

Harrison Landfill Expansion Location Restrictions Demonstration

Monongahela Power Company
A FirstEnergy Company
Harrison Power Station
Shinnston, Harrison County, West Virginia

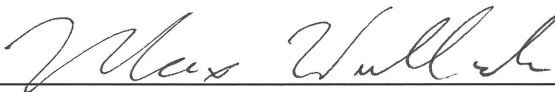
GAI Project Number: C150116.04

December 2018

Prepared for:
Monongahela Power Company
A FirstEnergy Company
5001 Nasa Boulevard
Fairmont, West Virginia 26554

Prepared by:
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Certification/Statement of Professional Opinion

The Location Restrictions Demonstration (Demonstration) for the Harrison Power Station Landfill Expansion was prepared by GAI Consultants, Inc. (GAI). The Demonstration 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 Demonstration was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the State of West Virginia that the Demonstration 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 Demonstration 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, §§ 257.61, 257.62, and 257.63.

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.



John R. Klamut, P.E.
Engineering Manager



1.0 Introduction

The Harrison Power Station (Station) is a coal-fired electric generating station located near the community of Shinnston, in Harrison County, West Virginia (WV). CCRs generated at the Station are placed in the captive CCR landfill (Landfill), which is located approximately one mile north-northeast of the Station. Approximately 95 percent of the waste consists of fixated flue gas desulfurization material. Fly ash, bottom ash, and miscellaneous wastes compose the remaining five percent.

According to the WV Department of Environmental Protection (WVDEP), the landfill is a Class F CCR Solid Waste Disposal Facility. The approximate center of the existing landfill is located at coordinates 39° 24' 16" north latitude, and 80° 19' 56" west longitude. Approximately 250 acres are currently permitted for landfill operations under WVDEP Permit No. WV0075795. The landfill is divided into three areas, referred to as the Lower Area, Upper Area, and Main Area. The landfill expansion, Phase 6A, is two sections of liner located within the existing footprint of the landfill in the Main Area. An approximately four-acre area was added to the western edge of the Main Area and an approximately two-acre area was added to the eastern edge of the Main Area.

This Demonstration was prepared in accordance with the applicable requirements [§§ 257.60(a), 257.61(a), 257.62(a), 257.63(a), and 257.64(a)] of the United States Environmental Protection Agency (USEPA) 40 Code of Federal Regulations (CFR) Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices (CCR Rule).

2.0 Placement above Uppermost Aquifer

Pursuant to 40 CFR § 257.60, new CCR landfills, existing and new surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 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.

Certification and information relating to placement above the uppermost aquifer is included in Appendix A.

3.0 Wetlands

Pursuant to 40 CFR § 257.61, new CCR landfills; existing and new surface impoundments; and all lateral expansion of CCR units must not be located in wetlands unless the owner or operator demonstrates that the CCR unit meets the following requirements:

- ▶ No alternative location to place the CCR unit is reasonably available that does not involve wetlands;
- ▶ The construction and operation of the CCR unit will not cause or contribute to violating applicable state or federal water quality standards, violating applicable toxic applicable toxic effluent standard or prohibition, or jeopardizing the continued existence of endangered or threatened species, or violating the protection of a marine sanctuary;
- ▶ The CCR unit will not cause or contribute to significant degradation of wetlands;
- ▶ No net loss of wetlands has occurred due to the placement of the CCR unit; and
- ▶ Sufficient information is available to make a reasoned determination with respect to the demonstrations required above.

The Phase 6A expansion areas were constructed in areas of the landfill that had previously been disturbed as part of construction activities for earlier landfill phases. The previous construction activities were performed under Department of Army permit application 20010244. No wetlands were identified in the Phase 6A project area.

4.0 Fault Areas

Pursuant to 40 CFR § 257.62, new CCR landfills; existing and new surface impoundments; and all lateral expansion of CCR units must not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time (<11,700 years ago) unless the owner demonstrates that an alternative setback distance of less than 200 feet will prevent damage to the structural integrity of the CCR unit.

A review of the United States Geological Survey (USGS), Earthquake Hazards Program, Quaternary Faults interactive map reveals that the Impoundment does not reside within 200 feet of a Holocene aged fault area.

5.0 Seismic Impact Zones

Pursuant to 40 CFR § 257.63, new CCR landfills; existing and new surface impoundments; and all lateral expansion of CCR units must not be located in seismic impact zones unless the owner demonstrates 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 defined as an area having a two percent or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. A review of the 2014 Long-term Model, USGS, Earthquake Hazards Program, Seismic Hazard Maps and Site-Specific Data reveals that the Landfill does not reside within a seismic impact zone. In addition, the peak ground acceleration at the site is 0.047 g for the same probability and time period (2% in 50 years).

