CCR COMPLIANCE
LOCATION RESTRICTIONS DEMONSTRATION REPORT
CONEMAUGH ASH FILTER PONDS

Prepared for:

GenOn Northeast Management Company
Conemaugh Generating Station
New Florence, Pennsylvania

Prepared by:

Aptim Environmental & Infrastructure, Inc.
St. Charles, Illinois

October 2018

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1.0 INTRODUCTION AND PURPOSE

GenOn Northeast Management Company (GenOn) operates the coal-fired Conemaugh Generating Station located in New Florence, Pennsylvania. The Conemaugh Generating Station utilizes surface impoundments for the purpose of managing coal combustion residuals (CCR).

In 2015, the *Disposal of Coal Combustion Residuals from Electric Utilities Final Rule* (CCR Rule) was enacted within the Federal Register under 40 CFR §257. The CCR Rule establishes technical requirements for CCR landfills and surface impoundments under Subtitle D of the Resource Conservation and Recovery Act (RCRA), which is the primary law regulating solid waste. Under the CCR Rule, the Conemaugh Station surface impoundments are designated as "existing CCR impoundments" as defined in §257.53. Multiple location restrictions are identified for landfills and surface impoundments to ensure that they are not placed in environmentally sensitive areas. These location requirements are defined under 40 CFR §257.60 through §257.64.

Demonstrations of compliance with location restrictions for an existing CCR surface impoundment are required to be placed in the facility's operating record [§257.105(e)] by October 17, 2018. In addition, the owner or operator must notify the State Director [§257.106(e)] that the demonstrations have been placed in the operating record and on the owner or operator's publicly accessible CCR internet site [§257.107(e)].

Per the applicable sections of the Rule, the location restrictions for CCR surface impoundments require that these units are NOT located:

- with a base that is constructed no less than 5 feet above the upper limit of the uppermost aquifer (§257.60);
- in wetlands (§257.61);
- within 200 feet of the outermost damage zone of a fault which has been displaced in Holocene time (§257.62);
- within a seismic impact zone (§257.63); or
- in an unstable area (§257.64).

The location restriction details are further described within **Section 3** of this report.

2.0 OVERVIEW OF SURFACE IMPOUNDMENTS

Four CCR surface impoundments are located at the Conemaugh Generating Station, and are referred to as Ash Filter Ponds A through D (ponds). The ponds have been in operation since 1986, and are aligned in a side-by-side layout in a southward progression. At a minimum, two ponds are in service at all times with the third being drained and cleaned (as needed) and the fourth used to store decant water for later use. **Figure 1** shows the location of the ponds.

The bottom liner system for each of the ponds, from top to bottom is comprised of 2.5 feet of bottom ash protective cover, 1.5 feet of American Association of State Highway and Transportation Officials (AASHTO) No. 8 coarse aggregate for pond dewatering, 1.5 feet of impervious fill, and an impervious liner comprised of 0.67 foot of bentonite-amended low-permeability compacted soil underlain by 1.33 feet of low-permeability compacted soil. The total liner system thickness is 7.5 feet of which the low-permeability soil barrier layer is the lowermost two feet.

The crest elevation is approximately 1,092 feet above mean sea level (ft MSL) and the elevation of the top of the protective bottom ash layer ranges from 1,084.6 ft MSL on the eastern end of each ash pond to 1,083.0 ft MSL on the western end. This provides an average pond depth of approximately eight (8) feet. The bottom elevation of the base liner is approximately 1,077.1 ft MSL on the eastern end and 1,075.5 ft MSL on the western end, with an estimated elevation of 1,076.3 ft MSL at the midpoint across each pond.

