The holding basin will not be sized to store the wash water simultaneously with storm events.

f. Refer to Exhibit E for additional details regarding the assumed wash volumes, associated process flows accounted for in the holding basin.

g. Each station is unique and the design will fit the station needs.

4. Periodic Precipitator Wash Water

a. The holding basin design does not address precipitator washes since they are relatively infrequent.

b. These wash volumes alone may exceed the volume of the holding basin.

c. Capturing the process flow alone during the duration of this wash may exceed the volume of the holding basin.
d. Each station is unique and the design will fit the station needs.
e. Staged cleaning or temporary storage may be required during these infrequent maintenance events to treat the waste water.

B. Industrial Storm water/Non-Contact Storm water

1. FGD/Fixation/Gypsum Stack out Areas

a. Where possible these materials should be handled dry due to difficulty in settling. These areas should be swept frequently to minimize solids in runoff.
b. No changes will be made to existing stack out areas with an existing permitted discharge.
c. Runoff flow will be rerouted to the new holding basin where practical or the RB.
d. Where space is practical and there is an economic advantage, storm water flows from these areas will be routed to an intermediate collection basin to provide for some initial solids settling as well as to act as a flow buffer prior to being sent to the new holding basin or RB. The intermediate collection basin or sump will be design to accommodate a 25-year, 24-hour design storm. The basin will be lined. The liner will be a GCL for leak prevention along with a granular protective cover over the liner system. Concrete pavement will be placed over the protective cover of the GCL. The concrete effluent sump, if used, will not be lined. The discharge from the intermediate collection basin will be sent to the new holding basin or the RB. Site specific topography will dictate if the flow is gravity fed or pumped to the holding basin or RB.
e. It is assumed that rainfall events in excess of the 25-year, 24-hour design storm will overflow and be discharged with general plant storm water.
f. Discharge pumps, if required, will be 2 x 100% pumps.

2. Limestone Pile Runoff

a. No changes will be made to existing limestone runoff ponds with an existing permitted discharge.
b. Existing limestone pile runoff that is currently directed to the ash basin will be rerouted to the new RB.
c. Where space is practical and there is an economic advantage, storm water flows from these areas will be routed to an intermediate collection basin or rim ditch depending on site needs and available space to provide for some initial solids settling as well as to act as a flow buffer

prior to being sent to the new holding basin or retention basin. The intermediate collection basin will be designed to accommodate a 25-year, 24-hour design storm. The earthen basin will be lined. The liner will be a GCL for leak prevention along with a granular protective cover over the liner system. Concrete pavement will be placed over the protective cover of the GCL. The GCL liner will not extent under the concrete sump. The discharge from the intermediate settling pond will be sent to the new holding basin or primary retention basin. Site specific topography will dictate if the flow can be gravity fed or pumped to the new basins.

d. It is assumed that rainfall events in excess of the 25-year, 24-hour design storm will overflow and be discharged with general plant storm water.
e. Discharge pumps, if required, will be 2 x 100% pumps.

3. Coal Pile Runoff

a. No changes will be made to existing coal runoff ponds with an existing permitted discharge.
b. Existing coal pile runoff that is currently directed to the ash basin will be rerouted to the new holding basin. Duke plans to evaluate, on a site by site basis, placing and maintaining limestone riprap in the flow path to the holding basin to mitigate the low pH and associated chemical treatment requirements associated with this flow.
c. Where space is practical and there is an economic advantage, storm water flows from these areas will be routed to an intermediate collection basin or rim ditch depending on site needs and available space to provide for some initial solids settling as well as to act as a flow buffer prior to being sent to the new holding basin. The intermediate collection basin will be designed to accommodate a 25-year, 24-hour design storm. The earthen basin will be lined. The liner will be a GCL for leak prevention along with a granular protective cover over the liner system. Concrete pavement will be placed over the protective cover of the GCL. The GCL liner will not extent under the concrete sump. The discharge from the intermediate settling pond will be sent to the new holding basin. Site specific topography will dictate if the flow can be gravity fed or pumped to the new holding basin.
d. It is assumed that rainfall events in excess of the 25-year, 24-hour design storm will overflow and be discharged with general plant storm water.
e. Discharge pumps, if required, will be 2 x 100% pumps.

4. Fly Ash Silo Area

a. Fly ash spills should be handled dry due to difficulty in settling. Very small amounts of fly ash area wash down may be handled wet.

b. Wet fly ash will be collected in intermediate basins or sumps and be pumped to the RB.
c. Discharge pumps, if required, will be 2 x 100% pumps.
d. Earthen basins will be lined. Concrete discharge sumps, if used, will not be lined.

5. Landfill Leachate and Runoff

a. If the specific plant has an existing landfill leachate and runoff system that is working well, no changes will be made to the existing landfill systems.
b. For sites where landfill leachate and runoff are currently routed to the ash pond, landfill leachate will be conveyed to the new RB from the existing pumping system or a new pumping station.
c. Based on site by site scope, contact landfill runoff may be conveyed to the holding basin or RB for further treatment as required, then discharged to the existing outfall.
d. Non-contact, landfill-site run-off will discharge to existing site drainage.
e. Currently only landfill leachate piping from the landfill to the RB is included. Scope to include landfill collection, holding or pumping additions is currently not in this project's scope.

6. Non-Contact Storm Water

a. Storm water gravity drain to existing off-site drainage.
b. Existing ash ponds which will be closed are considered non-contact areas. In the interim period prior to closure, it is assumed that rainwater entering the pond will be stored in the pond or discharged out the current pond outfall.
c. A site specific determination will be made for routing non-contact storm water to the RB. In some cases, it may be relatively easy to route non-contact storm water to a direct discharge. In other cases, it will be cost prohibitive to separate non-contact storm water from process water, and in these instances, non-contact storm water will be directed to the RB.

VIII. WATER REDIRECTS

A. Flow Basis

Plant process drains and industrial storm water (rain water that contacts power plant generated pollutants) will be redirected from the existing ash pond to the new RB at each site. Plant water balances developed for each site define the average and maximum plant process water and storm runoff flows. Maximum three hour average flows have been used to design the RB storage capacity, except where infrequent large flows have been identified where daily averages have been used. Local intermediate holding basins or tanks will be provided where practical to buffer these infrequent flows. Additionally, surge capacity will be incorporated into the RB to accommodate these infrequent flows. A summary of plant design flow and capacity basis is summarized in the attached Exhibit F. Below is a general explanation of the design basis for each flow category:

1. Design Process Flows

a. Plant Drains: Flow based on the water balance maximum (maximum 3 hour average, typ). Average flows are substantially less than maximum flows.

b. Oil Contaminated Drains: Flow based on the water balance maximum, except where surge tanks are used to reduce oil water separator costs.

c. Cooling Tower Blowdown: Flow based on water balance average flows. Water balance maximum flows reflect periodic basin draining for maintenance.

d. Water Treatment Wastewater: Flow based on the water balance maximum.

e. Wastewater Treatment Effluent: Flow based on water balance maximum or new WWT plant design flow.

f. Wastewater Treatment Effluent Cooling Water: Flow based on water balance maximum or new WWT plant design flow.

g. Treated Sewage Effluent: Flow based on water balance maximum flow.

h. Landfill leachate: Average leachate flow only.

i. Fly ash silo area sumps: Average daily flow.

j. FGD area sumps: Average daily flow.

k. Coal yard sumps: Zero flow as they are assumed to be redirected to the coal pile.

l. Truck wash facility: If wash facility is not closed loop, flow is based on water balance average flowrate.

2. Maintenance Flows

a. Air Heater Wash Water: Information was gathered from the plants regarding air heater wash flows, frequency, and quality (refer to Exhibit E). Based on the information received, air heater wash water may contain high concentrations of ash and the pH of the wastewater is often relatively low. To provide flexibility with managing air heater wash water flows, provisions will be included to be able to direct the wash water to the holding basin to allow solids to settle and provide pH adjustment if necessary prior to being routed to the RB.

b. Precipitator Wash Water: Due to the rare occurrence, duration and total wash flow from this event, specific provisions have not been included to send and hold this wash stream in the holding basin. Special provisions will need to be implemented to ensure the pH and solids can be simultaneously managed during a precipitator wash.

c. Economizer Wash Water: Similar to the air heater wash water, provisions will be included in the design to allow economizer wash water to be routed to either the holding basin or the RB

d. Boiler Fire Side Wash Water: Boiler fire side wash volumes are relatively high based on input received from the plants. Boiler fire side wash water is likely to contain high concentrations of ash during the first portion of the wash. If the boiler side wash down water source can be converted to high pressure ash sluice water, then boiler side wash water will be directed to the SFC for dewatering. Otherwise it will be treated similar to the air heater wash water.

e. It is recommended, fleet wide system wash best practices be implemented across the fleet to minimize the wash volume, wash duration and mitigate low pH during wash events.

f. Cooling Tower Basin Draining: Based on water balance maximum.

3. Industrial Storm Water

a. General:

1) Flow shall be based on NOAA published 25-year, 24-hour storm.
2) Flow in excess of the design storm would overflow to existing plant surface runoff and drain to its existing course.
3) Flows into existing sumps that exceed its current capacity would overflow to existing plant drainage course.

b. Coal pile runoff: Local collection basin to reduce peak outflow, where practical.

c. Limestone pile runoff: Local collection basin to reduce peak outflow, where practical. May be combined with coal or gypsum area if adjacent.

d. Gypsum stack out runoff: Local collection basin to reduce peak outflow, where practical. May be combined with coal or limestone area if adjacent.

e. Fly ash silo area runoff: Local collection basin to reduce peak outflow, where practical. May be combined with coal or limestone area if adjacent.

f. Landfill leachate and runoff:

   1) Leachate flow will be based on water balance average flow.

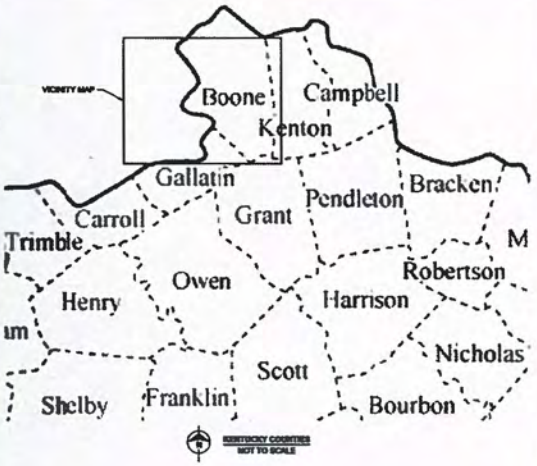
   2) Storm water are currently not included in the project scope at most sites.

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

Appendix C
Site and General Arrangements



NORTH

EAST BEND STATION

no.	date	by	chd	description
A	06/09/16	RNO		ISSUED FOR PERMITTING

no.	date	by	chd	description

FOR PERMITTING PURPOSES ONLY

BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

TITLE: DRY BOTTOM ASH CONVERSION PROJECT
VICINITY MAP AND PROJECT AREA

FOR: EAST BEND STATION UNIT 2

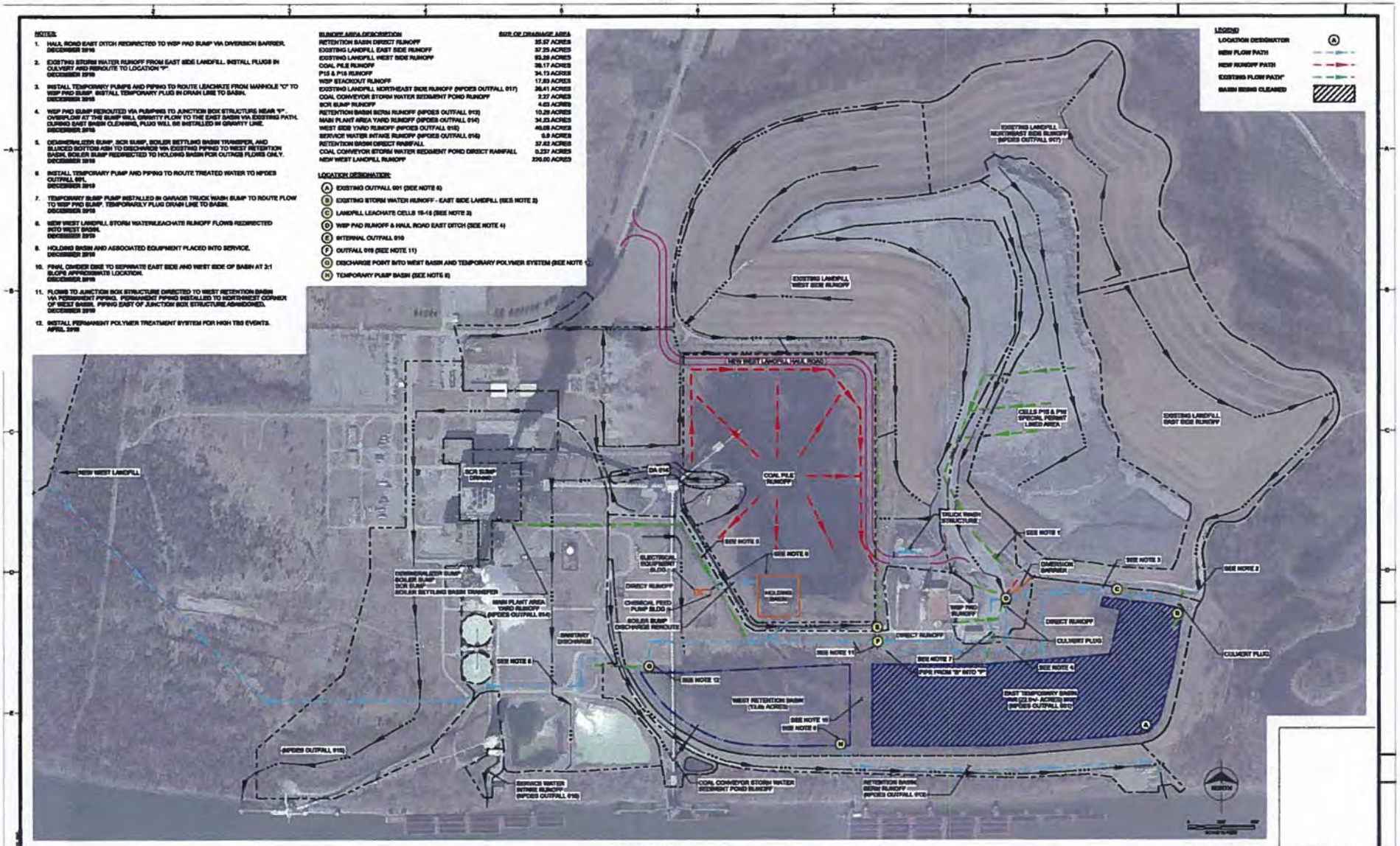
DUKE ENERGY.

DRAWING NO.: SKC014

REVISION: A

EXHIBIT 7
Page 79 of 157


PRELIMINARY - NOT FOR CONSTRUCTION
WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
TEMPORARY (1) LAYOUT
EAST BEND STATION UNIT 2
DUKE ENERGY
BURNS MCDONNELL



TEMPORARY (2) LAYOUT
*TEMPORARY (2) LAYOUT APPLIES FROM DECEMBER 2019 TO APRIL 2020
*WEST RETENTION BASIN AVAILABLE WHILE EAST SIDE ASH REMOVAL, LINING AND REPURPOSING ACTIVITIES OCCUR

no.	date	by	chd	description
D	09/23/19	MMM	RNO	ISSUED FOR OWNER REVIEW
C	09/03/19	MMM	RNO	ISSUED FOR OWNER REVIEW
B	07/30/19	MMM	RNO	ISSUED FOR OWNER REVIEW
A	05/13/19	MMM	RNO	ISSUED FOR OWNER REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

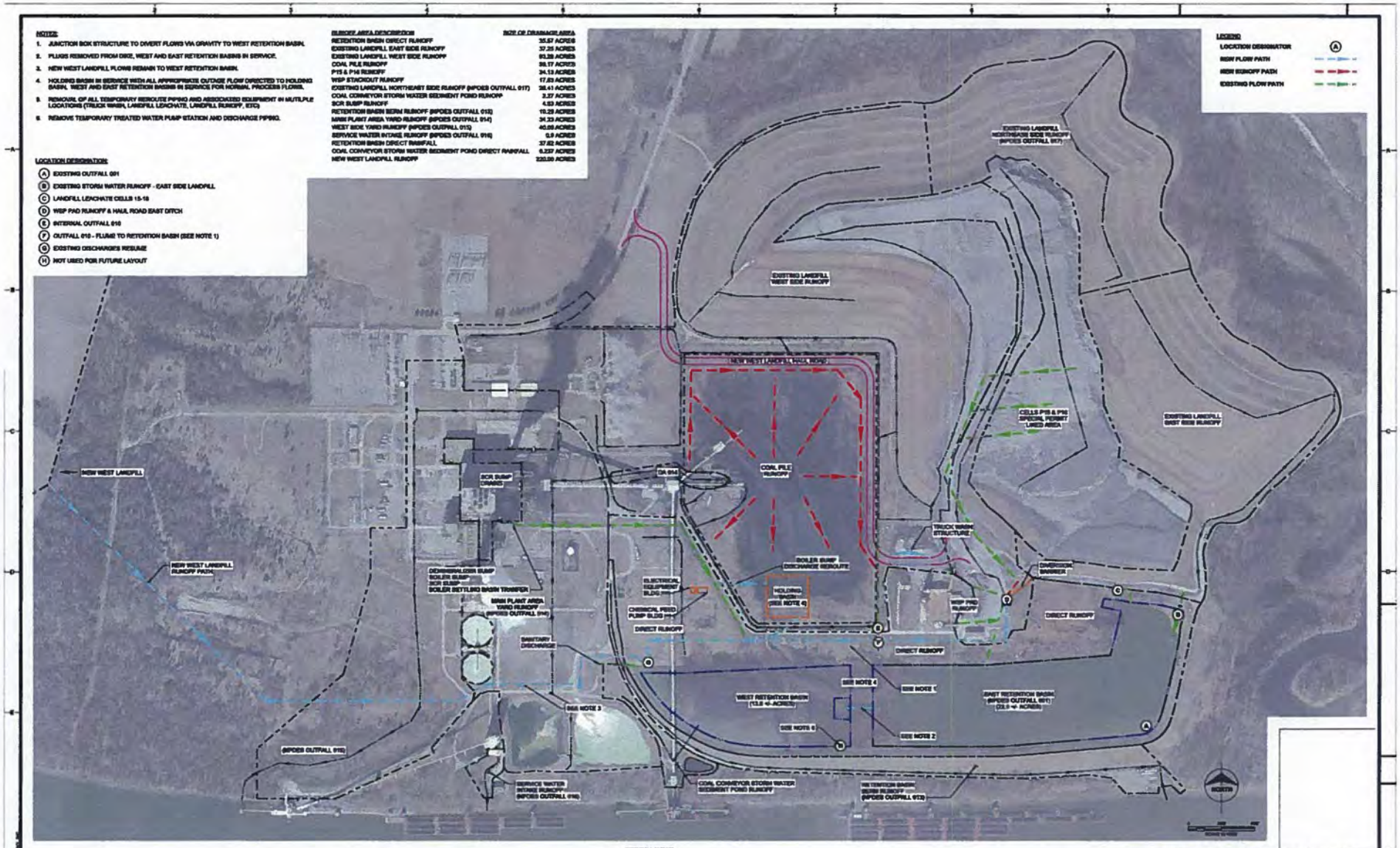
BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
TEMPORARY (2) LAYOUT
FOR EAST BEND STATION UNIT 2

DUKE ENERGY.
BOONE COUNTY, KY

DRAWING NO. SKC011 REVISION D

EXHIBIT 7
Page 81 of 157



FUTURE LAYOUT
*POST APRIL 2020
*HOLDING BASIN IN SERVICE
*RETENTION BASIN ASH REMOVAL, LINING AND REPURPOSED COMPLETE AND RETURNED TO SERVICE

no.	date	by	chd	description
D	09/23/16	MMM	RHO	ISSUED FOR OWNER REVIEW
C	09/16/16	MMM	RHO	ISSUED FOR OWNER REVIEW
B	07/20/16	MMM	RHO	ISSUED FOR OWNER REVIEW
A	03/10/16	MMM	RHO	ISSUED FOR OWNER REVIEW

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

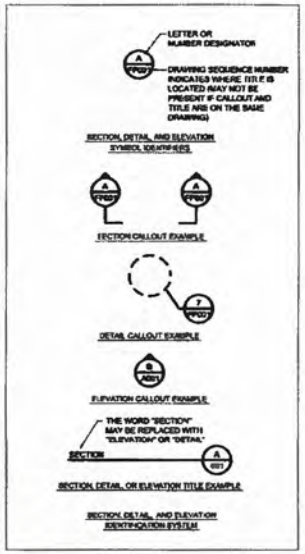
TITLE: WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
FUTURE LAYOUT
FOR: EAST BEND STATION UNIT 2
DUKE ENERGY.
DRAWING NO.: SKC012
REVISION: D

DUKE ENERGY

East Bend Station Unit 2
Boone County, Kentucky

2016

88669



Contract Drawings

GENERAL DRAWINGS

Dwg. No.	Title
E8G03-CVL-0000	COVER-INDEX
E8G03-CVL-0001	LEGEND ABBREVIATIONS, VICINITY MAP & GENERAL NOTES

CIVIL DRAWINGS

Dwg. No.	Title
E8G03-CVL-0002	EXISTING CONDITIONS
E8G03-CVL-0003	EROSION CONTROL PLAN
E8G03-CVL-0100	SITE PLAN - TEMPORARY (1)
E8G03-CVL-0101	OVERALL GRADING PLAN - TEMPORARY (1)
E8G03-CVL-0105	GRADING SECTIONS - SHEET 1 - TEMPORARY (1)
E8G03-CVL-0106	GRADING SECTIONS - SHEET 2 - TEMPORARY (1)
E8G03-CVL-0200	SITE PLAN - TEMPORARY (2)
E8G03-CVL-0201	OVERALL GRADING PLAN - TEMPORARY (2)
E8G03-CVL-0205	GRADING SECTIONS - SHEET 1 - TEMPORARY (2)
E8G03-CVL-0206	GRADING SECTIONS - SHEET 2 - TEMPORARY (2)
E8G03-CVL-0300	SITE PLAN - FUTURE
E8G03-CVL-0301	OVERALL GRADING PLAN - FUTURE
E8G03-CVL-0305	GRADING SECTIONS - SHEET 1 - FUTURE
E8G03-CVL-0306	GRADING SECTIONS - SHEET 2 - FUTURE
E8G03-CVL-0400	EROSION CONTROL DETAILS
E8G03-CVL-0401	LINER DETAILS
E8G03-CVL-0402	CIVIL DETAILS - SHEET 1

PRELIMINARY - NOT FOR CONSTRUCTION

no	date	by	chkd	description
A	[illegible]	[illegible]	RHO	ISSUED FOR REVIEW
B	[illegible]	[illegible]	RHO	ISSUED FOR OWNER REVIEW
C	[illegible]	[illegible]	RHO	ISSUED FOR PERMITTING

BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

Water Redirection Program
ISSUED FOR PERMITTING
Retention Basin

Cover-Index

LEGEND

NEW		EXISTING
	RAILROAD	
	ROADS	
750	CONTOURS	
	TOP OF SLOPE / TOE OF SLOPE	
	FLOWLINE	
ST-1	STORM SEWER	
	CRUSHED ROCK	
	RIPRAP	
	TOPSOIL & SEED	
	FENCES	
	SILT FENCE	
	STRUCTURES	
	SURVEY MONUMENTS	BM
	CLEARING AND GRUBBING	

* TOP OR TOE OF SLOPE TO MATCH EXISTING GRADE UNLESS AN ELEVATION ON SLOPE IS INDICATED.

ALL SYMBOLS ARE STANDARD WITHOUT RESPECT TO CONTRACTS.

ABBREVIATIONS

ABBREVIATION	TERM	ABBREVIATION	TERM
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS	M.O.	MIDORDINATE
AC	ACRE	N	NORTH
@	AT	NAD	NORTH AMERICAN DATUM
AHD	AHEAD	NGVD	NATIONAL GEODETIC VERTICAL DATUM
APPROX	APPROXIMATE	NO	NUMBER
ASPH	ASPHALT	O.C.	ON CENTER
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS	OD	OUTSIDE DIAMETER
AUX	AUXILIARY	OPNG	OPENING
BK	BACK	OZ	OUNCE
BLDG	BUILDING	±	PLUS OR MINUS
BM	BENCHMARK	PC	POINT OF CURVE
BOT	BOTTOM	PCC	PORTLAND CEMENT CONCRETE
CB	CATCH BASIN	PI	POINT OF INTERSECTION
C TO C	CENTER TO CENTER	PL	PROPERTY LINE
CL	CENTERLINE	PT	POINT OF TANGENT
CLMS	CONTROLLED LOW STRENGTH MATERIAL	P.R.C.	POINT OF REVERSE CURVE
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE	PSI	POUNDS PER SQUARE INCH
CJ	CONSTRUCTION JOINT	P.V.C.	POINT OF VERTICAL CURVE
CMAP	CORRUGATED METAL ARCH PIPE	P.V.I.	POINT OF VERTICAL INTERSECTION
CMP	CORRUGATED METAL PIPE	P.V.R.C.	POINT OF VERTICAL REVERSE CURVE
CONC	CONCRETE	P.V.T.	POINT OF VERTICAL TANGENT
CPT	CORRUGATED POLYETHYLENE TUBING	R	RADIUS
CVL	CIVIL	RBR	REBAR
DBL	DOUBLE	RCC	ROLLER COMPACTED CONCRETE
DET	DETAIL	RD	ROAD
DI	DROP INLET	RPT	RADIUS POINT
DIA	DIAMETER	RCP	REINFORCED CONCRETE PIPE
DWG	DRAWING	RR	RAILROAD
ECB	EXISTING CATCH BASIN	RT	RIGHT
EDB	ELECTRICAL DUCT BANK	ROW	RIGHT OF WAY
E	EAST	S	SOUTH
EF	EACH FACE	SLP	SLOPE
EJ	EXPANSION JOINT	SS	STAINLESS STEEL
EL	ELEVATION	SHLDR	SHOULDER
EMH	ELECTRICAL MANHOLE	STD	STANDARD
EQN	EQUATION	ST	STORM SEWER
EXIST	EXISTING	STA	STATION
EW	EACH WAY	SWG	SWING
FBD	FLAT BOTTOM DITCH	SY	SQUARE YARD
FFE	FINISHED FLOOR ELEVATION	T&B	TOP AND BOTTOM
FL	FLOWLINE	TEMP	TEMPORARY
FT	FEET, FOOT	TOA	TOP OF ASPHALT
GA	GAGE	TOC	TOP OF CONCRETE
GALV	GALVANIZED	TO GRATING	TOP OF GRATING
GCL	GEOSYNTHETIC CLAY LINER	TOM	TOP OF MANHOLE
H	HORIZONTAL	TOP	TOP OF PIPE
HDPE	HIGH DENSITY POLYETHYLENE	TOR	TOP OF RAIL
HORIZ	HORIZONTAL	TOSB	TOP OF SUBBALLAST
HP	HIGH POINT	TOSG	TOP OF SUBGRADE
HWY	HIGHWAY	TPI	THREADS PER INCH
ID	INSIDE DIAMETER	TYP	TYPICAL
IF	INSIDE FACE	UON	UNLESS OTHERWISE NOTED
INTSCT	INTERSECTION	V	VERTICAL
INV	INVERT	VC	VERTICAL CURVE
KYTC	KENTUCKY TRANSPORTATION CABINET	VERT	VERTICAL
L	LONG	W	WEST
LB	POUND	W/	WITH
LF	LINEAR FEET	W/O	WITH OUT
LT	LEFT	WT	WEIGHT
MAX	MAXIMUM	WWF	WELDED WIRE FABRIC
MH	MANHOLE		
MI	MILLI-INCH		
MIN	MINIMUM		
MISC	MISCELLANEOUS		

NOTES:

1. ALL ABBREVIATIONS ARE BURNS & McDONNELL STANDARDS WITHOUT RESPECT TO CONTRACTS.
2. ABBREVIATIONS ARE APPLICABLE TO ALL DWGS.

VICINITY MAP
NOT TO SCALE

GENERAL NOTES

1. ALL COORDINATES AND ELEVATIONS OF PERMANENT BENCHMARKS ARE PROVIDED BY DUKE ENERGY PRIOR TO THE START OF CONSTRUCTION. THE COORDINATES AND ELEVATIONS SHALL BE VERIFIED PRIOR TO THE START OF WORK. COORDINATES ARE STATE PLANE, NAD83 KENTUCKY NORTH, 1601.

11. UNKNOWN SITUATIONS OR CONDITIONS NOT COVERED IN THE CONTRACT DOCUMENTS MAY ARISE DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNER IF SUCH A CONDITION IS IDENTIFIED WITHIN 24 HOURS.

16. GRADES AND ELEVATIONS SHOWN ARE FINISHED SURFACING.

GENERAL DEMOLITION NOTES

1. ALL DEMOLITION WASTE, DEBRIS, AND UNSATISFACTORY MATERIALS SHALL BE DISPOSED OF OFF THE SITE. ITEMS WITHIN THE PROJECT LIMITS, EVEN IF NOT IDENTIFIED, SHALL BE REMOVED AND PROPERLY DISPOSED OFFSITE.

UTILITY DEMOLITION NOTES

EXCAVATION AND BACKFILL NOTES

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS & McDONNELL

REV	DATE	BY	CKD	DESCRIPTION
F			RMD	ISSUED FOR STAFF REVIEW
D			RMD	ISSUED FOR REVIEW
C			RMD	ISSUED FOR REVIEW
B			RMD	ISSUED FOR 60% REVIEW
A			RMD	ISSUED FOR 30% REVIEW
0			RMD	ISSUED FOR PERMITTING

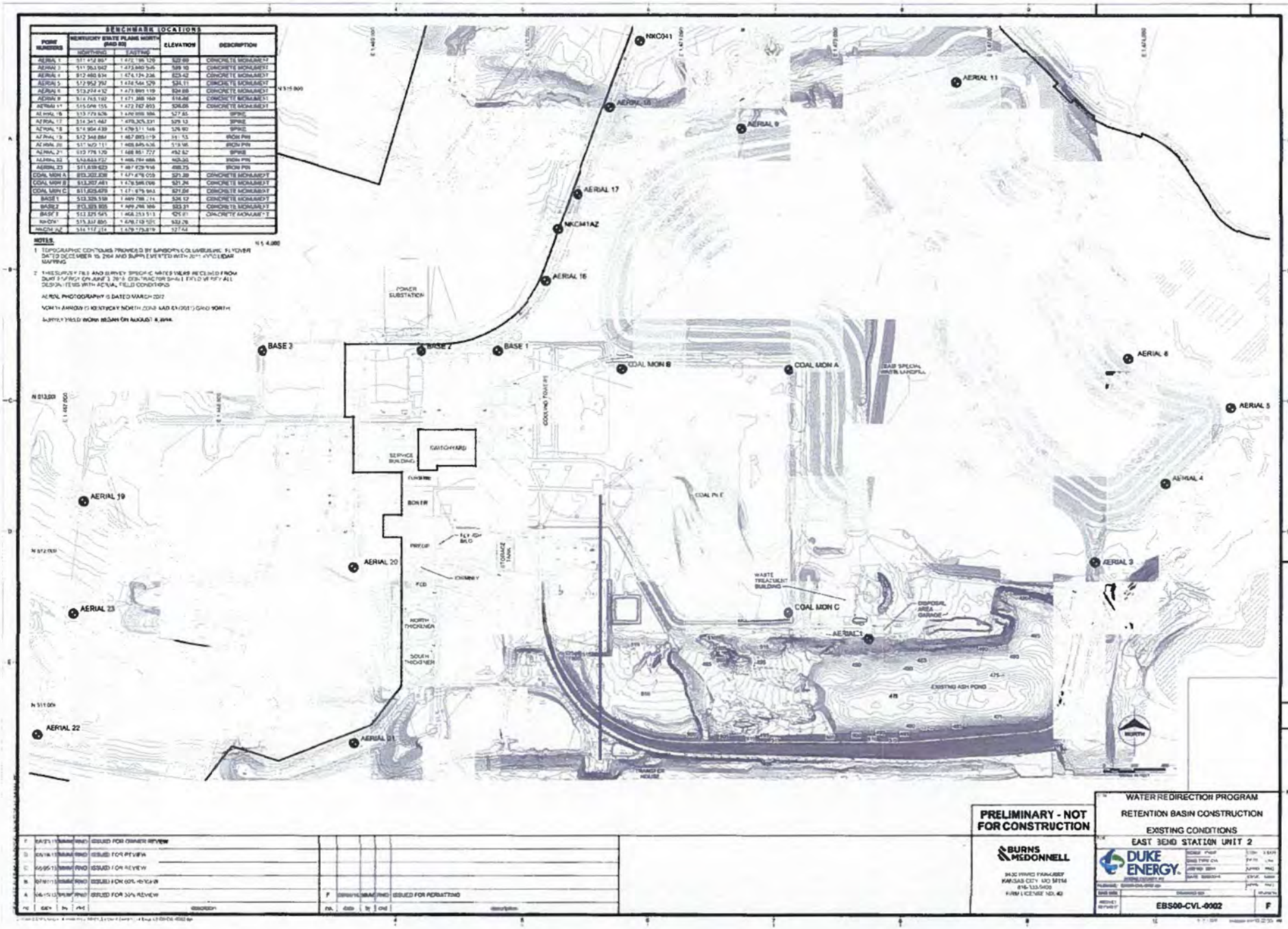
WATER REDIRECTION PROGRAM

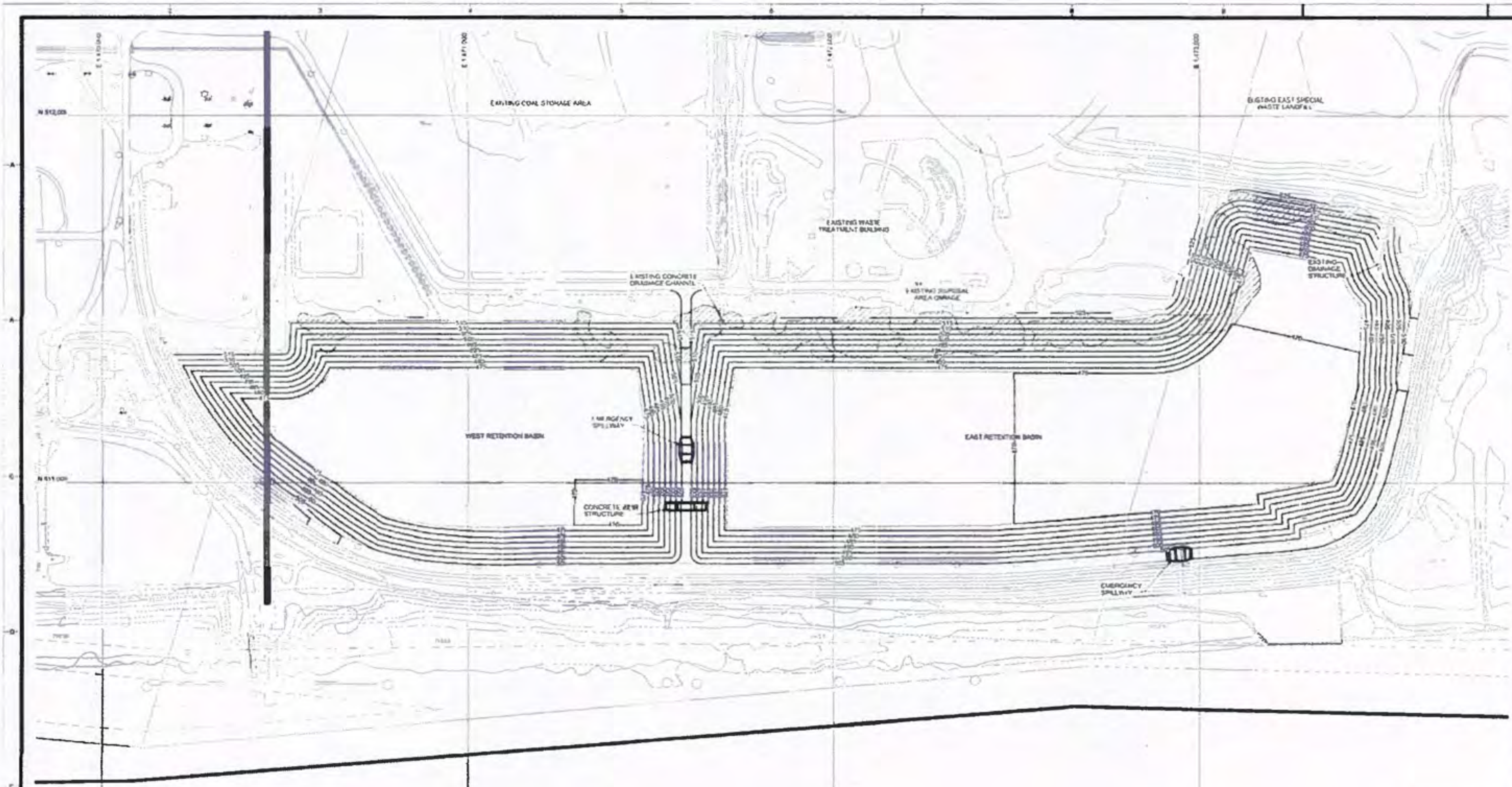
RETENTION BASIN CONSTRUCTION
LEGEND, ABBREVIATIONS,
VICINITY MAP & GENERAL NOTES

EAST BEND STATION UNIT 2

DUKE ENERGY.

EBS00-CVL-0301 F


BENCHMARK LOCATIONS
POINT NUMBERS
KENTUCKY STATE PLANE NORTH (NAD 83)
NORTHING
EASTING
ELEVATION
DESCRIPTION
AERIAL 1
AERIAL 2
AERIAL 3
AERIAL 4
AERIAL 5
AERIAL 6
AERIAL 7
AERIAL 8
AERIAL 9
AERIAL 10
AERIAL 11
AERIAL 12
AERIAL 13
AERIAL 14
AERIAL 15
AERIAL 16
AERIAL 17
AERIAL 18
AERIAL 19
AERIAL 20
AERIAL 21
AERIAL 22
AERIAL 23
COAL MON A
COAL MON B
COAL MON C
BASE 1
BASE 2
BASE 3
NKC041
NKC041AZ
NOTES:
1 TOPOGRAPHIC CONTOURS PROVIDED BY SANBORN COLUMBUS INC FLYOVER DATED DECEMBER 19, 2014 AND SUPPLEMENTED WITH 2017 AVOCEDAR MAPPING
2 THESE SURVEY FILE AND SURVEY SPECIFIC NOTES WERE RECEIVED FROM DUKE ENERGY ON JUNE 3, 2016. CONTRACTOR SHALL FIELD VERIFY ALL DESIGN ITEMS WITH ACTUAL FIELD CONDITIONS
AERIAL PHOTOGRAPHY IS DATED MARCH 2017
NORTH ARROW IS KENTUCKY NORTH ZONE NAD 83 (2011) GRID NORTH
SURVEY FIELD WORK BEGAN ON AUGUST 8, 2016
1" = 400'
POWER SUBSTATION
SWITCHYARD
SERVICE BUILDING
TURBINE
BOILER
PRECIP
FLY ASH SILO
CHIMNEY
FGD
STORAGE TANK
NORTH THICKENER
SOUTH THICKENER
COOLING TOWER #1
COAL PILE
WASTE TREATMENT BUILDING
DISPOSAL AREA GARAGE
EXISTING ASH POND
TRANSFER HOUSE
BASE SPECIAL WASTE LANDFILL
NORTH
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS MCDONNELL
WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
EXISTING CONDITIONS
EAST BEND STATION UNIT 2
DUKE ENERGY
EBS00-CVL-0002
F
ISSUED FOR OWNER REVIEW
ISSUED FOR REVIEW
ISSUED FOR REVIEW
ISSUED FOR 60% REVIEW
ISSUED FOR 30% REVIEW
ISSUED FOR PERMITTING



EROSION AND SEDIMENT CONTROL NOTES.

BEST MANAGEMENT PRACTICES

1. CONSTRUCTION ACTIVITY POLLUTION PREVENTION IS REQUIRED FOR THIS PROJECT. PREVENTION OF POLLUTION RESULTING FROM CONSTRUCTION ACTIVITIES SHALL BE ACCOMPLISHED BY CONTROLLING SOIL EROSION, WATERWAY SEDIMENTATION, AND AIRBORNE DUST GENERATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT EROSION AND SEDIMENTATION ARE CONTROLLED TO THE EXTENT PRACTICABLE.
2. SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED AND MAINTAINED THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES. PRIOR TO INITIATING CONSTRUCTION IN AN AREA, ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE IN PLACE. UPON PROJECT COMPLETION ALL TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED.
3. TEMPORARY EROSION CONTROL SHALL BE THE CONTRACTOR'S RESPONSIBILITY, WHO SHALL UTILIZE APPROPRIATE BEST MANAGEMENT PRACTICES (BMPS). THESE BMPS SHALL CONSIST OF SILT FENCE, FIBER LOGS OR OTHER MEANS TO CONTROL EROSION AS NEEDED. THE CONTRACTOR SHALL FOLLOW THE OWNER'S EROSION AND SWPPP PLANS AS NEEDED.
4. CONTRACTOR SHALL PLACE SILT FENCE AS SHOWN PRIOR TO BEGINNING WORK. THE DEVICES SHALL BE PLACED DOWN SLOPE OF DISTURBED AREAS WHERE SHEET EROSION WOULD OCCUR. THE IDEAL LOCATION IS ON THE SAME CONTOUR. SILT FENCE SHALL BE CLEANED AND REPAIRED WHEN SEDIMENT BUILDUP REACHES ONE THIRD OF SILT FENCE HEIGHT. AFTER SIGNIFICANT RUNOFF EVENTS THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL STRUCTURES FOR SILT BUILDUP THAT INTERFERES WITH THE PERFORMANCE OF THE EROSION CONTROL STRUCTURE AND REPAIR OR REPLACE THOSE STRUCTURES AS NECESSARY.
5. ALL STORM DRAIN INLETS SHALL BE PROTECTED BY APPROPRIATE BMPS DURING CONSTRUCTION UNTIL ALL SOURCES WITH POTENTIAL FOR DISCHARGE TO THE INLETS HAVE BEEN STABILIZED.

no.	date	by	ckd	description
E	[illegible]	[illegible]	RWO	ISSUED FOR PERMITTING
D	[illegible]	[illegible]	RWO	ISSUED FOR OWNER REVIEW
C	[illegible]	[illegible]	RWO	ISSUED FOR REVIEW
B	[illegible]	[illegible]	RWO	ISSUED FOR REVIEW
A	[illegible]	[illegible]	RWO	ISSUED FOR 60% REVIEW

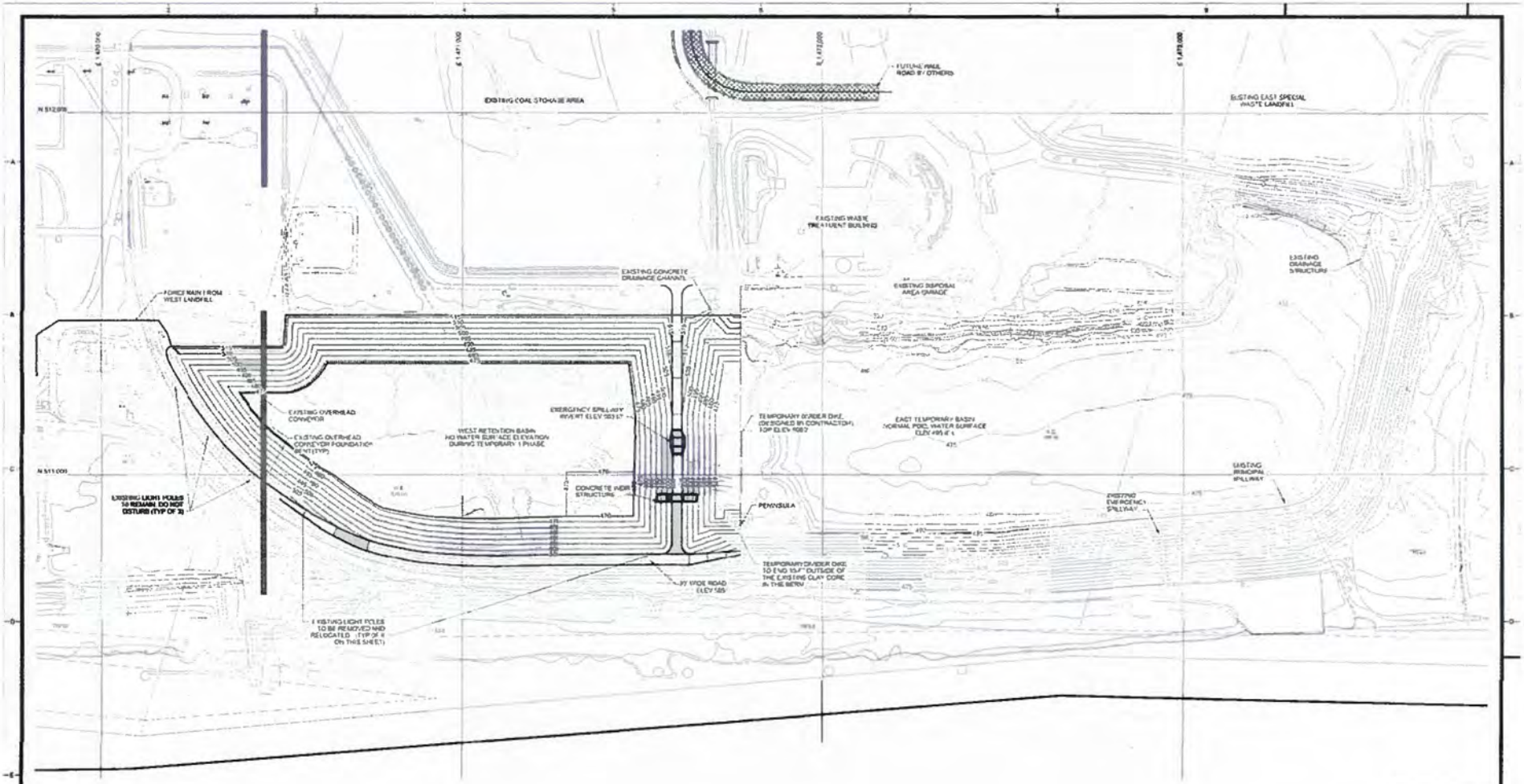
PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
EROSION CONTROL PLAN
EAST BEND STATION UNIT 2

DUKE ENERGY.

