Submitted to
Southern Indiana
Gas & Electric Company
(SIGECO) dba
CenterPoint Energy Indiana
South (CEIS)
211 Northwest Riverside
Drive, Evansville, IN 47708

Submitted by
AECOM
13640 Briarwick Drive
Austin, Texas 78729
August 17, 2023

CCR Certification:
Inflow Design Flood Control System Plan
§257.82

for the

Lined CCR Pond

at the

A.B. Brown Generating Station

Rev 0

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Appendices

Executive Summary

This Coal Combustion Residuals (CCR) Inflow Design Flood Control System Plan (Inflow Flood Control Plan) for the Lined CCR Pond at the Southern Indiana Gas & Electric Company (SIGECO), dba CenterPoint Energy Indiana South (CEIS)., A.B. Brown Generating Station has been prepared in accordance with the requirements specified in the USEPA CCR Rule under 40 Code of Federal Regulations §257.82 (a). The CCR Rule requires that the specified documentation, assessments, and plans for a new CCR surface impoundment be prepared no later than the first receipt of waste, which is scheduled for no later than September 1, 2023. Pursuant to that requirement, the Initial Inflow Flood Control Plan was completed and issued to SIGECO on August 17, 2023 for placement in the facility operating record.

This Inflow Flood Control Plan meets all requirements as summarized in **Table ES-1.**

Table ES-1 – Certification Summary				
Report Section	**CCR Rule Reference**	**Requirement Summary**	**Requirement Met?**	**Comments**
Inflow Design Flood Control System Plan				
4.1	§257.82 (a)(1)	*Adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood*	Yes	CCR unit has the storage capacity to handle the inflow design flood
4.2	§257.82 (a)(2)	*Adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood*	Yes	The outlet devices of the CCR unit control the peak discharge from the inflow design flood
4.3	§257.82 (a)(3)	*Required Inflow design flood for Significant Hazard Potential Impoundment*	Yes	Inflow design flood utilized was the 1,000 year event
4.4	§257.82 (b)	*Discharge handled in accordance with* §257.3 – 3	Yes	CCR unit discharges in accordance with the existing NPDES permit

The Lined CCR Pond is considered to be a significant hazard potential CCR surface impoundment, therefore per §257.82 (a)(3), the inflow design flood is the 1,000-year flood. In accordance with the requirements of §257.82

(a)(3), an Inflow Flood Control Plan was developed for the Lined CCR Pond. This was accomplished by evaluating the effects of a 24-hour duration design storm for the 1,000-year Inflow Design Flood (IDF) to evaluate the Lined CCR Pond's ability to collect and control the 1,000-year IDF of 10.0 inches, under existing operational and maintenance procedures. The results for the Lined CCR Pond indicate that the CCR unit has sufficient storage capacity and spillway structures to adequately manage inflows and collect and control outflows during peak discharge conditions created by the 1,000-year IDF.

1 Introduction

1.1 Purpose of This Report

The purpose of the Inflow Design Flood Control System Plan (Inflow Flood Control Plan) is to document that the requirements specified in 40 Code of Federal Regulations (CFR) §257.82 have been met to support the certification required under each of the applicable regulatory provisions for the A.B. Brown Generating Station (Brown) Lined CCR Pond. The Lined CCR Pond is a new coal combustion residuals (CCR) surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the specified documentation, assessments and plans for an existing CCR surface impoundment be prepared no later than the impoundment's first receipt of waste, which is scheduled for no later than September 1, 2023. Pursuant to that requirement, this Initial Inflow Flood Control Plan was completed and issued to SIGECO on August 17, 2023 for placement in the facility operating record.

The Brown station has an interconnected existing CCR surface impoundment, the Lined CCR Pond, which consists of a north pool and a south pool. The following table summarizes the documentation required within the CCR Rule and the sections that specifically respond to those requirements of this plan.

Table 1-1 – CCR Rule Cross Reference Table		
Report Section	**Title**	**CCR Rule Reference**
4.1	Inflow Analysis	§257.82 (a)(1)
4.2	Outflow Analysis	§257.82 (a)(2)
4.3	Inflow Design Flood	§257.82 (a)(3)
4.4	Discharge handled in accordance with *§257.3 – 3*	§257.82 (b)

Analyses completed for the hydrologic and hydraulic assessments of the Lined CCR Pond are described in this report. Data and analyses results in the following sections are based on spillway design information shown on design drawings, topographic surveys, information about operational and maintenance procedures provided by Southern Indiana Gas & Electric Company (SIGECO), dba CenterPoint Energy Indiana South (CEIS), and limited field measurements collected by AECOM. The analysis approach and results of the hydrologic and hydraulic analyses presented in the following sections were used by AECOM to confirm that the Lined CCR Pond meets the hydrologic and hydraulic capacity requirements of the rules referenced above for CCR surface impoundments.

1.2 Brief Description of Impoundment

The Brown station is a coal-fired[1] power plant located approximately 10 miles east of Mount Vernon in Posey County, Indiana and is owned and operated by SIGECO. The station is situated just west of the Vanderburgh-Posey County line and north of the Ohio River with the Lined CCR Pond positioned on the south side of the generating station, just west of the site's coal pile.

The Lined CCR Pond was commissioned in August 2023. The south pool of the impoundment was constructed partially over the former South Side Runoff Pond (SSRP), which was initially constructed along with the plant in 1978. The north pool of the impoundment is incised and was constructed by excavation into the existing topography north of the SSRP. The Lined CCR Pond utilizes the existing earthen dike of the former SSRP on its south and west sides. Currently, the north pool and the south pool act as one CCR unit referred to as the Lined CCR Pond, which has a total water area of approximately 1.9 acres, and a storage of 10.1 acre-feet at normal pool.

The Lined CCR Pond earthen dike is approximately 630 feet long, 9.5 feet high, and has side slopes varying from 2:1 to 2.5:1 (horizontal to vertical) covered with grassy vegetation. The dike's crest elevation is 391.5 feet[2] and has a crest width of 15 feet. A Site Location Map showing the area surrounding the station is included as **Figure 1** of **Appendix A**. **Figure 2** in **Appendix A** presents the Brown Site Map.

1.2.1 Inflow from Plant Operations and Stormwater Runoff

The Lined CCR Pond receives and impounds FGD wastewater from the plant in addition to other non-CCR flows. Under the current site layout, the SSRP manages and will manage the following flows (as provided in the attached Plant Water Balance, Rev. 5, dated 9/20/2021):

- Plant wastewater (610 gpm). This flow originates from the Unit 1 and Unit 2 wastewater sumps, and includes non-CCR flows such as boiler blowdown, water treatment filter and softener backwash, reverse osmosis reject flows, treated sanitary waste, neutralization tank flows, hopper seal and ash hopper overflows, and yard drainage and washdown. Of these flows, boiler blowdown, neutralization tank flows, and hopper seal and ash hopper overflows will cease following coal unit retirement, no later than October 15, 2023, at which point the flow rate is currently estimated to decrease to a maximum of 60 gpm. The flows collect in the Unit 1 and Unit 2 wastewater sumps, and the pumps turn on at a set elevation in the sump. Flows are pumped to the concrete-lined ditch north of the SSRP on the north side of the railroad embankment and drain from there to the SSRP via gravity. The wastewater sump pumps are in operation 24/7 and switch on approximately 3 times per hour, taking approximately 10 minutes each time to drain the sump. Due to the frequent switching off/on as well as the fact that the pumps are running ~50% of the time), these flows are assumed to be constant for modeling purposes.

- French drain (140 gpm). Contains groundwater flows from the French drain system northwest of the lower pool of the Ash Pond.

- Rainfall and runoff (from coal pile, buttress, etc.)

[1] The coal-fired units are scheduled to retire no later than October 15, 2023.

[2] Unless otherwise noted, all elevations in this report are in the NAVD88 datum.

- Coal trestle dust suppression (negligible)
- Drought mitigation system (negligible)
- Vault #4 discharge (negligible)
- FGD Wastewater (Not currently managed within the SSRP/Proposed to be managed by the Lined CCR Pond) (430 gpm) – This flow is transported to the pond via two pumps with nominal instantaneous flow rates of 500 gpm and 600 gpm, for a total peak instantaneous flow of 1100 gpm. Based on information provided by plant personnel, these pumps operate 24/7 slightly less than 50% of the time, operating for around 15 minutes, switching off for 15 minutes, etc. Due to the relatively rapid switching on/off, representing this flow with the average value was decided to be representative of actual conditions, and would not have a significant impact on the outcome of the calculation compared with modeling as an intermittent flow. This flow will cease with coal-fired unit retirement, which is scheduled for no later than October 15, 2023.

In addition to rain that falls directly into the pond, there are upstream areas that contribute runoff to the impoundment. Approximately 24.2 acres drain to the pond from upstream and adjacent areas.

1.2.2 Outlet Structures

The north pool of the Lined CCR Pond has one outlet device that is located at the southwestern corner of the berm that separates the north and south pools. This outlet device is a 48-inch diameter HDPE riser that has a rim elevation of 391.0 feet. The riser connects to a 24-inch diameter HDPE pipe that discharges into the south pool.

The south pool of the Lined CCR Pond has two outlet devices. The first outlet is the Lined CCR Pond Pump Station. The pump station includes two pumps, typically operating in a lead-lag configuration, with a total maximum discharge capacity of 2,300 gallons per minute (gpm). The pump discharges into a 12-inch HDPE pipe that goes to a chemical precipitation treatment system prior to mixing with other plant water and going to an NPDES-permitted outfall. Under normal conditions, the line discharges 3.2 cfs to the treatment system. The second outlet device is a 15-inch HDPE riser that acts as an emergency spillway. The riser has a rim elevation of 390.85 feet, and a diameter of 15 inches. It discharges to a network of manholes connected by 12” RCP that ultimately discharge to NPDES Outfall 001.

2 Hydrologic Analysis

2.1 Design Storm

The Lined CCR Pond has been categorized as a Significant hazard potential CCR impoundment, which indicates that the inflow design flood is the 1,000-year return frequency design storm event. The full analysis for this classification determination is included in the *CCR Certification: Hazard Potential Classification for the Lined CCR Pond at the A.B. Brown Generating Station*.

2.2 Rainfall Data

The rainfall information used in the analysis was based on the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Version 3 which provides rainfall data for storm events with average recurrence intervals ranging from 1 to 1,000 years and durations ranging from 5 minutes to 60 days. The design storm rainfall depth, obtained from the NOAA website, is 10.0 inches for the 1,000-year, 24-hour storm. The Indiana Huff Third Quartile rainfall distribution used by AECOM is appropriate to use for storms up to the 1,000-year, 24-hour flood at the project site.

2.3 Runoff Computations

The drainage areas for the Lined CCR Pond were determined using a computer-aided design (CAD) analysis of topographic surveys completed in 2022. In addition to rain that falls directly into the pond, there are upstream areas that contribute runoff to the impoundments. Approximately 6.2 acres drain to the north pool from upstream areas, including the area of the pool itself. The south pool receives direct runoff from approximately 18 acres upstream, including the pool itself. Because the north pool discharges into the south pool, the total drainage area to the lower pool is 24.2 acres. See **Figure 3** in **Appendix A** for the Drainage Area Maps.

Runoff was calculated using the SCS Curve Number Method, where curve numbers (CN) were assigned to each subcatchment based on the type of land cover and soil type present. Using the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey, the soil type of the site was determined to be hydrologic soil group C. CN values for the land cover were selected from the CN Table available in HydroCAD. This data was obtained from the SCS NRCS Technical Release-55 (TR-55) publication. The following CN values were used for each land cover type:

- Coal (coal pile) – CN of 96 (Gravel, Hydrologic Soil Group C)
- Brush (railroad embankment) – CN of 77 (Brush, Poor, Hydrologic Soil Group C)
- Grass (Ash Pond buttress) – CN of 74 (>75% Grass Cover, Good, HSG C)
- Open Water/Pond Liner Protection – CN of 98 (Open Water)

A composite CN was calculated for each subcatchment area by summing the products of each CN multiplied by its percentage of the total area.

The time of concentration is commonly defined as the time required for runoff to travel from the most hydrologically distant point to the point of collection. Calculations for the time of concentration for each sub-watershed were performed in HydroCAD and are included in **Appendix B**.

Stormwater runoff from the 1000-year event into the north pool has an inflow of 7.9 cfs and inflow volume of 15.1 acre-feet. Stormwater runoff into the south pool, including the discharged runoff from the north pool and process flow from the plant, has a peak inflow of 10.9 cfs and total inflow volume of 19.1 acre-feet. Refer to **Appendix B** for HydroCAD results.

2.4 Site Configuration

Upon completion of the Lined CCR Pond, the Contact Stormwater Pond construction will begin in the western portion of the site's Coal Pile. Runoff from the Coal Pile and buttress that formerly flowed directly into the SSRP will be intercepted in sumps/ditches during construction and pumped to the Lined CCR Pond. Therefore, the H&H analysis considers the performance of the Lined CCR Pond discharge system in a scenario where the Lined CCR Pond is complete, but the Contact Stormwater Pond is under construction and directing flow to the CCR Pond from a construction sump. This temporary construction flow will no longer be managed by the CCR Pond after construction of the Contact Stormwater Pond.

