# CCR COMPLIANCE
## LOCATION RESTRICTIONS DEMONSTRATION REPORT
## CHESWICK BOTTOM ASH RECYCLE AND BOTTOM ASH EMERGENCY PONDS

Prepared for:

NRG Power Midwest LP
Cheswick Generating Station
Springdale, Pennsylvania

Prepared by:

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

October 2018

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## 1.0 INTRODUCTION AND PURPOSE

NRG Power Midwest LP, a subsidiary of GenOn Energy, Inc. (GenOn), operates the coal-fired Cheswick Generating Station located in Springdale, Pennsylvania. The Cheswick 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. 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 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

Two surface impoundments are located at the Cheswick Generating Station: the Bottom Ash Recycle Pond (Recycle Pond) and the Bottom Ash Emergency Pond (Emergency Pond). These impoundments are collectively referred to as the Bottom Ash Ponds. The Bottom Ash Ponds have been in operation since 1970 (beginning with the Recycle Pond) and are located in the northern portion of Cheswick's property along Tawney Run, a tributary to the Allegheny River. The Recycle Pond serves as the primary impoundment; the Emergency Pond is located south of the Recycle Pond and is only in operation when the Recycle Pond is being dewatered and dredged for required annual maintenance/cleaning. Similarly, the Emergency Pond also is subjected to annual maintenance/cleaning. The approximate location of the facility and impoundments are shown on **Figure 1**.

## 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 alluvial deposits (along the floodplain of Tawney Run) and the Glenshaw Formation of the Conemaugh Group. The alluvial deposits include silt, sand, and gravel and are defined as either medium-stiff to stiff or medium-dense to dense. The deposits are described to be approximately 20 to 55 feet thick in the area of the Bottom Ash Ponds. The underlying bedrock is consistent with the Glenshaw Formation, which is comprised of cyclic patterns of shale, sandstone, limestone, and coal. This unit is estimated to be 300 feet thick in the location of the Bottom Ash Ponds.

The crest elevation for each pond is approximately 779 feet above mean sea level (ft MSL); the elevation of the pond bottom is approximately 769.6 ft MSL for the Recycle Pond and ranges from 763.5 to 763.8 ft MSL for the bottom of the Emergency Pond. Historical correspondence regarding pond re-lining activities (Cardinal Resources, 2006) provides indication of a 2-foot-thick clay liner placed within the Recycle Pond. Re-lining was also undertaken for the Emergency Pond during this same timeframe (Stevens Painton Corporation, 2006). More recent observations (as relayed to APTIM by GenOn) during the 2015 cleanout of the Recycle Pond reiterated the presence/thickness of the clay liner. Although review of available information/drawings has not provided a definitive elevation interval for the clay liner in each pond, it is reasonably assumed that the clay extends to a depth 2 feet immediately below the indicated pond bottom elevations. Since these clay intervals have not been certified to meet the liner requirements of §257.71, they are not considered as part of the respective pond liner systems. Accordingly, for purposes of evaluating compliance with §257.60(a), the pond bottoms remain at the values cited above, including 769.6 ft MSL for the Recycle Pond and an average of 763.65 ft MSL for the Emergency Pond.

The groundwater monitoring system for the ponds is comprised of four wells, including, Well MW-8 (upgradient), and Wells MW-9, MW-10, and MW-11 (downgradient). All four wells monitor the groundwater within the alluvium, which was determined to be the uppermost aquifer. A piezometer (PZ-1) is also used to gauge groundwater elevations, but is not used for groundwater sampling. The location of the groundwater monitoring wells is 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<br>Groundwater Level Observations Near Bottom Ash Ponds | | | | | |
|---|---|---|---|---|---|
| Monitoring Date | Groundwater Elevation (ft MSL) | | | | |
| | MW-8 | MW-9 | MW-10 | MW-11 | PZ-1 (observation only) |
| December 28, 2015 | 769.52 | 757.75 | 760.57 | 764.35 | 771.51 |
| January 28, 2016 | 768.82 | 757.12 | 760.04 | 763.77 | 769.09 |
| May 5, 2016 | 768.54 | 756.96 | 759.95 | 764.00 | 767.48 |
| July 28, 2016 | 767.89 | 757.22 | 760.13 | 763.88 | 762.50 |
| October 19. 2016 | 768.40 | 756.98 | 759.99 | 763.84 | 764.01 |
| January 30, 2017 | 768.27 | 758.17 | 760.75 | 764.29 | 771.35 |
| April 13, 2017 | 769.07 | 757.82 | 760.63 | 764.27 | 770.94 |
| August 1, 2017 | 769.43 | 758.55 | 760.89 | 764.23 | 774.22 |
| October 5, 2017 | 768.01 | 756.95 | 759.82 | 763.81 | 762.50 |
| April 3, 2018 | 770.91 | 758.50 | 760.92 | 764.91 | 773.54 |
| July 11, 2018 | 768.93 | 757.60 | 758.58 | 764.13 | 771.05 |
| Highest Water Level: | 770.91 | 758.55 | 760.92 | 764.91 | 774.22 |
| Lowest Water Level: | 767.89 | 756.95 | 758.58 | 763.77 | 762.50 |
| Average Water Level: | 768.89 | 757.60 | 760.21 | 764.13 | 768.93 |