EBS00-CVL-0003 | E



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D	06/2011	AHM	RHO	ISSUED FOR OWNER REVIEW
C	08/2010	AHM	RHO	ISSUED FOR REVIEW
B	06/2010	AHM	RHO	ISSUED FOR REVIEW
A	05/2010	AHM	RHO	ISSUED FOR BPC REVIEW

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FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM

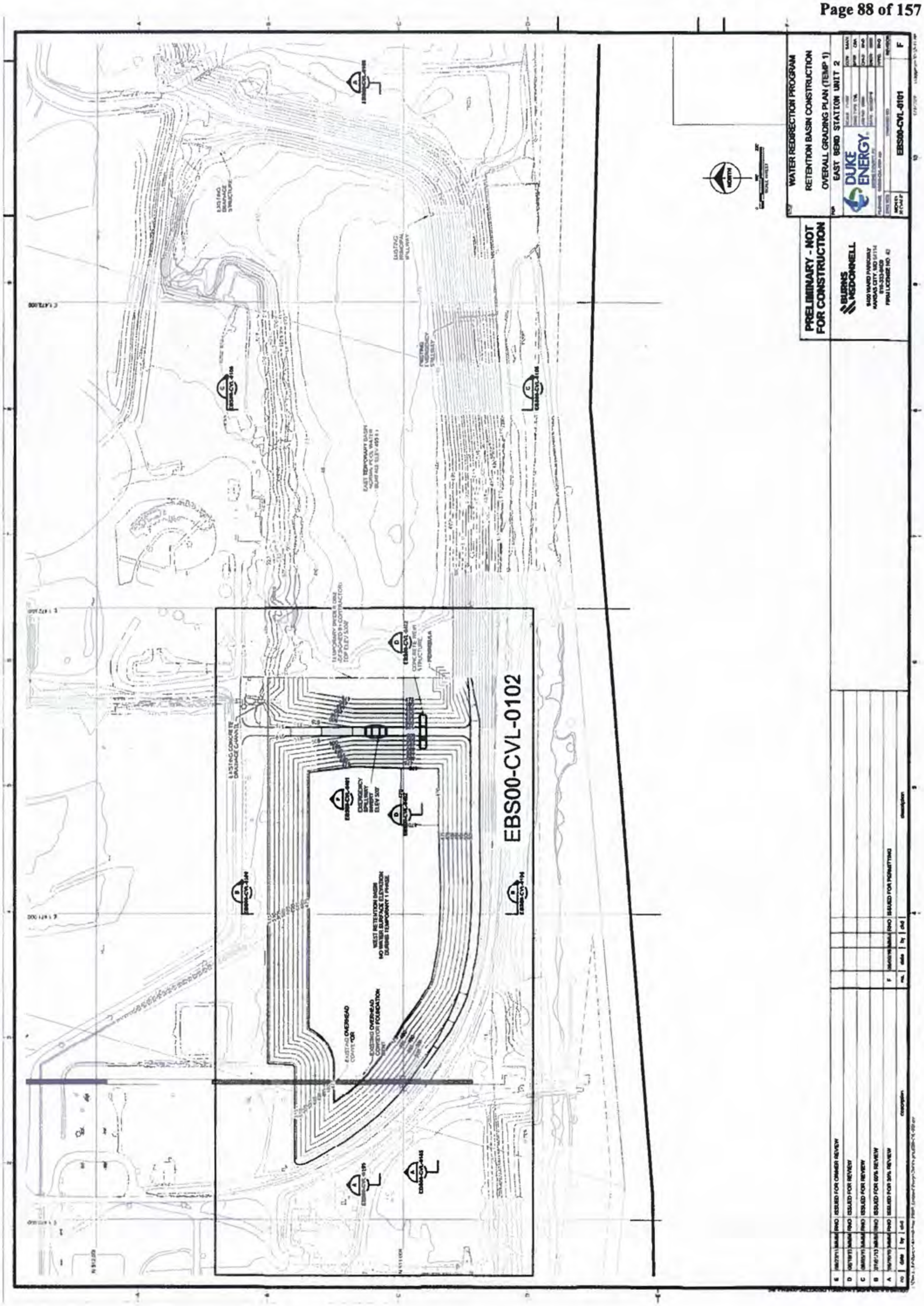
RETENTION BASIN CONSTRUCTION

SITE PLAN (TEMP 1)

FOR EAST BEND STATION UNIT 2

DUKE ENERGY

DRAWING NO. EBS80-CVL-0100 E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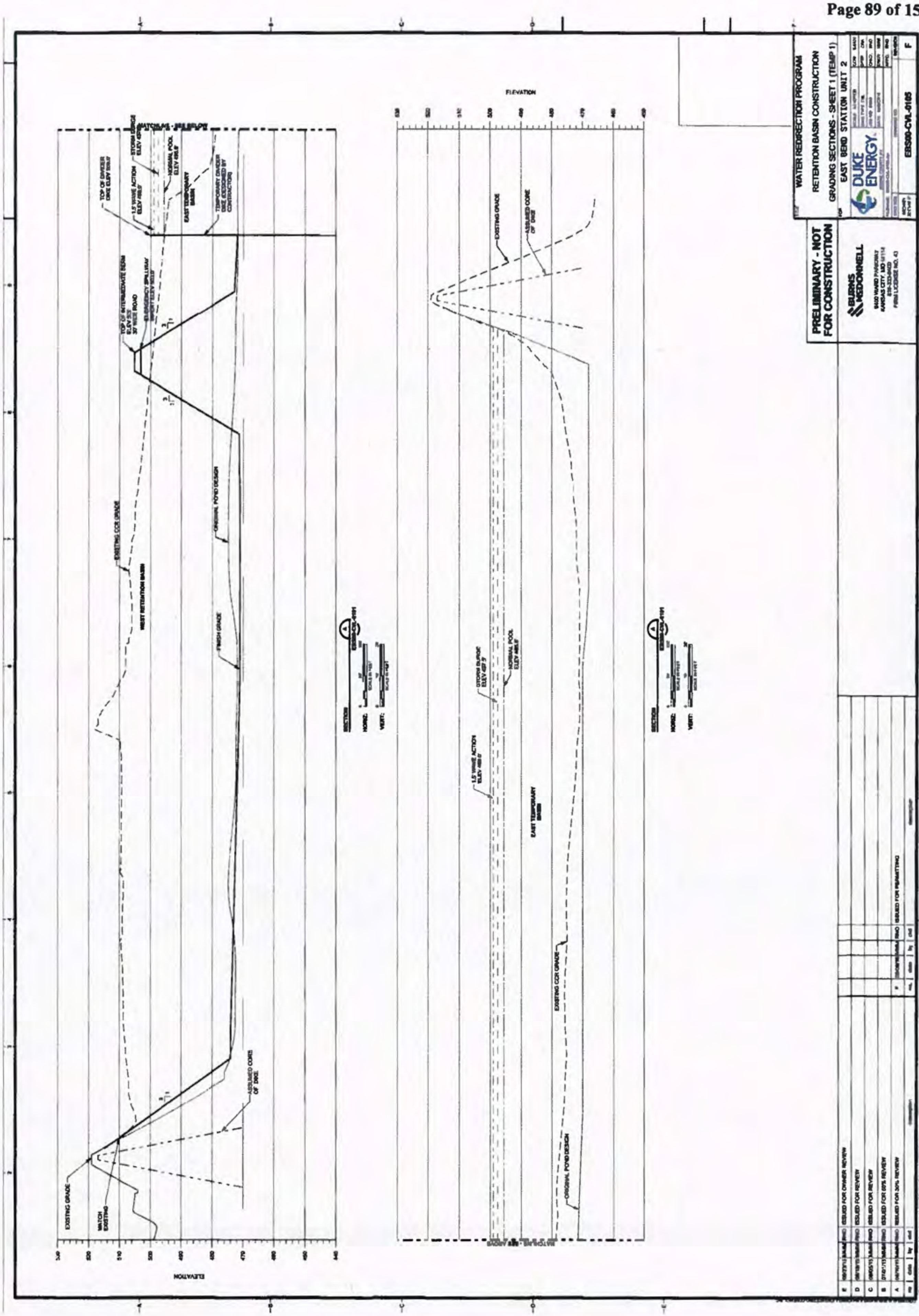
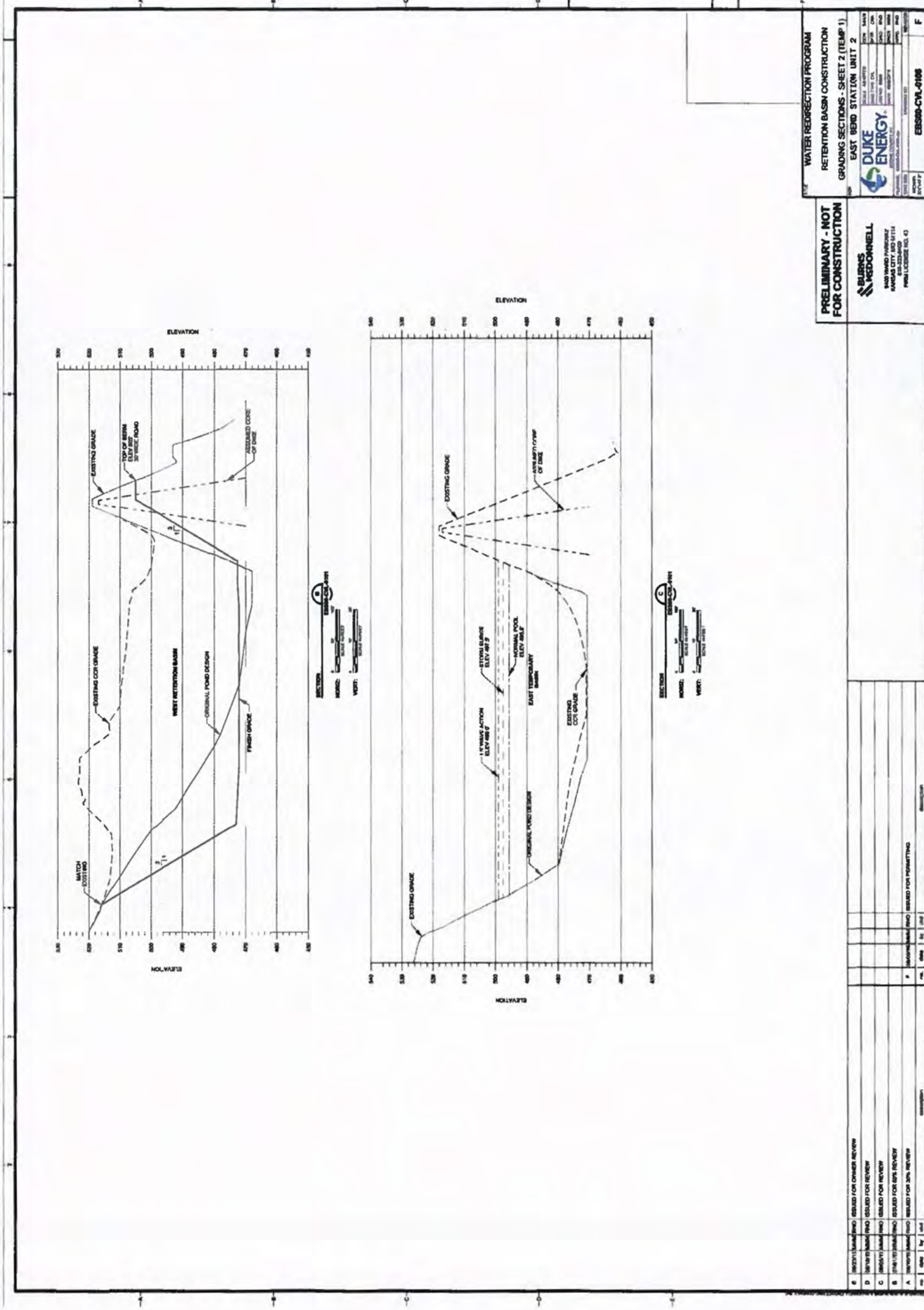
PRELIMINARY - NOT FOR CONSTRUCTION
WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
OVERALL GRADING PLAN (TEMP 1)
EAST BEND STATION UNIT 2
DUKE ENERGY
BURNS McDONNELL
EBS00-CVL-0101
ISSUED FOR OWNER REVIEW
ISSUED FOR REVIEW
ISSUED FOR REVIEW
ISSUED FOR 60% REVIEW
ISSUED FOR 30% REVIEW
ISSUED FOR PERMITTING


WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
GRADING SECTIONS - SHEET 1 (TEMP 1)
EAST BEND STATION UNIT 2
DUKE ENERGY
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS MCDONNELL
EBS00-CVL-0105
ELEVATION
EXISTING GRADE
EXISTING CCR GRADE
ORIGINAL POND DESIGN
FINISH GRADE
WEST RETENTION BASIN
EAST TEMPORARY BASIN
ASSUMED CORE OF DIKE
NORMAL POOL
SECTION
HORIZ
VERT


WATER REDIRECTION PROGRAM
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GRADING SECTIONS - SHEET 2 (TEMP 1)
EAST BEND STATION UNIT 2
DUKE ENERGY
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS McDONNELL
EBS00-CVL-0106
F
ELEVATION
EXISTING GRADE
TOP OF BERM
ASSUMED CORE OF DIKE
EXISTING CCR GRADE
WEST RETENTION BASIN
ORIGINAL POND DESIGN
FINISH GRADE
MATCH EXISTING
EAST TEMPORARY BASIN
NORMAL POOL
STORM EVENT
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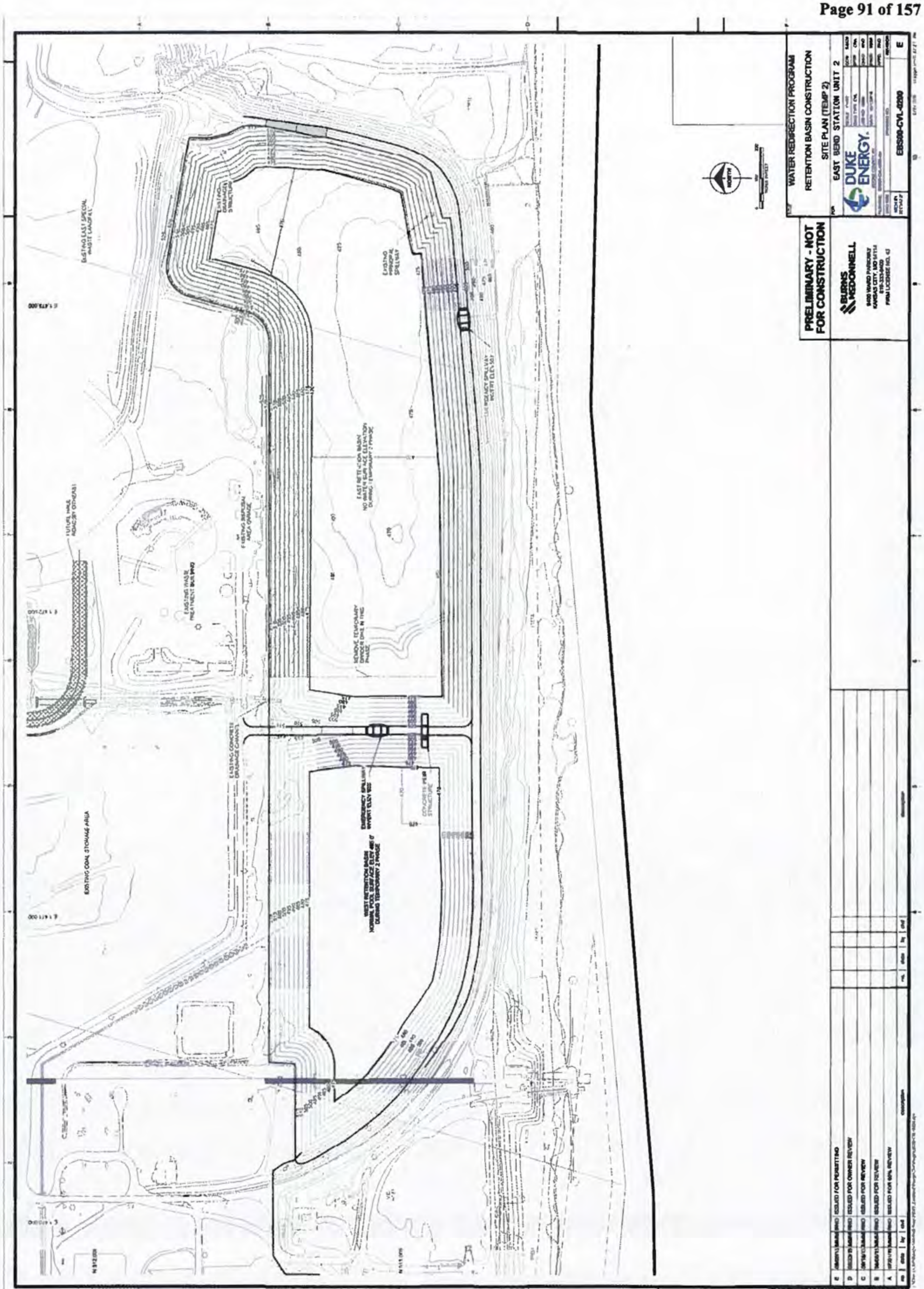
ISSUED FOR 60% REVIEW
ISSUED FOR 30% REVIEW
ISSUED FOR PERMITTING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SITE PLAN (TEMP 2)
EAST BEND STATION UNIT 2
DUKE ENERGY
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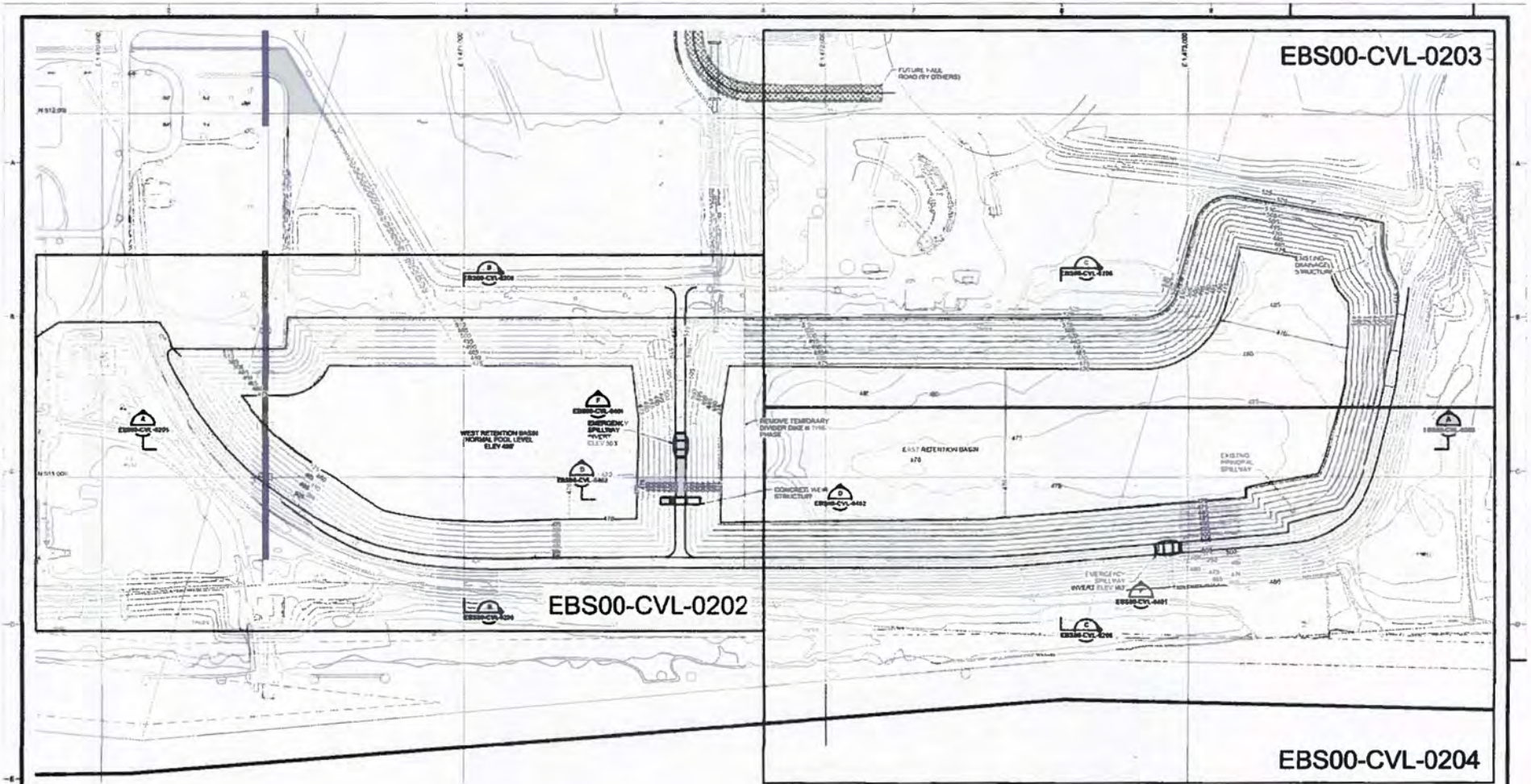
BURNS MCDONNELL
EAST RETENTION BASIN
WEST RETENTION BASIN
EXISTING COAL STORAGE AREA
EXISTING CONCRETE DRAINAGE CHANNEL
ISSUED FOR PERMITTING
ISSUED FOR OWNER REVIEW
ISSUED FOR REVIEW
ISSUED FOR REVIEW
ISSUED FOR 60% REVIEW
E



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D	08/16/13	MMM	RHO	ISSUED FOR REVIEW
C	08/05/13	MMM	RHO	ISSUED FOR REVIEW
B	07/01/13	MMM	RHO	ISSUED FOR 60% REVIEW
A	06/10/13	MMM	RHO	ISSUED FOR 30% REVIEW
F	05/09/15	MMM	RHO	ISSUED FOR PERMITTING

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BURNS McDONNELL
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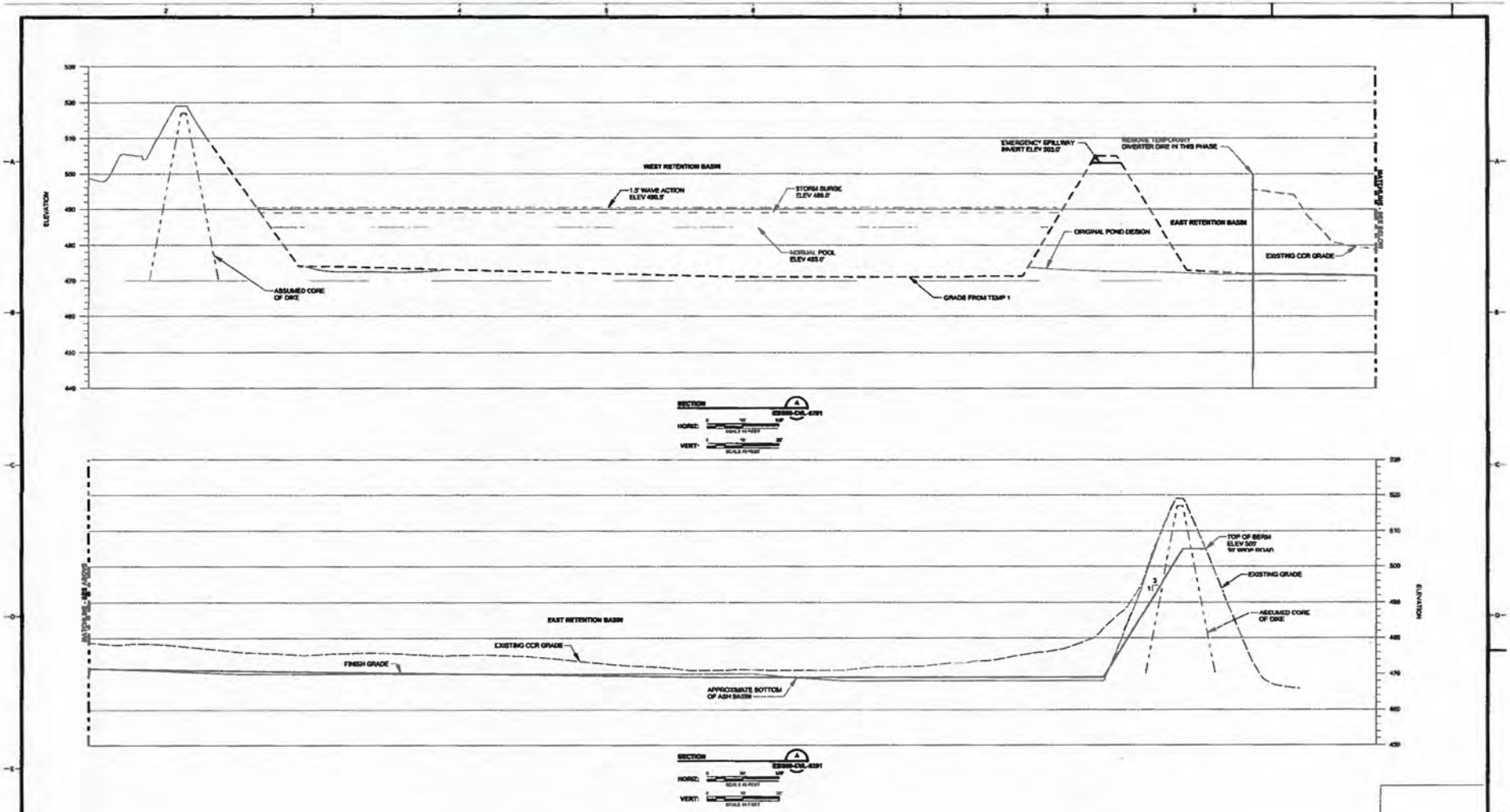
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
OVERALL GRADING PLAN (TEMP 2)
EAST BEND STATION UNIT 2

DUKE ENERGY.

EBS00-CVL-0201 F

EXHIBIT 7
Page 92 of 157



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D	08/16/13	MMM	RHO	ISSUED FOR REVIEW
C	7/8/05/13	MMM	RHO	ISSUED FOR REVIEW
B	07/01/13	MMM	RHO	ISSUED FOR 60% REVIEW
A	06/10/13	MMM	RHO	ISSUED FOR 30% REVIEW
P	05/08/13	MMM	RHO	ISSUED FOR PERMITTING

PRELIMINARY - NOT FOR CONSTRUCTION

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9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM

RETENTION BASIN CONSTRUCTION

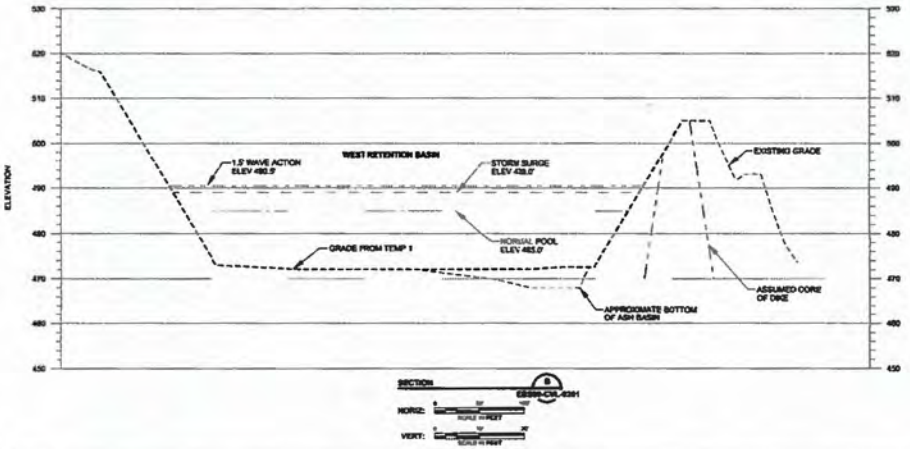
GRADING SECTIONS - SHEET 1 (TEMP 2)

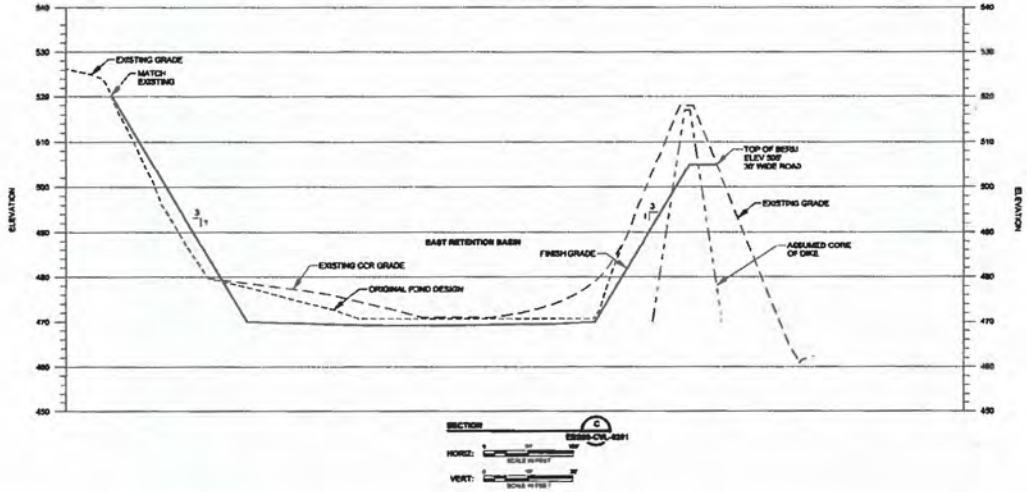
EAST BEND STATION UNIT 2

DUKE ENERGY

EBS00-CVL-0205 F

EXHIBIT 7
Page 93 of 157





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D	08/18/15	MMM	RNO	ISSUED FOR REVIEW
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B	07/01/15	MMM	RNO	ISSUED FOR 60% REVIEW
A	06/10/15	MMM	RNO	ISSUED FOR 30% REVIEW
F	05/08/16	MMM	RNO	ISSUED FOR PERMITTING

PRELIMINARY - NOT FOR CONSTRUCTION

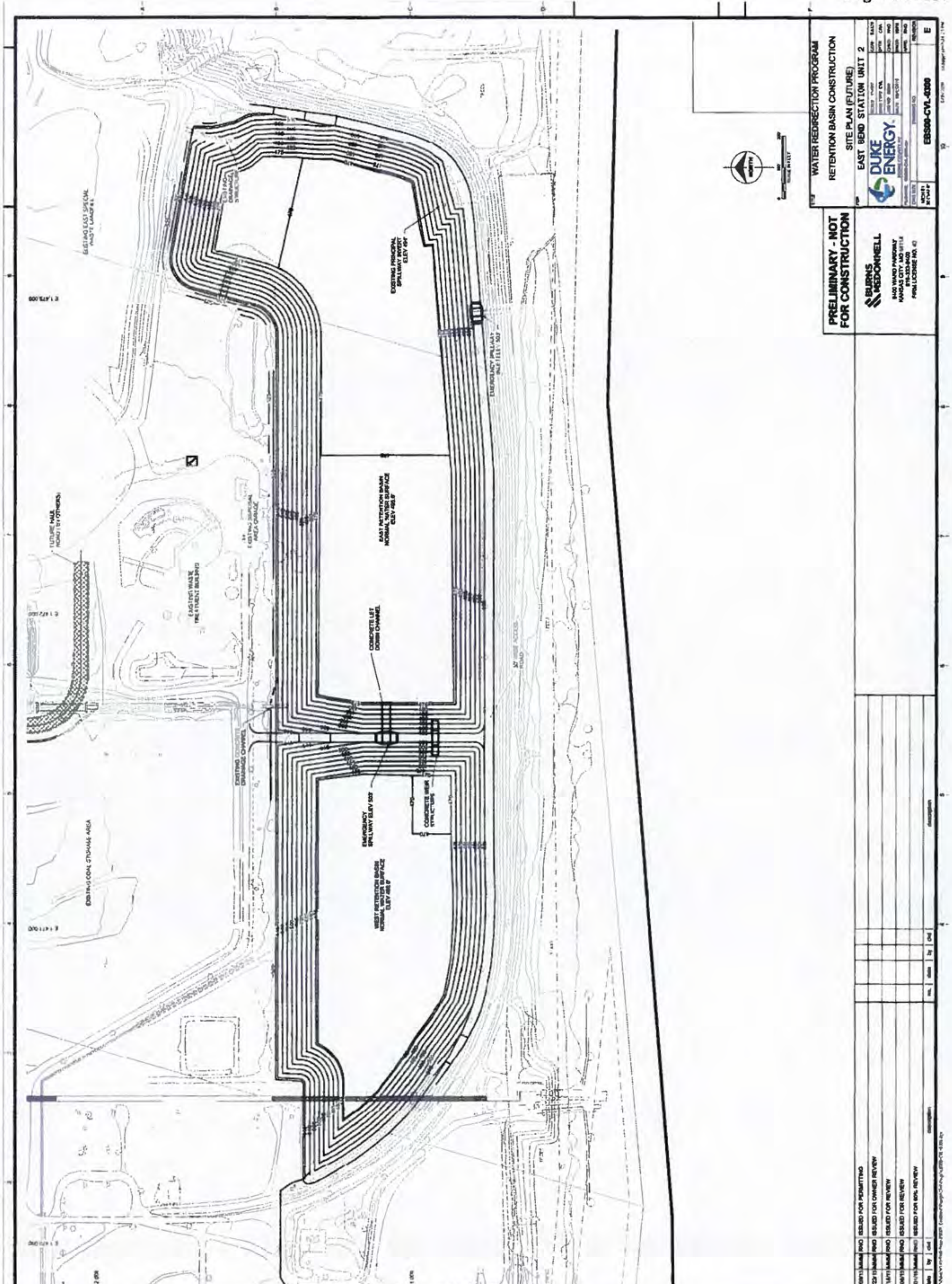
BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

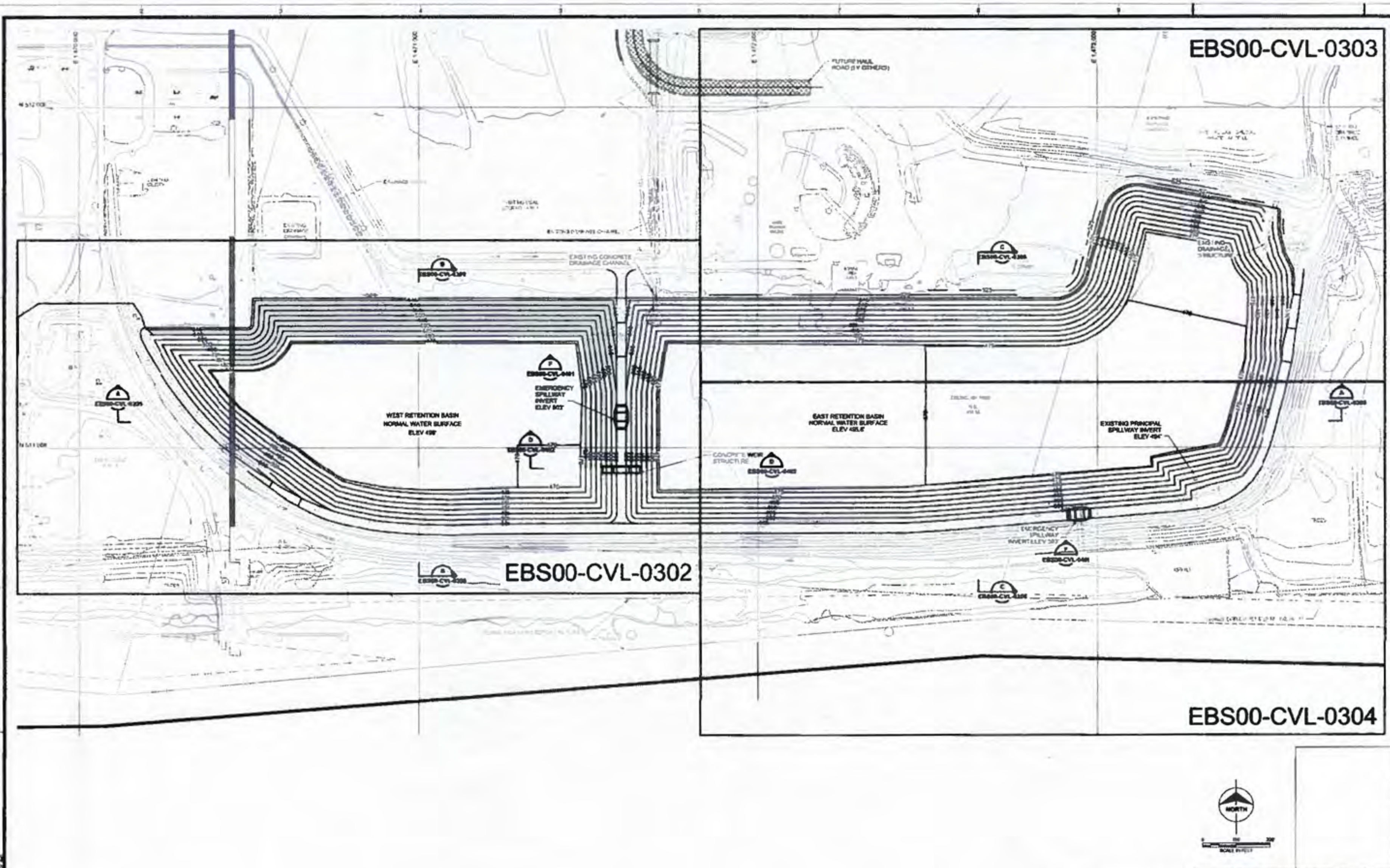
TITLE: WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
GRADING SECTIONS - SHEET 2 (TEMP 2)
FOR: EAST BEND STATION UNIT 2

DUKE ENERGY

DRAWING NO. EBS00-CVL-6206
REVISION F

EXHIBIT 7
Page 94 of 157


EXISTING COAL STORAGE AREA
FUTURE HAUL ROAD (BY OTHERS)
EXISTING EAST SPECIAL WASTE LANDFILL
EXISTING WASTE TREATMENT BUILDING
EXISTING CONCRETE DRAINAGE CHANNEL
EXISTING DRAINAGE STRUCTURE
WEST RETENTION BASIN NORMAL WATER SURFACE ELEV 495.0'
EMERGENCY SPILLWAY ELEV 503'
CONCRETE LET DOWN CHANNEL
CONCRETE WEIR STRUCTURE
EAST RETENTION BASIN NORMAL WATER SURFACE ELEV 495.0'
EXISTING PRINCIPAL SPILLWAY INVERT ELEV 494'
EMERGENCY SPILLWAY INLET ELEV 503'
NORTH
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS & McDONNELL
9400 WARD PARKWAY KANSAS CITY, MO 64114
FIRM LICENSE NO. 43
WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
SITE PLAN (FUTURE)
EAST BEND STATION UNIT 2
DUKE ENERGY
EBS00-CVL-0300
E
E ISSUED FOR PERMITTING
D ISSUED FOR OWNER REVIEW
C ISSUED FOR REVIEW
B ISSUED FOR REVIEW
A ISSUED FOR 60% REVIEW



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9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 41

WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
OVERALL GRADING PLAN (FUTURE)

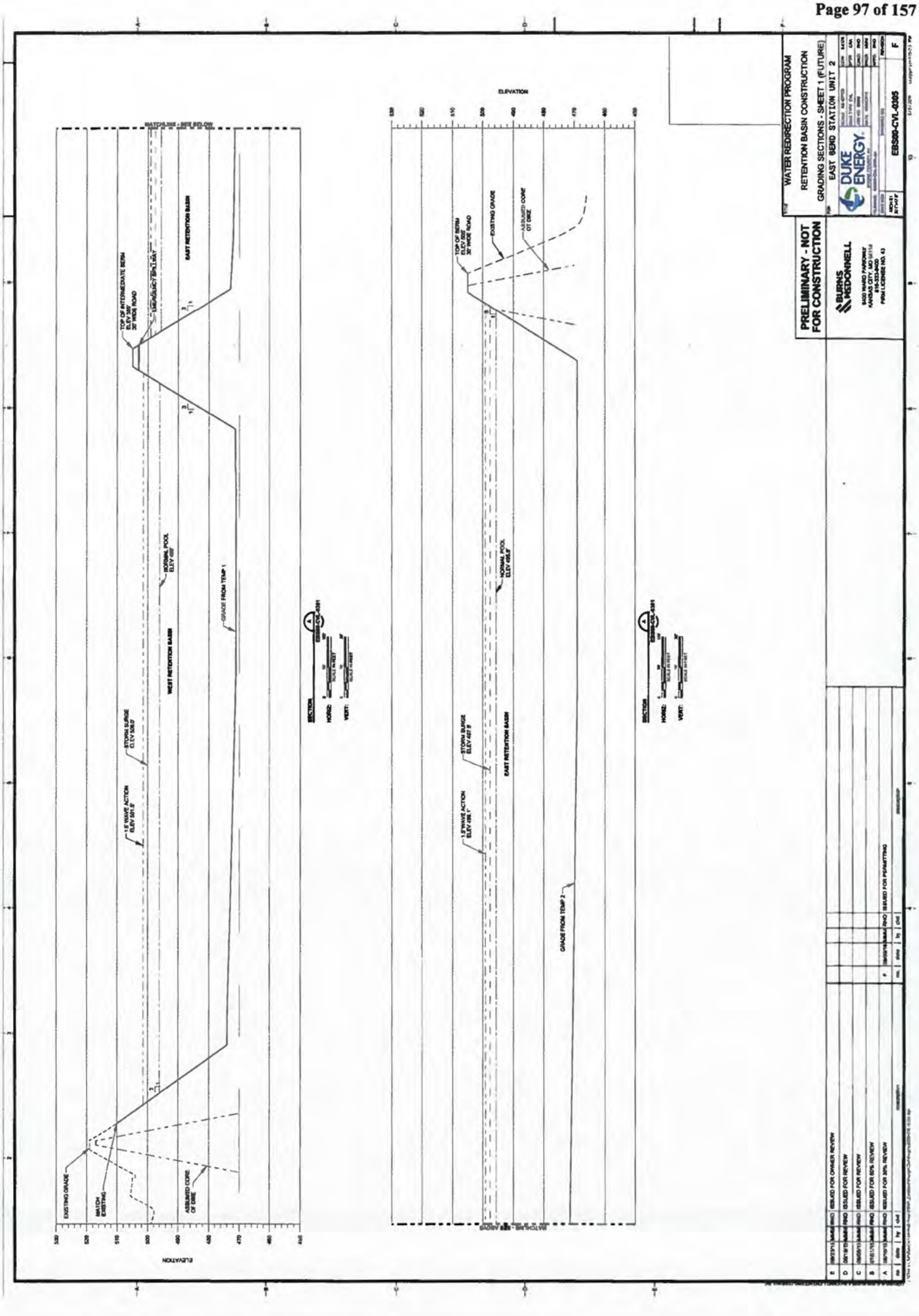
EAST BEND STATION UNIT 2

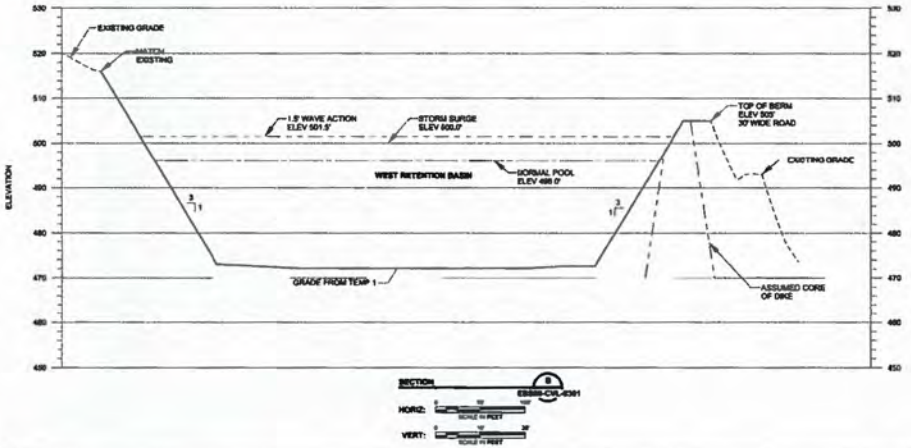
DUKE ENERGY.

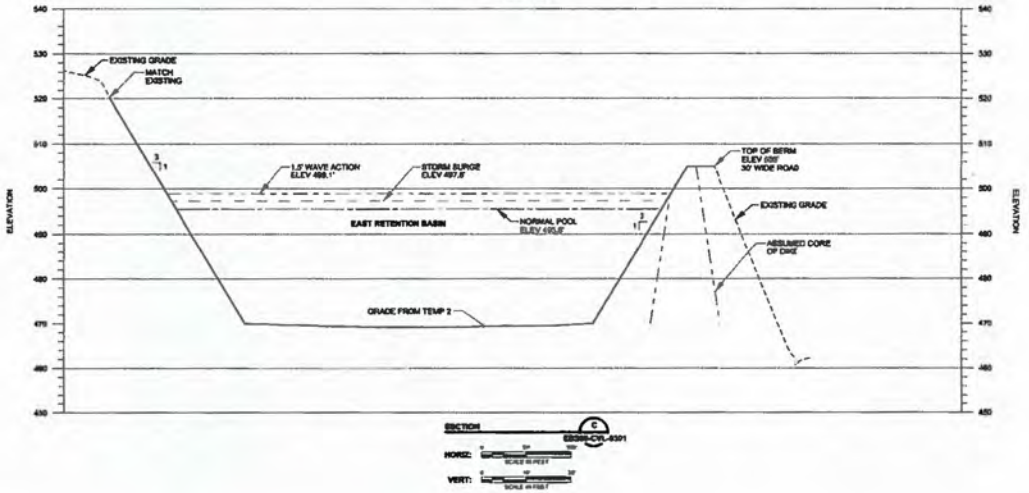
EBS00-CVL-0301 | F

no	date	by	ckd	description
E	08/21/15	MMM	RNO	ISSUED FOR OWNER REVIEW
D	08/18/15	MMM	RNO	ISSUED FOR REVIEW
C	08/05/15	MMM	RNO	ISSUED FOR REVIEW
B	07/01/15	MMM	RNO	ISSUED FOR 60% REVIEW
A	06/10/15	MMM	RNO	ISSUED FOR 30% REVIEW
F	08/08/16	MMM	RNO	ISSUED FOR PERMITTING

EXHIBIT 7
Page 96 of 157


WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
GRADING SECTIONS - SHEET 1 (FUTURE)
EAST BEND STATION UNIT 2
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS McDONNELL
DUKE ENERGY
EBS00-CVL-0305
ELEVATION
EXISTING GRADE
ASSUMED CORE OF DIKE
WEST RETENTION BASIN
EAST RETENTION BASIN
GRADE FROM TEMP 1
GRADE FROM TEMP 2
NORMAL POOL
STORM SURGE
EMERGENCY SPILLWAY
TOP OF INTERMEDIATE BERM
TOP OF BERM
ISSUED FOR PERMITTING
ISSUED FOR OWNER REVIEW
ISSUED FOR REVIEW
ISSUED FOR 60% REVIEW
ISSUED FOR 30% REVIEW





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D	06/18/13	MMM	RHO	ISSUED FOR REVIEW
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B	07/01/13	MMM	RHO	ISSUED FOR 60% REVIEW
A	08/10/13	MMM	RHO	ISSUED FOR 30% REVIEW
F	05/20/15	MMM	RHO	ISSUED FOR PERMITTING

PRELIMINARY - NOT FOR CONSTRUCTION

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9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM

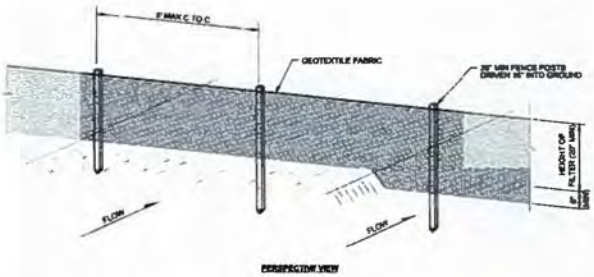
RETENTION BASIN CONSTRUCTION

GRADING SECTIONS - SHEET 2 (FUTURE)

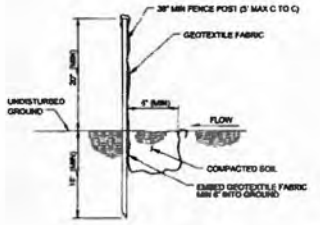
EAST BEND STATION UNIT 2

DUKE ENERGY

EBS00-CVL-0306 F



PERSPECTIVE VIEW



DETAIL 1 EBS00-CVL-0003

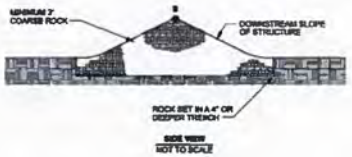
SILT FENCE TRENCH INSTALLATION DETAIL
NOT TO SCALE

CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. GEOTEXTILE FABRIC TO BE FASTENED SECURELY TO FENCE POSTS WITH STAPLES.
2. WHEN TWO SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS: STEEL EITHER "T" OR "L" TYPE OR 2" HARDWOOD

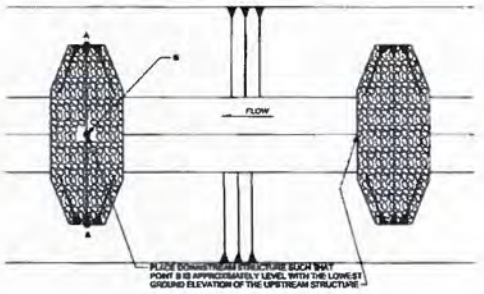
GEOTEXTILE FABRIC: FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL



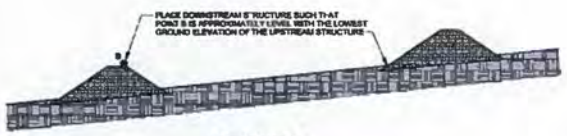
SIDE VIEW
NOT TO SCALE

FRONT VIEW
NOT TO SCALE

DEPTH OF ROCK (ft)	SUGGESTED ROCK DIAMETER AND FLOW DEPTHS					
	DOWNSTREAM FACE OF STRUCTURE					
	35%	30%	25%	20%	15%	10%
	MAXIMUM FLOW DEPTH ON ROCK (ft)					
2	8	7	9	10	14	20
8	12	14	18	20	28	40

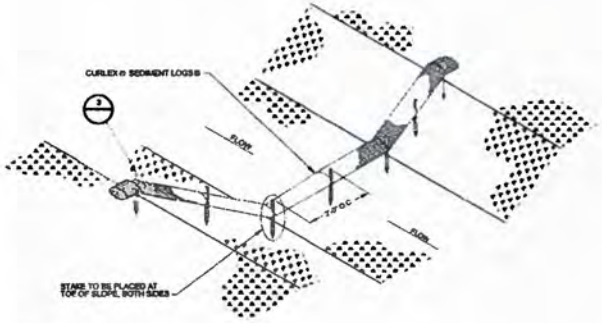


PLAN VIEW
NOT TO SCALE



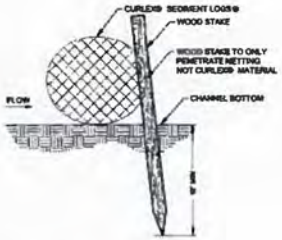
FLOWLINE PROFILE
NOT TO SCALE

ROCK CHECK DAM IN DITCH
NOT TO SCALE



DETAIL 2 EBS00-CVL-0003

CURLEX® SEDIMENT LOGS®
NOT TO SCALE



NOTES:

1. 1 1/4" X 1 1/4" X 30" WOODEN STAKES ARE RECOMMENDED FOR 8", 9", AND 12" SEDIMENT LOGS.
2. ANGLE STAKES UPSTREAM.
3. EXTEND SEDIMENT LOG UP THE SIDE SLOPES TO THE EXPECTED HIGH WATER LEVEL OR 2 FEET (VERTICAL), WHICHEVER IS GREATER.

DETAIL 3

STAKE DETAILS AND TRENCH
NOT TO SCALE

no	date	by	chd	description	no.	date	by	chd	description
E	08/20/13	MHM	RNO	ISSUED FOR PERMITTING					
D	06/23/13	MHM	RNO	ISSUED FOR OWNER REVIEW					
C	05/15/13	MHM	RNO	ISSUED FOR REVIEW					
B	05/03/13	MHM	RNO	ISSUED FOR REVIEW					
A	07/01/15	MHM	RNO	ISSUED FOR 60% REVIEW					

PRELIMINARY - NOT FOR CONSTRUCTION

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9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM

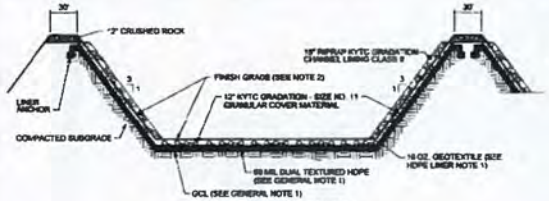
RETENTION BASIN CONSTRUCTION

EROSION CONTROL DETAILS

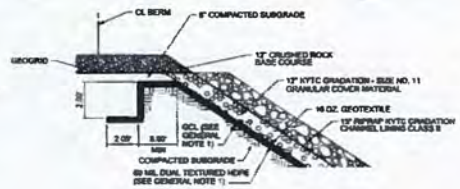
FOR EAST BEND STATION UNIT 2

DUKE ENERGY.

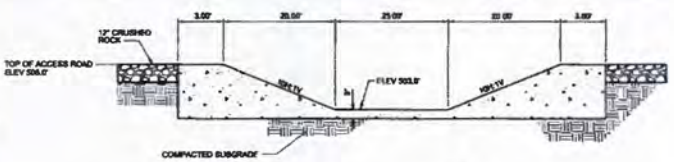
EBS00-CVL-0400 E



TYPICAL RETENTION BASIN LINER SECTION
NOT TO SCALE



LINER ANCHOR DETAIL
NOT TO SCALE



SECTION EBS00-CVL-0001, 0201, 0301

TYPICAL EMERGENCY SPILLWAY
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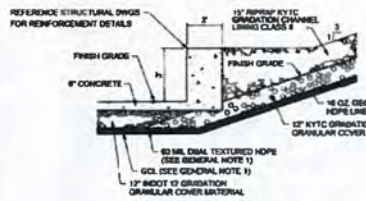
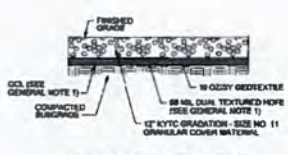
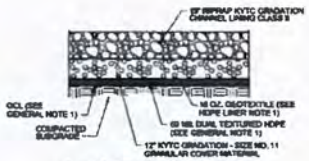


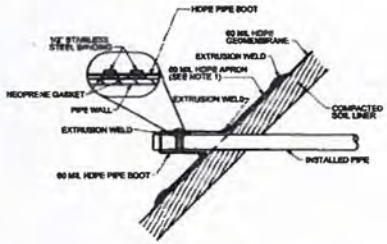
CONCRETE PUSH WALL FOR HOLDING BASIN
NOT TO SCALE



TYPICAL RETENTION BASIN BOTTOM SURFACING
NOT TO SCALE



TYPICAL RETENTION BASIN SLOPE SURFACING
NOT TO SCALE

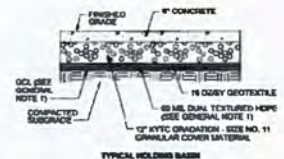


NOTES:
1. APRON MUST EXTEND A MINIMUM OF 18" BEYOND OUTSIDE DIAMETER OF PIPE.
2. GPECOMPOSITE AND PROTECTIVE SOIL COVER OVER HDPE GEOMEMBRANE NOT SHOWN FOR SAKE OF CLARITY.