6.0 Unstable Areas Demonstration

Pursuant to 40 CFR § 257.64, existing or new CCR landfills and surface impoundments; or any lateral expansion of a CCR unit, must not be located in an unstable area unless the owner demonstrates 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.

An Unstable Areas Demonstration and certification was prepared by GAI Consultants in October 2018 and is included as Appendix B.

7.0 Conclusion

Recognized and generally accepted good engineering practices have been incorporated into the design and construction of the Landfill expansion to reduce the potential for disruption of the structural components of the Landfill. Available documents were reviewed and it was determined that the planned Landfill expansion does not reside within a wetland, fault area, or a seismic impact zone. Additional documentation on unstable areas and placement above aquifers are included in the appendices.

8.0 References

- West Virginia Division of Natural Resources. *Letter of Information on Rare, Threatened and Endangered Species and Wetlands*; March 7, 2002.
- Allegheny Energy Supply Company, LLC. *Wetland Mitigation Agreement*; April 26, 2002.
- GAI Consultants, Inc. *Application for Renewal, Solid Waste Permit No. WV0075795 and Phase 5 Expansion, Harrison Power Station*; January 2011.
- GAI Consultants, Inc. *Application for Renewal, Phase 6 Expansion, Harrison Power Station*; February 2016.
- GAI Consultants, Inc. *Permit Modification, Application for Phase 6A Expansion*; November 2017.
- United States Geological Survey. *Two-percent probability of exceedance in 50 years map of peak ground acceleration*; 2014.
- United States Geological Survey. *Earthquake Fault Map*, <https://earthquake.usgs.gov/hazards/qfaults/map/#qfaults>; accessed September 1, 2018.
- Environmental Protection Agency. *40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities*; April 17, 2015.

APPENDIX A

GROUNDWATER LOCATION REPORT

PLACEMENT ABOVE UPPERMOST AQUIFER – LOCATION RESTRICTION DEMONSTRATION REPORT

CCR Rule §257.60

Harrison Coal Combustion Byproduct Landfill

WVDEP Solid Waste/NPDES Permit No. WV0075795

Harrison Power Station

Harrison County, WV

212C-SW-00169

January 24, 2019

PRESENTED TO

FirstEnergy

800 Cabin Hill Drive
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PRESENTED BY

Tetra Tech, Inc.

400 Penn Center Boulevard, Suite 200
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Prepared and Approved by:



January 24, 2019

Robert C. Baker, P.E.
CCR Compliance Leader

Date

Reviewed by:



January 24, 2019

Jeffrey P. Orient, P.G.
Senior Geologist

Date

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EXECUTIVE SUMMARY

In accordance with 40 CFR, Part 257, Subpart D, §257.60 of the United States Environmental Protection Agency's (USEPA's) *Disposal of Coal Combustion Residuals from Electric Utilities* ("CCR Rule"), Tetra Tech, Inc. (Tetra Tech) has prepared this Location Restriction Demonstration Report (the "Report") for the Harrison Coal Combustion Byproduct Landfill ("CCBL" or "CCR unit") at the Harrison Power Station ("Station") located in Harrison County, West Virginia (WV).

There are multiple Location Restrictions (LRs) outlined in CCR Rule §257.60 to §257.64 that apply to either: (a) new CCR landfills; (b) existing or new CCR surface impoundments; or (c) all lateral expansions of CCR units. The applicability of these LR's vary for the CCBL as it's considered an existing CCR unit under the Rule but will potentially be laterally expanded in the future. FirstEnergy (FE) has engaged Tetra Tech to evaluate if a currently planned lateral expansion of the CCR unit (Phase 6A) complies with §257.60 of the CCR Rule, which focuses on minimum separation requirements between the Rule-defined uppermost aquifer and the base of the overlying CCR unit. Demonstration of compliance with the remaining CCR Rule LR's (i.e., §257.61 to §257.64) is being performed by others and is not addressed herein.

Based on our document and data reviews, it is Tetra Tech's professional opinion and engineering judgment that the currently planned Phase 6A lateral expansion of the CCBL complies with the requirements of CCR Rule §257.60.

1.0 INTRODUCTION

In accordance with 40 CFR, Part 257, Subpart D, §257.60 to §257.64 of the USEPA's CCR Rule, the following Location Restrictions must be applied to new, existing, or lateral expansions of existing CCR units, as noted:

§257.60(a) – 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).

