ALLIANT ENERGY
Interstate Power and Light Company
Lansing Generating Station

CCR SURFACE IMPOUNDMENT

INFLOW DESIGN FLOOD CONTROL PLAN

Report Issued: August 10, 2021
Revision 1

HARD HAT SERVICES™
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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 (effective October 19, 2015) and subsequent amendments.

This Report assesses the hydrologic and hydraulic capacity requirements for each CCR unit at Burlington Generating Station in Burlington, Iowa 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.

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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.

Revision 1 of 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 Lansing Generating Station (LAN) in Lansing, Iowa (Figure 1) has one existing CCR surface impoundment identified as the LAN Upper Ash Pond.

2 FACILITY DESCRIPTION

LAN is located approximately three miles southeast of Lansing, Iowa on the western shore of the Mississippi River in Allamakee County, at 2320 Power Plant Drive, Lansing, Iowa (Figure 1).

LAN is a fossil-fueled electric generating station that has used four steam turbine electric generating units throughout its history. Unit 1, Unit 2, and Unit 3 were retired by 2014 and Unit 4 is the only operating unit. Sub-bituminous coal is the primary fuel for producing steam at LAN. The CCR at LAN is categorized into three types: bottom ash, fly ash, and scrubber byproduct. Fly ash is collected by electrostatic precipitators and pneumatically conveyed to an onsite fly ash silo, which is equipped with a baghouse for dust control. The fly ash is then either transported off-site for beneficial reuse, landfilled (in the case of high loss on ignition), or sluiced to LAN Upper Ash Pond (typically during startup and shutdown). Bottom ash is sluiced to a surface impoundment identified as the LAN Upper Ash Pond, Figure 2, where it is dredged, dewatered, and transported to the onsite landfill. The LAN Upper Ash Pond is located south of the generating plant and is the only existing CCR surface impoundment. Scrubber byproduct consists of fly ash, unreacted lime, and activated carbon. Scrubber byproduct is collected in the byproduct silo prior to being landfilled.

A previous CCR surface impoundment at LAN, identified as the Lower Ash Pond, was located west of the generating plant and north of Power Plant Drive. The Lower Ash Pond was closed in September 2015 by removing the CCR from the surface impoundment via hydraulic dredge and sluicing the CCR to the south end of the LAN Upper Ash Pond. CCR was removed from the Lower Ash Pond prior to backfilling the surface impoundment.

General Facility Information:

Date of Initial Facility Operations:	1946
NPDES Permit Number:	IA0300100

Latitude / Longitude:	41°56′38.43″N	91°38′22.39″W
Nameplate Ratings:	Unit 1 (1948): 16.6 MW (Retired)	
	Unit 2 (1949): 11.4 MW (Retired)	
	Unit 3 (1957): 35.8 MW (Retired)	
	Unit 4 (1977): 270 MW	

2.1 LAN Upper Ash Pond

The LAN Upper Ash Pond is located southwest of the generating plant and south of Power Plant Drive. The LAN Upper Ash Pond receives influent flows from the Unit 4 boiler floor sumps, water treatment sumps, fly ash hydroveyor system, storm water runoff from the active dry ash landfill and hillside east of the impoundment, as well as sluiced fly ash and bottom ash. The LAN Upper Ash Pond is the only receiver of sluiced CCR at LAN. The CCR is sluiced from the generating plant to the south east corner of the LAN Upper Ash Pond, Figure 2. The sluiced CCR discharges into the southeast corner of the LAN Upper Ash Pond where the majority of the CCR settles. Ongoing maintenance dredging is conducted in the southern portion of the LAN Upper Ash Pond. The dredged CCR is temporarily stockpiled and dewatered prior to being transported to the on-site active dry ash landfill located south of the LAN Upper Ash Pond.

The sluiced water that is discharged into the LAN Upper Ash Pond flows to the west prior to flowing north through a series of five interconnected settling ponds separated by intermediate dikes. The intermediate dikes have 30-inch diameter corrugated metal pipes on the west and east sides, which hydraulically connect the five settling ponds. The water from each settling pond flows north until it enters the large open settling area of the LAN Upper Ash Pond.

Currently construction is ongoing, and in the Fall of 2021, a new concrete outlet Weir Box structure will be commissioned, while the previous discharge structure (Weir Box #1) will be retrofitted to become and emergency stormwater overflow structure for sizeable precipitation events. The new outfall structure will be in the northeast corner of the impoundment and equipped with fiberglass stoplogs to adjust the operating elevation of the LAN Upper Ash Pond. Discharge will be directed north in a 16-inch HDPE pipe below Power Plant Drive. There it will transition to a 20-inch HDPE pipe and continue below the railroad tracks and then head east where National Pollution Discharge Elimination System (NPDES) Outfall 010 discharges into the Mississippi River.

Emergency Overflow Weir Box #1 located at north end of the LAN Upper Ash Pond, overflows a concrete weir into Weir Box #1, and then through a 24-inch diameter corrugated metal pipe under Power Plant Drive and into Weir Box #2. The water leaves Weir box 2 through a 24-inch diameter high density polyethylene pipe, which connects Weir Box #2 to Weir Box #3 in the backfilled former LAN Lower Ash Pond. The water flows through Weir Box #3 and discharges to the west through a 24-inch diameter corrugated metal pipe into Unnamed Creek #1. Unnamed Creek #1 flows to the north into Unnamed Creek #2 which then discharges into the Mississippi River.

The total surface area of the LAN Upper Ash Pond is approximately 11.5 acres and has an embankment height of approximately 20 feet from the crest to the toe of the downstream slope at its greatest height. The area of the entire CCR Unit inclusive of the impoundment and the dredging and dewatering areas is approximately 17 acres. The interior storage depth of the LAN Upper Ash Pond is approximately 28 feet. As stated in the 2020 Annual Inspection, the volume of impounded CCR and water within the LAN Upper Ash Pond is approximately 563,500 cubic yards.

3 HYDROLOGIC AND HYDRAULIC CAPACITY- §257.82(a)

This Report provides hydrologic and hydraulic capacity information for the inflow design flood control systems which is 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 NPDES regulations 40 CFR §257.3-3.

3.1 Hazard Classification and Design Storm

The 2021 Hazard Potential Classification analysis for the LAN Upper Ash Pond is classified as significant hazard potential due to the risk that the impoundment contents could enter the Unnamed Creek #2 which is the discharge of the LAN station condenser cooling water and travel from there directly into the Mississippi River. Additionally, as identified in the Hazard Potential Classification, Allamakee County Highway X-52 (Great River Road), immediately west of the LAN Upper Ash Pond, has the potential to become engulfed if a failure of the west embankment were to occur.

The design storm for the LAN Upper Ash Pond is the 1,000-year return event SCS Type II 24-hour storm as defined in 40 CFR 257.82 (3) (ii). The total rainfall for the event selected from the National Oceanographic and Atmospheric Administration's probabilistic map for the LAN site coordinates is 12.1 inches for the 1,000-year event, Appendix A.

3.2 Hydrologic and Hydraulic Capacity Methods

The 1,000-year SCS Type II storm was routed through the LAN Upper Ash Pond through its discharge weir, Figure 1. The routing was completed using the program Hydrology Studio. This program uses the unit hydrograph method to generate a Type II distribution rainfall for the drainage area to the LAN Upper Ash Pond. Hydrology Studio routes the rainfall hydrograph through the outlet structure storing water within the impoundment in accordance with the reservoir capacity of the impoundment. The proportion of runoff to rainfall for the drainage watershed is input based on characteristics of the watershed area. The drainage areas of the watershed include 54 acres of 19% slope hillside, 16 acres of ash landfill, 11.5 acres of open pond water, and 5.5 acres of embankment, Appendix B.

3.3 Hydrologic and Hydraulic Capacity Input and Assumptions

This section identifies the input and assumptions for the hydrologic and hydraulic capacity calculations. The input for each sub-drainage area of the LAN Upper Ash Pond are:

Sub-Area	Acreage	Curve Number (CN)	Slope (%)	Hydraulic Length (ft)
Wooded Side Slope	54	60	19	
Ash Landfill	16	86		
LAN Upper Ash Pond	11.5	100		
Ash Pond Embankments	5.5	77		
Weighted Average	87	72	19	2,150

The slope and hydraulic length for the steep hillside control the arrival of the peak water from rainfall due to the larger percentage of acreage from the wooded area and the steepness of the land.

The outlets from the four small ponds in the south end of the LAN Upper Ash Pond are not controlling flow and if the ponds fill water will overflow the center dividing embankments to reach the larger northern part of the LAN Upper Ash Pond. The storage of the smaller ponds is allotted to the larger pond as the pond fills and backs up into the smaller ponds, Appendix B. The outlet from the LAN Upper Ash Pond is through the four-foot-wide overflow within in concrete discharge structure. This overflow weir is adjustable and is normally operated with the weir set at elevation 646.5 feet NAVD 1988.

During normal LAN operation, the process water flow to the Upper Ash Pond is 1,740 gallons per minute (3.88 cubic feet per second). Based on the overflow weir equation[1]

[1] Q (flow in cfs) = weir coefficient * length of weir * $(\text{head (ft)})^2$

with a weir coefficient of 3.0 the normal operating elevation of the water in the LAN Upper Ash Pond is 647.0 feet. The operating water elevation in the LAN Upper Ash Pond north section is the starting elevation for storage of the 1,000-year rainfall event.

As discharge from the overflow weir increases, the wet well fills with water until the weir becomes submerged and the outlet from the impoundment becomes controlled by the outlet pipe from the bottom of concrete structure, Appendix B. The flow for the full outlet piping consisting of HDPE as described in Section 2.0 is controlled by head loss under Bernoulli's law and includes the losses from velocity, entrance effects, and friction. The flow equation is:

Head Loss (ft) = $(1 + k_e + 29*(n)^2*L/R^{1.33})*V^2/2g$

Where: ke = entrance loss coefficient (0.5 for flush face)
n = mannings friction factor (0.009 for HDPE)
L = Pipe length in feet (see section 2.0)
R = Hydraulic radius (Area divided by Perimeter of Pipe)
V = Velocity (feet/second)
g = gravity (32.2 ft/sec^2)

The calculation is performed for a flooded tailwater in the Mississippi River equivalent to elevation 623. The tailwater elevation is equal to the 2-year return period flood water in the Mississippi river[2] which controls the tailwater at the discharge. The flood water assumption is reasonable considering the river flood stage is not likely to correspond to the 1,000-year local rainfall event.

Once the emergency outlet elevation of 648.0 is reached, discharge occurs at the emergency overflow through Weir Box #1. This is a 4-foot-wide weir enters a concrete structure and is discharged though a 24-inch CMP, which transitions to a 24-inch HDPE pipe.

[2] USACE Upper Mississippi River Flow Frequency Predictions for Lock and Dam #9

A combined outlet control curve that operates by overflow weir control to approximately elevation 648.0 in the impoundment and then converts to outlet pipe control, until the emergency overflow weir is reached is shown in Appendix B along with the calculations to generate the outlet curve.

The storage capacity of the LAN Upper Ash Pond is generated by digitizing the area of the impoundment at varying storage elevations above 647.0 feet. The volume includes the storage available in the smaller ponds to the south of the overall impoundment area as water elevation floods those ponds. The storage curve calculations are shown in Appendix B.

No exfiltration of water from the LAN Upper Ash Pond is allowed during the storm routing. Actual evidence from inflow and outflows to the impoundment indicates that exfiltration occurs. However, the amount is less than normal operating flow and will not increase dramatically during storm routing.

4 Inflow Design Flood Control System Plan

The 87 acres of storm water flow into the LAN Upper Ash Pond will discharge from the outlet at a flow of 44.75 cubic feet per second during peak storm flow. The LAN Upper Ash Pond will store 33.8 acre-feet of water during the event and the maximum water elevation will reach 651.52 feet. The minimum crest elevation of the embankment is elevation 654 on the north embankment with a resultant freeboard of 2.48 feet at the peak of the storm flow.

The maximum flow includes the 3.88 cfs of base flow which was adjusted into the outlet control as shown in Appendix B.

The results of the storm routing through the LAN Upper Ash Pond using Hydrology Studio are presented 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 Iowa; 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.

