



## 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.

The surface impoundments at Columbia Energy Center adequately manage the design storm and are compliant with the requirements of CCR Rule section §257.82.



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# 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.

## 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 (Unit 1 and Unit 2). 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. WPL has announced that Unit 1 will retire by the end of 2023 and Unit 2 will be retired by the end of 2024.

### General Facility Information:

Date of Initial Facility Operations:	1975
WPDES Permit Number:	WI-0002780-09-0
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. As stated in the 2020 Annual Inspection, the total volume of impounded CCR and water within the COL Primary Ash Pond is approximately 350,000 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. As stated in the 2020 Annual Inspection, the total volume of impounded CCR and water within the COL Secondary Ash Pond is approximately 87,000 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  $\text{cm}/\text{sec}$ <sup>1</sup>. The impoundments will drain back to normal operating elevations soon after the end of the storm event.

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<sup>1</sup> SCS Engineers, “ Columbia Station, Monitoring Well Construction Documentation, February 9, 2016  
Wisconsin Power and Light Company – Columbia Energy Center  
Inflow Design Flood Control System Plan  
Revision 1 - May 6, 2021



## 4 Inflow Design Flood Control System Plan

The normal operating water elevations for the impoundments is 795 feet for the COL Primary Ash Pond (elevation set for recycling pumping) and 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.



By: 