As shown in **Table 1**, the highest observed groundwater elevation across the majority of the wells was recorded on April 3, 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 764.6 ft MSL in the location of the Recycle Pond; this elevation serves as the 5-ft vertical offset from the estimated bottom of the pond (i.e., 769.6 ft MSL – 5 ft separation = elevation 764.6 ft MSL). Similarly, the groundwater surface is greater than elevation 758.65 ft MSL in the location of the Emergency Pond; this elevation serves as the 5-ft vertical offset from the estimated bottom of the clay liner (i.e., 763.65 ft MSL – 5 ft separation = elevation 758.65 ft MSL).

Upon closer examination of **Figure 3**, it is further observed that the groundwater surface from the April 3, 2018 monitoring event actually encroached into the bottom of both ponds, offering evidence that an intermittent connection with the uppermost aquifer has occurred at least on one occasion, and likely others based on the data in **Table 1**. This information demonstrates that the ponds do not comply 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 Bottom Ash Ponds. The map, presented as **Figure 4**, show wetland boundaries that generally coincide with the Bottom Ash Ponds. However, it is noted that the NWI Database is intended as an initial assessment tool and can be refuted through site-specific investigation and delineation. A review of the Bottom Ash Ponds was completed by an APTIM wetland specialist, based on evaluation of photographs taken during a site visit conducted on October 3, 2018. Based on this review, the impoundments were concluded to be open waters, rather than wetlands. Therefore, it is concluded that the Bottom Ash Ponds comply with the requirements of §257.61(a), and are not located in a setting that constitutes a wetland environment.

### *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 Bottom Ash Ponds to the location of faults that have undergone displacement during the Holocene time, as shown 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 Bottom Ash 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 Bottom Ash 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 surface impoundments is estimated

to be 0.04g, 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 Bottom Ash Ponds for the presence of on-site or local unstable areas, as defined in §257.53. Evaluations 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 on-site range in thickness from approximately 20 to 55 feet, and are comprised of sandy clayey silt with some sand and gravel interbeds. Hence, the alluvial materials are considered a granular soil. . Based on this soil characterization and the lack of overburden loading, significant differential settlement is not anticipated. Furthermore, no significant settlement has been observed over the course of the Bottom Ash Ponds' operations since 1970, when they were first placed into service.

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

> *On-site or local geologic or geomorphologic features;*

The Bottom Ash Ponds were evaluated for the presence of on-site or local geologic and geomorphologic features, including the presence of karst terrain, steep slopes, and sinkholes. These features are not observed at the Bottom Ash Ponds. While the Bottom Ash Ponds are underlain by the Glenshaw Formation, which includes limestone bedding, there has not been evidence on site of karst topography, sinkholes, or underground caverns within the Cheswick Station's property boundary. Based on a review of this information, it was concluded that there is low probability that local geologic or geomorphologic features could feasibly result in an unstable condition at the Bottom 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).*

The location of the Bottom Ash Ponds was evaluated for the presence of on-site or local human-made features or events (both surface and subsurface), including surface and

subsurface mines, extensive oil and gas extractions, and sources of rapid groundwater drawdown that could feasibly impact the Bottom Ash Ponds.