LICENSED PROFESSIONAL ENGINEER
MARK W. LOEROP
22197
IOWA

By: [signature]

Name: Mark Loerop

Date: Aug 10, 2021

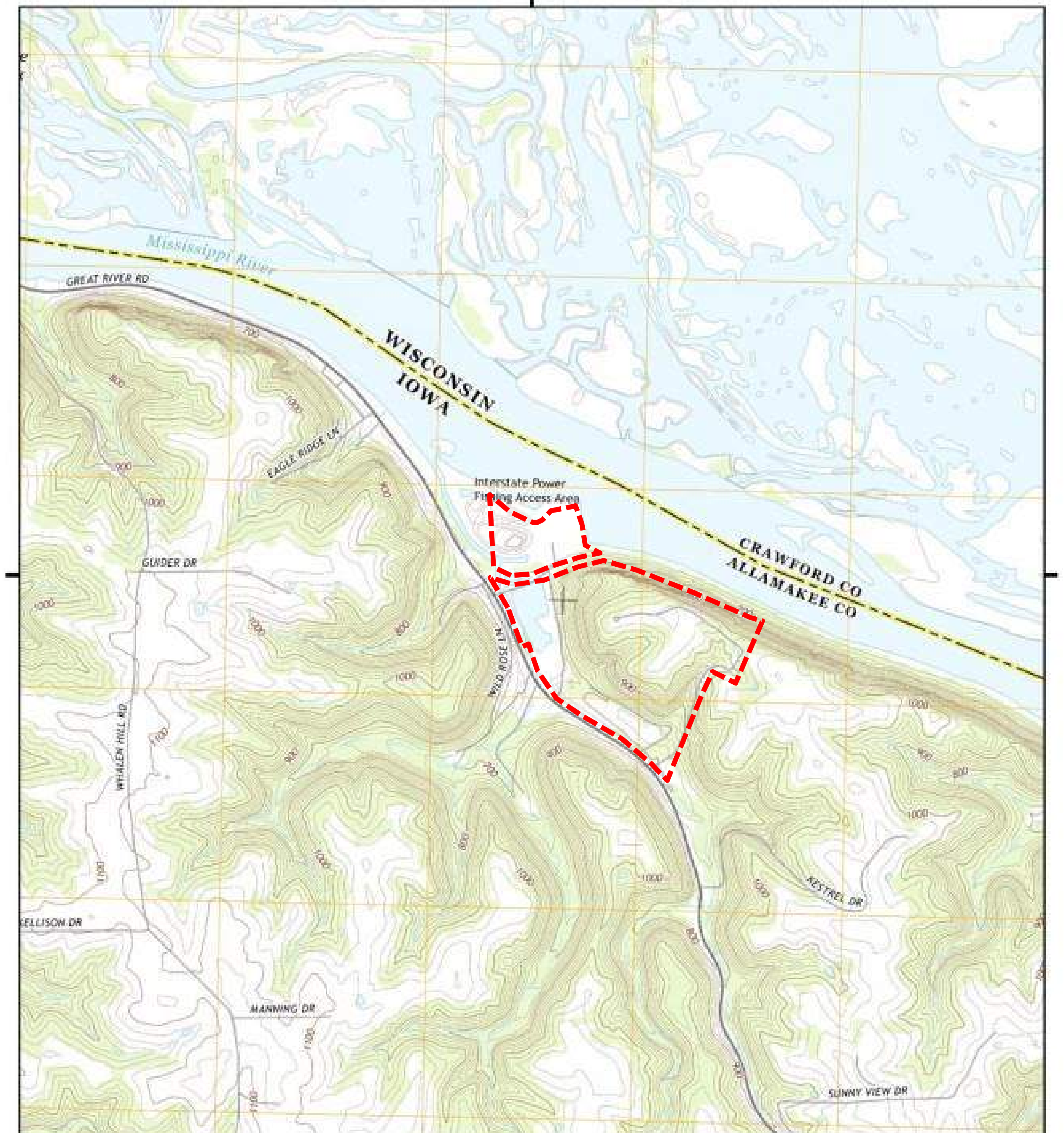
FIGURES

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Inflow Design Flood Control System Plan

Historical Topo Map

2013



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

Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Lansing, 2013, 7.5-minute

SITE NAME: Lasing Generating Station
ADDRESS: 2364-2366 Power Plant Dr
Lansing, IA 52151
CLIENT: Environmental Site Assessors

N

4555570 - 1 page 5

Historical Aerial Photo

Approximate Property Boundary

HARD HAT SERVICES ™
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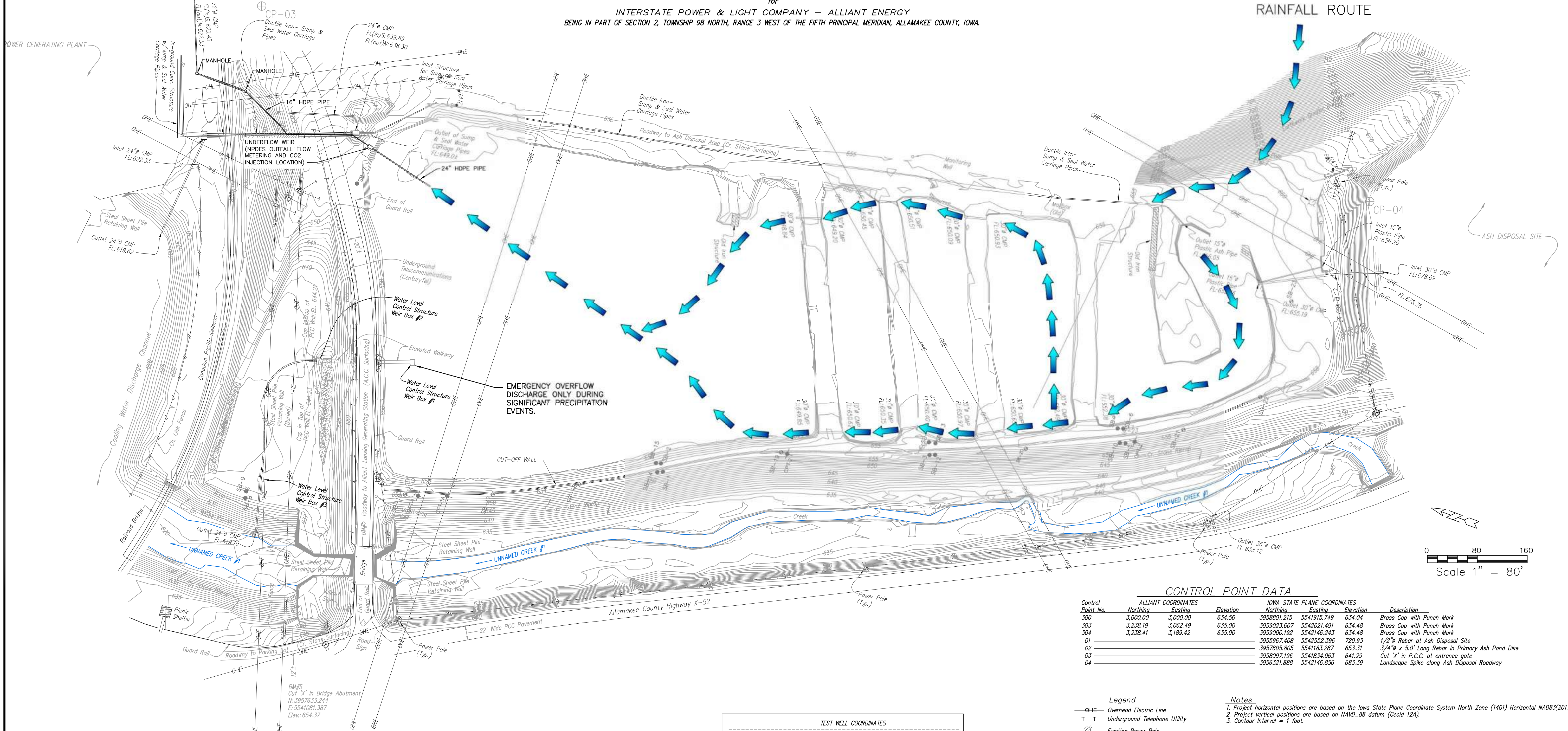
HARD HAT SERVICES	Site Location Lansing Generating Station Intersate Power and Light Company	Drawing Figure 1 Date 6/7/2016

UPPER AND LOWER CCR POND TOPOGRAPHIC SURVEY AND LOWER CCR POND BATHYMETRY
at
ALLIANT LANSING POWER GENERATING STATION
for
INTERSTATE POWER & LIGHT COMPANY – ALLIANT ENERGY
BEING IN PART OF SECTION 2, TOWNSHIP 98 NORTH, RANGE 3 WEST OF THE FIFTH PRINCIPAL MERIDIAN, ALLAMAKEE COUNTY, IOWA.



CONTROL POINT DATA

Control Point No.	ALLIANT COORDINATES Northing	Easting	Elevation	IOWA STATE PLANE COORDINATES Northing	Easting	Elevation	Description
300	3,000.00	3,000.00	634.56	3958801.215	5541915.749	634.04	Brass Cap with Punch Mark
303	3,238.19	3,062.49	635.00	3959023.607	5542021.491	634.48	Brass Cap with Punch Mark
304	3,238.41	3,189.42	635.00	3959000.192	5542146.243	634.48	Brass Cap with Punch Mark
01	—	—	—	3955967.408	5542552.396	720.93	1/2"ø Rebar at Ash Disposal Site
02	—	—	—	3957605.805	5541183.287	653.31	3/4"ø x 5.0' Long Rebar in Primary Ash Pond Dike
03	—	—	—	3958097.196	5541834.063	641.29	Cut 'X' in P.C.C. at entrance gate
04	—	—	—	3956321.888	5542146.856	683.39	Landscape Spike along Ash Disposal Roadway

Legend

- OHE — Overhead Electric Line
- T T — Underground Telephone Utility
- Existing Power Pole
- SB — Temporary Well Location
- SB — Soil Boring Location
- CPT — Cone Penitrometer Test Location
- CP — Control Point

Notes

1. Project horizontal positions are based on the Iowa State Plane Coordinate System North Zone (1401) Horizontal NAD83(2011).
2. Project vertical positions are based on NAVD_88 datum (Geoid 12A).
3. Contour Interval = 1 foot.

TEST WELL COORDINATES

WELL ID	Northing	Easting	TOP Elevation	Ground Elevation
SB-1	3957238.28	5541352.23	653.36	653.26
SB-2	3957245.81	5541363.76	652.66	652.63
SB-3	3956845.82	5541523.57	656.39	655.37
SB-4	3956853.80	5541542.37	655.88	655.34
SB-5	3956557.49	5541648.53	656.70	655.80
SB-6	3956569.09	5541669.35	656.19	655.97
SB-7	3957856.52	5541618.95	653.45	653.33
SB-8	3957852.40	5541084.50	641.74	638.43
SB-9	3957854.40	5541094.88	640.63	638.52
SB-10	NS	NS	656.38	655.85
SB-11	NS	NS	656.38	656.17
SB-12	NS	NS	656.40	655.44
SB-13	NS	NS	656.43	655.27
SB-14	NS	NS	654.37	653.15
SB-15	NS	NS	652.75	652.67

NOTE:
1. SURVEY INFORMATION PROVIDED ABOVE WAS COMPILED BY MOHN SURVEYING, INC. 1890 GREAT RIVER ROAD LANSING, IOWA 52151, APRIL 2015.
2. ALLIANT ENERGY REQUIRES 20 FEET OVERHEAD SEPARATION DISTANCE FOR EQUIPMENT OPERATING UNDER POWERLINES.

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1	4-19-21	MWL	MWL	REVISION 1 TO PLAN

SCALE: AS SHOWN | DATE: 4-19-21
DRAWN BY: JFD | CHECKED BY: MWL | APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
INFLOW FLOOD CONTROL
SITE PLAN

JOB 154.018.024.004
SHT. FIGURE 2
DWG. 154.018.024.004-D2

APPENDIX A – NOAA Storm Frequency

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Inflow Design Flood Control System Plan

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

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- Maps
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- Documents

Probable Maximum Precipitation
- Documents

Miscellaneous
- Publications
- Storm Analysis
- Record Precipitation

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USA.gov

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: IA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

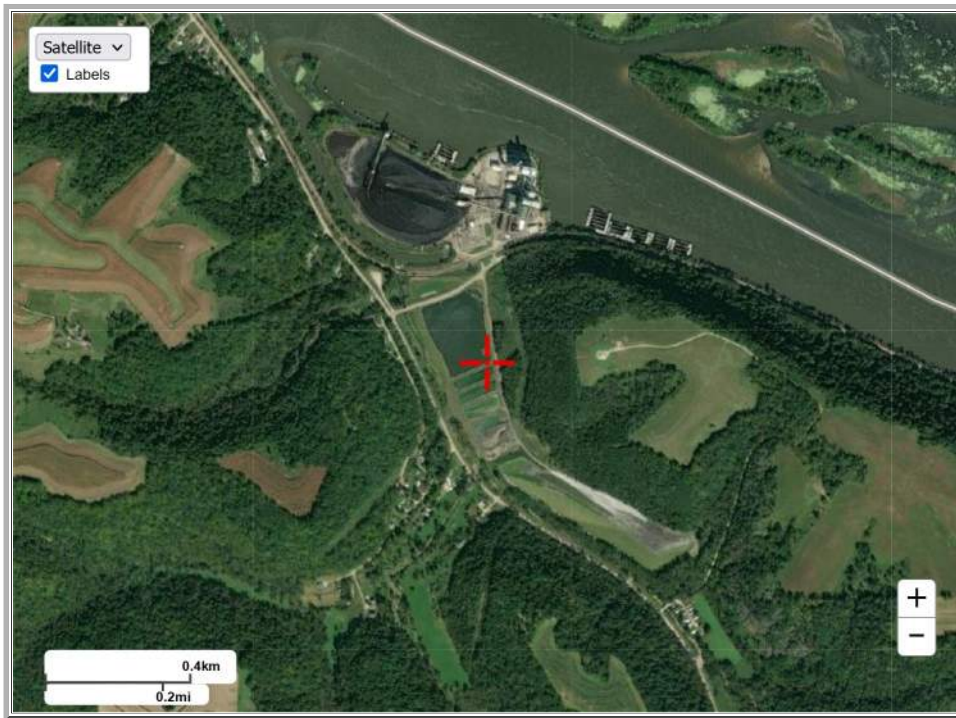
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: Longitude: Submit

b) By station (list of IA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Lansing, Iowa, USA*
Latitude: 43.3323°
Longitude: -91.1674°
Elevation: 650.18 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 8, Version 2