Name: MARK LOEROP

Date: MAY 6, 2021



## FIGURES

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

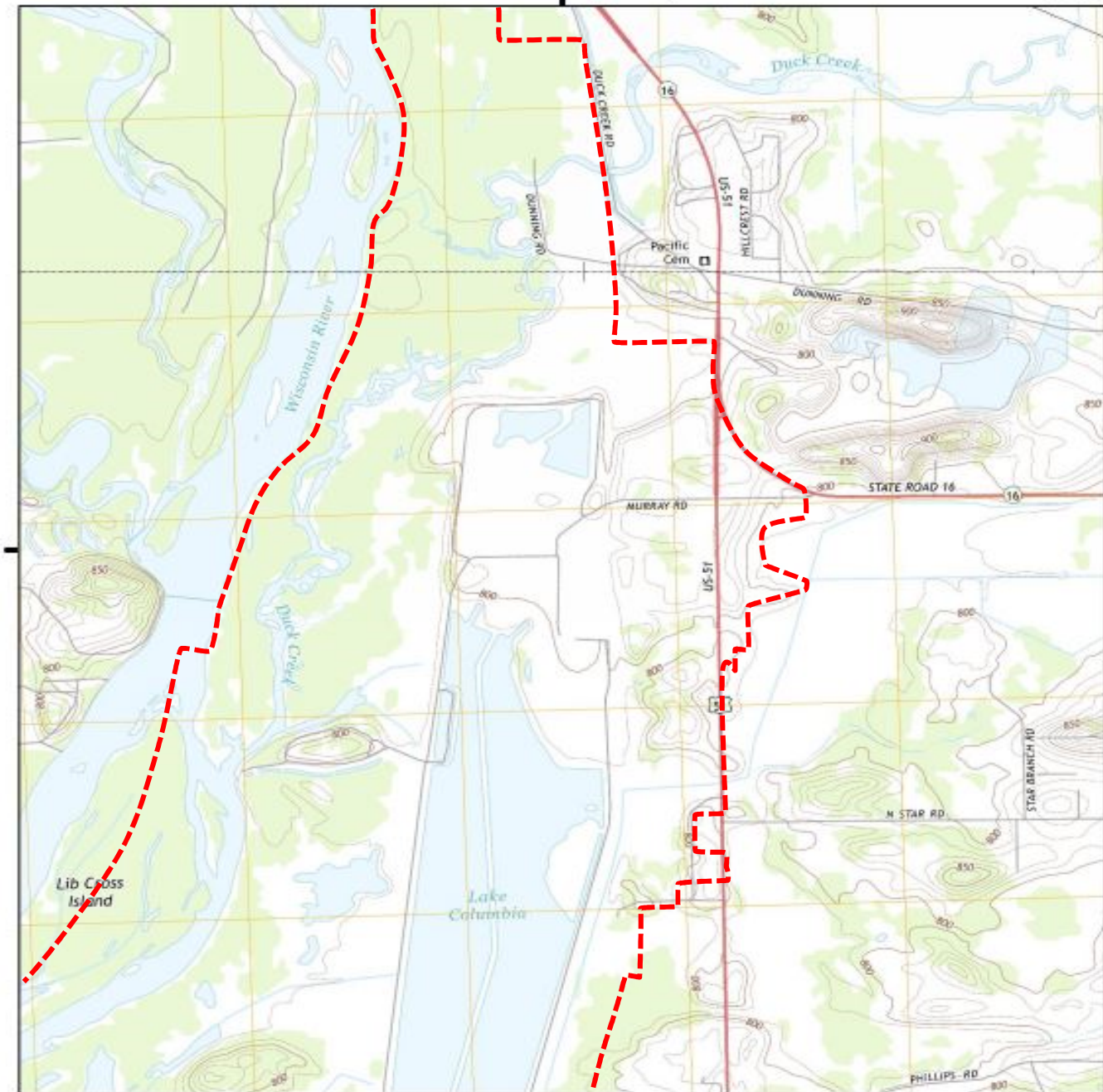
Inflow Design Flood Control System Plan



