


ALLIANT ENERGY
Wisconsin Power and Light Company
Columbia Energy Center

CCR SURFACE IMPOUNDMENT

INFLOW DESIGN FLOOD CONTROL PLAN

Report Issued: September 19, 2016
Revision 0



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EXECUTIVE SUMMARY

This Inflow Flood Control Plan (Report) is prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) published Final Rule for Hazardous and Solid Waste Management System – Disposal of Coal Combustion Residual from Electric Utilities (40 CFR Parts 257 and 261, also known as the CCR Rule) published on April 17, 2015 and effective October 19, 2015.

This Report assesses the hydrologic and hydraulic capacity requirements for each CCR unit at Columbia Energy Center in Pardeeville, Wisconsin in accordance with §257.82 of the CCR Rule. For purposes of this Report, a CCR unit is defined as any existing CCR surface impoundment. Primarily, the Report documents how the inflow design flood control system has been designed and constructed to meet the CCR Rule section §257.82.

Table of Contents

Figures

Appendices

1 Introduction

The owner or operator of the Coal Combustion Residual (CCR) unit must conduct an initial and periodic inflow design flood control system plan to determine if each CCR unit adequately manages flow into and from each CCR unit during and following the peak discharge of the inflow design flood. The inflow design flood is selected based on the hazard potential classification (§257.73(a)(2)) for each CCR unit.

This Report is prepared in accordance with the requirements of §257.82 of the CCR Rule.

1.1 CCR Rule Applicability

The CCR Rule requires an initial and periodic inflow design flood control system plan certified by a qualified professional engineer (PE) for all existing CCR surface impoundments. This report is the initial inflow design flood control system plan.

1.2 Hydrologic and Hydraulic Capacity Applicability

The Columbia Energy Center (COL) in Pardeeville, Wisconsin (Figure 1) has one existing and one inactive CCR surface impoundments, identified as follows:

- COL Primary Ash Pond (existing)
- COL Secondary Ash Pond (inactive)

2 FACILITY DESCRIPTION

COL is located southeast of the City of Portage on the eastern shore of the Wisconsin River in Columbia County at W8375 Murray Road, Pardeeville, Wisconsin (Figure 1). Wisconsin River backwaters are located north of the generating station, while Lake Columbia, south of the generating plant, is a 480-acre non-contact cooling water pond.

COL is a fossil-fueled electric generating station that initiated operations in 1975. COL consists of two steam electric generating units. Sub-bituminous coal is the primary fuel for producing steam. The burning of coal produces a by-product of CCR. The CCR at COL includes bottom ash, fly ash, and spray dryer absorber waste from scrubbers. The fly ash can also be subdivided into two types, economizer fly ash and precipitator fly ash.

General Facility Information:

Date of Initial Facility Operations:	1975
WPDES Permit Number:	WI-0002780-08-0
Latitude / Longitude:	43° 29′ 9.73″ N 89° 25′ 8.40″ W
Unit Nameplate Ratings:	Unit 1 (1975): 512 MW
	Unit 2 (1978): 511 MW

2.1 COL Primary Ash Pond

The COL Primary Ash Pond is located north of the generating plant and west of the COL Secondary Pond. The COL Primary Ash Pond is the primary receiver of process flows from the generating plant. Process flows include CCR sluice water (bottom ash and economizer fly ash), boiler/precipitator wash water, plant floor drains, ash line freeze protection flows, bottom ash area sump water, demineralizer area sump water, and air heater sump water. Additionally, the COL Primary Ash Pond receives storm water runoff from the surrounding area, inclusive of the closed ash landfill, located south of the CCR surface impoundments.

The western half of the COL Primary Ash Pond is a CCR handling area. A shallow narrow drainage channel is located along the south, west, and north sides of the CCR handling area. The sluiced CCR is discharged into the southeast corner of the western half of the COL Primary Ash Pond. The sluiced CCR settles out through the water column as it follows the flow of the narrow channel around the southern, western, and northern sides of the existing CCR surface impoundment. The water in the channel flows to the east and discharges through a narrow cut-out of an interior dike into the northwest corner of the large open area in the eastern half of the COL Primary Ash Pond.

The majority of the CCR that is discharged into the COL Primary Ash Pond is removed during routine maintenance dredging activities of the shallow narrow channel. The CCR that is dredged is stockpiled in the western half of the COL Primary Ash Pond for dewatering. Once dewatered the CCR is run through a sieve shaker machine to separate the coarsely graded CCR from the finely graded CCR. The CCR is then transported off-site for beneficial reuse or to the on-site active dry ash landfill.

The water in the COL Primary Ash Pond is recirculated to the generating plant via effluent pumps located in the ash recirculating pump house in the northeast corner of the eastern half of the COL Primary Ash Pond. The recirculating pumps return water to the generating plant for reuse and/or treatment and disposal per the facility's Wisconsin Pollution Discharge Elimination System (WPDES) permit. Instrumentation associated with the pump house in the northeast corner of the COL Primary Ash Pond includes a submersible hydrostatic level transducer, as well as a visual staff gauge, for monitoring water elevations in the COL Primary Ash Pond. An 18-inch diameter corrugated metal pipe is located immediately south of the pump house, in the interior dike between the COL Primary Ash Pond and COL Secondary Pond. The pipe drains to the Secondary Ash Pond and is no longer used. The influent end of the hydraulic structure, on the COL Primary Ash Pond side, consists of a manually operated gate valve which is closed.

The surface area of the COL Primary Ash Pond is approximately 14.7 acres and has an embankment height of approximately 23 feet from the crest to the toe of the downstream slope. The interior storage depth of the COL Primary Ash Pond is approximately 15 feet. The total volume of impounded CCR and water within the COL Primary Ash Pond is approximately 330,000 cubic yards.

