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Coal Combustion Residuals Surface Impoundments

Inflow Design Flood Control System Periodic Plan

Keystone Generating Station
Ash Filter Ponds
Shelocta, Pennsylvania

GAI Project Number: C151611.15, Task 001

October 2016
Rev. 01, October 2021
Rev. 02, October 2026

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Professional Engineer's Certification

The Inflow Design Flood Control System Periodic Plan (Plan) for the Keystone Generating Station Ash Filter Ponds was prepared by GAI Consultants, Inc. (GAI). The Plan was based on certain information that, other than for information GAI originally prepared, GAI has relied on but not independently verified. Therefore, this Certification/Statement of Professional Opinion is limited to the information available to GAI at the time the Plan was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Pennsylvania (PA), that the Plan has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, and at the time and in the same locale. It is my professional opinion that the Plan was prepared consistent with the requirements of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion, and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

Adam B Scheller, P.E.

Assistant Engineering Director



10/30/26

Plan Revisions

Revision	Date	Reason	Description	Reviewer
0	Oct. 2016		Original Document, Initial Plan	NRG, CB&I Inc.
1	Oct. 2021	Comprehensive review and as-needed revisions to develop Periodic Plan per CCR Rule, Section 257.82(c)(4) requirements (review of plan required every five years)	Remove NRG, additional miscellaneous administrative changes, revised hydrologic and hydraulic calculations and descriptions of the ponds to reflect pond reconstruction which occurred from 2017-2019.	Keystone Station, GAI Consultants, Inc
2	Oct. 2026	Comprehensive review and as-needed revisions to develop Periodic Plan per CCR Rule, Section 257.82(c)(4) requirements (review of plan required every five years)	Periodic review of plan, hydrologic and hydraulic calculations, and incorporation of information about site updates.	Keystone Station, GAI Consultants, Inc

1.0 Introduction

On December 19, 2014, the Administrator of the United States Environmental Protection Agency signed the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities final rule (the Rule). The Rule was published in the Federal Register on April 17, 2015, became effective on October 19, 2015, and is contained within amended portions of Title 40, Part 257 of the Code of Federal Regulations (CFR). The Rule establishes a comprehensive set of requirements for the disposal/management of CCR in landfills and surface impoundments at coal-fired power plants under Subtitle D of the Resource Conservation and Recovery Act. These requirements include compliance with location restrictions, design criteria, operating criteria, groundwater monitoring and corrective action criteria, and closure and post-closure care aspects.

Included with the operating criteria under 40 CFR §257.82 are requirements to prepare an initial inflow design flood control system plan (Plan) and subsequent periodic Plans for all existing, new, or expanded CCR surface impoundments. Pursuant to the Rule, this Plan is to serve as documentation by a professional engineer that the CCR unit is designed, constructed, operated, and maintained with an inflow design flood control system that will adequately manage flow into and from the CCR unit under the peak discharge conditions of the design flood. The specific design flood under which each CCR unit must be evaluated is based on the hazard potential classification of the impoundment as determined pursuant to §257.73(a)(2). Further details regarding the required content and criteria for the Plan (pursuant to §257.82[c]) are provided in Section 2.0 of this document. The initial Plan must be prepared no later than October 17, 2016, and periodic Plans must be prepared every 5 years thereafter.

The Keystone Generating Station (Station) is a coal-fired steam electric power generating station located in Shelocta, Pennsylvania. The Station has three surface impoundments that are subject to this Rule, specifically identified as Ash Filter Ponds A, B and C. The ponds are utilized as part of the bottom ash management system and are used for the settling of fine ash particles from sluice water. A further description of the key components and flow path associated with the sluice water is provided in the paragraphs below. Under normal operating conditions, all three ponds are in service; however, adequate capacity is provided by two ponds such that it is possible to periodically remove one pond from service for cleaning and maintenance. Accumulated bottom ash that is removed from the ponds during cleanout activities is transported to the Station's CCR landfill facility (comprised of the East Valley and West Valley Disposal Sites). The locations of the Station and the ponds are shown on Figure 1.

The Ash Filter Ponds were historically used as part of a once-through system to enable the discharge of clarified water to on-site surface water features. In 2026, the Station's bottom ash transport water system is undergoing modification to comply with the federal effluent limitations guidelines for bottom ash transport water at 40 CFR Part 423 (ELG Rule). Modifications include separation of non-bottom ash transport water (such as stormwater and water from other plant processes) from the bottom ash transport water, installation of a Bottom Ash Recycle Sump (BARS), and updates to the Ash Filter Ponds' distribution box to allow for one of the three ponds to be used for equalization during storm events to meet the requirements of the ELG Rule.

Once the modifications are complete, the Ash Filter Ponds will function as part of a system to recycle bottom ash transport water for continual reuse. Sluice water that is pumped through the ash hoppers associated with Units #1 and #2 flows to four bottom ash dewatering bins known as hydrobins. Overflow and decant water from the hydrobins gravity flows via piping to a distribution box, where it is directed to the ponds. Some stormwater is introduced into the system via precipitation falling directly into and around the ponds. As a result of the 2026 modifications, the Ash Filter Ponds also receive stormwater from around the dewatering bins that is comingled with leakage from the hydrobins that is discharged to the ground. Despite these inputs, the majority of water within the Ash Filter Ponds is represented by sluice water. Suspended ash particles are settled out from the water as it moves through the ponds

toward the outlet structures. Water exits each pond via an outlet consisting of two saw tooth weir troughs, a concrete riser box, and an 18-inch gravity flow pipe.

The outlet pipes from all three ponds will discharge into the current bottom ash pond sump and then into the newly constructed BARS. From the BARS, bottom ash transport water may be recycled for use as sluice water, sent to the flue gas desulfurization (FGD) make-up tanks for use in the FGD system (as permitted by the ELG Rule), or discharged from the system. Discharges from the system are routed via National Pollutant Discharge Elimination System (NPDES) permitted Internal Monitoring Point (IMP) 203 to the Final Settling Pond, which discharges to Crooked Creek via NPDES Outfall 003. Key features of the ash water management system are depicted on Figures 2 and 3.

In 2016, the Station engaged the services of CB&I Environmental & Infrastructure, Inc. (CB&I) to develop an Initial Plan for all three Ash Filter Ponds. This Initial Plan development followed the review of available background and design information and a field visit conducted on June 7, 2016. Additionally, development of this Plan occurred following completion of an Initial Hazard Potential Classification performed by CB&I, and documented under separate cover in October 2016.

In 2021, the Station engaged the services of GAI Consultants Inc. (GAI) to review and update as necessary the Initial Plan developed for all three Ash Filter Ponds. This Periodic Plan development followed the review of available background and design information (including the Initial Plan) and a field visit conducted on October 6, 2021. Additionally, development of this Periodic Plan occurred following a Periodic Hazard Potential Classification completed by GAI and documented under a separate cover in October 2021.

In 2026, the Station engaged the services of GAI to review and update as necessary the 2021 Periodic Plan developed for all three Ash Filter Ponds. This Periodic Plan development followed the review of available background and design information, including the initial Plan (2016) and Revision 1 to the Plan (2021), and a field visit conducted on October 13, 2026. Additionally, development of this Periodic Plan occurred following a Periodic Hazard Potential Classification completed by GAI and documented under a separate cover in October 2026.