3.0 LOCATION DEMONSTRATIONS

3.1 PLACEMENT ABOVE UPPERMOST AQUIFER (§257.60(a))

> Per §257.60(a) of the Rule, *"new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table)."*

The ponds are underlain by recent alluvium that was deposited by the Conemaugh River. The alluvium typically ranges from 20 to 25 feet thick but can extend to depths as great as 32 feet below ground surface (bgs). The alluvium directly overlies shale and siltstone bedrock and is comprised of clayey sand to sandy clay that extends from ground surface to depths ranging from 12 to 18 feet bgs. The alluvial materials become coarser grained with increasing depth and grade into silty sand and sand and gravel near the upper bedrock surface. Groundwater beneath the Ash Filter Ponds resides within the alluvium. This water-bearing zone further represents the uppermost aquifer in this area and exists in an unconfined condition.

Groundwater flow is topographically controlled and flows toward the Conemaugh River which is the naturally occurring groundwater discharge zone in the area of the ponds. Groundwater flowing from upgradient of the ponds will pass beneath the CCR unit and through the areas in which the downgradient monitoring wells are located.

The groundwater monitoring system for the ponds is comprised of five wells, including Wells MW-1B and MW-2 (upgradient), and Wells MW-3, MW-4, and MW-23 (downgradient). All five wells communicate with the alluvium, which is the uppermost aquifer. The locations of the groundwater monitoring wells are shown on **Figure 2**, along with depiction of the generalized groundwater flow direction in the area of the ponds.

The groundwater elevation in each of these wells (representing the upper surface of the uppermost aquifer) has been monitored on a routine basis since the inception of the CCR Rule. A summary of these observations is provided in **Table 1**.

TABLE 1 Groundwater Level Observations Near Ponds					
Monitoring Date	Groundwater Elevation (ft MSL)				
	MW-1B	MW-2	MW-3	MW-4	MW-23
December 16, 2015	1070.99	1072.72	1065.24	1069.53	1068.03
January 26, 2016	1071.19	1072.42	1065.89	1069.73	1069.08
April 25, 2016	1071.69	1073.02	1066.14	1070.08	1069.38
July 25, 2016	1071.69	1073.72	1064.99	1068.98	1067.93
October 24, 2016	1072.99	1073.82	1066.19	1070.08	1068.83
January 17, 2017	1072.54	1072.92	1066.94	1070.88	1070.13
April 25, 2017	1072.69	1073.02	1067.09	1070.93	1069.68
July 25, 2017	1072.04	1072.57	1065.99	1070.23	1069.18
October 1, 2017	1070.84	1071.17	1064.89	1068.83	1067.98
May 23, 2018	1074.94	1075.57	1067.79	1070.53	1071.18
Highest Water Level:	1074.94	1075.57	1067.79	1070.93	1071.18
Lowest Water Level:	1070.84	1071.17	1064.89	1068.83	1067.93
Average Water Level:	1072.16	1073.10	1066.12	1069.98	1069.14

As shown in **Table 1**, the highest observed groundwater elevation across the majority of the wells was recorded on May 23, 2018. The groundwater elevations from this date have been developed into a potentiometric surface and overlain on an aerial image of the ponds, as presented on **Figure 3**. As shown, the groundwater surface is greater than elevation 1,071.3 ft MSL in the location of the Ash Filter Ponds. This elevation serves as the 5-foot vertical offset of the bottom of the ponds' base liners (midpoint elevation 1,076.3 ft MSL – 5 ft separation = elevation 1,071.3 ft MSL). This indicates that these ponds are located above the uppermost aquifer, but with less than five feet of separation.

However, §257.60 states that if the base of the surface impoundment is less than five feet above the upper limit of the uppermost aquifer, a demonstration must be made "that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table)." Based on the two and one-half years of groundwater elevation data collected (and reflecting seasonal variations), it is observed that the seasonal high water table was observed during May 2018. The May 2018 potentiometric surface is presented in Figure 3. As shown, the highest elevation contour underneath the base of the ponds is 1075 ft MSL, located under the northeast corner of Ash Filter Pond A. This elevation is approximately 1.3 feet below the average base elevation of 1076.3 ft MSL. Upon further examination of Figure 3, this separation distance increases in the southward direction moving from Pond A to Pond D, whereupon the five-feet separation distance is achieved. It is therefore concluded that there is not an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).