§257.61(a) – 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 ... that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

§257.62(a) – 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 ... that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

§257.63(a) – 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 ... 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.

§257.64(a) – 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 ... 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.

Of the five Location Restriction criteria listed above, FirstEnergy has engaged Tetra Tech to evaluate compliance with only the uppermost aquifer separation criterion (§257.60) for the CCBL. Demonstration of compliance with the remaining CCR Rule LRs (i.e., §257.61 to §257.64) is being performed by others and is not addressed herein.

Preparation of this Report included review of the documents and data available in the CCBL's operating record and other background information available regarding the facility design, construction, operation and maintenance (e.g., public-domain permit applications, construction certification documents, and inspection records).

The subsequent sections of this Report describe the CCR unit, expand on the CCR Rule requirements pertinent to uppermost aquifer separation requirements affecting or potentially affecting the existing CCR unit, and summarize the scope, bases, and findings from our assessments.

2.0 BACKGROUND

The Station is located in Harrison County, WV, along the West Fork River. CCRs produced at the Station are placed in the facility's captive CCBL, which is located approximately 1.5 miles north of the Station. The landfill is an existing CCR unit that is regulated under West Virginia Department of Environmental Protection (WVDEP) Solid Waste/National Pollutant Discharge Elimination System (NPDES) Water Pollution Control Permit No. WV0075795. A WVDEP groundwater monitoring program for the landfill has been in effect since 1993 and a separate CCR Rule groundwater monitoring program has been in effect since 2017. The landfill facility consists of three adjacent disposal areas situated in the former Piggott's Run watershed as shown on attached Figure 1. The three disposal areas are identified as the Main Area (MA - approximately 150 acres), the Lower Area (LA - approximately 126 acres), and the Upper Area (UA - approximately 120 acres). Of this total, approximately 310 acres are currently permitted for landfill operations. Historically, landfilling operations have primarily been performed in the MA and LA disposal areas, with the UA disposal area more recently developed for use.

The MA disposal area, which has both unlined and lined portions, received CCR material from the station when the first units began operating in 1972, and was closed from 1979 (when disposal operations shifted over to the LA) until being reactivated in 2005. The LA disposal area is still active and has both unlined (pre-1994) and lined portions, with the liner system consisting of a 24-inch thick engineered compacted clay liner underlain by a leachate detection zone and overlain with a leachate collection system. The MA and UA have been used for CCR material disposal since 2005 and 2011, respectively, with MA disposal being an overlay of the materials originally placed there, and UA disposal being in new, lined areas that utilize one of two liner systems. Pre-CCR Rule areas in the UA have a liner consisting of "enhanced" FGD by-product (amended with excess lime) that is underlain by a leachate detection zone and overlain with a leachate collection system. Post-CCR Rule areas in the UA will have a composite-liner system comprised of a geomembrane and geosynthetic clay liner underlain by a leachate detection zone and overlain by a leachate collection system. Stormwater runoff and leachate from the landfill discharge to a lined sedimentation pond, referred to as Sedimentation Pond No. 1. The UA and MA have been developed using a phased approach and are currently in permitted operating Phase 5. This phased development has been further subdivided into construction subareas (e.g., Phase 5B) with the next planned lateral expansion subarea being Phase 6A, which overlies portions of the UA and MA disposal areas.

As presented in the *CCR Rule Groundwater Monitoring System Evaluation Report* (“GMS Evaluation Report” - Tetra Tech, 2017), which is part of the facility’s Operating Record, groundwater in the CCBL area occurs primarily within fractured bedrock and flow is controlled by a combination of topography and the bedrock structure (i.e., dip). The Lower Sewickley sandstone has been identified as the uppermost aquifer for CCR Rule groundwater monitoring for the CCBL area. This aquifer is situated approximately 60 to 70 feet above the Pittsburgh Coal which has been extensively deep-mined across the site. Historic and recent groundwater level data indicate groundwater flow at the CCBL to be from west to east (approximating the dip of the Pittsburgh Coal), and that the flow exhibits little seasonal and temporal fluctuations. A representative set of water level data from the last annual reporting period (2017) were used for contouring groundwater flow patterns at the site as shown on attached Figure 1.

A more detailed discussion of the site’s geologic and hydrogeologic characteristics is available in the aforementioned 2017 GMS Evaluation Report and is not provided herein to avoid duplication.