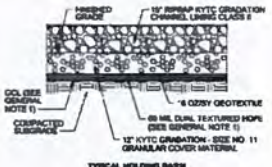
PIPE PENETRATION DETAIL
NOT TO SCALE

NOTE:
1. GRIND LINER PRIOR TO WELDING

TYPICAL EXTRUSION WELD
NOT TO SCALE



TYPICAL HOLDING BASIN BOTTOM SURFACING
NOT TO SCALE



TYPICAL HOLDING BASIN SLOPE SURFACING
NOT TO SCALE

TYPICAL DOUBLE FUSION WELD
NOT TO SCALE

TYPICAL GCL SLOPE TO BOTTOM LAPPING
NOT TO SCALE

HDPE LINER NOTES:
1. THE CONTRACTOR SHALL USE CAUTION WHEN INSTALLING LINER SECTION COMPONENTS. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. IN LIEU OF INSTALLING A LINER ANCHOR TRENCH, THE CONTRACTOR MAY EXTEND THE LINER BEYOND THE TOP OF THE SLOPE AROUND STRUCTURES. THE CONTRACTOR SHALL PROVIDE ENGINEERING CALCULATIONS AND LINER DESIGN INFORMATION AND APPROVAL IN LIEU OF THE ANCHOR TRENCH
3. IN LIEU OF INSTALLING A LINER ANCHOR TRENCHES BETWEEN THE PRIMARY AND SECONDARY BASINS, THE CONTRACTOR MAY EXTEND THE LINER BEYOND THE TOP OF THE SLOPE TO THE ADJACENT BASIN. THE CONTRACTOR SHALL PROVIDE ENGINEERING CALCULATIONS AND LINER DESIGN INFORMATION AND APPROVAL IN LIEU OF THE ANCHOR TRENCHES.
4. THE CONTRACTOR SHALL PROVIDE LINER DESIGN INFORMATION AND APPROVAL FOR THE ACCESS RAMP LOCATIONS. THE LINER SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS WITHOUT WRINKLES, OVERLAPS, AND CREASES
5. THE CONTRACTOR SHALL PROVIDE LINER DESIGN INFORMATION AND APPROVAL FOR THE PENETRATIONS.

GENERAL NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR PROPER STORAGE OF THE MATERIALS PER MANUFACTURER RECOMMENDATIONS
2. ALL FINISH GRADE ELEVATIONS ARE TO FINAL SURFACE ELEVATIONS EXCEPT FOR THE AREAS OF RIPRAP. RIPRAPED EMBANKMENT HAVE AN ADDITIONAL 18 INCH OF TRUE THICKNESS. ABOVE THE FINISH GRADE.
3. INSTALL ALL MATERIALS PER MANUFACTURER'S RECOMMENDATIONS.

E	08/23/13	MMM	RWD	ISSUED FOR OWNER REVIEW	
D	06/18/13	MMM	RWD	ISSUED FOR REVIEW	
C	08/05/13	MMM	RWD	ISSUED FOR REVIEW	
B	07/01/13	MMM	RWD	ISSUED FOR 60% REVIEW	
A	06/10/13	MMM	RWD	ISSUED FOR 30% REVIEW	
F	05/09/16	MMM	RWD	ISSUED FOR PERMITTING	

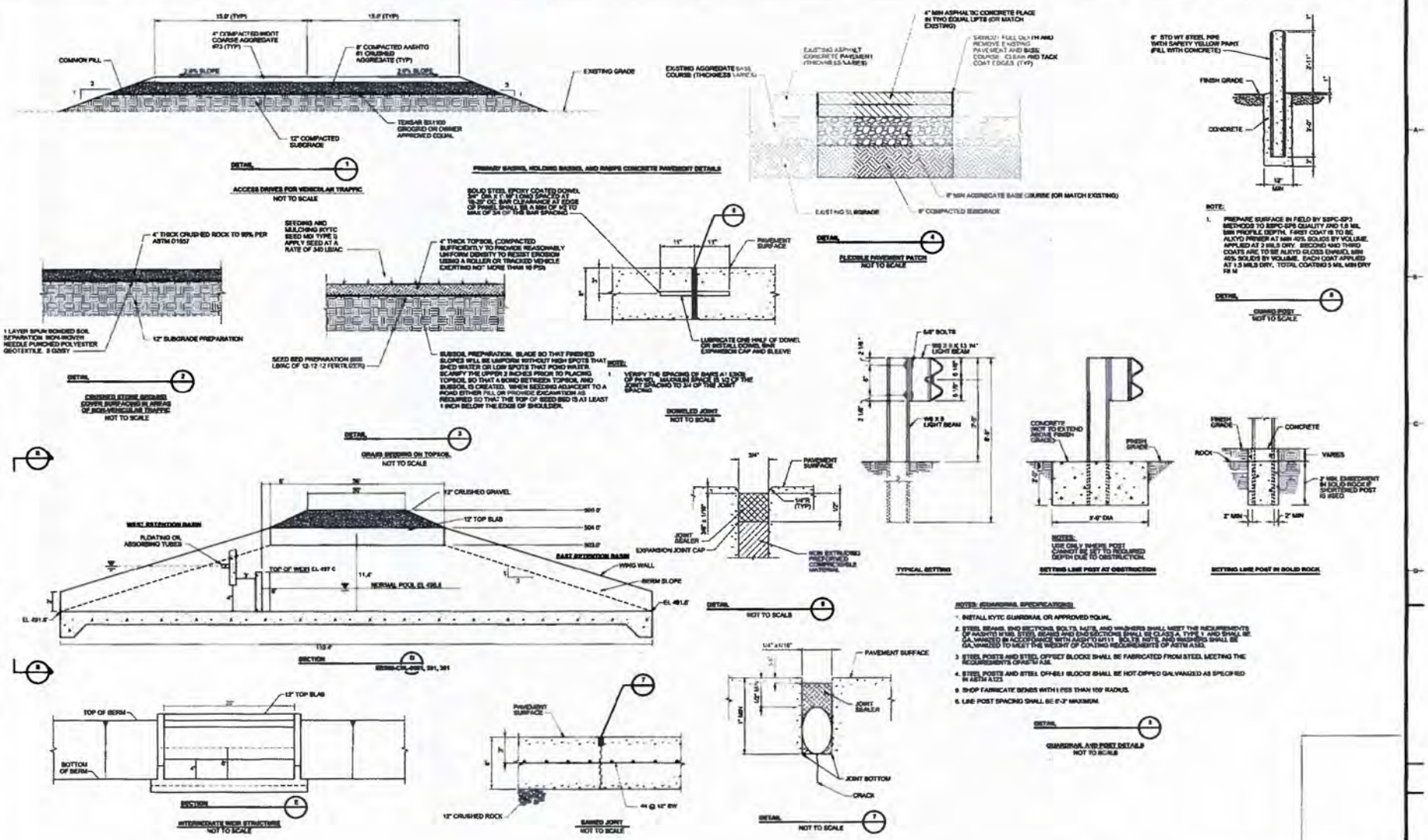
PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM
RETENTION BASIN CONSTRUCTION
LINER DETAILS
EAST BEND STATION UNIT 2
DUKE ENERGY.

EBS00-CVL-0401 F

EXHIBIT 7
Page 100 of 157



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C	08/18/15	MMM	RNO	ISSUED FOR REVIEW
B	08/05/15	MMM	RNO	ISSUED FOR REVIEW
A	07/31/15	MMM	RNO	ISSUED FOR 90% REVIEW

no.	date	by	chd	description

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

WATER REDIRECTION PROGRAM

RETENTION BASIN CONSTRUCTION

CIVIL DETAILS - SHEET 1

EAST BEND STATION UNIT 2

DUKE ENERGY

EBS00-CVL-0402 D

Appendix D
Equipment List

Equipment List - Water Re-Direct and Retention Basin

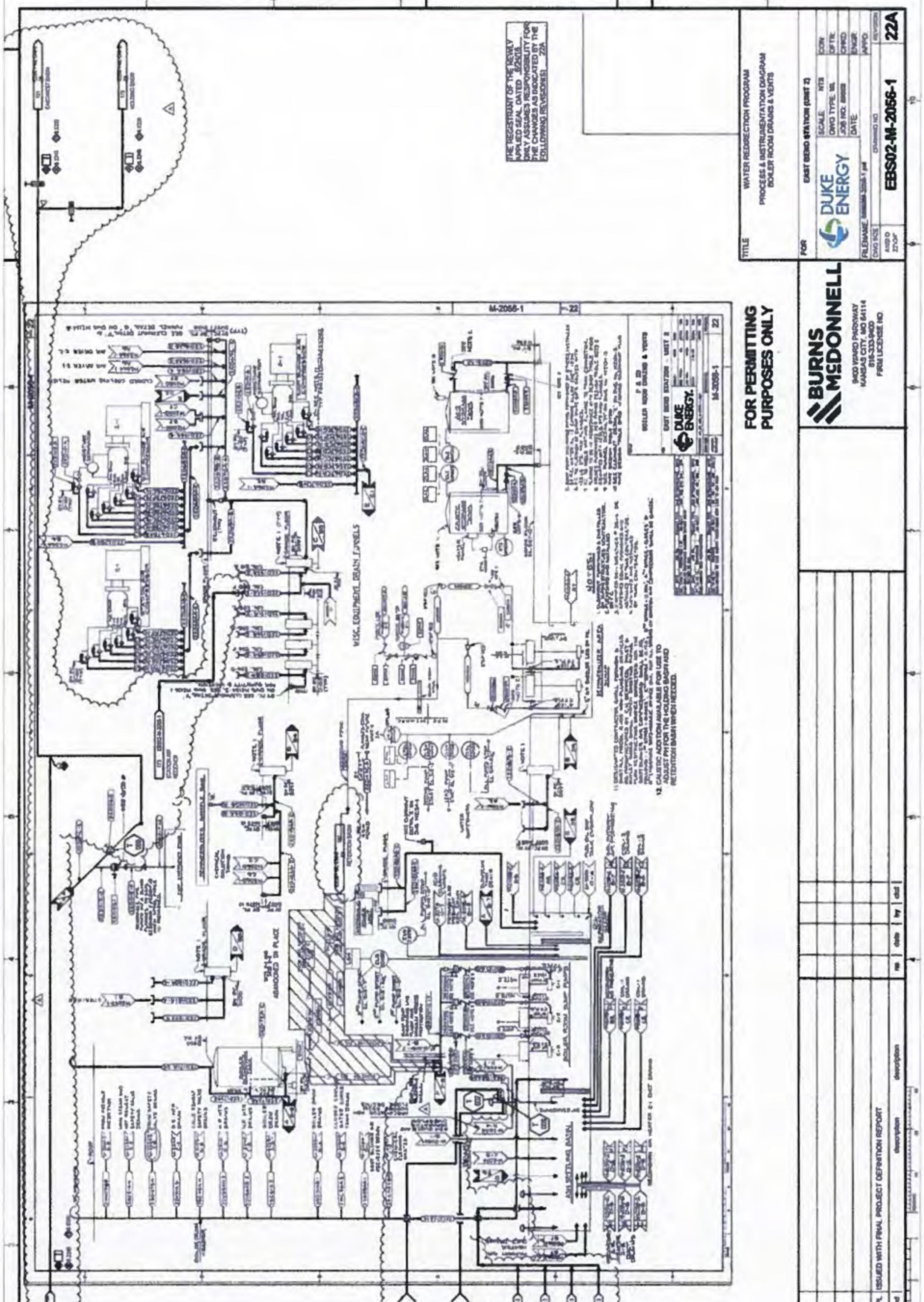
Duke Energy
East Bend
Project Number: 88669
Rev: B
PRELIMINARY - NOT FOR CONSTRUCTION

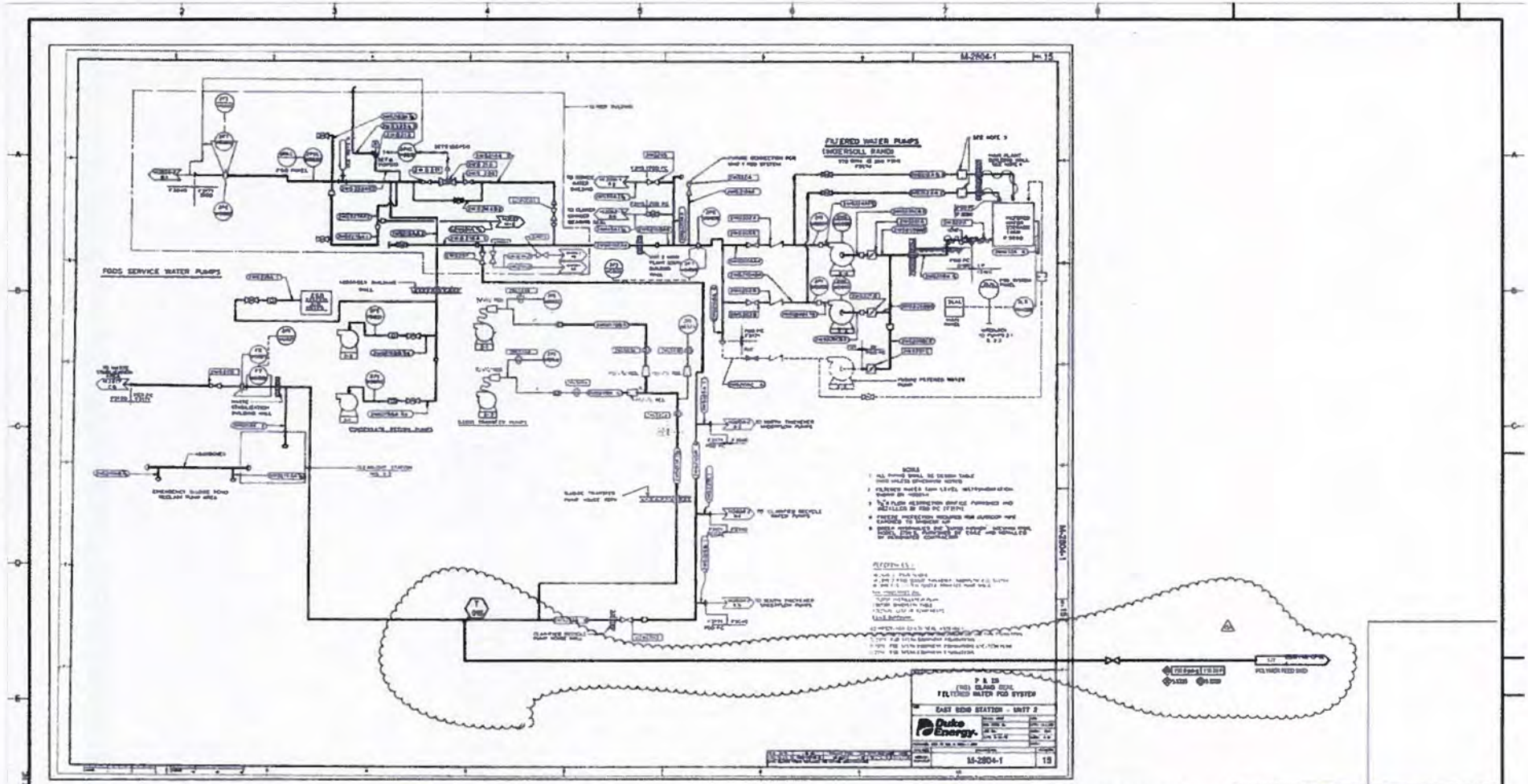
Item	Equipment Name/Description	Qty	Supplied by	Installed By	Skid Mtd	Motor Rating / Rated Load	Rating Units	Driver	Rated Voltage	Location	Quantity Operating	General Arrangement (note 1)	Notes	Revision
1	WSP Stackout Pad Runoff Pump (Submersible)	2	5.2170	5.8320		50	HP	Direct	480	WSP Stackout Pad Sump	1		2 x 100%	
2	Retention Basin Chemical Feed Pump - Caustic (centrifugal)	2	5.3418	5.8320		3	HP	Direct	480	Existing Demin Chem Feed Room	1		For existing caustic system expansion	
3	Retention Basin Chemical Feed Pump - Polymer (chemical dosing pump)	2	5.3418	5.8320		1	HP	Direct	480	RB Chemicial Addition Bld	1		One injection quill, 2 x 100%	
4	Retention Basin Chemical Feed Pump Motor Heater - Caustic	2	5.3418	5.8320		120	W	n/a	120	Existing Demin Chem Feed Room	2		For existing caustic system expansion	
5	Retention Basin Chemical Feed Pump Motor Heater - Polymer	2	5.3418	5.8320		120	W	n/a	120	RB Chemicial Addition Bld	2		One injection quill	
6	Unit heater	2	5.8320	5.8320		10	kW	n/a	480	RB Chemicial Addition Bld	2		One set at influent, one set at effluent	
7	Retention Basin Chemical Feed Tote - Polymer	2	Owner	5.8320		n/a	n/a	n/a	n/a	RB Chemicial Addition Bld	1		One injection quill	
8	Pre-engineered Building for Retention Basin Chemical Additions	1	5.4310	5.4310									20' x 30' x 10' Tall, to house chemical dosing totes, pumps, & heater.	
9	FGD Maintenance Tank	1	5.2970	5.2970									450k gallon working volume, agitated, field erected, open top, flake glass lining.	
10	FGD Maintenance Tank pumps (horizontal)	2	5.2190	5.8320		25	HP	Direct	480	FGD Maintentance Building	1		One set of 2x100% slurry pumps from FGD Maint Tank that go to each unit and absorber area sump	
11	FGD Maintenance Tank pump VFD	2		5.8320					480	FGD Maintentance Building	1			
12	FGD Maintenance Tank Agitator	1	5.3420	5.8320		100	HP	Direct	480	FGD Maintentance Tank	1			
13	20' x 25' pre-engineered building for FGD Maintenance pumps and Misc. Electrical		5.4310	5.4310										
14	Absorber Sump Pumps (vertical)	2	5.2190	5.8320		50	HP	Belt	480	Absorber Building	1		Replacements for existing sump pumps so that they have enough head to make it into the maintenance tank. Slurry service.	
15	North Tunnel Normal Sump Pumps (vertical)	2	5.2190	5.8320		50	HP	Direct	480	Thickener Tunnel	1		Replacements for existing sump pumps so that they have enough head to make it into the maintenance tank. Slurry service.	
16	South Tunnel Normal Sump Pumps (vertical)	2	5.2190	5.8320		50	HP	Direct	480	Thickener Tunnel	1		Replacements for existing sump pumps so that they have enough head to make it into the maintenance tank. Slurry service.	
17	Temporary Landfill Leachate Pumps (submersible)	2	5.2170	5.8320		5	HP	Direct	480	Landfill Leachage Manhole for cells 15 and 16	1		2 x 100%	
18	Temporary Landfill Runoff Pumps (submersible)	2	5.2170	5.8320		50	HP	Direct	480	Temporary landfill stormwater diversion structure	1		2 x 100%	
19	Temporary Truck Wash Sump Pumps (submersible)	2	5.2170	5.8320		10	HP	Direct	480	Temporary landfill stormwater diversion structure	1		2 x 100%	
20	Temporary RB Effluent Pump (self-priming)	2	2.2190	5.8320		25	HP	Direct	480	West Retention Basin	1		2 x 100%	
21	Temporary Polymer Feed System	1												

Appendix E

Not Used

Appendix F
P&IDs and Piping Plans


WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
BOILER ROOM DRAINS & VENTS
EAST BEND STATION (UNIT 2)
DUKE ENERGY
BURNS McDONNELL
FOR PERMITTING PURPOSES ONLY
MISC. EQUIPMENT DRAIN FUNNELS
EBS02-M-2056-1
22A
8/30/16 AES JPL ISSUED WITH FINAL PROJECT DEFINITION REPORT



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15A	8/30/16	AES	JPL	ISSUED WITH FINAL PROJECT DEFINITION REPORT					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO.

TITLE: WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
GLAND SEAL FILTERED WATER FGD SYSTEM

FOR: EAST BEND STATION (UNIT 2)

DUKE ENERGY

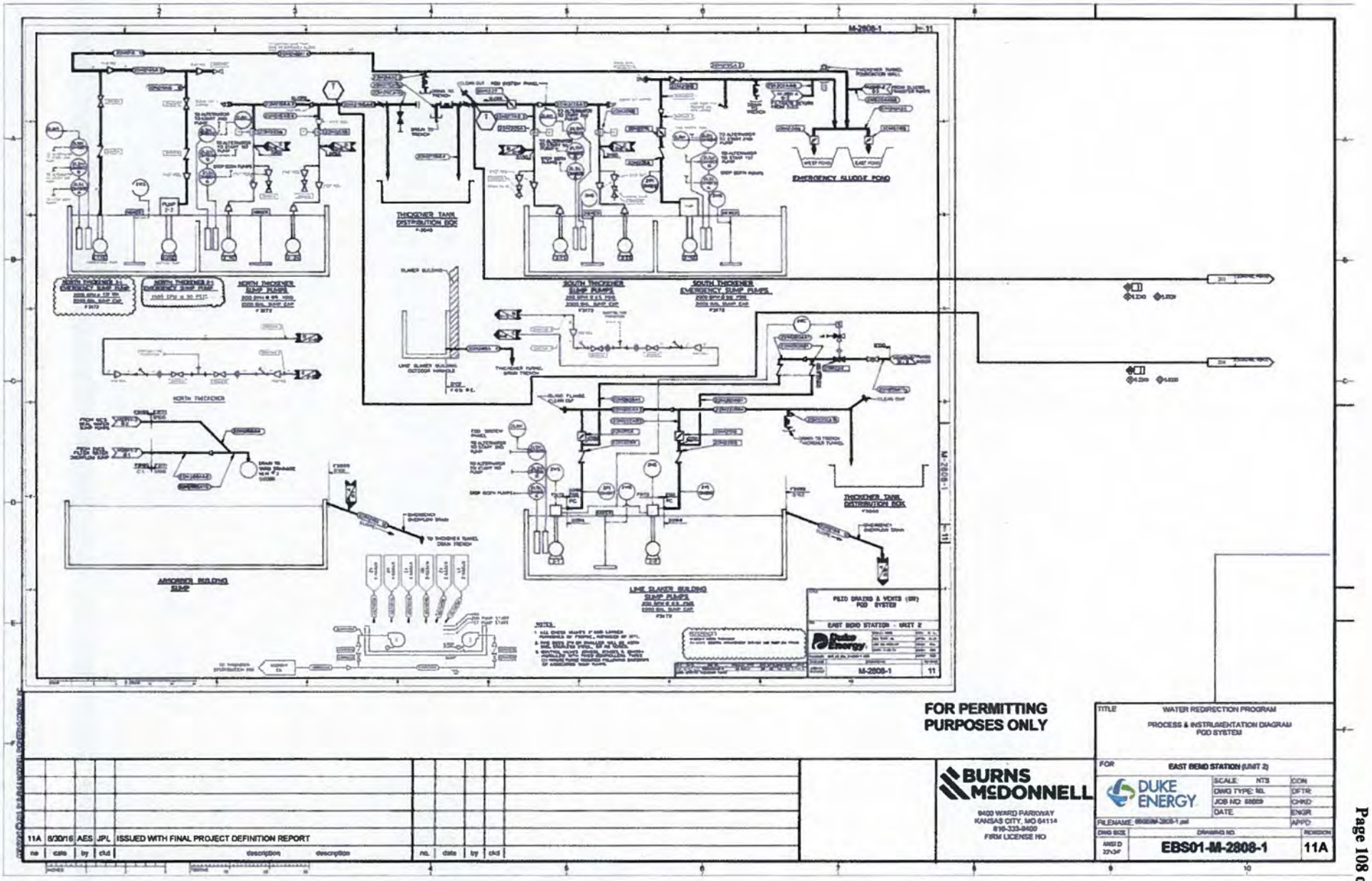
SCALE:	NTS
DWG TYPE:	MI
JOB NO:	89899
DATE:	
DES'GN:	
DFT'R:	
CHK'D:	
ENG'R:	
APP'D:	

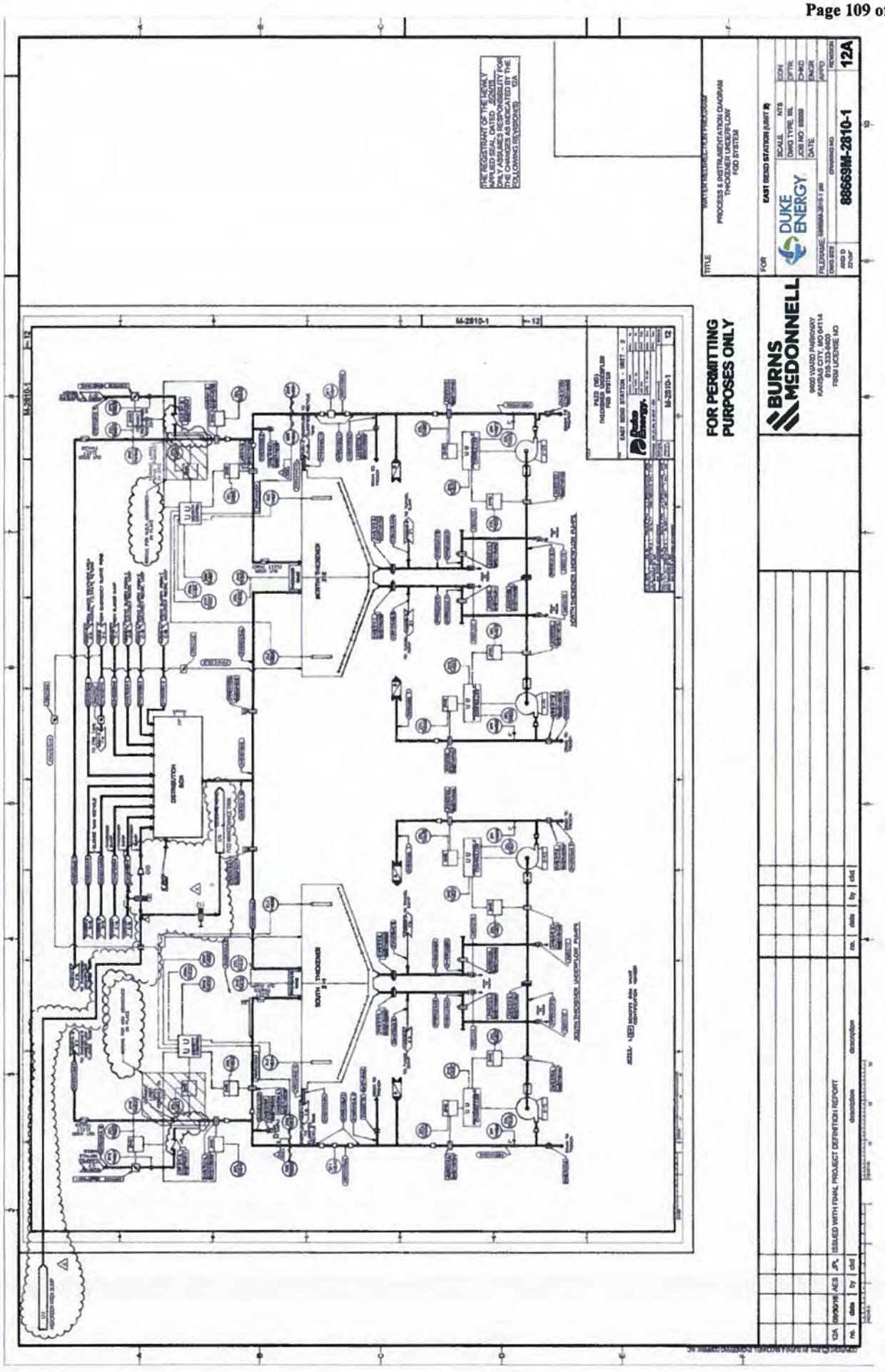
FILENAME: 89899M-2804-1.pid

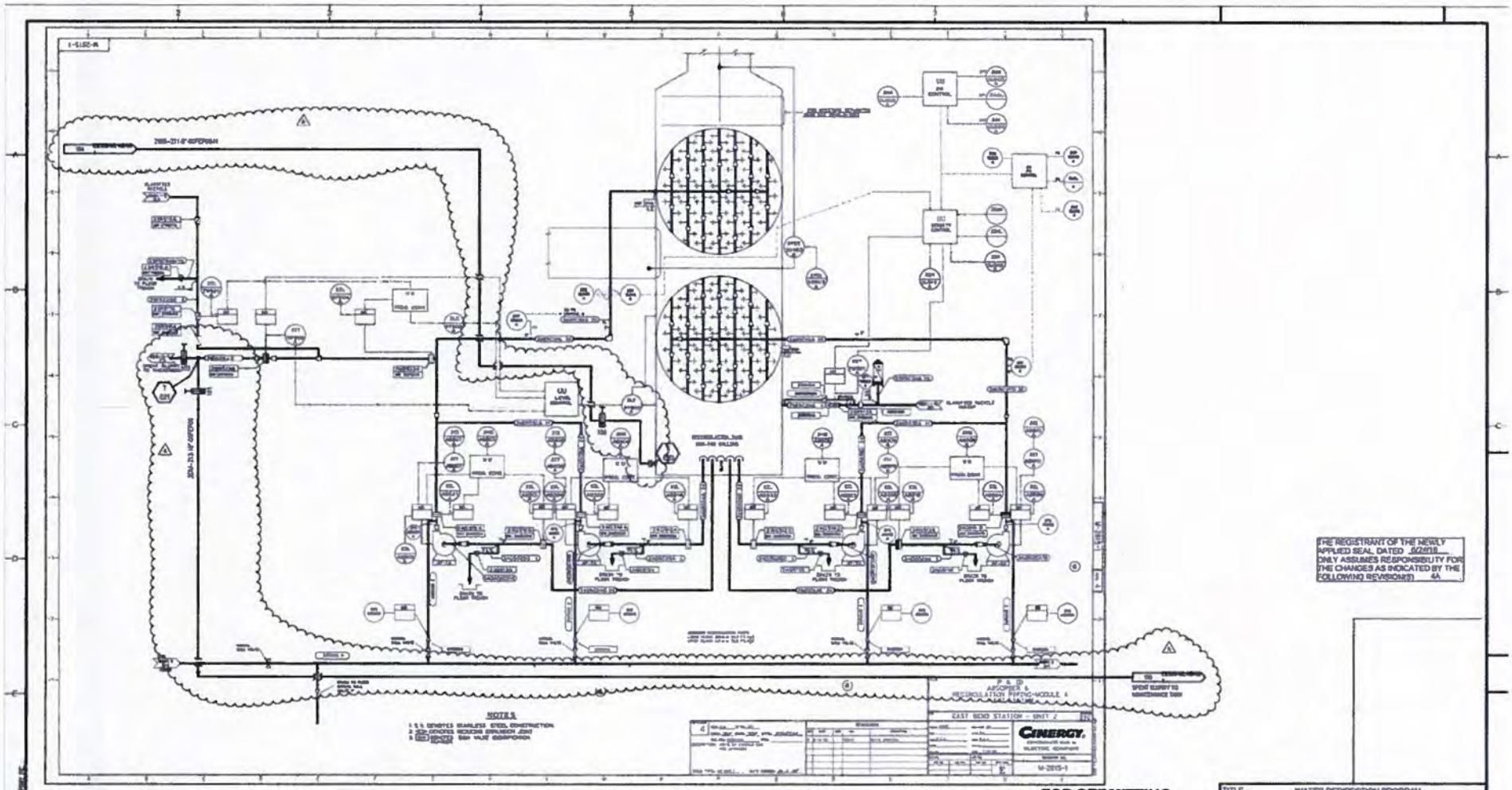
DWG SIZE: ANSI D 22X34"

DRAWING NO.: EBS02-M-2804-1

REVISION: 15A


M-2808-1
EMERGENCY SLUDGE POND
THICKENER TANK DISTRIBUTION BOX
NORTH THICKENER SUMP PUMPS
SOUTH THICKENER SUMP PUMPS
SOUTH THICKENER EMERGENCY SUMP PUMPS
LIME SLAKER BUILDING SUMP PUMPS
ABSORBER BUILDING SUMP
P&ID DRAINS & VENTS (DV) FGD SYSTEM
EAST BEND STATION - UNIT 2
M-2808-1
11
FOR PERMITTING PURPOSES ONLY
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM FGD SYSTEM
EAST BEND STATION (UNIT 2)
BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO
DUKE ENERGY
EBS01-M-2808-1
11A
11A 8/30/16 AES JPL ISSUED WITH FINAL PROJECT DEFINITION REPORT


FOR PERMITTING PURPOSES ONLY
BURNS McDONNELL
DUKE ENERGY
EAST SIDE STATION (UNIT 2)
PROCESS & INSTRUMENTATION DIAGRAM THICKENER UNDERFLOW/ FOD SYSTEM
M-2810-1
12A
ISSUED WITH FINAL PROJECT DEFINITION REPORT



THE REGISTRANT OF THE NEWLY APPLIED SEAL, DATED 8/28/18, ONLY ASSUMES RESPONSIBILITY FOR THE CHANGES AS INDICATED BY THE FOLLOWING REVISION(S): 4A

FOR PERMITTING PURPOSES ONLY

no.	date	by	chk	description	description	no.	date	by	chk
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BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO.

TITLE: WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
ABSORBER & RECIRCULATION PIPING-MODULE A FGD SYSTEM

FOR: EAST BEND STATION (UNIT 2)

DUKE ENERGY.

SCALE:	NTS
DWG TYPE:	M
JOB NO:	88669
DATE	
DES	
DFTR	
CHKD	
ENGR	
APPD	

FILENAME: 88669M-2815-1.dgn

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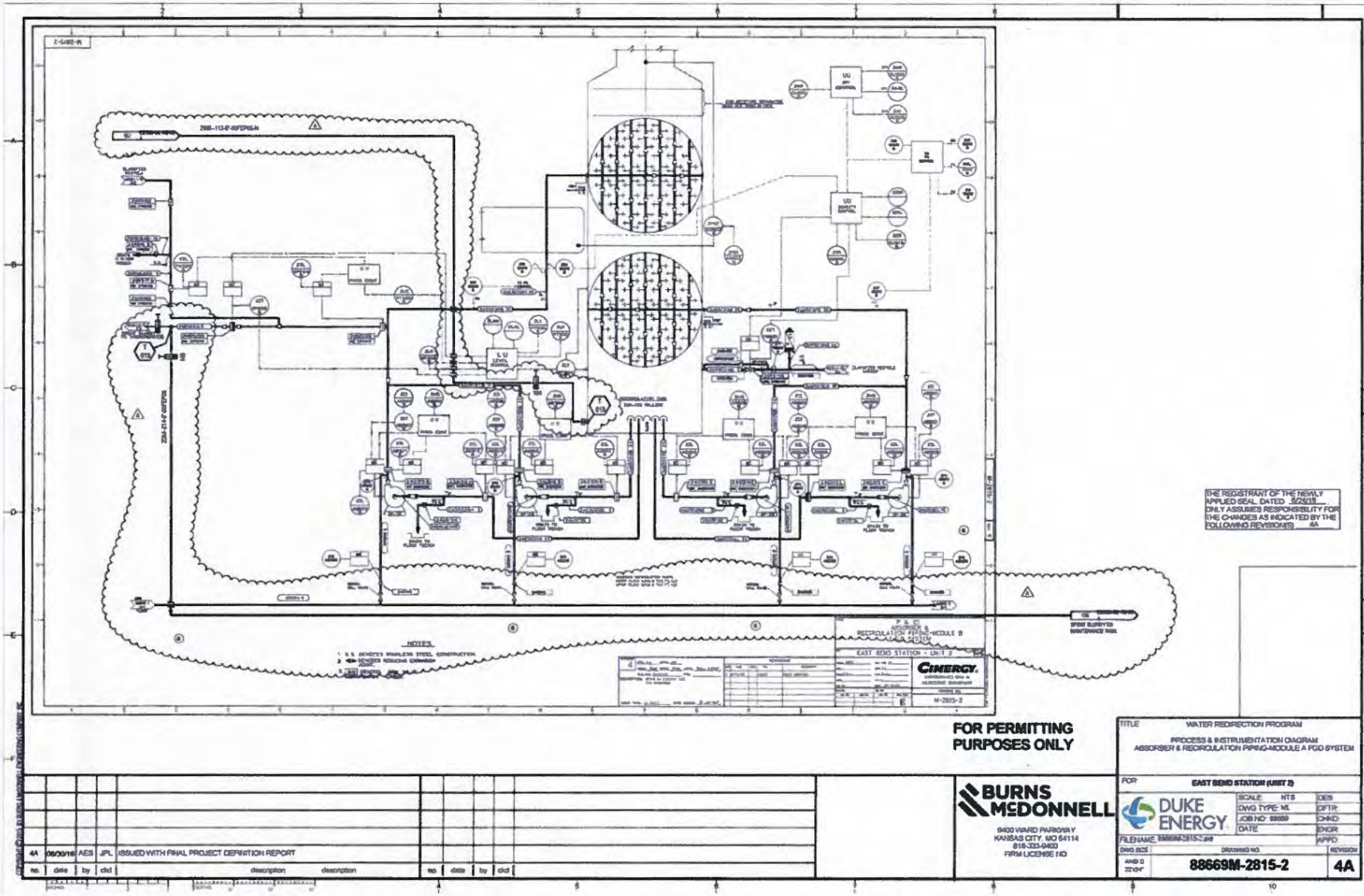
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FOR PERMITTING PURPOSES ONLY
CINERGY
EAST BEND STATION - UNIT 2
BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO
TITLE
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
ABSORBER & RECIRCULATION PIPING-MODULE A FGD SYSTEM
FOR
EAST BEND STATION (UNIT 2)
DUKE ENERGY
SCALE NTS
DWG TYPE ML
JOB NO 88669
DATE
DES
DFTR
CHKD
ENGR
APPD
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REVISION
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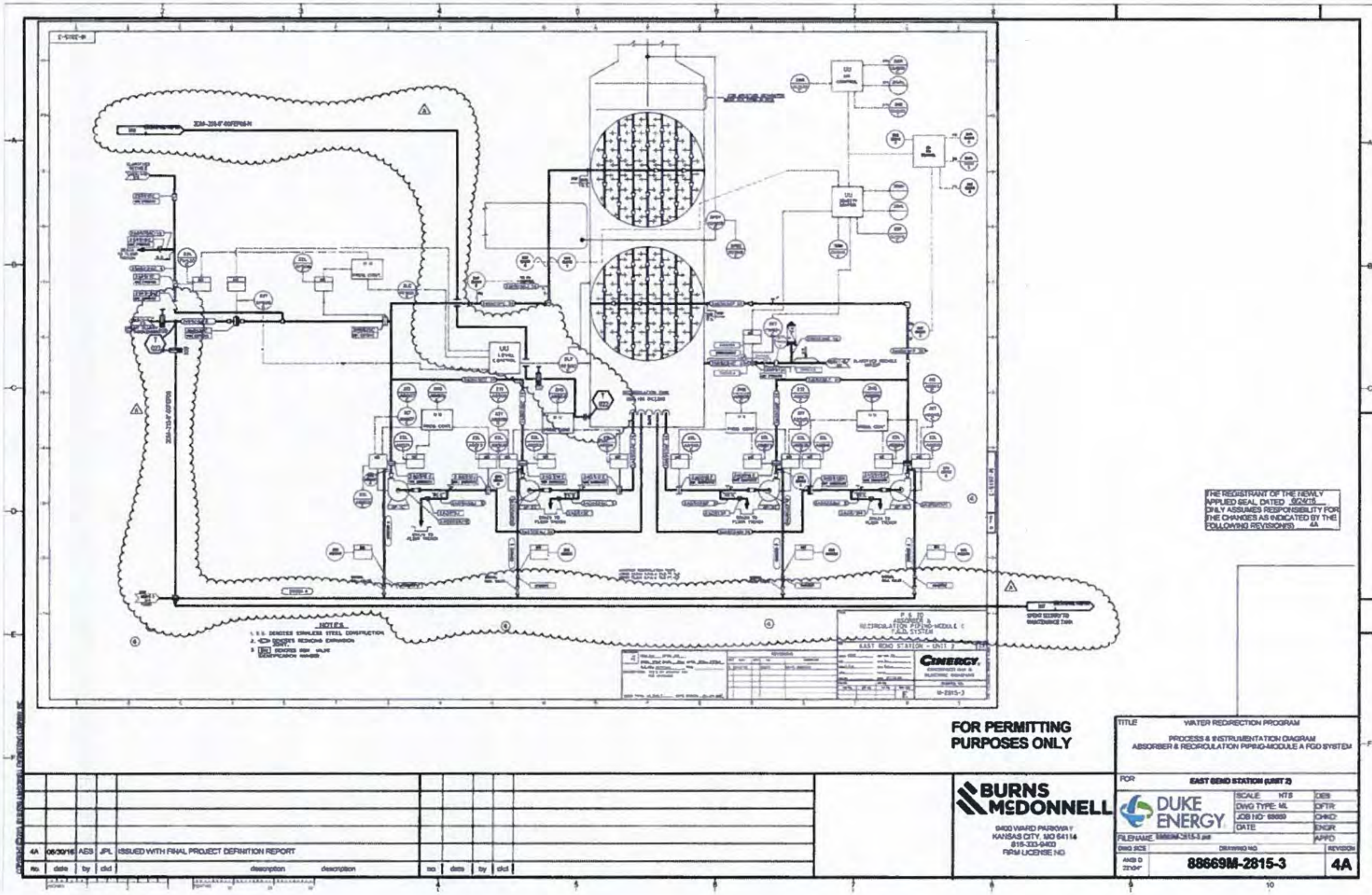
no. date by ckd description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FOR PERMITTING PURPOSES ONLY
BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO.
TITLE
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
ABSORBER & RECIRCULATION PIPING-MODULE A FGD SYSTEM
FOR
EAST BEND STATION (UNIT 2)
DUKE ENERGY
SCALE NTS
DWG TYPE ML
JOB NO 88669
DATE
DES
DFTR
CHKD
ENGR
APPD
FILENAME
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REVISION
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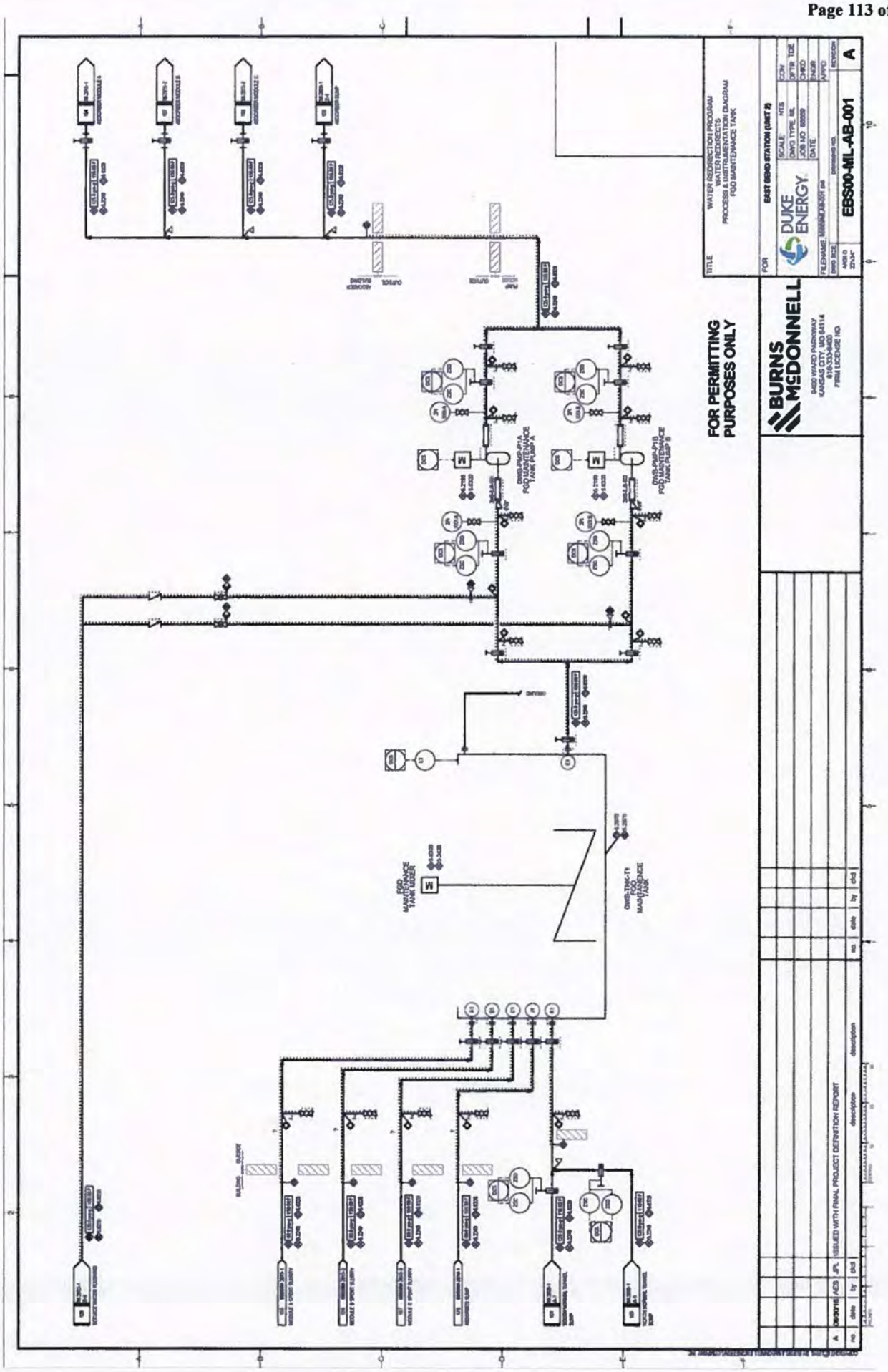
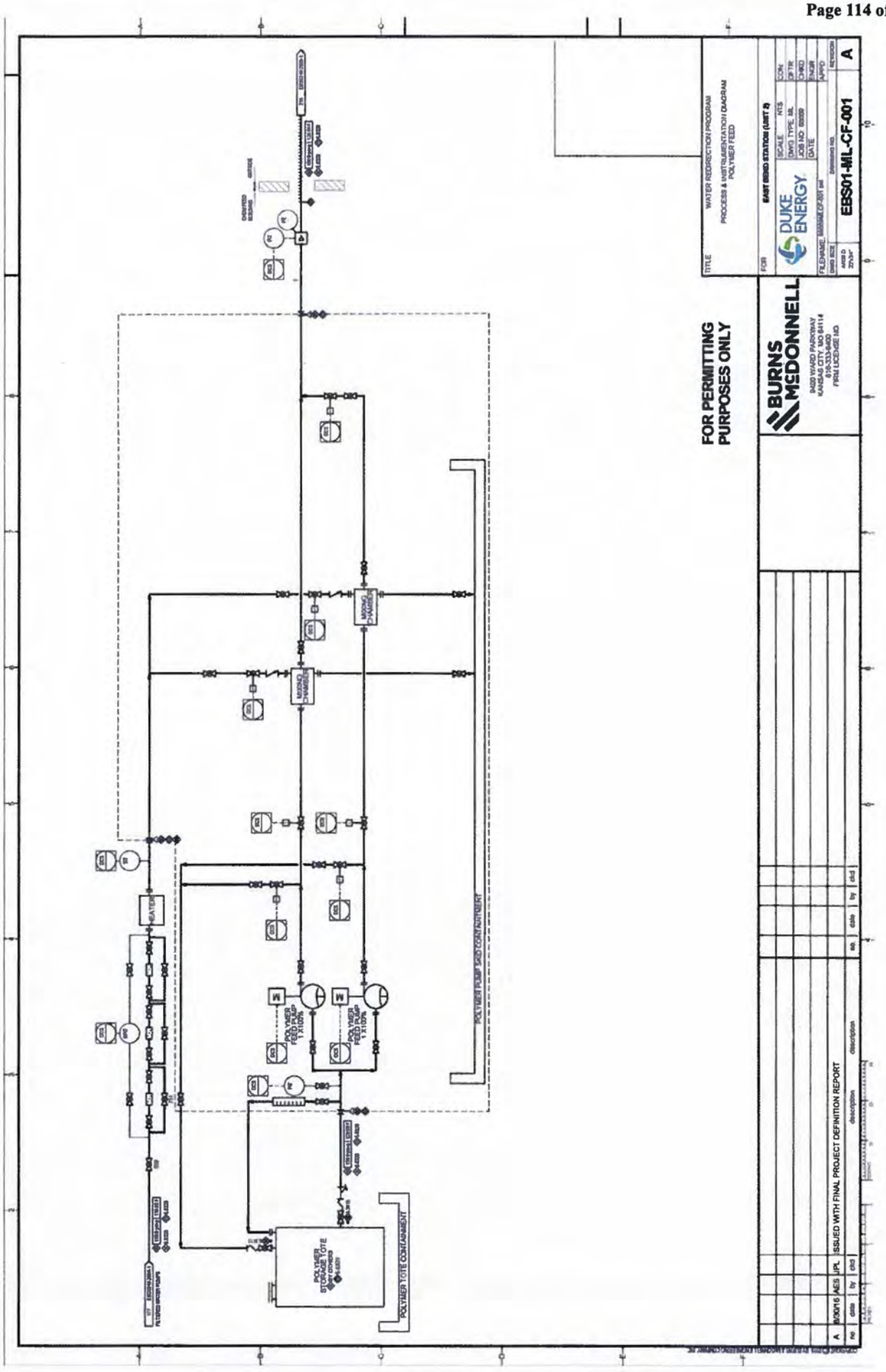
no. date by ckd description
CINERGY
M-2815-3


FOR PERMITTING PURPOSES ONLY
WATER REDIRECTION PROGRAM
WATER REDIRECTS
PROCESS & INSTRUMENTATION DIAGRAM
FGD MAINTENANCE TANK
EAST RIVER STATION (UNIT 7)
DUKE ENERGY
BURNS McDONNELL
EBS00-MIL-AB-001
A
ISSUED WITH FINAL PROJECT DEFINITION REPORT
FGD MAINTENANCE TANK PUMP A
FGD MAINTENANCE TANK PUMP B
FGD MAINTENANCE TANK