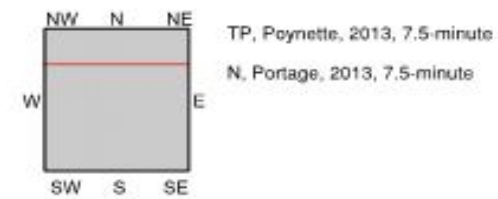


Historical Topo Map

2013



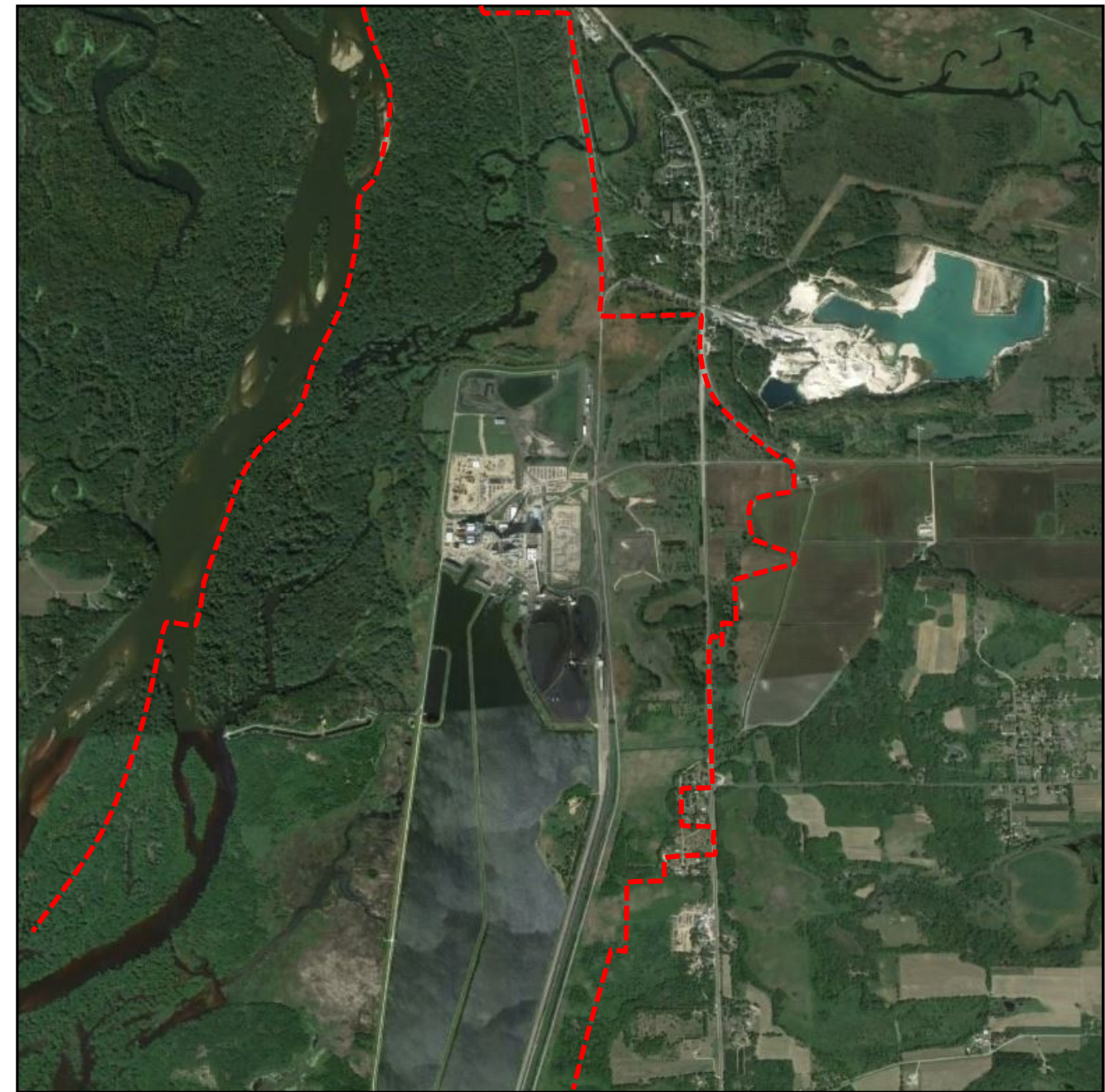
This report includes information from the following map sheet(s).