3.0 UPPERMOST AQUIFER SEPARATION – LANDFILL PHASE 6A

As previously noted, over its operating life the landfill has been developed in a series of now-contiguous construction subareas. All the combined subareas that have been constructed and operated to date are considered an existing landfill under the CCR Rule and, as such, are not subject to the requirements of §257.60. However, the next subarea that will be developed (Phase 6A) is considered a lateral expansion of an existing landfill under the CCR Rule and, as such, is subject to the requirements of §257.60. The limits and subgrade elevations of Phase 6A are depicted on attached FirstEnergy Drawing No. C89509278.

A review of Drawing No. C89509278 indicates that the lowest point of subgrade development will extend down to approximately elevation 1120 feet along the southern end of the west side of Phase 6A (near construction control point “CH-(56)”). Typical groundwater contours across the site and their relationship to the Phase 6A disposal limits are depicted on attached Figure 1. Referring to Figure 1 the highest observed groundwater levels in the lowest Phase 6A subgrade development subarea are encountered at approximately elevation 1080 feet. Therefore, the minimum vertical separation between the upper limit of the uppermost aquifer and the proposed base of the Phase 6A landfill subarea is on the order of 40 feet which exceeds the minimum five-foot (1.52 meter) requirement of §257.60(a).

4.0 CONCLUSION

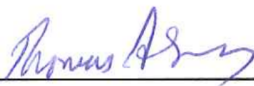
Based on our document and data reviews as summarized herein, it is Tetra Tech’s professional opinion and engineering judgment that the currently planned Phase 6A lateral expansion of the CCBL complies with the requirements of CCR Rule §257.60.

5.0 CLOSING

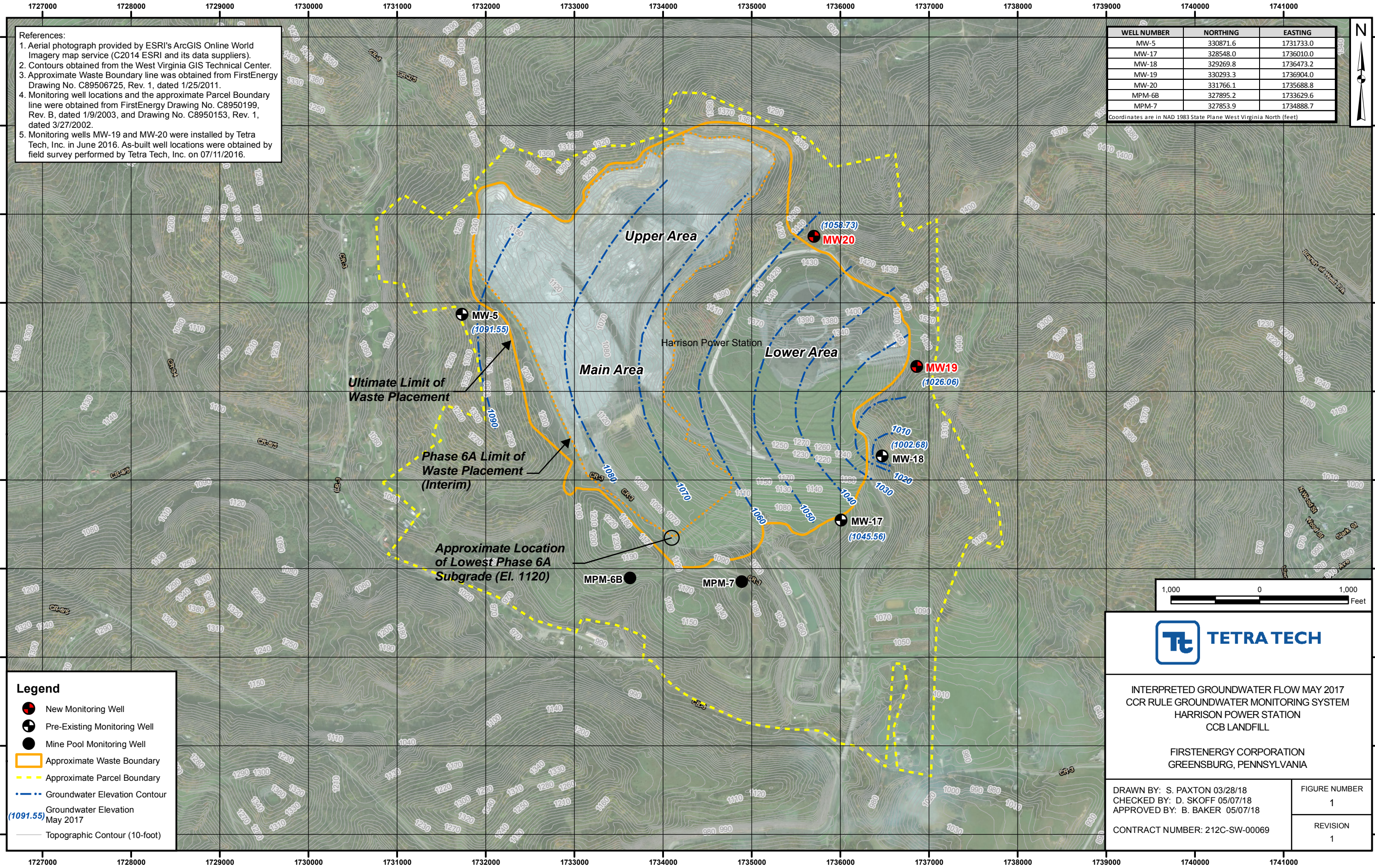
In preparing this Report, the professional services of Tetra Tech, Inc. have been performed, findings obtained, and recommendations prepared in accordance with generally accepted engineering principles and practices, based on the references, information and statements of understanding presented herein. This statement is in lieu of all warranties and guarantees, expressed or implied.