2.2 COL Secondary Ash Pond

The COL Secondary Pond is located north of the generating plant and east of the COL Primary Ash Pond. The COL Secondary Ash Pond was previously a downstream receiver of influent flows from the COL Primary Ash Pond. The water within the COL Secondary Pond, prior to 2004, was pumped to a surface impoundment identified as the polishing pond. The polishing pond was located east of the generating plant. The water pumped to the polishing pond would flow to the south through the facility's WPDES Outfall 002 into "Mint Ditch" and eventually flow into the backwaters of the Wisconsin River. Presently, the COL Secondary Pond acts as a storm water detention impoundment with the only influent sources being precipitation and storm water runoff from the surrounding area. The water within the COL Secondary Pond either infiltrates or evaporates. The water elevation within the COL Secondary Pond is normally the same as the ground water elevation under the CCR Ponds approximately 10 feet lower than the COL Primary Ash Pond.

The surface area of the COL Secondary Ash Pond is approximately 9.6 acres and has an embankment height of approximately 23 feet from the crest to the toe of the downstream slope. The interior storage depth of the COL Secondary Ash Pond is approximately 12 feet. The total volume of impounded CCR and water within the COL Secondary Ash Pond is approximately 185,000 cubic yards.

3 HYDROLOGIC AND HYDRAULIC CAPACITY- §257.82(a)

This Report provides hydrologic and hydraulic capacity information for inflow design flood control systems, which is intended to:

1. Adequately manage flow into each CCR unit during and following the peak discharge inflow of the specified design flood,
2. Adequately manage flow from each CCR unit during and following the peak discharge inflow of the specified design flood; and,
3. Handle discharge from the CCR unit in accordance with National Pollutant Discharge Elimination System (NPDES) regulations §257.3-3.

3.1 Hazard Classification and Design Storm

Both the COL Primary Ash Pond and COL Secondary Ash Pond are classified as a low hazard potential. Therefore the design storm for the COL impoundments is the 100 year return event SCS Type II 24 hour storm as defined in §257.82(a)(3)(ii). The total rainfall for the event selected from the National Oceanographic and Atmospheric Administration's probabilistic map for the COL site coordinates is 6.6 inches for the 100 year event, Appendix A.

3.2 Hydrologic and Hydraulic Capacity Methods

The two CCR impoundments receive rainfall from a total watershed of 92 acres, Figure 2. The watershed is the north end of the COL and includes the closed landfill, impoundments and the CCR handling area. The watershed is further subdivided into a 55 acre subarea which drains to the COL Primary Ash Pond and a 37 acre subarea which drains to the COL Secondary Ash Pond, Figure 2.

Since neither CCR impoundment discharges water during storm events, the impoundments are considered zero liquid discharge impoundments. The capacity of the impoundments for the design storm is found by comparing the volume of rainfall produced by the design storm to the capacity of the impoundments above normal operating elevations in the impoundments.

3.3 Hydrologic and Hydraulic Capacity Input and Assumptions

Because the storm routing is by full containment of the storm water volume the following simplifying assumptions are made in analysis of the impoundments capacity to contain the storm without distress.

1. The full volume of rainfall accumulates into the impoundments without consideration of the infiltration that occurs into the closed ash impoundments landfill or the product recycling areas.

2. The available volume is calculated as the area of the impoundment at normal water operating elevation projected vertically without considering the increase in area with depth of water in the impoundment.

3. The impoundments are analyzed separately with only their own drainage subarea contributing and no overflow of water from COL Primary Ash Pond to COL Secondary Ash Pond is considered (the interior berm between the impoundments is crest elevation 802 feet which is four foot lower than the exterior embankment elevation).

4. The primary ash impoundment receives approximately 1.5 million gallons per day of process water, Appendix B. The analysis assumes that the COL station recycles the process water during the accumulation of the rainfall event at the same rate it is generated.

5. The impoundment bottom is a sand aquifer with water elevation at approximately 785 feet. The impoundment bottom is reported to have a permeability of 0.01 to 0.005 $^{cm}/_{sec}$ [1]. The impoundments will drain back to normal operating elevations soon after the end of the storm event.

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[1] SCS Engineers, " Columbia Station, Monitoring Well Construction Documentation, February 9, 2016

4 Inflow Design Flood Control System Plan

The normal operating water elevations for the impoundments elevation 795 feet for the COL Primary Ash Pond (elevation set for recycling pumping) and elevation 783 feet for the COL Secondary Ash Pond (elevation of the ground water under the impoundments), Figure 2.

During the design storm, the COL Primary Ash Pond accumulates 30.25 acre feet of water and the COL Secondary Ash Pond accumulates 20.35 acre feet of water. At the end of the storm the water elevation in the COL Primary Ash Pond will be 799 feet with 5 feet of freeboard remaining on the exterior embankment. At the end of the storm the water elevation in the COL Secondary Ash Pond will be 787 feet with 17 feet of freeboard remaining on the exterior embankment. The calculation of volumes and storage elevation are included in Appendix C.

5 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

To meet the requirements of 40 CFR 257.82(c)(5), I Mark W. Loerop hereby certify that I am a licensed professional engineer in the State of Wisconsin; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR 257.82.