3 Hydraulic Analyses

3.1 Process Flows

The north pool of the Lined CCR Pond receives process flow from the plant at a rate of 3.2 cfs. The pond maintains a target level of 388.7 on the south pool using the pump station. Accordingly, on average, there is 3.2 cfs of discharge from the Lined CCR Pond primary outlet during normal operating conditions.

3.2 Storage Capacity

The storage volumes for the Lined CCR Pond were determined using a computer-aided design (CAD) analysis of the as-built topography of the pond prior to filling. The volume of storage was calculated by estimating the incremental storage volume present for each 1-foot elevation increment within the topographic surface. The incremental storage volume was then used to calculate a cumulative storage volume and was entered into HydroCAD. The volume of storage within the north pool from the starting water surface elevation of 391.3 feet to the top of embankment elevation of 393.1 feet is 0.9 acre-feet. The volume of storage within the south pool from normal pool elevation of 388.7 feet to the top of embankment elevation of 391.5 feet is 4.9 acre-feet. The normal operating levels of 388.7 feet (south pool) and 391.3 (north pool) were used as the starting water surface elevations during the hydraulic analysis. Refer to **Appendix B** for further storage volume details.

3.3 Discharge Analysis

A hydraulic model was created in HydroCAD 10.00 to assess the capacity of the pond to store and convey the storm flows. HydroCAD has the capability to evaluate each pool within the network, to respond to variable tailwater, pumping rates, permit flow loops, and reversing flows. HydroCAD routing calculations reevaluate the pond's discharge capability at each time increment, making the program an efficient and dynamic tool for this evaluation.

The analyzed scenario assumes a starting water surface elevation at the following invert elevations of each pool. The north pool water surface elevation is 391.3 feet, and the south pool is 388.7 feet. The peak elevations of each pool during the 1000-year storm event are 391.5 feet and 390.9, compared with the maximum top of embankment elevations of 393.1 feet and 391.5 feet, respectively. Therefore, the facility does not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the NPDES under section 402 of the Clean Water Act.

4 Results

The hydrologic and hydraulic conditions of Lined CCR Pond were modeled with the peak discharge of the 1,000-year storm event and the current process flow from the plant.

Regulatory Citation: 40 CFR §257.82 (a);

- *The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.*

4.1 Inflow Analysis

Regulatory Citation: 40 CFR §257.82 (a);

- *(1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflows design flood specified in paragraph (3).*

Background and Assessment

Runoff to the impoundment is added to the process flow from the plant to produce the total inflow to the Lined CCR Pond. Using the HydroCAD model, the total inflow was stored and routed through the outlet devices of the Lined CCR Pond to determine the peak water surface elevations.

Table 4-1 summarizes the water surface elevations of the Lined CCR Pond prior to and after the inflow design flood.

Table 4-1 - Summary of Hydrologic and Hydraulic Analysis
1,000-Year, 24-Hour Storm

CCR Unit	Beginning WSE[1] (feet)	Peak WSE (feet)	Top of Embankment Elevation (feet)	Freeboard Above Peak WSE (feet)
North Pool	391.3	391.5	393.1	1.6
South Pool	388.7	390.9	391.5	0.6

Notes:
[1] WSE = Water Surface Elevation used for hydraulic analysis

Conclusion and Recommendation

No modifications are necessary or recommended to this unit for compliance with the CCR Rule.

As there is adequate storage within the Lined CCR Pond to manage the inflow design flood as well as the process flow from the plant, there is no anticipated overtopping of the Lined CCR Pond embankment, which meets the requirements in §257.82 (a)(1).

4.2 Outflow Analysis

Regulatory Citation: 40 CFR §257.82 (a);

- *(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (3) of this section.*

Background and Assessment

Runoff to the impoundment is added to the process flow from the plant to produce the total inflow to the Lined CCR Pond. Using the HydroCAD model, the total inflow was stored and routed through the outlet devices of the Lined CCR Pond to determine the peak flowrate and velocity through the outlet devices.

Table 4-2 summarizes the peak flowrates and velocities through each of the outlet devices.

Table 4-2 - Summary of Outlet Devices 1,000-Year, 24-Hour Storm				
Outlet Device	**Type and Size**	**Invert Elevation (feet)**	**Peak Flowrate (cfs)**	**Velocity at Peak Flowrate (fps)**
Lined CCR Pond Pump Station	2 – 1,500 gpm pump (High Pressure Pump average capacity, lead-lag configuration) (Max discharge capacity 2,300 gpm)	388.7	5.4	NA
Lined CCR Pond Overflow Riser	15” HDPE drop inlet	390.85	0.02	0.4

Conclusion and Recommendation

No modifications are necessary or recommended to this unit for compliance with the CCR Rule.

As the Lined CCR Pond outlet devices manage the discharge of the inflow design flood and the process flow from the plant without the peak water surface elevation overtopping the Lined CCR Pond embankment, the pond meets the requirements in §257.82 (a)(2).

4.3 Inflow Design Flood

Regulatory Citation: 40 CFR §257.82 (a);

- *(3) The inflow design flood is:*
  - *(i) For a high hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the probable maximum flood;*
  - *(ii) For a significant hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the 1,000-year flood;*

- *(iii) For a low hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the 100-year flood; or*
- *(iv) For an incised CCR surface impoundment, the 25-year flood.*

Background and Assessment

The calculations for the inflow design flood are based on the hazard potential given to the impoundment. The different classifications of the impoundment hazard potential are high, significant, and low.

Conclusion and Recommendation

As the impoundment was given a significant hazard potential, the 1,000-year design storm was utilized in the analysis, which meets the requirements in §257.82 (a)(3).

4.4 Discharge

Regulatory Citation: 40 CFR §257.82 (b);

- *Discharge from the CCR unit must be handled in accordance with the surface water requirements under: §257.3 – 3.*

Background and Assessment

The primary discharge from the pond flows through a chemical precipitation treatment system prior to mixing with other plant water and discharging to a NPDES permitted outfall. The emergency discharge from the Lined CCR Pond outlet device discharges to a NPDES permitted outfall via a pipe network. The discharge must meet the requirements of the NDPES permit under section 402 of the Clean Water Act to meet the CCR rule.

Conclusion and Recommendation

No modifications are necessary or recommended to this unit for compliance with the CCR Rule.

The primary discharge from the pond flows through a chemical precipitation treatment system prior to mixing with other plant water and discharging to a NPDES permitted outfall. The emergency discharge from the Lined CCR Pond outlet device discharges to a NPDES permitted via a pipe network. As per the current NPDES permit, all discharged water is tested for pollutants to meet the minimum regulatory requirements of the permit, and thereby meets the requirements in §257.82 (b).

5 Conclusions

The Inflow Flood Control Plan of the Lined CCR Pond adequately manages flow into the CCR unit during and following the peak discharge of the 1,000-year frequency storm event inflow design flood. The inflow design flood control system of the Lined CCR Pond adequately manages flow from the CCR unit to collect and control the peak discharge resulting from the 1,000-year frequency storm event inflow design flood. Therefore, the Lined CCR Pond meets the requirements for certification.

The contents of this report, specifically **Section 1** through **Section 4**, represent the Inflow Design Flood Control System Plan for this site.

6 Certification

This Certification Statement documents that the Lined CCR Pond at the A.B. Brown Generating Station meets the Inflow Design Flood Control System Plan requirements specified in 40 CFR §257.82. The Lined CCR Pond is a new CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the specified documentation, assessments and plans for a new CCR surface impoundment be prepared no later than the first receipt of waste, which is scheduled for no later than September 1, 2023. Pursuant to that requirement, the Initial Inflow Flood Control Plan was completed and issued to SIGECO on August 17, 2023 for placement in the facility operating record.

CCR Unit: Southern Indiana Gas & Electric Company; A.B. Brown Generating Station; Lined CCR Pond

I, Jay Mokotoff, being a Registered Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the Inflow Design Flood Control System Plan dated August 17, 2023 meets the requirements of 40 CFR § 257.82.

Jay Mokotoff

Printed Name

08/17/2023

Date

7 Limitations

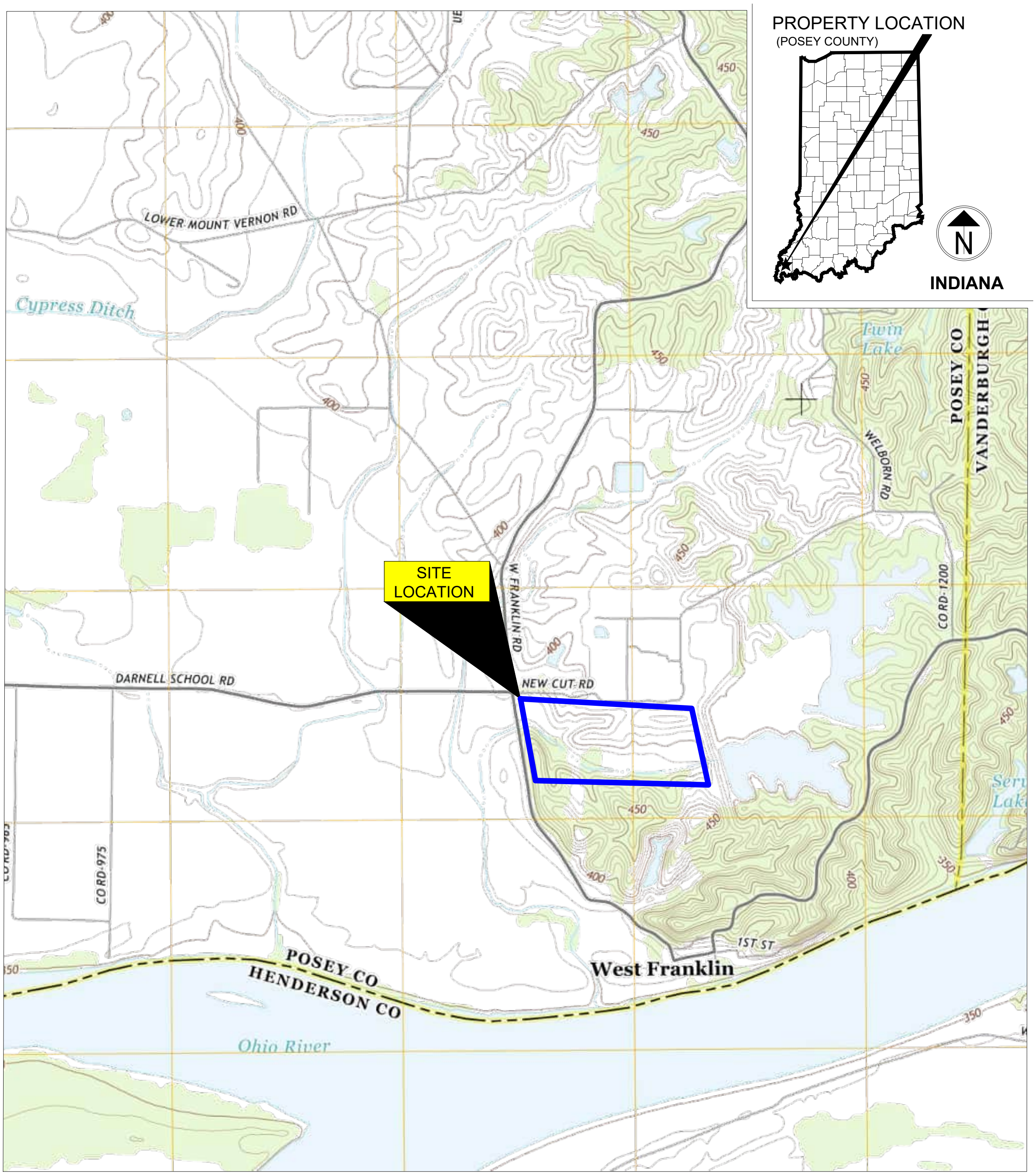
Background information, design basis, and other data have been furnished to AECOM by SIGECO, which AECOM has used in preparing this report. AECOM has relied on this information as furnished, and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

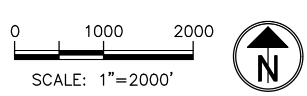
The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as provided by SIGECO. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings, and revise the report if necessary.

This hydrologic and hydraulic analysis was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the geological and geotechnical engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

While the CCR unit adequately manages the inflow design flood, SIGECO must perform routine maintenance on the CCR unit to continually manage flood events without failure. Outlet devices should be cleared of debris that could block or damage the device. Pipes and intake structures should be monitored and repaired if deterioration or deformation occurs. All grass lined slopes should be examined for erosion and repaired if damaged.

Appendix A
Figures





AECOM

AB BROWN GENERATING STATION

POSEY COUNTY, IN

FIGURE 1 - LOCATION MAP

DRAWN BY:	CHECKED BY:	PROJECT No:	DATE:	FIGURE No:
JET	DMB	60442676	5/16/23	1

Z:\Cleveland-USCLV01\DCS\Projects\V\Vectren Corporation\60442676_ABBClosure\400-Technical\454_Lined Pond\CCR Certification Letters\Closure Plan - IDEM\Figures\Figure 1 - Site Location Map_CLOSURE -12-21-18.