CERTIFICATION

I, Thomas A. Gray, being a Registered Professional Engineer in accordance with the West Virginia Professional Engineer's Registration Law, do hereby certify to the best of my knowledge, information, and belief that the information contained herein has been reviewed and prepared in accordance with accepted professional practice, is true and correct, and has been properly applied to determine compliance with the requirements of §257.60 of the USEPA's *Disposal of Coal Combustion Residuals from Electric Utilities* rule (40 CFR, Part 257, Subpart D).

Signature: 
Printed Name: Thomas A. Gray, PE
Certification Date: January 24, 2019
License Number: 010523
License Expiration: December 31, 2020
Company/Contact: Tetra Tech, Inc.
661 Anderson Drive, Foster Plaza 7
Pittsburgh, PA 15220
Tel: 412.921.7090





- References:
1. Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (©2014 ESRI and its data suppliers).
 2. Contours obtained from the West Virginia GIS Technical Center.
 3. Approximate Waste Boundary line was obtained from FirstEnergy Drawing No. C89506725, Rev. 1, dated 1/25/2011.
 4. Monitoring well locations and the approximate Parcel Boundary line were obtained from FirstEnergy Drawing No. C8950199, Rev. B, dated 1/9/2003, and Drawing No. C8950153, Rev. 1, dated 3/27/2002.
 5. Monitoring wells MW-19 and MW-20 were installed by Tetra Tech, Inc. in June 2016. As-built well locations were obtained by field survey performed by Tetra Tech, Inc. on 07/11/2016.

WELL NUMBER	NORTHING	EASTING
MW-5	330871.6	1731733.0
MW-17	328548.0	1736010.0
MW-18	329269.8	1736473.2
MW-19	330293.3	1736904.0
MW-20	331766.1	1735688.8
MPM-6B	327895.2	1733629.6
MPM-7	327853.9	1734888.7

Coordinates are in NAD 1983 State Plane West Virginia North (feet)