PF tabular | PF graphical | Supplementary information | Print page

PDS-based 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	**0.384** (0.308-0.481)	**0.447** (0.358-0.560)	**0.552** (0.440-0.692)	**0.641** (0.509-0.807)	**0.767** (0.591-0.996)	**0.867** (0.653-1.14)	**0.969** (0.707-1.30)	**1.08** (0.755-1.48)	**1.22** (0.825-1.72)	**1.33** (0.878-1.90)
10-min	**0.563** (0.451-0.704)	**0.654** (0.524-0.819)	**0.808** (0.645-1.01)	**0.938** (0.745-1.18)	**1.12** (0.866-1.46)	**1.27** (0.957-1.67)	**1.42** (1.04-1.90)	**1.58** (1.11-2.16)	**1.79** (1.21-2.51)	**1.95** (1.29-2.78)
15-min	**0.686** (0.550-0.859)	**0.798** (0.639-0.999)	**0.985** (0.786-1.24)	**1.14** (0.909-1.44)	**1.37** (1.06-1.78)	**1.55** (1.17-2.03)	**1.73** (1.26-2.32)	**1.92** (1.35-2.64)	**2.18** (1.47-3.06)	**2.38** (1.57-3.39)
30-min	**0.938** (0.752-1.17)	**1.10** (0.881-1.38)	**1.37** (1.09-1.72)	**1.60** (1.27-2.01)	**1.92** (1.48-2.49)	**2.17** (1.63-2.85)	**2.42** (1.77-3.25)	**2.69** (1.89-3.69)	**3.05** (2.06-4.28)	**3.32** (2.19-4.73)
60-min	**1.21** (0.970-1.52)	**1.42** (1.14-1.78)	**1.78** (1.42-2.24)	**2.10** (1.67-2.64)	**2.55** (1.97-3.33)	**2.92** (2.21-3.85)	**3.31** (2.42-4.45)	**3.71** (2.61-5.11)	**4.27** (2.89-6.02)	**4.71** (3.11-6.71)
2-hr	**1.48** (1.20-1.84)	**1.74** (1.41-2.16)	**2.20** (1.77-2.73)	**2.60** (2.09-3.25)	**3.19** (2.50-4.14)	**3.68** (2.81-4.82)	**4.19** (3.09-5.61)	**4.73** (3.36-6.49)	**5.50** (3.75-7.71)	**6.10** (4.05-8.64)
3-hr	**1.66** (1.35-2.04)	**1.95** (1.59-2.40)	**2.46** (2.00-3.04)	**2.93** (2.36-3.63)	**3.63** (2.86-4.70)	**4.22** (3.24-5.51)	**4.85** (3.60-6.47)	**5.53** (3.94-7.56)	**6.49** (4.46-9.09)	**7.27** (4.85-10.3)
6-hr	**1.96** (1.62-2.39)	**2.29** (1.88-2.79)	**2.88** (2.37-3.53)	**3.45** (2.81-4.23)	**4.33** (3.46-5.59)	**5.08** (3.96-6.62)	**5.91** (4.44-7.87)	**6.82** (4.92-9.30)	**8.13** (5.64-11.4)	**9.21** (6.18-12.9)
12-hr	**2.27** (1.89-2.74)	**2.61** (2.17-3.15)	**3.26** (2.71-3.95)	**3.90** (3.22-4.74)	**4.92** (3.99-6.33)	**5.81** (4.58-7.53)	**6.81** (5.17-9.01)	**7.91** (5.76-10.7)	**9.52** (6.65-13.2)	**10.9** (7.33-15.1)

08/20/2021 - Classification: Internal - ECRM12659618

24-hr	**2.58** (2.17-3.08)	**2.94** (2.47-3.51)	**3.65** (3.06-4.37)	**4.34** (3.62-5.22)	**5.46** (4.48-6.97)	**6.46** (5.14-8.30)	**7.56** (5.80-9.94)	**8.80** (6.46-11.9)	**10.6** (7.48-14.7)	**12.1** (8.25-16.8)
2-day	**2.94** (2.50-3.47)	**3.33** (2.83-3.93)	**4.09** (3.47-4.85)	**4.83** (4.08-5.76)	**6.03** (4.99-7.60)	**7.08** (5.69-9.00)	**8.25** (6.38-10.7)	**9.55** (7.07-12.7)	**11.5** (8.12-15.7)	**13.0** (8.92-17.9)
3-day	**3.21** (2.75-3.77)	**3.62** (3.11-4.26)	**4.42** (3.77-5.20)	**5.18** (4.40-6.13)	**6.40** (5.33-8.01)	**7.47** (6.03-9.43)	**8.65** (6.72-11.2)	**9.96** (7.40-13.2)	**11.9** (8.46-16.2)	**13.5** (9.25-18.4)
4-day	**3.45** (2.98-4.03)	**3.89** (3.35-4.55)	**4.71** (4.04-5.52)	**5.50** (4.69-6.48)	**6.74** (5.62-8.38)	**7.82** (6.33-9.81)	**9.01** (7.02-11.6)	**10.3** (7.69-13.6)	**12.2** (8.73-16.6)	**13.8** (9.52-18.8)
7-day	**4.08** (3.55-4.73)	**4.59** (3.99-5.32)	**5.52** (4.78-6.41)	**6.38** (5.49-7.45)	**7.70** (6.45-9.44)	**8.82** (7.18-10.9)	**10.0** (7.87-12.8)	**11.4** (8.51-14.9)	**13.3** (9.51-17.9)	**14.8** (10.3-20.1)
10-day	**4.66** (4.08-5.37)	**5.23** (4.58-6.03)	**6.26** (5.45-7.23)	**7.18** (6.22-8.34)	**8.58** (7.21-10.4)	**9.74** (7.96-12.0)	**11.0** (8.64-13.9)	**12.3** (9.27-16.0)	**14.3** (10.2-19.1)	**15.8** (11.0-21.4)
20-day	**6.38** (5.65-7.27)	**7.14** (6.31-8.14)	**8.43** (7.43-9.64)	**9.55** (8.36-11.0)	**11.2** (9.45-13.3)	**12.5** (10.3-15.1)	**13.8** (11.0-17.2)	**15.3** (11.5-19.6)	**17.2** (12.5-22.8)	**18.8** (13.2-25.2)
30-day	**7.86** (7.01-8.90)	**8.79** (7.83-9.96)	**10.3** (9.17-11.7)	**11.6** (10.3-13.3)	**13.5** (11.4-15.9)	**14.9** (12.3-17.9)	**16.4** (13.0-20.2)	**17.9** (13.6-22.8)	**19.9** (14.5-26.2)	**21.5** (15.1-28.8)
45-day	**9.78** (8.78-11.0)	**11.0** (9.83-12.3)	**12.9** (11.5-14.5)	**14.5** (12.8-16.4)	**16.6** (14.2-19.4)	**18.2** (15.2-21.7)	**19.9** (15.9-24.3)	**21.5** (16.4-27.2)	**23.6** (17.2-30.9)	**25.2** (17.8-33.6)
60-day	**11.4** (10.3-12.8)	**12.9** (11.6-14.4)	**15.1** (13.6-17.0)	**16.9** (15.1-19.1)	**19.4** (16.6-22.5)	**21.2** (17.7-25.1)	**23.0** (18.4-28.0)	**24.8** (18.9-31.1)	**27.0** (19.7-35.0)	**28.6** (20.3-38.0)

[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.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

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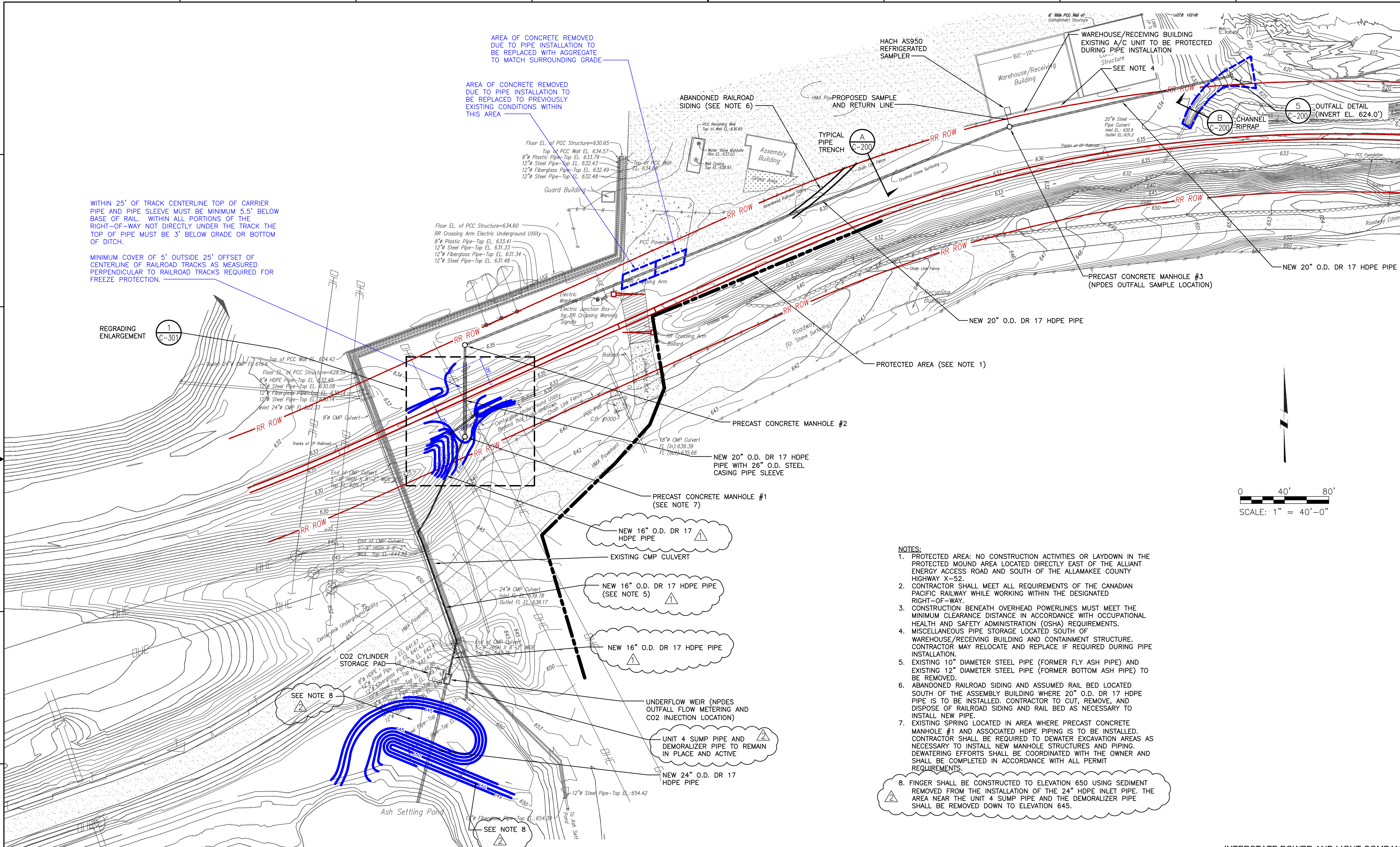
APPENDIX B – Outfall Drawings

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Inflow Design Flood Control System Plan

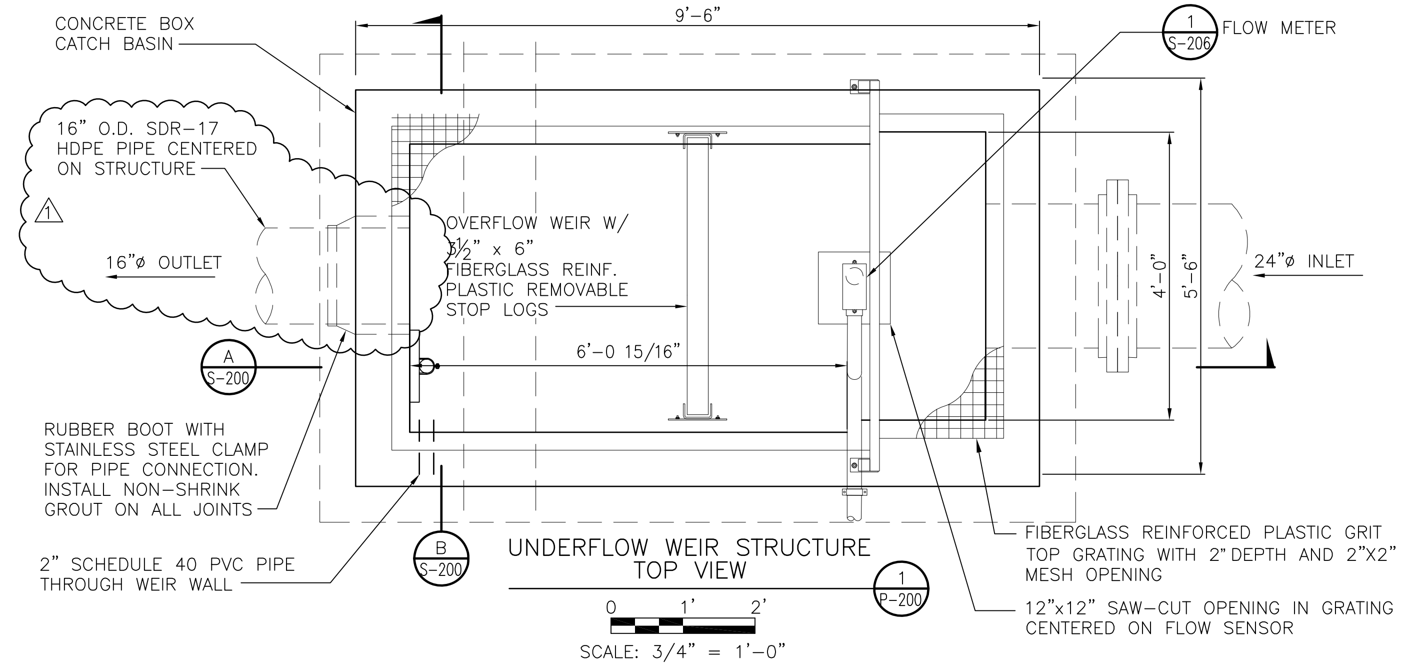


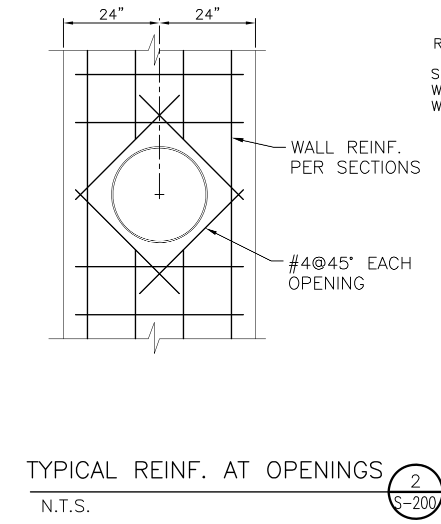
NOTES:

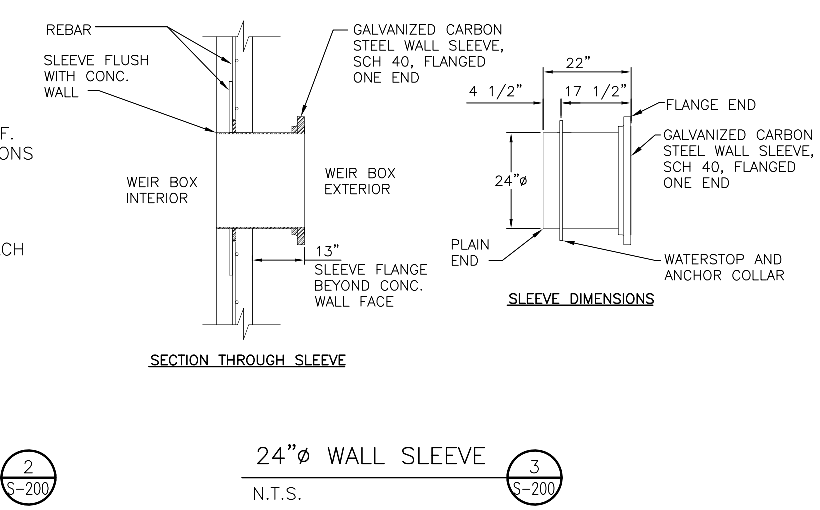
1. PROTECTED AREA: NO CONSTRUCTION ACTIVITIES OR LAYDOWN IN THE PROTECTED MOUND AREA LOCATED DIRECTLY EAST OF THE ALLIANT ENERGY ACCESS ROAD AND SOUTH OF THE ALLAMAKEE COUNTY HIGHWAY X-52.
2. CONTRACTOR SHALL MEET ALL REQUIREMENTS OF THE CANADIAN PACIFIC RAILWAY WHILE WORKING WITHIN THE DESIGNATED RIGHT-OF-WAY.
3. CONSTRUCTION BENEATH OVERHEAD POWERLINES MUST MEET THE MINIMUM CLEARANCE DISTANCE IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OSHA) REQUIREMENTS.
4. MISCELLANEOUS PIPE STORAGE LOCATED SOUTH OF WAREHOUSE/RECEIVING BUILDING AND CONTAINMENT STRUCTURE. CONTRACTOR MAY RELOCATE AND REPLACE IF REQUIRED DURING PIPE INSTALLATION.
5. EXISTING 10" DIAMETER STEEL PIPE (FORMER FLY ASH PIPE) AND EXISTING 12" DIAMETER STEEL PIPE (FORMER BOTTOM ASH PIPE) TO BE REMOVED.
6. ABANDONED RAILROAD SIDING AND ASSUMED RAIL BED LOCATED SOUTH OF THE ASSEMBLY BUILDING WHERE 20" O.D. DR 17 HDPE PIPE IS TO BE INSTALLED. CONTRACTOR TO CUT, REMOVE, AND DISPOSE OF RAILROAD SIDING AND RAIL BED AS NECESSARY TO INSTALL NEW PIPE.
7. EXISTING SPRING LOCATED IN AREA WHERE PRECAST CONCRETE MANHOLE #1 AND ASSOCIATED HDPE PIPING IS TO BE INSTALLED. CONTRACTOR SHALL BE REQUIRED TO DEWATER EXCAVATION AREAS AS NECESSARY TO INSTALL NEW MANHOLE STRUCTURES AND PIPING. DEWATERING EFFORTS SHALL BE COORDINATED WITH THE OWNER AND SHALL BE COMPLETED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
8. FINGER SHALL BE CONSTRUCTED TO ELEVATION 650 USING SEDIMENT REMOVED FROM THE INSTALLATION OF THE 24" HDPE INLET PIPE. THE AREA NEAR THE UNIT 4 SUMP PIPE AND THE DEMORALIZER PIPE SHALL BE REMOVED DOWN TO ELEVATION 645.

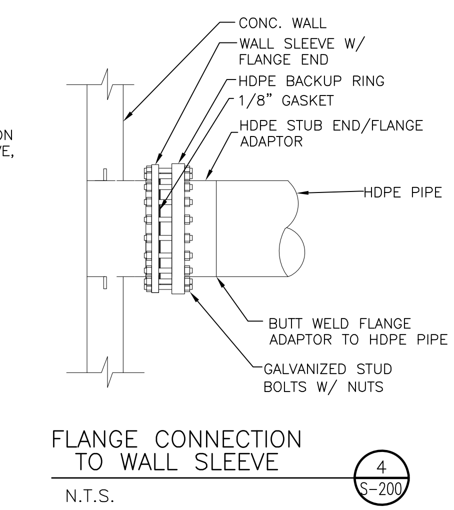
NO.	DATE	REVISION	BY	CHK'D	APV'D
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
2	10-15-20	CLIENT COMMENTS	JFD	MWL	RAS
1	10-2-20	ADD LOW VOLUME WASTE WATER FLOWS	JFD	MWL	RAS
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

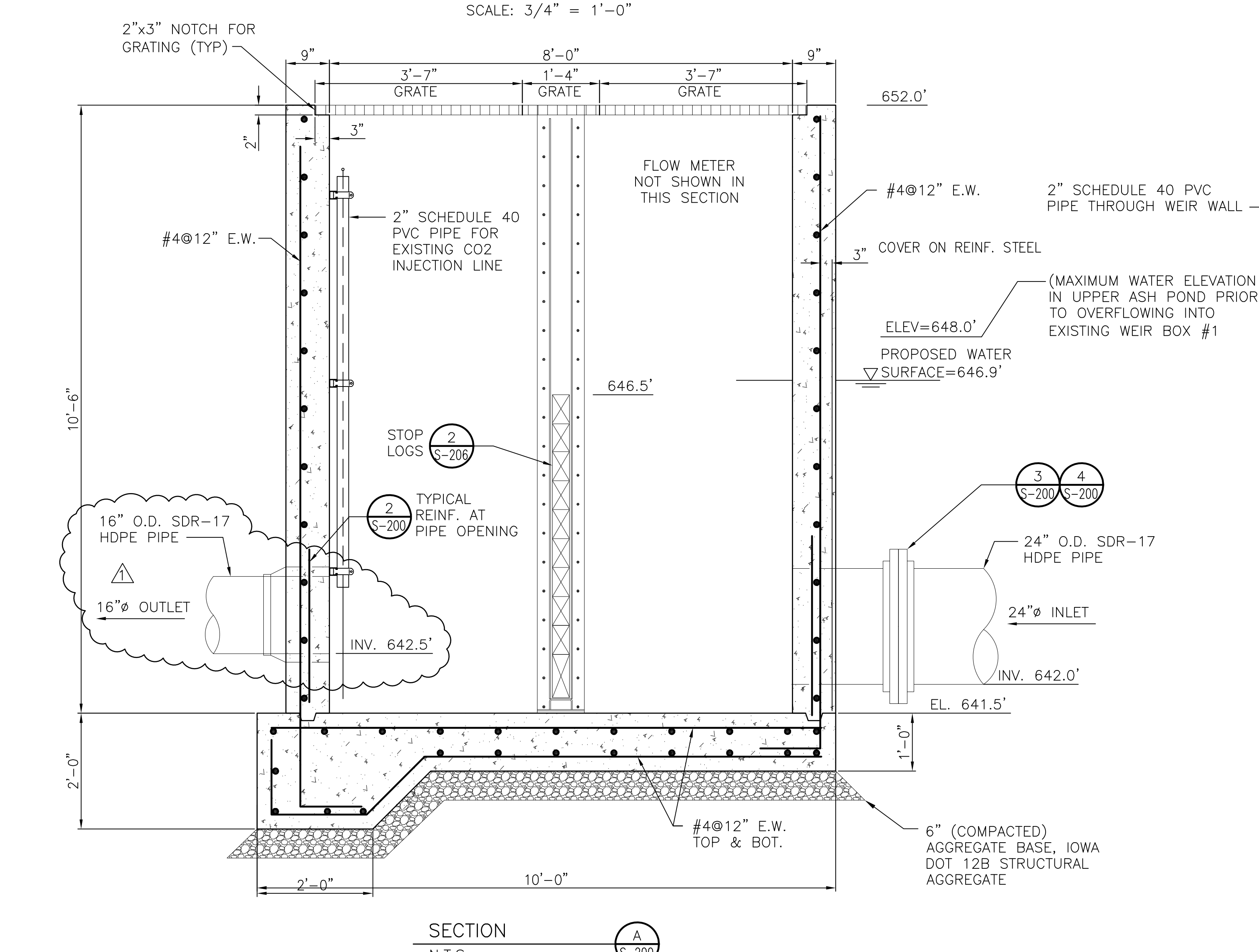
INTERSTATE POWER AND LIGHT COMPANY
LANSING GENERATING STATION — Unit 0
UPPER ASH POND OUTFALL REROUTE
CIVIL SITE GRADING
Scale: AS SHOWN
DWG. NO. C-300

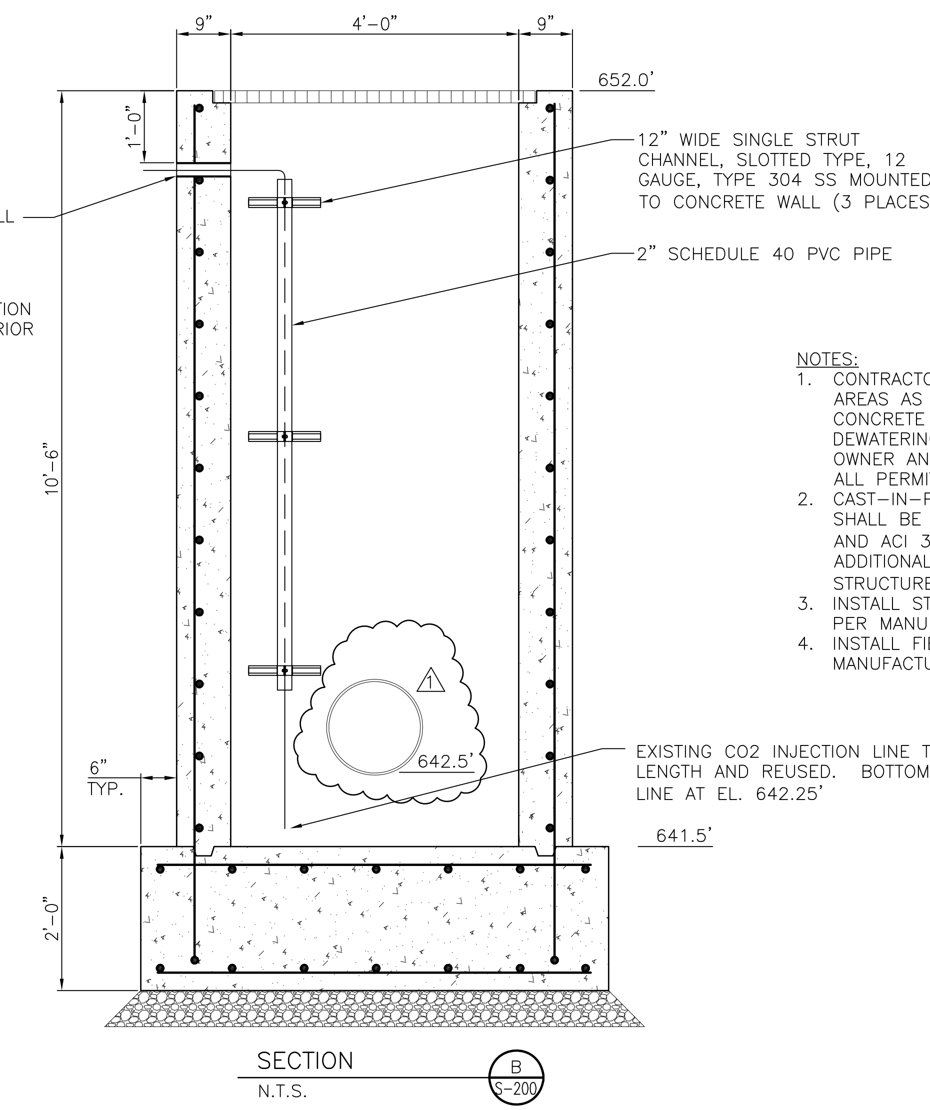












NOTES:

1. CONTRACTOR SHALL BE REQUIRED TO DEWATER EXCAVATION AREAS AS NECESSARY TO INSTALL NEW CAST-IN-PLACE CONCRETE WEIR STRUCTURE AND ASSOCIATED HDPE PIPING. DEWATERING EFFORTS SHALL BE COORDINATED WITH THE OWNER AND SHALL BE COMPLETED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
2. CAST-IN-PLACE CONCRETE UNDERFLOW WEIR STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH ACI 301 AND ACI 318 (SEE NOTES AND SPECIFICATIONS FOR ADDITIONAL DETAILS REGARDING CAST-IN-PLACE CONCRETE STRUCTURE CONSTRUCTION AND INSTALLATION).
3. INSTALL STOP LOGS AND IN-CHANNEL MOUNT GUIDE FRAME PER MANUFACTURER SPECIFICATIONS.
4. INSTALL FIBERGLASS REINFORCED PLASTIC GRATING PER MANUFACTURER SPECIFICATIONS.