Beyond this introductory section of the Plan, Section 2.0 outlines the regulatory requirements of §257.82; Section 3.0 describes the hydrologic and hydraulic evaluation performed for the subject impoundments, and Section 4.0 provides conclusions and recommendations regarding the adequacy of the impoundments to manage the specified flood conditions. Section 5.0 lists the references that were consulted during development of this Plan.

As required, this Plan will be appropriately placed in the facility's operating record pursuant to §257.105(g)(4), noticed to the State Director per §257.106(g)(4), and posted to the publicly accessible internet site pursuant to §257.107(g)(4).

2.0 Hydrologic and Hydraulic Capacity Requirements of 40 CFR §257.82

The Rule requires owners or operators of any existing CCR surface impoundment to design, construct, operate, and maintain an inflow design flood control system. The ability of the system to meet these requirements must be demonstrated in the form of an inflow design flood control system Plan.

2.1 Demonstration of the Adequacy of the Inflow Design Flood Control System

Pursuant to §257.82(a)(1)-(2), the design flood control system must:

> *Adequately Manage Flow Into the CCR Unit* – The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood.

Adequately Manage Flow From the CCR Unit – 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.

Pursuant to §257.82(a)(3), the inflow design flood that must be managed is based on the type of impoundment (incised or non-incised) and hazard potential classification as determined in accordance with §257.73(a)(2). The impoundment types and classifications and the associated inflow design floods are as follows:

- *Incised CCR Surface Impoundment* – A 25-year design flood applies to an incised CCR surface impoundment.
- *Low Hazard Potential CCR Surface Impoundment* – A 100-year design flood applies to a (non-incised) Low Hazard CCR surface impoundment.
- *Significant Hazard Potential CCR Surface Impoundment* – A 1000-year design flood applies to a (non-incised) Significant Hazard CCR surface impoundment.
- *High Hazard Potential CCR Surface Impoundment* – The probable maximum flood applies to a (non-incised) Significant Hazard CCR surface impoundment.

Since the subject ponds are diked, Low Hazard (refer to Section 3.3) impoundments, the 100-year design flood applies. Pursuant to §257.82(c), discharge from the CCR unit must be handled in accordance with the surface water requirements of §257.3-3 (i.e., the discharge must be authorized under the National Pollutant Discharge Elimination System [NPDES] program). Flow from these ponds is discharged in accordance with the Station's NPDES permit No. PA0002062 issued by the Pennsylvania Department of Environmental Protection (PADEP).

2.2 Inflow Design Flood Control System Plan

The Rule requires preparation of an initial Plan and periodic Plans to document the adequacy of the inflow design flood control system. The Plan must be supported by appropriate engineering calculations per §257.82(c)(1) and be certified by a qualified professional engineer in accordance with §257.82(c)(5).

3.0 Hydrologic and Hydraulic Evaluation

Confirmation of the adequacy of the inflow design flood control system was performed via a hydrologic and hydraulic evaluation conducted by GAI. The overall effort consisted of four main activities, including: (1) review of background and design information, (2) a site visit, (3) development of a hazard potential classification (provided under separate cover in a report by GAI dated October 2026, but referenced herein), and (4) preparation of stormwater calculations. These activities are described in the sections below.

3.1 Review of Background and Design Information

Prior to the field visit, GAI collected and reviewed available background and design information regarding the impoundments and surrounding area, including mapping, aerial images, reference drawings, reports and other documents provided by the Station. Mapping, reference drawings, and aerial images were utilized to prepare Figures 1 through 3 included with this Plan. Pertinent information identified during development of the figures included ground surface elevations and topography, surface water features, and pond design information (such as geometry, crest elevations, operating water levels, and inflow and outflow features).

The impoundments are situated on the southern reaches of the Station property, just northwest of the primary operations area. The nearest Station property boundary is to the south and southeast, and abuts Crooked Creek, which is approximately 0.4 miles away from the subject ponds. The ponds are located together in a common impoundment area and share an overall perimeter dike. Two interior

divider dikes separate the ponds so that the ponds are not hydraulically connected. The impoundment area is bordered by station haul roads to the northeast, northwest, and southwest,and power plant operational areas to the southeast.

Topographic information in the vicinity of the Ash Filter Ponds was obtained from a survey performed by the Station in August 2016 and from construction drawings prepared by GAI to support reconstruction of the Ponds, which occurred from 2017 to 2019. The natural ground surface in the vicinity of the impoundment area slopes to the southwest. The embankment top elevation around the perimeter of the ponds varies from approximately 1024.5 feet mean sea level (ft msl) along the western side of Pond A to about 1027.0 ft msl along the eastern side of Pond C. The greatest exterior embankment height occurs on the northwestern side of the ponds and is approximately 15.0 feet. The embankment height decreases to approximately 5.0 feet along the eastern side of Pond C. Channels or swales are located along the toe of all four sides of the embankment area. To the northeast, this channel prevents run-on toward the embankment as well as collecting runoff from the embankment itself. Along the remaining sides, the channels collect runoff from the embankment area and convey it toward on-site treatment facilities, including the Coal Pile Runoff (CPRO) ponds located southwest of the Ash Filter Ponds and the on-site Industrial Waste Treatment Facility (IWT).

The combined total capacity of all three Ash Filter Ponds is 17.4 acre-feet (ac-ft) (estimated from drawing E-781-2011), which equates to a capacity of about 5.8 ac-ft per pond. Under normal operating conditions, all three ponds are in service, although each pond is capable of providing 50 percent of the total required capacity to allow the temporary removal of one pond for cleaning and maintenance. The ponds are operated so as to keep a relatively constant water level for each pond that is in service. The normal water operating level is 1022.5 feet, 1024.0 feet, and 1024.9 feet for Ponds A, B, and C, respectively. The crest elevation is 1024.5 feet, 1026.0 feet, and 1027.0 feet for Ponds A, B, and C, respectively, providing a minimum of two feet between the normal operating water surface and the crest of the pond.

The primary inflow to the Ash Filter Ponds is sluice water from the hydrobins. Overflow and decant water from the hydrobins gravity flows via piping to a distribution box, where it is directed through piping into the southeastern side of each pond. Some water is introduced into the system via precipitation falling directly into and around the ponds and in the area of the dewatering bins, and the Station maintains the ability to add some process water to the system. Suspended ash particles settle out from the water as it moves through the ponds toward the outlet structures.

Clarified water exits on the northwestern side of the ash ponds. Water gravity flows from each pond via an outlet structure consisting of two saw tooth weir troughs connected to a concrete riser box. The riser box also collects underdrain flow. A gate valve controls the underdrain flow and is opened during pond dewatering procedures. Following completion of the 2026 modifications to the bottom ash transport water system, flow from each pond's riser box will be conveyed via gravity through piping to the current bottom ash pond sump and then to the newly constructed BARS. From the BARS, the water will be recycled and reused for bottom ash sluicing purposes or sent to the flue gas desulfurization (FGD) make-up tanks for use in the FGD system (as permitted by the ELG Rule). When necessary and in compliance with the ELG Rule, bottom ash transport water may be discharged from the system via a gravity fed line that will connect to the existing overflow pipeline and send the bottom ash transport water to NPDES-permitted IMP 203. From IMP 203, the water is discharged to the Final Settling Pond, which ultimately discharges to Crooked Creek via Outfall 003.