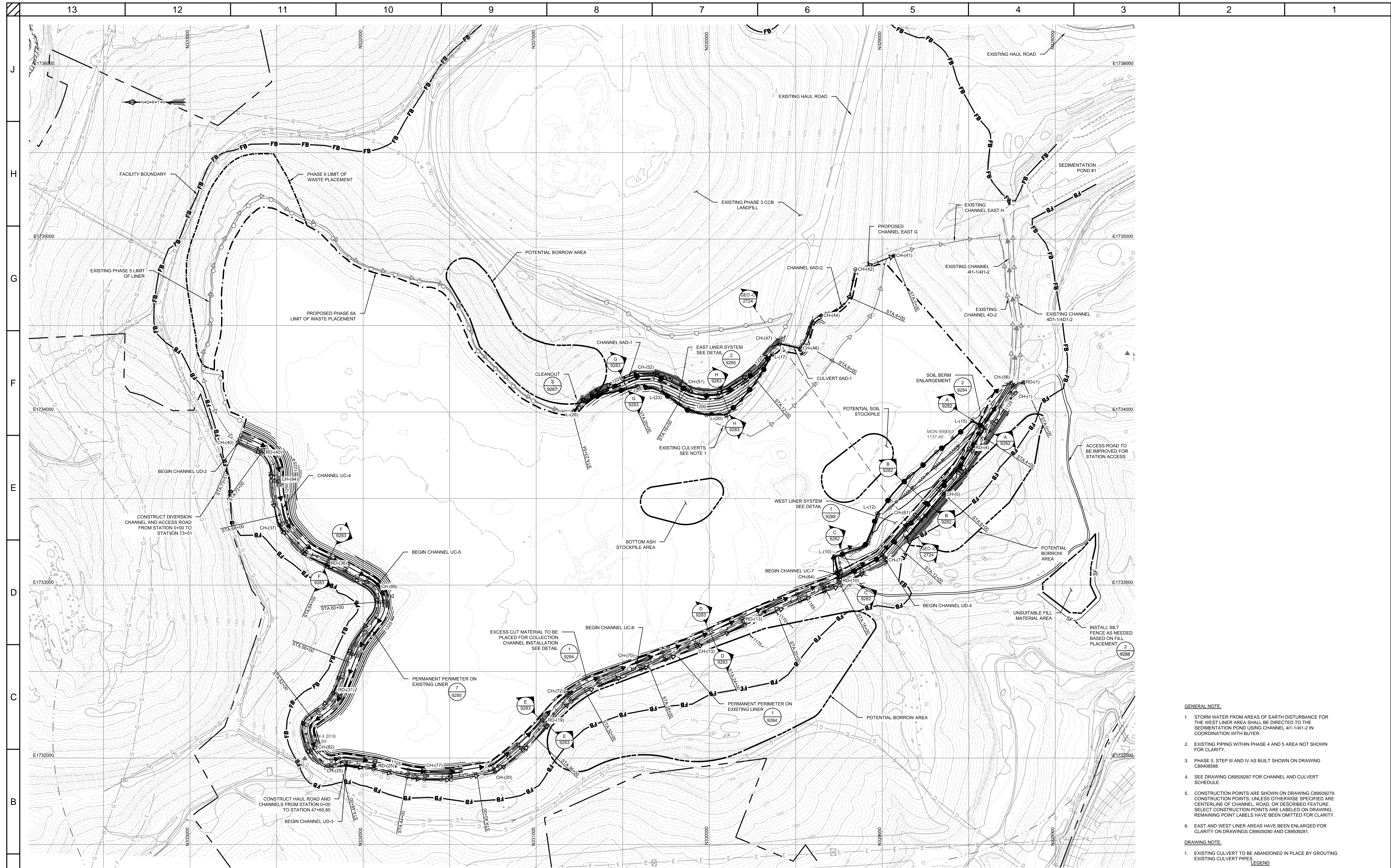
- Legend**
- New Monitoring Well
 - Pre-Existing Monitoring Well
 - Mine Pool Monitoring Well
 - Approximate Waste Boundary
 - Approximate Parcel Boundary
 - Groundwater Elevation Contour
 - Groundwater Elevation May 2017
 - Topographic Contour (10-foot)



INTERPRETED GROUNDWATER FLOW MAY 2017
 CCR RULE GROUNDWATER MONITORING SYSTEM
 HARRISON POWER STATION
 CCB LANDFILL

FIRSTENERGY CORPORATION
 GREENSBURG, PENNSYLVANIA

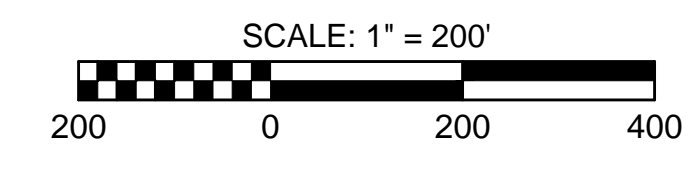
DRAWN BY: S. PAXTON 03/28/18	FIGURE NUMBER
CHECKED BY: D. SKOFF 05/07/18	1
APPROVED BY: B. BAKER 05/07/18	REVISION
CONTRACT NUMBER: 212C-SW-00069	1



- GENERAL NOTE:**
- STORM WATER FROM AREAS OF EARTH DISTURBANCE FOR THE WEST LINER AREA SHALL BE DIRECTED TO THE SEDIMENTATION POND USING CHANNEL 411-1/411-2 IN COORDINATION WITH BUYER.
 - EXISTING PIPING WITHIN PHASE 4 AND 5 AREA NOT SHOWN FOR CLARITY.
 - PHASE 5, STEP III AND IV AS BUILT SHOWN ON DRAWING C89408588.
 - SEE DRAWING C89509287 FOR CHANNEL AND CULVERT SCHEDULE.
 - CONSTRUCTION POINTS ARE SHOWN ON DRAWING C89509279. CONSTRUCTION POINTS, UNLESS OTHERWISE SPECIFIED ARE CENTERLINE OF CHANNEL, ROAD, OR DESCRIBED FEATURE. SELECT CONSTRUCTION POINTS ARE LABELED ON DRAWING. REMAINING POINT LABELS HAVE BEEN OMITTED FOR CLARITY.
 - EAST AND WEST LINER AREAS HAVE BEEN ENLARGED FOR CLARITY ON DRAWINGS C89509280 AND C89509281.
- DRAWING NOTE:**
- EXISTING CULVERT TO BE ABANDONED IN PLACE BY GROUTING EXISTING CULVERT PIPES.