NO.	DATE	REVISION	BY	CHK'D	APV'D
1	10-3-20	ADD LOW VOLUME WASTE WATER FLOWS	JFD	MWL	RAS
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

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INTERSTATE POWER AND LIGHT COMPANY

LANSING GENERATING STATION — Unit 0

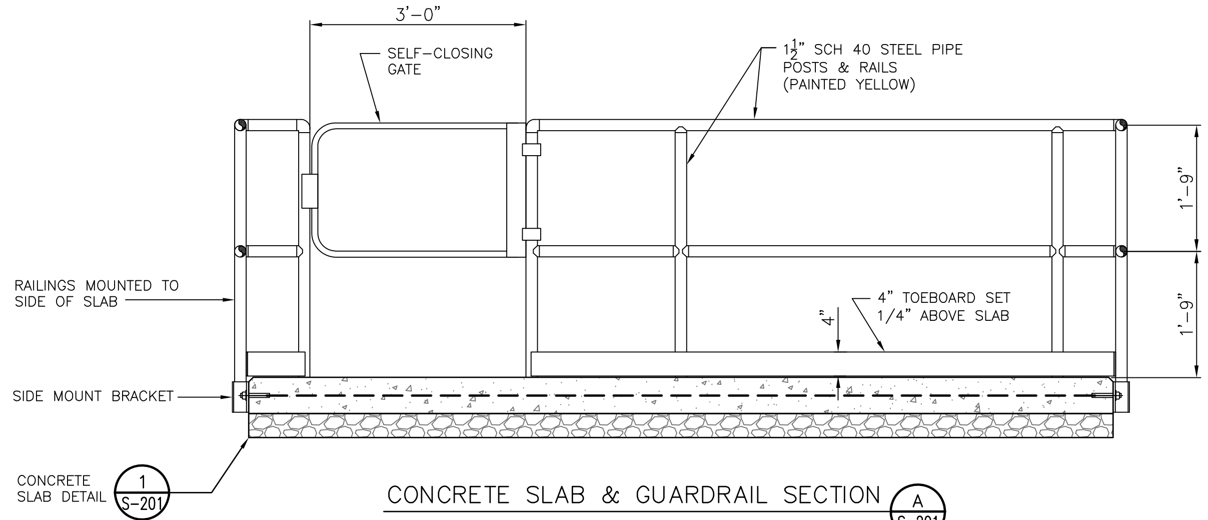
UPPER ASH POND OUTFALL REROUTE

CONCRETE PLAN AND DETAILS

UNDERFLOW WEIR

Scale: AS SHOWN

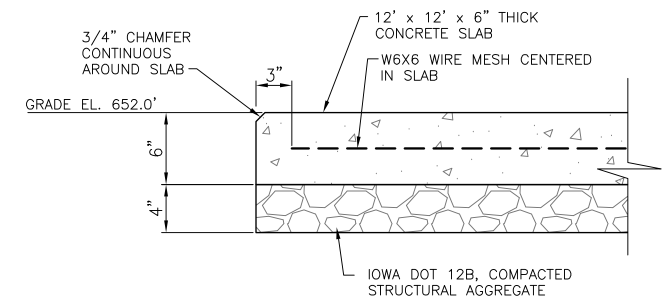
DWG. NO. S-200



CONCRETE SLAB & GUARDRAIL SECTION A S-201

0 1' 2'

SCALE: 3/4" = 1'-0"



CONCRETE SLAB DETAIL 1 S-201

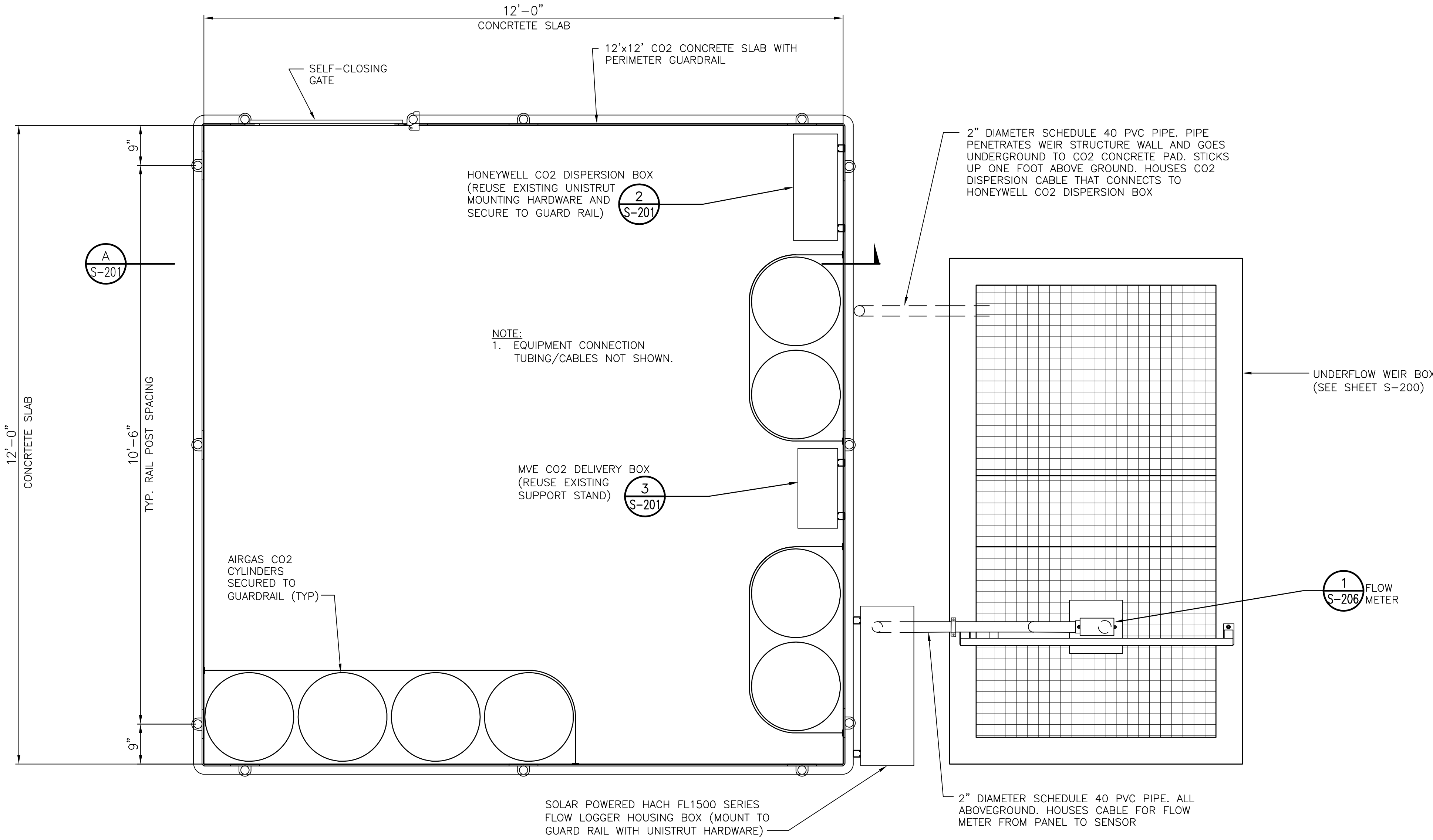
N.T.S.

HONEYWELL CO2 DISPERSION BOX 2 S-201

N.T.S.

MVE CO2 DELIVERY BOX 3 S-201

N.T.S.



PLAN VIEW

0 1' 2'

SCALE: 3/4" = 1'-0"

NO.	DATE	REVISION	BY	CHK'D	APV'D
·	·	·	·	·	·
·	·	·	·	·	·
·	·	·	·	·	·
·	·	·	·	·	·
·	·	·	·	·	·
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

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INTERSTATE POWER AND LIGHT COMPANY

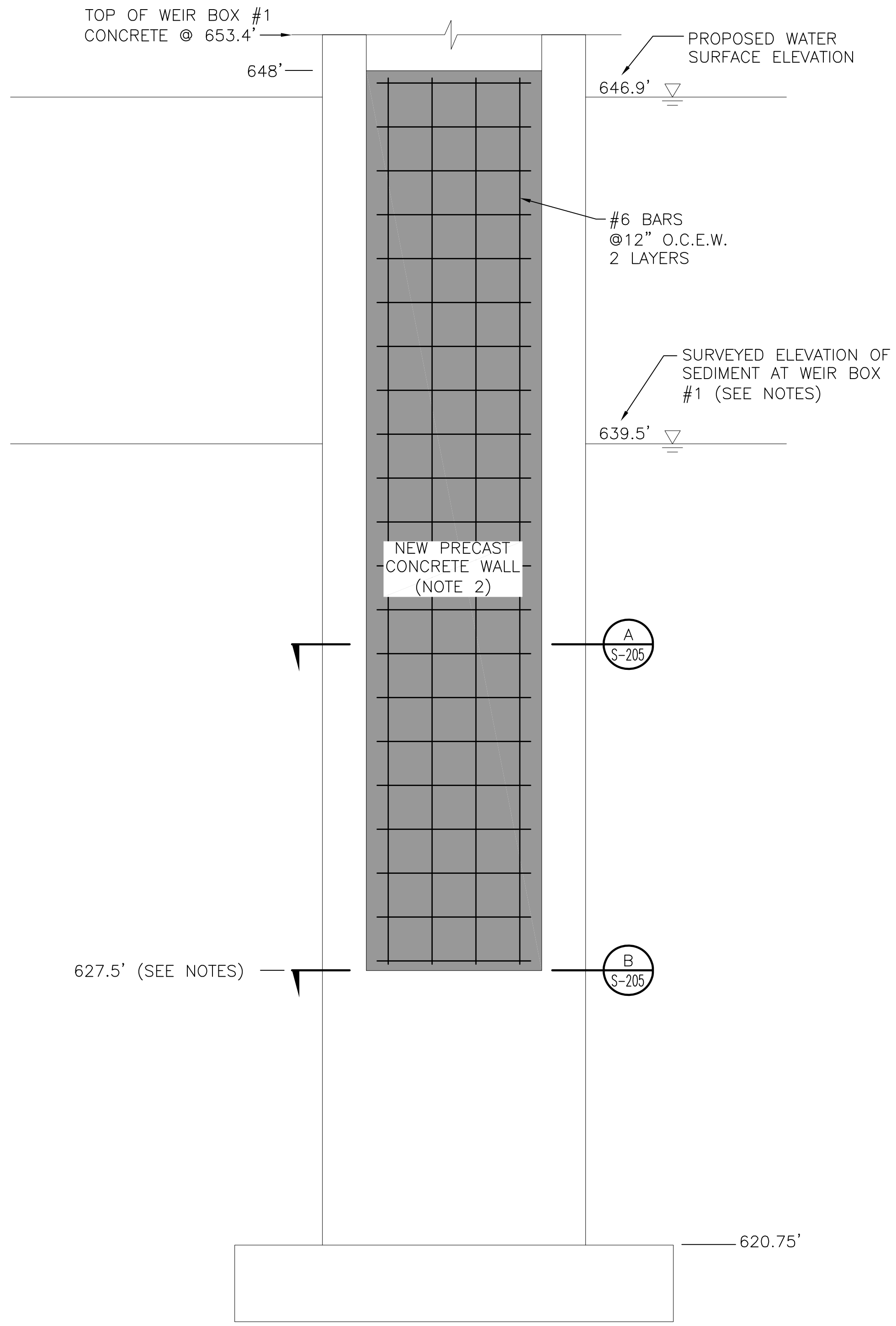
LANSING GENERATING STATION — Unit 0

UPPER ASH POND OUTFALL REROUTE

CONCRETE PLAN AND DETAILS

CO2 CYLINDER PAD

Scale: AS SHOWN — DWG. NO. S-201

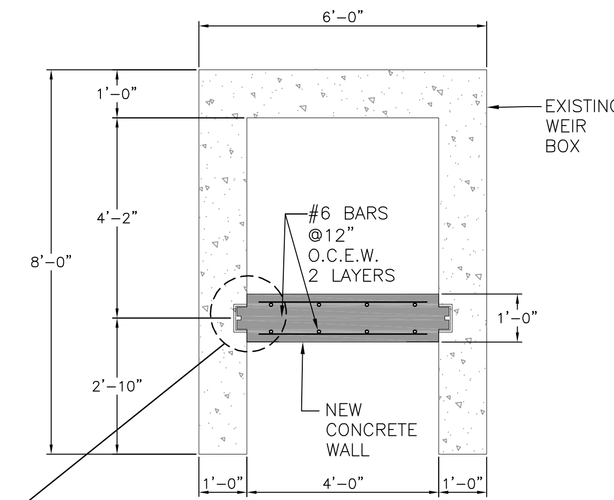


PRECAST CONCRETE WALL ADDITIONS
WEIR BOX #1

6 / P-200

0 2' 4'