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



Historical Aerial Photo 6/12/2014



----- Approximate Property Boundary



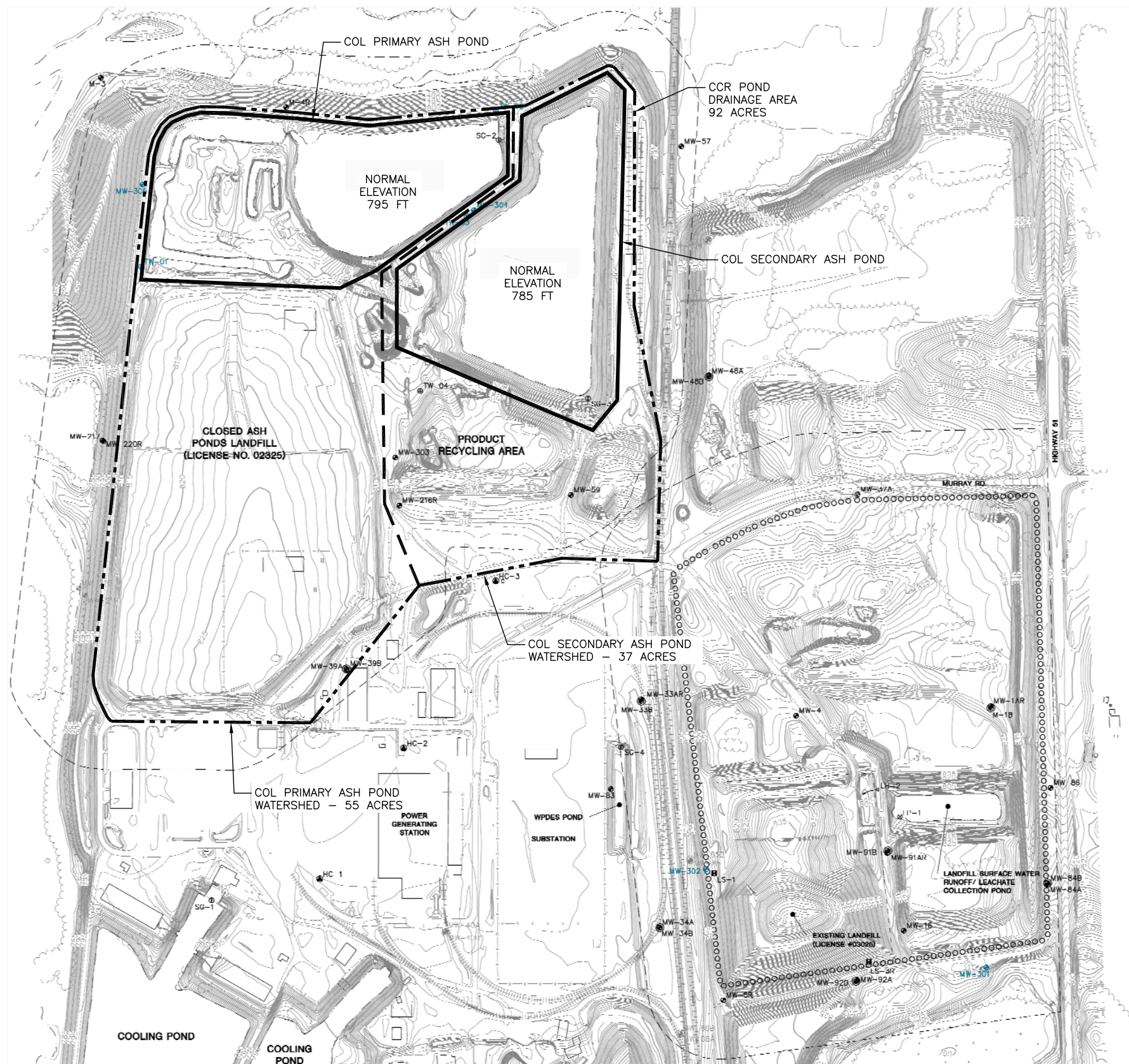
**HARD HAT SERVICES**<sup>TM</sup>  
 Engineering, Construction and Management Solutions

Site Location  
 Columbia Energy Center  
 Wisconsin Power and Light Company

Drawing  
**Figure 1**  
 Date  
 7/12/2016



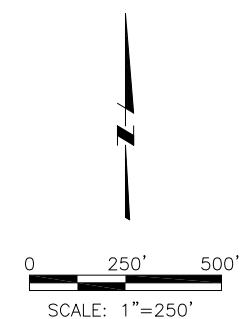
MAP SOURCE:  
SCS ENGINEERS  
COLUMBIA ASH PONDS AND DRY  
ASH DISPOSAL FACILITIES;  
WELL LOCATION MAP; FIGURE 2  
REV. DATE 2-2-16



LEGEND

— 10' —	EXISTING MAJOR CONTOUR (10' INTERVAL)
— 2' —	EXISTING MINOR CONTOUR (2' CONTOUR)
— — —	EXISTING FINCHLINE
— — — — —	EXISTING TRACKS
— — — — —	EXISTING PAVED ROAD
— — — — —	EXISTING UNPAVED ROAD
— — — — —	FDGF OF WATER
— — — — —	DESIGN MANAGEMENT ZONE
○ ○ ○ ○ ○ ○ ○ ○	APPROVED LIMITS OF WASTE
— — — — —	CONSTRUCTION LIMITS OF WASTE
●	WATER SUPPLY WELL
○	STAFF GAUGE
●	WATER TABLE WELL
○	PIP/COMPILER
●	SURFACE WATER SAMPLING LOCATION
■	LYSIMPILER
○	ABANDONED WATER TABLE WELL
○	ABANDONED PIP/COMPILER
—	FRACHTAF HEADWELL
●	TEMPORARY WELL
●	NEW WATER TABLE WELL

- NOTES:
1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN 10-20-04.
  2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN OCTOBER 1994, NOVEMBER 1996, APRIL 2003, AND AUGUST 2012.
  3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY IBC.
  4. THE LOCATIONS OF THE ASH POND FACILITY DESIGN MANAGEMENT ZONE DEMARCATION LINES ARE APPROXIMATE AND BASED ON THE WATER TABLE MAP (OCTOBER 2012) FIGURE BY KBM.
  5. THE LOCATION OF THE ACTIVE DRY ASH LANDFILL DESIGN MANAGEMENT ZONE DEMARCATION LINE IS BASED ON A 500 FOOT OFFSET FROM THE DESIGN LIMITS OF ASH EXCEPT WHERE CHISEL WOULD EXCEED THE BOUNDARY PROPERTY LINE.