LEGEND
 —FB—FB— ULTIMATE FACILITY BOUNDARY

- REFERENCE:**
- THE GRID SHOWN ON THIS DRAWING IS APPROXIMATE AND IS BASED ON THE WEST VIRGINIA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, 1983 NORTH AMERICAN DATUM.
 - EXISTING TOPOGRAPHY PROVIDED BY FIRSTENERGY GENERATION, LLC, DATED 04-02-2017. THE DRAWING MAY NOT REFLECT CURRENT SITE CONDITIONS.



FUNCTIONAL LOCATION NO. _____

REVISION	DR	CHWD	APPD	DATE	REVISION	DR	CHWD	APPD	DATE	REVISION	DR	CHWD	APPD	DATE	REVISION	DR	CHWD	APPD	DATE	REVISION	DR	CHWD	APPD	DATE
0																								

ISSUED FOR BID	DATE: 01/25/2018	SCALE: 1"=200'	PROJECT NUMBER: C89509278
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ENGINEERING	DATE	DATE	DATE
SLODOJID	01/25/2018		
COCKLKC	01/25/2018		
SHIELJF	01/25/2018		

PHASE 6A CCB LANDFILL EXPANSION OVERALL PLAN		UNIT	COMMON
MonPower	DWG. NO.	C89509278	REV. 0

APPENDIX B

UNSTABLE AREAS REPORT

Harrison Landfill Unstable Areas Demonstration

Monongahela Power Company
A FirstEnergy Company
Harrison Power Station
Shinnston, Harrison County, West Virginia

October 2018

Prepared for:
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Charles F. Straley, PE, PS
Senior Engineering Manager

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Certification/Statement of Professional Opinion

The Unstable Areas Demonstration (Demonstration) for the Harrison Landfill was prepared by GAI Consultants, Inc. (GAI). The Demonstration 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 Demonstration was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the State of West Virginia, that the Demonstration 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 Location Restrictions Demonstration 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.

Kenneth R. Harris

Kenneth R. Harris, PE
Assistant Engineering Manager



1.0 Introduction

The Harrison Power Station (Station) is a coal-fired electric generating station located near the community of Shinnston, in Harrison County, West Virginia (WV). Coal combustion residuals (CCRs) generated at the Station are placed in the captive CCR landfill (Landfill), which is located approximately one-mile north-northeast of the Station. Approximately 95 percent of the waste consists of fixated flue gas desulfurization material. Fly ash, bottom ash, and miscellaneous wastes compose the remaining five percent.

According to the WV Department of Environmental Protection (WVDEP), the landfill is a Class F CCR Solid Waste Disposal Facility. The approximate center of the landfill is located at coordinates 39° 24' 16" north latitude, and 80° 19' 56" west longitude. Approximately 250 acres are currently permitted for landfill operations under WVDEP Permit No. WV0075795. The landfill is divided into three areas, referred to as the Lower Area, Upper Area, and Main Area.

This Demonstration was prepared in accordance with the applicable requirements [§ 257.64(a)] of the United States Environmental Protection Agency's 40 Code of Federal Regulations (CFR) Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices (CCR Rule).

2.0 Unstable Areas Demonstration

Pursuant to 40 CFR § 257.64, an existing CCR unit must not be located in an unstable area unless the owner or operator demonstrates 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. This Demonstration will be maintained in the facility's operating record in accordance with § 257.64(e).

2.1 Demonstration Overview

The Demonstration includes descriptions of the following factors used to determine that the CCR unit is not located in an unstable area:

- on-site or local soil conditions that may result in significant differential settlement;
- on-site or local geologic or geomorphic features; and
- on-site or local human-made features or events (both surface and subsurface).

These factors were evaluated based on the following information:

- United States Geological Survey (USGS) topographic maps (current and historic);
- landslide maps;
- geologic maps;
- mine maps;
- coal resource maps;
- United States Department of Agriculture (USDA) soil reports;
- karst maps;
- aerial photographs (current and historic); and
- as-built construction and permit documents.