WISCONSIN PROFESSIONAL ENGINEER
MARK W. LOEROP
E-43783-6
NAPERVILLE
IL

By: [signature]

Name: MARK LOEROP

Date: SEP 19, 2016

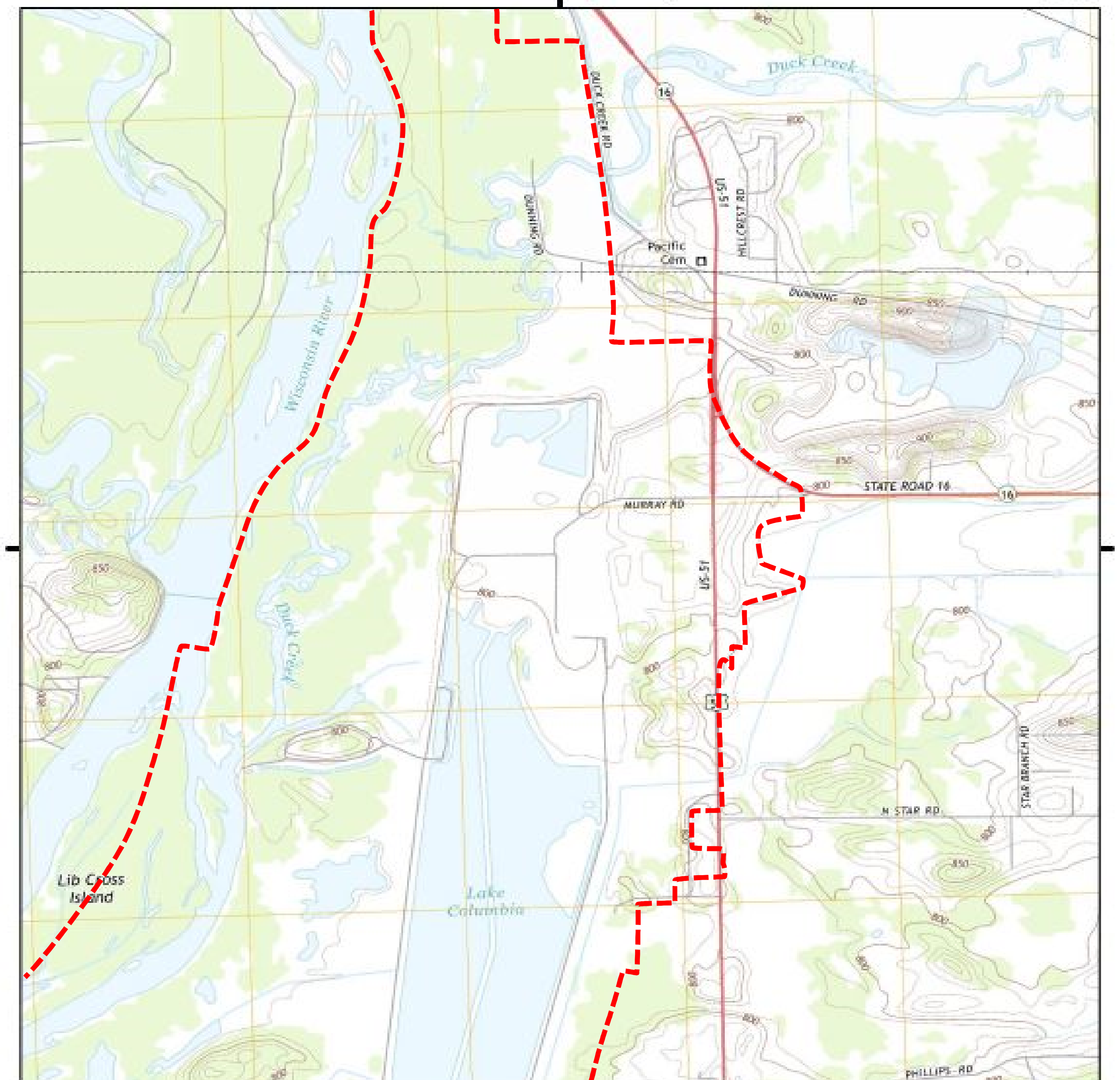
FIGURES

Alliant Energy
Wisconsin Power and Light Company
Columbia Energy Center
Pardeeville, Wisconsin

Inflow Design Flood Control System Plan

Historical Topo Map

2013



Miles 0.25 0.5 1 1.5

This report includes information from the following map sheet(s).

NW N NE W E SW S SE

TP, Poynette, 2013, 7.5-minute

N, Portage, 2013, 7.5-minute

SITE NAME: Columbia Energy Center
ADDRESS: W8375 Murray Road
Pardeeville, WI 53954
CLIENT: Environmental Site Assessors