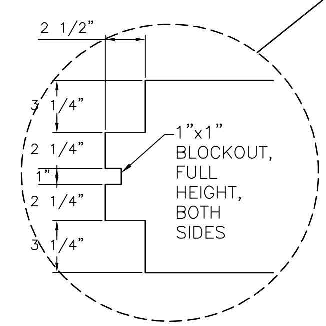
SCALE: 1/2" = 1'-0"



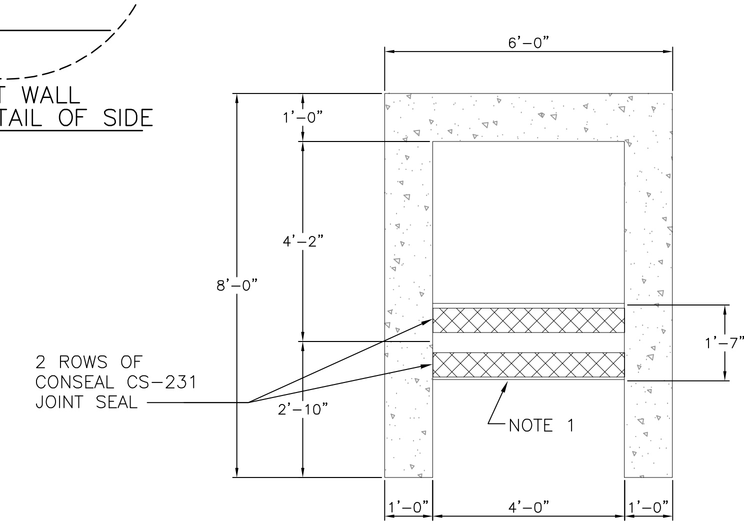
SECTION A / S-205

0 2' 4'

SCALE: 1/2" = 1'-0"



PRECAST WALL
ENLARGED DETAIL OF SIDE



SECTION B / S-205

0 2' 4'

SCALE: 1/2" = 1'-0"

NOTES:

1. ANY LOOSE CONCRETE TO BE REMOVED BY CHIPPING.
2. INSIDE OF WEIR BOXES TO BE POWER WASHED PRIOR TO INSTALLATION OF NEW PRECAST CONCRETE WALL.
3. DEWATER LAN UPPER ASH POND TO ELEVATION NECESSARY IN ORDER TO INSTALL NEW PRECAST CONCRETE WALL. DEWATERING EFFORTS SHALL BE COORDINATED WITH THE OWNER AND SHALL BE COMPLETED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
4. PUREFOAM SEAL TO BE TREMMIED FROM BOTTOM TO TOP INTO KEYWAY JOINT JOINING PRECAST CONCRETE WALL EDGES TO WEIR BOX TO FORM A WATER TIGHT SEAL.
5. EXISTING HACH SC200 FLOW METER INSTRUMENTATION TO REMAIN AND BE REPROGRAMED FOR NEW PRECAST CONCRETE WALL AT WEIR BOX #1.
6. BASED ON 2018 SURVEY BY HARD HAT SERVICES, SURVEYED TOP OF SEDIMENT ELEVATION ADJACENT TO WEIR BOX #1 STOP LOGS APPROXIMATELY 639.5'. THUS, REMOVAL OF SEDIMENT IN FRONT OF WEIR BOX #1 STRUCTURE PRIOR TO INSTALLATION OF NEW CONCRETE WALL WILL BE REQUIRED.
7. CONTRACTOR SHALL FIELD VERIFY DIMENSIONS/ELEVATIONS OF EXISTING WEIR BOX #1 WHERE NEW PRECAST CONCRETE WALL TO BE INSTALLED.
8. WEIR BOX #1 EXISTING STOP LOGS, AS WELL AS STEEL LIFTING BEAM (AND STEEL COLUMNS) AT END OF CAT WALK USED TO REMOVE EXISTING STOP LOGS, SHALL BE REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.

NO.	DATE	REVISION	BY	CHK'D	APV'D
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

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INTERSTATE POWER AND LIGHT COMPANY

LANSING GENERATING STATION — Unit 0

UPPER ASH POND OUTFALL REROUTE

CONCRETE PLAN AND DETAILS

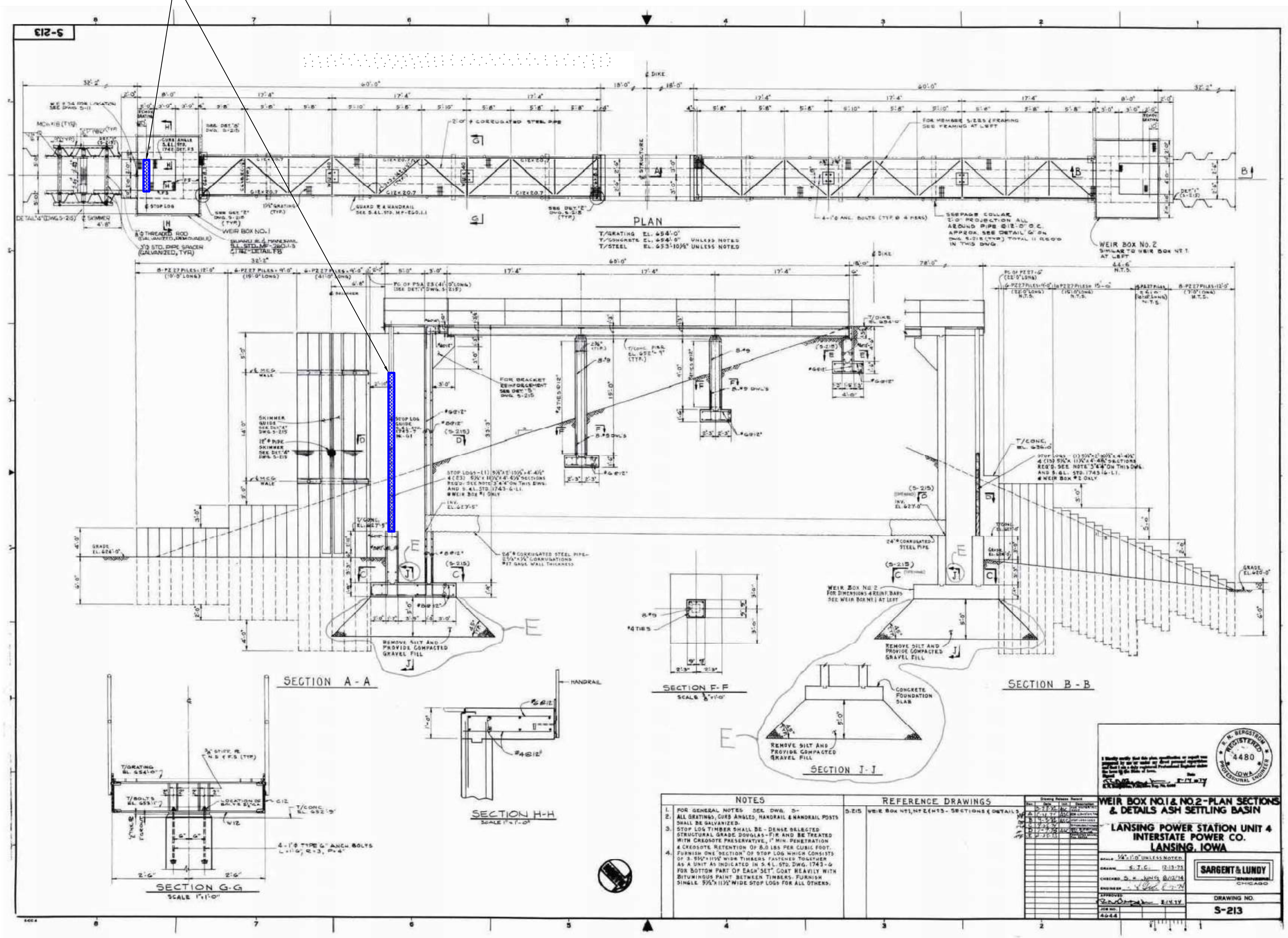
EXISTING WEIR BOX #1 PANEL

Scale: AS SHOWN

DWG. NO. S-205

NEW CONCRETE WALL PANEL (6 / S-205)

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY DIMENSIONS/ELEVATIONS OF EXISTING WEIR BOX #1 WHERE NEW PRECAST CONCRETE WALL TO BE INSTALLED.



NO.	DATE	REVISION	BY	CHK'D	APV'D
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

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INTERSTATE POWER AND LIGHT COMPANY