FOR PERMITTING PURPOSES ONLY
BURNS MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO.
DUKE ENERGY
EAST BEND STATION (UNIT 2)
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
POLYMER FEED
EBS01-MIL-CF-001
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ISSUED WITH FINAL PROJECT DEFINITION REPORT
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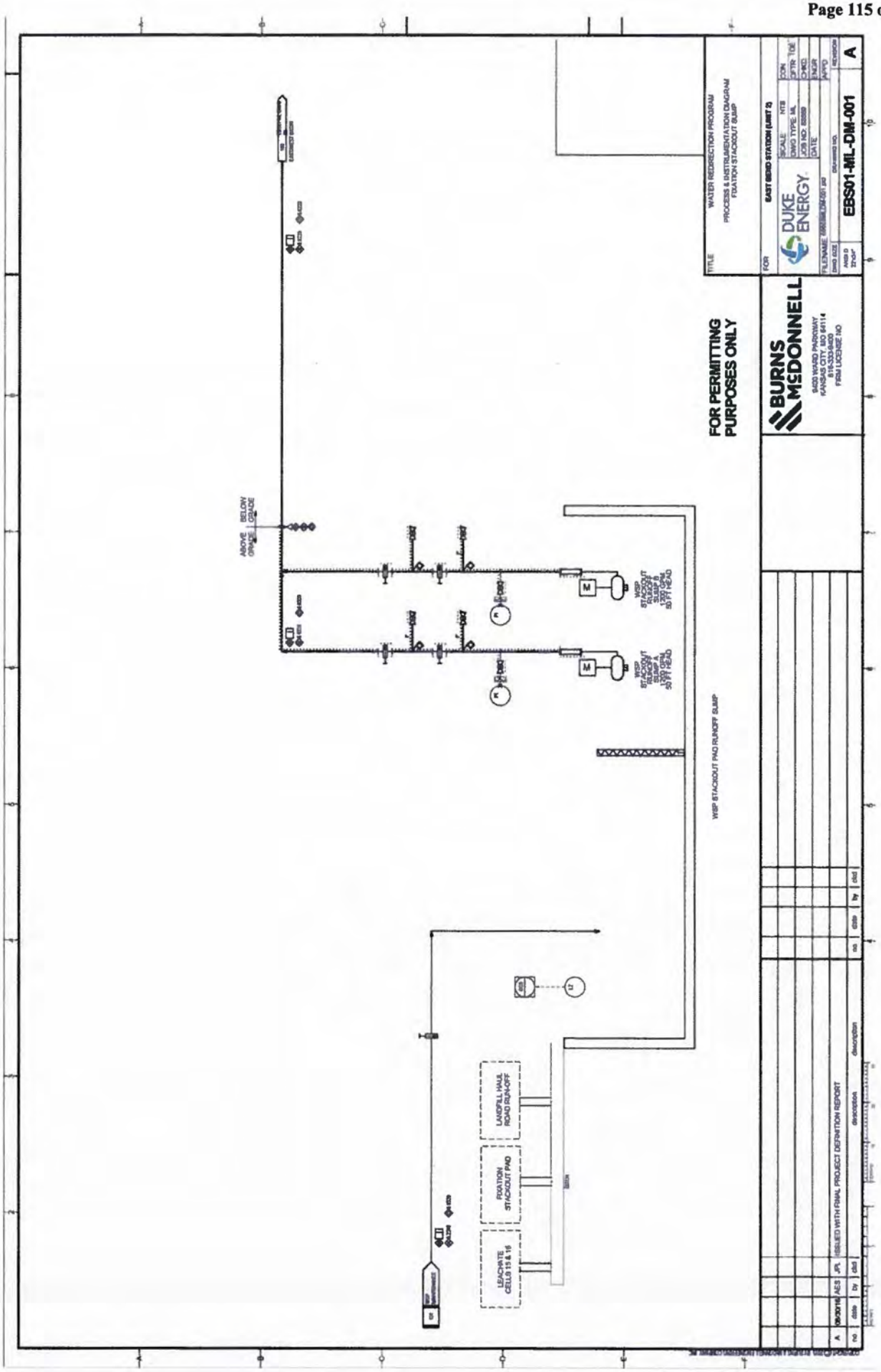
POLYMER PUMP SKID CONTAINMENT
MIXING CHAMBER
WATER
POLYMER FEED PUMP 1 X 110%
POLYMER STORAGE TOTE


FOR PERMITTING PURPOSES ONLY
BURNS McDONNELL
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
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EAST BEND STATION (UNIT 2)
DUKE ENERGY
EBS01-MIL-DIM-001
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ISSUED WITH FINAL PROJECT DEFINITION REPORT
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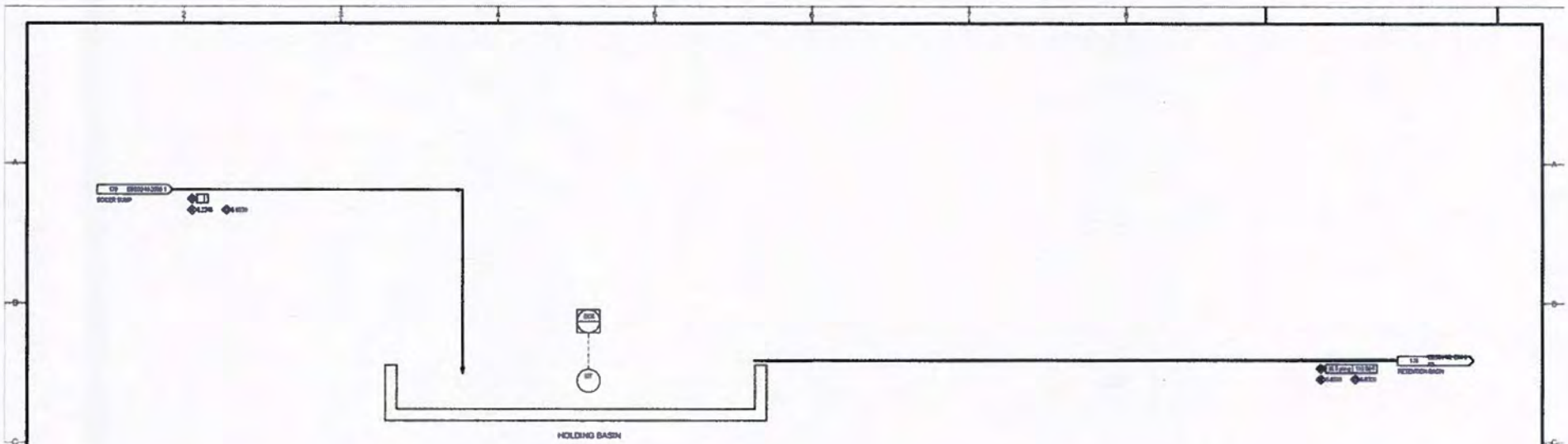
LEACHATE CELLS 15 & 16
FGD/ATION STACKOUT PAD
LANDFILL HAUL ROAD RUN-OFF
ABOVE GRADE
BELOW GRADE



FOR PERMITTING PURPOSES ONLY

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BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO

TITLE: WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
Holding Basin

FOR: EAST BEND STATION (UNIT 2)

DUKE ENERGY

SCALE: NTS		DSN	
DWG TYPE: MI		DFTR	
JOB NO. 68699		CHKD	
DATE:		ENGR	
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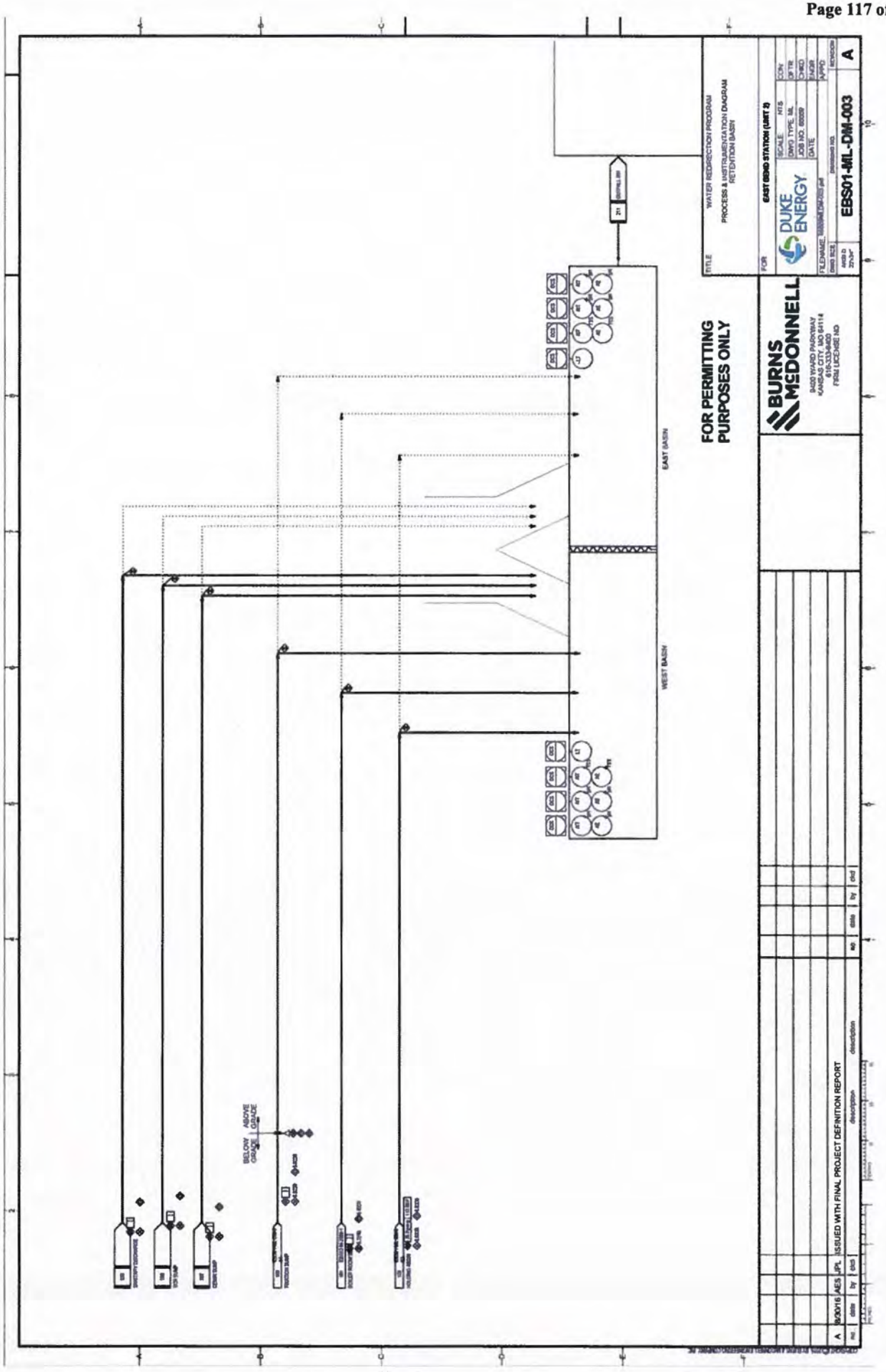
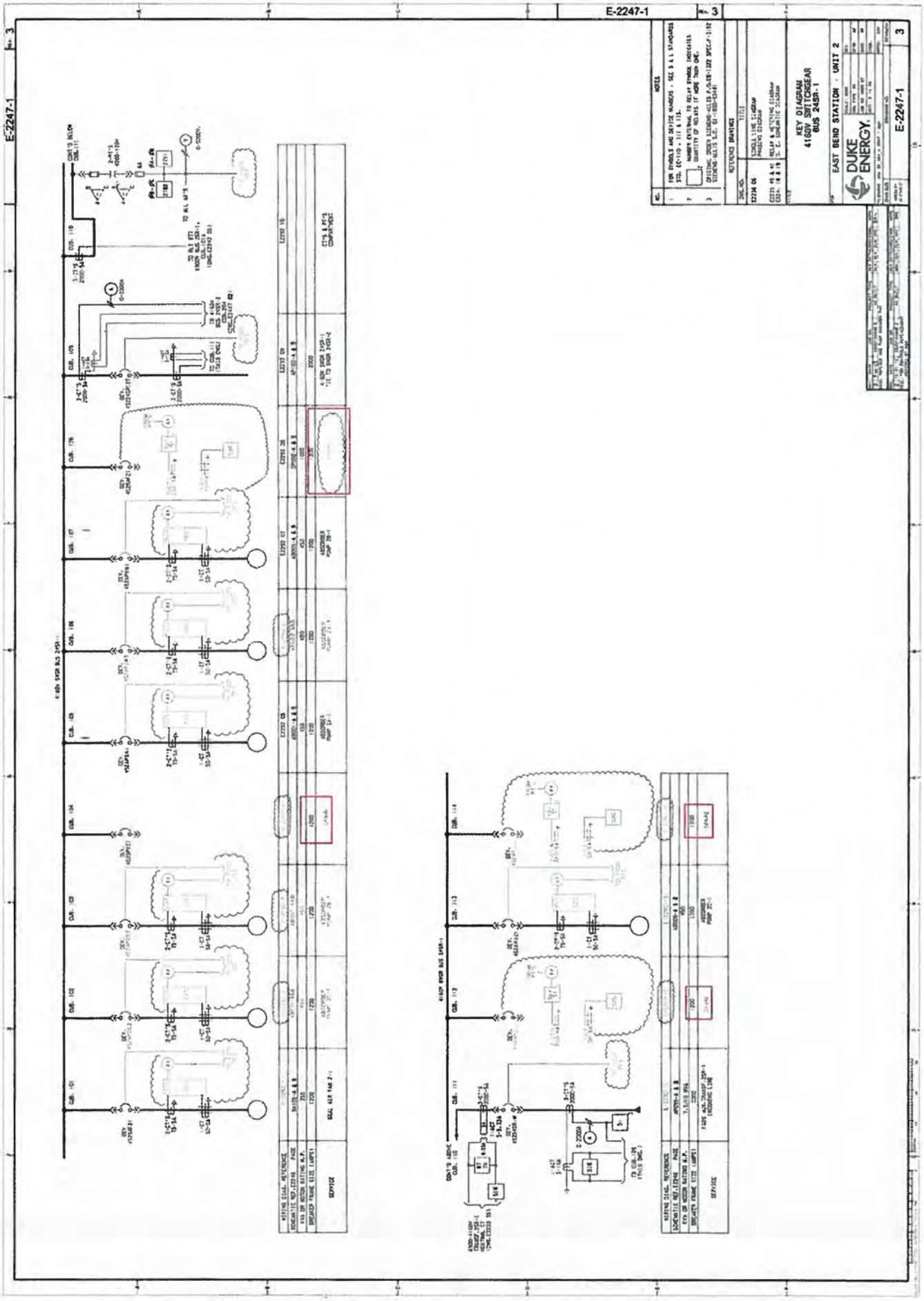

FOR PERMITTING PURPOSES ONLY
EAST BASIN
WEST BASIN
BELOW GRADE
ABOVE GRADE
WATER REDIRECTION PROGRAM
PROCESS & INSTRUMENTATION DIAGRAM
RETENTION BASIN
EAST ERD STATION (UNIT 2)
DUKE ENERGY
BURNS MCDONNELL
EBS01-ML-DM-003
A
A 8/30/16 AES JPL ISSUED WITH FINAL PROJECT DEFINITION REPORT

Appendix G
Electrical One Lines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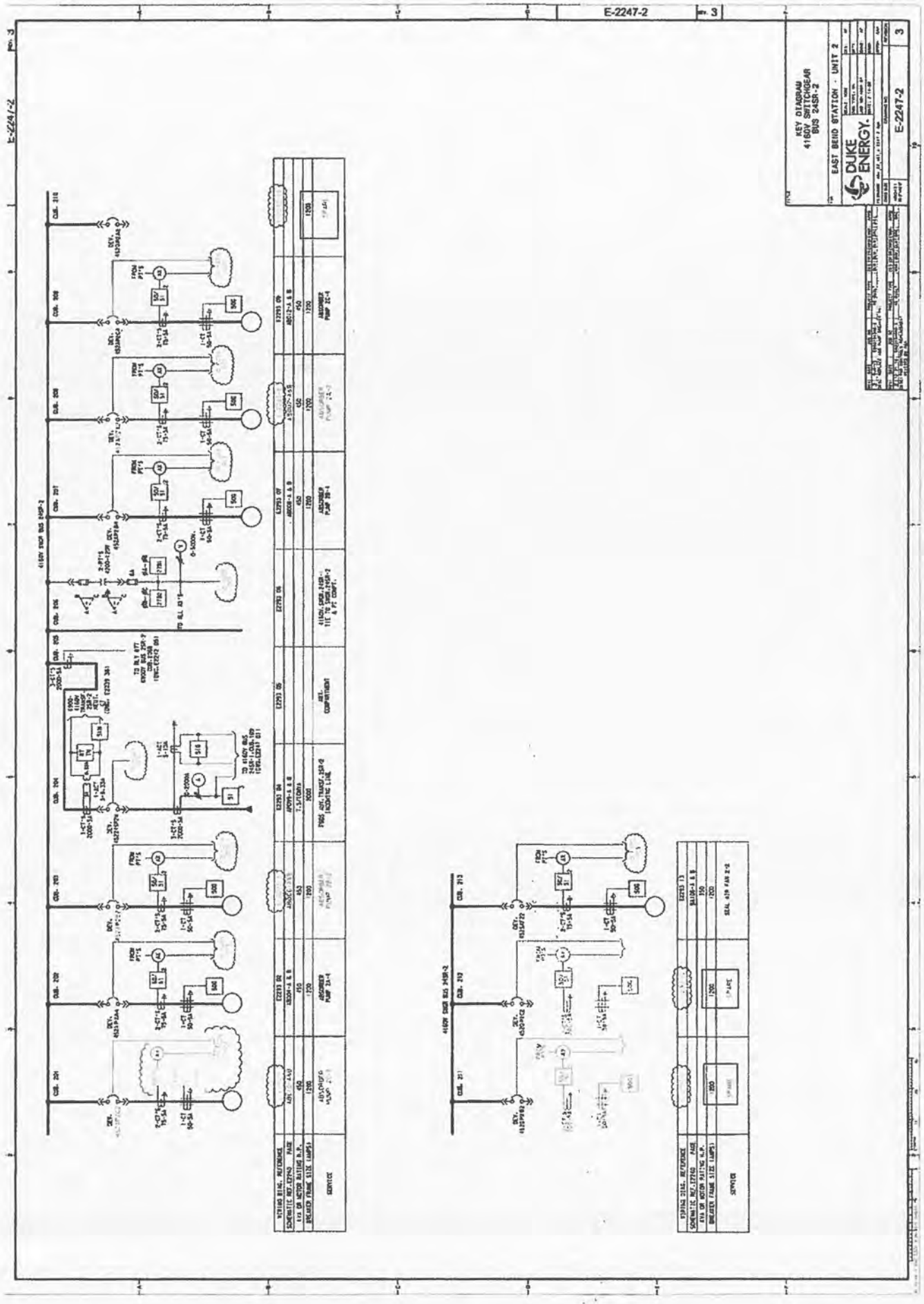
KEY DIAGRAM
4160V SWITCHGEAR
BUS 2459-1
DUKE ENERGY.
E-2247-1
3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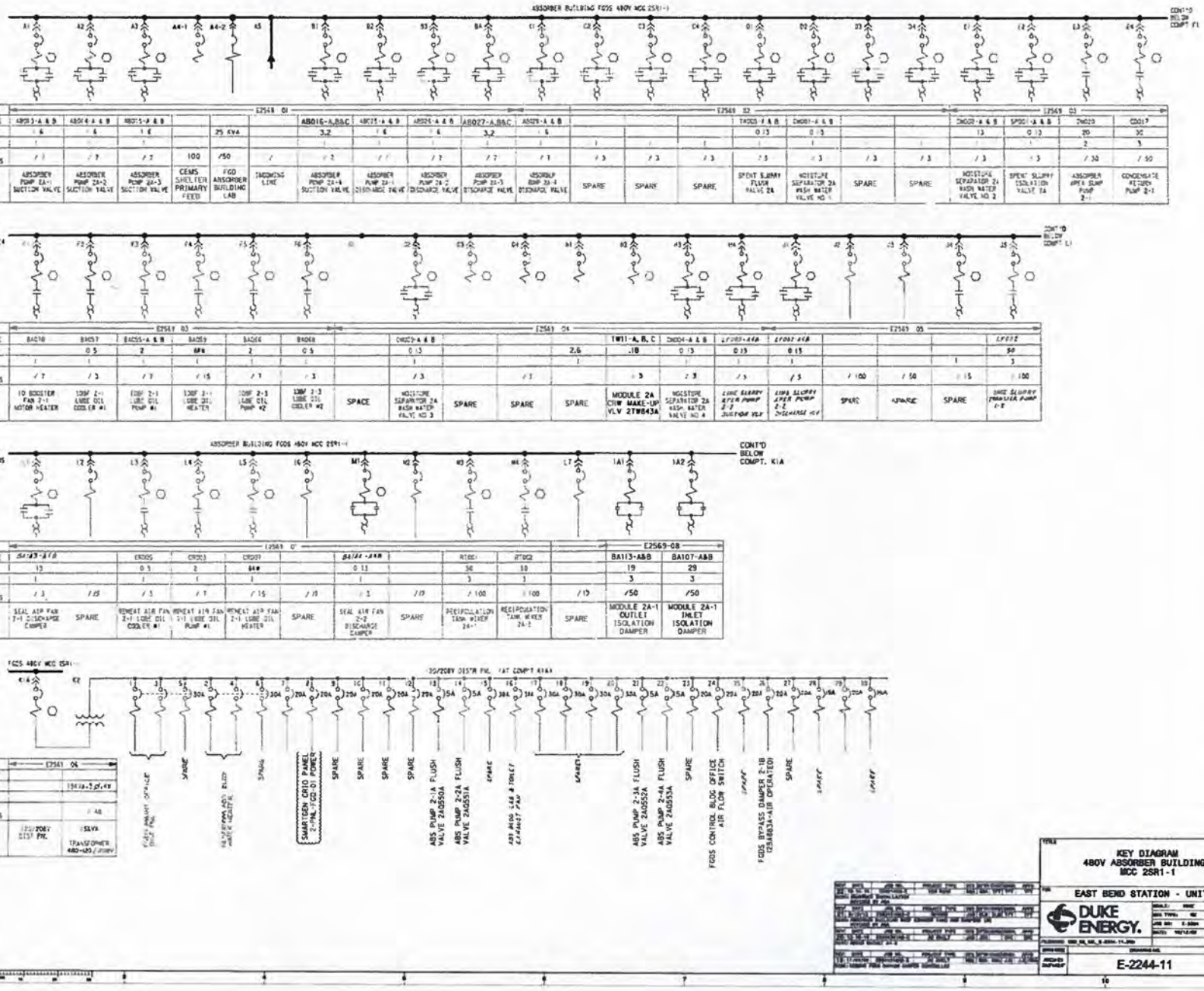
KEY DIAGRAM
4160V SWITCHGEAR
BUS 2A3R-2
EAST BEND STATION - UNIT 2
DUKE ENERGY.
E-2247-2
3



TITLE	
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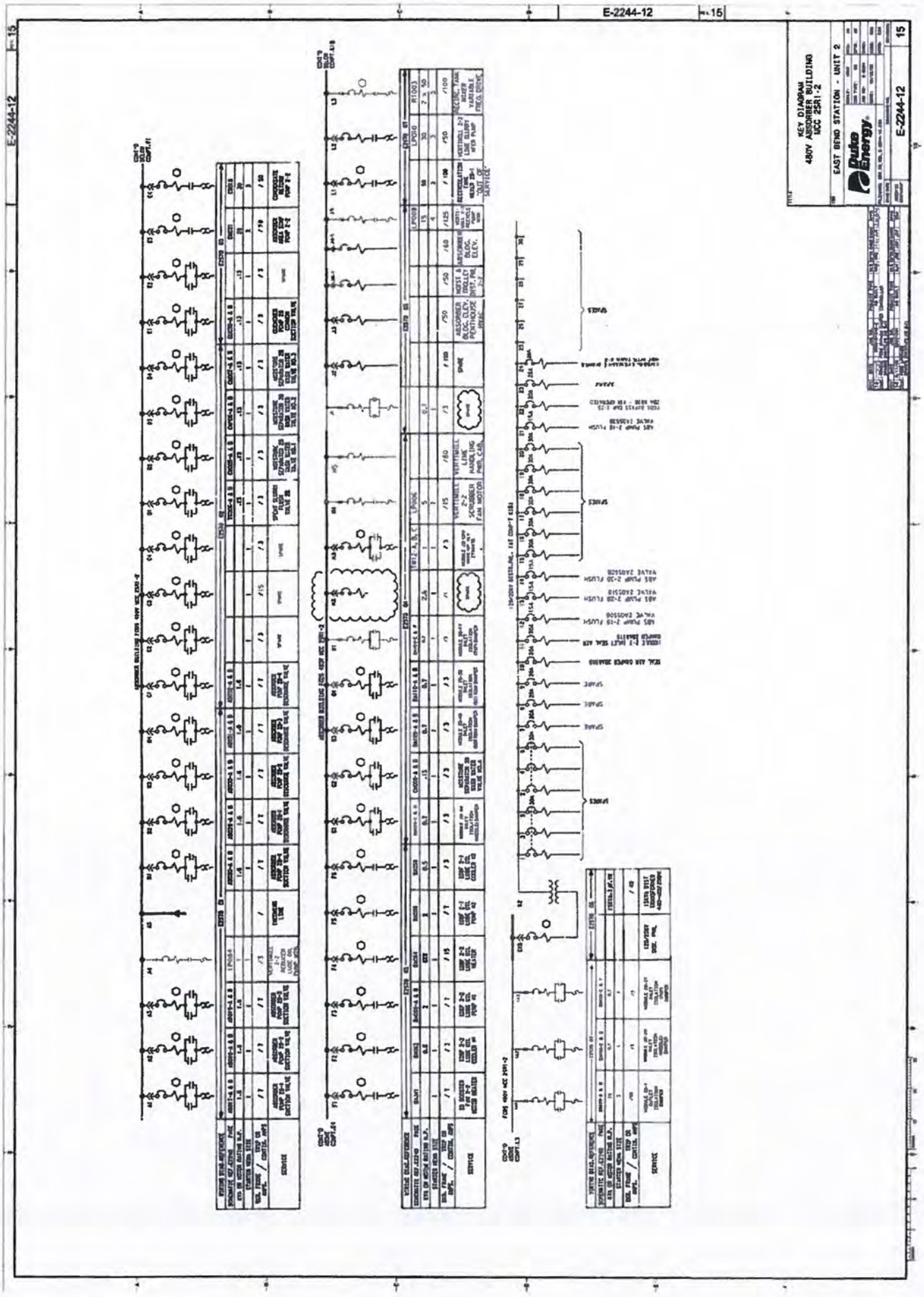
	EAST BEND STATION - UNIT 2
	DUKE ENERGY.
	E-2244-11 — 22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KEY DIAGRAM
480V ABSORBER BUILDING
MCC 25R1-2
EAST BEND STATION - UNIT 2
Duke Energy
E-2244-12
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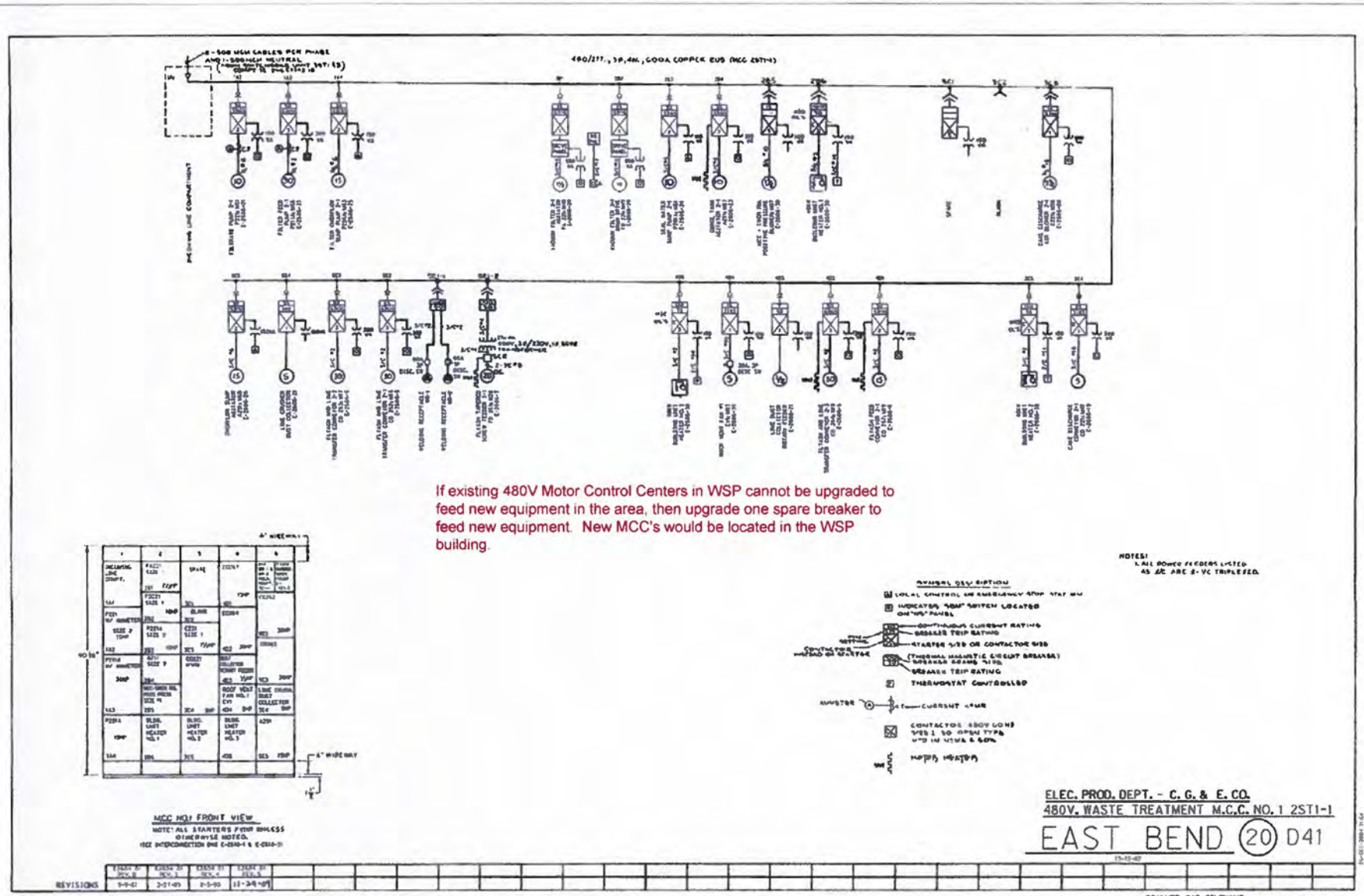
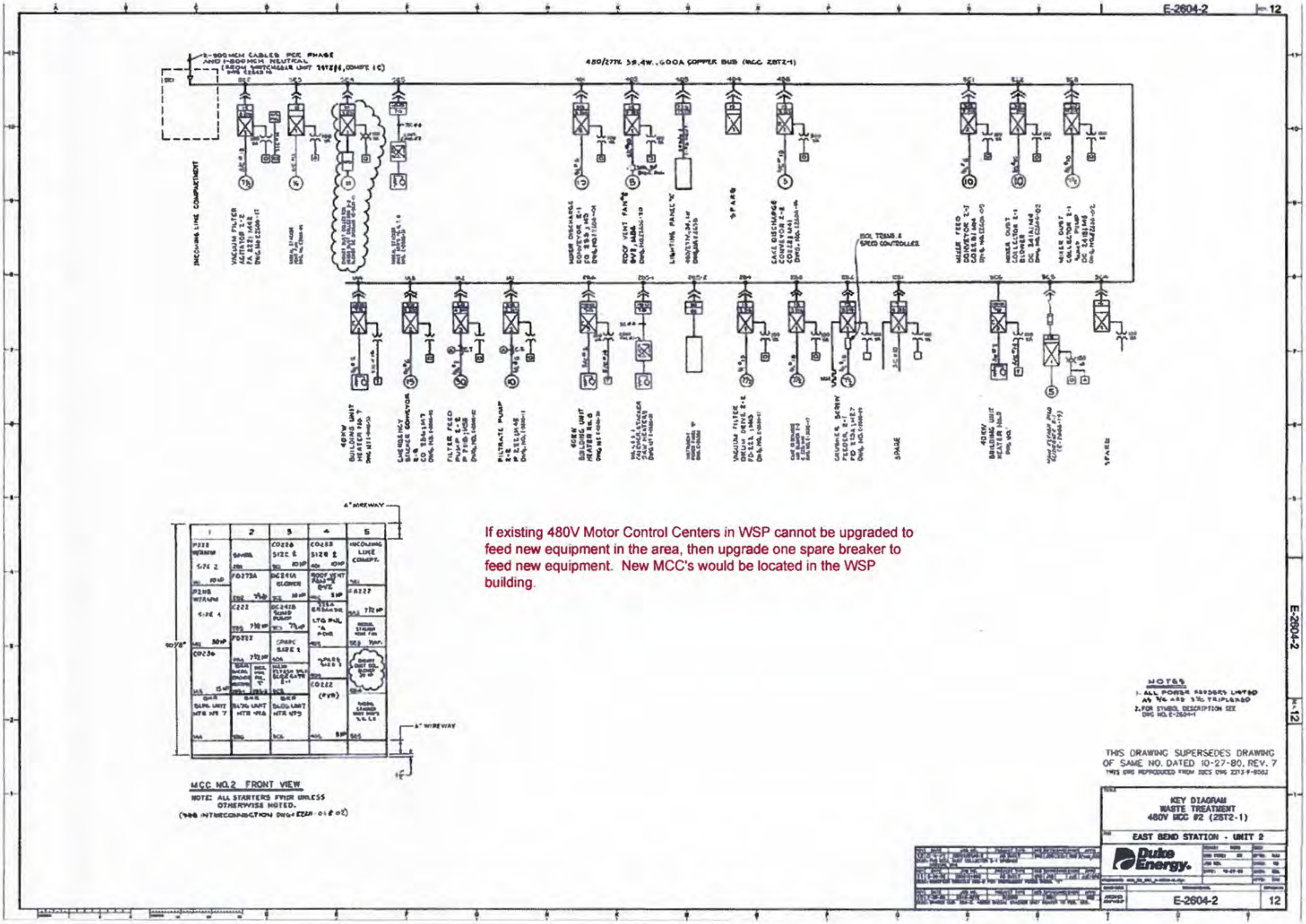


If existing 480V Motor Control Centers in WSP cannot be upgraded to feed new equipment in the area, then upgrade one spare breaker to feed new equipment. New MCC's would be located in the WSP building.

ELEC. PROD. DEPT. - C. G. & E. CO.
480V. WASTE TREATMENT M.C.C. NO. 1 2ST1-1
EAST BEND (20) D41



If existing 480V Motor Control Centers in WSP cannot be upgraded to feed new equipment in the area, then upgrade one spare breaker to feed new equipment. New MCC's would be located in the WSP building.

Appendix H
Contract List and Descriptions

APPENDIX H – Contract List and Descriptions

1 EQUIPMENT CONTRACTS

Where practical equipment will be contracted on a program wide basis as noted below. The below scope reflects site specific rather than program wide contract scope.

5.2170 – Submersible Pumps

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. Two (100%) WSP pad runoff sump pumps
   2. Two (100%) Temporary Landfill Leachate pumps
   3. Two (100%) Temporary Landfill Runoff pumps
   4. Two (100%) Temporary Truck Wash Sump pumps
   5. All submittals and operating and maintenance manuals.

5.2190 – Miscellaneous Pumps

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. Two (100%) Fixation pad runoff sump transfer pumps.
   2. Two (100%) Absorber sump pumps.
   3. Two (100%) North tunnel sump pumps.
   4. Two (100%) South tunnel sump pumps.
   5. Two (100%) FGD Maintenance Tank pumps
   6. Two (100%) Temporary RB effluent pump
   7. All submittals and operating and maintenance manuals
   8. Field technical services to support startup.

5.2240 – FRP Fabricated Pipe

A. General Description: Design, fabricate, and deliver to site the following materials:
   1. FRP fabricated pipe for the FGD maintenance tank and pump systems.
   2. Spool drawings.
   3. Shop QA/QC documents.

5.3418 – Retention Basin Chemical Feed Equipment (Program)

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. Polymer feed skid.
   2. Caustic feed pump skid.
   3. Flow, pH, TSS, and temperature measurement.
   4. All submittals and operating and maintenance manuals.
   5. Field technical services to support startup.

5.3420 – Agitators (Program)

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. One FGD maintenance tank agitator.
   2. All submittals and operating and maintenance manuals.
   3. Field technical services to support startup.

5.5330 – 480V Motor Control Centers

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. 480V motor control centers.

APPENDIX H – Contract List and Descriptions

2. All submittals and operating and maintenance manuals.
3. Field technical services to support startup.

5.6110 – Distributed Control System

A. General Description: Design, fabricate, and deliver to site the following equipment:
   1. DCS I/O cabinets.
   2. DCS programming.
   3. Factory acceptance test.
   4. All submittals and operating and maintenance manuals.
   5. Field technical services to support initial operation, startup, and tuning.

5.6210 – Instruments

A. General Description: Design, fabricate, and deliver to site the following loose instruments which are not supplied under other contracts or the construction contracts:
   1. Pressure transmitters.
   2. Level transmitters.
   3. Flow meters.
   4. pH meters.
   5. Indicators.
   6. All submittals and operating and maintenance manuals.

2 FURNISH AND ERECT CONTRACTS

5.2970 – Field Erected Tank

A. General Description: Design, furnish, and site erection of the following field erected tank:
   1. Furnish and erect the following tanks:
      a. One FGD maintenance tank.
   2. Field applied coatings.

5.4310 – Pre-Engineered Buildings

A. General Description: Design, furnish, and site erection of the following buildings:
   1. FGD maintenance tank pump building.
   2. Rention basin chemical feed equipment building.

3 CONSTRUCTION CONTRACTS

5.8120 – Retention Basin Construction

A. General Description: Construction services to install the retention basin and related facilities:
   1. Clearing, grubbing, and grading of required area on plant site.
   2. Rough and finish grading.
   3. Removal of the ash in the existing portion of the ash basin to be used for the new retention basin.
   4. Over-excavation and removal of material below the ash basin.

APPENDIX H – Contract List and Descriptions

5. Import fill to bring the elevation to correct grade prior to liner installation.
6. Concrete lined primary settling basins.
7. Vacuum truck dump pads.
8. Foundations for the retention basin wastewater influent and effluent packaged treatment systems.
9. Polishing basin including furnish and installation of the basin liner, cover and side slope protection.
10. Retention basin access roads.
11. Underground utilities relocation if required.
12. Underground utilities installation.
13. Surveying.
14. Soil compaction testing using a third part testing service.

5.8140 – Site Finishing

A. General Description: Construction services for finish grading, asphalt, and concrete pavement installation, and any required site work not covered by other contracts including:
   1. Construct the subgrade for the final surfacing.
   2. Complete finish grading and final drainage.
   3. Furnish and place crushed rock, asphalt paving, and concrete surfacing.
   4. Complete all final pavement markings.
   5. Topsoil and seed all disturbed areas not receiving alternate surfacing.
   6. Upon completion of project, remove all erosion control structures once proper grass has been established.

5.8210 – Piling

A. General Description: Construction services to install piles:
   1. Furnish and install piles.
   2. Perform pile load tests or PDA testing. Due to the schedule for the project and the need for information to support design, this scope may result in a separate contract.

5.8220 – Site Preparation and Foundations

A. General Description: Construction services for civil construction, construct foundations, and install underground utilities:
   1. Construct the Erosion and Sedimentation Control Plan (E&SC Plan) features.
   2. Maintain the E&SC Plan features through demobilization.
   3. Install temporary construction facilities.
   4. Perform clearing, grubbing, and rough grading of required areas.
   5. Construct access roads.
   6. Excavation, subgrade preparation, dewatering and backfill for all foundations.
   7. Construct pile caps, mats, foundations, grade beams and anchor bolts as required for all building, tanks, equipment, etc.
   8. Perform soil compaction and concrete testing during construction.
   9. Furnish and install below-grade piping.

APPENDIX H – Contract List and Descriptions

10. Furnish and install electrical manholes, duct banks, and all below grade conduit embedded in or under concrete.
11. Furnish and install below grade electrical grounding grid.
12. Construct the storm drainage system.
13. Construction testing services.

5.8320 – Mechanical/Electrical Construction

A. General Description: This is a furnish and construct contract including, but is not limited to, the following major activities:
   1. Unload, receive, and install all Owner-furnished equipment:
      a. Motor control centers.
      b. DCS hardware.
   2. Unload, receive, and install all balance of plant furnished equipment:
      a. Slurry pumps
      b. Miscellaneous pumps.
      c. FRP piping.
      d. Retention basin chemical feed equipment.
      e. Agitator.
      f. Instruments.
   3. Furnish and install the following:
      a. Large bore and small bore piping systems including pipe supports.
      b. Miscellanous manual valves.
      c. Piping and equipment insulation and lagging.
      d. Fire protection system.
      e. Heat tracing system.
      f. Building HVAC systems.
      g. Electrical raceway systems including cable tray, conduit, and supports.
      h. Electrical cable.
      i. Above-grade grounding cables.
      j. Lighting systems including all yard and roadway lighting.
      k. Miscellaneous instruments not supplied under any other contract.
   4. Perform final calibration of instruments.
   5. Performing touch-up painting for equipment and materials.
   6. Provide mechanical and electrical startup craft labor to support commissioning, startup, and initial operation of the installed systems.
   7. Providing final cleanup of all areas worked around or painted by this Contract.

4 CONSTRUCTION SERVICES CONTRACTS

5.9010 – Subsurface Investigation

A. General Description: Construction services to perform field geotechnical investigation work:
   1. Field drilling of test borings.
   2. Prepare a geotechnial report to document field investigation results and to provide foundation recommendations.

APPENDIX H – Contract List and Descriptions

5.9020 – Surveying

A. General Description: Construction services prepare a survey:
   1. Perform field survey of existing and new construction areas.
   2. Prepare drawings and electronic files of the surveying results for use in detailed design.

5.9030 – Underground Utility Investigation

A. General Description: Construction services to locate underground utilities:
   1. Hydroexcavation services to locate existing underground utilities.
   2. Survey services.
   3. Prepare drawings showing locations of underground utilities.

5.9210 – Civil/Structural Testing

A. General Description: Construction services testing to independently verify construction contractor field testing:
   1. Compaction testing.
   2. Concrete testing.
   3. Bolt torque testing
   4. Field services test reports.

5.9250 – Electrical Testing

A. General Description: Construction electrical testing services:
   1. Adjust relay settings.
   2. Relay testing.
   3. MV electrical system testing.
   4. Testing contractor will provide test equipment and labor to direct testing.
   5. Field services test reports.

* * * * *

Appendix I
Division of Responsibility

APPENDIX I – Division of Responsibilities

1 OVERALL PROJECT DIVISION OF RESPONSIBLITIES

The following table shows the division of responsibility for the various parties involved in the Project where O = Duke Energy, CE = Burns and McDonnell, G = General Work Contractor and V = Miscellaneous Vendors.

Item No.	Work Categories	Specify Design Criteria	General Argmt	Engineering Design & Drawings	Prepare Technical Spec. Bid Eval	Issue Contract	Vendor Drawings	Material Procurement & Fabrication	Erection	Start-Up & Commissio
1.0	**Project Development**									-
1.1	Site Plan		CE	CE						
1.2	Subsurface investigation	CE	CE	CE	CE/O	O	V			
1.3	Surveying	CE	CE	CE	CE/O	O	V			
1.4	Project Definition Report		CE	CE						
3.0	**Retention Basin (RB)**	CE/O	CE	CE	CE/O	O	CE	G	G	G/O
3.1	Process / Mechanical Equipment	CE	CE	CE	CE	CE	V	V	G	CE/O
3.2	Construction	CE/O	CE	CE	CE	O	G	G	G	G/CE/O
4.0	**Water Redirects (WR)**									
5.1	Process Wastewater Treatment Equip	CE	CE	CE	CE	CE	V	V	G	CE/O
5.2	BOP Mechanical Equipment	CE	CE	CE	CE	CE	V	V	G	CE/O
5.2	Electrical	CE/O	CE	CE	CE/O	O	V	G	G	CE
5.3	Control System/DCS	CE/O	CE	CE	CE/O	O	V	G	G	CE/O
5.4	Construction	CE/O	CE	CE	CE	O	G	G	G	G/CE/O

APPENDIX I – Division of Responsibilities

2 STARTUP DIVISION OF RESPONSIBLITIES

The following tables shows the recommend startup and commissioning responsibilities for the various parties involved with the Project:

Responsibility Area	BMcD Engineering	BMcD Construction	Mech /Elec Construction Contractor	BMcD Startup	Duke Energy	Equipment Suppliers	Comments
Procurement							
Onsite Procurement			X		X		Each company supplies their own site procurements
Materials Management							
Receipt			X		C		
Storage / Maintenance			X		C		
Spares / Consumables Inventory control			X		C		
System Cleaning Operations							
Lube Oil Flushes			X	S			
Water System Flushes			X				
Misc Blows / Flushes			X				
Construction Completion							
Const. Completion Punchlist			X	S			
QA/QC Construction Completion Documentation			X	S	C		
Construction Completion Documentation (by SU package)			X	S			
Spares & Consumables							
Supply of SU Consumables						X	
Application of first fill of lubricants etc.			X				
Supply of Plant Spares	S		S		X	S	Equipment Suppliers to provide list to Duke.
Supply of SU Spares			X			X	Equipment Suppliers to provide SU spares with order.
Mechanical							
Pressure / Leak Testing			X	C			
In Service Test			X	C			Need to determine where this may apply
Supply of Mech. SU Techs			L				
Supply of Mech. SU Tools			X				

APPENDIX I – Division of Responsibilities

Responsibility Area	BMcD Engineering	BMcD Construction	Mech /Elec Construction Contractor	BMcD Startup	Duke Energy	Equipment Suppliers	Comments
Instrument & Control							
I&C Device Initial Calibration				C	X	X	Factory Calibration. I&C Techs to perform field calibration if no factory calibration
I&C Device Functionality				X	S		I&C Techs to support
Loop Checkout				X	S		I&C Techs to support
Logic Checkout	S			X	S		I&C Techs to support
Supply of I&C SU Techs			L				
Supply of I&C SU Tools			X				
Calibration of Performance Test Instruments					X		
Electrical SU							
Wire Ringout			X	C			
Transformer Dressing			X				
Electrical Device Calibration & Setting (Med Voltage)			X	S			
Electrical Device Calibration & Setting (Low Voltage)				X			
Supply of Electrical SU Techs			L				
Supply of Electrical SU Tools			X				
Startup / Operational Misc.							
Schedule Administration	S		S	S	X		
System Functional Testing	S		S	X	S		
Logic Functional Testing	S		S	X	S		
Lead on individual system startups	S		S	X	S		
Lead Plant Startup Coordination Role	S			X	S		
Safety Tagging Program Administration			S	S	X		
Punchlist Administration			X	C	X		
Plant Operator Training (Equipment Familiarization)	S					X	

APPENDIX I – Division of Responsibilities

Responsibility Area	BMcD Engineering	BMcD Construction	Mech /Elec Construction Contractor	BMcD Startup	Duke Energy	Equipment Suppliers	Comments
Plant Operator Training (operations)	S					X	
Supply of Operators					X		
Shift Supervision of Operators			C	S	X		
Responsibility for operations direction (up to PA or CO)			C	S	X		
Implementation of PDM/PM Program (Up to Substantial Completion)			X				
Execution of Operations Readings and Routines					X		
Supply of Chemistry control testing facilities					X		
Supply of Chemistry control analytical equipment					X		
Supply of Plant Chemist					X		
Testing / Demonstrations							
Performance Testing	S			S	X		
Procedures							
Project Startup Manual				X			
Project Checkout Forms			S	X		S	Suppliers to provide forms for equipment supplied.
Safety Tagging Procedure				S	X		
Punchlist Procedure					X		
Back Energization Procedure	X						
Chemical Cleaning Procedure	X						
Flushing Procedures			X				
Performance Test Procedure	X			S			
Warranty Administration Procedure				S	X		
Plant Operating Procedures					X		
Operations Routines and Readings Procedure				S	X		

APPENDIX I – Division of Responsibilities

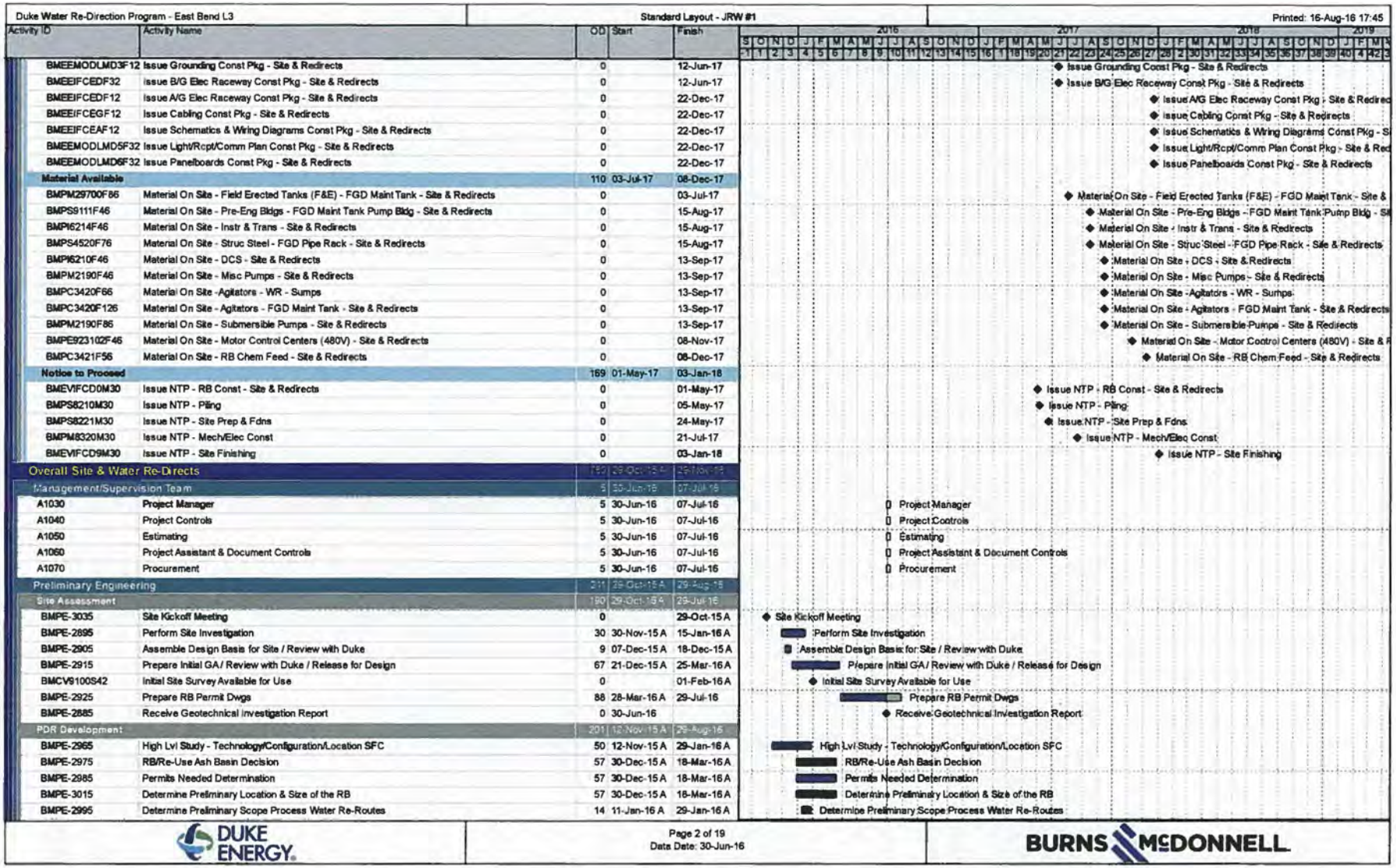
Responsibility Area	BMcD Engineering	BMcD Construction	Mech /Elec Construction Contractor	BMcD Startup	Duke Energy	Equipment Suppliers	Comments
PDM/PM Procedures (preventive/predictive maintenance)						X	
Plant Chemistry Control Plan (testing & dosing plans, etc.)				S	X		If Required
System Descriptions	X			S			
Turnover							
Conformed to Construction Records	X		X	S			
Construction QC Records (welding, etc.)			X				
SU Turnover Packages			X	S		S	
Supplier Manuals	S		X	S		X	
Closeout							
Closeout of Project assets	S				X		
Warranty Administration	S		S		X		