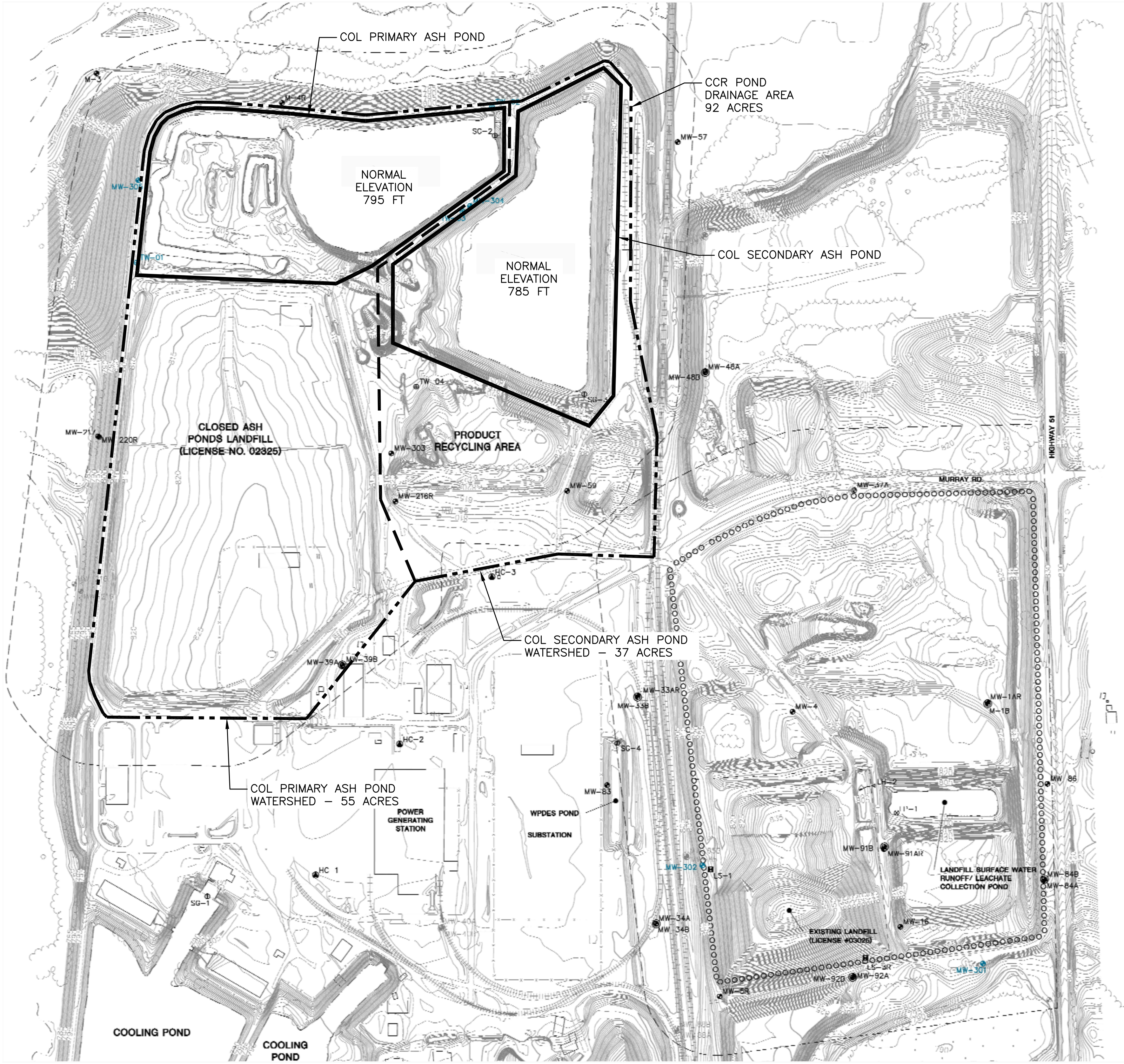
N

4555570 - 7 page 4

Historical Aerial Photo 6/12/2014

Approximate Property Boundary

HARD HAT SERVICES™ Engineering, Construction and Management Solutions	Site Location Columbia Energy Center Wisconsin Power and Light Company	Drawing Figure 1 Date 7/12/2016



MAP SOURCE:
SCS ENGINEERS
COLUMBIA ASH PONDS AND DRY ASH DISPOSAL FACILITIES;
WELL LOCATION MAP; FIGURE 2
REV. DATE 2-2-16

LEGEND

—810—	EXISTING MAJOR CONTOUR (10' INTERVAL)
———	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—x—x—	EXISTING FENCELINE
++++++++	EXISTING TRACKS
———	EXISTING PAVED ROAD
=======	EXISTING UNPAVED ROAD
—··—··—	EDGE OF WATER
— — — —	DESIGN MANAGEMENT ZONE
-OOOOOOOOOO	APPROVED LIMITS OF WASTE
—·—·—·—	CONSTRUCTED LIMITS OF WASTE
●	WATER SUPPLY WELL
●	STAFF GAUGE
●	WATER TABLE WELL
●	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
■	LYSIMETER
●	ABANDONED WATER TABLE WELL
●	ABANDONED PIEZOMETER
⊸	LEACHATE HEADWELL
⊕	TEMPORARY WELL
●	NEW WATERTABLE WELL

NOTES;

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND AUGUST 2012.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. THE LOCATIONS OF THE ASH PONDS FACILITY DESIGN MANAGEMENT ZONE DEMARCATION LINES ARE APPROXIMATE AND BASED ON THE WATER TABLE MAP (OCTOBER 2012) FIGURE BY RMT.
5. THE LOCATION OF THE ACTIVE DRY ASH LANDFILL DESIGN MANAGEMENT ZONE DEMARCATION LINE IS BASED ON A 300 FOOT OFFSET FROM THE DESIGN LIMITS OF ASH EXCEPT WHERE OFFSET WOULD EXTEND LINE BEYOND PROPERTY LINE.

0 250' 500'
SCALE: 1"=250'

REV	DATE	BY	DESCRIPTION
5			
4			
3			
2			
1			

hard hat™ SERVICES

SCALE:	AS SHOWN
DATE:	8-1-16
DRAWN BY:	JFD
CHKD BY:	TJH
APRVD BY:	MWL

CLIENT / LOCATION
WISCONSIN POWER AND LIGHT (WPL) COMPANY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WISCONSIN

DRAWING DESCRIPTION
INFLOW FLOOD CONTROL PLAN
CCR SURFACE INPOUNDMENTS
STORM WATER ROUTING

JOB 154.010.025
SHT. FIGURE 2
DWG. 154.010.025-D1

APPENDIX A – NOAA Storm Frequency Tabulation

Alliant Energy
Wisconsin Power and Light Company
Columbia Energy Center
Pardeeville, Wisconsin