LANSING GENERATING STATION — Unit 0

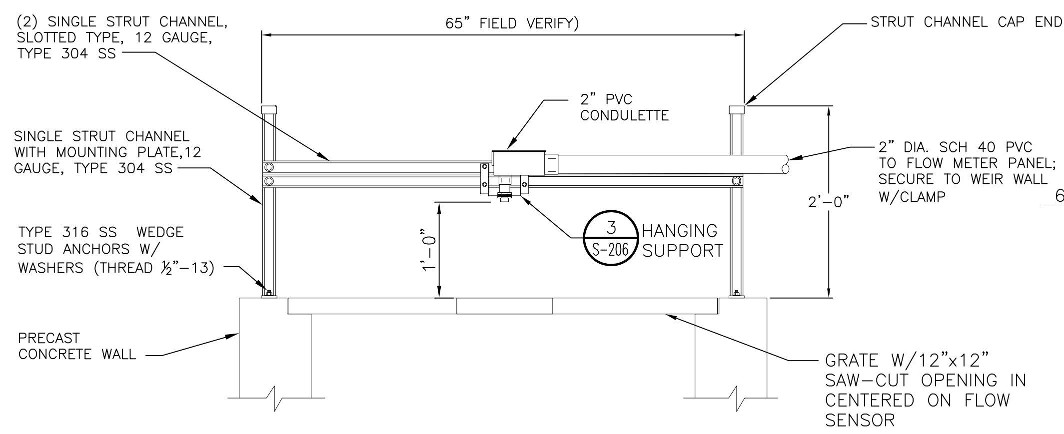
UPPER ASH POND OUTFALL REROUTE

STRUCTURAL DETAILS

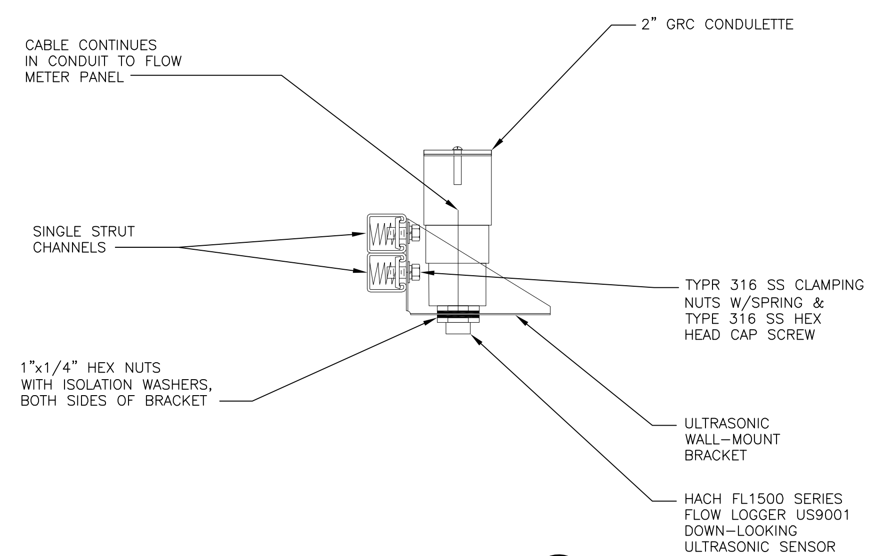
EXISTING WEIR BOX #1

Scale: AS SHOWN

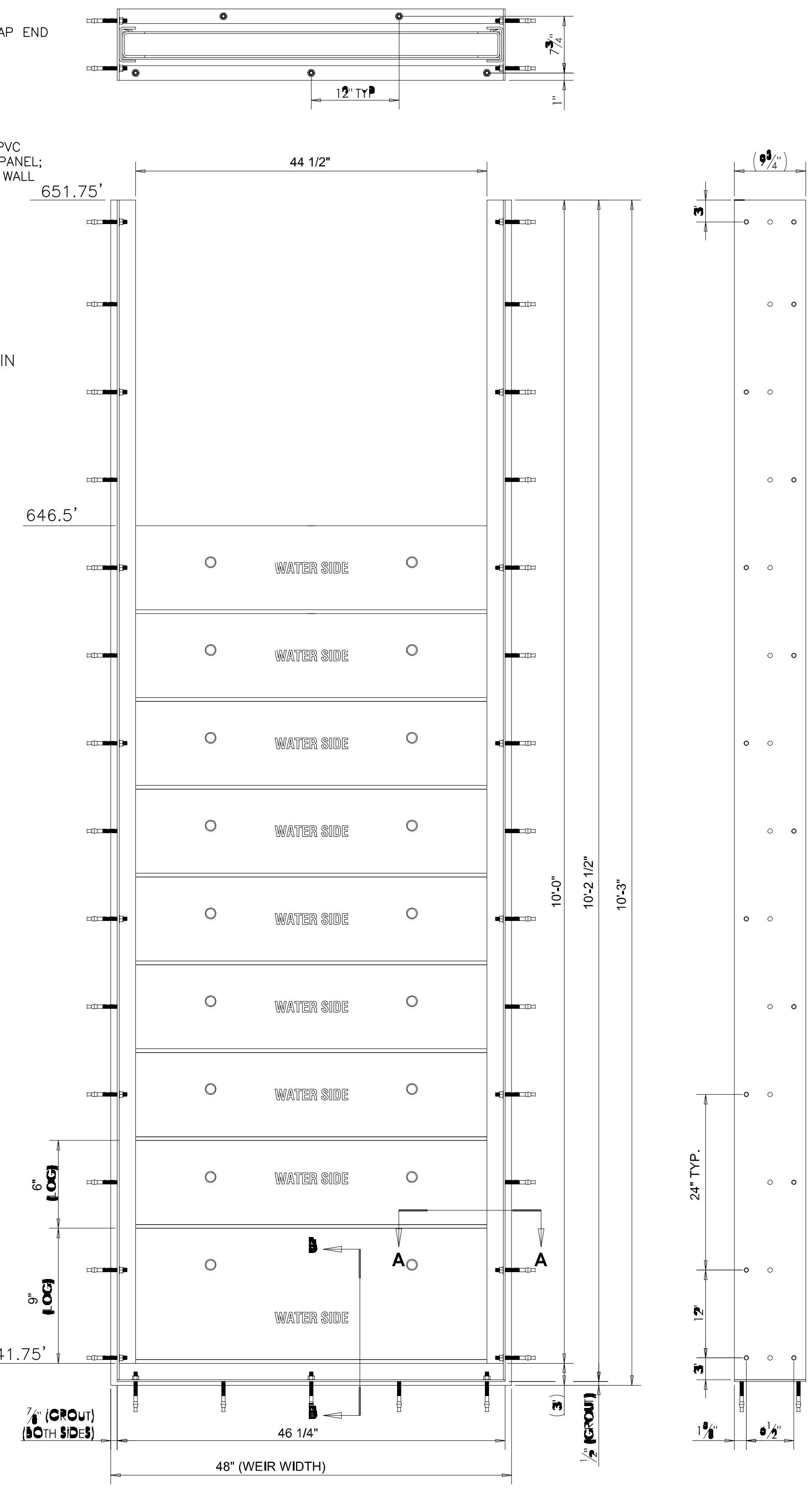
DWG. NO. S-207

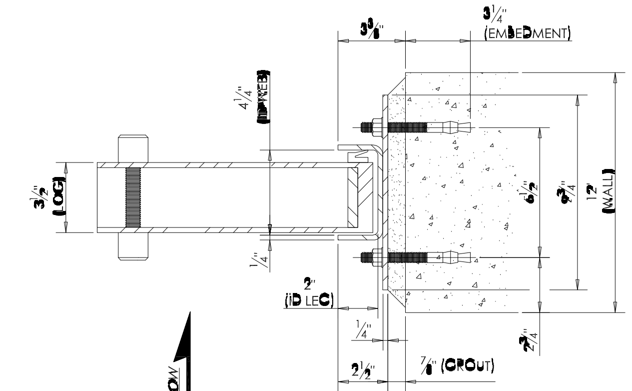


FLOW METER AND SUPPORT (1/S-200)

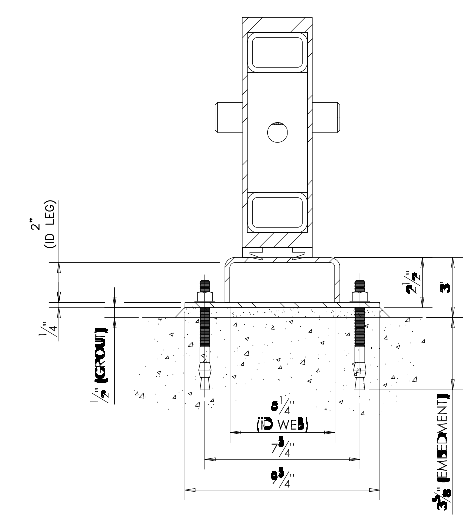


HANGING SUPPORT (3/S-206)

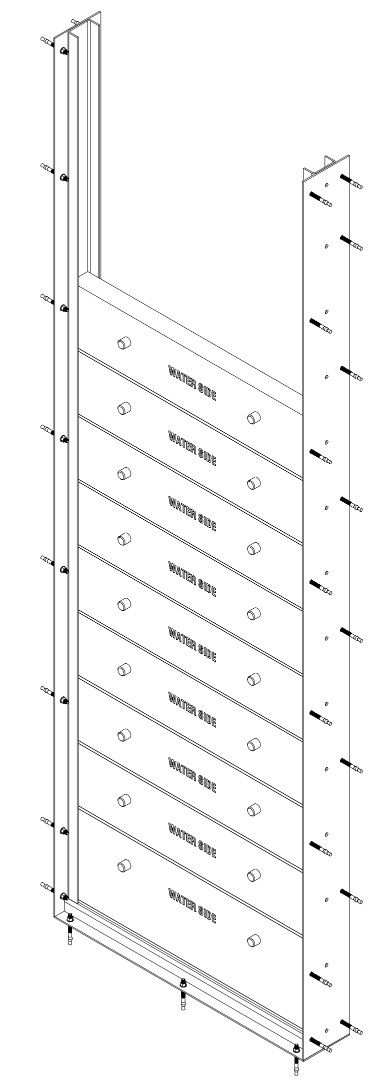




SECTION A-A
SCALE 1 : 4



SECTION B-B
SCALE 1 : 4



NOTES:
1. STOP LOG GUIDE FRAME TO BE T304L S/S WELDED CONSTRUCTION.
2. STOP LOGS TO BE STEEL REINFORCED FRP (FIBERGLASS REINFORCED PLASTIC).
3. ALL STOP LOG HARDWARE TO BE T304 S/S.
4. FLOW METER TO BE HACH FL1500 SERIES FLOW LOGGER WITH SOLAR PANEL POWER SUPPLY (SEE SHEET P-101 FOR INSTRUMENTATION SPECIFICATIONS). FLOW METER PANEL AND SOLAR PANEL TO BE MOUNTED TO CO2 CYLINDER STORAGE PAD GUARD RAIL (SEE SHEET S-201).

STOP LOG DETAIL (2/S-200)

NO.	DATE	REVISION	BY	CHK'D	APV'D
0	10-15-18	ISSUED FOR CONSTRUCTION	JFD	CTS	MWL

Alliant Energy

INTERSTATE POWER AND LIGHT COMPANY
LANSING GENERATING STATION Unit 0
UPPER ASH POND OUTFALL REROUTE
STRUCTURAL DETAILS
FLOW METER AND STOP LOGS
Scale: AS SHOWN
DWG. NO. S-206

APPENDIX C – Hydraulic Analysis

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Inflow Design Flood Control System Plan

Hydrograph 1000 yr Summary

Hydrology Studio v 3.0.0.19

Project Name: 2016 HydraFlow #2

07-27-2021

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Entire Watershed	806.8	12.00	2,495,167	----		
2	Pond Route	Ponds	38.58	13.90	2,495,147	1	651.63	1,511,159

Hydrograph Report

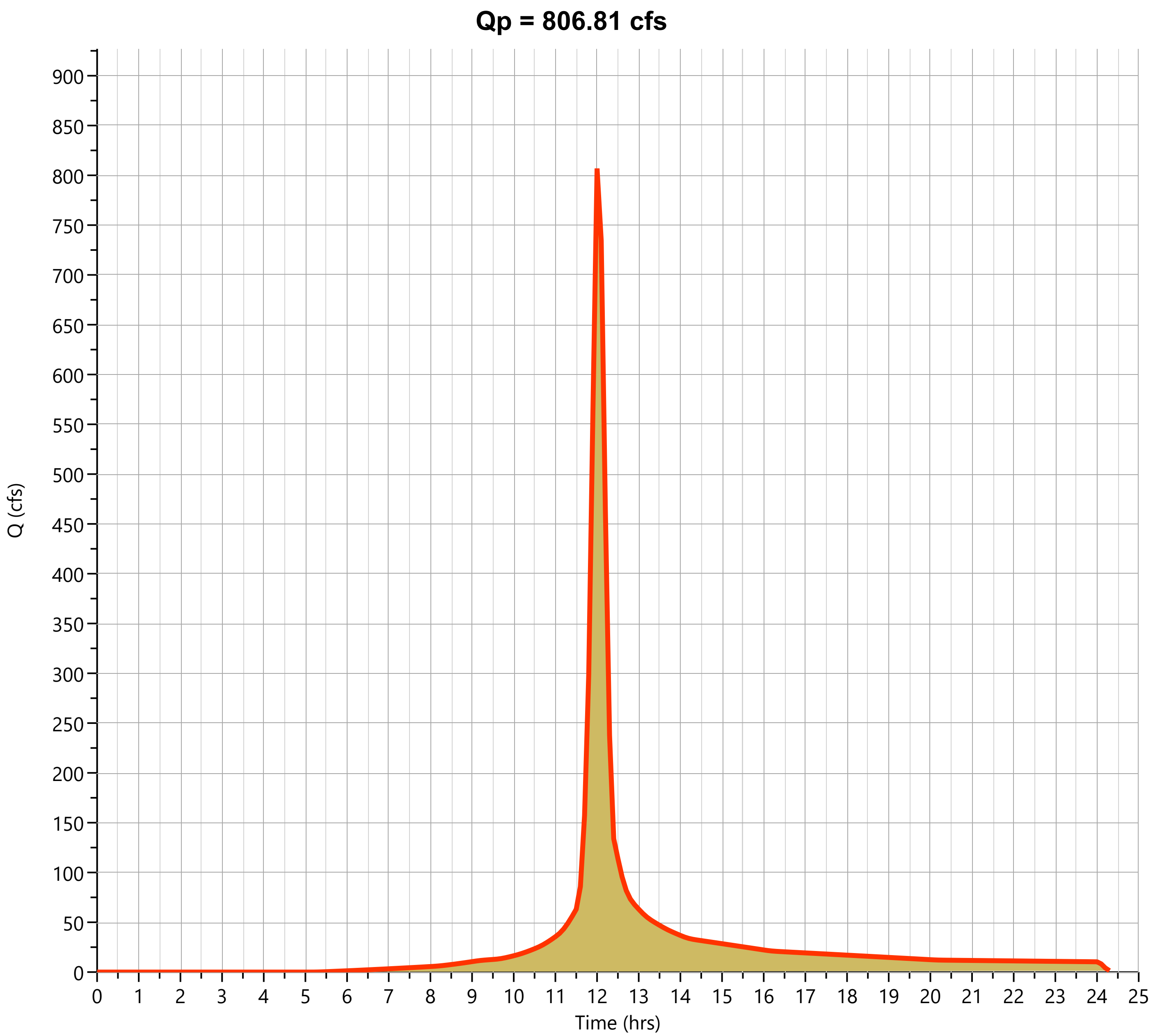
Project Name: 2016 HydraFlow #2

Hydrology Studio v 3.0.0.19 | 07-27-2021

Entire Watershed

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 806.8 cfs
Storm Frequency	= 1000 - yr	Time to Peak	= 12.00 hrs
Time Interval	= 6 min	Runoff Volume	= 2,495,167 cuft
Drainage Area	= 87.0 ac	Curve Number	= 72
Tc Method	= Lag	Time of Conc. (Tc)	= 17.0 min
Basin Slope	= 19.0 %	Hydraulic Length	= 2150 ft
Total Rainfall	= 12.10 in	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name: 2016 HydraFlow #2