3.2 Field Visit

On October 13, 2026, Adam Scheller (GAI engineer) met with Nate Rozic (Station Environmental Specialist) to perform a site walk and visual reconnaissance of the ponds and surrounding area. The visit was conducted to support GAI's hazard assessment of the impoundments (provided under separate cover) and the hydrologic and hydraulic evaluation performed herein. GAI walked the perimeter dike crest and the crest of each of the interior dikes, and confirmed that the components and

configuration of the ash water management system (pump station, inlet and outlet structures, distribution box, etc.) appeared to be in general agreement with the previously-reviewed design documents. As part of the hydrologic and hydraulic evaluation, GAI visually assessed upstream conditions for run-on potential. Due to the diked construction of the impoundment, potential run-on is minimal, limited to precipitation falling directly on and in the immediate vicinity of the ponds.

3.3 Hazard Potential Classification

Based on the review of background information and field observations, GAI assigned a Low Hazard rating to each of the three subject ponds. A full discussion of the process and rationale for this assignment is provided in a report entitled, "Ash Filter Ponds Hazard Potential Classification Periodic Assessment Report" (GAI, 2026). The Low Hazard rating for each pond is based on the determination that a failure or mis-operation of these impoundments would be unlikely to cause a loss of human life and would cause minor economic or environmental losses principally limited to the surface impoundment owner's property. In addition, a failure or mis-operation would be unlikely to impact lifeline or critical facilities or cause other significant negative effects.

This hazard potential classification is consistent with the classification assigned to the Ash Filter Ponds as part of the Initial Design Flood Control Plan, submitted in October 2016 and the Periodic Design Flood Control Plan, submitted in October 2021.

3.4 Hydrologic Calculations

As noted previously, the ponds are operated so as to maintain constant operating water levels in the ponds that are in service. Under normal operating conditions, this is accomplished by application of pond inflow rates that are below the capacity of the pond outfall structures with very minimal increases in water levels, such that pond outflow equals pond inflow. Accordingly, the water level rises to just slightly (less than a few inches) above the crest of the effluent saw tooth weirs, and discharge occurs until the water level drops and becomes approximately equal to the crest of the effluent weirs. For practical purposes, the normal operating water level for each pond is approximately equal to the crest of the effluent weir structure.

These calculations consider the capacity of each pond to contain stormwater from the inflow design flood. For the modeling of each pond, it is assumed that the pond is filled to its normal water operating level when the design flood occurs. The design flood is assumed to be equivalent to the design storm, because hydrologic analyses are based upon storm events rather than floods. If the available capacity of the pond between the operating water level and the crest is determined to be greater than the design storm inflow volume, the flood control system is deemed adequate to manage the flow into the pond during and following the inflow design storm. Under these conditions, the storm water inflow would temporarily raise the water level of the subject pond above the normal operating level, but would not overtop the basin crest. Conservatively, these calculations consider each pond's capacity to temporarily hold the entire storm event inflow volume. In actuality, pond discharge would occur during the storm event and the entire storm inflow volume would not need to be held at once.

Attachment A provides calculations showing the capability of each pond to hold the contents of a 24-hour, 100-year design storm within the volume between its operating water level and crest. The point precipitation associated with the specified storm event is 5.19 inches (NOAA, 2006). Because stormwater inflow into each pond is limited to the precipitation that falls directly on the pond footprint, a small area surrounding the pond, and the dewatering bins area, a direct computation of inflow volume was performed as the precipitation depth for the inflow design storm times the approximate pond surface water drainage area. The drainage areas were obtained via CAD and are depicted on Figure 3. The available volume between the operating water level and crest elevation for each pond was computed using the areas at each elevation (determined via CAD and shown on Figure 3), freeboard height, and the average end area method. The inflow volume and available volume were computed and compared for each pond. These calculations show the available capacity for stormwater inflow to be adequate for all of the ponds.

3.5 Pond Outflow Considerations

Following the design storm event, the pond water level would gradually return to its normal operating water level via the regular discharge process (gravity drainage to the current bottom ash pond sump, then to the BARS, and subsequent reuse in the Station's bottom ash transport water recycle system). As mentioned previously, discharge from the BARS can also occur via the existing gravity fed line that sends water through the Final Settling Pond and eventually to Crooked Creek via Outfall 003. With the routing of potential overflow to downstream on-site ponds that would further attenuate the flow, and the routing of all discharges through NPDES-permitted outfalls located on Station property, outflow from the design storm event would not result in any adverse downstream impacts. Any such discharges would be temporary and limited. Accordingly,the inflow design flood control system adequately manages flow from each CCR unit that results from the inflow design storm.

4.0 Conclusions and Recommendations

Based upon observations, review of information, and the hydrologic and hydraulic analyses described herein (and associated calculations contained in Attachment A), the subject ponds have flood control systems that are adequate to manage flow into and from the units under the applicable inflow design flood. Outflow from the ponds will be via an approved NPDES outfall.

These conclusions are based upon the background information provided to GAI by the Station and field observations made around the time of the Plan preparation. The applicability of these results is dependent upon the ongoing operation and maintenance of the ponds in accordance with design documents and appropriate operating procedures. Any deviations from the crest elevations or operating conditions presented in this Plan would warrant a re-evaluation of the ponds to ensure adequate available capacity for stormwater inflow. Such a re-evaluation would fall under the provisions of §257.82(c)(2), which stipulate that the Plan must be amended whenever significant changes in CCR unit configuration/operation affect the validity of the Plan that is currently in effect. Once completed, the amended Plan must be appropriately placed into the facility's operating record. As a matter of routine maintenance/inspection, any areas of settlement, depressions, ruts, or similar features along the crest shall be regraded and filled as needed. In addition, the integrity of the grading and diversion channels around the ponds should be periodically inspected to ensure their continued functionality.

5.0 References

CB&I. “Ash Filter Ponds Hazard Potential Classification Initial Assessment Report.” October 2016.

Federal Emergency Management Agency (FEMA). “National Flood Hazard Layer.” Armstrong County, Pennsylvania. February 16, 2016.

Federal Register, Vol. 80, No. 74. Section 257.82 (Hydrologic and Hydraulic Capacity Requirements for CCR Surface Impoundments). April 17, 2015.

GAI. “Ash Filter Ponds Hazard Potential Classification Periodic Assessment Report.” October 2026.

GAI. “Ash Filter Pond Replacement – Plan View, Drawing No. 781-2011.” Last Revised May 2, 2019.

GAI. “Ash Filter Pond Replacement – Cross Sections, Drawing No. 781-2012.” Last Revised May 2,2019.

NOAA. “Point Precipitation Frequency (PF) Estimates, Shelocta, PA.” NOAA Atlas 14, Vol. 2, Version 3. 2006.