Inflow Design Flood Control System Plan

NOAA Atlas 14, Volume 8, Version 2
Location name: Pardeeville, Wisconsin, US*
Latitude: 43.4930°, Longitude: -89.4205°
Elevation: 796 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.366** (0.319–0.431)	**0.416** (0.362–0.490)	**0.503** (0.436–0.594)	**0.581** (0.501–0.688)	**0.696** (0.582–0.855)	**0.791** (0.644–0.982)	**0.891** (0.699–1.13)	**0.999** (0.749–1.30)	**1.15** (0.826–1.53)	**1.27** (0.885–1.70)
10-min	**0.536** (0.467–0.631)	**0.609** (0.530–0.718)	**0.737** (0.639–0.870)	**0.851** (0.733–1.01)	**1.02** (0.853–1.25)	**1.16** (0.943–1.44)	**1.31** (1.02–1.65)	**1.46** (1.10–1.90)	**1.68** (1.21–2.24)	**1.86** (1.30–2.49)
15-min	**0.654** (0.570–0.770)	**0.743** (0.647–0.875)	**0.899** (0.779–1.06)	**1.04** (0.894–1.23)	**1.24** (1.04–1.53)	**1.41** (1.15–1.75)	**1.59** (1.25–2.02)	**1.78** (1.34–2.31)	**2.05** (1.48–2.73)	**2.27** (1.58–3.04)
30-min	**0.906** (0.789–1.07)	**1.03** (0.896–1.21)	**1.25** (1.08–1.47)	**1.44** (1.24–1.71)	**1.73** (1.45–2.13)	**1.97** (1.60–2.44)	**2.22** (1.74–2.81)	**2.49** (1.87–3.23)	**2.87** (2.06–3.81)	**3.17** (2.21–4.25)
60-min	**1.15** (1.00–1.35)	**1.32** (1.15–1.56)	**1.63** (1.41–1.92)	**1.91** (1.64–2.26)	**2.32** (1.94–2.86)	**2.66** (2.17–3.31)	**3.03** (2.38–3.85)	**3.43** (2.57–4.45)	**3.99** (2.87–5.30)	**4.44** (3.09–5.95)
2-hr	**1.40** (1.22–1.63)	**1.62** (1.41–1.89)	**2.01** (1.75–2.36)	**2.37** (2.05–2.79)	**2.91** (2.45–3.57)	**3.36** (2.76–4.16)	**3.84** (3.04–4.85)	**4.37** (3.30–5.64)	**5.11** (3.70–6.75)	**5.71** (4.00–7.59)
3-hr	**1.54** (1.36–1.79)	**1.80** (1.58–2.09)	**2.25** (1.97–2.63)	**2.67** (2.32–3.13)	**3.31** (2.80–4.05)	**3.85** (3.17–4.75)	**4.43** (3.51–5.57)	**5.06** (3.84–6.52)	**5.96** (4.33–7.85)	**6.69** (4.71–8.86)
6-hr	**1.82** (1.61–2.10)	**2.11** (1.86–2.43)	**2.63** (2.32–3.05)	**3.13** (2.74–3.64)	**3.90** (3.34–4.75)	**4.56** (3.79–5.60)	**5.28** (4.22–6.62)	**6.07** (4.64–7.78)	**7.21** (5.29–9.45)	**8.14** (5.78–10.7)
12-hr	**2.14** (1.90–2.45)	**2.43** (2.16–2.78)	**2.98** (2.64–3.42)	**3.51** (3.09–4.04)	**4.34** (3.75–5.27)	**5.08** (4.25–6.20)	**5.88** (4.74–7.33)	**6.78** (5.23–8.64)	**8.08** (5.97–10.5)	**9.15** (6.54–12.0)
24-hr	**2.44** (2.19–2.78)	**2.77** (2.48–3.16)	**3.40** (3.02–3.87)	**3.99** (3.53–4.56)	**4.91** (4.26–5.90)	**5.71** (4.81–6.91)	**6.59** (5.35–8.14)	**7.56** (5.87–9.56)	**8.96** (6.67–11.6)	**10.1** (7.28–13.1)
2-day	**2.73** (2.46–3.08)	**3.18** (2.86–3.59)	**3.97** (3.55–4.49)	**4.68** (4.17–5.32)	**5.75** (4.99–6.82)	**6.65** (5.62–7.95)	**7.61** (6.20–9.30)	**8.65** (6.74–10.8)	**10.1** (7.57–12.9)	**11.3** (8.19–14.6)
3-day	**3.00** (2.71–3.37)	**3.48** (3.14–3.91)	**4.32** (3.88–4.86)	**5.07** (4.53–5.74)	**6.19** (5.39–7.29)	**7.12** (6.03–8.47)	**8.11** (6.63–9.85)	**9.17** (7.18–11.4)	**10.7** (8.01–13.6)	**11.9** (8.64–15.2)