X = Total Responsibility
C = Coordination/Supervision Responsibility
S = Provision of Support
L = Provision of Labor

Appendix J
Schedule

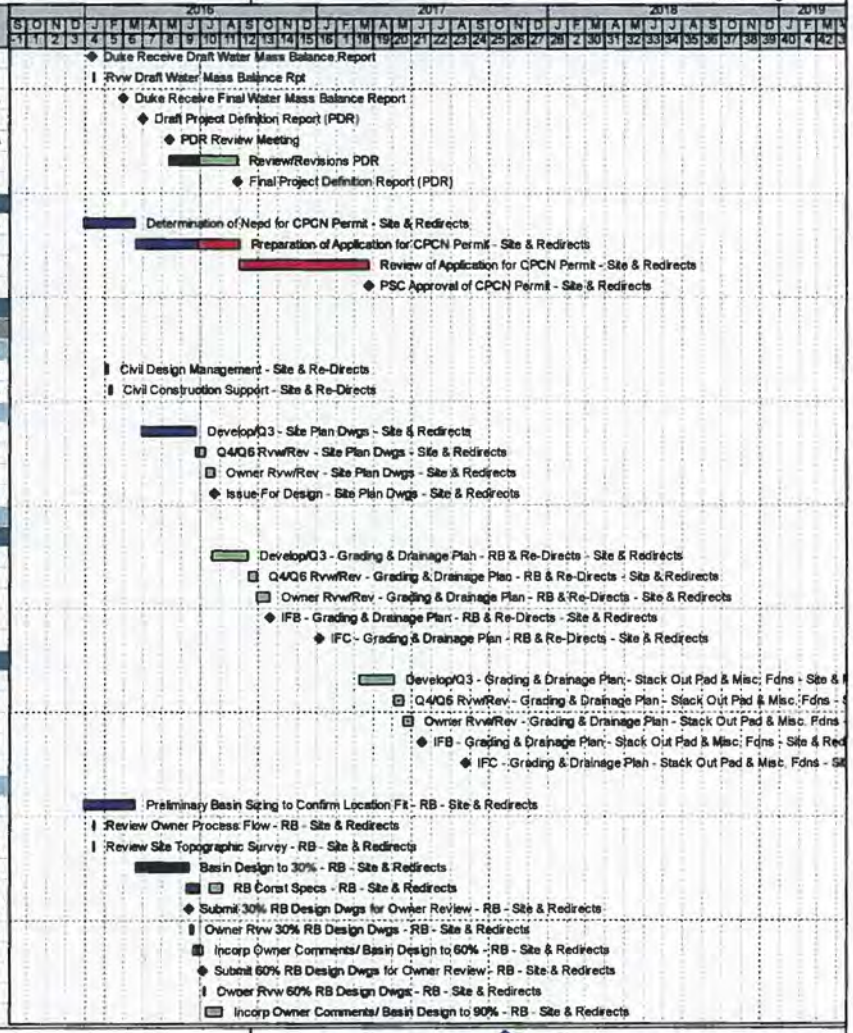
Duke Water Re-Direction Program - East Bend L3 | Standard Layout - JRW #1 | Printed: 16-Aug-16 17:45

Activity ID	Activity Name	OD	Start	Finish
Duke Water Re-Direction Program - East Bend L3		845	09-Oct-15 A	13-Feb-19
Milestones		845	09-Oct-15 A	13-Feb-19
Project Milestones		845	09-Oct-15 A	13-Feb-19
Contractual Milestones		845	09-Oct-15 A	13-Feb-19
BMMM0000M01	Notice To Proceed	0		09-Oct-15 A
BMMM0000M10	Program Kickoff Meeting Charlotte	0		14-Oct-15 A
BMMM0000M110	CPCN Application Submitted for Ash Pond Closure by Removal/ Repurpose & WR	0		01-Sep-16
BMMM0000M150	Owner Issues PO to BMcD for Material/Equip Procurement	0		02-Sep-16*
BMMM0000M120	CPCN Application Approved for Ash Pond Closure by Removal/ Repurpose & WR	0		24-Mar-17
BMMM0000M170	East Bend U2 Outage - Turbine - HP/IP/LP Turbine, Burners, Precip Refurbishment	72	10-Mar-18*	20-May-18
BMMM0000M70	Target In Service Date WR	0		11-Apr-18
BMMM0000M60	Target In Service Date FGD Maint Tank	0		16-Apr-18
BMMM0000M20	Required In Service Date FGD Maint Tank - August 2018	0		14-Aug-18*
BMMM0000M90	Target In Service Date RB	0		29-Nov-18
BMMM0000M80	Required In Service Date WR - November 2018	0		30-Nov-18*
BMMM0000M100	Required In Service Date RB - November 2018	0		30-Nov-18*
BMMM0000M50	Project Complete	0		13-Feb-19*
Firewall Milestones		349	12-Aug-16	03-Jan-18
Overall Site & Water Re-Directs		349	12-Aug-16	03-Jan-18
Issue Documents for Bid		212	12-Aug-16	15-Jun-17
BMPC3420F76	IFB - RB Chem Feed - Site & Redirects	0		12-Aug-16
BMPM2190F18	IFB - Misc Pumps - Site & Redirects	0		22-Aug-16
BMPM2970F18	IFB - Field Erected Tanks (F&E) - Site & Redirects	0		12-Sep-16
BMPC3420F20	IFB - Agitators - Site & Redirects	0		16-Sep-16
BMPS4310F18	IFB - Pre-Eng Bldgs - Site & Redirects	0		19-Sep-16
BMPI6210F18	IFB - pH & Conductivity - Site & Redirects	0		10-Oct-16
BMPI6210F66	IFB - TSS Analyzers - Site & Redirects	0		10-Oct-16
BMPS4520F18	IFB - Struc Steel - Site & Redirects	0		16-Nov-16
BMPI6110F18	IFB - DCS - Site & Redirects	0		02-Dec-16
BMPS8210F18	IFB - Piling - Site & Redirects	0		09-Dec-16
BMPS8250F18	IFB - Fdns - Site & Redirects	0		25-Jan-17
BMPM8320F18	IFB - Mech/ElecConst - Site & Redirects	0		15-Mar-17
BMPE5130F18	IFB - Motor Control Centers (480V) - Site & Redirects	0		24-Mar-17
BMEVIFCDF18	IFB - Site Finishes - Site & Redirects	0		15-Jun-17
Issue For Construction		247	04-Jan-17	22-Dec-17
BMEEIFCETF12	Issue RB Const Pkg - Site & Redirects	0		04-Jan-17
BMESIFCDPF12	Issue Piling Design Const Pkg - Site & Redirects	0		24-Mar-17
BMESIFCDFF12	Issue Fdn Design Const Pkg - Site & Redirects	0		05-Apr-17
BMEMIFCPBF12	Issue BG Plans/Iso's Const Pkg - Site & Redirects	0		05-Apr-17
BMESIFCDSF12	Issue Struc Steel Design Const Pkg - Site & Redirects	0		08-Jun-17
BMEMIFCGAF12	Issue Overall GA & AG Plans Const Pkg - Site & Redirects	0		08-Jun-17
BMEMQUAPSF12	Issue AG LB Pipe Supports Const Pkg - Site & Redirects	0		08-Jun-17
BMEMIFCPAF12	Issue AG Plans/Iso's Const Pkg - Site & Redirects	0		08-Jun-17
BMEMQUAPBF12	Issue HVAC Const Pkg - Site & Redirects	0		08-Jun-17
BMEIFLODF12	Issue Instr List Const Pkg - Site & Redirect	0		08-Jun-17
BMEIIFCD9F12	Issue Inst Plan Dwgs & Details Const Pkg - Site & Redirects	0		08-Jun-17


Duke Water Re-Direction Program - East Bend L3
Standard Layout - JRW #1
Printed: 16-Aug-16 17:45
Activity ID
Activity Name
OD
Start
Finish
2016
2017
2018
2019
BMEEMODLMD3F12 Issue Grounding Const Pkg - Site & Redirects 0 12-Jun-17
BMEEIFCEDF32 Issue B/G Elec Raceway Const Pkg - Site & Redirects 0 12-Jun-17
BMEEIFCEDF12 Issue A/G Elec Raceway Const Pkg - Site & Redirects 0 22-Dec-17
BMEEIFCEGF12 Issue Cabling Const Pkg - Site & Redirects 0 22-Dec-17
BMEEIFCEAF12 Issue Schematics & Wiring Diagrams Const Pkg - Site & Redirects 0 22-Dec-17
BMEEMODLMD5F32 Issue Light/Rcpt/Comm Plan Const Pkg - Site & Redirects 0 22-Dec-17
BMEEMODLMD6F32 Issue Panelboards Const Pkg - Site & Redirects 0 22-Dec-17
Material Available 110 03-Jul-17 08-Dec-17
BMPM29700F86 Material On Site - Field Erected Tanks (F&E) - FGD Maint Tank - Site & Redirects 0 03-Jul-17
BMPS9111F46 Material On Site - Pre-Eng Bldgs - FGD Maint Tank Pump Bldg - Site & Redirects 0 15-Aug-17
BMPI6214F46 Material On Site - Instr & Trans - Site & Redirects 0 15-Aug-17
BMPS4520F76 Material On Site - Struc Steel - FGD Pipe Rack - Site & Redirects 0 15-Aug-17
BMPI6210F46 Material On Site - DCS - Site & Redirects 0 13-Sep-17
BMPM2190F46 Material On Site - Misc Pumps - Site & Redirects 0 13-Sep-17
BMPC3420F66 Material On Site - Agitators - WR - Sumps 0 13-Sep-17
BMPC3420F126 Material On Site - Agitators - FGD Maint Tank - Site & Redirects 0 13-Sep-17
BMPM2190F86 Material On Site - Submersible Pumps - Site & Redirects 0 13-Sep-17
BMPE923102F46 Material On Site - Motor Control Centers (480V) - Site & Redirects 0 08-Nov-17
BMPC3421F56 Material On Site - RB Chem Feed - Site & Redirects 0 08-Dec-17
Notice to Proceed 169 01-May-17 03-Jan-18
BMEVIFCD0M30 Issue NTP - RB Const - Site & Redirects 0 01-May-17
BMPS8210M30 Issue NTP - Piling 0 05-May-17
BMPS8221M30 Issue NTP - Site Prep & Fdns 0 24-May-17
BMPM8320M30 Issue NTP - Mech/Elec Const 0 21-Jul-17
BMEVIFCD9M30 Issue NTP - Site Finishing 0 03-Jan-18
Overall Site & Water Re-Directs 750 29-Oct-15 A 29-Nov-18
Management/Supervision Team 5 30-Jun-16 07-Jul-16
A1030 Project Manager 5 30-Jun-16 07-Jul-16
A1040 Project Controls 5 30-Jun-16 07-Jul-16
A1050 Estimating 5 30-Jun-16 07-Jul-16
A1060 Project Assistant & Document Controls 5 30-Jun-16 07-Jul-16
A1070 Procurement 5 30-Jun-16 07-Jul-16
Preliminary Engineering 211 29-Oct-15 A 29-Aug-16
Site Assessment 180 29-Oct-15 A 29-Jul-16
BMPE-3035 Site Kickoff Meeting 0 29-Oct-15 A
BMPE-2695 Perform Site Investigation 30 30-Nov-15 A 15-Jan-16 A
BMPE-2905 Assemble Design Basis for Site / Review with Duke 9 07-Dec-15 A 18-Dec-15 A
BMPE-2915 Prepare Initial GA/ Review with Duke / Release for Design 67 21-Dec-15 A 25-Mar-16 A
BMCV9100S42 Initial Site Survey Available for Use 0 01-Feb-16 A
BMPE-2925 Prepare RB Permit Dwgs 88 28-Mar-16 A 29-Jul-16
BMPE-2685 Receive Geotechnical Investigation Report 0 30-Jun-16
PDR Development 201 12-Nov-15 A 29-Aug-16
BMPE-2965 High Lvl Study - Technology/Configuration/Location SFC 50 12-Nov-15 A 29-Jan-16 A
BMPE-2975 RB/Re-Use Ash Basin Decision 57 30-Dec-15 A 18-Mar-16 A
BMPE-2985 Permits Needed Determination 57 30-Dec-15 A 18-Mar-16 A
BMPE-3015 Determine Preliminary Location & Size of the RB 57 30-Dec-15 A 18-Mar-16 A
BMPE-2995 Determine Preliminary Scope Process Water Re-Routes 14 11-Jan-16 A 29-Jan-16 A
Issue Grounding Const Pkg - Site & Redirects
Issue B/G Elec Raceway Const Pkg - Site & Redirects
Issue A/G Elec Raceway Const Pkg - Site & Redirec
Issue Cabling Const Pkg - Site & Redirects
Issue Schematics & Wiring Diagrams Const Pkg - Si
Issue Light/Rcpt/Comm Plan Const Pkg - Site & Red
Issue Panelboards Const Pkg - Site & Redirects
Material On Site - Field Erected Tanks (F&E) - FGD Maint Tank - Site &
Material On Site - Pre-Eng Bldgs - FGD Maint Tank Pump Bldg - Si
Material On Site - Instr & Trans - Site & Redirects
Material On Site - Struc Steel - FGD Pipe Rack - Site & Redirects
Material On Site - DCS - Site & Redirects
Material On Site - Misc Pumps - Site & Redirects
Material On Site - Agitators - WR - Sumps
Material On Site - Agitators - FGD Maint Tank - Site & Redirects
Material On Site - Submersible Pumps - Site & Redirects
Material On Site - Motor Control Centers (480V) - Site & R
Material On Site - RB Chem Feed - Site & Redirects
Issue NTP - RB Const - Site & Redirects
Issue NTP - Piling
Issue NTP - Site Prep & Fdns
Issue NTP - Mech/Elec Const
Issue NTP - Site Finishing
Project Manager
Project Controls
Estimating
Project Assistant & Document Controls
Procurement
Site Kickoff Meeting
Perform Site Investigation
Assemble Design Basis for Site / Review with Duke
Prepare Initial GA/ Review with Duke / Release for Design
Initial Site Survey Available for Use
Prepare RB Permit Dwgs
Receive Geotechnical Investigation Report
High Lvl Study - Technology/Configuration/Location SFC
RB/Re-Use Ash Basin Decision
Permits Needed Determination
Determine Preliminary Location & Size of the RB
Determine Preliminary Scope Process Water Re-Routes
DUKE ENERGY.
Page 2 of 19
Data Date: 30-Jun-16
BURNS McDONNELL

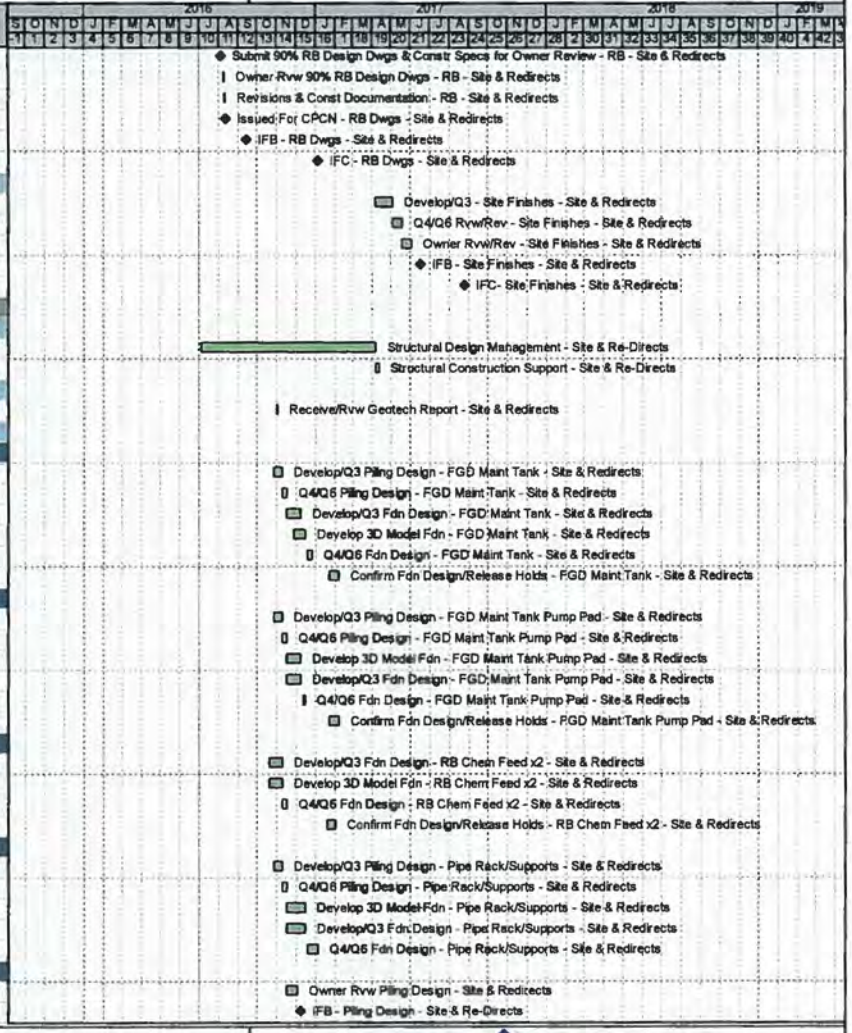
Duke Water Re-Direction Program - East Bend L3 | Standard Layout - JRW #1 | Printed: 16-Aug-16 17:45

Activity ID	Activity Name	OD	Start	Finish
BMPE-2945	Duke Receive Draft Water Mass Balance Report	0		13-Jan-16 A
BMPE-2935	Rvw Draft Water Mass Balance Rpt	1	14-Jan-16 A	15-Jan-16 A
BMPE-2955	Duke Receive Final Water Mass Balance Report	0		29-Feb-16 A
MSEN-5680	Draft Project Definition Report (PDR)	0		01-Apr-16 A
BMPE-3135	PDR Review Meeting	0		12-May-16 A
BMPE-3025	Review/Revisions PDR	75	13-May-16 A	29-Aug-16
MSEN-5690	Final Project Definition Report (PDR)	0		29-Aug-16
Permitting		314	30-Dec-15 A	24-Mar-17
BMPE-3125	Determination of Need for CPCN Permit - Site & Redirects	57	30-Dec-15 A	18-Mar-16 A
BMPE-3055	Preparation of Application for CPCN Permit - Site & Redirects	117	21-Mar-16 A	01-Sep-16
BMPE-3065	Review of Application for CPCN Permit - Site & Redirects	140	02-Sep-16	24-Mar-17
BMPE-3075	PSC Approval of CPCN Permit - Site & Redirects	0		24-Mar-17
Engineering		576	30-Dec-15 A	06-Apr-18
Civil Engineering		422	30-Dec-15 A	25-Aug-17
Civil Management & Construction Support		10	01-Feb-16 A	12-Feb-16 A
A1080	Civil Design Management - Site & Re-Directs	5	01-Feb-16 A	05-Feb-16 A
A1090	Civil Construction Support - Site & Re-Directs	5	08-Feb-16 A	12-Feb-16 A
Site Plan		80	31-Mar-16 A	22-Jul-16
BMEVDEVS91	Develop/Q3 - Site Plan Dwgs - Site & Redirects	60	31-Mar-16 A	23-Jun-16 A
BMEVQUAS209	Q4/Q6 Rvw/Rev - Site Plan Dwgs - Site & Redirects	10	24-Jun-16 A	08-Jul-16
BMEVOWNS209	Owner Rvw/Rev - Site Plan Dwgs - Site & Redirects	10	11-Jul-16	22-Jul-16
BMEVDEVS101	Issue For Design - Site Plan Dwgs - Site & Redirects	0		22-Jul-16
Grading & Drainage		280	20-Jul-16	25-Aug-17
Retention Basin & Re-Directs		115	20-Jul-16	04-Jan-17
BMEVDEVG10	Develop/Q3 - Grading & Drainage Plan - RB & Re-Directs - Site & Redirects	40	20-Jul-16	14-Sep-16
BMEVQUAG309	Q4/Q6 Rvw/Rev - Grading & Drainage Plan - RB & Re-Directs - Site & Redirects	10	15-Sep-16	28-Sep-16
BMEVOWNG329	Owner Rvw/Rev - Grading & Drainage Plan - RB & Re-Directs - Site & Redirects	15	29-Sep-16	19-Oct-16
BMEVOWNG339	IFB - Grading & Drainage Plan - RB & Re-Directs - Site & Redirects	0		19-Oct-16
BMEVOWNG369	IFC - Grading & Drainage Plan - RB & Re-Directs - Site & Redirects	0		04-Jan-17
Stack Out Pad & Miscellaneous Foundations		120	06-Mar-17	25-Aug-17
BMEVDEVG20	Develop/Q3 - Grading & Drainage Plan - Stack Out Pad & Misc. Fdns - Site & Redirects	40	09-Mar-17	03-May-17
BMEVQUAG319	Q4/Q6 Rvw/Rev - Grading & Drainage Plan - Stack Out Pad & Misc. Fdns - Site & Redirects	10	04-May-17	17-May-17
BMEVOWNG349	Owner Rvw/Rev - Grading & Drainage Plan - Stack Out Pad & Misc. Fdns - Site & Redirects	10	18-May-17	01-Jun-17
BMEVOWNG359	IFB - Grading & Drainage Plan - Stack Out Pad & Misc. Fdns - Site & Redirects	0		15-Jun-17
BMEVOWNG379	IFC - Grading & Drainage Plan - Stack Out Pad & Misc. Fdns - Site & Redirects	0		25-Aug-17
Retention Basin		257	30-Dec-15 A	04-Jan-17
BMEVSIZR369	Preliminary Basin Sizing to Confirm Location Fit - RB - Site & Redirects	57	30-Dec-15 A	18-Mar-16 A
BMEVOWNR349	Review Owner Process Flow - RB - Site & Redirects	1	14-Jan-16 A	15-Jan-16 A
BMEVREVR379	Review Site Topographic Survey - RB - Site & Redirects	1	14-Jan-16 A	15-Jan-16 A
BMEVDESR389	Basin Design to 30% - RB - Site & Redirects	60	21-Mar-16 A	13-Jun-16 A
BMEVSPCR409	RB Const Specs - RB - Site & Redirects	30	10-Jun-16 A	05-Aug-16
BMEVDESR409	Submit 30% RB Design Dwgs for Owner Review - RB - Site & Redirects	0		13-Jun-16 A
BMEVDESR429	Owner Rvw 30% RB Design Dwgs - RB - Site & Redirects	5	14-Jun-16 A	20-Jun-16 A
BMEVDESR399	Incorp Owner Comments/ Basin Design to 60% - RB - Site & Redirects	10	21-Jun-16 A	05-Jul-16
BMEVDESR419	Submit 60% RB Design Dwgs for Owner Review - RB - Site & Redirects	0		05-Jul-16
BMEVDESR439	Owner Rvw 60% RB Design Dwgs - RB - Site & Redirects	3	06-Jul-16	08-Jul-16
BMEVDESR449	Incorp Owner Comments/ Basin Design to 90% - RB - Site & Redirects	20	11-Jul-16	05-Aug-16



Duke Water Re-Direction Program - East Bend L3 | Standard Layout - JRW #1 | Printed: 16-Aug-16 17:45

Activity ID	Activity Name	OD	Start	Finish
BMEVDESR459	Submit 90% RB Design Dwgs & Constr Specs for Owner Review - RB - Site & Redirects	0		05-Aug-16
BMEVDESR469	Owner Rvw 90% RB Design Dwgs - RB - Site & Redirects	3	08-Aug-16	10-Aug-16
BMEVRSNR429	Revisions & Const Documentation - RB - Site & Redirects	2	11-Aug-16	12-Aug-16
BMEVOWNC110	Issued For CPCN - RB Dwgs - Site & Redirects	0		12-Aug-16
BMEVOWNC120	IFB - RB Dwgs - Site & Redirects	0		14-Sep-16
BMEVOWNC130	IFC - RB Dwgs - Site & Redirects	0		04-Jan-17
Site Finishing		100	06-Apr-17	25-Aug-17
BMEVDEVF20	Develop/Q3 - Site Finishes - Site & Redirects	20	06-Apr-17	03-May-17
BMEVQUAF419	Q4/Q6 Rvw/Rev - Site Finishes - Site & Redirects	10	04-May-17	17-May-17
BMEVOWNF429	Owner Rvw/Rev - Site Finishes - Site & Redirects	10	18-May-17	01-Jun-17
BMEVIFCD9M24	IFB - Site Finishes - Site & Redirects	0		15-Jun-17
BMEVIFCD9M40	IFC- Site Finishes - Site & Redirects	0		25-Aug-17
Structural Engineering		196	05-Jul-16	12-Apr-17
Structural Management & Construction Support		196	05-Jul-16	12-Apr-17
A1100	Structural Design Management - Site & Re-Directs	191	05-Jul-16	05-Apr-17
A1110	Structural Construction Support - Site & Re-Directs	5	06-Apr-17	12-Apr-17
Geotechnical		3	31-Oct-16	02-Nov-16
BMESGPS1DF372	Receive/Rvw Geotech Report - Site & Redirects	3	31-Oct-16	02-Nov-16
Piling & Foundation Design		115	20-Oct-16	05-Apr-17
FGD Maintenance Tank		88	27-Oct-16	06-Feb-17
BMESGPS1DF232	Develop/Q3 Piling Design - FGD Maint Tank - Site & Redirects	10	27-Oct-16	09-Nov-16
BMESGPS1DF252	Q4/Q6 Piling Design - FGD Maint Tank - Site & Redirects	5	10-Nov-16	16-Nov-16
BMESGPS1DF332	Develop/Q3 Fdn Design - FGD Maint Tank - Site & Redirects	15	17-Nov-16	09-Dec-16
BMESGPS1DF242	Develop 3D Model Fdn - FGD Maint Tank - Site & Redirects	15	28-Nov-16	16-Dec-16
BMESGPS1DF342	Q4/Q6 Fdn Design - FGD Maint Tank - Site & Redirects	5	19-Dec-16	27-Dec-16
BMESGPS1DF402	Confirm Fdn Design/Release Holds - FGD Maint Tank - Site & Redirects	10	24-Jan-17	06-Feb-17
FGD Maint Tank Pump Pad		88	27-Oct-16	06-Feb-17
BMESGPS1DF262	Develop/Q3 Piling Design - FGD Maint Tank Pump Pad - Site & Redirects	10	27-Oct-16	09-Nov-16
BMESGPS1DF282	Q4/Q6 Piling Design - FGD Maint Tank Pump Pad - Site & Redirects	5	10-Nov-16	16-Nov-16
BMESGPS1DF272	Develop 3D Model Fdn - FGD Maint Tank Pump Pad - Site & Redirects	15	17-Nov-16	09-Dec-16
BMESGPS1DF352	Develop/Q3 Fdn Design - FGD Maint Tank Pump Pad - Site & Redirects	15	17-Nov-16	09-Dec-16
BMESGPS1DF362	Q4/Q6 Fdn Design - FGD Maint Tank Pump Pad - Site & Redirects	5	12-Dec-16	16-Dec-16
BMESGPS1DF412	Confirm Fdn Design/Release Holds - FGD Maint Tank Pump Pad - Site & Redirects	10	24-Jan-17	06-Feb-17
Retention Basin Chemical Feed		70	20-Oct-16	01-Feb-17
BMESACA1DF142	Develop/Q3 Fdn Design - RB Chem Feed x2 - Site & Redirects	15	20-Oct-16	09-Nov-16
BMESACA1DF152	Develop 3D Model Fdn - RB Chem Feed x2 - Site & Redirects	15	20-Oct-16	09-Nov-16
BMESACA1DF162	Q4/Q6 Fdn Design - RB Chem Feed x2 - Site & Redirects	5	10-Nov-16	16-Nov-16
BMESACA1DF172	Confirm Fdn Design/Release Holds - RB Chem Feed x2 - Site & Redirects	10	19-Jan-17	01-Feb-17
Pipe Rack/Supports		45	27-Oct-16	04-Jan-17
BMESGPS1DF292	Develop/Q3 Piling Design - Pipe Rack/Supports - Site & Redirects	10	27-Oct-16	09-Nov-16
BMESGPS1DF312	Q4/Q6 Piling Design - Pipe Rack/Supports - Site & Redirects	5	10-Nov-16	16-Nov-16
BMESGPS1DF302	Develop 3D Model Fdn - Pipe Rack/Supports - Site & Redirects	20	17-Nov-16	16-Dec-16
BMESGPS1DF382	Develop/Q3 Fdn Design - Pipe Rack/Supports - Site & Redirects	20	17-Nov-16	16-Dec-16
BMESGPS1DF392	Q4/Q6 Fdn Design - Pipe Rack/Supports - Site & Redirects	10	19-Dec-16	04-Jan-17
Design Finalization/Issue		95	17-Nov-16	05-Apr-17
BMESOWNPP19	Owner Rvw Piling Design - Site & Redirects	10	17-Nov-16	02-Dec-16
BMESIFCDPM1C1	IFB - Piling Design - Site & Re-Directs	0		09-Dec-16



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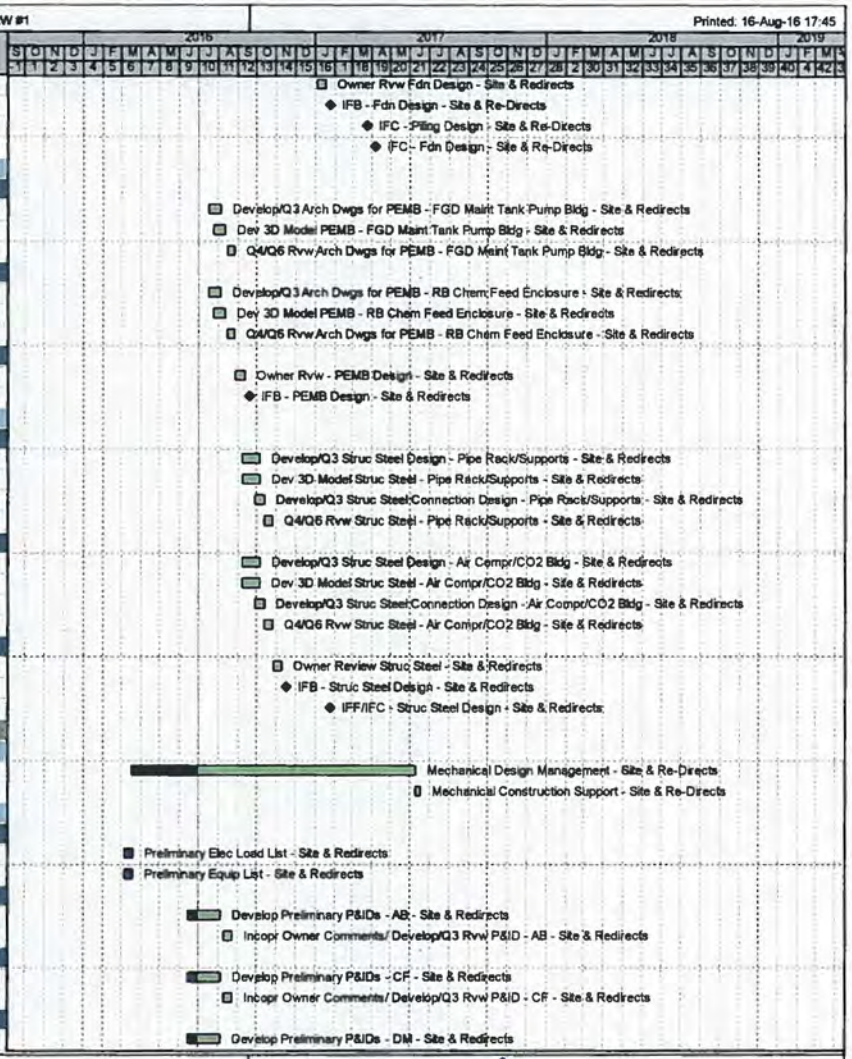
Activity ID	Activity Name	OD	Start	Finish
BMESOWNFF19	Owner Rvw Fdn Design - Site & Redirects	10	05-Jan-17	18-Jan-17
BMESIFCDMC123	IFB - Fdn Design - Site & Re-Directs	0		25-Jan-17
BMESIFCDPM1C1	IFC - Piling Design - Site & Re-Directs	0		24-Mar-17
BMESIFCDMC133	IFC - Fdn Design - Site & Re-Directs	0		05-Apr-17
Pre-Engineered Buildings		45	18-Jul-16	19-Sep-16
FGD Maintenance Tank Pump Bldg		30	18-Jul-16	26-Aug-16
BMESGPS1DS122	Develop/Q3 Arch Dwgs for PEMB - FGD Maint Tank Pump Bldg - Site & Redirects	15	18-Jul-16	05-Aug-16
BMESGPS1DS132	Dev 3D Model PEMB - FGD Maint Tank Pump Bldg - Site & Redirects	15	25-Jul-16	12-Aug-16
BMESGPS1MS52	Q4/Q6 Rvw Arch Dwgs for PEMB - FGD Maint Tank Pump Bldg - Site & Redirects	10	15-Aug-16	26-Aug-16
Retention Basin Chem Feed Bldgs		30	18-Jul-16	26-Aug-16
BMESGPS1DS142	Develop/Q3 Arch Dwgs for PEMB - RB Chem Feed Enclosure - Site & Redirects	15	18-Jul-16	05-Aug-16
BMESGPS1DS152	Dev 3D Model PEMB - RB Chem Feed Enclosure - Site & Redirects	15	25-Jul-16	12-Aug-16
BMESGPS1MS62	Q4/Q6 Rvw Arch Dwgs for PEMB - RB Chem Feed Enclosure - Site & Redirects	10	15-Aug-16	26-Aug-16
Design Finalization/Issue		15	29-Aug-16	19-Sep-16
BMESGPS1MS72	Owner Rvw - PEMB Design - Site & Redirects	10	29-Aug-16	12-Sep-16
BMESGPS1MS82	IFB - PEMB Design - Site & Redirects	0		19-Sep-16
Structural Steel		94	09-Sep-16	25-Jan-17
Pipe Rack/Supports		24	09-Sep-16	26-Oct-16
BMESGPS1DS32	Develop/Q3 Struc Steel Design - Pipe Rack/Supports - Site & Redirects	20	09-Sep-16	06-Oct-16
BMESGPS1DS52	Dev 3D Model Struc Steel - Pipe Rack/Supports - Site & Redirects	20	09-Sep-16	06-Oct-16
BMESGPS1DS42	Develop/Q3 Struc Steel Connection Design - Pipe Rack/Supports - Site & Redirects	10	29-Sep-16	12-Oct-16
BMESGPS1MS22	Q4/Q6 Rvw Struc Steel - Pipe Rack/Supports - Site & Redirects	10	13-Oct-16	26-Oct-16
Air Compressor/CO2 Bldg Steel		24	09-Sep-16	26-Oct-16
BMESGPS1DS212	Develop/Q3 Struc Steel Design - Air Compr/CO2 Bldg - Site & Redirects	20	09-Sep-16	06-Oct-16
BMESGPS1DS222	Dev 3D Model Struc Steel - Air Compr/CO2 Bldg - Site & Redirects	20	09-Sep-16	06-Oct-16
BMESGPS1DS232	Develop/Q3 Struc Steel Connection Design - Air Compr/CO2 Bldg - Site & Redirects	10	29-Sep-16	12-Oct-16
BMESGPS1MS132	Q4/Q6 Rvw Struc Steel - Air Compr/CO2 Bldg - Site & Redirects	10	13-Oct-16	26-Oct-16
Design Finalization/Issue		60	27-Oct-16	25-Jan-17
BMESOWNSMS22	Owner Review Struc Steel - Site & Redirects	10	27-Oct-16	09-Nov-16
BMESIFCDSQC135	IFB - Struc Steel Design - Site & Redirects	0		16-Nov-16
BMESIFCDSQC125	IFF/IFC - Struc Steel Design - Site & Redirects	0		25-Jan-17
Mechanical Engineering		325	07-Mar-16 A	15-Jun-17
Mechanical Management & Construction Support		317	17-Mar-16 A	15-Jun-17
A1120	Mechanical Design Management - Site & Re-Directs	238	17-Mar-16 A	08-Jun-17
A1130	Mechanical Construction Support - Site & Re-Directs	5	09-Jun-17	15-Jun-17
P&ID Design		150	07-Mar-16 A	06-Oct-16
Preliminary Design		10	07-Mar-16 A	18-Mar-16 A
BMEMACAD643	Preliminary Elec Load List - Site & Redirects	10	07-Mar-16 A	18-Mar-16 A
BMEMACAD644	Preliminary Equip List - Site & Redirects	10	07-Mar-16 A	18-Mar-16 A
AB - Absorber Slurry		50	14-Jun-16 A	23-Aug-16
BMEMCWBD532	Develop Preliminary P&IDs - AB - Site & Redirects	40	14-Jun-16 A	05-Aug-16
BMEMCWBD472	Incopr Owner Comments/ Develop/Q3 Rvw P&ID - AB - Site & Redirects	10	10-Aug-16	23-Aug-16
CF - Chemical Feed		50	14-Jun-16 A	23-Aug-16
BMEMCWBD542	Develop Preliminary P&IDs - CF - Site & Redirects	40	14-Jun-16 A	05-Aug-16
BMEMDGND474	Incopr Owner Comments/ Develop/Q3 Rvw P&ID - CF - Site & Redirects	10	10-Aug-16	23-Aug-16
DM - Drains, Misc		50	14-Jun-16 A	23-Aug-16
BMEMCWBD552	Develop Preliminary P&IDs - DM - Site & Redirects	40	14-Jun-16 A	05-Aug-16



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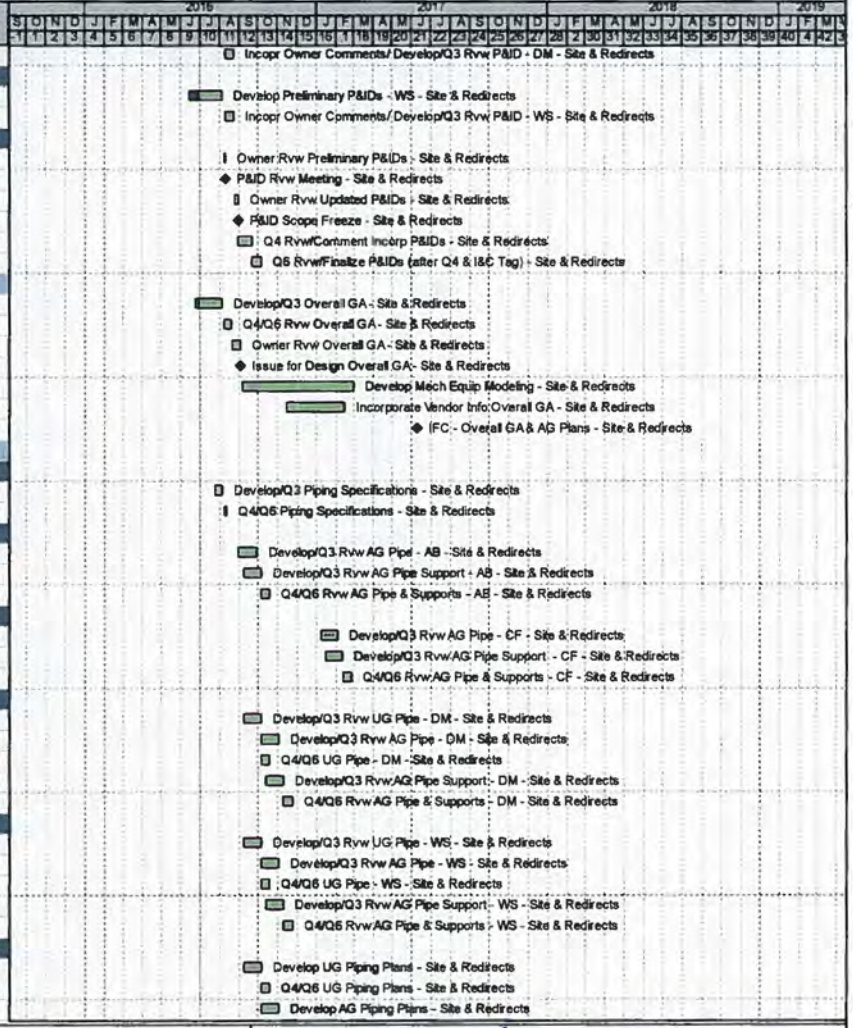
Activity ID	Activity Name	OD	Start	Finish
BMEMDLLD472	Incopr Owner Comments/ Develop/Q3 Rvw P&ID - DM - Site & Redirects	10	10-Aug-16	23-Aug-16
WS - Service Water		50	14-Jun-16 A	23-Aug-16
BMEMCWBD562	Develop Preliminary P&IDs - WS - Site & Redirects	40	14-Jun-16 A	05-Aug-16
BMEMWWED582	Incopr Owner Comments/ Develop/Q3 Rvw P&ID - WS - Site & Redirects	10	10-Aug-16	23-Aug-15
Finalize P&ID Development		42	08-Aug-16	05-Oct-16
BMEMWWED732	Owner Rvw Preliminary P&IDs - Site & Redirects	2	08-Aug-16	09-Aug-16
BMEMWWED742	P&ID Rvw Meeting - Site & Redirects	0		09-Aug-16
BMEMWWED752	Owner Rvw Updated P&IDs - Site & Redirects	5	24-Aug-16	30-Aug-16
BMEMWWED682	P&ID Scope Freeze - Site & Redirects	0		30-Aug-16
BMEMCWBD502	Q4 Rvw/Comment Incorp P&IDs - Site & Redirects	15	31-Aug-16	21-Sep-16
BMEMWWED672	Q5 Rvw/Finalize P&IDs (after Q4 & I&C Tag) - Site & Redirects	10	22-Sep-16	05-Oct-16
General Arrangement & Model		242	24-Jun-16 A	08-Jun-17
BMEMDEVGA32	Develop/Q3 Overall GA - Site & Redirects	30	24-Jun-16 A	05-Aug-16
BMEMQUALGA42	Q4/Q6 Rvw Overall GA - Site & Redirects	10	08-Aug-16	19-Aug-16
BMEMOWNGA52	Owner Rvw Overall GA - Site & Redirects	10	22-Aug-16	02-Sep-16
BMEMDEVGA82	Issue for Design Overall GA - Site & Redirects	0		02-Sep-16
BMEMDEVMEM2	Develop Mech Equip Modeling - Site & Redirects	122	06-Sep-16	01-Mar-17
BMEMINCPGA62	Incorporate Vendor Info Overall GA - Site & Redirects	60	15-Nov-16	13-Feb-17
BMEMIFCGANC110	IFC - Overall GA & AG Plans - Site & Redirects	0		08-Jun-17
Pipe Routing		222	25-Jul-16	08-Jun-17
Piping Specifications		15	25-Jul-16	12-Aug-16
BMEMAHWPA183	Develop/Q3 Piping Specifications - Site & Redirects	10	25-Jul-16	05-Aug-16
BMEMAHWPA194	Q4/Q6 Piping Specifications - Site & Redirects	5	08-Aug-16	12-Aug-16
AB - Absorber Slurry		25	31-Aug-16	19-Oct-16
BMEMCWBPA102	Develop/Q3 Rvw AG Pipe - AB - Site & Redirects	20	31-Aug-16	28-Sep-16
BMEMCWBPA162	Develop/Q3 Rvw AG Pipe Support - AB - Site & Redirects	20	08-Sep-16	05-Oct-16
BMEMCWBPA142	Q4/Q6 Rvw AG Pipe & Supports - AB - Site & Redirects	10	06-Oct-16	19-Oct-16
CF - Chemical Feed		35	09-Jan-17	24-Feb-17
BMEMDGNPA103	Develop/Q3 Rvw AG Pipe - CF - Site & Redirects	20	09-Jan-17	03-Feb-17
BMEMDGNPA163	Develop/Q3 Rvw AG Pipe Support - CF - Site & Redirects	20	16-Jan-17	10-Feb-17
BMEMDGNPA143	Q4/Q6 Rvw AG Pipe & Supports - CF - Site & Redirects	10	13-Feb-17	24-Feb-17
DM - Drains; Misc		55	08-Sep-16	23-Nov-16
BMEMDLLPB22	Develop/Q3 Rvw UG Pipe - DM - Site & Redirects	20	08-Sep-16	05-Oct-16
BMEMDLLPA102	Develop/Q3 Rvw AG Pipe - DM - Site & Redirects	20	06-Oct-16	02-Nov-16
BMEMDLLPB32	Q4/Q6 UG Pipe - DM - Site & Redirects	10	06-Oct-16	19-Oct-16
BMEMDLLPA162	Develop/Q3 Rvw AG Pipe Support - DM - Site & Redirects	20	13-Oct-16	09-Nov-16
BMEMDLLPA142	Q4/Q6 Rvw AG Pipe & Supports - DM - Site & Redirects	10	10-Nov-16	23-Nov-16
WS - Service Water		55	08-Sep-16	23-Nov-16
BMEMWWEPB62	Develop/Q3 Rvw UG Pipe - WS - Site & Redirects	20	08-Sep-16	05-Oct-16
BMEMWWEPA352	Develop/Q3 Rvw AG Pipe - WS - Site & Redirects	20	06-Oct-16	02-Nov-16
BMEMWWEPB72	Q4/Q6 UG Pipe - WS - Site & Redirects	10	06-Oct-16	19-Oct-16
BMEMWWEPA412	Develop/Q3 Rvw AG Pipe Support - WS - Site & Redirects	20	13-Oct-16	09-Nov-16
BMEMWWEPA392	Q4/Q6 Rvw AG Pipe & Supports - WS - Site & Redirects	10	10-Nov-16	23-Nov-16
Piping Plan Drawings		190	08-Sep-16	08-Jun-17
BMEMQUAPS342	Develop UG Piping Plans - Site & Redirects	20	08-Sep-16	05-Oct-16
BMEMQUAPS352	Q4/Q6 UG Piping Plans - Site & Redirects	10	06-Oct-16	19-Oct-16
BMEMQUAPS292	Develop AG Piping Plans - Site & Redirects	20	06-Oct-16	02-Nov-16



DUKE ENERGY

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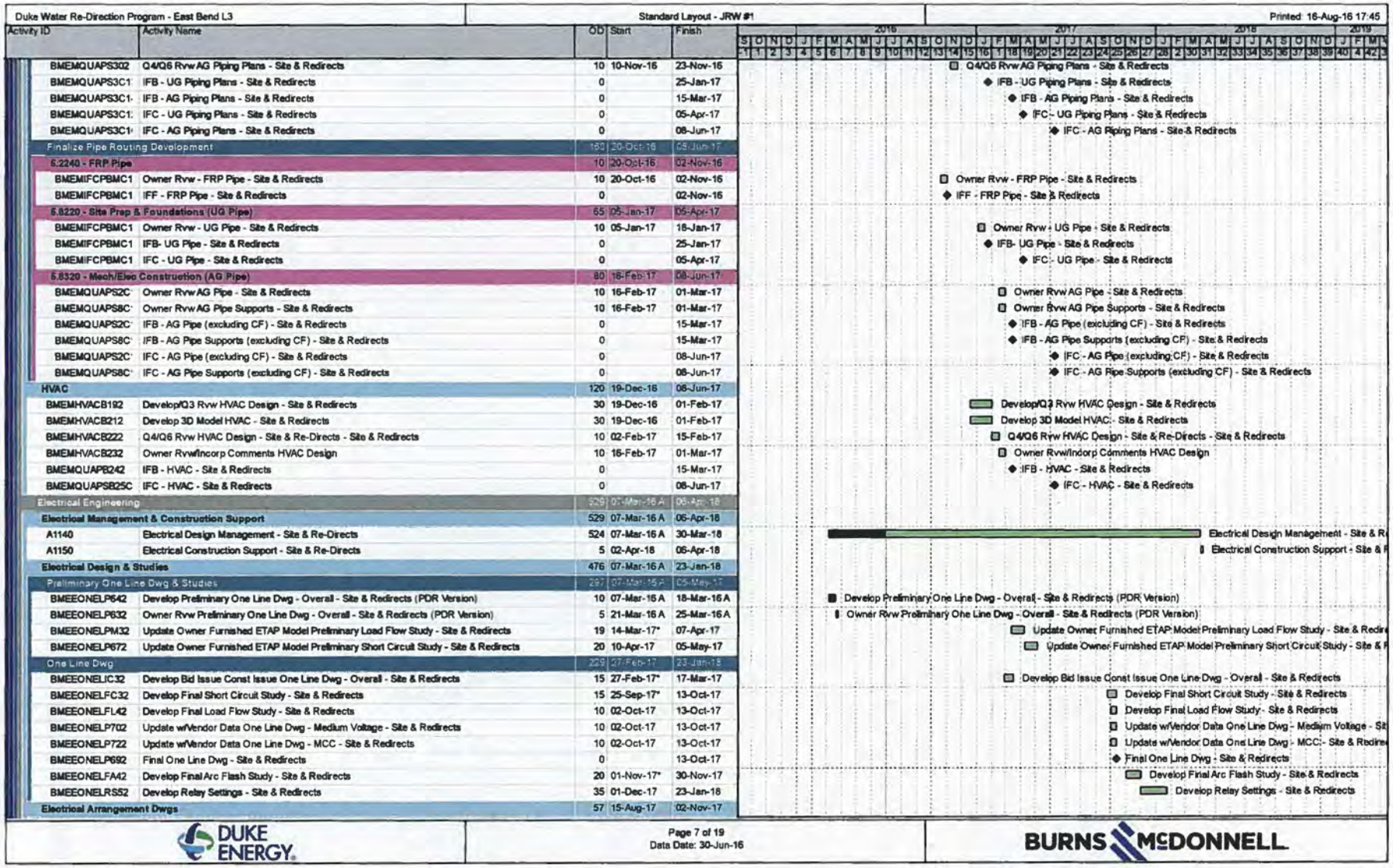
BURNS McDONNELL