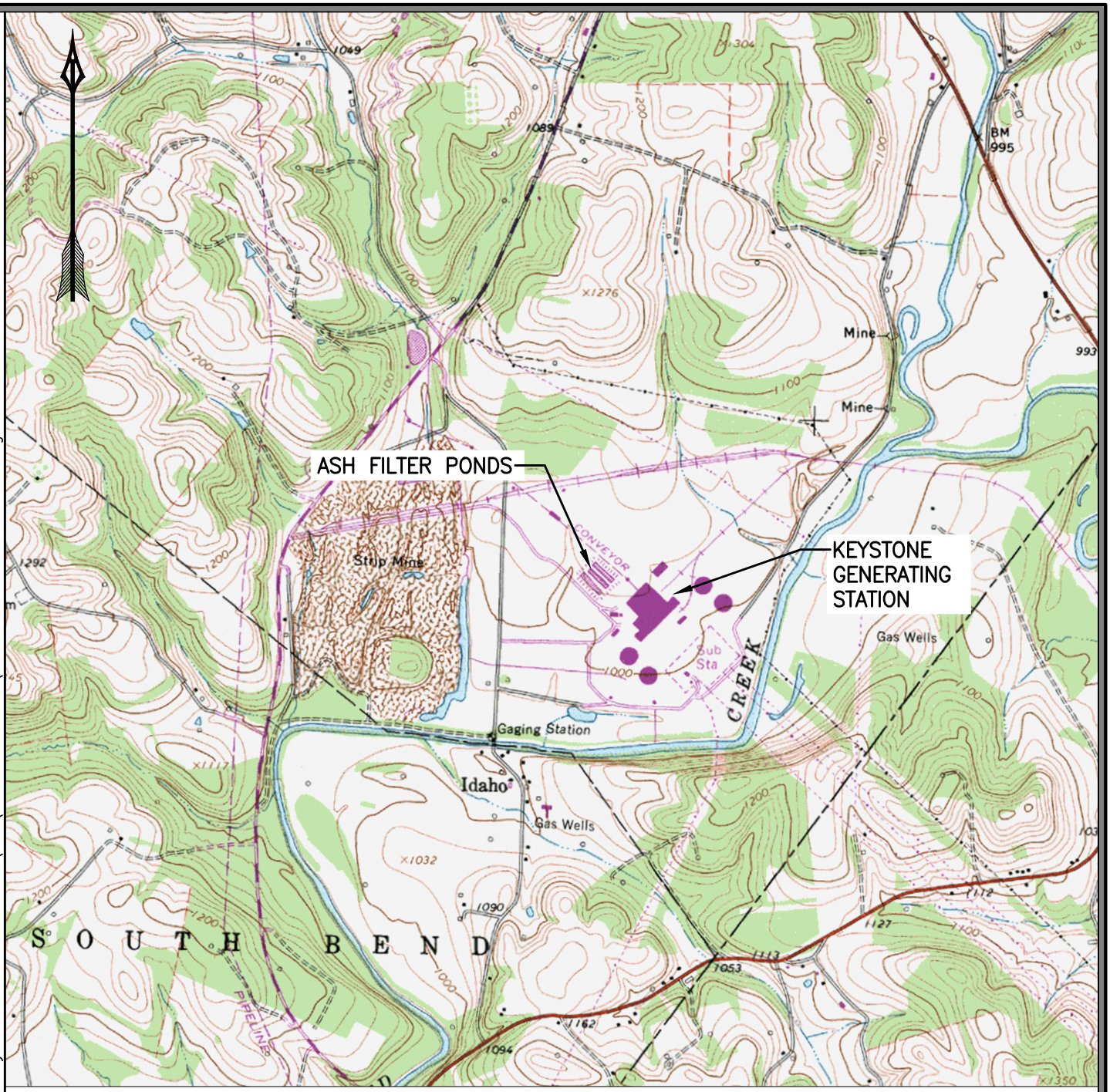
NRG. “SPCC Plan Sketch, General Plot Plan, Drawing No. E-727-1002.” Last Revised January 27, 2016.

Michael Baker International. “Keystone Generating Station – Utility Plan Sheet 6, Drawing No. CU-106a, CU-106b.” Last Revised June 11, 2026.

Michael Baker International. “Keystone Generating Station – Stormwater Management Plan, Drawing No. CU-401.” January 16, 2026.

.

FIGURES



REFERENCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, ELDERTON, PENNSYLVANIA, 1964, PHOTOINSPECTED 1977.

SCALE: 1" = 2000'

2000 0 2000 4000

DRAWING TITLE: **FIGURE 1 - SITE LOCATION MAP**		GAI DRAWING NUMBER: **FIGURE 1**
PROJECT: **ASH FILTER PONDS KEYSTONE GENERATING STATION SHELOCTA, PA**	gai consultants	GAI FILE NUMBER: **C151611-15-C-A1-FIG 1**
CLIENT: **KEYSTONE-CONEMAUGH PROJECTS, LLC BLAIRSVILLE, PA**		DRAWN BY: **T.BORING** / CHECKED BY: **L.ROUNCE** / APPROVED BY: **A.SCHELLER**
		SHEET NO.: **1 OF 1** / SCALE: **AS SHOWN** / ISSUE DATE: **08/06/2026**

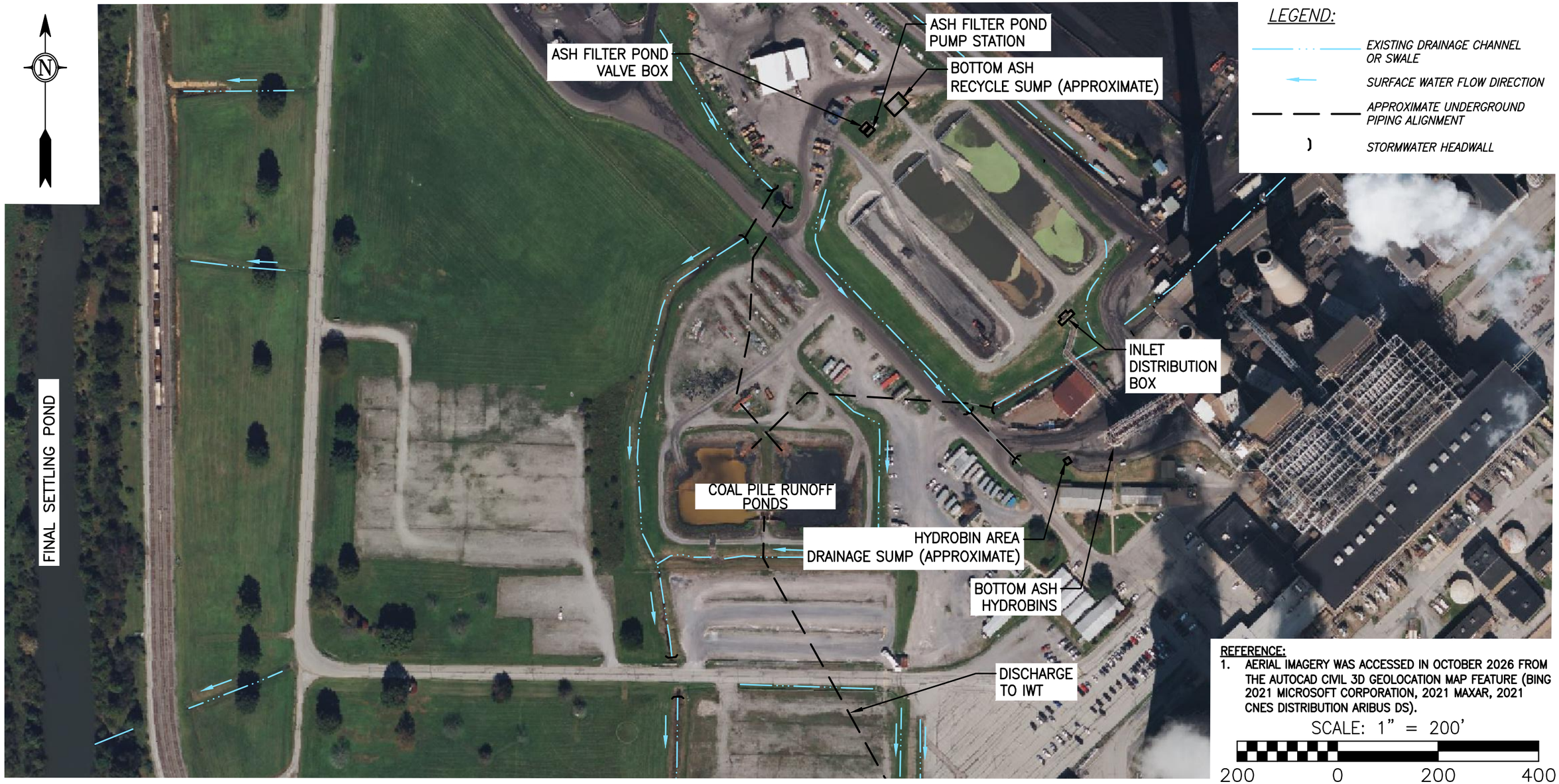
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REVISION RECORD