4-day	**3.25** (2.94–3.64)	**3.74** (3.38–4.19)	**4.60** (4.15–5.17)	**5.38** (4.82–6.06)	**6.52** (5.69–7.65)	**7.47** (6.34–8.85)	**8.48** (6.94–10.3)	**9.56** (7.50–11.8)	**11.1** (8.34–14.1)	**12.3** (8.98–15.7)
7-day	**3.88** (3.53–4.32)	**4.42** (4.02–4.92)	**5.36** (4.85–5.97)	**6.18** (5.57–6.93)	**7.41** (6.48–8.61)	**8.41** (7.18–9.88)	**9.47** (7.80–11.4)	**10.6** (8.36–13.0)	**12.2** (9.23–15.4)	**13.5** (9.89–17.1)
10-day	**4.45** (4.06–4.93)	**5.03** (4.59–5.58)	**6.04** (5.49–6.71)	**6.92** (6.25–7.72)	**8.22** (7.21–9.49)	**9.27** (7.93–10.8)	**10.4** (8.56–12.4)	**11.5** (9.13–14.1)	**13.2** (10.0–16.5)	**14.5** (10.7–18.3)
20-day	**6.08** (5.58–6.68)	**6.82** (6.26–7.50)	**8.07** (7.37–8.89)	**9.12** (8.29–10.1)	**10.6** (9.34–12.1)	**11.8** (10.1–13.6)	**13.0** (10.8–15.4)	**14.3** (11.3–17.3)	**16.0** (12.2–19.8)	**17.3** (12.9–21.8)
30-day	**7.47** (6.89–8.17)	**8.37** (7.71–9.17)	**9.85** (9.04–10.8)	**11.1** (10.1–12.2)	**12.8** (11.3–14.4)	**14.1** (12.1–16.1)	**15.4** (12.8–18.0)	**16.7** (13.3–20.1)	**18.4** (14.1–22.8)	**19.8** (14.8–24.8)
45-day	**9.26** (8.57–10.1)	**10.4** (9.61–11.3)	**12.2** (11.2–13.3)	**13.7** (12.5–15.0)	**15.7** (13.8–17.6)	**17.1** (14.8–19.5)	**18.6** (15.5–21.6)	**20.0** (16.0–23.9)	**21.8** (16.8–26.7)	**23.1** (17.4–28.9)
60-day	**10.8** (10.0–11.7)	**12.2** (11.3–13.2)	**14.3** (13.2–15.6)	**16.0** (14.7–17.5)	**18.2** (16.1–20.3)	**19.9** (17.2–22.5)	**21.4** (17.9–24.8)	**22.9** (18.4–27.3)	**24.8** (19.1–30.3)	**26.2** (19.7–32.6)

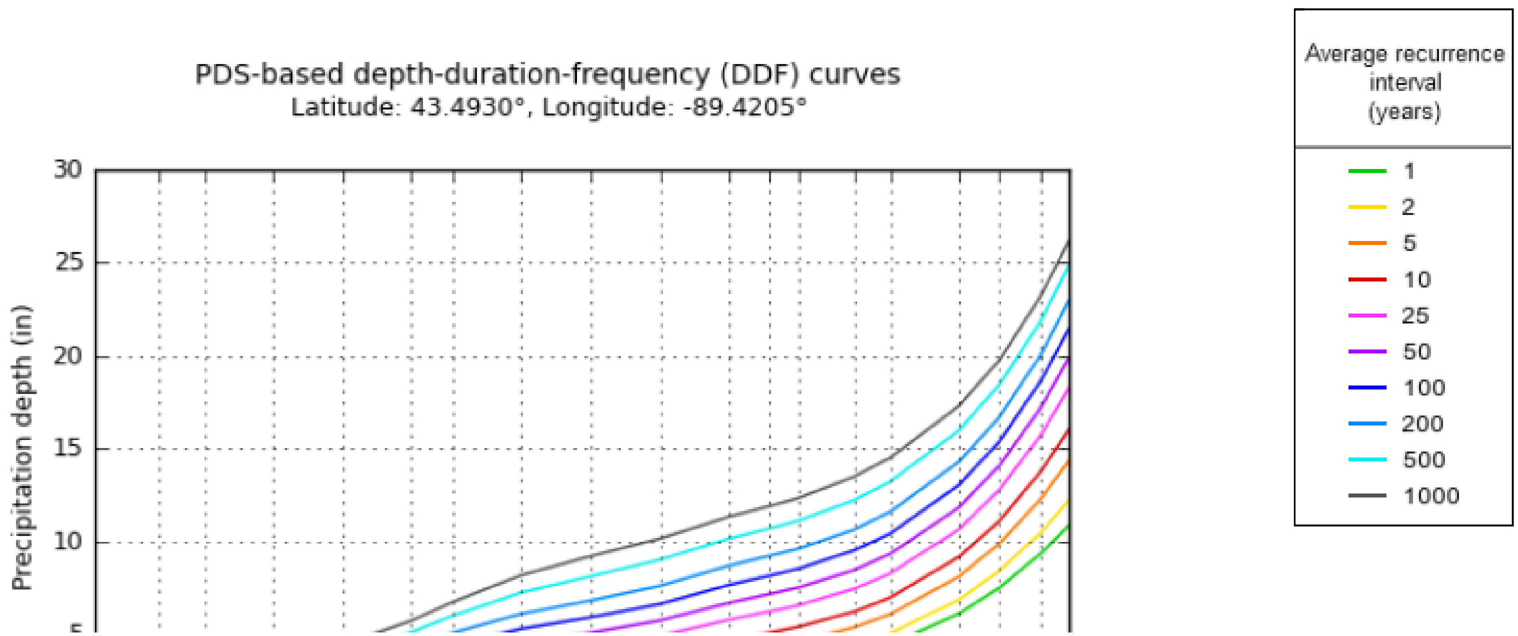
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