It was determined that the Bottom Ash Ponds are located near the boundary of the Harwick Mine where deep mining of the Upper Freeport Coal has occurred. Mining operations ceased in 1970. Pillar extraction methods were used at this mine with clean roof breaks. This method of mining results in complete subsidence of the ground surface within a few years of mining operations. Therefore, the likelihood of future subsidence impacting the ponds is minimal. It is concluded that it is unlikely that the site would be impacted by deep mining or human-made surficial features.

Based on the evidence presented above in Section 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 Cheswick Generating Station operates two CCR surface impoundments, which are collectively known as the Bottom Ash Ponds. These ponds meet most, but not all, location restrictions, as defined within §257.60 through §257.64, and 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 | No |
| §257.61(a) | Wetlands | Yes |
| §257.62(a) | Fault Areas | Yes |
| §257.63(a) | Seismic Impact Zone | Yes |
| §257.64(a) | Unstable Areas | Yes |

Due to the fact that all location restriction demonstrations cannot be made for the Bottom Ash Ponds, the ponds are subject to closure requirements specified in § 257.101(b)(1)(i-ii).

## 5.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

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 §§257.61(a), 257.62(a), 257.63(a), and 257.64(a), but are not compliant with the requirements of §257.60(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 Number: PE 085411

Professional Engineer Seal:

## 6.0 REFERENCES

"Ground Water Sampling – Quality Assurance Procedures – Field Manual," GAI Consultants, Inc. Pittsburgh, Pennsylvania, December 2002.

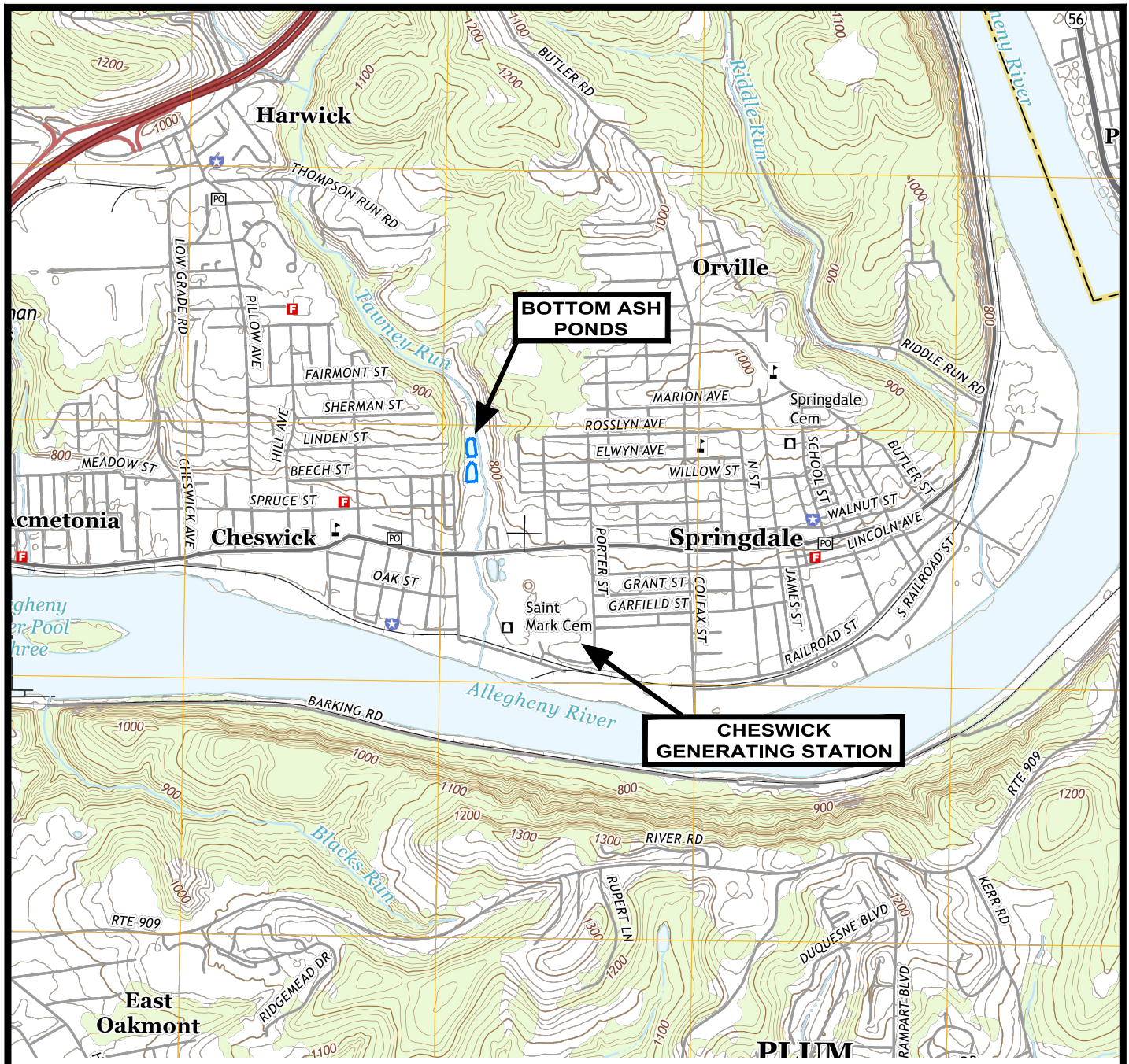
"Ash Pond Liner Repairs," Stevens Painton Corporation, Contractors and Engineers, November 30, 2006.