DRAWING TITLE

FIGURE 2: PHOTOGRAPHIC MAP

PROJECT

ASH FILTER PONDS

KEYSTONE GENERATING STATION

SHELOCTA, PA

gai consultants

CLIENT

KEYSTONE-CONEMAUGH PROJECTS, LLC

BLAIRSVILLE, PA

DRAWN BY:	CHECKED BY:	APPROVED BY:
S.WOLFE	T.BORING	A.SCHELLER
REVISION	SCALE:	ISSUE DATE:
	AS SHOWN	10/07/2026
	SHEET NO.:	
	1 OF 1	

GAI FILE NUMBER: **C151611-15-C-B2-FIG 2**

GAI DRAWING NUMBER: **FIGURE 2**

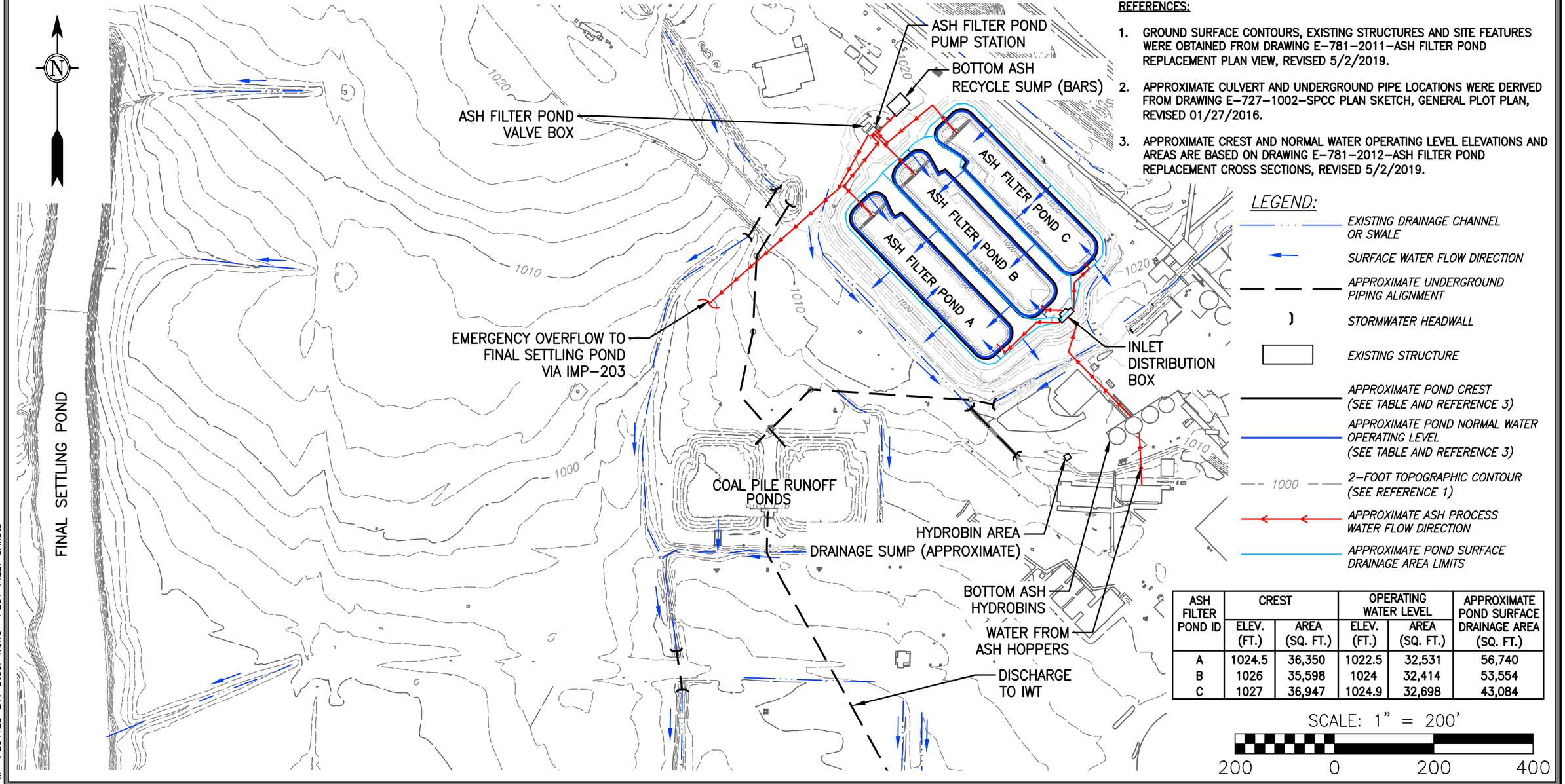
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REFERENCES:

1. GROUND SURFACE CONTOURS, EXISTING STRUCTURES AND SITE FEATURES WERE OBTAINED FROM DRAWING E-781-2011-ASH FILTER POND REPLACEMENT PLAN VIEW, REVISED 5/2/2019.
2. APPROXIMATE CULVERT AND UNDERGROUND PIPE LOCATIONS WERE DERIVED FROM DRAWING E-727-1002-SPCC PLAN SKETCH, GENERAL PLOT PLAN, REVISED 01/27/2016.
3. APPROXIMATE CREST AND NORMAL WATER OPERATING LEVEL ELEVATIONS AND AREAS ARE BASED ON DRAWING E-781-2012-ASH FILTER POND REPLACEMENT CROSS SECTIONS, REVISED 5/2/2019.