LEGEND

- - - - LINED CCR POND BOUNDARY

N

0 100 200 300

GRAPHIC SCALE (IN FEET)

AECOM

PROJECT

Lined CCR Pond
Issued for Certification

A.B. BROWN GENERATING STATION
8511 Welborn Rd
Mount Vernon, IN 47620

CenterPoint Energy

CLIENT

SIGECO DBA CENTERPOINT ENERGY
INDIANA SOUTH
P.O. Box 209
Evansville, IN 47702
800.227.1376 tel
http:///www.centerpointenergy.com

CONSULTANT

AECOM Process Technologies
9400 Amberglen Boulevard
Austin, Tx 78729
512.454.4797 tel 512.419.6004 fax
www.aecom.com

REGISTRATION

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60583533

SHEET TITLE

FIGURE 2 - SITE MAP

SHEET NUMBER

2

Project Management Initials: Designer:___ Checked:___ Approved:___ ARCH D 24" x 36"

Last saved by: DREW.BROWNING(2023-08-09) Last Plotted: 2023-08-09
Filename: C:\USERS\DREW.BROWNING\ONEDRIVE - AECOM\DESKTOP\FIGURE 2\FIGURE 2_ABB_SITE MAP.DWG

Printed on ___% Post-Consumer Recycled Content Paper

NOTES:

1. THE EXISTING SURVEY INFORMATION (TOPOGRAPHY, AERIAL PHOTOGRAPHY, PLANIMETRICS, ETC.) IS BASED ON THE AERIAL SURVEY CONDUCTED ON JANUARY 31, 2022 BY CT CONSULTANTS FOR THREE I DESIGN.

0 75 150 225
GRAPHIC SCALE (IN FEET)

AECOM

PROJECT

South Ponds Project
Issued For Certification

A.B. BROWN GENERATING STATION
8511 Welborn Rd
Mount Vernon, IN 47620

CenterPoint Energy

CLIENT

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REGISTRATION

ISSUE/REVISION

0	12/9/2022	ISSUED FOR CERTIFICATION
I/R	DATE	DESCRIPTION

AECOM PROJECT NO:	60583533
DRAWN BY:	DMB
DESIGNED BY:	DMB
CHECKED BY:	JDM
PLOT DATE:	12/9/2022
SCALE:	NOTED
AUTOCAD VER:	2019

PROJECT NUMBER

60583533

SHEET TITLE

SITE DRAINAGE AREA MAP

SHEET NUMBER

3

ARCH D 24" x 36"
Approved:___ Checked:___ Designer:___ Project Management Initials:___

Last saved by: DREW.BROWNING(2023-08-11) Last Plotted: 2023-08-11
Filename: C:\PWWORKING\SUSOH\DMS20857\FIGURE 3 - DRAINAGE AREA MAP.DWG

Appendix B
Hydrologic and Hydraulic Calculations

NOAA Precipitation Data
Soils Data
Water Balance
HydroCAD Output

NOAA Precipitation Data

NOAA Atlas 14, Volume 2, Version 3
Location name: Mount Vernon, Indiana, US*
Latitude: 37.9028°, Longitude: -87.7092°
Elevation: 440 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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	0.394 (0.360–0.433)	0.465 (0.425–0.511)	0.551 (0.503–0.604)	0.620 (0.564–0.678)	0.707 (0.640–0.773)	0.776 (0.700–0.847)	0.843 (0.757–0.919)	0.914 (0.815–0.997)	1.01 (0.893–1.10)	1.08 (0.950–1.18)
10-min	0.612 (0.559–0.672)	0.726 (0.664–0.798)	0.856 (0.782–0.939)	0.956 (0.870–1.05)	1.08 (0.979–1.18)	1.18 (1.06–1.28)	1.27 (1.14–1.38)	1.37 (1.22–1.49)	1.48 (1.31–1.62)	1.57 (1.38–1.72)
15-min	0.750 (0.685–0.824)	0.888 (0.812–0.976)	1.05 (0.960–1.15)	1.18 (1.07–1.29)	1.34 (1.21–1.46)	1.46 (1.31–1.59)	1.58 (1.42–1.72)	1.70 (1.51–1.85)	1.85 (1.64–2.02)	1.96 (1.73–2.15)
30-min	0.993 (0.907–1.09)	1.19 (1.09–1.31)	1.44 (1.31–1.58)	1.63 (1.49–1.79)	1.89 (1.71–2.06)	2.08 (1.88–2.27)	2.28 (2.04–2.48)	2.48 (2.21–2.70)	2.74 (2.43–2.99)	2.94 (2.59–3.22)
60-min	1.21 (1.11–1.33)	1.46 (1.33–1.60)	1.81 (1.65–1.98)	2.08 (1.89–2.28)	2.45 (2.22–2.68)	2.74 (2.47–2.99)	3.05 (2.73–3.32)	3.36 (3.00–3.67)	3.79 (3.36–4.14)	4.14 (3.64–4.52)
2-hr	1.46 (1.34–1.60)	1.77 (1.62–1.94)	2.21 (2.03–2.42)	2.56 (2.34–2.80)	3.05 (2.77–3.32)	3.44 (3.11–3.74)	3.84 (3.46–4.18)	4.26 (3.82–4.64)	4.85 (4.31–5.27)	5.31 (4.69–5.78)
3-hr	1.57 (1.44–1.72)	1.90 (1.74–2.08)	2.38 (2.17–2.60)	2.76 (2.52–3.02)	3.31 (3.00–3.60)	3.75 (3.38–4.08)	4.21 (3.78–4.58)	4.70 (4.20–5.11)	5.39 (4.76–5.86)	5.94 (5.22–6.46)
6-hr	1.93 (1.77–2.11)	2.33 (2.13–2.55)	2.90 (2.66–3.18)	3.37 (3.08–3.69)	4.04 (3.67–4.41)	4.59 (4.14–5.00)	5.17 (4.64–5.63)	5.78 (5.16–6.30)	6.66 (5.88–7.25)	7.37 (6.45–8.04)
12-hr	2.28 (2.09–2.49)	2.75 (2.52–3.00)	3.41 (3.13–3.72)	3.96 (3.61–4.31)	4.72 (4.30–5.13)	5.34 (4.84–5.81)	6.00 (5.41–6.52)	6.70 (5.99–7.27)	7.68 (6.80–8.34)	8.47 (7.44–9.21)
24-hr	2.74 (2.56–2.93)	3.29 (3.09–3.53)	4.10 (3.83–4.38)	4.75 (4.43–5.07)	5.65 (5.26–6.03)	6.39 (5.93–6.82)	7.16 (6.61–7.63)	7.97 (7.31–8.50)	9.10 (8.27–9.73)	10.0 (9.03–10.7)
2-day	3.25 (3.02–3.49)	3.91 (3.63–4.20)	4.86 (4.52–5.23)	5.65 (5.24–6.07)	6.77 (6.25–7.28)	7.70 (7.09–8.28)	8.70 (7.95–9.37)	9.76 (8.86–10.5)	11.3 (10.1–12.2)	12.5 (11.2–13.6)
3-day	3.46 (3.22–3.73)	4.15 (3.87–4.47)	5.15 (4.79–5.56)	5.98 (5.56–6.45)	7.19 (6.65–7.74)	8.19 (7.54–8.82)	9.27 (8.48–9.99)	10.4 (9.48–11.3)	12.1 (10.9–13.1)	13.5 (12.0–14.6)
4-day	3.67 (3.42–3.96)	4.39 (4.10–4.75)	5.44 (5.07–5.88)	6.32 (5.87–6.82)	7.61 (7.04–8.20)	8.68 (8.00–9.36)	9.84 (9.01–10.6)	11.1 (10.1–12.0)	12.9 (11.6–14.0)	14.4 (12.9–15.7)
7-day	4.27 (3.97–4.61)	5.11 (4.75–5.52)	6.31 (5.86–6.83)	7.32 (6.78–7.92)	8.78 (8.09–9.50)	10.0 (9.18–10.8)	11.3 (10.3–12.3)	12.7 (11.5–13.8)	14.8 (13.2–16.1)	16.4 (14.6–18.0)
10-day	4.81 (4.46–5.23)	5.75 (5.34–6.26)	7.11 (6.59–7.74)	8.23 (7.61–8.96)	9.85 (9.06–10.7)	11.2 (10.2–12.2)	12.6 (11.5–13.7)	14.2 (12.8–15.4)	16.4 (14.6–17.9)	18.2 (16.1–19.9)
20-day	6.63 (6.23–7.07)	7.87 (7.40–8.39)	9.43 (8.86–10.1)	10.7 (10.0–11.4)	12.4 (11.6–13.2)	13.8 (12.9–14.7)	15.2 (14.1–16.3)	16.7 (15.4–17.8)	18.7 (17.1–20.0)	20.2 (18.4–21.8)
30-day	8.17 (7.71–8.67)	9.65 (9.10–10.2)	11.4 (10.7–12.1)	12.8 (12.0–13.6)	14.7 (13.8–15.6)	16.2 (15.2–17.2)	17.7 (16.5–18.8)	19.2 (17.9–20.5)	21.3 (19.6–22.8)	22.9 (21.0–24.5)
45-day	10.2 (9.71–10.8)	12.0 (11.4–12.7)	14.1 (13.3–14.8)	15.7 (14.8–16.5)	17.8 (16.8–18.8)	19.5 (18.3–20.6)	21.2 (19.8–22.4)	22.8 (21.3–24.2)	25.1 (23.3–26.6)	26.8 (24.7–28.5)
60-day	12.2 (11.5–12.8)	14.3 (13.6–15.1)	16.6 (15.8–17.5)	18.4 (17.4–19.4)	20.8 (19.6–21.9)	22.5 (21.3–23.8)	24.3 (22.9–25.7)	26.0 (24.4–27.5)	28.2 (26.4–30.0)	29.9 (27.8–31.8)

[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.

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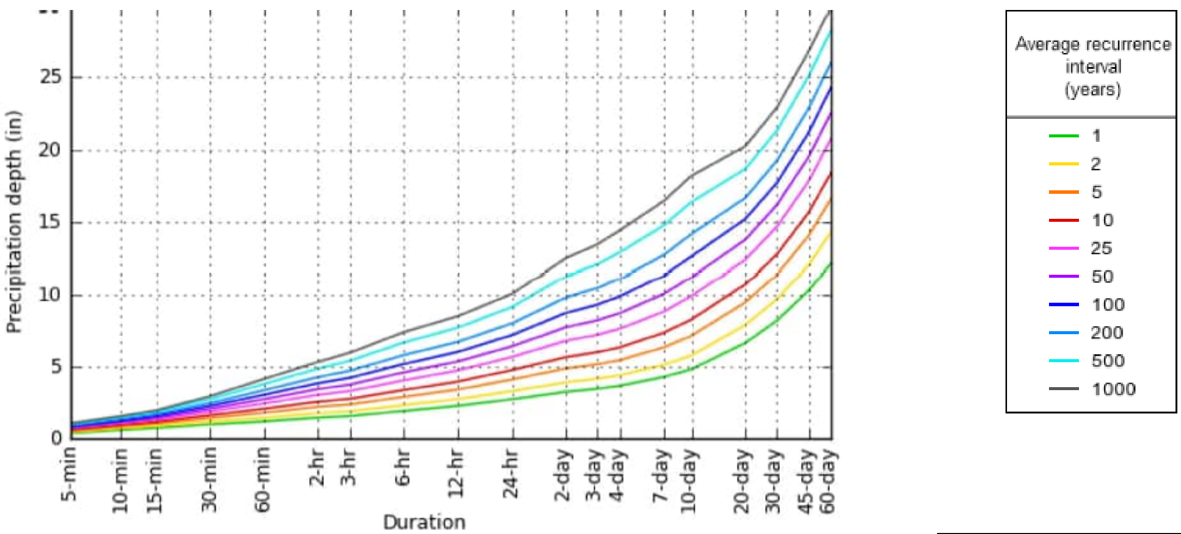
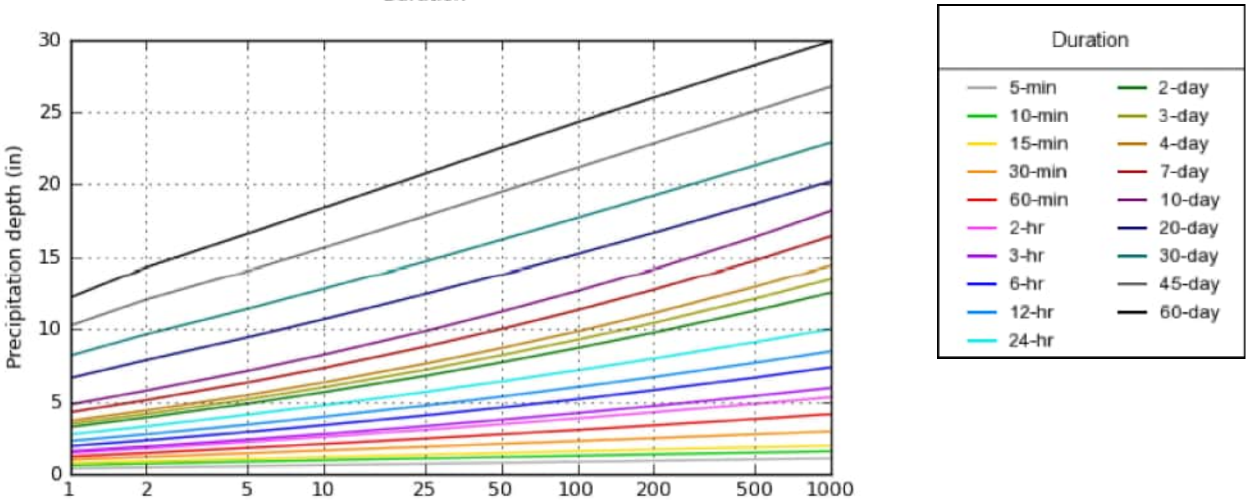
PF graphical