Hydrology Studio v 3.0.0.19

07-27-2021

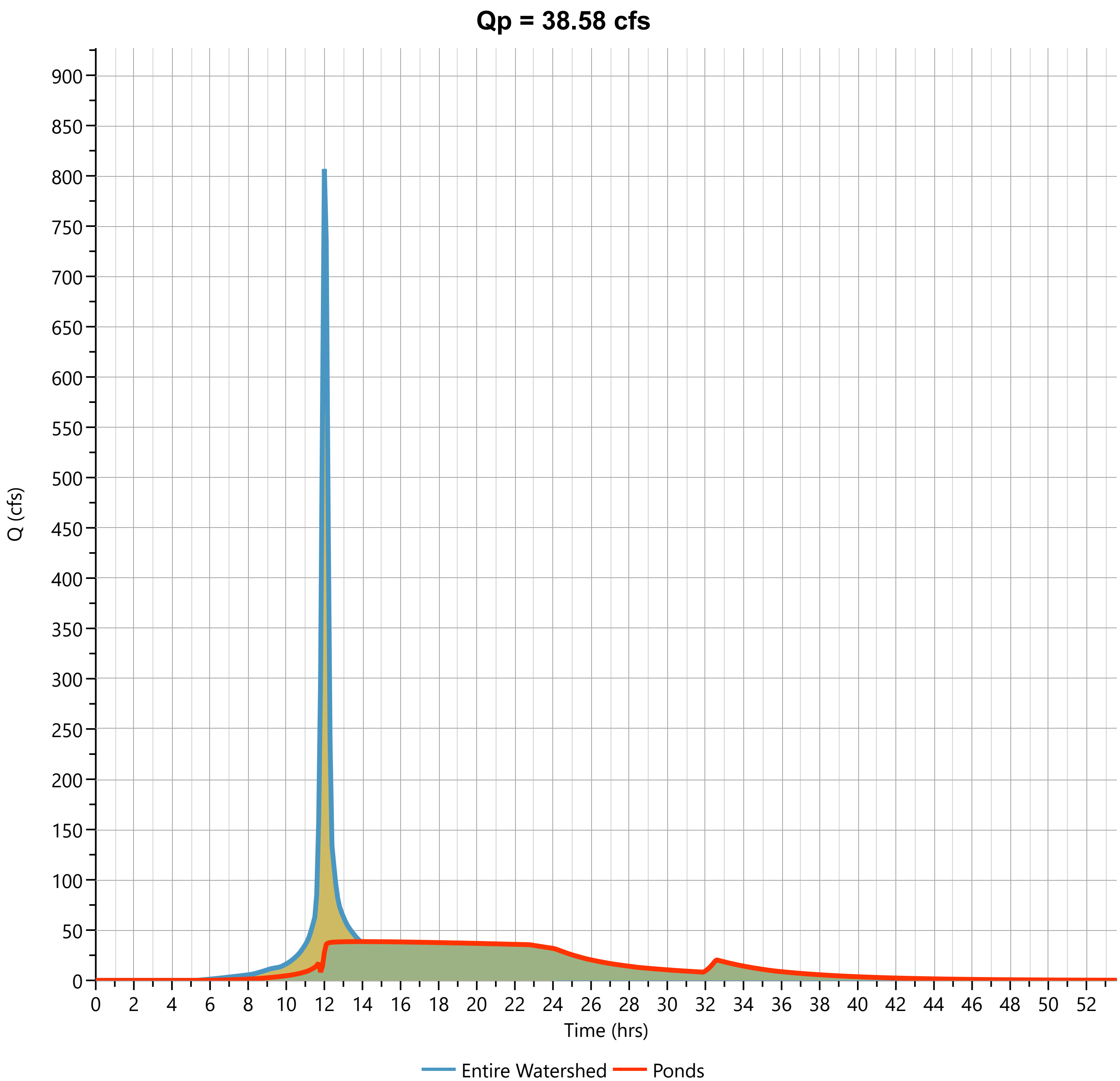
Ponds

Hyd. No. 2

Hydrograph Type	= Pond Route	Peak Flow	= 38.58 cfs
Storm Frequency	= 1000 - yr	Time to Peak	= 13.90 hrs
Time Interval	= 6 min	Hydrograph Volume	= 2,495,147 cuft
Inflow Hydrograph	= 1 - Entire Watershed	Max. Elevation	= 651.63 ft
Pond Name	= Ponds	Max. Storage	= 1,511,159 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 8.38 hrs



Pond Report

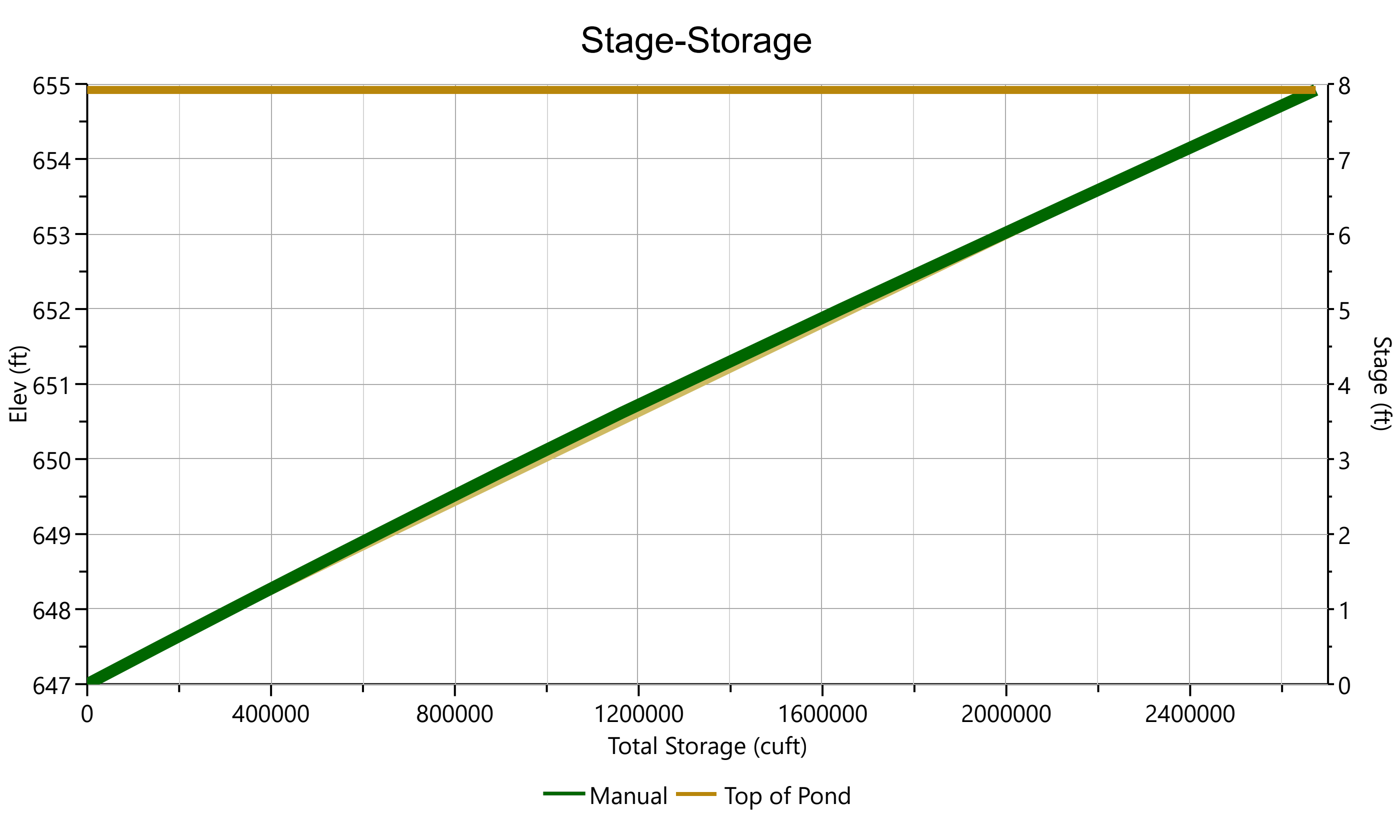
Ponds

Stage-Storage

User Defined Storage	
Description	**Input**
Bottom Elevation, ft	647.00

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	647.00	n/a	0.000	0.000
0.50	647.50	n/a	155,808	155,808
1.00	648.00	n/a	157,313	313,121
1.10	648.10	n/a	31,644	344,765
1.25	648.25	n/a	47,578	392,343
1.50	648.50	n/a	79,598	471,941
1.75	648.75	n/a	79,974	551,915
2.00	649.00	n/a	80,351	632,266
2.25	649.25	n/a	80,728	712,994
2.50	649.50	n/a	81,103	794,097
2.82	649.82	n/a	104,087	898,184
3.62	650.62	n/a	265,722	1,163,906
5.00	652.00	n/a	476,514	1,640,420
6.44	653.44	n/a	507,120	2,147,540
7.92	654.92	n/a	525,600	2,673,140



Pond Report

Hydrology Studio v 3.0.0.19

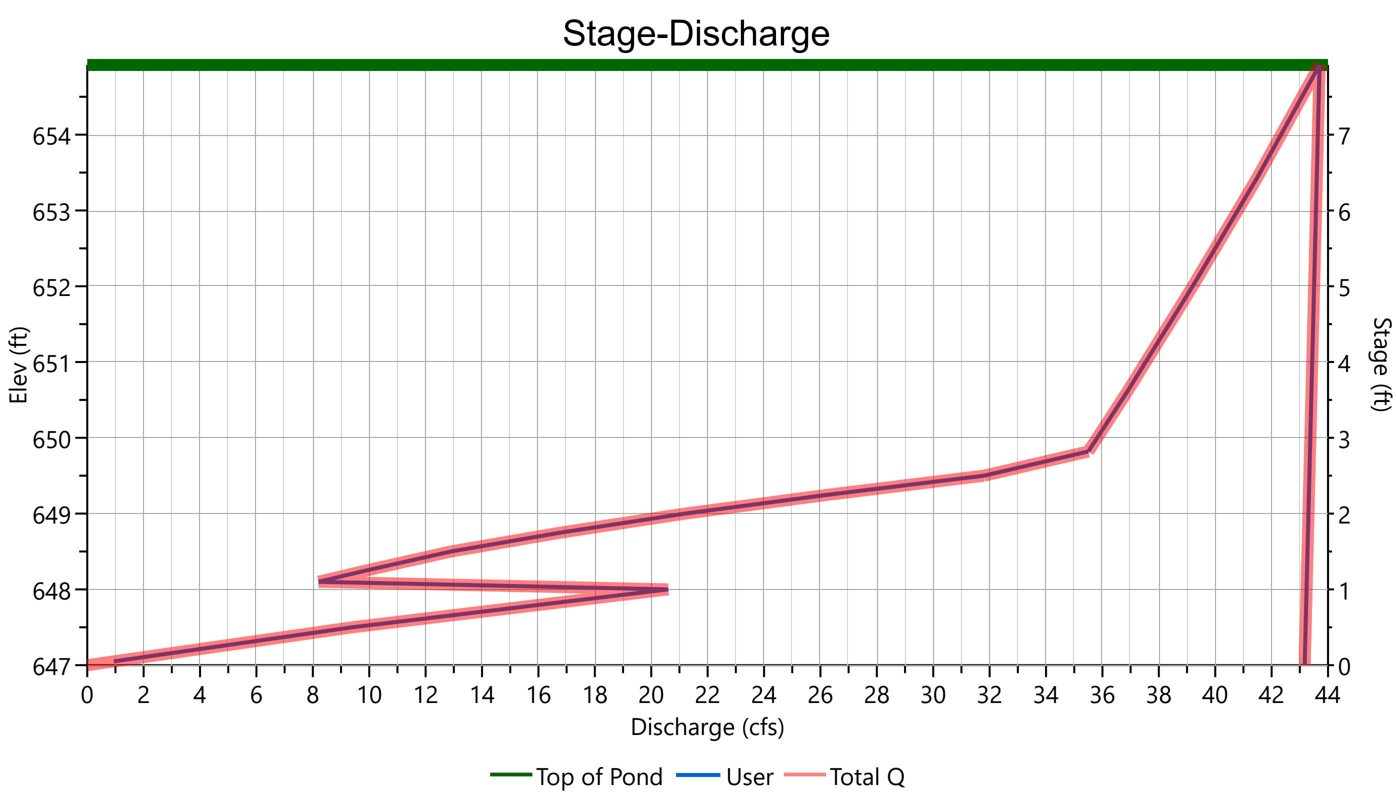
07-27-2021

Ponds

Stage-Discharge

Culvert / Orifices	Culvert	Orifices 1	Orifices 2	Orifices 3	Perforated Riser	
Rise, in					Hole Diameter, in	
Span, in					No. holes	
No. Barrels					Invert Elevation, ft	
Invert Elevation, ft					Height, ft	
Orifice Coefficient, Co					Orifice Coefficient, Co	
Length, ft						
Barrel Slope, %						
N-Value, n	0.000					
Weirs	**Riser***	**Weirs 1**	**Weirs 2**	**Weirs 3**	**Ancillary**	
Shape / Type					Exfiltration, in/hr	
Crest Elevation, ft						
Crest Length, ft						
Angle, deg						
Weir Coefficient, Cw						

Routes through Culvert.



Ponds

Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	647.00	0.000												0.000
0.50	647.50	155,808											9.400	9.400
1.00	648.00	313,121											20.60	20.60
1.10	648.10	344,765											8.200	8.200
1.25	648.25	392,343											9.900	9.900
1.50	648.50	471,941											12.90	12.90
1.75	648.75	551,915											16.80	16.80
2.00	649.00	632,266											21.20	21.20
2.25	649.25	712,994											26.30	26.30
2.50	649.50	794,097											31.80	31.80
2.82	649.82	898,184											35.50	35.50
3.62	650.62	1,163,906											36.90	36.90
5.00	652.00	1,640,420											39.20	39.20
6.44	653.44	2,147,540											41.50	41.50
7.92	654.92	2,673,140											43.70	43.70
0.00	0.00	0.000											43.70	43.70

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Ponds

Pond Drawdown