LEGEND:

- EXISTING DRAINAGE CHANNEL OR SWALE
- SURFACE WATER FLOW DIRECTION
- APPROXIMATE UNDERGROUND PIPING ALIGNMENT
- STORMWATER HEADWALL
- EXISTING STRUCTURE
- APPROXIMATE POND CREST (SEE TABLE AND REFERENCE 3)
- APPROXIMATE POND NORMAL WATER OPERATING LEVEL (SEE TABLE AND REFERENCE 3)
- 1000 — 2-FOOT TOPOGRAPHIC CONTOUR (SEE REFERENCE 1)
- APPROXIMATE ASH PROCESS WATER FLOW DIRECTION
- APPROXIMATE POND SURFACE DRAINAGE AREA LIMITS

ASH FILTER POND ID	CREST		OPERATING WATER LEVEL		APPROXIMATE POND SURFACE DRAINAGE AREA (SQ. FT.)
	ELEV. (FT.)	AREA (SQ. FT.)	ELEV. (FT.)	AREA (SQ. FT.)	
A	1024.5	36,350	1022.5	32,531	56,740
B	1026	35,598	1024	32,414	53,554
C	1027	36,947	1024.9	32,698	43,084

SCALE: 1" = 200'

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NO.:	DATE:	DWN:	CHK:	APV:	DESCRIPTION:

REVISION RECORD

DRAWING TITLE

FIGURE 3: HYDROLOGIC MAP

PROJECT

ASH FILTER PONDS

KEYSTONE GENERATING STATION

SHELOCTA, PA

gai consultants

CLIENT

KEYSTONE-CONEMAUGH PROJECTS, LLC

BLAIRSVILLE, PA

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S.WOLFE	T.BORING	A.SCHELLER
REVISION	SCALE:	ISSUE DATE:
	AS SHOWN	10/07/2026
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GAI FILE NUMBER: **C151611-15-C-B2-FIG 3**

GAI DRAWING NUMBER: **FIGURE 3**

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GAI CAD FILE PATH: \\gaiconsultants.local\BUProj\Energy\2015\C151611.15 – Keystone CCR 5 Year Perio\CAD\Production DWGs\Inflow Design Flood Control System Plan Drawings\C151611-15-C-B2-FIG 3.dwg

PLOTTED ON: 10/30/2026 12:24:45 PM PLOTTED BY: Staci Wolfe PLOT FILE: GAI.stb

ATTACHMENT A
Hydrologic Calculations

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Kestone CCR Pond Stormwater Inflow Analysis	By:	ROUNCLL	Date:	10/29/2026
Keystone Generating Station - Ash Filter Ponds	Checked By:	BORINTR	Date:	10/29/2026

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I. Purpose

To evaluate the stormwater inflow volume that will result from the design flood (storm) as specified by 40 CFR §257.82(a)(3), and to compare this volume with the available storage capacity for each subject pond.

II. Given

Three CCR impoundments located in Shelocta, PA, each having a Low Hazard Rating and the following design information (From Fig. 3 by GAI, 2026):

Ash Filter Pond A		
Crest Elevation, Ec	1024.5	ft
Pond Area at Crest, Ac	36,350	sq ft
Operating Water Level, Ew	1022.5	ft
Area at Operating Water Level	32,531	ft
Approximate Inflow Area, A_{IN}	56,740	sq ft
Freeboard, FB = Ec-Ew	2.0	ft

Ash Filter Pond B		
Crest Elevation, Ec	1026.0	ft
Pond Area at Crest, Ac	35,598	sq ft
Operating Water Level, Ew	1024.0	ft
Area at Operating Water Level	32,414	ft
Approximate Inflow Area, A_{IN}	53,554	sq ft
Freeboard, FB = Ec-Ew	2.0	ft

Ash Filter Pond C		
Crest Elevation, Ec	1027.0	ft
Pond Area at Crest, Ac	36,947	sq ft
Operating Water Level, Ew	1024.9	ft
Area at Operating Water Level	32,698	ft
Approximate Inflow Area, A_{IN}	43,084	sq ft
Freeboard, FB = Ec-Ew	2.1	ft

Hydrobin Area (See Note 1)		
Drainage Area	25,744	sq ft

Note

1. As part of the 2026 bottom ash transport water system modifications, leakage from the four hydrobins as well as stormwater from the 25,744 square foot (0.59 acre) drainage area surrounding the hydrobins is sent to the Ash Filter Ponds. This contribution to the Ash Filter Ponds is incorporated into the calculations below. The relevant design information was taken from the 2026 project documents, and references are included below.

III. Methodology

Step 1:

Determine the appropriate Rainfall Depth (D_R) for the stormwater inflow calculations.

From 40 CFR §257.82(a)(3), the CCR units must adequately manage flow resulting from the following design floods:

* For an incised impoundment, the 25-year flood.
* For a non-incised, Low Hazard impoundment, a 100-year design flood.
* For a non-incised, Significant Hazard impoundment, a 1000-year design flood.
* For a non-incised, High Hazard impoundment, the probable maximum flood.

Step 2:

Determine the Inflow Volume (V_{IN}). For a pond with a limited inflow area (i.e., with inflow limited to rainfall directly on top of the pond footprint and on berm areas right around the pond perimeter), compute the volume directly as the Rainfall Depth (D_R) times the Inflow Area (A_{IN}). For ponds with run-on from additional upstream areas, compute V_{IN} using HydraFlow. For the area around the hydrobins, compute the inflow volume directly as the Rainfall Depth (D_R) times the drainage area. Add the inflow volume from the hydrobins area to the inflow volume (V_{IN}) for the Ash Filter Ponds. Assume that each pond recieves the full inflow volume for a conservative estimate.

Step 3:

Compute the Available Capacity (V_{AVAIL}) of each pond to contain stormwater runoff as the volume between the pond operating water level and the pond crest elevation. Use the Average End Area Method.

Step 4:

Compare the volume of inflow (V_{IN}) for the specified design flood (storm) to the pond's available capacity (V_{AVAIL}) for stormwater runoff to determine if the pond will manage the specified stormwater inflow without overtopping.

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IV. Calculations

Step 1: Determine the appropriate Rainfall Depth (D_R).

None of the ponds are completely incised, and all are assigned Low Hazard classifications.
Pursuant to 40 CFR §257.82(a)(3), the ponds must manage flow from the 100-year flood (storm).
From NOAA (NOAA, 2006), the rainfall depth (D_R) associated with the 24-hour, 100-year storm is:

	Inches	Feet
D_R =	5.19	0.4325

Step 2: Determine the Inflow Volume (VIN).

Inflow is limited to rainfall directly on top of each pond footprint and upon a limited area around each pond. Therefore, directly compute V_{IN} as follows:

Inflow , V_{IN} (cu ft) = Rainfall depth, D_R (ft) x Inflow Area, A_{IN} (sq ft)

For the Hydrobins Area

V_{IN} = 0.4325 ft x 25,744 sq ft
V_{IN} = 11,134 cu ft

For Ash Filter Pond A:

V_{IN} = 0.4325 ft x 56,740 sq ft
V_{IN} = 24,540 cu ft

For Ash Filter Pond B:

V_{IN} = 0.4325 ft x 53,554 sq ft
V_{IN} = 23,162 cu ft

For Ash Filter Pond C:

V_{IN} = 0.4325 ft x 43,084 sq ft
V_{IN} = 18,634 cu ft

Step 3:

Compute the Available Capacity (V_{AVAIL}) of each pond to contain stormwater runoff as the volume between the pond operating water level and the pond crest elevation. Use the Average End Area method.

Available Capacity, V_{AVAIL} (cu ft) = $[(A_c + A_w)/2]$ x FB

Pond	Area at water operating level (sq ft)	Area At Crest (sq ft)	Freeboard (ft)	Available Capacity (cu ft)
	A_w	A_c	FB	V_{AVAIL}
A	32,531	36,350	2	68,881
B	32,414	35,598	2	68,012
C	32,698	36,947	2.1	73,127

V. Results

Step 4:

For each pond, compare the Inflow Volume (V_{IN}) for the specified design flood (storm) to the Available Capacity (V_{AVAIL}) for stormwater runoff to determine if it will manage the specified inflow without overtopping. For a conservative estimate, the added inflow from the hydrobins drainage area (11,134 cu ft) is included in all three of the Ash Filter Ponds' total inflow volume.