This information demonstrates compliance with the requirements of §257.60(a).

3.2 WETLANDS (§257.61(a))

> Per §257.61 of the Rule, *"new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section."*

Wetlands are defined under §232.2 as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

APTIM reviewed the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) Database Surface Waters and Wetlands Map to determine whether wetlands are shown to overlap with the ponds. The map, presented as **Figure 4**, does not show any wetlands in or near the ponds.

Additionally, a wetland delineation report was completed by GAI Consultants, Inc. and a Pennsylvania Natural Diversity Inventory was completed in advance of the rail line construction in 2005. While there were several wetlands present in low-lying areas between the ponds and Conemaugh River, no wetlands were found in the location of the ponds. The study indicated that in general, the wetlands in the vicinity of the rail line and downstream of the ponds are palustrine emergent (with precipitation and runoff as the only water sources) and palustrine scrub-shrub wetlands.

These data sources are presented as a demonstration of compliance with the requirements of §257.61(a).

3.3 FAULT AREAS (§257.62(a))

> Per §257.62 of the Rule, *"new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit."*

APTIM compared the location of the ponds to the location of faults that have undergone displacement during the Holocene time, as recorded in the United States Geological Survey (USGS) Quaternary Fault and Fold Database for the United States. There are no known faults that are identified within 200 feet of the ponds. This information demonstrates compliance with the requirements of §257.62(a).

3.4 SEISMIC IMPACT ZONE (§257.63(a))

> Per §257.63 of the Rule, *"new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site."*

A seismic impact zone is an area with a ten percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitation pull (g), will exceed 0.10g in 250 years. Probabilistically, this is equal to a two percent or greater probability within a 50-year timeframe.

APTIM compared the location of the ponds to the location of seismic impact zones, as defined in §257.53, using the USGS map "Two Percent Probability of Exceedance in 50 Years Map of Peak Ground Acceleration", shown in **Figure 5**. The maximum ground acceleration for the location of the ponds is estimated to be 0.046g, and is therefore not considered a seismic impact zone. This information demonstrates compliance with the requirements of §257.63(a).

3.5 UNSTABLE AREAS (§257.64(a))

Per §257.64 of the Rule, *"an existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted."*

APTIM evaluated the location of the ponds for the presence of on-site or local unstable areas, as defined in §257.53. Evaluation of the conditions listed in §257.64(b)(1)-(3) were conducted and are discussed in the following subsections. Based on these evaluations, APTIM concludes that the ponds are not located within an unstable area and are compliant with the requirements of §257.64(a).

> *The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:*

3.5.1 Unstable Factors Considered: Differential Settling (§257.64(b)(1))

> *On-site or local soil conditions that may result in significant differential settling;*

The alluvial soils underlying the ponds are typically in the range of 20 to 25 feet thick but extend to depths as great as 32 feet bgs and are comprised of sandy clay to clayey and silty sand that extends from ground surface to depths of 12 to 18 feet below ground surface. The alluvial soil becomes coarser grained with increasing depth grading into silty sand and sand and gravel. Standard penetration tests in the test boring for Monitoring Well MW-23 indicate that the cohesive alluvial soil is very stiff and that the granular alluvial soil is dense to very dense. The very stiff consistency and dense to very dense in place density indicate that the alluvial soil has low compressibility and will not undergo significant differential settling beneath the ponds. The bottoms of the ponds are very near original grade and the only increase in loads will be from the dikes and material contained within the ponds. Moreover, the ponds have existed for approximately 30 years and no measurable settling has occurred, based on the present topography.

Based on the information presented above, on-site and local soil conditions will not cause excessive differential settling of the ponds or any components thereof.