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REV	DATE	BY	DESCRIPTION



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
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DRAWING DESCRIPTION	INFLOW FLOOD CONTROL PLAN CCR SURFACE INPOUNDMENTS STORM WATER ROUTING
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JOB	154.010.025
SHT.	FIGURE 2
DWG.	154.010.025-D1

## **APPENDIX A – NOAA Storm Frequency Tabulation**

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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 & aeriels](#)

**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.366</b> (0.319–0.431)	<b>0.416</b> (0.362–0.490)	<b>0.503</b> (0.436–0.594)	<b>0.581</b> (0.501–0.688)	<b>0.696</b> (0.582–0.855)	<b>0.791</b> (0.644–0.982)	<b>0.891</b> (0.699–1.13)	<b>0.999</b> (0.749–1.30)	<b>1.15</b> (0.826–1.53)	<b>1.27</b> (0.885–1.70)
<b>10-min</b>	<b>0.536</b> (0.467–0.631)	<b>0.609</b> (0.530–0.718)	<b>0.737</b> (0.639–0.870)	<b>0.851</b> (0.733–1.01)	<b>1.02</b> (0.853–1.25)	<b>1.16</b> (0.943–1.44)	<b>1.31</b> (1.02–1.65)	<b>1.46</b> (1.10–1.90)	<b>1.68</b> (1.21–2.24)	<b>1.86</b> (1.30–2.49)
<b>15-min</b>	<b>0.654</b> (0.570–0.770)	<b>0.743</b> (0.647–0.875)	<b>0.899</b> (0.779–1.06)	<b>1.04</b> (0.894–1.23)	<b>1.24</b> (1.04–1.53)	<b>1.41</b> (1.15–1.75)	<b>1.59</b> (1.25–2.02)	<b>1.78</b> (1.34–2.31)	<b>2.05</b> (1.48–2.73)	<b>2.27</b> (1.58–3.04)
<b>30-min</b>	<b>0.906</b> (0.789–1.07)	<b>1.03</b> (0.896–1.21)	<b>1.25</b> (1.08–1.47)	<b>1.44</b> (1.24–1.71)	<b>1.73</b> (1.45–2.13)	<b>1.97</b> (1.60–2.44)	<b>2.22</b> (1.74–2.81)	<b>2.49</b> (1.87–3.23)	<b>2.87</b> (2.06–3.81)	<b>3.17</b> (2.21–4.25)
<b>60-min</b>	<b>1.15</b> (1.00–1.35)	<b>1.32</b> (1.15–1.56)	<b>1.63</b> (1.41–1.92)	<b>1.91</b> (1.64–2.26)	<b>2.32</b> (1.94–2.86)	<b>2.66</b> (2.17–3.31)	<b>3.03</b> (2.38–3.85)	<b>3.43</b> (2.57–4.45)	<b>3.99</b> (2.87–5.30)	<b>4.44</b> (3.09–5.95)
<b>2-hr</b>	<b>1.40</b> (1.22–1.63)	<b>1.62</b> (1.41–1.89)	<b>2.01</b> (1.75–2.36)	<b>2.37</b> (2.05–2.79)	<b>2.91</b> (2.45–3.57)	<b>3.36</b> (2.76–4.16)	<b>3.84</b> (3.04–4.85)	<b>4.37</b> (3.30–5.64)	<b>5.11</b> (3.70–6.75)	<b>5.71</b> (4.00–7.59)
<b>3-hr</b>	<b>1.54</b> (1.36–1.79)	<b>1.80</b> (1.58–2.09)	<b>2.25</b> (1.97–2.63)	<b>2.67</b> (2.32–3.13)	<b>3.31</b> (2.80–4.05)	<b>3.85</b> (3.17–4.75)	<b>4.43</b> (3.51–5.57)	<b>5.06</b> (3.84–6.52)	<b>5.96</b> (4.33–7.85)	<b>6.69</b> (4.71–8.86)
<b>6-hr</b>	<b>1.82</b> (1.61–2.10)	<b>2.11</b> (1.86–2.43)	<b>2.63</b> (2.32–3.05)	<b>3.13</b> (2.74–3.64)	<b>3.90</b> (3.34–4.75)	<b>4.56</b> (3.79–5.60)	<b>5.28</b> (4.22–6.62)	<b>6.07</b> (4.64–7.78)	<b>7.21</b> (5.29–9.45)	<b>8.14</b> (5.78–10.7)
<b>12-hr</b>	<b>2.14</b> (1.90–2.45)	<b>2.43</b> (2.16–2.78)	<b>2.98</b> (2.64–3.42)	<b>3.51</b> (3.09–4.04)	<b>4.34</b> (3.75–5.27)	<b>5.08</b> (4.25–6.20)	<b>5.88</b> (4.74–7.33)	<b>6.78</b> (5.23–8.64)	<b>8.08</b> (5.97–10.5)	<b>9.15</b> (6.54–12.0)
<b>24-hr</b>	<b>2.44</b> (2.19–2.78)	<b>2.77</b> (2.48–3.16)	<b>3.40</b> (3.02–3.87)	<b>3.99</b> (3.53–4.56)	<b>4.91</b> (4.26–5.90)	<b>5.71</b> (4.81–6.91)	<b>6.59</b> (5.35–8.14)	<b>7.56</b> (5.87–9.56)	<b>8.96</b> (6.67–11.6)	<b>10.1</b> (7.28–13.1)
<b>2-day</b>	<b>2.73</b> (2.46–3.08)	<b>3.18</b> (2.86–3.59)	<b>3.97</b> (3.55–4.49)	<b>4.68</b> (4.17–5.32)	<b>5.75</b> (4.99–6.82)	<b>6.65</b> (5.62–7.95)	<b>7.61</b> (6.20–9.30)	<b>8.65</b> (6.74–10.8)	<b>10.1</b> (7.57–12.9)	<b>11.3</b> (8.19–14.6)
<b>3-day</b>	<b>3.00</b> (2.71–3.37)	<b>3.48</b> (3.14–3.91)	<b>4.32</b> (3.88–4.86)	<b>5.07</b> (4.53–5.74)	<b>6.19</b> (5.39–7.29)	<b>7.12</b> (6.03–8.47)	<b>8.11</b> (6.63–9.85)	<b>9.17</b> (7.18–11.4)	<b>10.7</b> (8.01–13.6)	<b>11.9</b> (8.64–15.2)