Percent of Freeboard Capacity Utilized, $\%V_{FB} = V_{IN,\,TOTAL} / V_{AVAIL}$

where $V_{IN,TOTAL} = V_{IN(Pond)} + V_{IN(Hydrobins)}$

Pond	V_{IN} (cu ft) (Pond Drainage Areas)	V_{IN} (cu ft) (Hydrobins Area)	V_{IN} (cu ft) (Total)	V_{AVAIL} (cu ft)	% Freeboard Capacity Used
A	24,540	11,134	35,675	68,881	52%
B	23,162	11,134	34,296	68,012	50%
C	18,634	11,134	29,768	73,127	41%

VI. Conclusions

All three ash filter ponds have adequate capacity to meet the temporary storage requirements for a 100-year design flood (storm).

VII. References

GAI. "Figure 3 Hydrologic Map, Keystone Generating Station. Dated October 6, 2026.

NOAA. "Point Precipitation Frequency (PF) Estimates, Shelocta, PA." NOAA Atlas 14, Vol. 2, Version 3. 2006.

Michael Baker International. Drawing CU-402, *Post-Construction Drainage Area.* Dated June 2026.

ATTACHMENT A-1
NOAA Point Precipitation Frequency Estimates

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NOAA Atlas 14, Volume 2, Version 3
Location name: Shelocta, Pennsylvania, USA*
Latitude: 40.6591°, Longitude: -79.3415°
Elevation: 1001 ft**
* source: ESRI Maps
** source: USGS

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	**0.318** (0.288-0.350)	**0.380** (0.345-0.419)	**0.459** (0.416-0.506)	**0.520** (0.471-0.573)	**0.599** (0.540-0.659)	**0.659** (0.592-0.724)	**0.718** (0.642-0.787)	**0.778** (0.693-0.853)	**0.858** (0.760-0.939)	**0.917** (0.809-1.00)
10-min	**0.494** (0.447-0.544)	**0.593** (0.538-0.654)	**0.713** (0.646-0.786)	**0.803** (0.726-0.885)	**0.916** (0.826-1.01)	**0.999** (0.897-1.10)	**1.08** (0.967-1.18)	**1.16** (1.04-1.27)	**1.26** (1.12-1.38)	**1.34** (1.18-1.46)
15-min	**0.605** (0.548-0.667)	**0.725** (0.658-0.800)	**0.875** (0.793-0.966)	**0.988** (0.894-1.09)	**1.13** (1.02-1.24)	**1.24** (1.11-1.36)	**1.34** (1.20-1.47)	**1.44** (1.29-1.58)	**1.57** (1.39-1.72)	**1.67** (1.47-1.82)
30-min	**0.801** (0.725-0.882)	**0.970** (0.880-1.07)	**1.20** (1.09-1.32)	**1.37** (1.24-1.51)	**1.60** (1.44-1.76)	**1.77** (1.59-1.94)	**1.94** (1.74-2.12)	**2.11** (1.88-2.31)	**2.33** (2.07-2.55)	**2.50** (2.21-2.74)
60-min	**0.978** (0.885-1.08)	**1.19** (1.08-1.31)	**1.50** (1.36-1.66)	**1.75** (1.58-1.92)	**2.07** (1.87-2.28)	**2.33** (2.09-2.56)	**2.59** (2.32-2.84)	**2.86** (2.55-3.14)	**3.23** (2.86-3.53)	**3.52** (3.10-3.84)
2-hr	**1.13** (1.02-1.24)	**1.37** (1.24-1.50)	**1.72** (1.56-1.90)	**2.00** (1.82-2.20)	**2.39** (2.16-2.62)	**2.70** (2.43-2.95)	**3.02** (2.70-3.29)	**3.35** (2.99-3.65)	**3.81** (3.37-4.14)	**4.17** (3.67-4.52)
3-hr	**1.20** (1.10-1.33)	**1.46** (1.33-1.61)	**1.83** (1.67-2.01)	**2.13** (1.93-2.34)	**2.55** (2.30-2.79)	**2.88** (2.60-3.15)	**3.23** (2.90-3.52)	**3.60** (3.21-3.92)	**4.11** (3.63-4.46)	**4.52** (3.96-4.90)
6-hr	**1.44** (1.32-1.59)	**1.73** (1.58-1.92)	**2.16** (1.97-2.38)	**2.51** (2.28-2.76)	**3.00** (2.72-3.29)	**3.41** (3.08-3.73)	**3.83** (3.44-4.18)	**4.28** (3.82-4.66)	**4.92** (4.34-5.34)	**5.43** (4.76-5.89)
12-hr	**1.74** (1.60-1.91)	**2.08** (1.91-2.29)	**2.57** (2.35-2.82)	**2.97** (2.72-3.26)	**3.56** (3.23-3.88)	**4.04** (3.65-4.40)	**4.55** (4.09-4.94)	**5.10** (4.54-5.51)	**5.88** (5.19-6.34)	**6.51** (5.71-7.01)
24-hr	**2.08** (1.92-2.24)	**2.47** (2.30-2.68)	**3.02** (2.80-3.27)	**3.47** (3.22-3.75)	**4.11** (3.80-4.43)	**4.64** (4.27-4.98)	**5.19** (4.76-5.57)	**5.76** (5.26-6.17)	**6.57** (5.96-7.01)	**7.21** (6.50-7.69)
2-day	**2.41** (2.25-2.60)	**2.87** (2.68-3.10)	**3.48** (3.24-3.75)	**3.98** (3.70-4.28)	**4.66** (4.33-5.01)	**5.22** (4.83-5.60)	**5.80** (5.35-6.20)	**6.39** (5.88-6.83)	**7.21** (6.59-7.70)	**7.86** (7.14-8.38)
3-day	**2.59** (2.42-2.79)	**3.08** (2.88-3.32)	**3.70** (3.46-3.99)	**4.21** (3.92-4.53)	**4.92** (4.57-5.28)	**5.48** (5.08-5.87)	**6.07** (5.60-6.50)	**6.67** (6.13-7.13)	**7.49** (6.85-8.00)	**8.14** (7.41-8.69)
4-day	**2.77** (2.59-2.98)	**3.28** (3.07-3.53)	**3.93** (3.67-4.22)	**4.45** (4.15-4.77)	**5.17** (4.80-5.54)	**5.75** (5.32-6.15)	**6.34** (5.86-6.79)	**6.95** (6.39-7.43)	**7.78** (7.12-8.31)	**8.42** (7.68-9.00)
7-day	**3.33** (3.12-3.56)	**3.93** (3.69-4.20)	**4.64** (4.35-4.96)	**5.21** (4.87-5.56)	**5.98** (5.58-6.37)	**6.58** (6.13-7.01)	**7.18** (6.68-7.65)	**7.80** (7.22-8.29)	**8.61** (7.94-9.15)	**9.22** (8.48-9.80)
10-day	**3.86** (3.65-4.10)	**4.55** (4.29-4.82)	**5.31** (5.01-5.63)	**5.92** (5.58-6.28)	**6.74** (6.33-7.13)	**7.37** (6.92-7.80)	**8.00** (7.49-8.45)	**8.62** (8.06-9.11)	**9.44** (8.78-9.97)	**10.1** (9.32-10.6)
20-day	**5.43** (5.14-5.73)	**6.36** (6.02-6.72)	**7.33** (6.94-7.74)	**8.09** (7.66-8.54)	**9.10** (8.59-9.60)	**9.86** (9.31-10.4)	**10.6** (10.0-11.2)	**11.3** (10.7-11.9)	**12.3** (11.5-12.9)	**13.0** (12.1-13.7)
30-day	**6.85** (6.52-7.22)	**8.01** (7.62-8.44)	**9.14** (8.69-9.64)	**10.0** (9.53-10.6)	**11.2** (10.6-11.8)	**12.1** (11.4-12.7)	**12.9** (12.2-13.6)	**13.7** (13.0-14.4)	**14.8** (13.9-15.5)	**15.5** (14.6-16.3)
45-day	**8.79** (8.36-9.25)	**10.2** (9.74-10.8)	**11.6** (11.0-12.2)	**12.6** (12.0-13.2)	**13.9** (13.2-14.6)	**14.8** (14.1-15.6)	**15.7** (14.9-16.5)	**16.6** (15.7-17.4)	**17.6** (16.6-18.5)	**18.3** (17.3-19.3)
60-day	**10.6** (10.1-11.2)	**12.3** (11.8-13.0)	**13.8** (13.2-14.5)	**15.0** (14.2-15.7)	**16.4** (15.6-17.2)	**17.4** (16.5-18.3)	**18.3** (17.4-19.3)	**19.2** (18.2-20.2)	**20.3** (19.2-21.3)	**21.0** (19.9-22.0)