3.5.2 Unstable Factors Considered: Geologic/Geomorphologic Features (§257.64 (b)(2))

On-site or local geologic or geomorphologic features;

The ash ponds are underlain by alluvial soil which in turn is underlain by rocks of the Glenshaw Formation (Conemaugh Group) of the Pennsylvanian System. The Lower Mahoning Sandstone, which is the basal member of the Glenshaw Formation underlies the alluvium and is comprised of siltstone and argillaceous sandstone with some thin shale interbeds. The Lower Mahoning Sandstone is approximately 80 feet thick but in the generating station proper, it has been eroded and approximately the lowermost 50 feet remains. Because the Lower Mahoning Sandstone is a clastic sedimentary rock rather than a carbonate sedimentary rock, there is no karst development in the area of the ash ponds. Moreover, the uppermost 150 feet of the Allegheny Group underlying the Glenshaw Formation is also largely comprised of clastic sedimentary rocks, including the Butler and Freeport Sandstones. No carbonate beds capable of karst development are present in the upper part of the Allegheny Group. Considering the absence of carbonate beds capable of karst development in either the Lower Mahoning Sandstone or in the rock units of the upper portion of the Allegheny Group, including the Butler and Freeport Sandstones, no on-site or local geologic or geomorphic features capable of producing unstable conditions exist within the area of the ash ponds.

3.5.3 Unstable Factors Considered: Human-made Features or Events (§257.64 (b)(3))

On-site or local human-made features or events (both surface and subsurface).

Deep mining of the Upper Freeport Coal, Lower Freeport Coal, and Lower Kittanning Coal Beds occurred within the Conemaugh Generating Station property. According to a study conducted by the John T. Boyd Company (Boyd), the Upper Freeport Coal Bed, which is discontinuous and of varying thickness in the area, was deep mined in the Florence Mining Company's Florence No. 2 Mine. This mine is located mostly west and southwest of the Conemaugh Station's Ash/Refuse Disposal Site. The mine operated from 1970 to 1992 when it was abandoned and sealed. Per the Boyd report, the Upper Freeport Coal Bed ranges from 36 to 84 inches thick in the area where it was mined. No portions of mining took place beneath the ponds based on mine location maps contained within the Boyd report.

Per the Boyd Report, the Lower Kittanning Coal Bed is 0 to 83 inches thick, has an average thickness of 52 inches, and was mined in the Conemaugh No. 1 Mine by various companies, including the North American Coal Company between 1914 and 1982. The Conemaugh No. 1 mine was later renamed the Penelec No. 5 Mine which was operated by the Pennsylvania Electric Company from 1940 to 1989. According to a map showing the limits of the Conemaugh No. 1/Penelec No. 5 Mine, the Lower Kittanning Coal Bed was underground mined mostly east of the Ash/Refuse Disposal Site, but the mine did not extend beneath the current station property proper.

Based on the evidence presented above in Sections 3.5.1 through 3.5.3, the ponds are not located in an unstable area and meet the requirements of §257.64(b)(1)-(3), and in, turn the requirements of §257.64(a).

4.0 SUMMARY

The Conemaugh Generating Station operates four CCR surface impoundments, which are collectively known as the Ash Filter Ponds (Ponds A, B, C, and D). These ponds meet all location restrictions, as defined within §257.60 through §257.64, and as summarized below in Table 2.

Table 2 Location Restriction Compliance Demonstration Summary		
40 CFR Section	**Location Restriction Description**	**Demonstration Provided**
§257.60(a)	Placement above the uppermost aquifer	Yes
§257.61(a)	Wetlands	Yes
§257.62(a)	Fault Areas	Yes
§257.63(a)	Seismic Impact Zone	Yes
§257.64(a)	Unstable Areas	Yes

5.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION (§§257.60(b), 257.61(b), 257.62(b), 257.63(b), 257.64(c))

I, the undersigned Professional Engineer licensed in the Commonwealth of Pennsylvania, am familiar with the requirements of the CCR Rule Section 257. It is my professional opinion that the impoundments described in this report meet the requirements of §§257.60(a), 257.61(a), 257.62(a), 257.63(a) and 257.64(a). The basis of this professional opinion is described within this report and is limited to the available information known to APTIM. This professional opinion is not to be interpreted or construed as a guarantee, warranty, or legal opinion.