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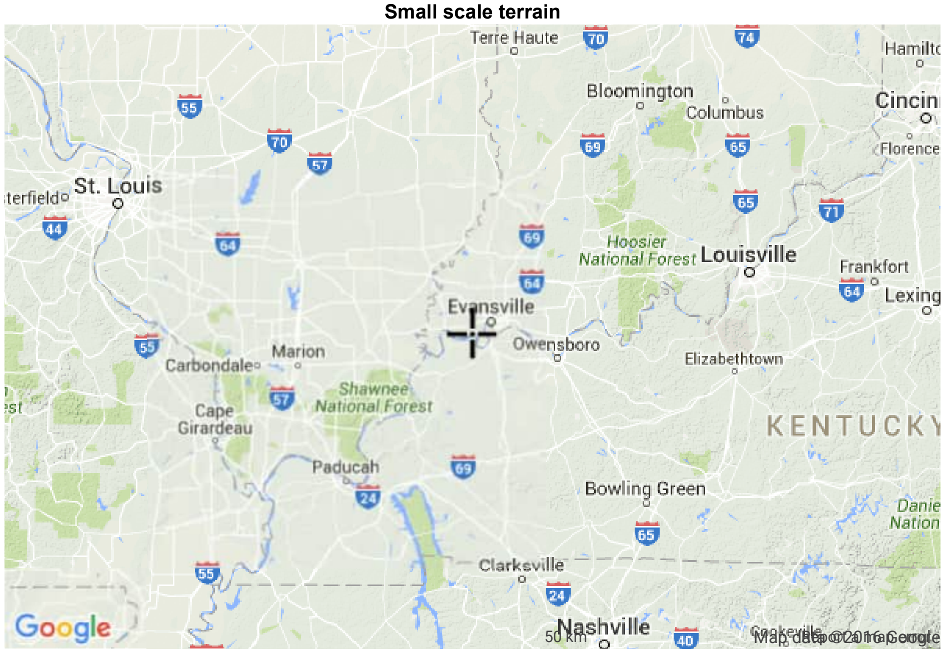
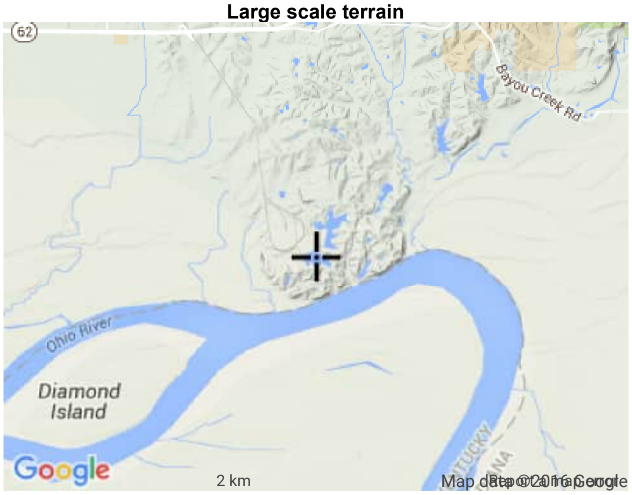
NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Thu Jun 30 17:57:02 2016

Maps & aerials

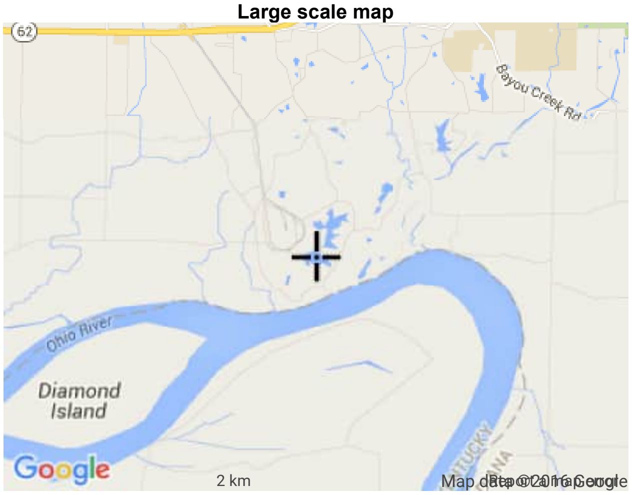
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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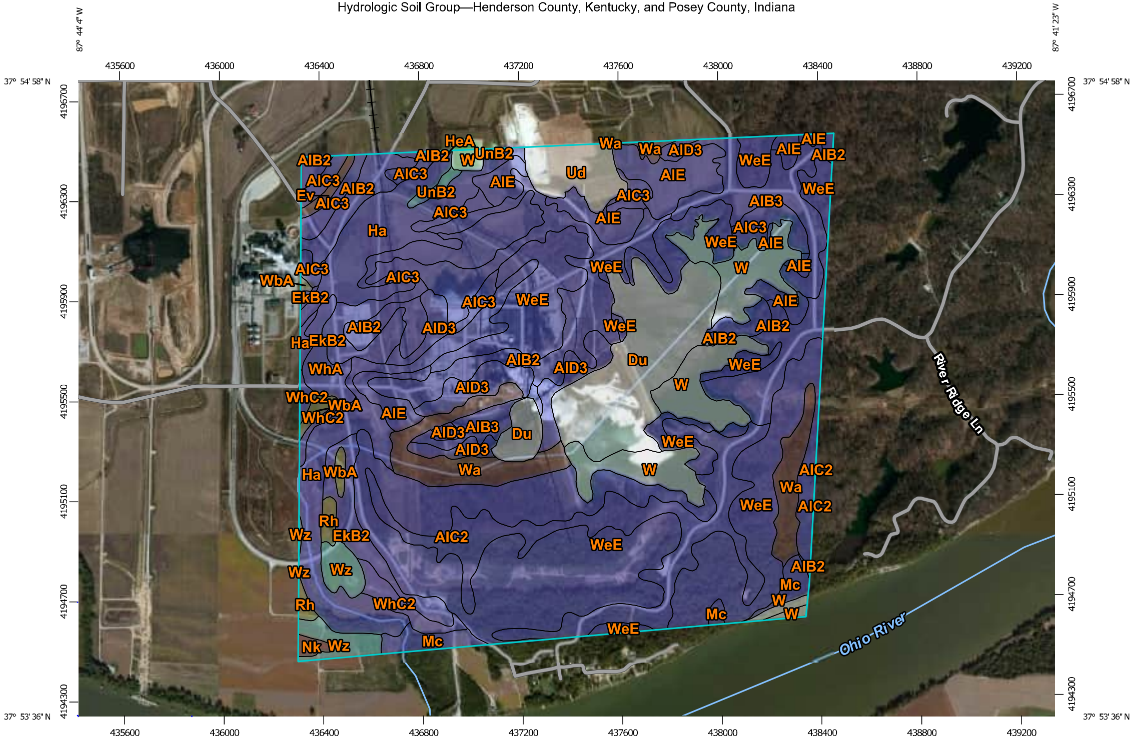
Soils Data



Map Scale: 1:17,900 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 250, 500, 1000, 1500

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, Kentucky
Survey Area Data: Version 15, Sep 15, 2015

Soil Survey Area: Posey County, Indiana
Survey Area Data: Version 15, Sep 10, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Henderson County, Kentucky (KY101)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
W	Water		1.1	0.1%
Subtotals for Soil Survey Area			**1.1**	**0.1%**
Totals for Area of Interest			**1,022.6**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — Posey County, Indiana (IN129)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded	B	111.3	10.9%
AlB3	Alford silt loam, 2 to 6 percent slopes, severely eroded	B	37.0	3.6%
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded	B	67.5	6.6%
AlC3	Alford silt loam, 6 to 12 percent slopes, severely eroded	B	67.5	6.6%
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded	B	33.9	3.3%
AlE	Alford silt loam, 18 to 25 percent slopes	B	49.6	4.9%
Du	Dumps, mine		75.8	7.4%
EkA	Elkinsville silt loam, 0 to 2 percent slopes, rarely flooded	B	0.3	0.0%
EkB2	Elkinsville silt loam, 2 to 6 percent slopes, eroded, rarely flooded	B	18.8	1.8%
Ev	Evansville silt loam, rarely flooded	B/D	2.9	0.3%
Ha	Haymond silt loam, wet substratum, frequently flooded	B	90.1	8.8%
HeA	Henshaw silt loam, 0 to 2 percent slopes, rarely flooded	C/D	0.2	0.0%
Mc	McAdoo silt loam, frequently flooded	B	13.0	1.3%
Nk	Newark silty clay loam, frequently flooded	B/D	2.1	0.2%

Hydrologic Soil Group— Summary by Map Unit — Posey County, Indiana (IN129)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
Rh	Rahm silt loam, occasionally flooded	C/D	4.3	0.4%
Ud	Udorthents, cut and filled		19.4	1.9%
UnA	Uniontown silt loam, 0 to 2 percent slopes, rarely flooded	C	0.1	0.0%
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded, rarely flooded	C	2.9	0.3%
W	Water		62.7	6.1%
Wa	Wakeland silt loam, frequently flooded	B/D	41.0	4.0%
WbA	Weinbach silt loam, 0 to 2 percent slopes, rarely flooded	C/D	4.7	0.5%
WeE	Wellston silt loam, 18 to 25 percent slopes	B	279.6	27.3%
WhA	Wheeling loam, 0 to 2 percent slopes, rarely flooded	B	10.2	1.0%
WhC2	Wheeling loam, 6 to 12 percent slopes, eroded, rarely flooded	B	11.4	1.1%
Wz	Woodmere silt loam, occasionally flooded	C	15.4	1.5%
Subtotals for Soil Survey Area			**1,021.5**	**99.9%**
Totals for Area of Interest			**1,022.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

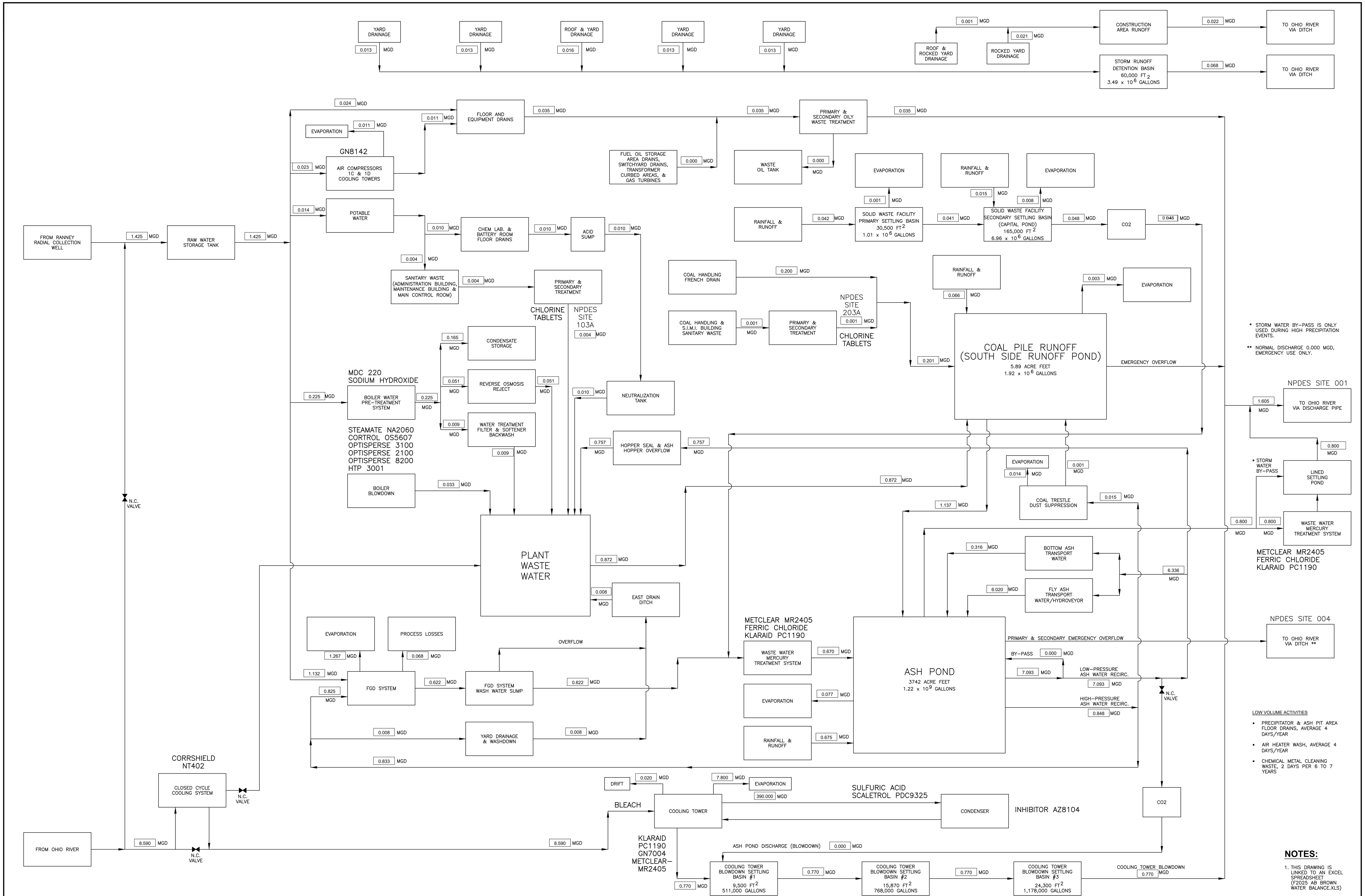
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Water Balance



SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
A. B. BROWN POWER STATION
EVANSVILLE, INDIANA

SIGECO

REV.	DATE	BY	ITEM
0	12 24 03	3i	ISSUED FOR RECORD
1	4 22 09	3i	UPDATED TREATMENT INFORMATION
2	5 4 11	3i	ADD AIR COMPRESSOR COOLING TOWERS
3	6 18 14	RES/3i	ADD MERCURY TREATMENT SYSTEMS
4	1 12 17	AJW/3i	UPDATED PER VECTREN RED-LINES
5	9 20 21	ERB/3i	UPDATED PER CENTERPOINT RED-LINES

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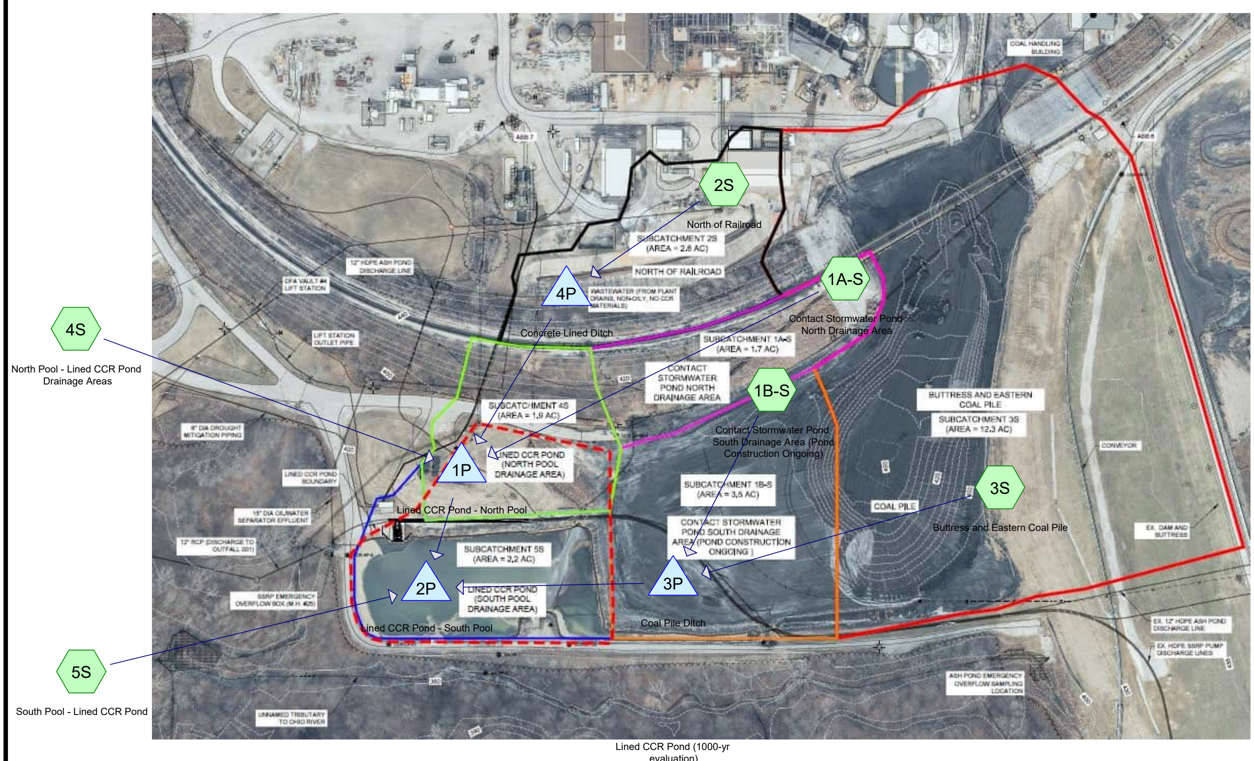
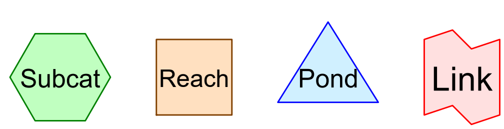
WWW.THREEIDESIGN.COM (812) 423-6800
THREE i DESIGN JOB NUMBER: 02218A

PLANT WATER BALANCE WITH GE BETZ TREATMENT

DRAWN BY: H.W.D. | DATE: 12-23-03 | SHEET NO:
CKD. BY: J.M.R. | SCALE: NONE
DRAWING NO: F-2025.1

HydroCAD Output Report





Routing Diagram for CCR Pond - 1000-yr Storm Evaluation
Prepared by AECOM, Printed 8/11/2023
HydroCAD® 10.10-7b s/n 01723 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1000-YR 24-HR INDY HUFF	Indy Huff	3rd Quartile	Scale	24.00	1	10.00	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.042	96	<50% Grass cover, Poor, HSG B (2S)
4.461	74	>75% Grass cover, Good, HSG C (3S)
2.759	77	Brush, Poor, HSG C (1A-S, 2S, 3S, 4S)
2.056	96	Gravel surface, HSG A (1B-S, 4S)
8.350	96	Gravel surface, HSG B (3S, 5S)
2.107	96	Gravel surface, HSG C (1A-S, 1B-S)
1.591	98	Open Water (5S)
0.815	98	Open water and Pond Liner (4S)
24.180	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.056	HSG A	1B-S, 4S
10.392	HSG B	2S, 3S, 5S
9.326	HSG C	1A-S, 1B-S, 2S, 3S, 4S
0.000	HSG D	
2.406	Other	4S, 5S
24.180		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	2.042	0.000	0.000	0.000	2.042	<50% Grass cover, Poor	2S
0.000	0.000	4.461	0.000	0.000	4.461	>75% Grass cover, Good	3S
0.000	0.000	2.759	0.000	0.000	2.759	Brush, Poor	1A-S, 2S, 3S, 4S
2.056	8.350	2.107	0.000	0.000	12.513	Gravel surface	1A-S, 1B-S, 3S, 4S, 5S
0.000	0.000	0.000	0.000	1.591	1.591	Open Water	5S
0.000	0.000	0.000	0.000	0.815	0.815	Open water and Pond Liner	4S
2.056	**10.392**	**9.326**	**0.000**	**2.406**	**24.180**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	385.00	384.00	60.0	0.0167	0.012	0.0	21.0	0.0
2	2P	386.35	385.24	25.0	0.0444	0.012	0.0	15.0	0.0
3	4P	401.83	388.00	275.0	0.0503	0.024	0.0	21.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1A-S: Contact Stormwater Runoff Area=74,645 sf 0.00% Impervious Runoff Depth=7.39"
Flow Length=630' Tc=14.7 min CN=79 Runoff=1.33 cfs 1.056 af

Subcatchment 1B-S: Contact Stormwater Runoff Area=150,179 sf 0.00% Impervious Runoff Depth=9.52"
Flow Length=540' Tc=3.4 min CN=96 Runoff=3.03 cfs 2.734 af

Subcatchment 2S: North of Railroad Runoff Area=113,076 sf 0.00% Impervious Runoff Depth=9.03"
Flow Length=466' Tc=9.4 min CN=92 Runoff=2.24 cfs 1.953 af

Subcatchment 3S: Buttress and Eastern Runoff Area=536,048 sf 0.00% Impervious Runoff Depth=8.53"
Flow Length=696' Tc=14.1 min CN=88 Runoff=10.32 cfs 8.749 af

Subcatchment 4S: North Pool - Lined CCR Runoff Area=83,744 sf 42.39% Impervious Runoff Depth=8.90"
Flow Length=208' Tc=11.8 min CN=91 Runoff=1.65 cfs 1.426 af

Subcatchment 5S: South Pool - Lined CCR Runoff Area=95,581 sf 72.49% Impervious Runoff Depth=9.64"
Tc=0.0 min CN=97 Runoff=1.93 cfs 1.762 af

Pond 1P: Lined CCR Pond - North Pool Peak Elev=391.53' Storage=105,891 cf Inflow=7.89 cfs 15.149 af
Outflow=7.87 cfs 15.156 af

Pond 2P: Lined CCR Pond - South Pool Peak Elev=390.86' Storage=545,810 cf Inflow=10.90 cfs 19.106 af
Primary=5.35 cfs 19.421 af Secondary=0.02 cfs 0.001 af Tertiary=0.00 cfs 0.000 af Outflow=5.36 cfs 19.422 af

Pond 3P: Coal Pile Ditch Peak Elev=391.53' Storage=9,681 cf Inflow=13.33 cfs 11.483 af
Primary=1.12 cfs 2.151 af Secondary=12.21 cfs 9.306 af Outflow=13.32 cfs 11.457 af

Pond 4P: Concrete Lined Ditch Peak Elev=402.53' Storage=962 cf Inflow=2.24 cfs 1.953 af
21.0" Round Culvert n=0.024 L=275.0' S=0.0503 '/' Outflow=2.23 cfs 1.956 af

Total Runoff Area = 24.180 ac Runoff Volume = 17.680 af Average Runoff Depth = 8.77"
90.05% Pervious = 21.774 ac 9.95% Impervious = 2.406 ac

Summary for Subcatchment 1A-S: Contact Stormwater Pond North Drainage Area

Represents the area of the railroad embankment that will drain to the Contact Stormwater Pond in the future, but currently drains to the Lined CCR Pond.

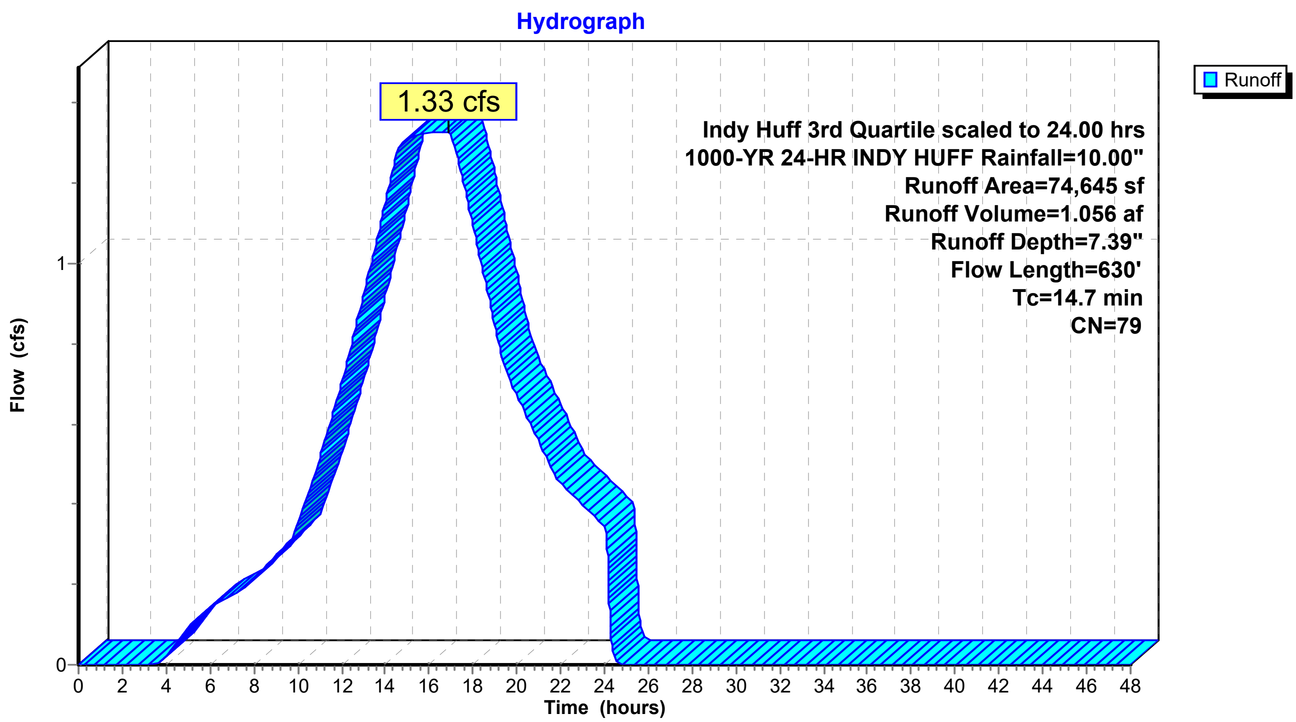
Runoff = 1.33 cfs @ 16.84 hrs, Volume= 1.056 af, Depth= 7.39"
Routed to Pond 1P : Lined CCR Pond - North Pool

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

Area (sf)	CN	Description
65,159	77	Brush, Poor, HSG C
9,486	96	Gravel surface, HSG C
74,645	79	Weighted Average
74,645		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	90	0.4400	0.15		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.29"
4.9	540	0.0130	1.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.7	630	Total			

Subcatchment 1A-S: Contact Stormwater Pond North Drainage Area



mmary for Subcatchment 1B-S: Contact Stormwater Pond South Drainage Area (Pond Construction Ong

Represents the area of the future Contact Stormwater Pond that will be under construction while the Lined CCR Pond is in operation. The coal pile will be cleared and the Contact Stormwater Pond excavation will be under progress. Flows will go to the coal pile ditch (or accumulate in the excavation during very large storm events).