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

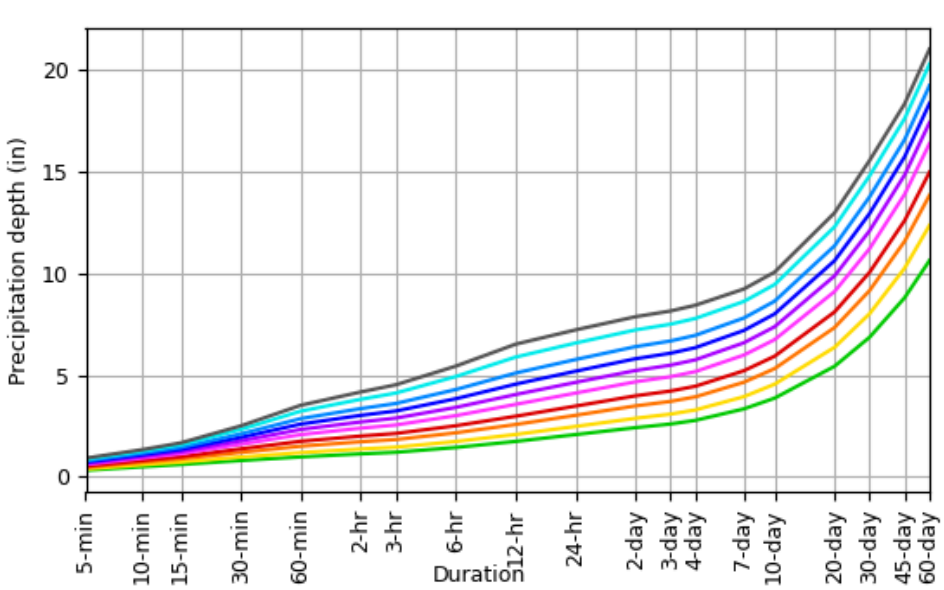
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

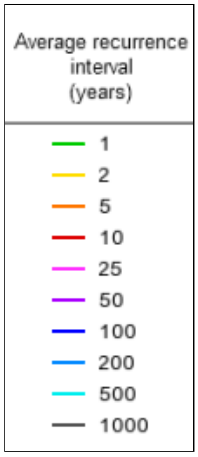
Please refer to NOAA Atlas 14 document for more information.

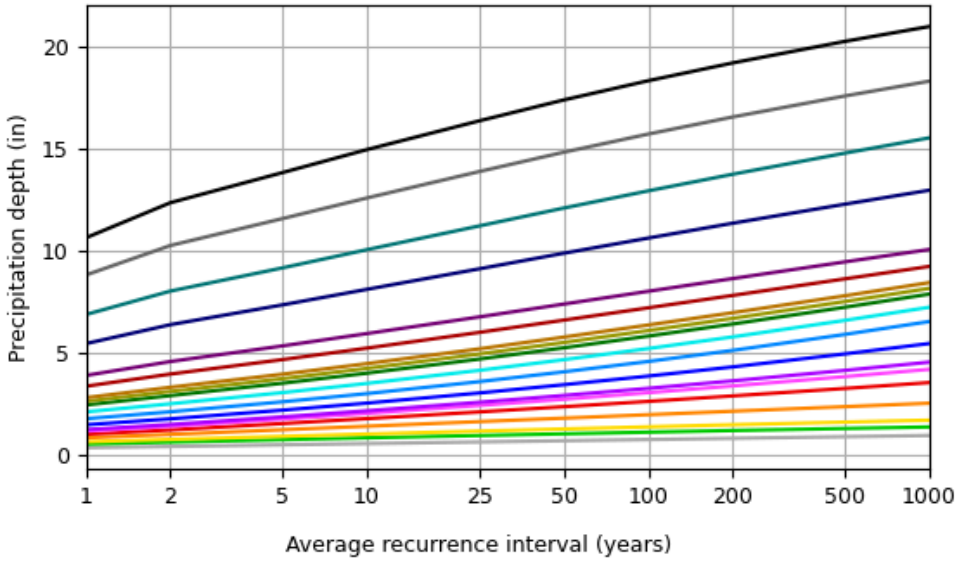
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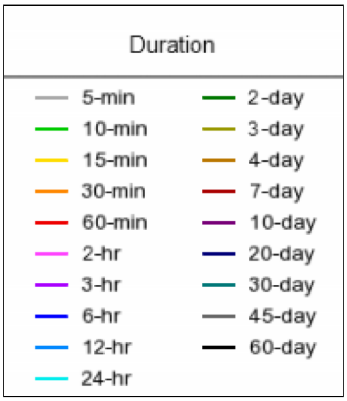
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 40.6591°, Longitude: -79.3415°









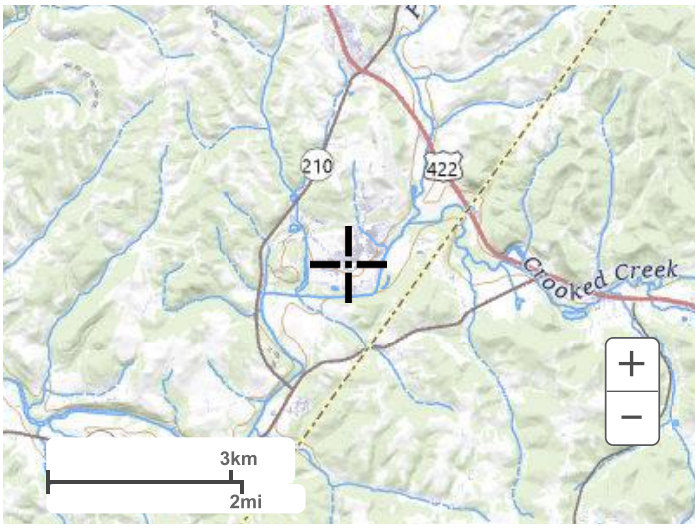
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Large scale terrain



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