"Impoundment Cleaning and Repair Procedure Specifications – Cheswick Power Station," GAI Consultants, Inc. Pittsburgh, Pennsylvania, March, 2012.

"Dam Safety Assessment of CCW Impoundments, NRG Cheswick Power Station, O'Brien & Gere, 2014.

"CCR Compliance Groundwater Monitoring and Corrective Action Annual Report Bottom Ash Ponds and Ash Disposal Site," APTIM, 2018.

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.




## LEGEND

APPROXIMATE CCR UNIT BOUNDARY

N

0 2000'

GRAPHIC SCALE

## NOTES

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

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# CHESWICK GENERATING STATION

## FIGURE 1
## SITE LOCATION PLAN

| APPROVED BY: | RDS | PROJ. NO.: | 1009134004 | DATE: | SEPT. 2018 |
|---|---|---|---|---|---|

T:\AutoCAD\Projects\NRG\CCR - Location Evaluation Figures\Cheswick\Impoundment\Figure 1 - Site Location (Impoundments).dwg, 9/26/2018 2:59:07 PM, AutoCAD PDF (High Quality Print).pc3

| DRAWING NUMBER | APPROVED BY | CHECKED BY | DRAWN BY | DESIGNED BY | DATE | OFFICE |
|---|---|---|---|---|---|---|
| 1009134004-B8 | -- | -- | E. Schlegel | -- | 1/31/18 | Pittsburgh, PA |


LEGEND:

- MW-10 (759.82) — CCR GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION MEASURED ON OCTOBER 5, 2017
- PZ-1 (772.50) — OBSERVATION WELL (GROUNDWATER LEVELS ONLY) WITH GROUNDWATER ELEVATION MEASURED ON OCTOBER 5, 2017
- GROUNDWATER FLOW DIRECTION

SCALE

0 80 160 FEET

REFERENCE:

GOOGLE AERIAL PHOTOGRAPH, DATED 6/14/2014.


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# FIGURE 2
## CCR COMPLIANCE GROUNDWATER MONITORING WELL LOCATION MAP
## BOTTOM ASH PONDS
CHESWICK GENERATING STATION
SPRINGDALE, ALLEGHENY COUNTY, PENNSYLVANIA


File: O:\PROJECT\1009134004_Cheswick\1009134004-B8.dwg
Plot Date/Time: Jan 31, 2018 - 9:34am
Plotted By: Evan.Schlegel
Xref: Image


## LEGEND

MONITORING WELL

770 POTENTIOMETRIC CONTOUR

N

0 100'

GRAPHIC SCALE

## NOTES

1. AERIAL IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED APRIL 2016.
2. POTENTIOMETRIC DATA COLLECTED DEC. 2015 - MAY 2018. (HIGHEST WATER LEVEL OBSERVED)

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# CHESWICK GENERATING STATION

## FIGURE 3
## UPPERMOST AQUIFER
## POTENTIOMETRIC SURFACE: HIGHEST WATER LEVEL

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

T:\AutoCAD\Projects\NRG\CCR - Location Evaluation Figures\Cheswick\Impoundment\Figure 3 - Potentiometric.dwg, 9/26/2018 2:59:20 PM, AutoCAD PDF (High Quality Print).pc3