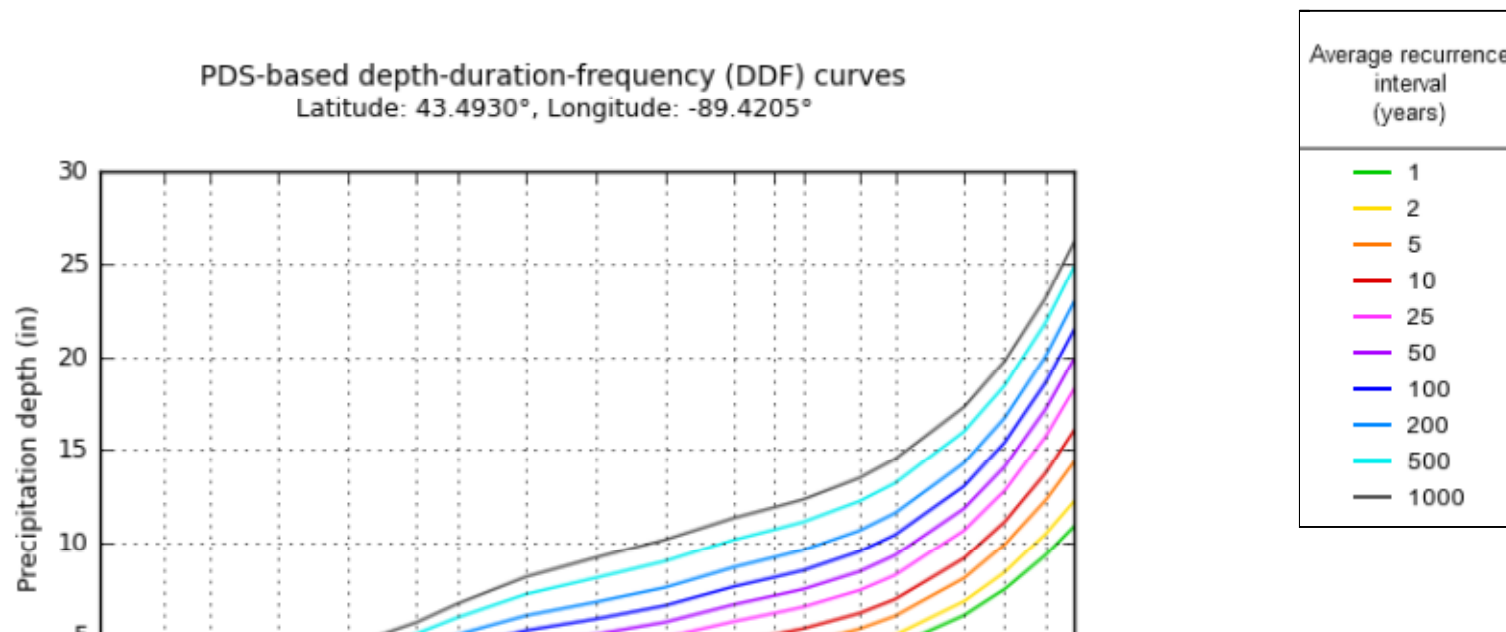


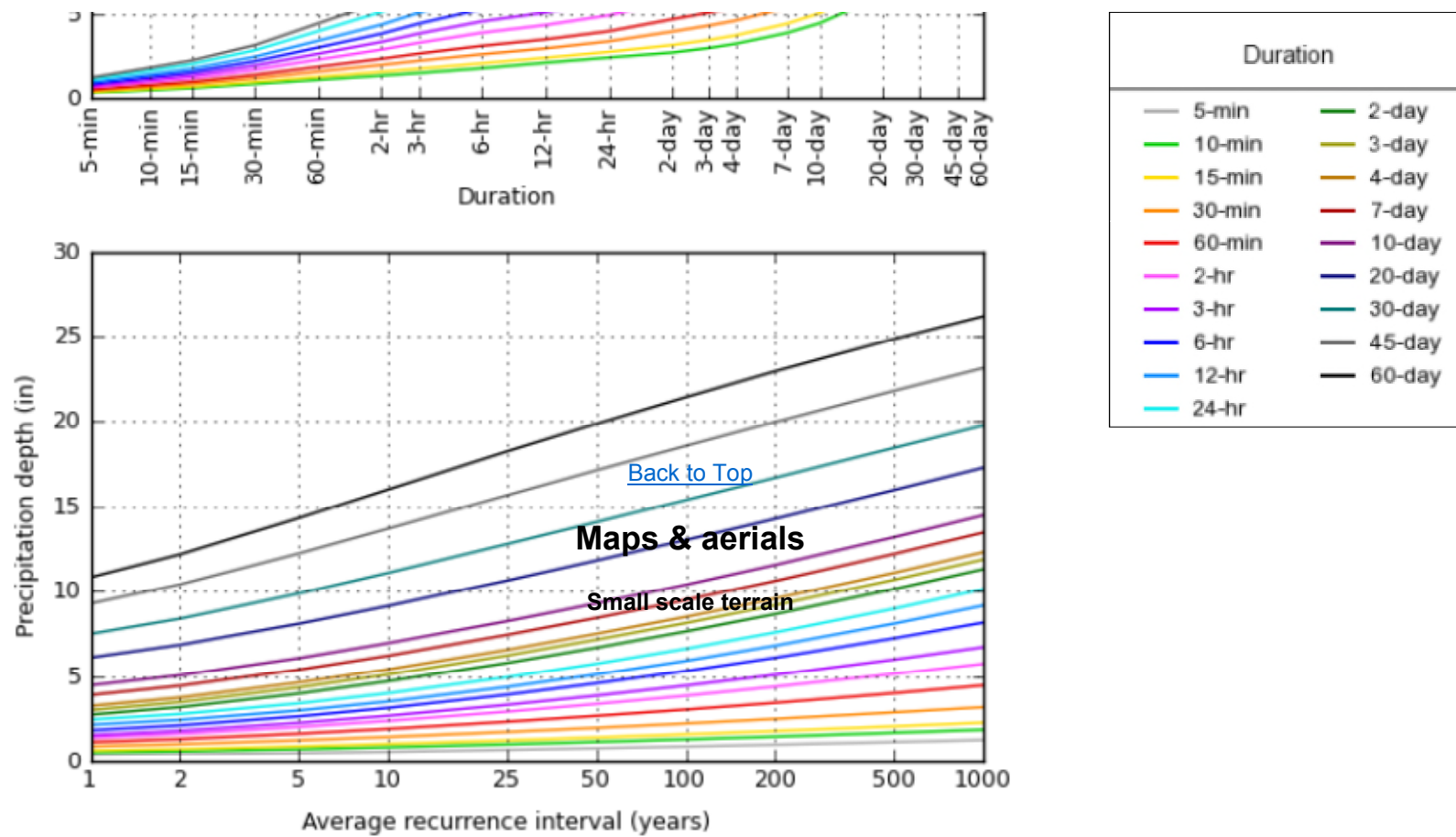
<b>4-day</b>	<b>3.25</b> (2.94-3.64)	<b>3.74</b> (3.38-4.19)	<b>4.60</b> (4.15-5.17)	<b>5.38</b> (4.82-6.06)	<b>6.52</b> (5.69-7.65)	<b>7.47</b> (6.34-8.85)	<b>8.48</b> (6.94-10.3)	<b>9.56</b> (7.50-11.8)	<b>11.1</b> (8.34-14.1)	<b>12.3</b> (8.98-15.7)
<b>7-day</b>	<b>3.88</b> (3.53-4.32)	<b>4.42</b>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

<sup>1</sup> 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.