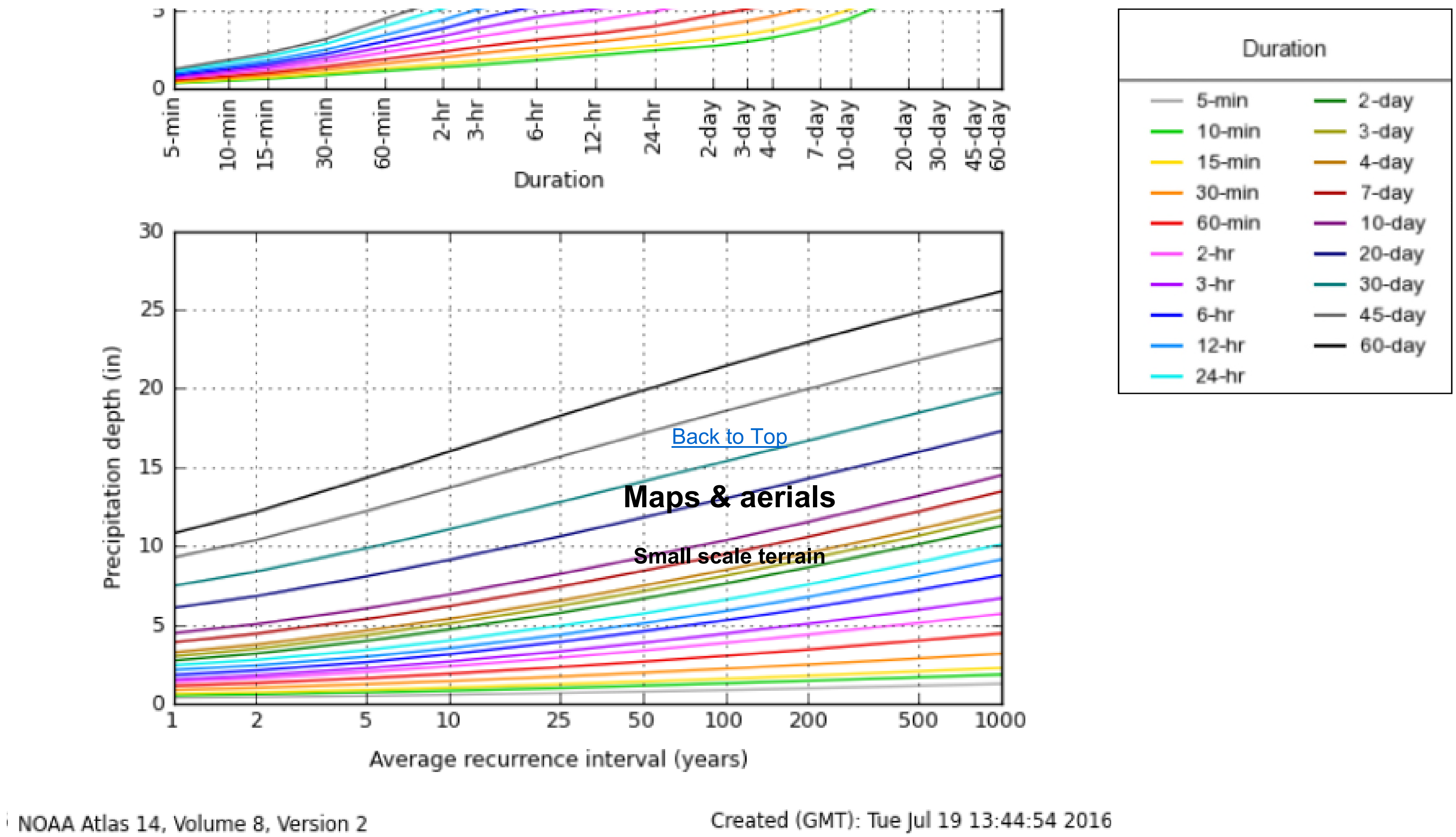
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