Duke Water Re-Direction Program - East Bend L3
Standard Layout - JRW #1
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Activity Name
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Start
Finish
2016
2017
2018
2019
BMEMQUAPS302 Q4/Q6 Rvw AG Piping Plans - Site & Redirects 10 10-Nov-16 23-Nov-16
BMEMQUAPS3C1 IFB - UG Piping Plans - Site & Redirects 0 25-Jan-17
BMEMQUAPS3C1 IFB - AG Piping Plans - Site & Redirects 0 15-Mar-17
BMEMQUAPS3C1 IFC - UG Piping Plans - Site & Redirects 0 05-Apr-17
BMEMQUAPS3C1 IFC - AG Piping Plans - Site & Redirects 0 08-Jun-17
Finalize Pipe Routing Development 160 20-Oct-16 08-Jun-17
5.2240 - FRP Pipe 10 20-Oct-16 02-Nov-16
BMEMIFCPBMC1 Owner Rvw - FRP Pipe - Site & Redirects 10 20-Oct-16 02-Nov-16
BMEMIFCPBMC1 IFF - FRP Pipe - Site & Redirects 0 02-Nov-16
5.8220 - Site Prep & Foundations (UG Pipe) 65 05-Jan-17 05-Apr-17
BMEMIFCPBMC1 Owner Rvw - UG Pipe - Site & Redirects 10 05-Jan-17 18-Jan-17
BMEMIFCPBMC1 IFB- UG Pipe - Site & Redirects 0 25-Jan-17
BMEMIFCPBMC1 IFC - UG Pipe - Site & Redirects 0 05-Apr-17
5.8320 - Mech/Elec Construction (AG Pipe) 80 16-Feb-17 08-Jun-17
BMEMQUAPS2C Owner Rvw AG Pipe - Site & Redirects 10 16-Feb-17 01-Mar-17
BMEMQUAPS8C Owner Rvw AG Pipe Supports - Site & Redirects 10 16-Feb-17 01-Mar-17
BMEMQUAPS2C IFB - AG Pipe (excluding CF) - Site & Redirects 0 15-Mar-17
BMEMQUAPS8C IFB - AG Pipe Supports (excluding CF) - Site & Redirects 0 15-Mar-17
BMEMQUAPS2C IFC - AG Pipe (excluding CF) - Site & Redirects 0 08-Jun-17
BMEMQUAPS8C IFC - AG Pipe Supports (excluding CF) - Site & Redirects 0 08-Jun-17
HVAC 120 19-Dec-16 08-Jun-17
BMEMHVACB192 Develop/Q3 Rvw HVAC Design - Site & Redirects 30 19-Dec-16 01-Feb-17
BMEMHVACB212 Develop 3D Model HVAC - Site & Redirects 30 19-Dec-16 01-Feb-17
BMEMHVACB222 Q4/Q6 Rvw HVAC Design - Site & Re-Directs - Site & Redirects 10 02-Feb-17 15-Feb-17
BMEMHVACB232 Owner Rvw/Incorp Comments HVAC Design 10 16-Feb-17 01-Mar-17
BMEMQUAPB242 IFB - HVAC - Site & Redirects 0 15-Mar-17
BMEMQUAPSB25C IFC - HVAC - Site & Redirects 0 08-Jun-17
Electrical Engineering 529 07-Mar-16 A 06-Apr-18
Electrical Management & Construction Support 529 07-Mar-16 A 06-Apr-18
A1140 Electrical Design Management - Site & Re-Directs 524 07-Mar-16 A 30-Mar-18
A1150 Electrical Construction Support - Site & Re-Directs 5 02-Apr-18 06-Apr-18
Electrical Design & Studies 476 07-Mar-16 A 23-Jan-18
Preliminary One Line Dwg & Studies 297 07-Mar-16 A 05-May-17
BMEEONELP642 Develop Preliminary One Line Dwg - Overall - Site & Redirects (PDR Version) 10 07-Mar-16 A 18-Mar-16 A
BMEEONELP632 Owner Rvw Preliminary One Line Dwg - Overall - Site & Redirects (PDR Version) 5 21-Mar-16 A 25-Mar-16 A
BMEEONELPM32 Update Owner Furnished ETAP Model Preliminary Load Flow Study - Site & Redirects 19 14-Mar-17* 07-Apr-17
BMEEONELP672 Update Owner Furnished ETAP Model Preliminary Short Circuit Study - Site & Redirects 20 10-Apr-17 05-May-17
One Line Dwg 229 27-Feb-17 23-Jan-18
BMEEONELIC32 Develop Bid Issue Const Issue One Line Dwg - Overall - Site & Redirects 15 27-Feb-17* 17-Mar-17
BMEEONELFC32 Develop Final Short Circuit Study - Site & Redirects 15 25-Sep-17* 13-Oct-17
BMEEONELFL42 Develop Final Load Flow Study - Site & Redirects 10 02-Oct-17 13-Oct-17
BMEEONELP702 Update w/Vendor Data One Line Dwg - Medium Voltage - Site & Redirects 10 02-Oct-17 13-Oct-17
BMEEONELP722 Update w/Vendor Data One Line Dwg - MCC - Site & Redirects 10 02-Oct-17 13-Oct-17
BMEEONELP692 Final One Line Dwg - Site & Redirects 0 13-Oct-17
BMEEONELFA42 Develop Final Arc Flash Study - Site & Redirects 20 01-Nov-17* 30-Nov-17
BMEEONELRS52 Develop Relay Settings - Site & Redirects 35 01-Dec-17 23-Jan-18
Electrical Arrangement Dwgs 57 15-Aug-17 02-Nov-17
Q4/Q6 Rvw AG Piping Plans - Site & Redirects
IFB - UG Piping Plans - Site & Redirects
IFB - AG Piping Plans - Site & Redirects
IFC - UG Piping Plans - Site & Redirects
IFC - AG Piping Plans - Site & Redirects
Owner Rvw - FRP Pipe - Site & Redirects
IFF - FRP Pipe - Site & Redirects
Owner Rvw - UG Pipe - Site & Redirects
IFB- UG Pipe - Site & Redirects
IFC - UG Pipe - Site & Redirects
Owner Rvw AG Pipe - Site & Redirects
Owner Rvw AG Pipe Supports - Site & Redirects
IFB - AG Pipe (excluding CF) - Site & Redirects
IFB - AG Pipe Supports (excluding CF) - Site & Redirects
IFC - AG Pipe (excluding CF) - Site & Redirects
IFC - AG Pipe Supports (excluding CF) - Site & Redirects
Develop/Q3 Rvw HVAC Design - Site & Redirects
Develop 3D Model HVAC - Site & Redirects
Q4/Q6 Rvw HVAC Design - Site & Re-Directs - Site & Redirects
Owner Rvw/Incorp Comments HVAC Design
IFB - HVAC - Site & Redirects
IFC - HVAC - Site & Redirects
Develop Preliminary One Line Dwg - Overall - Site & Redirects (PDR Version)
Owner Rvw Preliminary One Line Dwg - Overall - Site & Redirects (PDR Version)
Update Owner Furnished ETAP Model Preliminary Load Flow Study - Site & Redirects
Update Owner Furnished ETAP Model Preliminary Short Circuit Study - Site & Redirects
Develop Bid Issue Const Issue One Line Dwg - Overall - Site & Redirects
Develop Final Short Circuit Study - Site & Redirects
Develop Final Load Flow Study - Site & Redirects
Update w/Vendor Data One Line Dwg - Medium Voltage - Site & Redirects
Update w/Vendor Data One Line Dwg - MCC - Site & Redirects
Final One Line Dwg - Site & Redirects
Develop Final Arc Flash Study - Site & Redirects
Develop Relay Settings - Site & Redirects
DUKE ENERGY.
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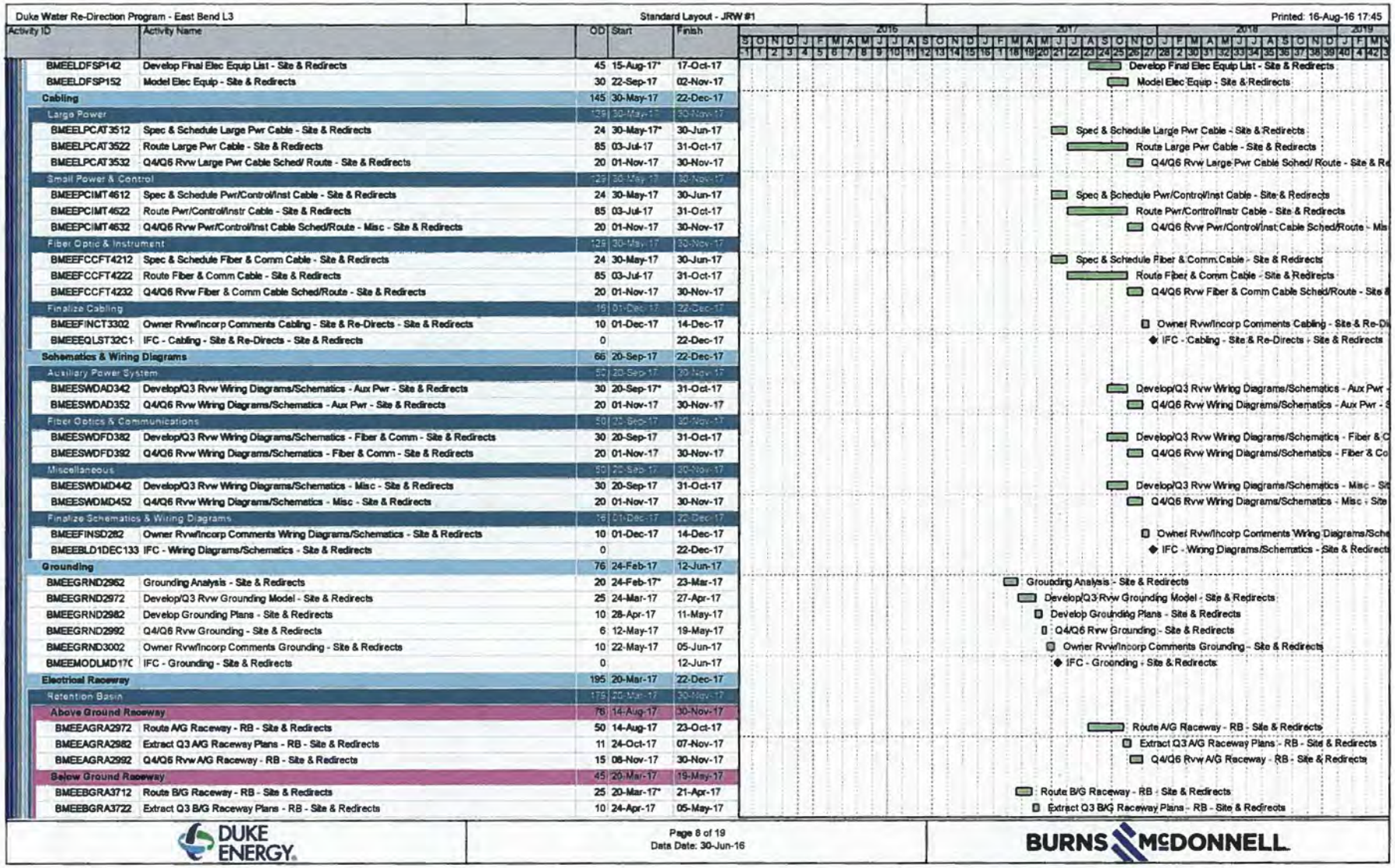
Duke Water Re-Direction Program - East Bend L3
Standard Layout - JRW #1
Printed: 16-Aug-16 17:45
Activity ID
Activity Name
OD
Start
Finish
2016
2017
2018
2019
BMEELDFSP142 Develop Final Elec Equip List - Site & Redirects 45 15-Aug-17* 17-Oct-17
BMEELDFSP152 Model Elec Equip - Site & Redirects 30 22-Sep-17 02-Nov-17
Cabling 145 30-May-17 22-Dec-17
Large Power 125 30-May-17 30-Nov-17
BMEELPCAT3512 Spec & Schedule Large Pwr Cable - Site & Redirects 24 30-May-17* 30-Jun-17
BMEELPCAT3522 Route Large Pwr Cable - Site & Redirects 85 03-Jul-17 31-Oct-17
BMEELPCAT3532 Q4/Q6 Rvw Large Pwr Cable Sched/ Route - Site & Redirects 20 01-Nov-17 30-Nov-17
Small Power & Control 125 30-May-17 30-Nov-17
BMEEPCIMT4612 Spec & Schedule Pwr/Control/Inst Cable - Site & Redirects 24 30-May-17 30-Jun-17
BMEEPCIMT4622 Route Pwr/Control/Instr Cable - Site & Redirects 85 03-Jul-17 31-Oct-17
BMEEPCIMT4632 Q4/Q6 Rvw Pwr/Control/Inst Cable Sched/Route - Misc - Site & Redirects 20 01-Nov-17 30-Nov-17
Fiber Optic & Instrument 125 30-May-17 30-Nov-17
BMEEFCCFT4212 Spec & Schedule Fiber & Comm Cable - Site & Redirects 24 30-May-17 30-Jun-17
BMEEFCCFT4222 Route Fiber & Comm Cable - Site & Redirects 85 03-Jul-17 31-Oct-17
BMEEFCCFT4232 Q4/Q6 Rvw Fiber & Comm Cable Sched/Route - Site & Redirects 20 01-Nov-17 30-Nov-17
Finalize Cabling 15 01-Dec-17 22-Dec-17
BMEEFINCT3302 Owner Rvw/Incorp Comments Cabling - Site & Re-Directs - Site & Redirects 10 01-Dec-17 14-Dec-17
BMEEEQLST32C1 IFC - Cabling - Site & Re-Directs - Site & Redirects 0 22-Dec-17
Schematics & Wiring Diagrams 66 20-Sep-17 22-Dec-17
Auxiliary Power System 50 20-Sep-17 30-Nov-17
BMEESWDAD342 Develop/Q3 Rvw Wiring Diagrams/Schematics - Aux Pwr - Site & Redirects 30 20-Sep-17* 31-Oct-17
BMEESWDAD352 Q4/Q6 Rvw Wiring Diagrams/Schematics - Aux Pwr - Site & Redirects 20 01-Nov-17 30-Nov-17
Fiber Optics & Communications 50 20-Sep-17 30-Nov-17
BMEESWDFD382 Develop/Q3 Rvw Wiring Diagrams/Schematics - Fiber & Comm - Site & Redirects 30 20-Sep-17 31-Oct-17
BMEESWDFD392 Q4/Q6 Rvw Wiring Diagrams/Schematics - Fiber & Comm - Site & Redirects 20 01-Nov-17 30-Nov-17
Miscellaneous 50 20-Sep-17 30-Nov-17
BMEESWDMD442 Develop/Q3 Rvw Wiring Diagrams/Schematics - Misc - Site & Redirects 30 20-Sep-17 31-Oct-17
BMEESWDMD452 Q4/Q6 Rvw Wiring Diagrams/Schematics - Misc - Site & Redirects 20 01-Nov-17 30-Nov-17
Finalize Schematics & Wiring Diagrams 15 01-Dec-17 22-Dec-17
BMEEFINSD282 Owner Rvw/Incorp Comments Wiring Diagrams/Schematics - Site & Redirects 10 01-Dec-17 14-Dec-17
BMEEBLD1DEC133 IFC - Wiring Diagrams/Schematics - Site & Redirects 0 22-Dec-17
Grounding 76 24-Feb-17 12-Jun-17
BMEEGRND2962 Grounding Analysis - Site & Redirects 20 24-Feb-17* 23-Mar-17
BMEEGRND2972 Develop/Q3 Rvw Grounding Model - Site & Redirects 25 24-Mar-17 27-Apr-17
BMEEGRND2982 Develop Grounding Plans - Site & Redirects 10 28-Apr-17 11-May-17
BMEEGRND2992 Q4/Q6 Rvw Grounding - Site & Redirects 6 12-May-17 19-May-17
BMEEGRND3002 Owner Rvw/Incorp Comments Grounding - Site & Redirects 10 22-May-17 05-Jun-17
BMEEMODLMD17C IFC - Grounding - Site & Redirects 0 12-Jun-17
Electrical Raceway 195 20-Mar-17 22-Dec-17
Retention Basin 175 20-Mar-17 30-Nov-17
Above Ground Raceway 76 14-Aug-17 30-Nov-17
BMEEAGRA2972 Route A/G Raceway - RB - Site & Redirects 50 14-Aug-17 23-Oct-17
BMEEAGRA2982 Extract Q3 A/G Raceway Plans - RB - Site & Redirects 11 24-Oct-17 07-Nov-17
BMEEAGRA2992 Q4/Q6 Rvw A/G Raceway - RB - Site & Redirects 15 08-Nov-17 30-Nov-17
Below Ground Raceway 45 20-Mar-17 19-May-17
BMEEBGRA3712 Route B/G Raceway - RB - Site & Redirects 25 20-Mar-17* 21-Apr-17
BMEEBGRA3722 Extract Q3 B/G Raceway Plans - RB - Site & Redirects 10 24-Apr-17 05-May-17
Develop Final Elec Equip List - Site & Redirects
Model Elec Equip - Site & Redirects
Spec & Schedule Large Pwr Cable - Site & Redirects
Route Large Pwr Cable - Site & Redirects
Q4/Q6 Rvw Large Pwr Cable Sched/ Route - Site & Re
Spec & Schedule Pwr/Control/Inst Cable - Site & Redirects
Route Pwr/Control/Instr Cable - Site & Redirects
Q4/Q6 Rvw Pwr/Control/Inst Cable Sched/Route - Mis
Spec & Schedule Fiber & Comm Cable - Site & Redirects
Route Fiber & Comm Cable - Site & Redirects
Q4/Q6 Rvw Fiber & Comm Cable Sched/Route - Site &
Owner Rvw/Incorp Comments Cabling - Site & Re-Di
IFC - Cabling - Site & Re-Directs - Site & Redirects
Develop/Q3 Rvw Wiring Diagrams/Schematics - Aux Pwr -
Q4/Q6 Rvw Wiring Diagrams/Schematics - Aux Pwr -
Develop/Q3 Rvw Wiring Diagrams/Schematics - Fiber & C
Q4/Q6 Rvw Wiring Diagrams/Schematics - Fiber & Co
Develop/Q3 Rvw Wiring Diagrams/Schematics - Misc - Sit
Q4/Q6 Rvw Wiring Diagrams/Schematics - Misc - Site
Owner Rvw/Incorp Comments Wiring Diagrams/Sche
IFC - Wiring Diagrams/Schematics - Site & Redirects
Grounding Analysis - Site & Redirects
Develop/Q3 Rvw Grounding Model - Site & Redirects
Develop Grounding Plans - Site & Redirects
Q4/Q6 Rvw Grounding - Site & Redirects
Owner Rvw/Incorp Comments Grounding - Site & Redirects
IFC - Grounding - Site & Redirects
Route A/G Raceway - RB - Site & Redirects
Extract Q3 A/G Raceway Plans - RB - Site & Redirects
Q4/Q6 Rvw A/G Raceway - RB - Site & Redirects
Route B/G Raceway - RB - Site & Redirects
Extract Q3 B/G Raceway Plans - RB - Site & Redirects
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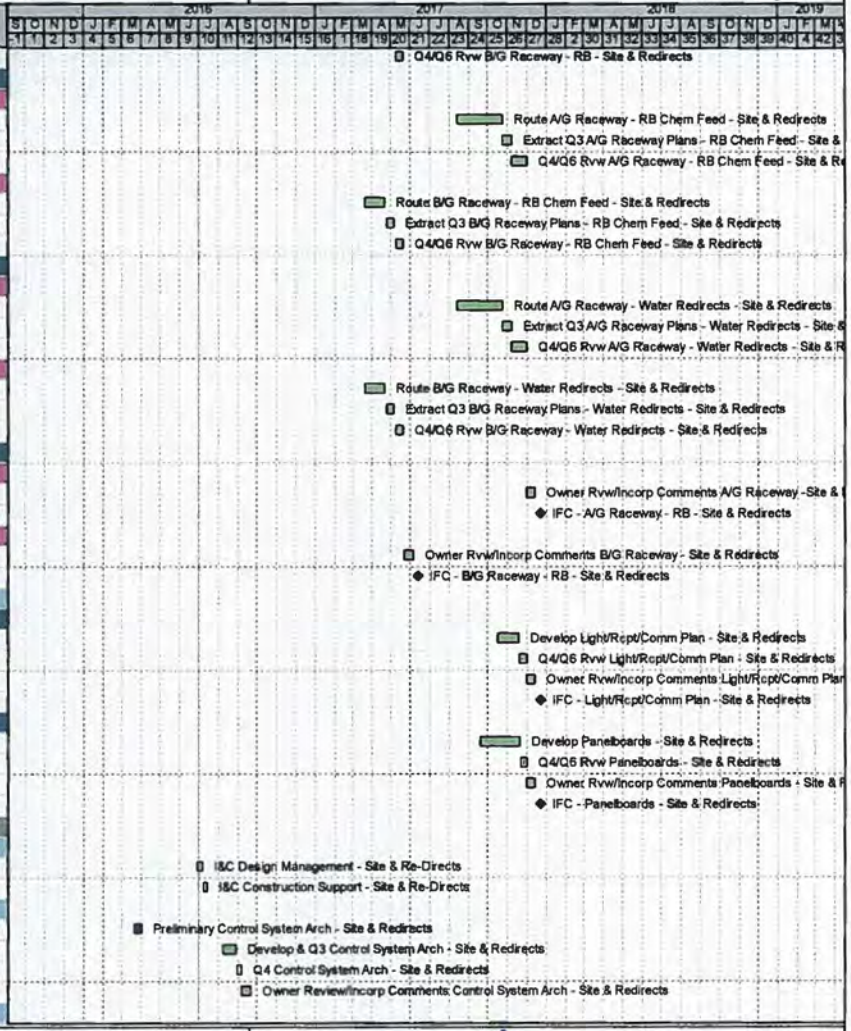
Activity ID	Activity Name	OD	Start	Finish
BMEEBGRA3732	Q4/Q6 Rvw B/G Raceway - RB - Site & Redirects	10	06-May-17	19-May-17
Retention Basin Chemical Feed		179	20-Mar-17	30-Nov-17
Above Ground Raceway		76	14-Aug-17	30-Nov-17
BMEEAGRA3052	Route A/G Raceway - RB Chem Feed - Site & Redirects	50	14-Aug-17	23-Oct-17
BMEEAGRA3062	Extract Q3 A/G Raceway Plans - RB Chem Feed - Site & Redirects	11	24-Oct-17	07-Nov-17
BMEEAGRA3072	Q4/Q6 Rvw A/G Raceway - RB Chem Feed - Site & Redirects	15	08-Nov-17	30-Nov-17
Below Ground Raceway		45	20-Mar-17	19-May-17
BMEEBGRA3672	Route B/G Raceway - RB Chem Feed - Site & Redirects	25	20-Mar-17	21-Apr-17
BMEEBGRA3682	Extract Q3 B/G Raceway Plans - RB Chem Feed - Site & Redirects	10	24-Apr-17	05-May-17
BMEEBGRA3692	Q4/Q6 Rvw B/G Raceway - RB Chem Feed - Site & Redirects	10	08-May-17	19-May-17
Water Redirects		179	20-Mar-17	30-Nov-17
Above Ground Raceway		76	14-Aug-17	30-Nov-17
BMEEAGRA3092	Route A/G Raceway - Water Redirects - Site & Redirects	50	14-Aug-17	23-Oct-17
BMEEAGRA3102	Extract Q3 A/G Raceway Plans - Water Redirects - Site & Redirects	11	24-Oct-17	07-Nov-17
BMEEAGRA3112	Q4/Q6 Rvw A/G Raceway - Water Redirects - Site & Redirects	15	08-Nov-17	30-Nov-17
Below Ground Raceway		45	20-Mar-17	19-May-17
BMEEBGRA3752	Route B/G Raceway - Water Redirects - Site & Redirects	25	20-Mar-17	21-Apr-17
BMEEBGRA3762	Extract Q3 B/G Raceway Plans - Water Redirects - Site & Redirects	10	24-Apr-17	05-May-17
BMEEBGRA3772	Q4/Q6 Rvw B/G Raceway - Water Redirects - Site & Redirects	10	08-May-17	19-May-17
Finalize Electrical Raceway		152	22-May-17	22-Dec-17
Above Ground Raceway		16	01-Dec-17	22-Dec-17
BMEEAGRA3242	Owner Rvw/Incorp Comments A/G Raceway -Site & Redirects	10	01-Dec-17	14-Dec-17
BMEEMODLMD1	IFC - A/G Raceway - RB - Site & Redirects	0		22-Dec-17
Below Ground Raceway		15	22-May-17	12-Jun-17
BMEEBGRA3782	Owner Rvw/Incorp Comments B/G Raceway - Site & Redirects	10	22-May-17	05-Jun-17
BMEEMODLMD2	IFC - B/G Raceway - RB - Site & Redirects	0		12-Jun-17
Miscellaneous Electrical Design		67	19-Sep-17	22-Dec-17
Lighting & Receptacles		48	16-Oct-17	22-Dec-17
BMEEMEDLR2732	Develop Light/Rcpt/Comm Plan - Site & Redirects	25	16-Oct-17	17-Nov-17
BMEEMEDLR2742	Q4/Q6 Rvw Light/Rcpt/Comm Plan - Site & Redirects	7	20-Nov-17	30-Nov-17
BMEEMEDLR2752	Owner Rvw/Incorp Comments Light/Rcpt/Comm Plan - Site & Redirects	10	01-Dec-17	14-Dec-17
BMEEMODLMD1C	IFC - Light/Rcpt/Comm Plan - Site & Redirects	0		22-Dec-17
Panelboards		67	19-Sep-17	22-Dec-17
BMEEMEDPB2852	Develop Panelboards - Site & Redirects	45	19-Sep-17	20-Nov-17
BMEEMEDPB2862	Q4/Q6 Rvw Panelboards - Site & Redirects	6	21-Nov-17	30-Nov-17
BMEEMEDPB2872	Owner Rvw/Incorp Comments Panelboards - Site & Redirects	10	01-Dec-17	14-Dec-17
BMEEMODLMD1C	IFC - Panelboards - Site & Redirects	0		22-Dec-17
I&C Engineering		310	21-Mar-16 A	08-Jun-17
I&C Management & Construction Support		10	30-Jun-16	14-Jul-16
A1160	I&C Design Management - Site & Re-Directs	5	30-Jun-16	07-Jul-16
A1170	I&C Construction Support - Site & Re-Directs	5	08-Jul-16	14-Jul-16
Control System Architecture		129	21-Mar-16 A	20-Sep-16
BMEIPCSAD104	Preliminary Control System Arch - Site & Redirects	10	21-Mar-16 A	01-Apr-16 A
BMEIPCSAD34	Develop & Q3 Control System Arch - Site & Redirects	15	09-Aug-16	29-Aug-16
BMEIPCSAD44	Q4 Control System Arch - Site & Redirects	5	30-Aug-16	06-Sep-16
BMEIPCSAD54	Owner Review/Incorp Comments Control System Arch - Site & Redirects	10	07-Sep-16	20-Sep-16
I/O List and Wiring		115	02-Dec-16	16-May-17



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Activity ID	Activity Name	OD	Start	Finish
I/O List		50	02-Dec-16	14-Feb-17
BMEIWWELD662	Develop & Q3 Hardwired I/O List - Site & Redirects	30	02-Dec-16	17-Jan-17
BMEIPIOLD392	Q4 Hardwired I/O List - Site & Redirects	10	18-Jan-17	31-Jan-17
BMEIPIOLD622	Owner Rvw/Incorp Comments I/O List - Site & Redirects	10	01-Feb-17	14-Feb-17
BMEIPIOLD402	Issue For Partitioning - 5.6110 - Site & Redirects	0		14-Feb-17
Wiring		115	02-Dec-16	16-May-17
BMEIUIOLD392	Develop & Q3 I&C Cable Schedule - Site & Redirects	30	02-Dec-16	17-Jan-17
BMEIUIOLD402	Q4 I&C Cable Schedule - Site & Redirects	10	18-Jan-17	31-Jan-17
BMEIUIOLD172	Develop & Q3 I&C Wiring Diagrams - Site & Redirects	30	01-Mar-17	11-Apr-17
BMEIUIOLD182	Q4 I&C Wiring Diagrams - Site & Redirects	10	12-Apr-17	25-Apr-17
BMEIUIOLD192	Owner Review/Incorp Comments I&C Wiring Diagrams - Site & Redirects	15	26-Apr-17	16-May-17
Logics & Graphics		55	21-Nov-16	10-Feb-17
BMEICWBL1549	Develop/Q3 Logics - Site & Redirects	30	21-Nov-16	06-Jan-17
BMEICWBG1539	Develop/Q3 Graphics - Site & Redirects	30	21-Nov-16	06-Jan-17
BMEICWBL1559	Q4 Logics - Site & Redirects	10	09-Jan-17	20-Jan-17
BMEICWBG1559	Owner Review/Incorp Comments Graphics - Site & Redirects	15	09-Jan-17	27-Jan-17
BMEICWBL1569	Owner Review/Incorp Comments Logics - Site & Redirects	15	23-Jan-17	10-Feb-17
DCS		70	15-Feb-17	23-May-17
BMEIDCSRD52	Vendor DCS Programming - Site & Re-Directs - Site & Redirects	60	15-Feb-17	09-May-17
BMEIDCSRD92	Vendor I/O Partitioning - Site & Re-Directs - Site & Redirects	20	15-Feb-17	14-Mar-17
BMEILGGRD62	Software Freeze (2 months before FAT) - Site & Redirects	0		28-Mar-17
BMEIDCSRD72	Vendor DCS Configuration FAT - Site & Redirects	10	10-May-17	23-May-17
Instrument Design		195	31-Aug-16	08-Jun-17
BMEICWBD452	I&C P&ID Design/Instr Tagging - Site & Redirects	15	31-Aug-16	21-Sep-16
Instrument List & Data Sheets		132	15-Sep-16	24-Mar-17
BMEICWBD462	Develop/Q3 Instr List - Site & Redirects	20	15-Sep-16	12-Oct-16
BMEIFIDD32	Develop/Q3 Inst Datasheets - Site & Redirects	20	13-Oct-16	09-Nov-16
BMEIFIDD582	Q4 Instr Lists & Datasheets - Site & Redirects	10	10-Nov-16	23-Nov-16
BMEIFIDD702	Owner Rvw Instr Lists & Datasheets - Site & Redirects (part of 5.6210 review)	10	28-Nov-16	09-Dec-16
BMEIFLOD6C118	IFB - Instr Lists & Datasheets - Site & Redirects	0		27-Dec-16
BMEIFLOD6C128	IFC - Instr Lists & Datasheets - Site & Redirects	0		24-Mar-17
I&C Modeling & Plan Dwgs		110	05-Jan-17	08-Jun-17
BMEIFIDD52	Develop I&C Plan Dwgs & Q3 - Site & Redirects	20	05-Jan-17	01-Feb-17
BMEICWBD472	Model Instr & Q3 Rvw - Site & Redirects	20	05-Jan-17	01-Feb-17
BMEIFIDD532	Q4 I&C Plan Dwgs - Site & Redirects	10	02-Feb-17	15-Feb-17
BMEIFIDD542	Owner Rvw I&C Plan Dwgs - Site & Redirects (part of 5.8320 review)	10	16-Feb-17	01-Mar-17
BMEIFLOD9C119	IFB - Instr Plan Dwgs - Site & Redirects	0		15-Mar-17
BMEIFLOD9C129	IFC - Instr Plan Dwgs - Site & Redirects	0		08-Jun-17
I&C Installation Details		110	05-Jan-17	08-Jun-17
BMEIFIDD22	Develop/Q3 I&C Installation Details - Site & Redirects	20	05-Jan-17	01-Feb-17
BMEIFIDD92	Q4 I&C Installation Details - Site & Redirects	10	02-Feb-17	15-Feb-17
BMEIFIDD712	Owner Rvw I&C Installation Details - Site & Redirects (part of 5.8320 review)	10	16-Feb-17	01-Mar-17
BMEIFIDD692	IFB - I&C Installation Details - Site & Redirects	0		15-Mar-17
BMEIFIDD742	IFC - I&C Installation Details - Site & Redirects	0		08-Jun-17
Procurement		430	02-May-16 A	15-Jan-18
Mechanical Contracts		430	02-May-16 A	15-Jan-18
5.2170 - Submersible Pumps (Program)		288	27-Jun-16 A	13-Sep-17

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Activity ID	Activity Name	OD	Start	Finish
BMPM8324441	Prep Tech Spec for Q3 Rvw - Submersible Pumps	25	27-Jun-16 A	29-Jul-16
BMPM8324451	Owner Rvw - Submersible Pumps	10	01-Aug-16	12-Aug-16
BMPM8324531	Q4/Q5 Rvw Spec - Submersible Pumps	10	01-Aug-16	12-Aug-16
BMPM8324461	IFB - Submersible Pumps	0		19-Aug-16
BMPM8324471	Supplier Prep and Submit Bids - Submersible Pumps	20	22-Aug-16	19-Sep-16
BMPM8324481	Technical Evaluation & Bid Tab - Submersible Pumps	15	20-Sep-16	10-Oct-16
BMPM8324541	Owner Confirm Purchase Order - Submersible Pumps	15	27-Sep-16	17-Oct-16
BMPM8324501	Conform Contract/Issue - Submersible Pumps	10	11-Oct-16	24-Oct-16
BMPM8324491	Program Award - Submersible Pumps	0		24-Oct-16
BMPM8324801	Issue PO - Submersible Pumps	0		04-Nov-16*
BMPM8324521	Vndr Submittal [Fnd Load & Anchor Bolt Design] - Submersible Pumps	0		06-Dec-16
BMPM8324591	Rvw Vndr Submittals [Fnd Load & Anchor Bolt Design] - Submersible Pumps	15	07-Dec-16	29-Dec-16
BMPM8324561	Vndr Submittal [Wiring Diagrams] - Submersible Pumps	0		06-Jan-17
BMPM8324571	Vndr Submittal [Equip Dwgs] - Submersible Pumps	0		06-Jan-17
BMPM8324581	Rvw Vndr Submittals [Equip Dwgs] - Submersible Pumps	15	09-Jan-17	27-Jan-17
BMPM8324601	Rvw Vndr Submittals [Wiring Diagrams] - Submersible Pumps	15	09-Jan-17	27-Jan-17
BMPM8324611	Issue PO Rev/ Release for Fab & Del - Submersible Pumps	0		24-Mar-17
BMPM8324551	Vndr Engr/Manufacture & Del to Site - Submersible Pumps - WR	120	27-Mar-17	13-Sep-17
5.2190 - Miscellaneous Pumps (Program)		297	13-Jul-16	13-Sep-17
BMPM2190340	Prep Tech Spec for Q3 Rvw - Misc Pumps	14	13-Jul-16*	01-Aug-16
BMPM2190350	Owner Rvw - Misc Pumps	10	02-Aug-16	15-Aug-16
BMPM2190820	Q4/Q5 Rvw Spec - Misc Pumps	10	02-Aug-16	15-Aug-16
BMPM2190360	IFB - Misc Pumps	0		22-Aug-16
BMPM2190370	Supplier Prep and Submit Bids - Misc Pumps	20	23-Aug-16	20-Sep-16
BMPM2190380	Technical Evaluation & Bid Tab - Misc Pumps	15	21-Sep-16	11-Oct-16
BMPM2190830	Owner Confirm Purchase Order - Misc Pumps	15	28-Sep-16	18-Oct-16
BMPM2190400	Conform Contract/Issue - Misc Pumps	10	12-Oct-16	25-Oct-16
BMPM2190390	Program Award - Misc Pumps	0		25-Oct-16
BMPM8324811	Issue PO/ Award Engineering - Misc Pumps	0		04-Nov-16*
BMPM2190440	Vndr Submittal [Fnd Load & Anchor Bolt Design] - Misc Pumps	0		06-Dec-16
BMPM8321701	Rvw Vndr Submittals [Fnd Load & Anchor Bolt Design] - Misc Pumps	15	07-Dec-16	29-Dec-16
BMPM8321491	Vndr Submittal [Wiring Diagrams] - Misc Pumps	0		06-Jan-17
BMPM8321501	Vndr Submittal [Equip Dwgs] - Misc Pumps	0		06-Jan-17
BMPM8321691	Rvw Vndr Submittals [Equip Dwgs] - Misc Pumps	15	09-Jan-17	27-Jan-17
BMPM8321711	Rvw Vndr Submittals [Wiring Diagrams] - Misc Pumps	15	09-Jan-17	27-Jan-17
BMPM8324391	Issue PO Rev/ Release for Fab & Del - Misc Pumps	0		24-Mar-17
BMPM8320971	Vndr Engr/Manufacture & Del to Site - Misc Pumps - WR	120	27-Mar-17	13-Sep-17
5.2240 - FRP Pipe (Midwest)		268	19-May-16 A	15-Aug-17
BMPM8324231	Prep Tech Spec for Q3 Rvw - FRP Pipe	20	19-May-16 A	10-Jun-16 A
BMPM8324331	Q4/Q5 Rvw Spec - FRP Pipe	10	13-Jun-16 A	27-Jun-16 A
BMPM8324241	Owner Rvw - FRP Pipe	10	28-Jun-16 A	12-Jul-16
BMPM8324251	IFB - FRP Pipe	0		25-Jul-16
BMPM8324261	Supplier Prep and Submit Bids - FRP Pipe	15	26-Jul-16	15-Aug-16
BMPM8324271	Technical Evaluation & Bid Tab - FRP Pipe	15	16-Aug-16	06-Sep-16
BMPM8324291	Conform Contract/Issue - FRP Pipe	5	07-Sep-16	13-Sep-16
BMPM8324321	Owner Rvw Period - FRP Pipe	5	07-Sep-16	13-Sep-16
BMPM8324281	Midwest Projects Award - FRP Pipe	0		13-Sep-16

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Activity ID	Activity Name	OD	Start	Finish
BMPM8324831	Issue PO/ Award Engineering - FRP Pipe	0		02-Nov-16
BMPM8324351	Vndr Submittal [Piping Spool Dwgs] - FRP Pipe	0		04-Jan-17
BMPM8324381	Rvw Vndr Submittals [Piping Spool Dwgs] - FRP Pipe	15	05-Jan-17	25-Jan-17
BMPM8324401	Issue PO Rev/ Release for Fab & Del - FRP Pipe	0		24-Mar-17
BMPM8324341	Vndr Engr/Manufacture & Del to Site - FRP Pipe - Site & Redirects	100	27-Mar-17	15-Aug-17
5.2631 - Bottom Ash Handling		430	02-May-16 A	15-Jan-18
5.2710 - Compressed Air Equipment (Program)		296	23-May-16 A	13-Sep-17
5.2970 - Field Erected Tanks		249	11-Jul-16	03-Jul-17
BMPM2970460	Prep Tech Spec for Q3 Rvw - Field Erected Tanks (F&E)	20	11-Jul-16*	05-Aug-16
BMPM2970010	Q4/Q6 Rvw Spec - Field Erected Tanks (F&E)	10	08-Aug-16	19-Aug-16
BMPM2970470	Owner Rvw/Incorp Comments - Field Erected Tanks (F&E)	10	22-Aug-16	02-Sep-16
BMPM2970480	IFB - Field Erected Tanks (F&E)	0		12-Sep-16
BMPM2970490	Supplier Prep and Submit Bids - Field Erected Tanks (F&E)	20	13-Sep-16	10-Oct-16
BMPM2970500	Technical Evaluation & Bid Tab - Field Erected Tanks (F&E)	20	11-Oct-16	07-Nov-16
BMPM2970020	Owner Rvw Period - Field Erected Tanks (F&E)	5	08-Nov-16	14-Nov-16
BMPM2970520	Conform Contract/Issue - Field Erected Tanks (F&E)	5	15-Nov-16	21-Nov-16
BMPM2970510	Issue PO/ Award Engineering - Field Erected Tanks (F&E)	0		21-Nov-16
BMPM8321571	Vndr Submittal [Tank Arrangement Dwgs] - Field Erected Tanks (F&E)	0		21-Dec-16
BMPM2970580	Vndr Submittal [Fdn Load & Anchor Bolt Design] - Field Erected Tanks (F&E)	0		21-Dec-16
BMPM2970590	Vndr Submittal [Inst Lists] - Field Erected Tanks (F&E)	0		21-Dec-16
BMPM2970620	Vndr Submittal [Design/Dwg Info] - Field Erected Tanks (F&E)	0		21-Dec-16
BMPM8322541	Rvw Vndr Submittals [Fdn Load & Anchor Bolt Design] - Field Erected Tanks (F&E)	15	22-Dec-16	16-Jan-17
BMPM8322631	Rvw Vndr Submittals [Inst Lists] - Field Erected Tanks (F&E)	15	22-Dec-16	16-Jan-17
BMPM8322691	Rvw Vndr Submittals [Tank Arrangement Dwgs] - Field Erected Tanks (F&E)	15	22-Dec-16	16-Jan-17
BMPM8322751	Rvw Vndr Submittals [Design/Dwg Info] - Field Erected Tanks (F&E)	15	22-Dec-16	16-Jan-17
BMPM8324411	Issue PO Rev/ Release for Fab & Del - Field Erected Tanks (F&E)	0		24-Mar-17
BMPM8321331	Vndr Engr/Manufacture & Del to Site -Field Erected Tanks (F&E) - FGD Maint Tank - Site & Redire	70	27-Mar-17	03-Jul-17
BMPM2970600	Vndr Submittal [Insurance/Safety/Site Info] - Field Erected Tanks (F&E)	0		07-Apr-17
BMPM8322601	Rvw Vndr Submittals [Insurance/Safety/Site Info] - Field Erected Tanks (F&E)	10	10-Apr-17	21-Apr-17
BMPM2970M58	Begin Mobilization to Site - Field Erected Tanks (F&E)	0		03-Jul-17
Chemical/Process Contracts		360	17-Jun-16 A	08-Dec-17
5.3418 - Retention Basin Chemical Feed (Program)		360	08-Jul-16	08-Dec-17
BMPC3420446	Prep Tech Spec for Q3 Rvw - RB Chem Feed	21	08-Jul-16*	05-Aug-16
BMPC3420456	Q4/Q6 Rvw Spec - RB Chem Feed	5	08-Aug-16	12-Aug-16
BMPC3420476	IFB - RB Chem Feed	0		12-Aug-16
BMPC3420466	Owner Rvw - RB Chem Feed	10	15-Aug-16	26-Aug-16
BMPC3420486	Supplier Prep and Submit Bids - RB Chem Feed	18	15-Aug-16	08-Sep-16
BMPC3420496	Technical Evaluation & Bid Tab - RB Chem Feed	16	09-Sep-16	30-Sep-16
BMPC3420506	Owner Rvw Period - RB Chem Feed	16	16-Sep-16	07-Oct-16
BMPC3420526	Conform Contract/Issue - RB Chem Feed	10	03-Oct-16	14-Oct-16
BMPC3420516	Program Award - RB Chem Feed	0		14-Oct-16
BMPC3420776	Issue PO/ Award Engineering - RB Chem Feed	0		14-Oct-16
BMPC3420556	Vndr Submittal [Fdn Load & Anchor Bolt Design] - RB Chem Feed	0		29-Nov-16
BMPC8323141	Rvw Vndr Submittals [Fdn Load & Anchor Bolt Design] - RB Chem Feed	15	30-Nov-16	20-Dec-16
BMPC3420536	Vndr Submittal [Elect Load Info] - RB Chem Feed	0		13-Dec-16
BMPC3420696	Vndr Submittal [Equip Dwgs] - RB Chem Feed	0		13-Dec-16
BMPC3420706	Vndr Submittal [Wiring Diagrams] - RB Chem Feed	0		13-Dec-16

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Activity ID	Activity Name	OD	Start	Finish
BMPM8323111	Rvw Vndr Submittals [Elect Load Info] - RB Chem Feed	15	14-Dec-16	06-Jan-17
BMPM8323171	Rvw Vndr Submittals [Equip Dwgs] - RB Chem Feed	15	14-Dec-16	06-Jan-17
BMPM8323201	Rvw Vndr Submittals [Wiring Diagrams] - RB Chem Feed	15	14-Dec-16	06-Jan-17
BMPC3420736	Issue PO Rev/ Release for Fab & Del - RB Chem Feed	0		24-Mar-17
BMPC3420546	Vndr Engr/Manufacture & Del to Site - RB Chem Feed	180	27-Mar-17	08-Dec-17
5.3420 - Agitators (Program)		299	17-Jun-16 A	13-Sep-17
BMPC3420286	Prep Tech Spec for Q3 Rvw - Agitators	35	17-Jun-16 A	04-Aug-16
BMPC3420426	Q4/Q6 Rvw Spec - Agitators	15	05-Aug-16	25-Aug-16
BMPC3420296	Owner Rvw - Agitators	10	26-Aug-16	09-Sep-16
BMPC3420306	IFB - Agitators	0		16-Sep-16
BMPC3420316	Supplier Prep and Submit Bids - Agitators	20	19-Sep-16	14-Oct-16
BMPC3420326	Technical Evaluation & Bid Tab - Agitators	15	17-Oct-16	04-Nov-16
BMPC3420436	Owner Rvw Period - Agitators	15	24-Oct-16	11-Nov-16
BMPC3420346	Conform Contract/Issue - Agitators	10	07-Nov-16	18-Nov-16
BMPC3420336	Program Award - Agitators	0		18-Nov-16
BMPC3420766	Issue PO/ Award Engineering - Agitators	0		21-Nov-16*
BMPC3420756	Vndr Submittal [Baffle Design] - Agitators	0		07-Dec-16
BMPM8324421	Rvw Vndr Submittals [Baffle Design] - Agitators	15	08-Dec-16	30-Dec-16
BMPC3420386	Vndr Submittal [FDN Load Info] - Agitators	0		21-Dec-16
BMPM8323321	Rvw Vndr Submittals [FDN Load Info] - Agitators	15	22-Dec-16	16-Jan-17
BMPC3420396	Vndr Submittal [Elect Load Info] - Agitators	0		23-Jan-17
BMPC3420716	Vndr Submittal [Wiring Diagrams] - Agitators	0		23-Jan-17
BMPC3420726	Vndr Submittal [Equip Dwgs] - Agitators	0		23-Jan-17
BMPM8323231	Rvw Vndr Submittals [Elect Load Info] - Agitators	15	24-Jan-17	13-Feb-17
BMPM8323261	Rvw Vndr Submittals [Wiring Diagrams] - Agitators	15	24-Jan-17	13-Feb-17
BMPM8323291	Rvw Vndr Submittals [Equip Dwgs] - Agitators	15	24-Jan-17	13-Feb-17
BMPC3420746	Issue PO Rev/ Release for Fab & Del - Agitators	0		24-Mar-17
BMPC3420566	Vndr Engr/Manufacture & Del to Site - Agitators - WR- Sumps	120	27-Mar-17	13-Sep-17
BMPC3420686	Vndr Engr/Manufacture & Del to Site - Agitators - WR - FGD Maint Tank	120	27-Mar-17	13-Sep-17
Structural/Architectural Contracts		274	18-Jul-16	15-Aug-17
5.4310 - Pre-Engineered Metal Buildings		274	18-Jul-16	15-Aug-17
BMPS4310580	Prep Tech Spec for Q3 Rvw - Pre-Engineered Bldg	20	18-Jul-16*	12-Aug-16
BMPS4310290	Q4/Q6 Rvw Spec - Pre-Engineered Bldg	10	15-Aug-16	26-Aug-16
BMPS4310590	Owner Rvw - Pre-Eng Bldgs	10	29-Aug-16	12-Sep-16
BMPS4310600	IFB - Pre-Eng Bldgs	0		19-Sep-16
BMPS4310610	Supplier Prep and Submit Bids - Pre-Eng Bldgs	20	20-Sep-16	17-Oct-16
BMPS4310620	Technical Evaluation & Bid Tab - Pre-Eng Bldgs	20	18-Oct-16	14-Nov-16
BMPS4310300	Owner Rvw Period - Pre-Engineered Bldg	5	15-Nov-16	21-Nov-16
BMPS4310640	Conform Contract/Issue - Pre-Eng Bldgs	5	22-Nov-16	30-Nov-16
BMPS4310630	Issue PO/ Award Engineering - Pre-Eng Bldgs	0		30-Nov-16
BMPS9112340	Vndr Submittal [FDN Load & Anchor Bolt Design Info] - Pre-Eng Bldgs	0		30-Dec-16
BMPS9112350	Vndr Submittal [Bldg Arrangement Dwgs] - Pre-Eng Bldgs	0		30-Dec-16
BMPM8323381	Rvw Vndr Submittals [FDN Load & Anchor Bolt Design Info] - Pre-Eng Bldgs	15	03-Jan-17	23-Jan-17
BMPM8323411	Rvw Vndr Submittals [Bldg Arrangement Dwgs] - Pre-Eng Bldgs	15	03-Jan-17	23-Jan-17
BMPS9112450	Issue PO Rev/ Release for Fab & Del - Pre-Eng Bldgs	0		24-Mar-17
BMPS9112250	Vndr Engr/Manufacture & Del to Site - Pre-Eng Bldgs - FGD Maint Tank Pump Bldg - Site & Redire	100	27-Mar-17	15-Aug-17
6.4620 - Structural Steel (Program)		237	08-Sep-16	15-Aug-17