## LEGEND

APPROXIMATE NATIONAL WETLAND INVENTORY (NWI) WETLAND BOUNDARY

N

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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**CHESWICK GENERATING STATION**

**FIGURE 4**
**NATIONAL WETLANDS INVENTORY**

| APPROVED BY: RDS | PROJ. NO.: 1009134004 | DATE: SEPT. 2018 |
|---|---|---|

T:\AutoCAD\Projects\NRG\CCR - Location Evaluation Figures\Cheswick\Impoundment\Figure 4 - Map of Wetlands Inspection Area (Impoundments).dwg, 9/26/2018 2:59:28 PM, AutoCAD PDF (High Quality Print).pc3

USGS
science for a changing world

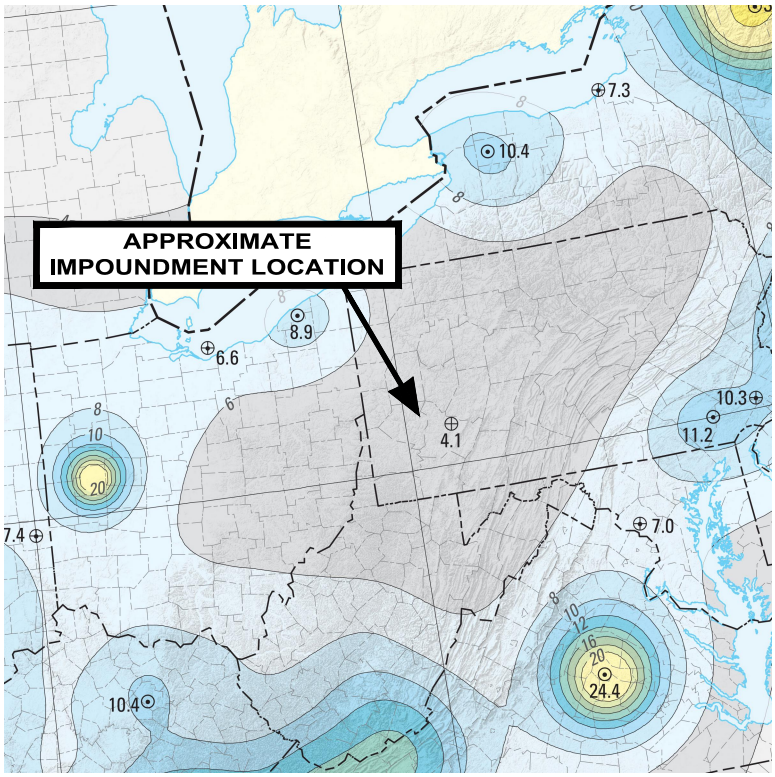
Earthquake Hazards Program

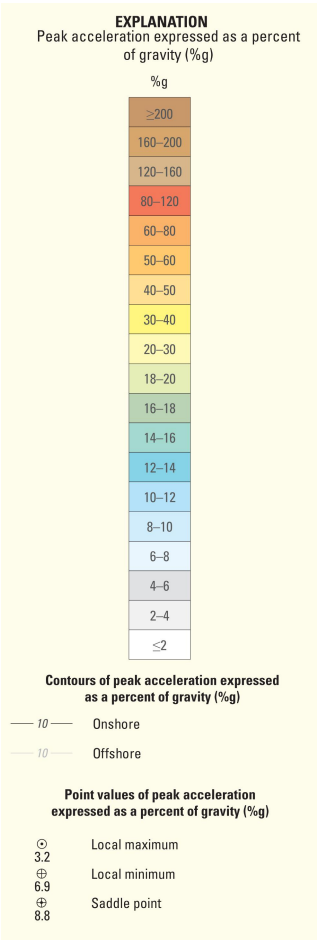
LOCATION 40.544351 Lat. -79.794174 Long.

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

| P.E. % | Exp. Time (years) | Ground Motion (g) |
|---|---|---|
| 2 | 50 | 0.0415 |

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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**CHESWICK GENERATING STATION**

**FIGURE 5**
**MAP OF HORIZONTAL ACCELERATION**

| APPROVED BY: RDS | PROJ. NO.: 1009134004 | DATE: SEPT. 2018 |
|---|---|---|