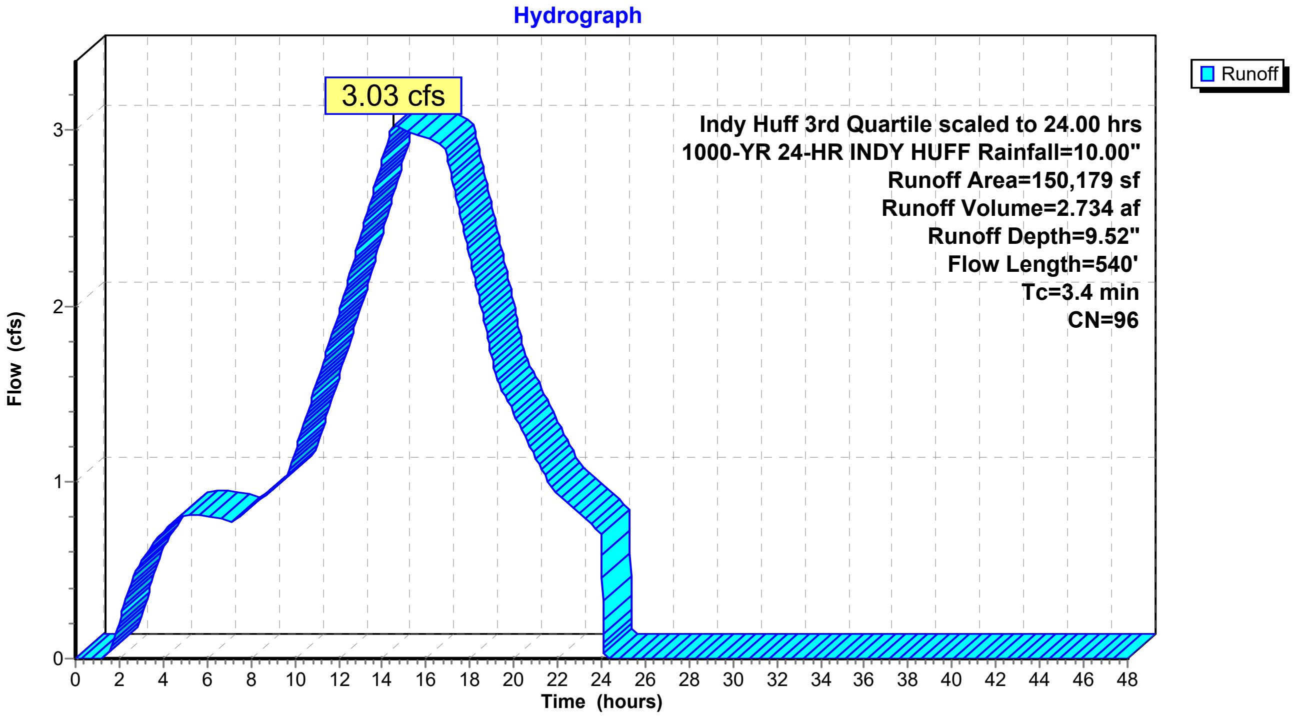
Runoff = 3.03 cfs @ 14.50 hrs, Volume= 2.734 af, Depth= 9.52"
Routed to Pond 3P : Coal Pile Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

Area (sf)	CN	Description
67,895	96	Gravel surface, HSG A
82,284	96	Gravel surface, HSG C
150,179	96	Weighted Average
150,179		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0600	2.16		**Sheet Flow, Sheet flow - western coal pile** Smooth surfaces n= 0.011 P2= 3.29"
2.6	440	0.0300	2.79		**Shallow Concentrated Flow, Shallow concentrated flow over we** Unpaved Kv= 16.1 fps
3.4	540	Total			

Subcatchment 1B-S: Contact Stormwater Pond South Drainage Area (Pond Construction Ongoing)



Summary for Subcatchment 2S: North of Railroad

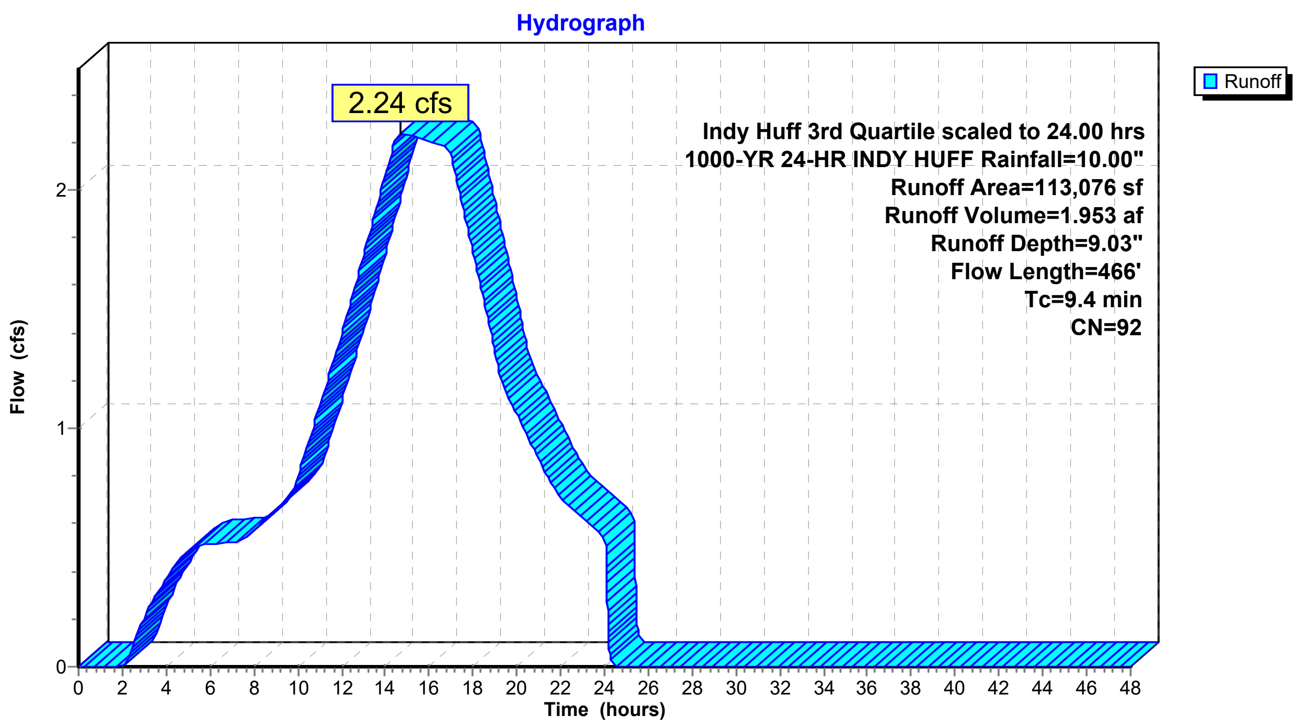
Runoff = 2.24 cfs @ 14.65 hrs, Volume= 1.953 af, Depth= 9.03"
Routed to Pond 4P : Concrete Lined Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

	Area (sf)	CN	Description
*	88,959	96	<50% Grass cover, Poor, HSG B
	24,117	77	Brush, Poor, HSG C
	113,076	92	Weighted Average
	113,076		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	67	0.4000	0.14		**Sheet Flow, Sheet flow on railroad embankment** Woods: Dense underbrush n= 0.800 P2= 3.29"
0.2	45	0.3000	3.51		**Sheet Flow, Sheet flow down side slope of concrete lined ditch** Smooth surfaces n= 0.011 P2= 3.29"
1.1	354	0.0050	5.19	33.75	**Trap/Vee/Rect Channel Flow, Flow in concrete-lined ditch** Bot.W=12.00' D=0.50' Z= 2.0 '/' Top.W=14.00' n= 0.012
9.4	466	Total			

Subcatchment 2S: North of Railroad



Summary for Subcatchment 3S: Buttress and Eastern Coal Pile

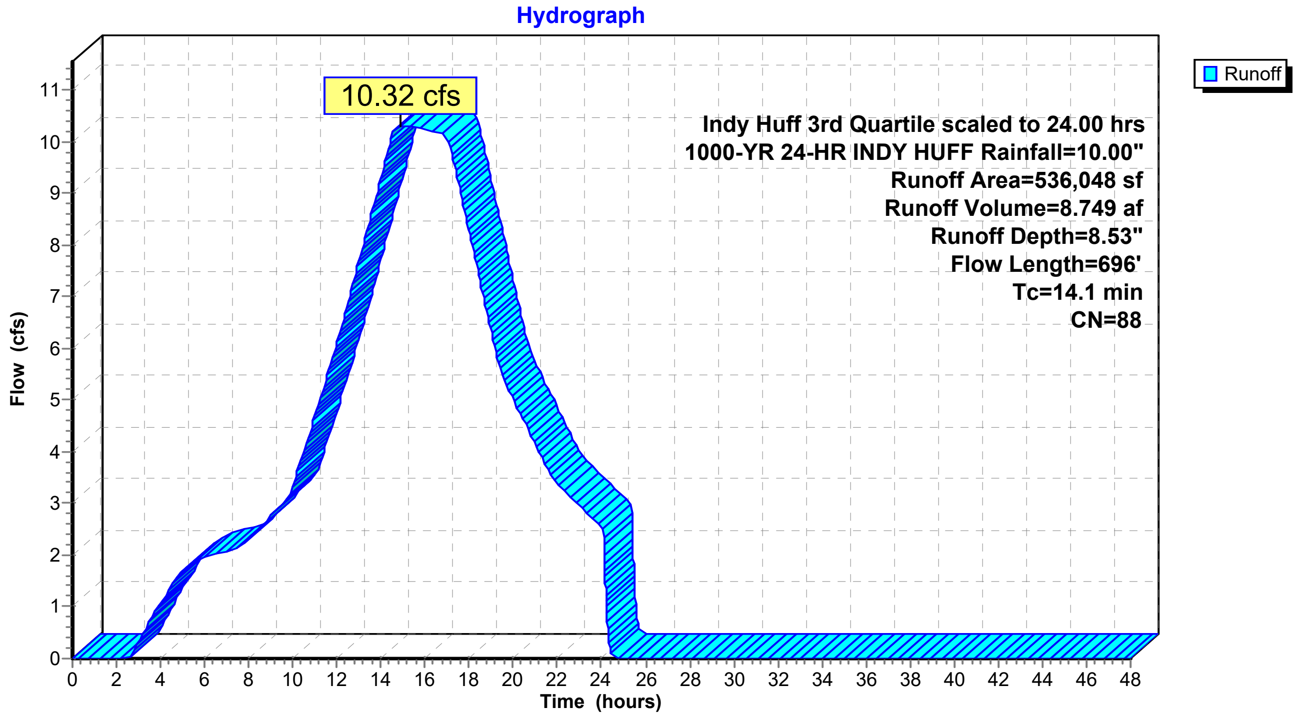
Runoff = 10.32 cfs @ 14.90 hrs, Volume= 8.749 af, Depth= 8.53"
Routed to Pond 3P : Coal Pile Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

Area (sf)	CN	Description
194,309	74	>75% Grass cover, Good, HSG C
337,430	96	Gravel surface, HSG B
4,309	77	Brush, Poor, HSG C
536,048	88	Weighted Average
536,048		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	40	0.4000	0.48		**Sheet Flow, Outer slope of Lower Dam to buttress** Grass: Short n= 0.150 P2= 3.29"
6.9	60	0.0167	0.14		**Sheet Flow, Flat portion of buttress** Grass: Short n= 0.150 P2= 3.29"
3.9	212	0.0167	0.90		**Shallow Concentrated Flow, Top of buttress** Short Grass Pasture Kv= 7.0 fps
1.9	384	0.1100	3.32		**Shallow Concentrated Flow, Buttress slope to coal pile ditch** Nearly Bare & Untilled Kv= 10.0 fps
14.1	696	Total			