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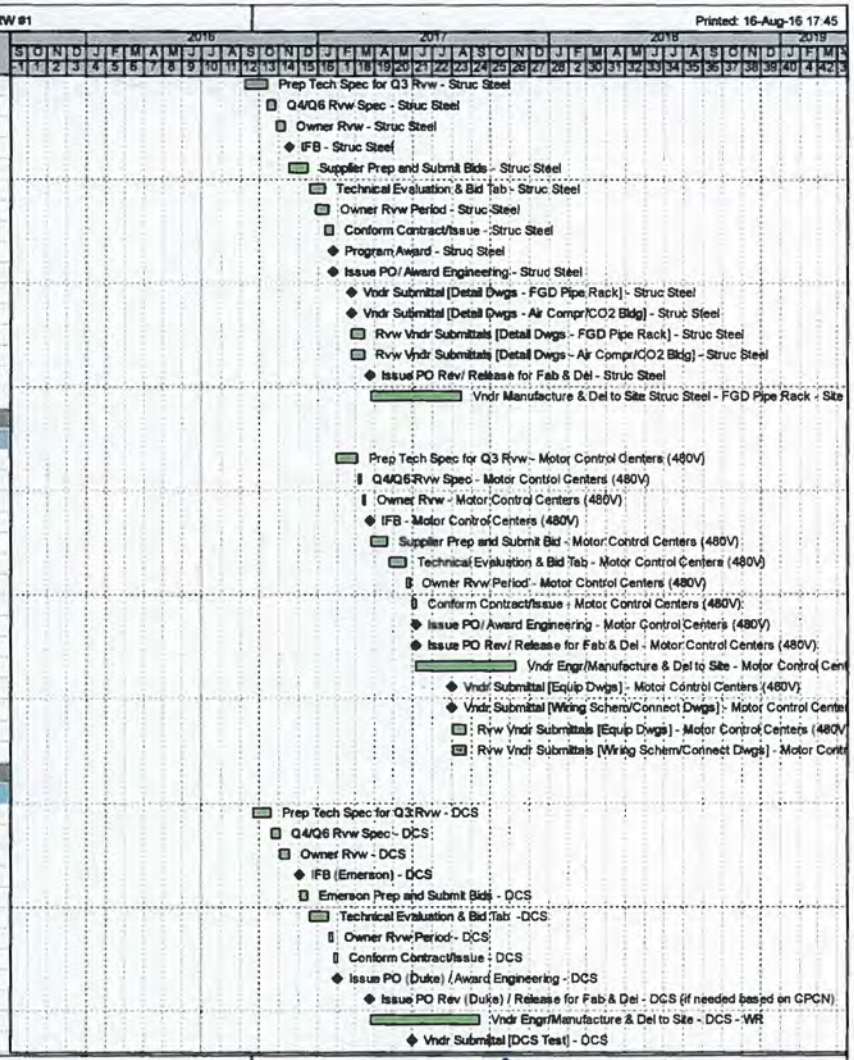
Activity ID	Activity Name	OD	Start	Finish
BMPS4520690	Prep Tech Spec for Q3 Rvw - Struc Steel	25	06-Sep-16*	12-Oct-16
BMPS4520310	Q4/Q6 Rvw Spec - Struc Steel	10	13-Oct-16	26-Oct-16
BMPS4520700	Owner Rvw - Struc Steel	10	27-Oct-16	09-Nov-16
BMPS4520710	IFB - Struc Steel	0		16-Nov-16
BMPS4520720	Supplier Prep and Submit Bids - Struc Steel	20	17-Nov-16	16-Dec-16
BMPS4520730	Technical Evaluation & Bid Tab - Struc Steel	15	19-Dec-16	11-Jan-17
BMPS4520320	Owner Rvw Period - Struc Steel	15	28-Dec-16	18-Jan-17
BMPS4520750	Conform Contract/Issue - Struc Steel	10	12-Jan-17	25-Jan-17
BMPS4520740	Program Award - Struc Steel	0		25-Jan-17
BMPS9112490	Issue PO/ Award Engineering - Struc Steel	0		25-Jan-17
BMPS9112380	Vndr Submittal [Detail Dwgs - FGD Pipe Rack] - Struc Steel	0		22-Feb-17
BMPS9112480	Vndr Submittal [Detail Dwgs - Air Compr/CO2 Bldg] - Struc Steel	0		22-Feb-17
BMPM8323501	Rvw Vndr Submittals [Detail Dwgs - FGD Pipe Rack] - Struc Steel	15	23-Feb-17	15-Mar-17
BMPM8324431	Rvw Vndr Submittals [Detail Dwgs - Air Compr/CO2 Bldg] - Struc Steel	15	23-Feb-17	15-Mar-17
BMPS9112460	Issue PO Rev/ Release for Fab & Del - Struc Steel	0		24-Mar-17
BMPS9112330	Vndr Manufacture & Del to Site Struc Steel - FGD Pipe Rack - Site & Redirects	100	27-Mar-17	15-Aug-17
Electrical Contracts		200	30-Jan-17	08-Nov-17
5.6330 - Motor Control Centers		200	30-Jan-17	08-Nov-17
BMPE5130150	Prep Tech Spec for Q3 Rvw - Motor Control Centers (480V)	25	30-Jan-17	03-Mar-17
BMPE5130560	Q4/Q6 Rvw Spec - Motor Control Centers (480V)	5	06-Mar-17	10-Mar-17
BMPE5130160	Owner Rvw - Motor Control Centers (480V)	5	13-Mar-17	17-Mar-17
BMPE5130170	IFB - Motor Control Centers (480V)	0		24-Mar-17
BMPE5130180	Supplier Prep and Submit Bid - Motor Control Centers (480V)	20	27-Mar-17	21-Apr-17
BMPE5130190	Technical Evaluation & Bid Tab - Motor Control Centers (480V)	20	24-Apr-17	19-May-17
BMPE5130570	Owner Rvw Period - Motor Control Centers (480V)	5	22-May-17	26-May-17
BMPE5130210	Conform Contract/Issue - Motor Control Centers (480V)	5	30-May-17	05-Jun-17
BMPE5130200	Issue PO/ Award Engineering - Motor Control Centers (480V)	0		05-Jun-17
BMPE9230660	Issue PO Rev/ Release for Fab & Del - Motor Control Centers (480V)	0		05-Jun-17
BMPE9230590	Vndr Engr/Manufacture & Del to Site - Motor Control Centers (480V) - WR	110	06-Jun-17	08-Nov-17
BMPE9230640	Vndr Submittal [Equip Dwgs] - Motor Control Centers (480V)	0		01-Aug-17
BMPE9230650	Vndr Submittal [Wiring Schem/Connect Dwgs] - Motor Control Centers (480V)	0		01-Aug-17
BMPM8323621	Rvw Vndr Submittals [Equip Dwgs] - Motor Control Centers (480V)	15	02-Aug-17	22-Aug-17
BMPM8323651	Rvw Vndr Submittals [Wiring Schem/Connect Dwgs] - Motor Control Centers (480V)	15	02-Aug-17	22-Aug-17
Instrument/Control Contracts		274	15-Aug-16	13-Sep-17
5.6110 - DCS System		247	22-Sep-16	13-Sep-17
BMPI6110126	Prep Tech Spec for Q3 Rvw - DCS	20	22-Sep-16	19-Oct-16
BMPI6110336	Q4/Q6 Rvw Spec - DCS	10	20-Oct-16	02-Nov-16
BMPI6110136	Owner Rvw - DCS	10	03-Nov-16	16-Nov-16
BMPI6110146	IFB (Emerson) - DCS	0		02-Dec-16
BMPI6110156	Emerson Prep and Submit Bids - DCS	10	05-Dec-16	16-Dec-16
BMPI6110166	Technical Evaluation & Bid Tab -DCS	20	19-Dec-16	18-Jan-17
BMPI6110346	Owner Rvw Period - DCS	5	19-Jan-17	25-Jan-17
BMPI6110186	Conform Contract/Issue - DCS	5	26-Jan-17	01-Feb-17
BMPI6110176	Issue PO (Duke) / Award Engineering - DCS	0		01-Feb-17
BMPI6210426	Issue PO Rev (Duke) / Release for Fab & Del - DCS (if needed based on CPCN)	0		24-Mar-17
BMPI6210386	Vndr Engr/Manufacture & Del to Site - DCS - WR	120	27-Mar-17	13-Sep-17
BMPI6110376	Vndr Submittal [DCS Test] - DCS	0		31-May-17



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Activity ID	Activity Name	OD	Start	Finish
BMPM8323741	Rvw Vndr Submittals [DCS Test] - DCS	15	01-Jun-17	21-Jun-17
5.6210 - pH & Conductivity (program)		254	15-Aug-16	15-Aug-17
BMPI6210236	Prep Tech Spec for Q3 Rvw - pH & Conductivity	20	15-Aug-16*	12-Sep-16
BMPI6210356	Q4/Q6 Rvw Spec - pH & Conductivity	10	13-Sep-16	26-Sep-16
BMPI6210246	Owner Rvw - pH & Conductivity	10	27-Sep-16	10-Oct-16
BMPI6210256	IFB - pH & Conductivity	0		10-Oct-16
BMPI6210266	Supplier Prep and Submit Bids - pH & Conductivity	15	11-Oct-16	31-Oct-16
BMPI6210276	Technical Evaluation & Bid Tab - pH & Conductivity	10	01-Nov-16	14-Nov-16
BMPI6210366	Owner Rvw Period - pH & Conductivity	10	02-Nov-16	15-Nov-16
BMPI6210296	Conform Contract/Issue - pH & Conductivity	5	16-Nov-16	22-Nov-16
BMPI6210286	Program Award - pH & Conductivity	0		22-Nov-16
BMPI6210576	Issue PO - pH & Conductivity	0		24-Mar-17
BMPI6210406	Vndr Engr/Manufacture & Del to Site - pH & Conductivity - WR	60	22-May-17	15-Aug-17
5.6215 - TSS Analyzers (program)		254	15-Aug-16	15-Aug-17
BMPI6210446	Prep Tech Spec for Q3 Rvw - TSS Analyzers	20	15-Aug-16*	12-Sep-16
BMPI6210526	Q4/Q6 Rvw Spec - TSS Analyzers	10	13-Sep-16	26-Sep-16
BMPI6210456	Owner Rvw - TSS Analyzers	10	27-Sep-16	10-Oct-16
BMPI6210466	IFB - TSS Analyzers	0		10-Oct-16
BMPI6210476	Supplier Prep and Submit Bids - TSS Analyzers	15	11-Oct-16	31-Oct-16
BMPI6210486	Technical Evaluation & Bid Tab - TSS Analyzers	10	01-Nov-16	14-Nov-16
BMPI6210536	Owner Rvw Period - TSS Analyzers	10	02-Nov-16	15-Nov-16
BMPI6210506	Conform Contract/Issue - TSS Analyzers	5	16-Nov-16	22-Nov-16
BMPI6210496	Program Award - TSS Analyzers	0		22-Nov-16
BMPI6210586	Issue PO - TSS Analyzers	0		24-Mar-17
BMPI6210556	Vndr Engr/Manufacture & Del to Site - TSS Analyzers - WR	60	22-May-17	15-Aug-17
Construction Contracts		352	10-Jun-16 A	30-Oct-17
5.8120 - Retention Basin Construction		225	10-Jun-16 A	01-May-17
BMPV8110020	Prep Tech Spec & Q3 Rvw - RB Const	30	10-Jun-16 A	05-Aug-16
BMPV8110030	Owner Rvw - RB Const	10	08-Aug-16	19-Aug-16
BMPV9030210	Q4/Q6 Rvw Spec - RB Const	10	08-Aug-16	19-Aug-16
BMPV8110040	IFB - RB Const	0		19-Oct-16*
BMPV8110050	Bid Period - RB Const	20	20-Oct-16	16-Nov-16
BMPV8110060	Evaluate Bids/Neg & Award - RB Const	20	17-Nov-16	16-Dec-16
BMPV9030190	Owner Rvw Period - RB Const	5	19-Dec-16	27-Dec-16
BMPV8110080	Conform Contract/Issue IFC Dwgs - RB Const	5	28-Dec-16	04-Jan-17
BMPV8110070	Issue PO - RB Const	0		24-Mar-17
BMPV8110090	Vndr Submittal [Insurance/Safety/Site Info] - RB Const	0		07-Apr-17
BMPM8323771	Rvw Vndr Submittals [Insurance/Safety/Site Info] - RB Const	10	10-Apr-17	21-Apr-17
BMPM8323791	Vndr Updates/ Issue Final Submittals [Insurance/Safety/Site Info] - RB Const	5	24-Apr-17	28-Apr-17
BMPV8110M58	Issue NTP - RB Const	0		01-May-17
5.8140 - Site Finishing		145	06-Apr-17	30-Oct-17
BMPV8140100	Prep Tech Spec & Q3 Rvw - Site Finishing	20	06-Apr-17	03-May-17
BMPV9030220	Q4/Q6 Rvw Spec - Site Finishing	10	04-May-17	17-May-17
BMPV8140110	Owner Rvw - Site Finishing	10	18-May-17	01-Jun-17
BMPV8140120	IFB - Site Finishing	0		15-Jun-17
BMPV8140130	Bid Period - Site Finishing	20	16-Jun-17	14-Jul-17
BMPV8140140	Evaluate Bids/Neg & Award - Site Finishing	20	17-Jul-17	11-Aug-17

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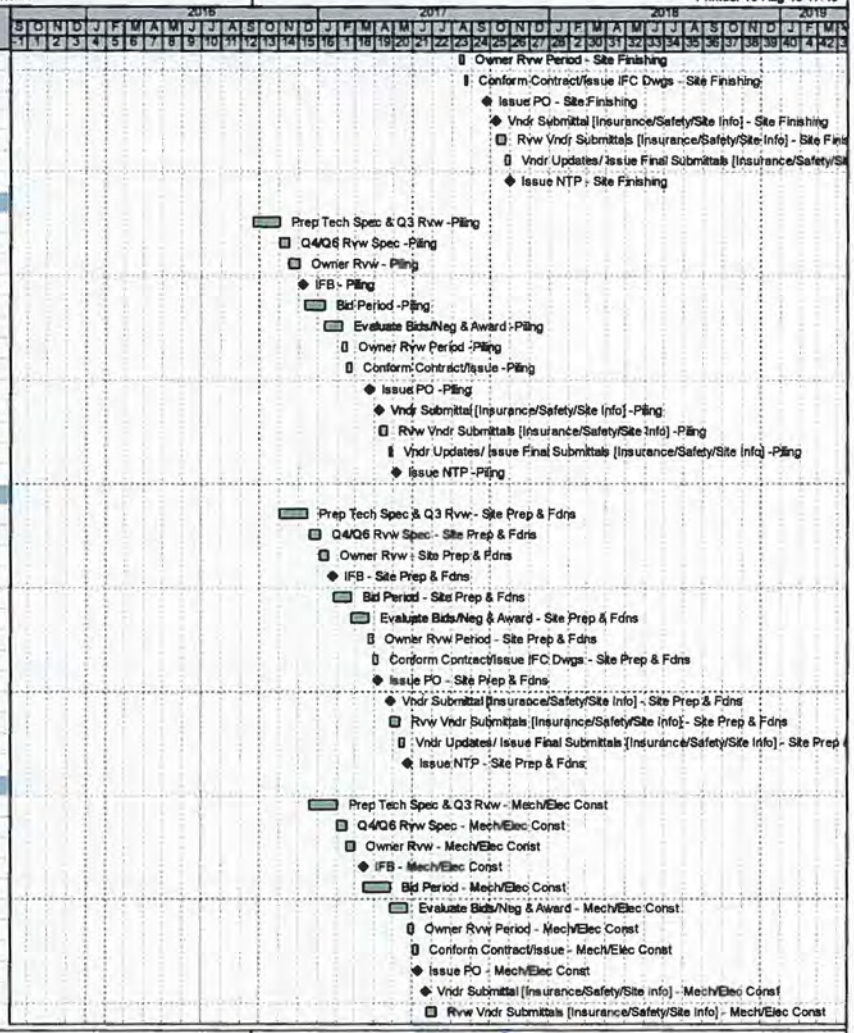
Activity ID	Activity Name	OD	Start	Finish
BMPV9030200	Owner Rvw Period - Site Finishing	5	14-Aug-17	18-Aug-17
BMPV8140160	Conform Contract/Issue IFC Dwgs - Site Finishing	5	21-Aug-17	25-Aug-17
BMPV8140150	Issue PO - Site Finishing	0		25-Sep-17
BMPV8140170	Vndr Submittal [Insurance/Safety/Site Info] - Site Finishing	0		09-Oct-17
BMPM8323801	Rvw Vndr Submittals [Insurance/Safety/Site Info] - Site Finishing	10	10-Oct-17	23-Oct-17
BMPM8323821	Vndr Updates/ Issue Final Submittals [Insurance/Safety/Site Info] - Site Finishing	5	24-Oct-17	30-Oct-17
BMPV8140M58	Issue NTP - Site Finishing	0		30-Oct-17
5.8210 - Piling		157	22-Sep-16	05-May-17
BMPS8210860	Prep Tech Spec & Q3 Rvw -Piling	30	22-Sep-16	02-Nov-16
BMPS9112430	Q4/Q6 Rvw Spec -Piling	10	03-Nov-16	16-Nov-16
BMPS8210870	Owner Rvw - Piling	10	17-Nov-16	02-Dec-16
BMPS8210880	IFB - Piling	0		09-Dec-16
BMPS8210890	Bid Period -Piling	20	12-Dec-16	11-Jan-17
BMPS8210900	Evaluate Bids/Neg & Award -Piling	20	12-Jan-17	08-Feb-17
BMPS9112400	Owner Rvw Period -Piling	5	09-Feb-17	15-Feb-17
BMPS8210920	Conform Contract/Issue -Piling	5	16-Feb-17	22-Feb-17
BMPS8210910	Issue PO -Piling	0		24-Mar-17
BMPS8210930	Vndr Submittal [Insurance/Safety/Site Info] -Piling	0		07-Apr-17
BMPM8323831	Rvw Vndr Submittals [Insurance/Safety/Site Info] -Piling	10	10-Apr-17	21-Apr-17
BMPM8323851	Vndr Updates/ Issue Final Submittals [Insurance/Safety/Site Info] -Piling	5	24-Apr-17	28-Apr-17
BMPS8210M58	Issue NTP -Piling	0		05-May-17
5.8220 - Site Prep & Foundations		140	03-Nov-16	24-May-17
BMPS8220940	Prep Tech Spec & Q3 Rvw - Site Prep & Fdns	30	03-Nov-16	16-Dec-16
BMPS9112440	Q4/Q6 Rvw Spec - Site Prep & Fdns	10	19-Dec-16	04-Jan-17
BMPS8220950	Owner Rvw - Site Prep & Fdns	10	05-Jan-17	18-Jan-17
BMPS8220960	IFB - Site Prep & Fdns	0		25-Jan-17
BMPS8220970	Bid Period - Site Prep & Fdns	20	26-Jan-17	22-Feb-17
BMPS8220980	Evaluate Bids/Neg & Award - Site Prep & Fdns	20	23-Feb-17	22-Mar-17
BMPS9112410	Owner Rvw Period - Site Prep & Fdns	5	23-Mar-17	29-Mar-17
BMPS8220000	Conform Contract/Issue IFC Dwgs - Site Prep & Fdns	5	30-Mar-17	05-Apr-17
BMPS8220990	Issue PO - Site Prep & Fdns	0		05-Apr-17
BMPS8220010	Vndr Submittal [Insurance/Safety/Site Info] - Site Prep & Fdns	0		26-Apr-17
BMPM8323861	Rvw Vndr Submittals [Insurance/Safety/Site Info] - Site Prep & Fdns	10	27-Apr-17	10-May-17
BMPM8323881	Vndr Updates/ Issue Final Submittals [Insurance/Safety/Site Info] - Site Prep & Fdns	5	11-May-17	17-May-17
BMPS8220M58	Issue NTP - Site Prep & Fdns	0		24-May-17
5.8320 - Mechanical/Electrical Construction		150	19-Dec-16	21-Jul-17
BMPM8320741	Prep Tech Spec & Q3 Rvw - Mech/Elec Const	30	19-Dec-16	01-Feb-17
BMPM8324221	Q4/Q6 Rvw Spec - Mech/Elec Const	10	02-Feb-17	15-Feb-17
BMPM8320751	Owner Rvw - Mech/Elec Const	10	16-Feb-17	01-Mar-17
BMPM8320762	IFB - Mech/Elec Const	0		15-Mar-17
BMPM8320771	Bid Period - Mech/Elec Const	30	16-Mar-17	26-Apr-17
BMPM8320781	Evaluate Bids/Neg & Award - Mech/Elec Const	20	27-Apr-17	24-May-17
BMPM8323951	Owner Rvw Period - Mech/Elec Const	5	25-May-17	01-Jun-17
BMPM8320801	Conform Contract/Issue - Mech/Elec Const	5	02-Jun-17	08-Jun-17
BMPM8320791	Issue PO - Mech/Elec Const	0		08-Jun-17
BMPM8320811	Vndr Submittal [Insurance/Safety/Site Info] - Mech/Elec Const	0		22-Jun-17
BMPM8323891	Rvw Vndr Submittals [Insurance/Safety/Site Info] - Mech/Elec Const	10	23-Jun-17	07-Jul-17



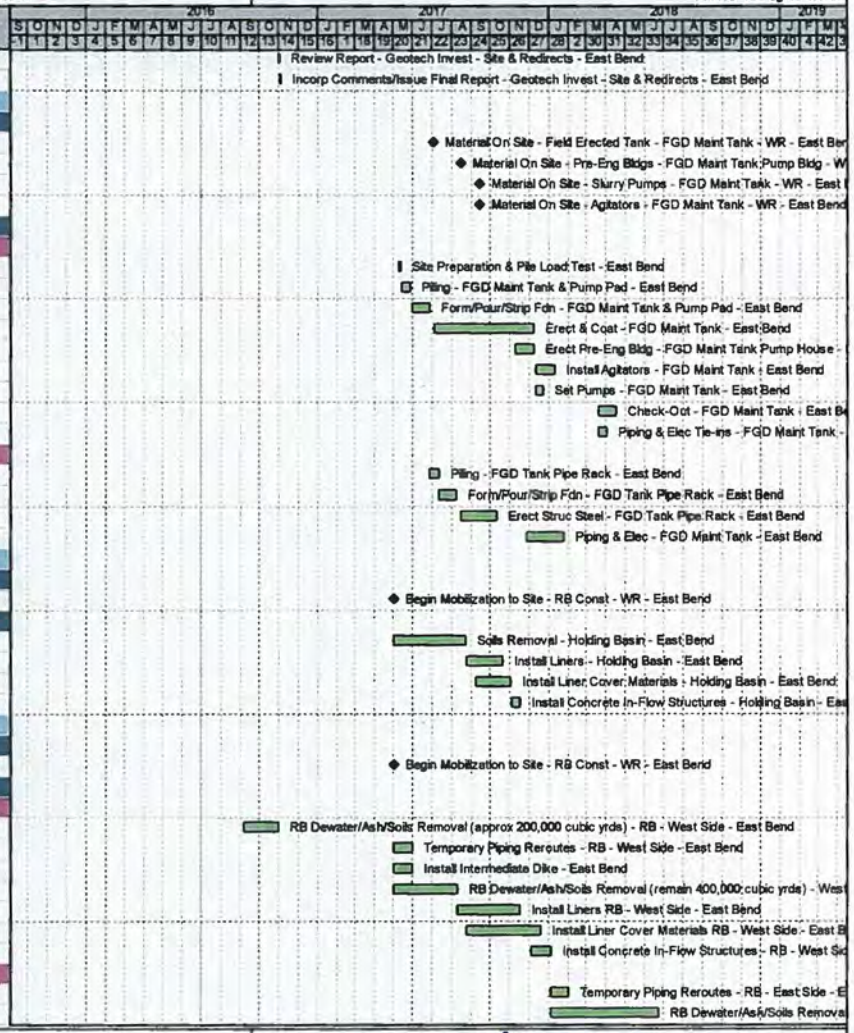
DUKE ENERGY

BURNS McDONNELL

Activity ID	Activity Name	OD	Start	Finish
BMPM8323911	Vndr Updates/ Issue Final Submittals [Insurance/Safety/Site Info] - Mech/Elec Const	5	10-Jul-17	14-Jul-17
BMPM8320M58	Issue NTP -Mech/ElecConst	0		21-Jul-17
Construction Service Contracts		32	13-Jul-16	25-Aug-16
5.9010 - Geotechnical Investigation		32	13-Jul-16	25-Aug-16
BMPV9030230	Prep Tech Spec & Q3 Rvw - Geotech Investigation	10	13-Jul-16*	26-Jul-16
BMPV9030240	Q4/Q6 Rvw Spec - Geotech Investigation	5	27-Jul-16	02-Aug-16
BMPV9030250	Owner Rvw - Geotech Investigation	5	03-Aug-16	09-Aug-16
BMPV9030260	IFB - Geotech Investigation	0		09-Aug-16
BMPV9030270	Bid Period - Geotech Investigation	5	10-Aug-16	16-Aug-16
BMPV9030280	Evaluate Bids/Neg & Award - Geotech Investigation	5	17-Aug-16	23-Aug-16
BMPV9030300	Conform Contract/Issue - Geotech Investigation	2	24-Aug-16	25-Aug-16
BMPV9030310	Issue PO - Geotech Investigation	0		25-Aug-16
Construction		571	26-Aug-16	29-Nov-18
WR		571	26-Aug-16	29-Nov-18
Overall Water Redirects Construction		340	26-Aug-16	03-Jan-18
Information & Equipment Available		195	24-Mar-17	03-Jan-18
IFC Packages		190	24-Mar-17	22-Dec-17
BMESIFCDQC122	Issue Piling Const Pkg - WR - East Bend	0		24-Mar-17
BMEMIFCPBC12	Issue BG Plans/Iso's Const Pkg - WR - East Bend	0		05-Apr-17
BMESIFCDVC113	Issue Fdn Design Const Pkg - WR - East Bend	0		05-Apr-17
BMEMQUAPSB3	Issue HVAC Const Pkg - WR - East Bend	0		08-Jun-17
BMEMQUAPS3C	Issue AG LB Pipe Supports Const Pkg - WR - East Bend	0		08-Jun-17
BMEMIFCGDC110	Issue Overall GA & AG Plans Const Pkg - WR - East Bend	0		08-Jun-17
BMEMIFCPBC102	Issue AG Plans/Iso's Const Pkg - WR - East Bend	0		08-Jun-17
BMEIFLOD61C118	Issue Instr List Const Pkg - WR - East Bend	0		08-Jun-17
BMEIIFCD9C1C1	Issue Inst Plan Dwgs & Details Const Pkg - WR - East Bend	0		08-Jun-17
BMESIFCDSTC1	Issue Struc Steel Design Const Pkg - WR - East Bend	0		08-Jun-17
BMEEMODLMD2	Issue Grounding Const Pkg - WR - East Bend	0		12-Jun-17
BMEEIFCEAC111	Issue BG Elec Raceway Const Pkg - WR - East Bend	0		12-Jun-17
BMEEMODLMD3	Issue Cabling Const Pkg - WR - East Bend	0		22-Dec-17
BMEEMODLMDC	Issue Schematics & Wiring Diagrams Const Pkg - WR - East Bend	0		22-Dec-17
BMEEIFCEAC101	Issue AG Elec Raceway Const Pkg - WR - East Bend	0		22-Dec-17
BMEEMODLMDC	Issue Light/Rcpt/Comm Plan Const Pkg - Site & Redirects	0		22-Dec-17
BMEEMODLMDC	Issue Panelboards Const Pkg - Site & Redirects	0		22-Dec-17
Equipment/Contractor Available		165	05-May-17	03-Jan-18
PR4310-3295	Begin Mobilization to Site - Piling Const - WR - East Bend	0		05-May-17
PR4310-3285	Begin Mobilization to Site - Site Prep & Fdns - WR - East Bend	0		24-May-17
PR4310-3305	Begin Mobilization to Site - Mech/Elec Const - WR - East Bend	0		21-Jul-17
PR4520-060	Material On Site - Struc Steel - FGD Pipe Rack - WR - East Bend	0		15-Aug-17
PR6110-060	Material On Site - DCS - WR - East Bend	0		13-Sep-17
PR5330-060	Material On Site - Motor Control Centers - WR - East Bend	0		08-Nov-17
BMPV8140C58	Begin Mobilization to Site - Site Finishing - WR - East Bend	0		03-Jan-18
Geotechnical Investigation		50	26-Aug-16	04-Nov-16
CN17360	Mobilization to Site - Geotech Invest - Site & Redirects - East Bend	10	26-Aug-16	09-Sep-16
CN17370	Field Invest - Geotech Invest - Site & Redirects - East Bend	10	12-Sep-16	23-Sep-16
CN17380	Lab Work - Geotech Invest - Site & Redirects - East Bend	15	26-Sep-16	14-Oct-16
CN17390	Develop/Issue Draft Report - Geotech Invest - Site & Redirects - East Bend	10	17-Oct-16	28-Oct-16

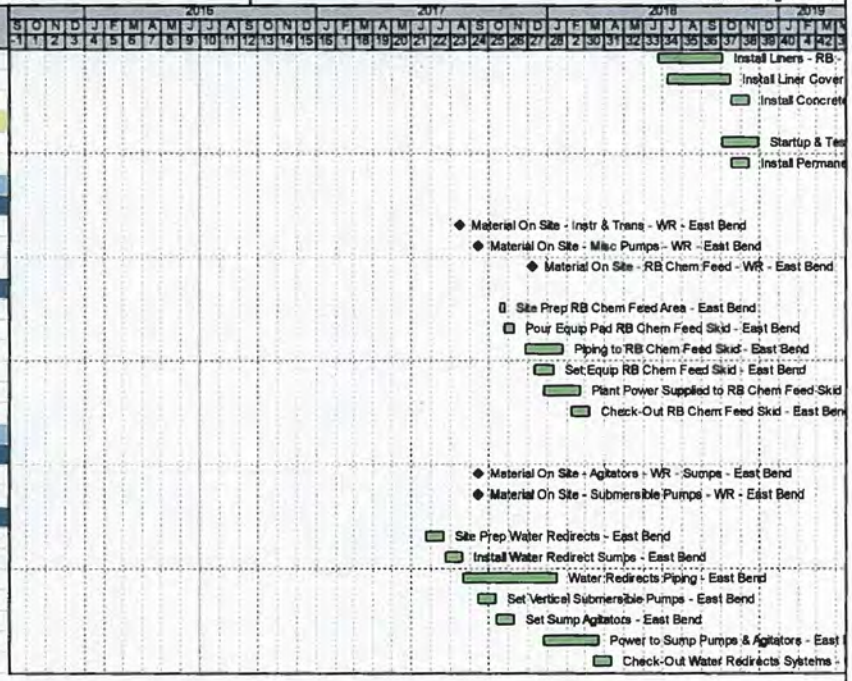
Duke Water Re-Direction Program - East Bend L3 | Standard Layout - JRW #1 | Printed: 16-Aug-16 17:45

Activity ID	Activity Name	OD	Start	Finish
CN17400	Review Report - Geotech Invest - Site & Redirects - East Bend	3	31-Oct-16	02-Nov-16
CN17410	Incorp Comments/Issue Final Report - Geotech Invest - Site & Redirects - East Bend	2	03-Nov-16	04-Nov-16
Field Erected Tank		238	08-May-17	16-Apr-18
Information & Equipment Available		50	03-Jul-17	13-Sep-17
PR2970-050	Material On Site - Field Erected Tank - FGD Maint Tank - WR - East Bend	0		03-Jul-17
BMPS4310C66	Material On Site - Pre-Eng Bldgs - FGD Maint Tank Pump Bldg - WR - East Bend - East Bend	0		15-Aug-17
PR2180-050	Material On Site - Slurry Pumps - FGD Maint Tank - WR - East Bend	0		13-Sep-17
PR3420-050	Material On Site - Agitators - FGD Maint Tank - WR - East Bend	0		13-Sep-17
Construction		238	08-May-17	16-Apr-18
FGD Maint Tank & Pump House		236	08-May-17	16-Apr-18
CN16890	Site Preparation & Pile Load Test - East Bend	5	08-May-17	12-May-17
CN17090	Piling - FGD Maint Tank & Pump Pad - East Bend	10	15-May-17	26-May-17
CN17600	Form/Pour/Strip Fdn - FGD Maint Tank & Pump Pad - East Bend	20	30-May-17	26-Jun-17
CN17110	Erect & Coat - FGD Maint Tank - East Bend	110	05-Jul-17	08-Dec-17
CN17340	Erect Pre-Eng Bldg - FGD Maint Tank Pump House - East Bend	20	09-Nov-17	06-Dec-17
CN17140	Install Agitators - FGD Maint Tank - East Bend	20	11-Dec-17	10-Jan-18
CN17350	Set Pumps - FGD Maint Tank - East Bend	10	11-Dec-17	22-Dec-17
CN17160	Check-Out - FGD Maint Tank - East Bend	20	20-Mar-18	16-Apr-18
CN17640	Piping & Elec Tie-ins - FGD Maint Tank - East Bend	10	20-Mar-18	02-Apr-18
FGD Tank Pipe Rack		145	27-Jun-17	24-Jan-18
CN17610	Piling - FGD Tank Pipe Rack - East Bend	10	27-Jun-17	11-Jul-17
CN17620	Form/Pour/Strip Fdn - FGD Tank Pipe Rack - East Bend	20	12-Jul-17	08-Aug-17
CN17630	Erect Struc Steel - FGD Tank Pipe Rack - East Bend	40	16-Aug-17	11-Oct-17
CN17150	Piping & Elec - FGD Maint Tank - East Bend	40	27-Nov-17	24-Jan-18
Holding Basin		140	01-May-17	16-Nov-17
Information & Equipment Available		0	01-May-17	01-May-17
PR4310-3335	Begin Mobilization to Site - RB Const - WR - East Bend	0		01-May-17
Construction		140	02-May-17	16-Nov-17
CN17690	Soils Removal - Holding Basin - East Bend	80	02-May-17	23-Aug-17
CN17700	Install Liners - Holding Basin - East Bend	40	24-Aug-17	19-Oct-17
CN17710	Install Liner Cover Materials - Holding Basin - East Bend	40	06-Sep-17	02-Nov-17
CN17720	Install Concrete In-Flow Structures - Holding Basin - East Bend	10	03-Nov-17	16-Nov-17
Retention Basin		565	06-Sep-16	29-Nov-18
Information & Equipment Available		0	01-May-17	01-May-17
PR4310-3315	Begin Mobilization to Site - RB Const - WR - East Bend	0		01-May-17
Construction		565	06-Sep-16	29-Nov-18
West Retention Basin		335	06-Sep-16	04-Jan-18
CN16550	RB Dewater/Ash/Soils Removal (approx 200,000 cubic yrds) - RB - West Side - East Bend	40	06-Sep-16	31-Oct-16
CN16620	Temporary Piping Reroutes - RB - West Side - East Bend	20	02-May-17	30-May-17
CN17520	Install Intermediate Dike - East Bend	20	02-May-17	30-May-17
CN17650	RB Dewater/Ash/Soils Removal (remain 400,000 cubic yrds) - West Side - East Bend	70	02-May-17	09-Aug-17
CN16580	Install Liners RB - West Side - East Bend	70	10-Aug-17	16-Nov-17
CN16590	Install Liner Cover Materials RB - West Side - East Bend	80	24-Aug-17	18-Dec-17
CN16560	Install Concrete In-Flow Structures - RB - West Side - East Bend	20	05-Dec-17	04-Jan-18
East Retention Basin		230	05-Jan-18	29-Nov-18
CN17420	Temporary Piping Reroutes - RB - East Side - East Bend	20	05-Jan-18	01-Feb-18
CN17660	RB Dewater/Ash/Soils Removal - RB - East Side - East Bend	120	05-Jan-18	22-Jun-18



Duke Water Re-Direction Program - East Bend L3 | Standard Layout - JRW #1 | Printed: 16-Aug-16 17:45

Activity ID	Activity Name	OD	Start	Finish
CN17430	Install Liners - RB - East Side - East Bend	70	25-Jun-18	02-Oct-18
CN17440	Install Liner Cover Materials - RB - East Side - East Bend	70	10-Jul-18	16-Oct-18
CN17450	Install Concrete In-Flow Structures - RB - East Side - East Bend	20	17-Oct-18	13-Nov-18
Startup & Commissioning		40	03-Oct-18	29-Nov-18
CN16640	Startup & Testing RB - East Bend	40	03-Oct-18	29-Nov-18
CN17500	Install Permanent Piping Hookups - RB - East Bend	20	17-Oct-18	13-Nov-18
Retention Basin Chemical Feed		140	15-Aug-17	07-Mar-18
Information & Equipment Available		80	15-Aug-17	08-Dec-17
PR6210-060	Material On Site - Instr & Trans - WR - East Bend	0		15-Aug-17
PR2190-060	Material On Site - Misc Pumps - WR - East Bend	0		13-Sep-17
PR3418-060	Material On Site - RB Chem Feed - WR - East Bend	0		08-Dec-17
Construction		95	19-Oct-17	07-Mar-18
CN16680	Site Prep RB Chem Feed Area - East Bend	5	19-Oct-17	25-Oct-17
CN16700	Pour Equip Pad RB Chem Feed Skid - East Bend	10	26-Oct-17	08-Nov-17
CN16730	Piping to RB Chem Feed Skid - East Bend	40	27-Nov-17	24-Jan-18
CN16710	Set Equip RB Chem Feed Skid - East Bend	20	11-Dec-17	10-Jan-18
CN16720	Plant Power Supplied to RB Chem Feed Skid - East Bend	40	27-Dec-17	21-Feb-18
CN16740	Check-Out RB Chem Feed Skid - East Bend	20	08-Feb-18	07-Mar-18
Water Re-Directs		202	23-Jun-17	11-Apr-18
Information & Equipment Available		0	13-Sep-17	13-Sep-17
BMPC3420C46	Material On Site - Agitators - WR - Sumps - East Bend	0		13-Sep-17
PR2170-060	Material On Site - Submersible Pumps - WR - East Bend	0		13-Sep-17
Construction		202	23-Jun-17	11-Apr-18
CN16790	Site Prep Water Redirects - East Bend	20	23-Jun-17	21-Jul-17
CN16830	Install Water Redirect Sumps - East Bend	20	24-Jul-17	18-Aug-17
CN16690	Water Redirects Piping - East Bend	100	21-Aug-17	15-Jan-18
CN16800	Set Vertical Submersible Pumps - East Bend	20	14-Sep-17	11-Oct-17
CN17670	Set Sump Agitators - East Bend	20	12-Oct-17	08-Nov-17
CN16810	Power to Sump Pumps & Agitators - East Bend	60	27-Dec-17	21-Mar-18
CN16840	Check-Out Water Redirects Systems - East Bend	20	15-Mar-18	11-Apr-18



Appendix K

Cost Estimate
(Submitted Separately)

Prepared by:

DUKE ENERGY.

EAST BEND STATION

ASH POND

CLOSURE PLAN

OCTOBER 10, 2016

Certified by:

amec foster wheeler

Amec Foster Wheeler Environment & Infrastructure, Inc.

1075 Big Shanty Road, NW, Suite 100

Kennesaw, Georgia 30144

EB_CLOSE_PLN

Rev. 0

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Rev. 0

Duke Energy Kentucky, LLC (Duke Energy) prepared this Closure Plan for the Coal Combustion Residuals (CCR) surface impoundment (Ash Pond) at the East Bend Station (East Bend) pursuant to the requirements of 40 C.F.R. § 257.102(b) of the Disposal of CCR from Electric Utilities rule, 80 Fed. Reg. 21302 (April 17, 2015). Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was retained by Duke Energy to certify that this Closure Plan meets the requirements of 40 C.F.R. § 257.102. The information contained in this Closure Plan will be used to assist Duke Energy in the closure of the Ash Pond located in Boone County, Kentucky, on property owned by Duke Energy. This Closure Plan may be amended pursuant to the requirements of 40 C.F.R. § 257.102(b)(3). Presented below are:

1. A narrative of closure activities;
2. A description of the procedures to remove CCR and decontaminate the CCR unit;
3. An estimate of the in-place CCR inventory requiring closure;
4. An estimate of the largest area of the CCR unit requiring a final cover (as needed);
5. A closure schedule; and
6. A written certification from a qualified professional engineer, licensed in Kentucky, that this Closure Plan meets the requirements of 40 C.F.R. § 257.102.

1 NARRATIVE OF CLOSURE ACTIVITIES

The purpose of this Closure Plan is to describe the steps required to close the Ash Pond at East Bend Station consistent with recognized and generally accepted good engineering practices. Closure of the Ash Pond will be designed to reduce the need for long-term maintenance and control the post-closure release of constituents into environmental pathways (i.e. air, surface water, and groundwater).

The Ash Pond will be closed through the removal of CCR, and the closure will be performed pursuant to 40 CFR § 257.102(c). CCR will be removed as described in the following section.

2 CCR REMOVAL AND DECONTAMINATION

The procedures to remove CCR from the Ash Pond include dewatering and utilizing appropriate equipment and methods to excavate and move the CCR to a permitted on-site landfill. Dewatering will include removal of bulk water/free liquids and interstitial/pore water (as needed) to allow for safe excavation.

Existing appurtenant structures, such as ditches, culverts and miscellaneous piping, will be decontaminated and abandoned in place, removed and disposed in a permitted disposal facility, or removed and recycled in a beneficial use facility identified at the time of closure. Decontamination procedures may consist of pressure washing, scrubbing, or other generally accepted decontamination procedures.

Pursuant to 40 C.F.R. § 257.102(c), closure will be complete when groundwater monitoring concentrations do not exceed the applicable groundwater protection standard established pursuant to 40 C.F.R. § 257.95(h) for constituents listed in appendix IV 40 of C.F.R. Part 257.

3 ESTIMATE OF IN-PLACE CCR INVENTORY

The volume of CCR present in the Ash Pond was calculated and is presented in Table 1 below, pursuant to 40 C.F.R. § 257.102(b)(1)(iv). The volume is the inventory of CCR that will be open (and require closure) at one time, and the estimate is based on bathymetric surveys and historical topography as of September 2014. The annual surface impoundment inspections completed, pursuant to 40 C.F.R. § 257.83(b), contain the most recent estimates of CCR material in the Ash Pond. These are posted to the Duke Energy CCR website, pursuant to 40 C.F.R § 257.107(g)(5).

Table 1. Estimated In-Place CCR Inventory

Basin	Quantity of CCR (cubic yards)
Ash Pond	878,070

4 ESTIMATE OF LARGEST AREA REQUIRING FINAL COVER

CCR will be removed from the Ash Pond pursuant to 40 C.F.R. § 257.102(c). Therefore, no final cover system will be needed in support of closure activities.

5 CLOSURE SCHEDULE

Closure of the Ash Pond will be initiated pursuant to 40 C.F.R. § 257.102(e) and is anticipated to be completed within five years of the commencement of closure pursuant to 40 C.F.R. § 257.102(f)(1)(ii). Closure of the Ash Pond is anticipated to be completed by 2021.

Prior to commencing closure construction, design documents will be prepared to support applications for required local, state, and federal permits. Closure construction design documents will include construction drawings, technical specifications, and quality assurance testing work plans. The permits required for closure construction activities will be evaluated at the time of closure, and are anticipated to include permits from Kentucky Department for Environmental Protection (KDEP). Preliminary time frames for anticipated closure activities are included below in Table 2.

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Table 2. Estimated Time Frames for Closure Activities

Closure Activity	Time Frame (year)*
KDEP Closure Plan Approval	1
KDEP Permitting Approvals (NPDES, E&SC, Air)	1
Dewatering and Stabilization	2
CCR Excavation	1

*Estimated closure activity time frames may include some overlap.

6 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, James L. Studer, being a registered Professional Engineer in the state of Kentucky, do hereby certify to the best of my knowledge, information, and belief, that the information contained in this written Closure Plan dated October 10, 2016, was developed pursuant to the requirements of 40 C.F.R. § 257.102 and has been prepared pursuant to recognized and generally accepted good engineering practices.

SIGNATURE _____ DATE 10 OCT 16

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ASH BASIN CLOSURE PLAN

EAST BEND STATION

6293 BEAVER ROAD

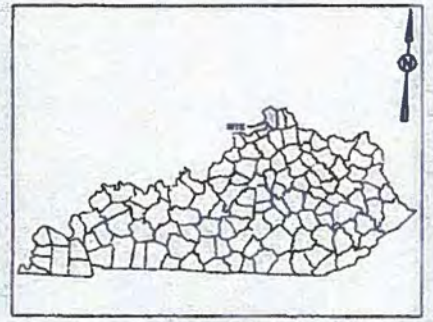
BOONE COUNTY, KENTUCKY

Latitude: 38°54'55.97"N, Longitude -84°50'44.28"W

SITE VICINITY MAP - 1" = 5 MILES
MAP SOURCE: ESRI WORLD TOPOGRAPHIC BASEMAP

SITE VICINITY MAP - 1" = 2000'
MAP SOURCE: ESRI WORLD TOPOGRAPHIC BASEMAP

SITE VICINITY MAP - 1" = 500'
MAP SOURCE: ESRI WORLD TOPOGRAPHIC BASEMAP



KENTUCKY STATE MAP
MAP SOURCE: USGS COUNTY DIGITAL MAPS

DRAWING INDEX	
DRAWING NUMBER	Sheet Title
EBS_C901.001.001	COVER SHEET
EBS_C901.001.002	AERIAL SITE PLAN
EBS_C901.001.003	SITE EXISTING CONDITIONS PLAN - OVERALL
EBS_C901.001.004	SITE BOUNDARY PLAN
EBS_C901.001.005	SITE EXISTING CONDITIONS PLAN 1 OF 2
EBS_C901.001.006	SITE EXISTING CONDITIONS PLAN 2 OF 2
EBS_C901.001.007	CCR EXCAVATION PLAN 1 OF 2
EBS_C901.001.008	CCR EXCAVATION PLAN 2 OF 2
EBS_C904.001.009	CLOSURE SECTIONS 1 OF 2
EBS_C901.001.010	CLOSURE SECTIONS 2 OF 2
EBS_C901.001.011	STORMWATER MANAGEMENT DETAILS 1 OF 2
EBS_C901.001.012	STORMWATER MANAGEMENT DETAILS 2 OF 2

CONTACT INFORMATION

OWNER: DUKE ENERGY KENTUCKY INC
ADDRESS: 139 EAST FOURTH STREET
CINCINNATI OHIO 45202

ENGINEER: AMEC FOSTER WHEELER
ADDRESS: 1675 BIG SHANTY ROAD
KENNESAW GEORGIA 30144
PHONE: 770-421-3400

Commercial & Infrastructure

amec foster wheeler

TITLE: ASH BASIN CLOSURE PLAN
EAST BEND STATION
COVER SHEET

100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION

DUKE ENERGY.

DRAWING NO: EBS_C901.001.001
REVISION: 0

EBS_C901.001.001 Rev. 0

NOTES:
APPROXIMATE LIMITS OF CCR BOUNDARY ARE BASED ON RECENT "TOPOGRAPHY AND AERIAL IMAGERY."