Name of Professional Engineer: Richard Southorn, P.E. P.G.,

Company: APTIM

PE Registration State: Pennsylvania

PE Registration Number: PE 085411

Professional Engineer Seal:

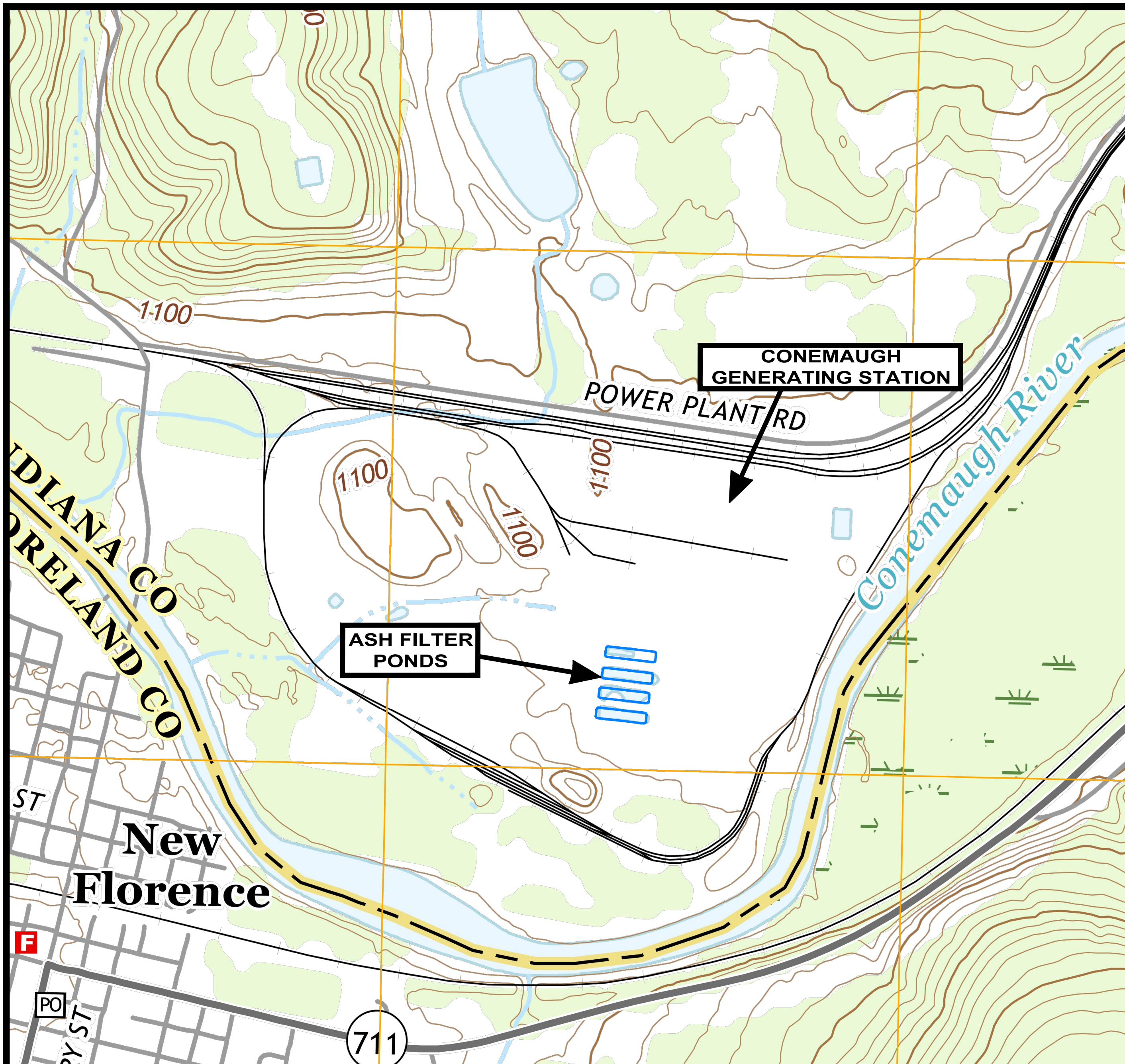
6.0 REFERENCES

"Coal and Mineral Resource Study Conemaugh Generating Station Residual Waste Disposal Site, Indiana County Pennsylvania," John T. Boyd Company, December 1994.

"Pennsylvania Department of Environmental Protection Residual Waste Major Permit Modification, Conemaugh Station Disposal Site, New Florence, Pennsylvania, Volume 1, Form 6R – Geologic Information," GAI Consultants, Inc., May 1997.

U.S. Environmental Protection Agency (2015), Hazardous Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, Federal Register Volume 80, No. 74 40 CFR Parts 257 and 261, April 17, 2015.

United States Geological Survey (USGS) Quaternary Fault and Fold Database for the United States.



N

0 1000'

GRAPHIC SCALE

LEGEND

APPROXIMATE CCR UNIT BOUNDARY

NOTES

1. TOPOGRAPHY OBTAINED FROM USGS 7.5-MINUTE SERIES, NEW FLORENCE QUADRANGLE, PENNSYLVANIA, 2016.
2. ALL BOUNDARIES ARE APPROXIMATE

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CONEMAUGH GENERATING STATION

FIGURE 1