Subcatchment 3S: Buttress and Eastern Coal Pile



Summary for Subcatchment 4S: North Pool - Lined CCR Pond Drainage Areas

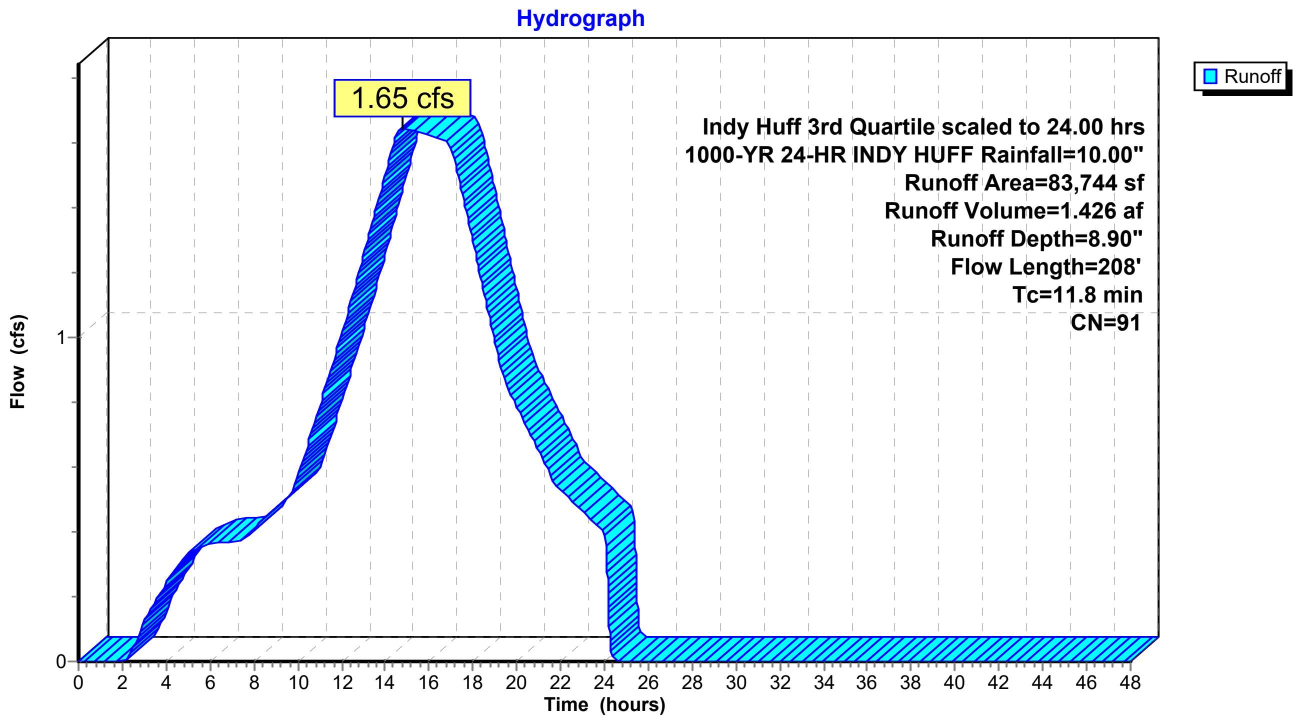
Runoff = 1.65 cfs @ 14.75 hrs, Volume= 1.426 af, Depth= 8.90"
Routed to Pond 1P : Lined CCR Pond - North Pool

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

	Area (sf)	CN	Description
	21,666	96	Gravel surface, HSG A
	26,576	77	Brush, Poor, HSG C
*	35,502	98	Open water and Pond Liner
	83,744	91	Weighted Average
	48,242		57.61% Pervious Area
	35,502		42.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.3800	0.15		**Sheet Flow, Flow trhough brush on railroad embankment** Woods: Dense underbrush n= 0.800 P2= 3.29"
0.4	108	0.0500	4.54		**Shallow Concentrated Flow, Flow across paved road into pond** Paved Kv= 20.3 fps
11.8	208	Total			

Subcatchment 4S: North Pool - Lined CCR Pond Drainage Areas



Summary for Subcatchment 5S: South Pool - Lined CCR Pond

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

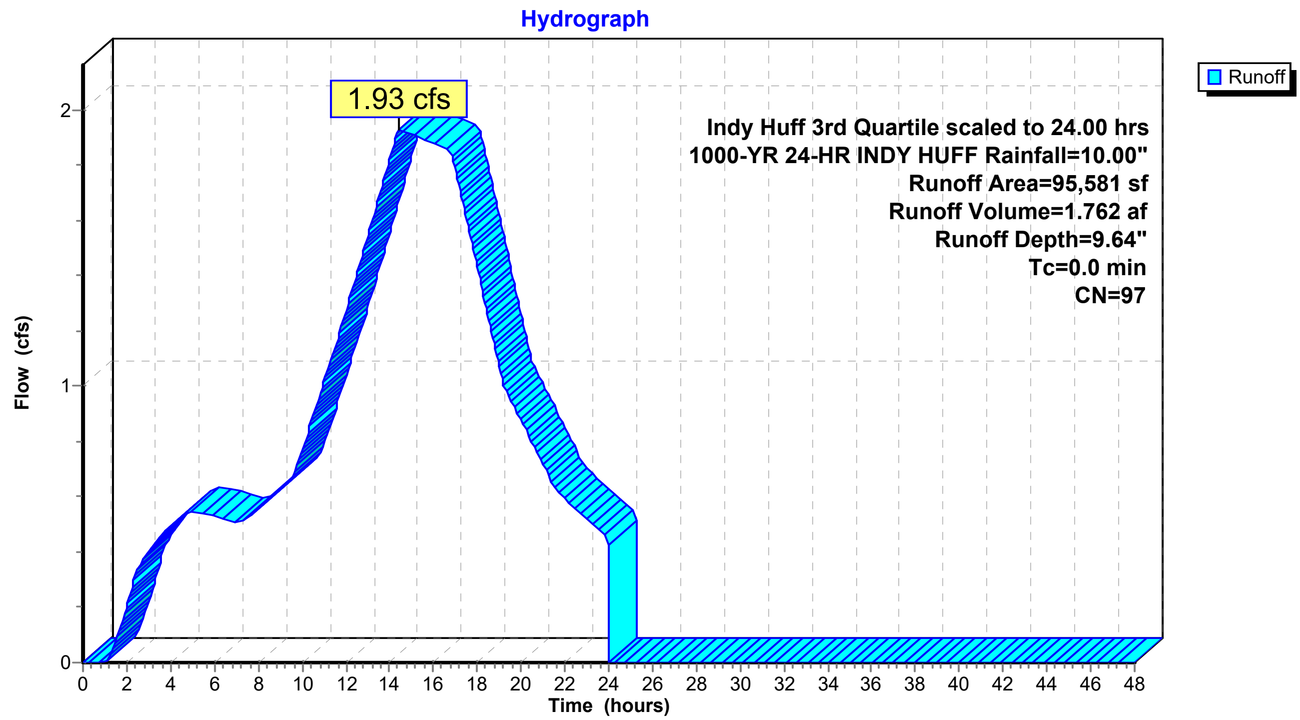
Runoff = 1.93 cfs @ 14.41 hrs, Volume= 1.762 af, Depth= 9.64"
Routed to Pond 2P : Lined CCR Pond - South Pool

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile scaled to 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.00"

	Area (sf)	CN	Description
*	69,290	98	Open Water
	26,291	96	Gravel surface, HSG B
	95,581	97	Weighted Average
	26,291		27.51% Pervious Area
	69,290		72.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry, Open water**

Subcatchment 5S: South Pool - Lined CCR Pond



Summary for Pond 1P: Lined CCR Pond - North Pool

Pond is modeled with the following outlets:

- 24" HDPE culvert connecting the North Pool of the CCR Pond to South Pool of the CCR Pond.

Inflow Area = 6.232 ac, 13.08% Impervious, Inflow Depth > 29.17" for 1000-YR 24-HR INDY HUFF event
Inflow = 7.89 cfs @ 14.91 hrs, Volume= 15.149 af, Incl. 2.70 cfs Base Flow
Outflow = 7.87 cfs @ 15.52 hrs, Volume= 15.156 af, Atten= 0%, Lag= 36.4 min
Primary = 7.87 cfs @ 15.52 hrs, Volume= 15.156 af
Routed to Pond 2P : Lined CCR Pond - South Pool

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 391.27' Surf.Area= 19,205 sf Storage= 100,883 cf
Peak Elev= 391.53' @ 15.52 hrs Surf.Area= 19,680 sf Storage= 105,891 cf (5,008 cf above start)

Plug-Flow detention time= 418.7 min calculated for 12.837 af (85% of inflow)
Center-of-Mass det. time= 5.0 min (1,288.2 - 1,283.2)

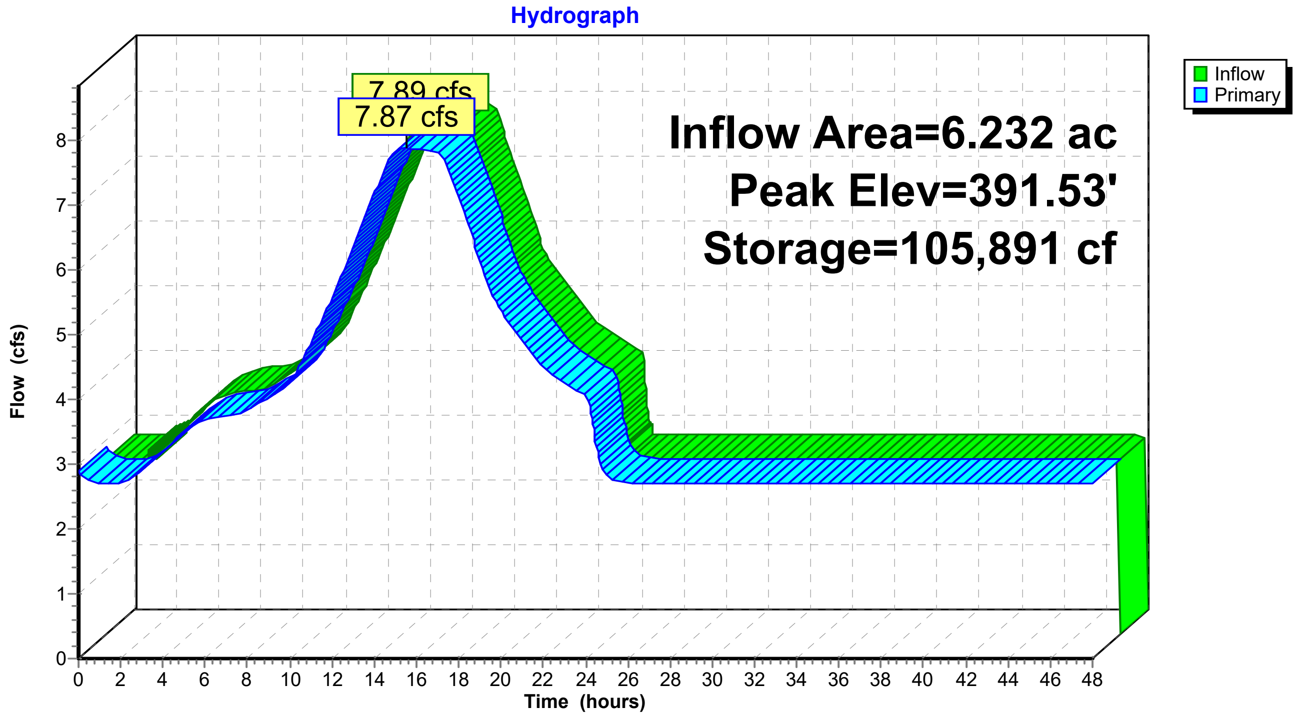
Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	249,453 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
383.00	3,352	281.0	0	0	3,352
384.00	7,702	513.0	5,378	5,378	18,016
388.70	14,786	621.0	51,950	57,328	28,120
393.00	22,505	719.0	79,597	136,925	38,960
398.00	22,506	720.0	112,527	249,453	42,559

Device	Routing	Invert	Outlet Devices
#1	Primary	385.00'	**21.0" Round Culvert** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 385.00' / 384.00' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 2.41 sf
#2	Device 1	391.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.87 cfs @ 15.52 hrs HW=391.53' TW=389.79' (Dynamic Tailwater)
↑ **1=Culvert** (Passes 7.87 cfs of 13.48 cfs potential flow)
↑ **2=Orifice/Grate** (Weir Controls 7.87 cfs @ 2.38 fps)

Pond 1P: Lined CCR Pond - North Pool



Summary for Pond 2P: Lined CCR Pond - South Pool

Pond is modeled with the following outlets:

1) Pump Station - 2300 gpm constant capacity.

2) Overflow Riser - Elevations from Drought Mitigation System drawing ABB0-31-C-001.

3) SSRP Dike - acts as broad-crested weir.