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### PF graphical





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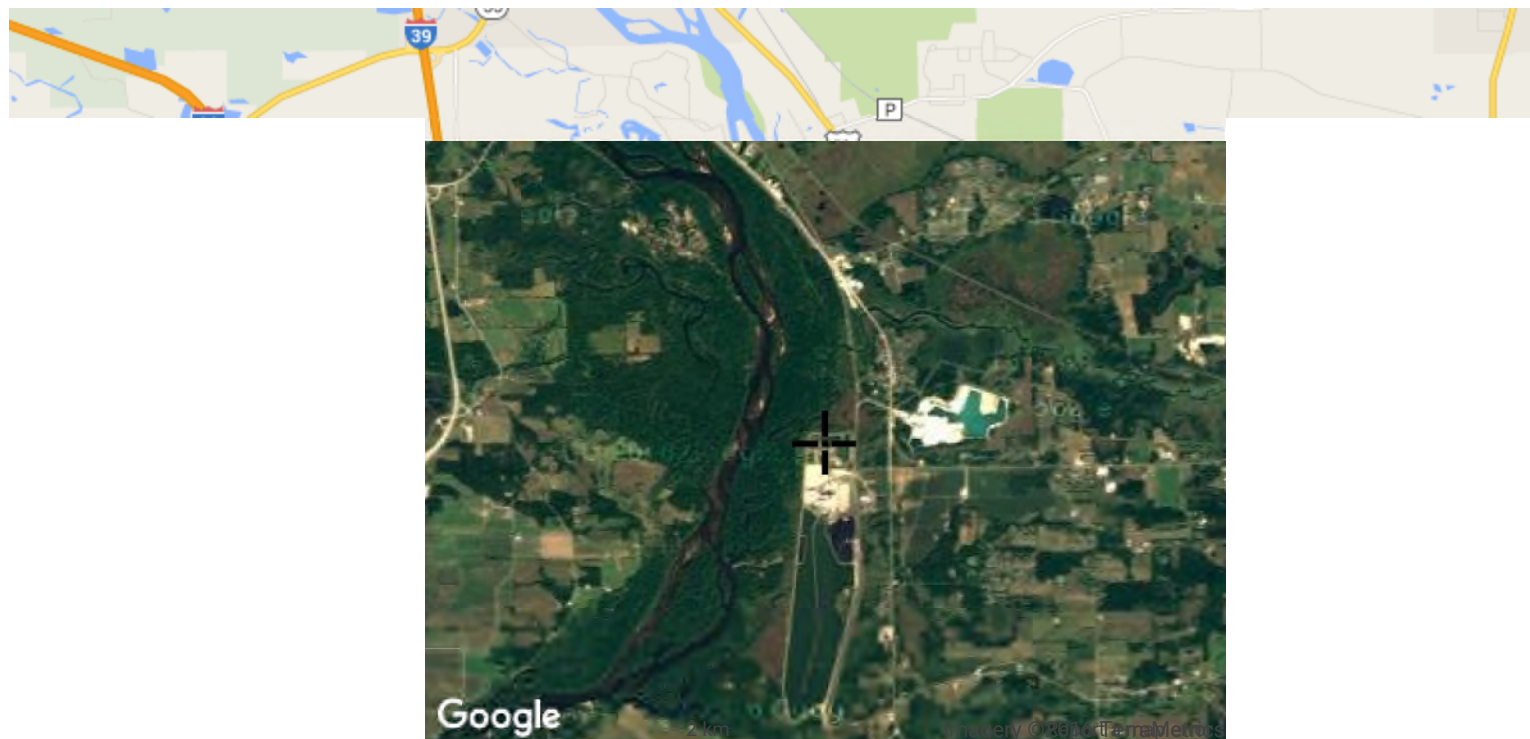
**Maps & aeriels**

**Small scale terrain**



Large scale map





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[National Weather Service](#)  
[National Water Center](#)  
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Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

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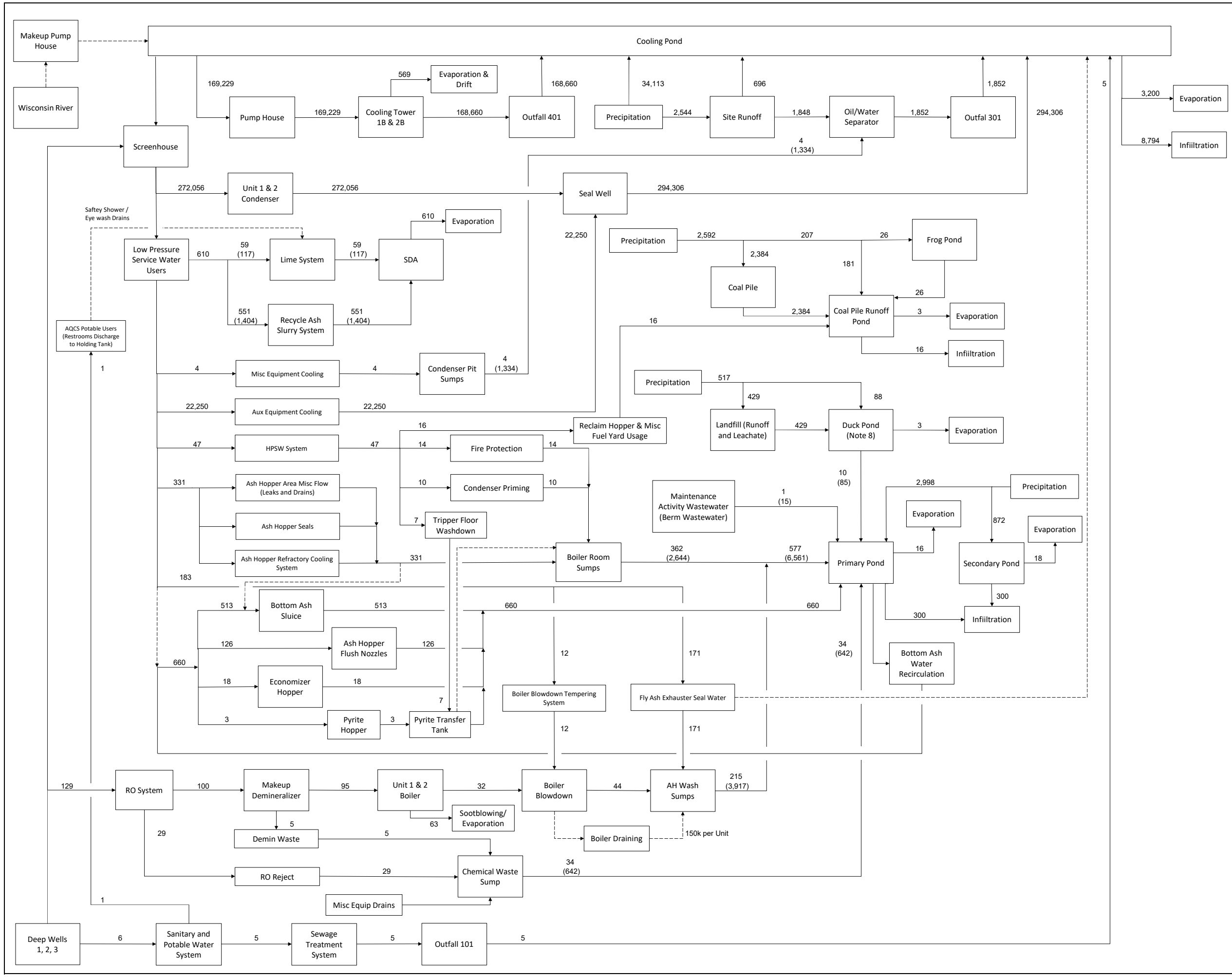
## **APPENDIX B – Water Balance Flow Chart**