The documents were reviewed to determine if the CCR unit is located in an unstable area. The following sections provide evaluation of on-site and local conditions related to the Landfill.

2.1.1 On-Site or Local Soil Conditions

No unanticipated settlement nor significant differential settlement of the Landfill was observed during the annual (2015, 2016, and 2017) and weekly (April 2016 through September 2018) inspections, both of which are required by the CCR Rule. Historically, no unanticipated settlement nor significant differential settlement has been reported in past documented Landfill inspections. CCR placement techniques typically used reduce the likelihood of differential settlement.

The on-site presence of landslide prone soils was researched by reviewing available USDA Soil Reports. The USDA Soils Report for Harrison County, West Virginia defines the existing on-site soils by origin. The majority of the existing site soils are residual in nature. Residual soils are soils that form in-situ by weathering of bedrock. One on-site soil was classified as colluvium, which was formed by down slope movement of existing soils via landslides, soil creep, etc., and can generally be considered slide-prone. According to the USDA Soils Report, the colluvium accounted for approximately ten percent of the total site soil. However, the majority of the colluvium was located higher in elevation, thus having no impact on the Landfill. One colluvium deposit was located below the Upper Area, but the colluvium was removed prior to liner construction in accordance with construction documents. Therefore, based on site research, the Landfill area should not be prone to significant differential settlement nor landslides.

The Landfill was designed based on numerous subsurface investigations and on the results of stability analyses for this site. Calculations are located in the permit applications for the Lower Area, and Phases IV, V, and VI.

2.1.2 On-Site or Local Geologic or Geomorphologic Features

A review of the *August 2016 West Virginia Tax Districts Containing Karst Terrain* map reveals that the Landfill resides in an area with no sinkholes, subsidence, caverns, nor karstic rock formations. Furthermore, the Geologic Map of West Virginia shows that the rocks below the Landfill are comprised of the Monongahela and Conemaugh Groups, both of which do not contain rocks associated with karst terrain formation.

Current and historic topographic maps and aerial photographs were reviewed to determine whether on-site or local geomorphic features exist or existed in the past that could create an unstable area. The documents evaluated did not identify any of these features.

2.1.3 On-Site or Local Human-Made Features or Events (both Surface and Subsurface)

Permit documents, geologic maps, USGS topographic maps, mine maps, and coal resources maps were reviewed for evidence of surface and deep mining. Mine maps from the West Virginia Geologic and Economic Survey (WVGES) show that surface mining and deep mining were performed in areas of the site.

The Pittsburgh coal seam has been deep mined underneath the site, and crops out in limited areas of the Main Area and Lower Area where it was also surface mined. The WVGES mine maps show the Pittsburgh coal structure contours are approximate elevation (El.) 920 feet mean sea level (MSL) to the east of the Landfill and El. 1,020 feet MSL to the west. Existing ground (i.e. prior to CCR placement) in the Main and Lower Areas where CCR depth is the greatest is approximate El. 1,100 feet MSL; therefore, soil and rock overburden exceeds 120 and 160 feet thick, respectively, where the ground pressure would be the greatest. The minimum overburden thickness is 40 feet near the toe of the landfill where the ground

pressure from the Landfill would be the least. Prior to landfill construction, the areas where surface mining occurred were reclaimed to provide for a stable foundation. According to permit documents, investigations have determined that subsidence has not occurred at the Landfill. Mine stabilization and other preventive measures have been implemented to mitigate subsidence impacts. To mitigate for mine subsidence impacting the Landfill, the portions of the Pittsburgh coal seam mine workings where the rock overburden was less than 100 feet thick were filled with grout; for the portions of the mine workings where rock overburden was between 100 and 150 feet thick, a geosynthetic reinforcement liner support system was installed at the ground surface. Site areas where the overburden above deep mine workings is greater than 150 feet thick should not be impacted by mine subsidence.

The Redstone coal is typically of poor quality or absent and has not been deep mined below the landfill. The Waynesburg coal occurs only in the higher elevations along drainage divides. There is no recorded mining of Waynesburg coal on site.

3.0 Conclusion

Recognized and generally accepted good engineering practices have been incorporated into the design and construction of the Landfill to reduce the potential for disruption of the structural components of the Landfill. GAI Consultants, Inc. reviewed the available documents to determine if the existing Landfill was constructed in an unstable area. The soil, geologic, geomorphologic, and human-made features evaluated show that the Landfills are not located in an unstable area, or were addressed as part of the engineering design and construction of the Landfills.

4.0 References

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