Inflow Area = 24.180 ac, 9.95% Impervious, Inflow Depth > 9.48" for 1000-YR 24-HR INDY HUFF event
Inflow = 10.90 cfs @ 15.32 hrs, Volume= 19.106 af, Incl. 0.01 cfs Base Flow
Outflow = 5.36 cfs @ 24.01 hrs, Volume= 19.422 af, Atten= 51%, Lag= 521.2 min
Primary = 5.35 cfs @ 0.70 hrs, Volume= 19.421 af
Secondary = 0.02 cfs @ 24.01 hrs, Volume= 0.001 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 388.70' Surf.Area= 69,290 sf Storage= 384,544 cf
Peak Elev= 390.86' @ 24.01 hrs Surf.Area= 80,528 sf Storage= 545,810 cf (161,266 cf above start)

Plug-Flow detention time= 1,356.0 min calculated for 10.592 af (55% of inflow)
Center-of-Mass det. time= 233.4 min (1,434.1 - 1,200.7)

Volume	Invert	Avail.Storage	Storage Description
#1	380.00'	800,634 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
380.00	187	55.9	0	0	187
381.00	392	80.4	283	283	461
382.00	21,366	651.9	8,217	8,501	33,767
383.00	50,832	1,088.0	35,051	43,552	94,155
388.70	69,290	1,148.0	340,992	384,544	106,588
389.00	70,293	1,153.0	20,937	405,482	107,566
390.90	80,742	1,230.0	143,369	548,850	122,343
391.40	81,262	1,159.0	40,501	589,351	135,854
394.00	81,263	1,160.0	211,282	800,634	138,874

Device	Routing	Invert	Outlet Devices (Turned on 3 times)
#1	Primary	388.80'	**Pump** Discharges@0.00' Turns Off<388.50' 12.0" Diam. x 100.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 2,300.0 2,400.0 Head (feet)= 50.00 1.00 -Loss (feet)= 1.19 1.28 =Lift (feet)= 48.81 -0.28
#2	Secondary	386.35'	**15.0" Round Culvert** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 386.35' / 385.24' S= 0.0444 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

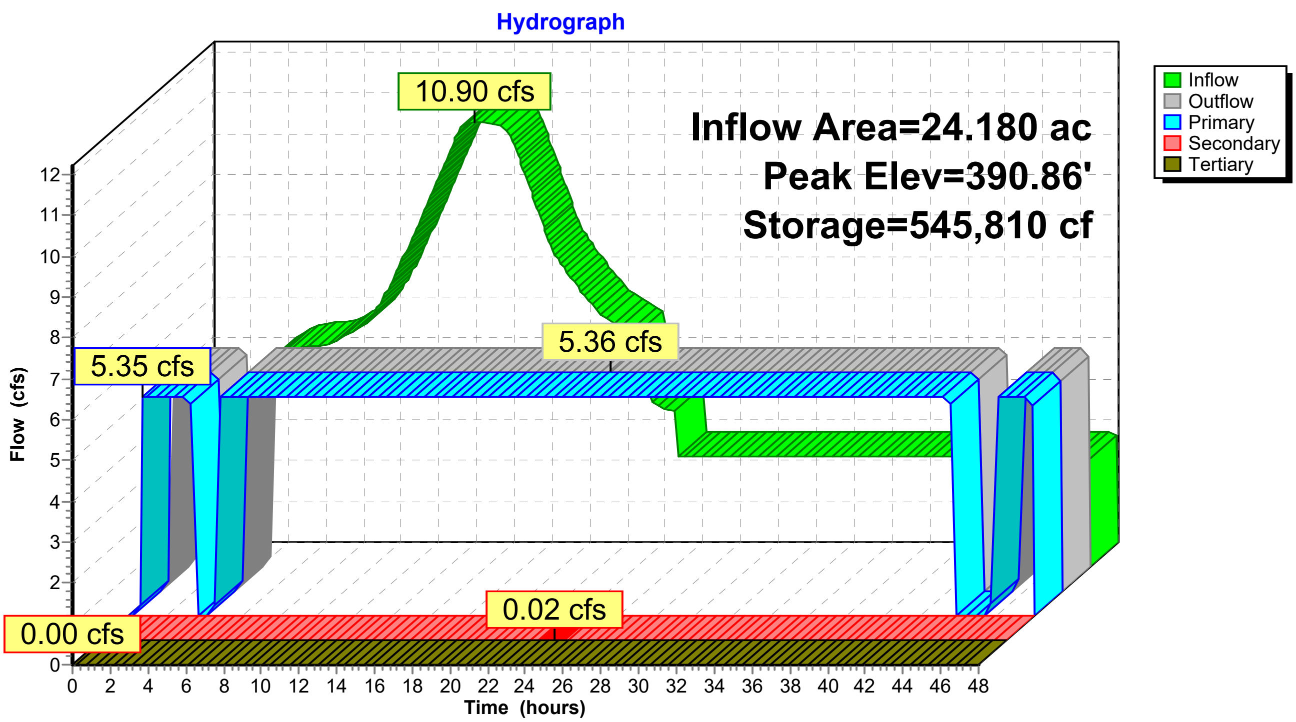
#3	Device 2	390.85'	**15.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Tertiary	391.50'	**400.0' long + 2.5 '/' SideZ x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.35 cfs @ 0.70 hrs HW=388.80' (Free Discharge)
└─**1=Pump** (Pump Controls 5.35 cfs)

Secondary OutFlow Max=0.02 cfs @ 24.01 hrs HW=390.86' (Free Discharge)
└─**2=Culvert** (Passes 0.02 cfs of 10.28 cfs potential flow)
  └─**3=Orifice/Grate** (Weir Controls 0.02 cfs @ 0.36 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=388.70' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Lined CCR Pond - South Pool



Summary for Pond 3P: Coal Pile Ditch

Inflow Area = 15.754 ac, 0.00% Impervious, Inflow Depth = 8.75" for 1000-YR 24-HR INDY HUFF event
Inflow = 13.33 cfs @ 14.87 hrs, Volume= 11.483 af
Outflow = 13.32 cfs @ 14.85 hrs, Volume= 11.457 af, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 8.30 hrs, Volume= 2.151 af
Routed to Pond 2P : Lined CCR Pond - South Pool
Secondary = 12.21 cfs @ 14.85 hrs, Volume= 9.306 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 391.53' @ 14.85 hrs Surf.Area= 4,777 sf Storage= 9,681 cf

Plug-Flow detention time= 23.0 min calculated for 11.457 af (100% of inflow)
Center-of-Mass det. time= 21.7 min (918.6 - 896.9)

Volume	Invert	Avail.Storage	Storage Description
#1	388.00'	23,011 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

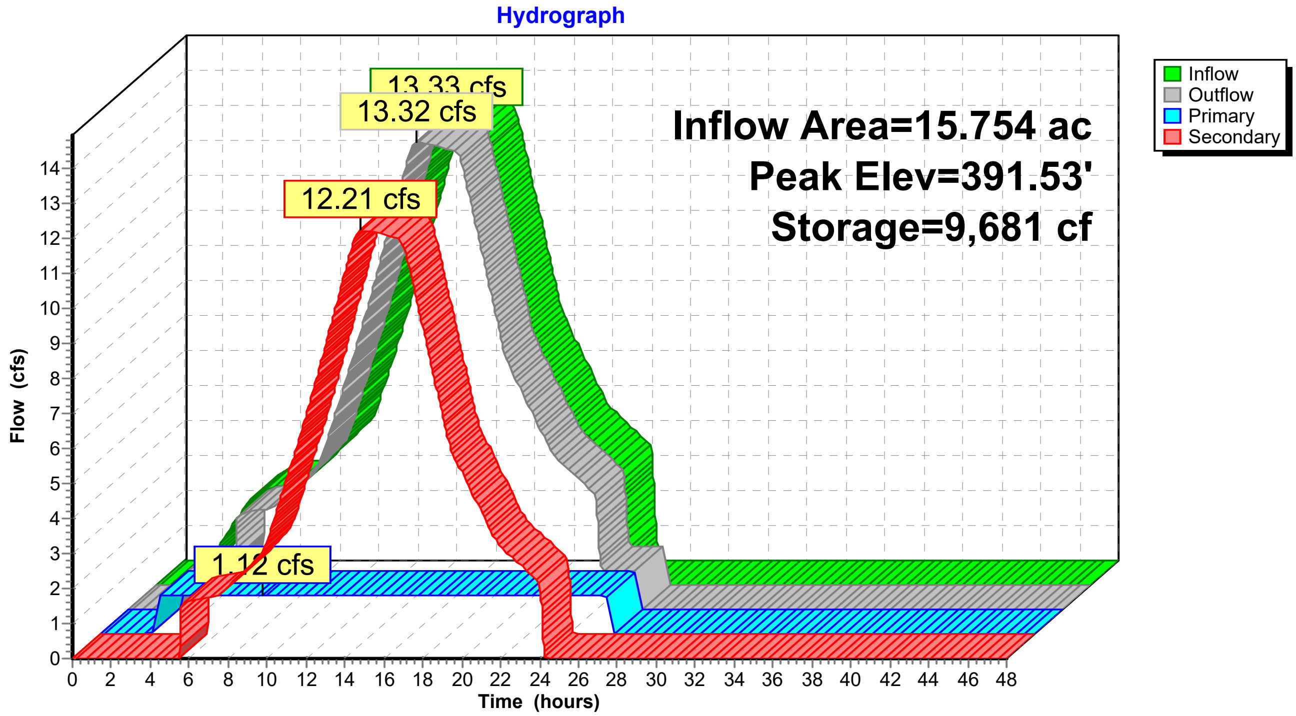
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
388.00	1,627	346.2	0	0	1,627
389.00	1,699	369.0	1,663	1,663	2,973
390.00	2,840	391.4	2,245	3,908	4,381
392.00	5,468	456.0	8,166	12,074	8,819
394.00	5,469	457.0	10,937	23,011	9,735

Device	Routing	Invert	Outlet Devices (Turned on 1 times)
#1	Primary	388.90'	**Construction Pump** Discharges@388.70' Turns Off<388.70' 4.0" Diam. x 100.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 0.0 100.0 200.0 300.0 400.0 530.0 Head (feet)= 98.00 93.00 88.00 77.00 60.00 0.00 -Loss (feet)= 0.00 0.75 2.71 5.75 9.79 16.49 =Lift (feet)= 98.00 92.25 85.29 71.25 50.21 -16.49
#2	Secondary	391.30'	**35.0' long + 30.0 '/' SideZ x 24.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.12 cfs @ 8.30 hrs HW=391.38' TW=388.80' (Dynamic Tailwater)
└─**1=Construction Pump** (Pump Controls 1.12 cfs)

Secondary OutFlow Max=12.21 cfs @ 14.85 hrs HW=391.53' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 12.21 cfs @ 1.25 fps)

Pond 3P: Coal Pile Ditch



Summary for Pond 4P: Concrete Lined Ditch

[44] Hint: Outlet device #1 is below defined storage
[86] Warning: Oscillations may require smaller dt (severity=35)

Inflow Area = 2.596 ac, 0.00% Impervious, Inflow Depth = 9.03" for 1000-YR 24-HR INDY HUFF event
Inflow = 2.24 cfs @ 14.65 hrs, Volume= 1.953 af
Outflow = 2.23 cfs @ 14.87 hrs, Volume= 1.956 af, Atten= 0%, Lag= 13.2 min
Primary = 2.23 cfs @ 14.87 hrs, Volume= 1.956 af
Routed to Pond 1P : Lined CCR Pond - North Pool

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 402.53' @ 14.87 hrs Surf.Area= 2,339 sf Storage= 962 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.7 min (892.3 - 885.5)

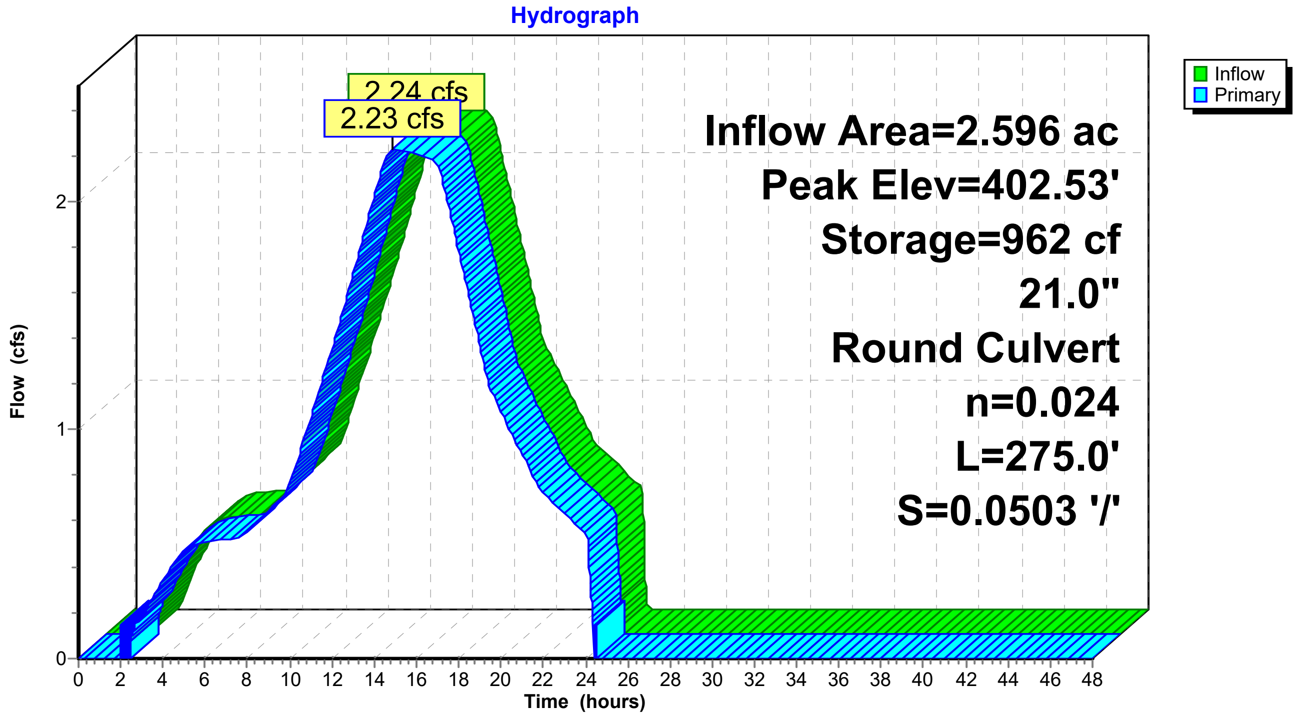
Volume	Invert	Avail.Storage	Storage Description
#1	402.00'	23,691 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
402.00	1,364	411.0	0	0	1,364
404.00	6,468	827.0	7,201	7,201	42,366
406.00	10,160	888.0	16,490	23,691	50,866

Device	Routing	Invert	Outlet Devices
#1	Primary	401.83'	**21.0" Round Culvert** L= 275.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 401.83' / 388.00' S= 0.0503 '/' Cc= 0.900 n= 0.024, Flow Area= 2.41 sf

Primary OutFlow Max=2.23 cfs @ 14.87 hrs HW=402.53' TW=391.52' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.23 cfs @ 2.51 fps)

Pond 4P: Concrete Lined Ditch



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