SITE LOCATION PLAN

APPROVED BY:	RDS	PROJ. NO.:	1009144003	DATE:	SEPT. 2018

T:\AutoCAD\Projects\NRG\CCR - Location Evaluation Figures\Conemaugh\Impoundments\Figure 1 - Site Location (Impoundment).dwg, 9/24/2018 2:24:45 PM, AutoCAD PDF (High Quality Print).pc3

LEGEND:

MW-3 (1064.89) — CCR GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION MEASURED BETWEEN OCTOBER 1 AND 4, 2017

GROUNDWATER FLOW DIRECTION

REFERENCE:

GOOGLE AERIAL PHOTOGRAPH, DATED 10/2015.

SCALE

0 100 200 FEET

APTIM

500 Penn Center Boulevard, Suite 1000
Pittsburgh, Pennsylvania 15235

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FIGURE 2
CCR COMPLIANCE GROUNDWATER MONITORING WELL LOCATION MAP
ASH FILTER PONDS
CONEMAUGH GENERATING STATION
INDIANA COUNTY, PENNSYLVANIA

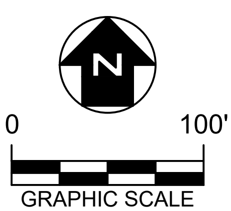
OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	1/31/18	--	E. Schlegel	--	--	1009144003-B7

File: O:\PROJECT\1009144003_Conemaugh\1009144003-B7.dwg
Xref:
Image
Plot Date/Time: Jan 31, 2018 - 9:02am
Plotted By: Evan.Schlegel

LEGEND

MONITORING WELL

1070 POTENTIOMETRIC CONTOUR



NOTES

1. AERIAL IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED APRIL 2016.
2. POTENTIOMETRIC DATA COLLECTED ON MAY 2018.