ASH BASIN CLOSURE PLAN
EAST BEND STATION
AERIAL SITE PLAN

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DUKE ENERGY

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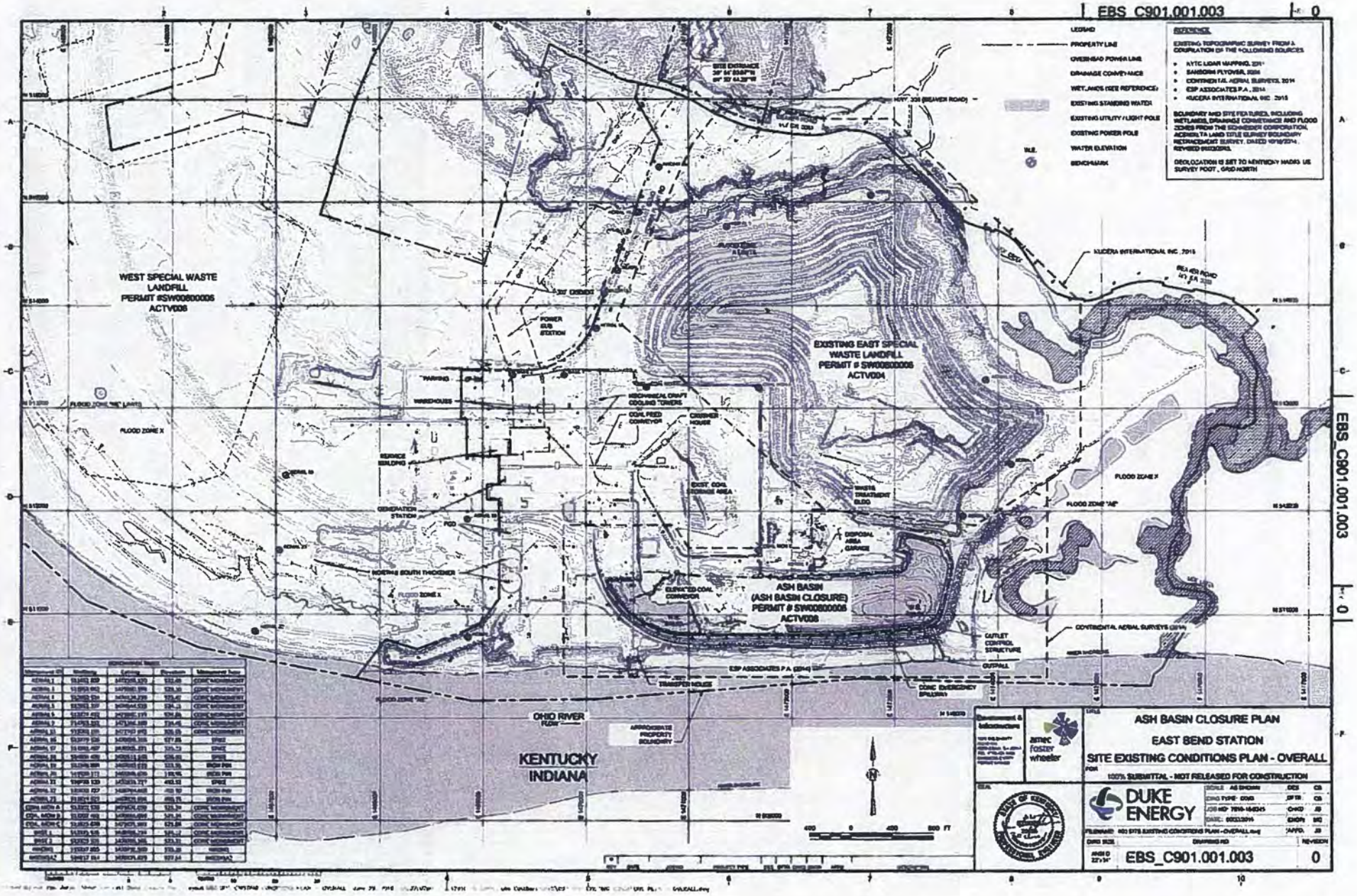
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WEST SPECIAL WASTE LANDFILL PERMIT #SW00800005 ACTV008
EXISTING EAST SPECIAL WASTE LANDFILL PERMIT # SW00800005 ACTV004
ASH BASIN (ASH BASIN CLOSURE) PERMIT # SW00800005 ACTV008
KENTUCKY
INDIANA
OHIO RIVER FLOW
KUCERA INTERNATIONAL INC. 2015
CONTINENTAL AERIAL SURVEYS (2014)
ESP ASSOCIATES P.A. (2014)
ASH BASIN CLOSURE PLAN
EAST BEND STATION
SITE EXISTING CONDITIONS PLAN - OVERALL
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
DUKE ENERGY
EBS_C901.001.003
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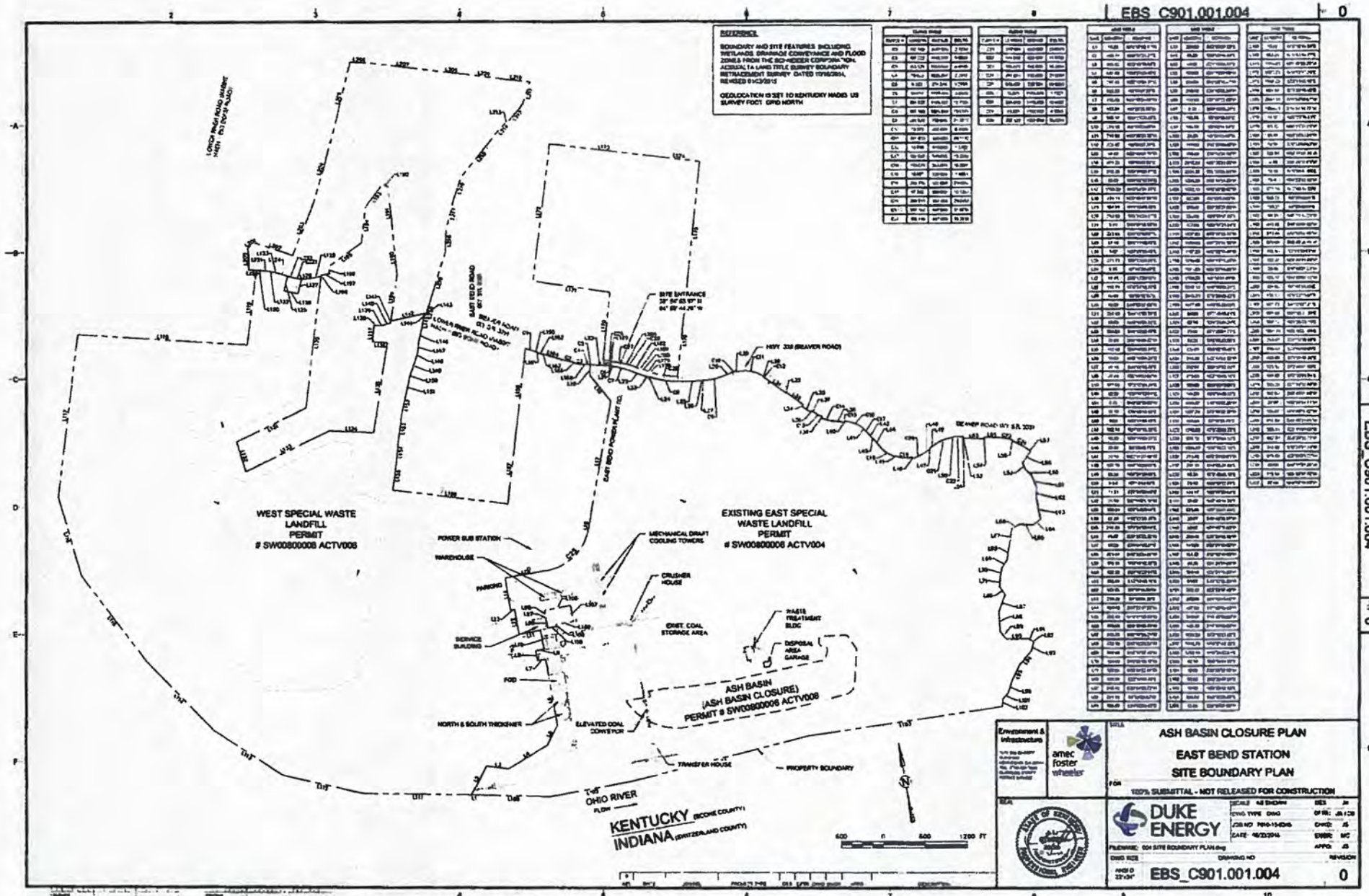
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REFERENCE
BOUNDARY AND SITE FEATURES INCLUDING WETLANDS, DRAINAGE CONVEYANCE AND FLOOD ZONES FROM THE SCHNEIDER CORPORATION ACSS/ALTA LAND TITLE SURVEY BOUNDARY RETRACEMENT SURVEY DATED 10/16/2014, REVISED 01/23/2015
GEOLOCATION IS SET TO KENTUCKY NAD83 US SURVEY FOOT GRID NORTH
WEST SPECIAL WASTE LANDFILL PERMIT # SW00800008 ACTV008
EXISTING EAST SPECIAL WASTE LANDFILL PERMIT # SW00800006 ACTV004
ASH BASIN (ASH BASIN CLOSURE) PERMIT # SW00800006 ACTV008
SITE ENTRANCE
HWY 338 (BEAVER ROAD)
EAST BEND POWER PLANT RD
POWER SUB STATION
WAREHOUSE
PARKING
SERVICE BUILDING
MECHANICAL DRAFT COOLING TOWERS
CRUSHER HOUSE
EXIST. COAL STORAGE AREA
WASTE PRETREATMENT BLDG
DISPOSAL AREA GARAGE
FGD
NORTH & SOUTH THICKENER
ELEVATED COAL CONVEYOR
TRANSFER HOUSE
PROPERTY BOUNDARY
OHIO RIVER
KENTUCKY (BOONE COUNTY)
INDIANA (SWITZERLAND COUNTY)
400 0 400 1200 FT
Environment & Infrastructure
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
SITE BOUNDARY PLAN
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
DUKE ENERGY
EBS_C901.001.004
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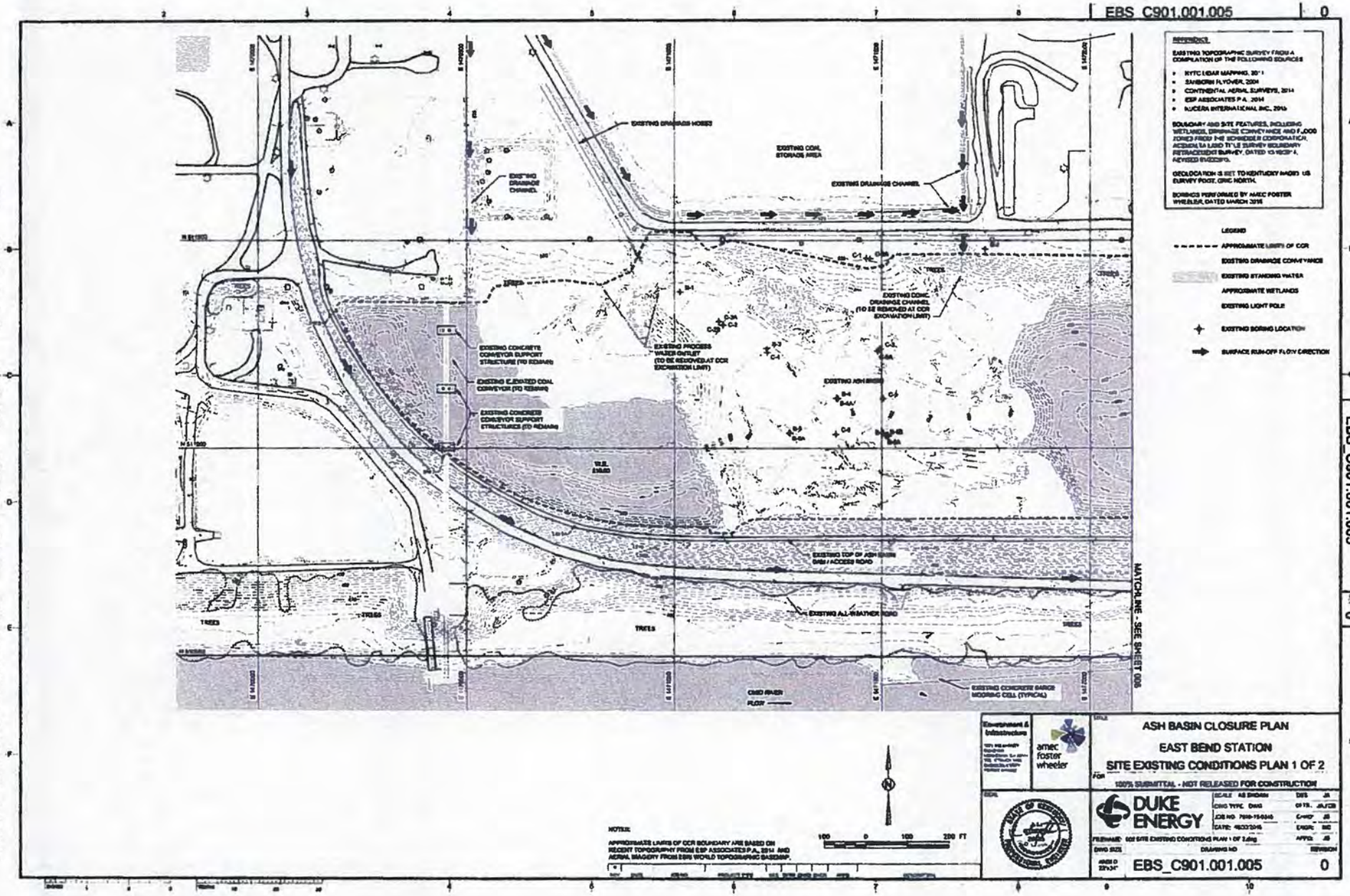
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EXISTING DRAINAGE HOSES
EXISTING COAL STORAGE AREA
EXISTING DRAINAGE CHANNEL
EXISTING DRAINAGE CHANNEL
EXISTING CONCRETE CONVEYOR SUPPORT STRUCTURE (TO REMAIN)
EXISTING ELEVATED COAL CONVEYOR (TO REMAIN)
EXISTING CONCRETE CONVEYOR SUPPORT STRUCTURES (TO REMAIN)
EXISTING PROCESS WATER OUTLET (TO BE REMOVED AT CCR EXCAVATION LIMIT)
EXISTING CONC DRAINAGE CHANNEL (TO BE REMOVED AT CCR EXCAVATION LIMIT)
EXISTING ASH BASIN
EXISTING TOP OF ASH BASIN DIKE / ACCESS ROAD
EXISTING ALL-WEATHER ROAD
EXISTING CONCRETE BARGE MOORING CELL (TYPICAL)
TREES
MATCHLINE - SEE SHEET 005
EBS_C901.001.005
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LEGEND
APPROXIMATE LIMITS OF CCR
EXISTING DRAINAGE CONVEYANCE
EXISTING STANDING WATER
APPROXIMATE WETLANDS
EXISTING LIGHT POLE
EXISTING BORING LOCATION
SURFACE RUN-OFF FLOW DIRECTION
NOTES:
APPROXIMATE LIMITS OF CCR BOUNDARY ARE BASED ON RECENT TOPOGRAPHY FROM ESP ASSOCIATES P.A., 2014 AND AERIAL IMAGERY FROM ESRI WORLD TOPOGRAPHIC BASEMAP.
100 0 100 200 FT
Environment & Infrastructure
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
SITE EXISTING CONDITIONS PLAN 1 OF 2
FOR 100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
DUKE ENERGY
EBS_C901.001.005
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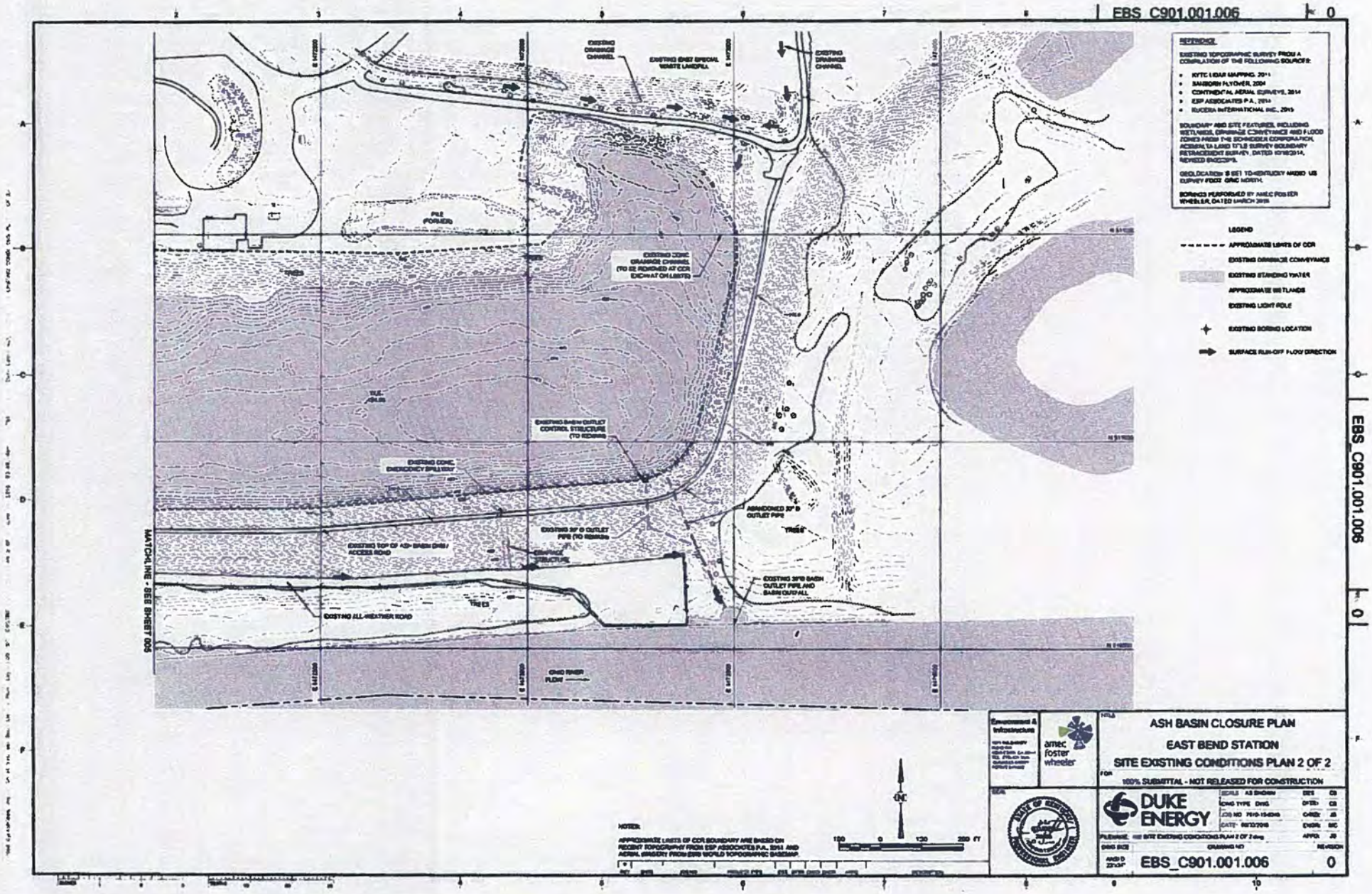
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EXISTING DRAINAGE CHANNEL
EXISTING EAST BEND ASH WASTE LANDFILL
EXISTING DRAINAGE CHANNEL
FILE FORMER
EXISTING ZONE DRAINAGE CHANNEL (TO BE REMOVED AT CCR ENDWALL OR LIMITS)
EXISTING BASIN OUTLET CONTROL STRUCTURE (TO REMAIN)
EXISTING CONC. EMERGENCY SPILLWAY
ABANDONED 30" Ø OUTLET PIPE
EXISTING 30" Ø OUTLET PIPE (TO REMAIN)
EXISTING TOP OF ASH BASIN DIKE / ACCESS ROAD
DRAINAGE STRUCTURE
EXISTING 30"Ø BASIN OUTLET PIPE AND BASIN OUTFALL
EXISTING ALL-WEATHER ROAD
MATCHLINE - SEE SHEET 002
CRAIG RIVER FLOW
REFERENCE
EXISTING TOPOGRAPHIC SURVEY FROM A COMPILATION OF THE FOLLOWING SOURCES:
KYTC LIDAR MAPPING, 2011
SANBORN FLYOVER, 2004
CONTINENTAL AERIAL SURVEYS, 2014
ESP ASSOCIATES P.A., 2014
KUCERA INTERNATIONAL INC., 2015
BOUNDARY AND SITE FEATURES, INCLUDING WETLANDS, DRAINAGE CONVEYANCE AND FLOOD ZONES FROM THE SCHNEIDER CORPORATION, ACREAGE/AS LAND TITLE SURVEY BOUNDARY RETRACEMENT SURVEY, DATED 10/16/2014, REVISED 04/22/15.
GEOLOCATION IS SET TO KENTUCKY NAD83 US SURVEY FOOT GRID NORTH.
BORINGS PERFORMED BY AMEC FOSTER WHEELER, DATED MARCH 2015
LEGEND
APPROXIMATE LIMITS OF CCR
EXISTING DRAINAGE CONVEYANCE
EXISTING STANDING WATER
APPROXIMATE WETLANDS
EXISTING LIGHT POLE
EXISTING BORING LOCATION
SURFACE RUN-OFF FLOW DIRECTION
EBS_C901.001.006
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NOTES:
APPROXIMATE LIMITS OF CCR BOUNDARY ARE BASED ON RECENT TOPOGRAPHY FROM ESP ASSOCIATES P.A., 2014 AND AERIAL IMAGERY FROM ESRI WORLD TOPOGRAPHIC BASEMAP.
100 0 100 200 FT
Environment & Infrastructure
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
SITE EXISTING CONDITIONS PLAN 2 OF 2
FOR
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
DUKE ENERGY
SCALE: AS SHOWN
DRAWING NO
EBS_C901.001.006
REVISION
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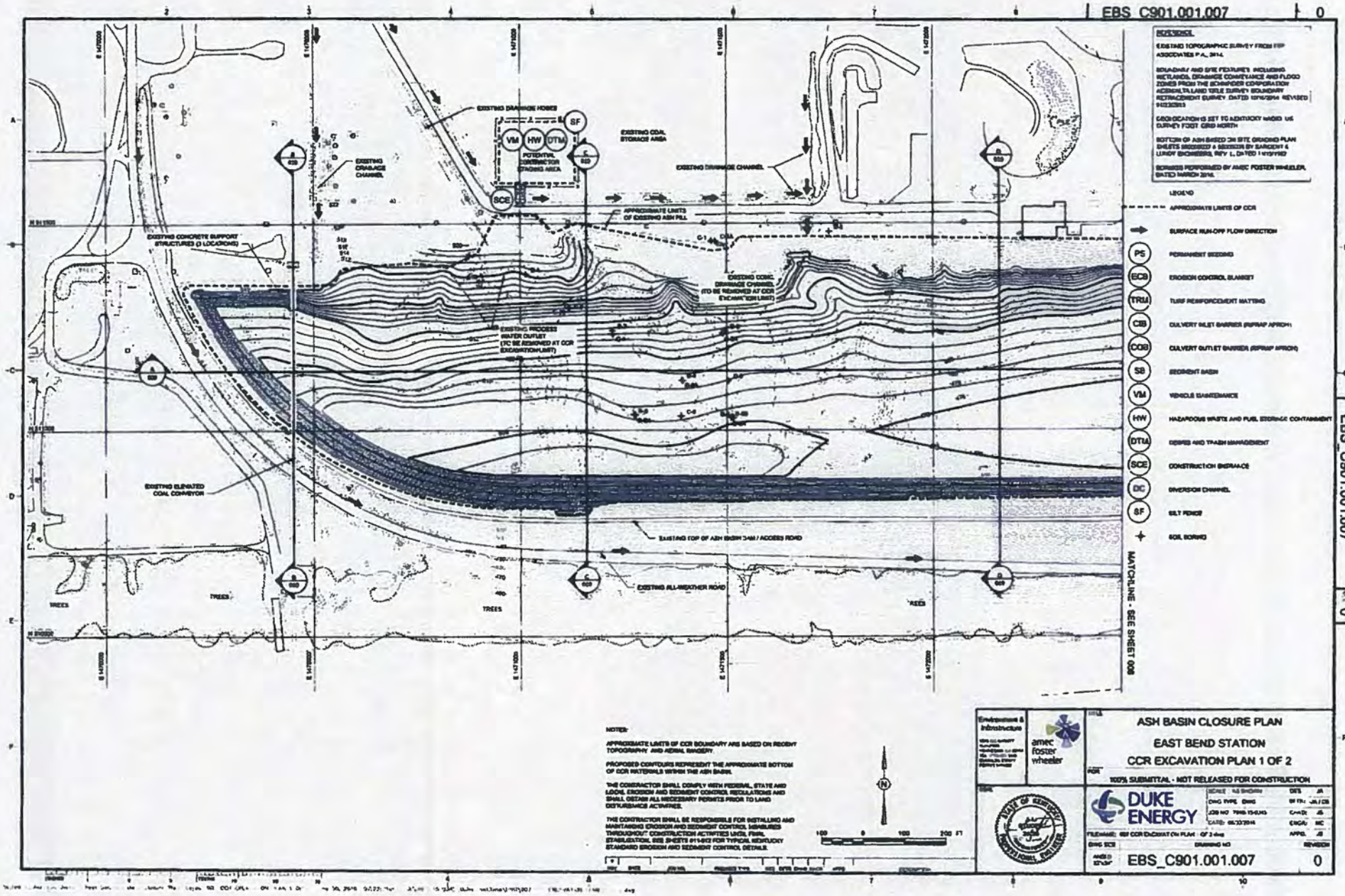
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EXISTING DRAINAGE HOSES
SF
VM
HW
DTM
POTENTIAL CONTRACTOR STAGING AREA
SCE
EXISTING COAL STORAGE AREA
EXISTING DRAINAGE CHANNEL
EXISTING DRAINAGE CHANNEL
APPROXIMATE LIMITS OF EXISTING ASH FILL
EXISTING CONCRETE SUPPORT STRUCTURES (3 LOCATIONS)
EXISTING CONC. DRAINAGE CHANNEL (TO BE REMOVED AT CCR EXCAVATION LIMIT)
EXISTING PROCESS WATER OUTLET (TO BE REMOVED AT CCR EXCAVATION LIMIT)
EXISTING ELEVATED COAL CONVEYOR
EXISTING TOP OF ASH BASIN DAM / ACCESS ROAD
EXISTING ALL-WEATHER ROAD
TREES
TREES
TREES
MATCHLINE - SEE SHEET 008
EBS_C901.001.007
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REFERENCE
EXISTING TOPOGRAPHIC SURVEY FROM EFP ASSOCIATES P.A., 2014.
BOUNDARY AND SITE FEATURES INCLUDING WETLANDS, DRAINAGE CONVEYANCE AND FLOOD ZONES FROM THE EDWARDS CORPORATION AGRICULTURAL LAND TITLE SURVEY BOUNDARY RETRACEMENT SURVEY DATED 10/16/2014 REVISED 01/23/2015
GEOREFERENCED TO KENTUCKY NAD83 US SURVEY FOOT GRID NORTH
BOTTOM OF ASH BASED ON SITE GRADING PLAN SHEETS SIGNED & SEALED BY SARGENT & LUNDY ENGINEERS, REV 1, DATED 11/17/1982
BORINGS PERFORMED BY AMEC FOSTER WHEELER, DATED MARCH 2014.
LEGEND
APPROXIMATE LIMITS OF CCR
SURFACE RUN-OFF FLOW DIRECTION
PS PERMANENT SEEDING
ECB EROSION CONTROL BLANKET
TRM TURF REINFORCEMENT MATTING
CIB CULVERT INLET BARRIER (RIPRAP APRON)
COB CULVERT OUTLET BARRIER (RIPRAP APRON)
SB SEDIMENT BASIN
VM VEHICLE MAINTENANCE
HW HAZARDOUS WASTE AND FUEL STORAGE CONTAINMENT
DTM DEBRIS AND TRASH MANAGEMENT
SCE CONSTRUCTION ENTRANCE
DC DIVERSION CHANNEL
SF SILT FENCE
SOIL BORING
NOTES:
APPROXIMATE LIMITS OF CCR BOUNDARY ARE BASED ON RECENT TOPOGRAPHY AND AERIAL IMAGERY.
PROPOSED CONTOURS REPRESENT THE APPROXIMATE BOTTOM OF CCR MATERIALS WITHIN THE ASH BASIN.
THE CONTRACTOR SHALL COMPLY WITH FEDERAL, STATE AND LOCAL EROSION AND SEDIMENT CONTROL REGULATIONS AND SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO LAND DISTURBANCE ACTIVITIES.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING AND MAINTAINING EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT CONSTRUCTION ACTIVITIES UNTIL FINAL STABILIZATION. SEE SHEETS 811-812 FOR TYPICAL KENTUCKY STANDARD EROSION AND SEDIMENT CONTROL DETAILS.
N
100 0 100 200 FT
Environment & Infrastructure
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
CCR EXCAVATION PLAN 1 OF 2
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
DUKE ENERGY
EBS_C901.001.007
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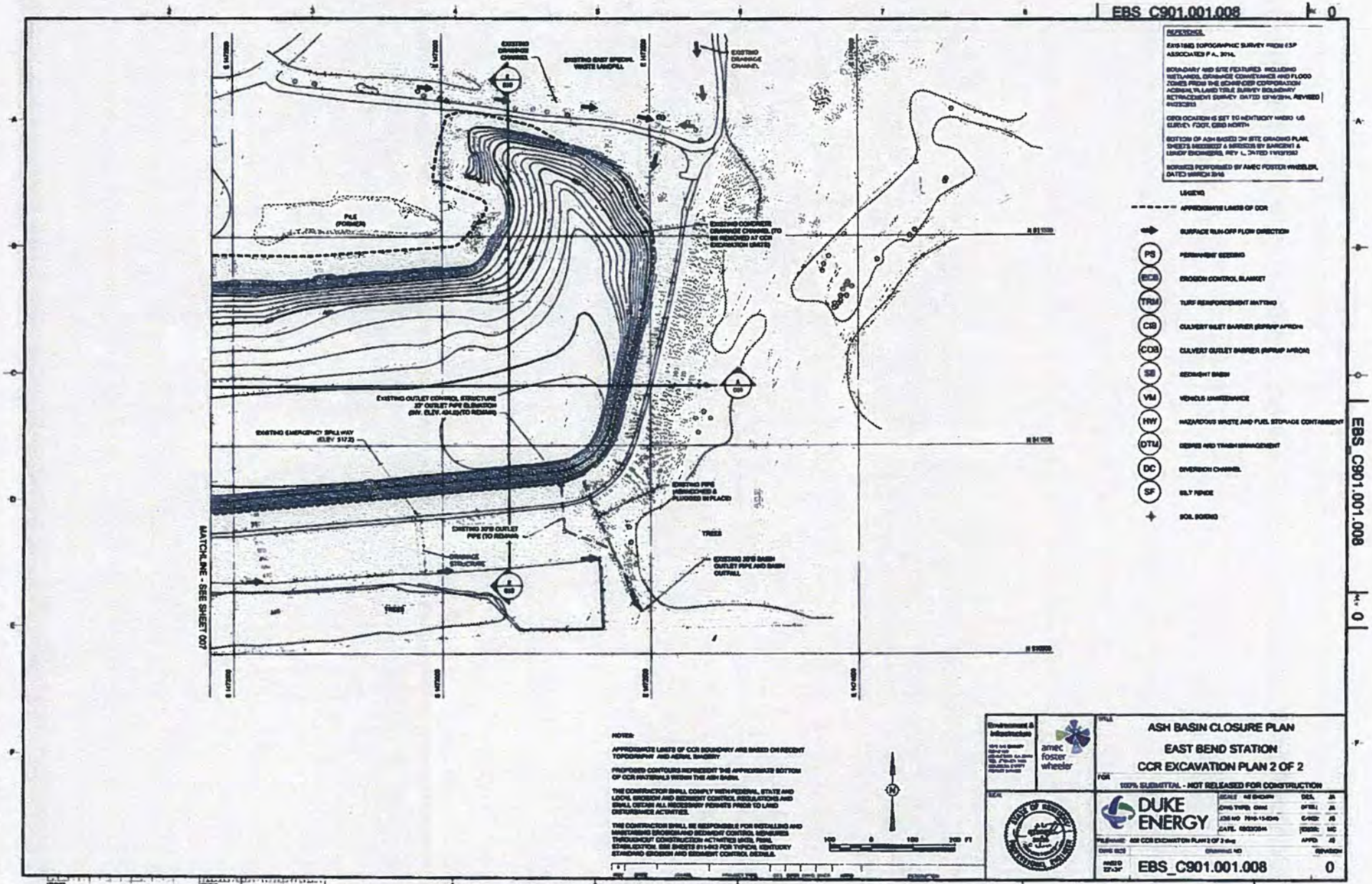
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EXISTING DRAINAGE CHANNEL
EXISTING EAST SPECIAL WASTE LANDFILL
EXISTING DRAINAGE CHANNEL
PILE (FORMER)
EXISTING CONCRETE DRAINAGE CHANNEL (TO BE REMOVED AT CCR EXCAVATION LIMITS)
EXISTING OUTLET CONTROL STRUCTURE 27' OUTLET PIPE ELEVATION (INV. ELEV. 494.5)(TO REMAIN)
EXISTING EMERGENCY SPILLWAY (ELEV 517.2)
EXISTING PIPE HEADWALLS & PLUGGED IN PLACE
EXISTING 30"Ø OUTLET PIPE (TO REMAIN)
DRAINAGE STRUCTURE
TREES
EXISTING 30"Ø BASIN OUTLET PIPE AND BASIN OUTFALL
MATCHLINE - SEE SHEET 007
REFERENCE
EXISTING TOPOGRAPHIC SURVEY FROM ESP ASSOCIATES P.A., 2014.
BOUNDARY AND SITE FEATURES INCLUDING WETLANDS, DRAINAGE EASEMENTS AND FLOOD ZONES FROM THE BOWMAN CORPORATION ADRIAN, PLLC LAND TITLE SURVEY BOUNDARY RETRACEMENT SURVEY DATED 03/18/2014, REVISED 01/23/2015
GEOREFERENCE IS SET TO KENTUCKY NAD83 US SURVEY FOOT, GRID NORTH
BOTTOM OF ASH BASED ON SITE GRADING PLAN, SHEETS 2 AND 3 OF 3 DRAWINGS BY SARGENT & LUNDY ENGINEERS, REV 1, DATED 11/12/2010
BORINGS PERFORMED BY AMEC FOSTER WHEELER, DATED MARCH 2015
LEGEND
APPROXIMATE LIMITS OF CCR
SURFACE RUN-OFF FLOW DIRECTION
PS PERMANENT SEEDING
ECB EROSION CONTROL BLANKET
TRM TURF REINFORCEMENT MATTING
CIB CULVERT INLET BARRIER (RIPRAP APRON)
COB CULVERT OUTLET BARRIER (RIPRAP APRON)
SB SEDIMENT BASIN
VM VEHICLE MAINTENANCE
HW HAZARDOUS WASTE AND FUEL STORAGE CONTAINMENT
DTM DEBRIS AND TRASH MANAGEMENT
DC DIVERSION CHANNEL
SF SILT FENCE
SOIL BORING
EBS_C901.001.008
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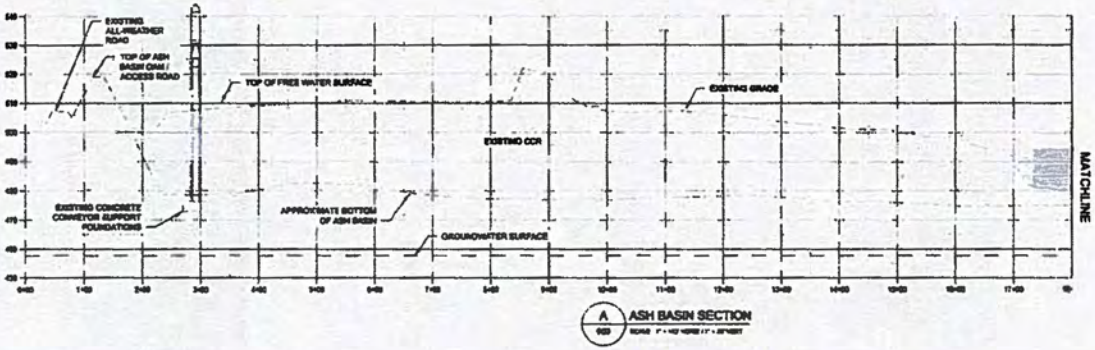
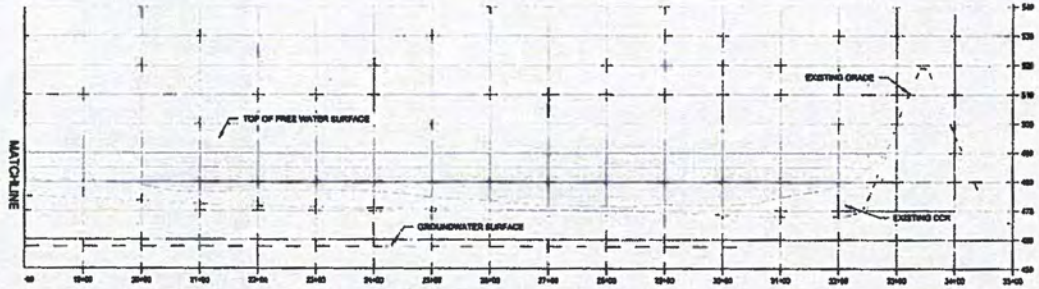
NOTES:
APPROXIMATE LIMITS OF CCR BOUNDARY ARE BASED ON RECENT TOPOGRAPHY AND AERIAL IMAGERY.
PROPOSED CONTOURS REPRESENT THE APPROXIMATE BOTTOM OF CCR MATERIALS WITHIN THE ASH BASIN.
THE CONTRACTOR SHALL COMPLY WITH FEDERAL, STATE AND LOCAL EROSION AND SEDIMENT CONTROL REGULATIONS AND SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO LAND DISTURBANCE ACTIVITIES.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING AND MAINTAINING EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT CONSTRUCTION ACTIVITIES UNTIL FINAL STABILIZATION. SEE SHEETS 813-843 FOR TYPICAL KENTUCKY STANDARD EROSION AND SEDIMENT CONTROL DETAILS.
100 0 100 200 FT
Environment & Infrastructure
amec foster wheeler
ASH BASIN CLOSURE PLAN
EAST BEND STATION
CCR EXCAVATION PLAN 2 OF 2
FOR
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
SEAL
DUKE ENERGY
DES. JA
DRN. JA
CHK. JS
APPD. JS
DRAWING NO.
EBS_C901.001.008
REVISION
0

EBS_C901.001.009 | 0



A ASH BASIN SECTION



A ASH BASIN SECTION

REFERENCE

EXISTING TOPOGRAPHIC SURVEY FROM ESP ASSOCIATES P.A. 2014

BOTTOM OF ASH BASED ON SITE GRADING PLAN, UNITED MACHINERY & MODERN BY SARGENT & LUNDY ENGINEERS, REV. 1, DATED 11-15-1977

GROUNDWATER SURFACE ELEVATION FROM AECOM, GROUNDWATER SURFACE MAP, DATED 1/19/2015

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Environment & Infrastructure

amec foster wheeler

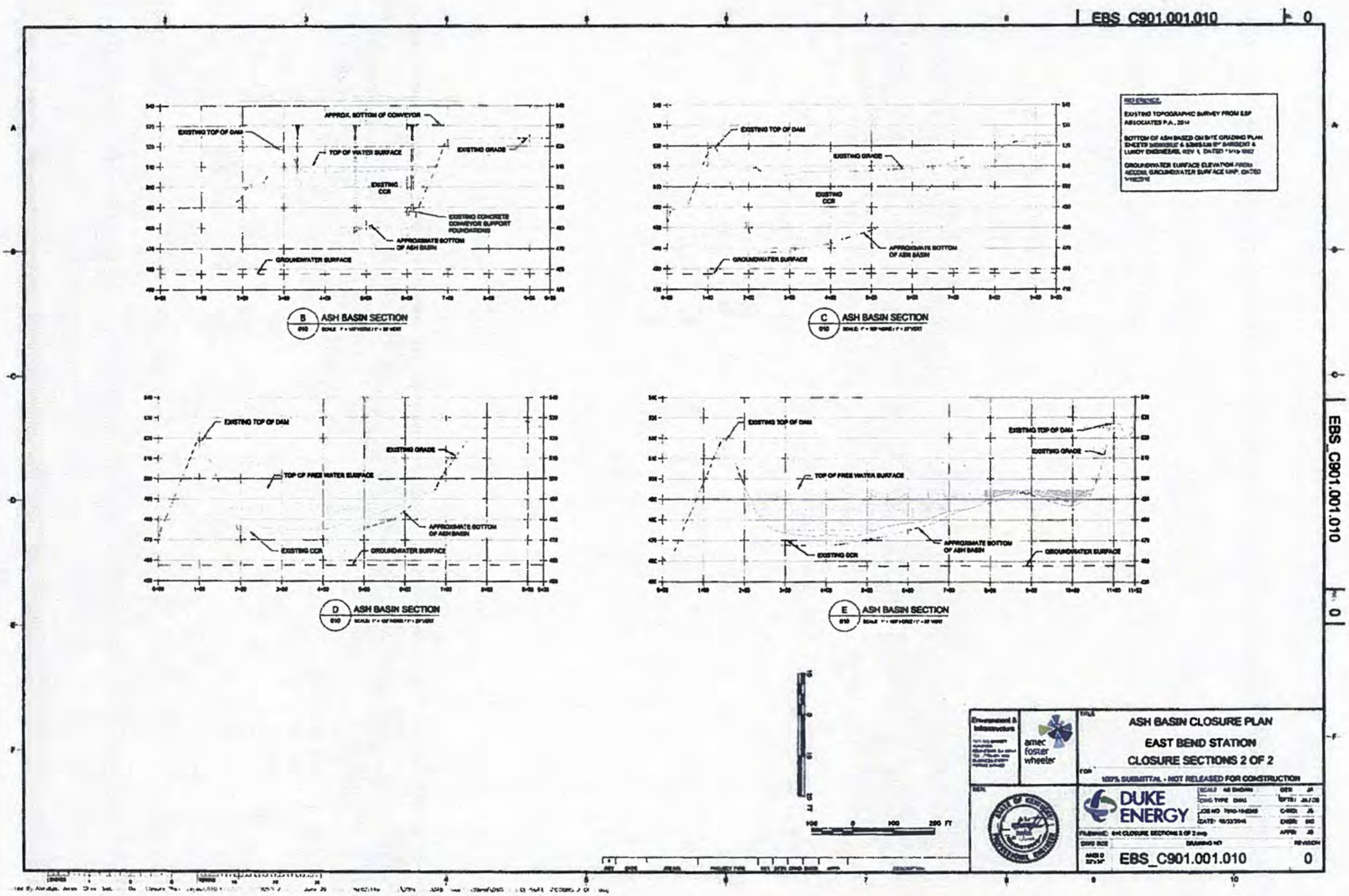
ASH BASIN CLOSURE PLAN
EAST BEND STATION
CLOSURE SECTIONS 1 OF 2

FOR 100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION

DUKE ENERGY

DRAWING NO: EBS_C901.001.009

REVISION: 0


EBS_C901.001.010
EXISTING TOP OF DAM
APPROX. BOTTOM OF CONVEYOR
TOP OF WATER SURFACE
EXISTING GRADE
EXISTING CCR
EXISTING CONCRETE CONVEYOR SUPPORT FOUNDATIONS
APPROXIMATE BOTTOM OF ASH BASIN
GROUNDWATER SURFACE
B
010
ASH BASIN SECTION
C
010
ASH BASIN SECTION
TOP OF FREE WATER SURFACE
D
010
ASH BASIN SECTION
E
010
ASH BASIN SECTION
ASH BASIN CLOSURE PLAN
EAST BEND STATION
CLOSURE SECTIONS 2 OF 2
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION
amec foster wheeler
DUKE ENERGY
EBS_C901.001.010
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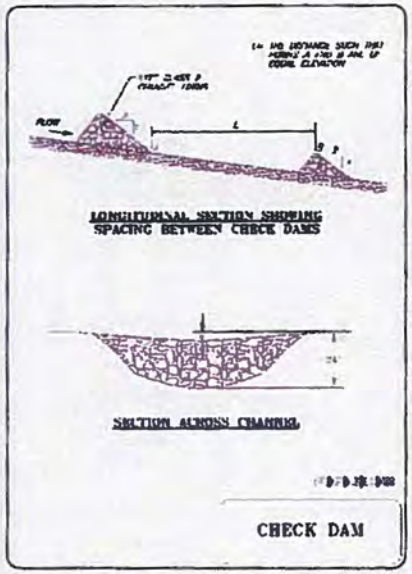
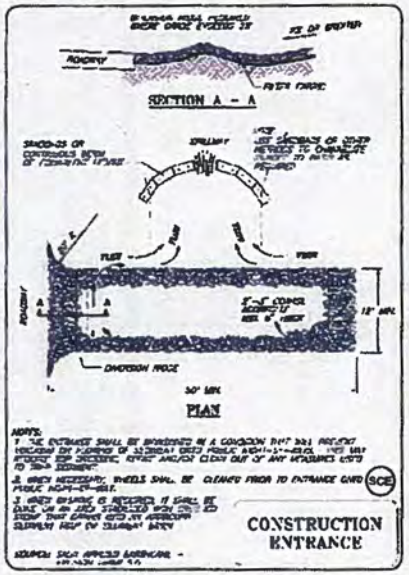
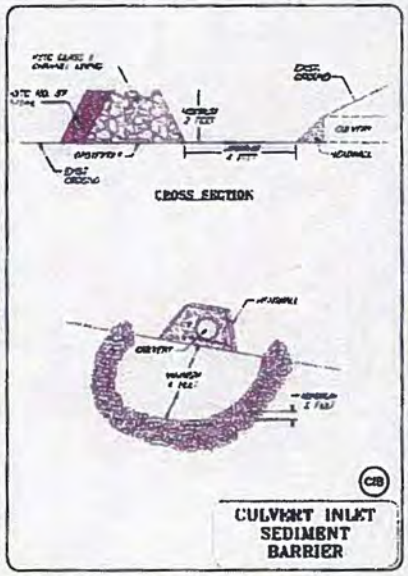
EBS_C901.001.011 rev. 0



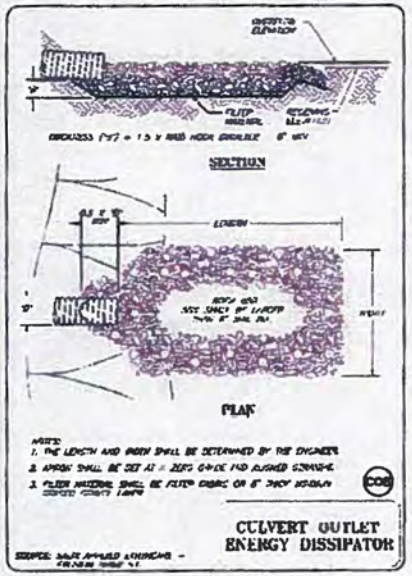
CHECK DAM



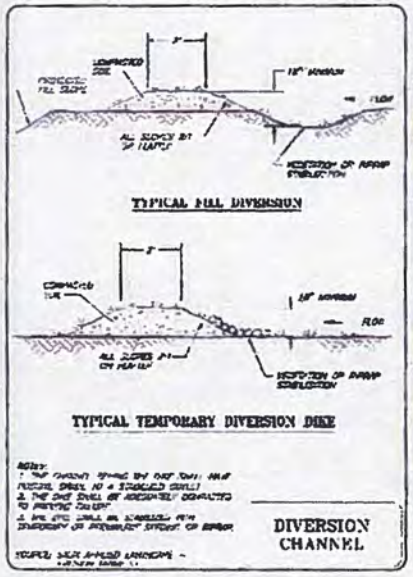
CONSTRUCTION ENTRANCE



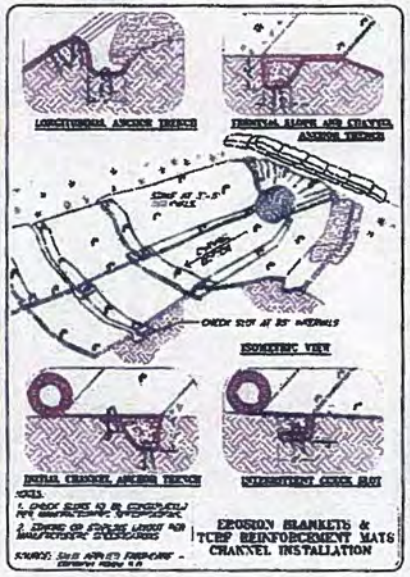
CULVERT INLET SEDIMENT BARRIER



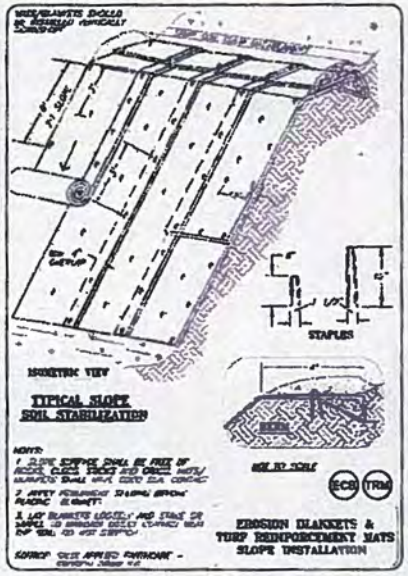
CULVERT OUTLET ENERGY DISSIPATOR



DIVERSION CHANNEL



EROSION BLANKETS & TURF REINFORCEMENT MATS CHANNEL INSTALLATION



EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

ASH BASIN CLOSURE PLAN
EAST BEND STATION
STORMWATER MANAGEMENT DETAILS 1 OF 2
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION

DUKE ENERGY

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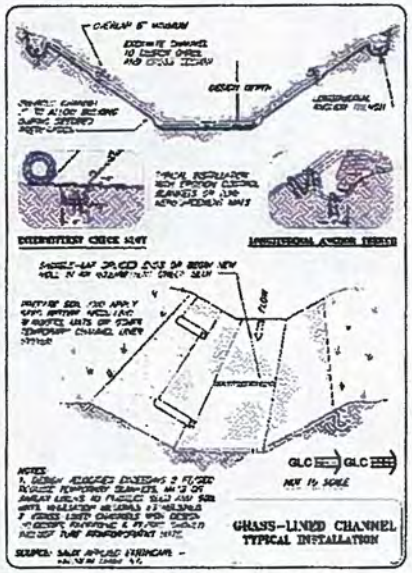
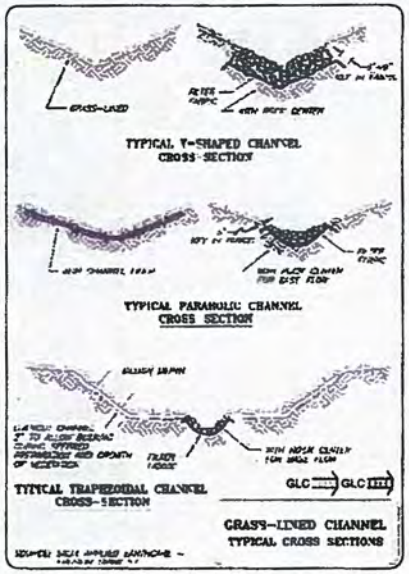
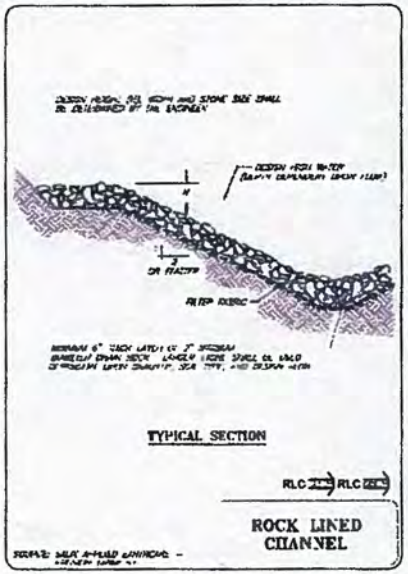
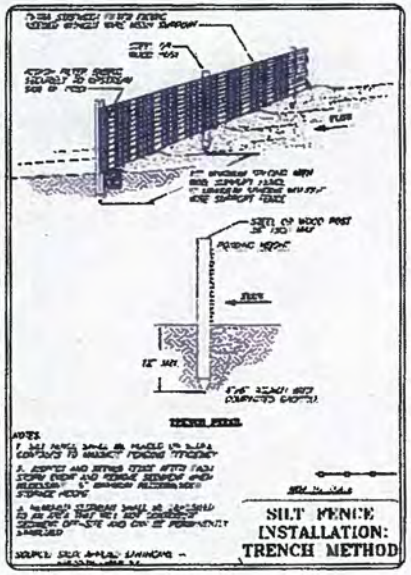
EBS_C901.001.011 rev. 0

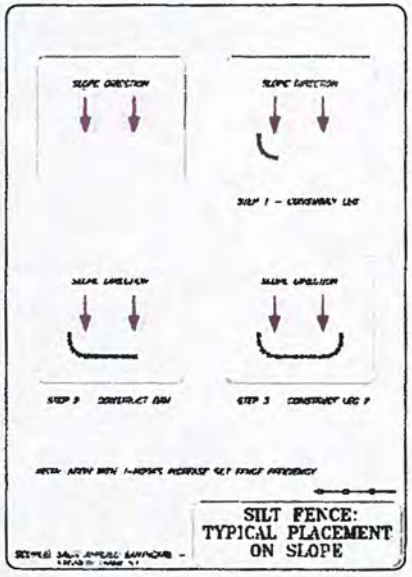
EBS C901.001.012 REV. 0

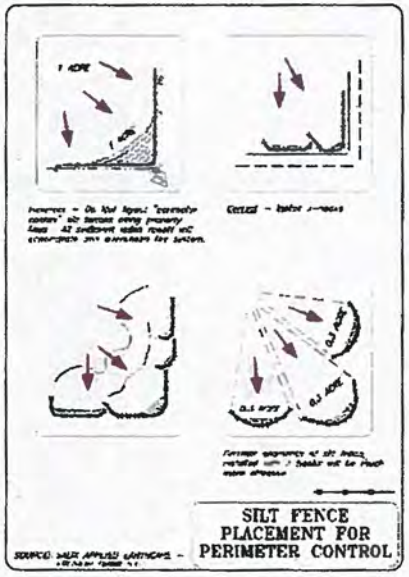


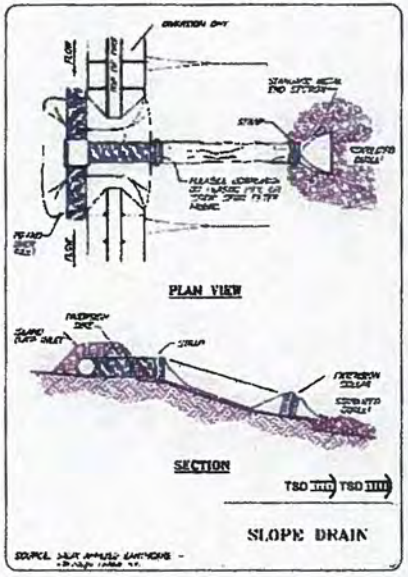












ASH BASIN CLOSURE PLAN
EAST BEND STATION
STORMWATER MANAGEMENT DETAILS 2 OF 2
100% SUBMITTAL - NOT RELEASED FOR CONSTRUCTION

DUKE ENERGY

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