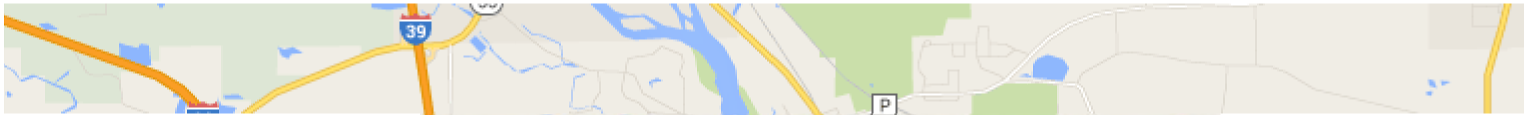


Back to Top

Maps & aerials

Small scale terrain

Large scale map



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

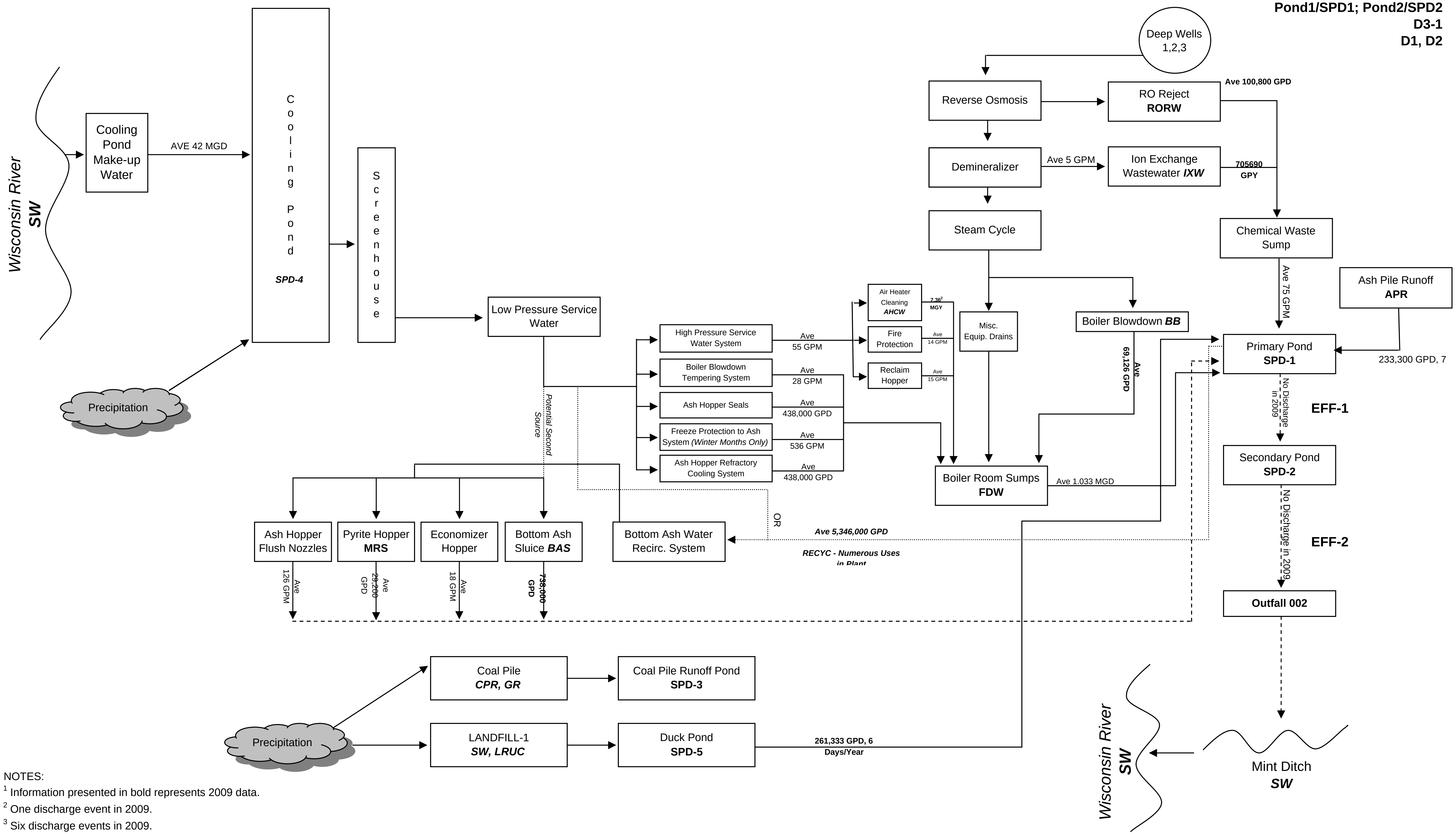
APPENDIX B – Water Balance Flow Chart

Alliant Energy
Wisconsin Power and Light Company
Columbia Energy Center
Pardeeville, Wisconsin

Inflow Design Flood Control System Plan

CONFIDENTIAL BUSINESS INFORMATION

WPL - Columbia Energy Center
Plant ID# 03728
Pond1/SPD1; Pond2/SPD2
D3-1
D1, D2



NOTES:

[1] Information presented in bold represents 2009 data.

[2] One discharge event in 2009.

[3] Six discharge events in 2009.

APPENDIX C – Inflow Flood Control Analysis

Alliant Energy
Wisconsin Power and Light Company
Columbia Energy Center
Pardeeville, Wisconsin

Inflow Design Flood Control System Plan

- PRIMARY AND SECONDARY ASH PONDS ACCUMULATE DESIGN 100 YEAR RAINFALL (6.6 INCHES) WITHOUT DISCHARGE

- PRIMARY POND RECEIVES APPROXIMATELY 1.3 MGD OF PROCESS WATER WHICH IS RECYCLED FOR BOTTOM ASH SLUICING

- PONDS ARE CONSTRUCTED IN SAND WITH A PERMEABILITY OF 10^{-2} cm/SEC

- WATERSHED AREA IS 92 ACRES WHICH FORMERLY DISCHARGED TO WPDES 002 (AREA INCLUDES CLOSED FLY ASH LANDFILL AND BOTTOM ASH HANDLING AREA WEST OF GENERATING STATION

- SECONDARY ASH POND RECEIVES 40% OF RAINFALL FROM (0.4×92 ACRES = 37 ACRES). PRIMARY ASH POND RECEIVES (92 ACRES − 37 ACRES = 55 ACRES).

VOLUME OF DESIGN STORM (NO INFILTRATION)

PRIMARY ASH POND $55 \text{ ACRES} \times 6.6 \text{ IN} / 12 \text{ IN/FT} = 30.25$ ACRE-FT

SECONDARY ASH POND $37 \text{ ACRES} \times 6.6 \text{ IN} / 12 \text{ IN/FT} = 20.35$ ACRE-FT

HE&C
Harrington Engineering & Construction, Inc.

By TJH Date 7/20/16 Subject COLUMBIA STATION Sheet No. 2 of 2
Chk: ______ Date ______ ZERO DISCHARGE CCR PONDS Proj. # 154.018.012.005
1/4" x 1/4"

PRIMARY POND VOLUME

AREA @ 795' APPROXIMATELY 6.5 ACRES

IGNORING SIDE SLOPE VOLUME INCREASE
REQUIRED STORAGE = 30.25 AC-FT / 6.5 ACRES = 4.65 ft

FINAL ELEVATION = 795 ft + 4.65 FT = 799.7 FT (USE 799 FT)
FREEBOARD = 804' - 799' = 5 FEET

SECONDARY POND VOLUME

AREA @ 785' APPROXIMATELY 9.0 ACRES

IGNORING SIDE SLOPE VOLUME INCREASE
REQUIRED STORAGE = 20.35 ACRE-ft / 9.0 ACRES = 2.25 Ft

FINAL ELEVATION = 785 FT + 2.25 FT = 787.25' (USE 787 FT)
FREEBOARD = 804' - 787' = 17 FEET