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FIGURE 3
UPPERMOST AQUIFER
POTENTIOMETRIC SURFACE: MAY 2018

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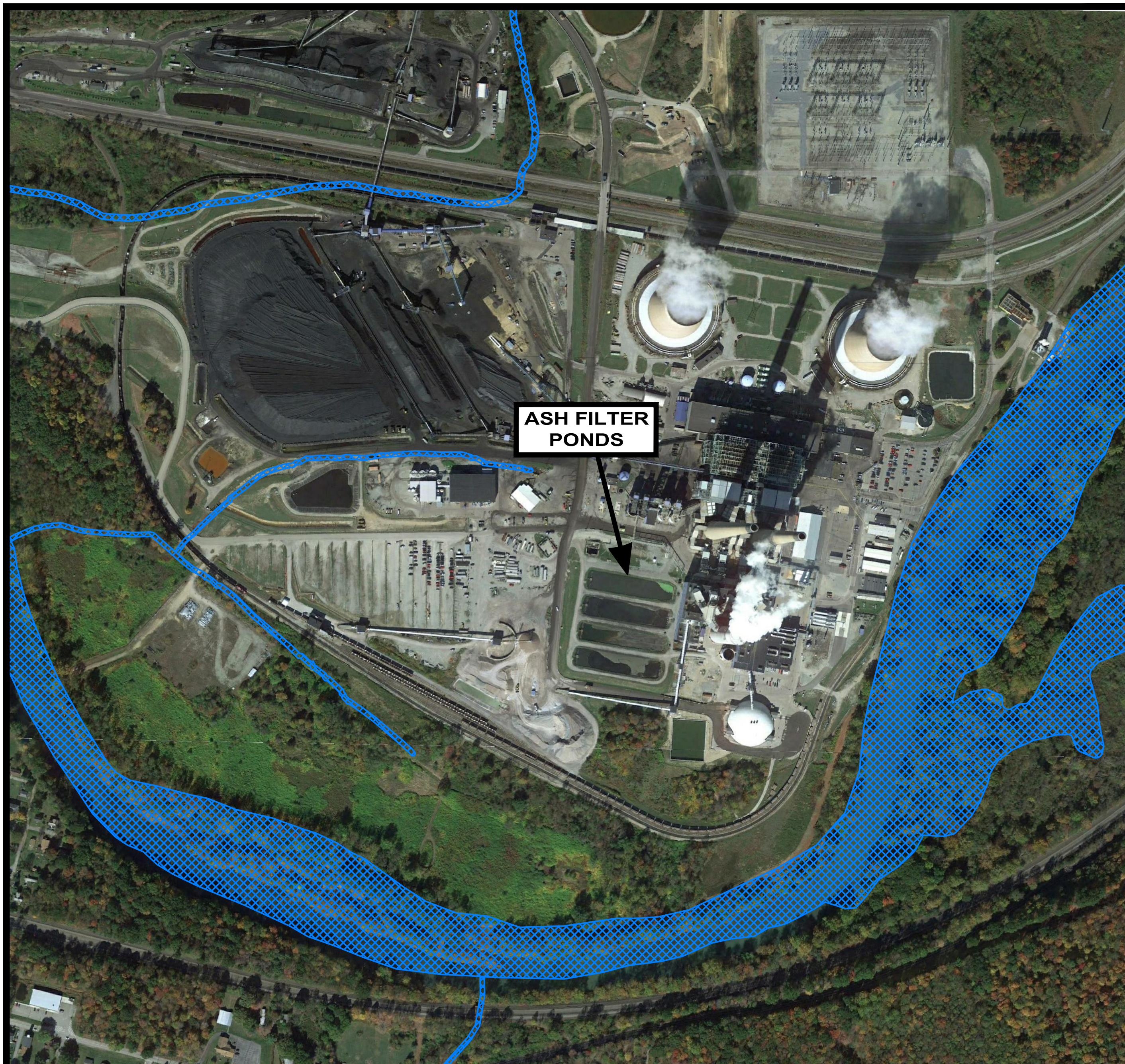

LEGEND

APPROXIMATE NATIONAL WETLAND INVENTORY (NWI) WETLAND BOUNDARY

0 700'
GRAPHIC SCALE

NOTES

1. AERIAL IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED APRIL 2016.
2. APPROXIMATE WETLAND BOUNDARIES OBTAINED FROM THE UNITED STATES FISH AND WILDLIFE SERVICES NATIONAL WETLANDS INVENTORY DATABASE. WETLAND DELINEATIONS ARE PHOTO INTERPRETED USING IMAGERY FROM 1977.