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

Inflow Design Flood Control System Plan





Site Name and Location: Columbia Generating Station

1. SELECT 24-HR RAINFALL EVENT  
 Exclude Rainfall  
 4.91 inches of rainfall

2. UNIT OPERATION  
 Low Load Operation  Low Load

3. MISCELLANEOUS FLOWS  
 Bottom Ash Flows  Include

NOTES:  
 1. Flows are shown in gallons per minute (gpm) and rounded to the nearest gpm.  
 2. Flows are based on average daily conditions. Max process flows shown in parentheses. Max flows do not balance.  
 3. Precipitation calculated by using SCS curve number method for the different runoff areas. Flow shown is the rain event chosen, averaged over a 24 hour period.  
 4. Dashed lines represent intermittent process flows or atypical paths.  
 5. Flow paths not dictated by a flow value were not measured or enough data was not present to make a reasonable estimation for the value.  
 6. Infiltration values provided by Alliant Energy and were not calculated by BMcD.  
 7. In general, flows do not balance around pond systems. Precipitation or intermittent flows are expected to be captured in storage capacity of existing ponds.  
 8. Duck Pond water is hauled via truck to the Primary Pond. Flow rate based on hauling records. Typically 10k gallons of water hauled per trip.

# PRELIMINARY

Date	10/16/2020	Detailed	D. Elliott
Designed	D. Elliott	Checked	B. Hansen

**Alliant - Columbia Generating Station  
Water Balance**

Project	114958	Contract	
Drawing	WMB - 01	Rev	C

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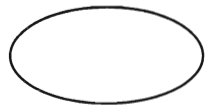
## **APPENDIX C – Inflow Flood Control Analysis**

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

Inflow Design Flood Control System Plan





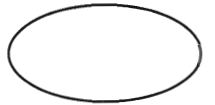
By TJK Date 7/20/16 Subject COLUMBIA STATION Sheet No. 1 of 2  
Chk: \_\_\_\_\_ Date \_\_\_\_\_ ZERO DISCHARGE CCP PONDS Proj. # 154.018.02.005  
1/4" x 1/4"

- 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 SLURRING
- PONDS ARE CONSTRUCTED IN SAND WITH A PERMEABILITY OF  $10^{-2}$  CM/SEC
- WATERSHED AREA IS 92 ACRES WHICH FORMERLY DISCHARGED TO WPDOS 002 (AREA INCLUDES CLOSED FLY ASH LANDFILL AND BOTTOM ASH HANDLING AREA WEST OF GENERATING STATION)
- SECONDARY ASH POND RECEIVES 40% OF RAINFALL FROM ( $0.4 \times 92 \text{ ACRES} = 37 \text{ ACRES}$ ). PRIMARY ASH POND RECEIVES ( $92 \text{ ACRES} - 37 \text{ ACRES} = 55 \text{ ACRES}$ ).

VOLUME OF DESIGN STORM (NO INFILTRATION)

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

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

By TJH Date 7/20/16 Subject COLUMBIA STATION Sheet No. 2 of 2Chk: \_\_\_\_\_ Date \_\_\_\_\_ ZERO DISCHARGE CCR POND 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 =  $30.25 \text{ AC-Ft} / 6.5 \text{ ACRES} = 4.65 \text{ FT}$ FINAL ELEVATION =  $795 \text{ FT} + 4.65 \text{ FT} = 799.7 \text{ FT}$  (USE 799 FT)FREEBOARD =  $804' - 799' = 5 \text{ FEET}$ SECONDARY POND VOLUME

AREA @ 785' APPROXIMATELY 9.0 ACRES

IGNORING SIDE SLOPE VOLUME INCREASE  
REQUIRED STORAGE =  $20.35 \text{ ACRE-Ft} / 9.0 \text{ ACRES} = 2.25 \text{ FT}$ FINAL ELEVATION =  $785 \text{ FT} + 2.25 \text{ FT} = 787.25'$  (USE 787 FT)FREEBOARD =  $804' - 787' = 17 \text{ FEET}$