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FIGURE 4
NATIONAL WETLANDS INVENTORY

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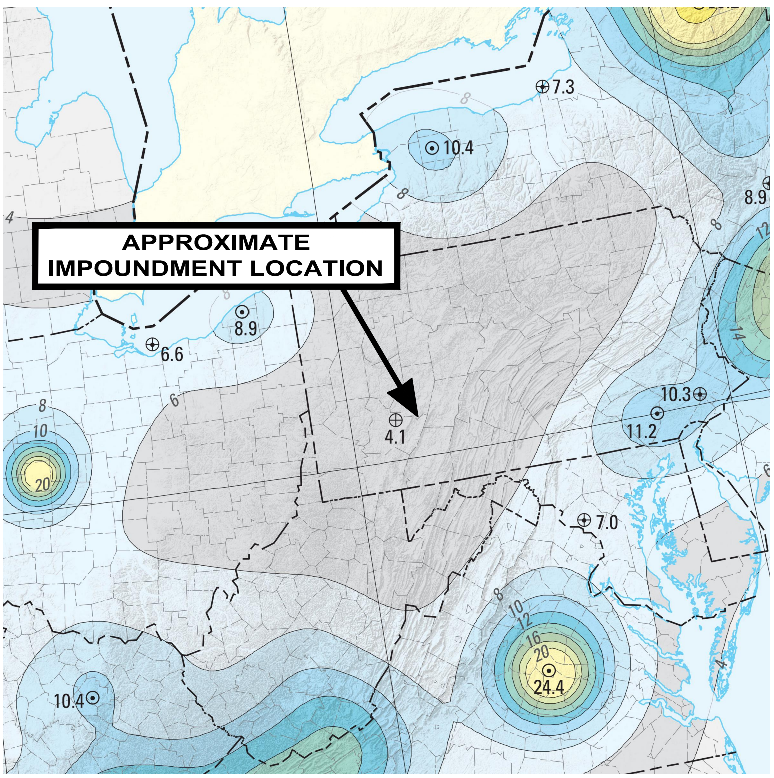
USGS
science for a changing world
Earthquake Hazards Program

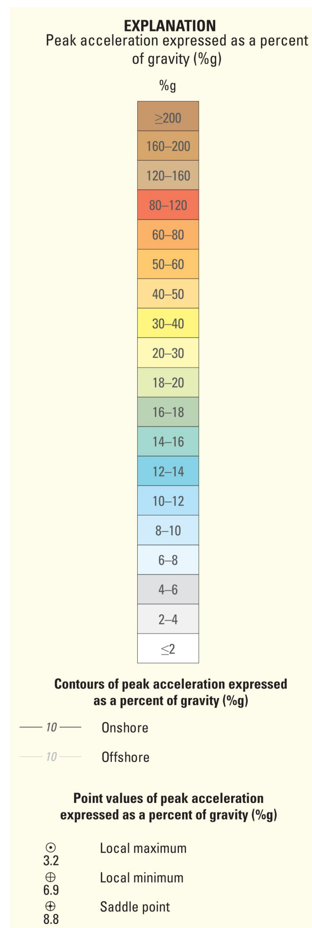
LOCATION 40.383316 Lat. -79.062566 Long.

The interpolated probabilistic ground motion values, in %g, at the requested point are:

P.E. %	Exp. Time (years)	Ground Motion (g)
2	50	0.04617

U.S. NATIONAL SEISMIC HAZARD MAPS: Peterson, M.D., et al, 2014





Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 Years

NOTES

1. Information obtained from the United States Geological Survey website.

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FIGURE 5
MAP OF HORIZONTAL ACCELERATION

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