

Disposal of Coal Combustion Residuals from Electric Utilities Rule
ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

PREFACE

Report Requirements

This report documents the status of the groundwater monitoring and corrective action program in place under the federal Coal Combustion Residuals (CCR) Rule. Containing data for the previous calendar year, it must be placed in the facility operating record by January 31 and posted publicly by March 2. It summarizes key actions completed, describes any challenges and how they were addressed, and projects key activities for the upcoming year. It must include a map or diagram depicting the CCR unit and all the wells in the monitoring network, identifying any that were decommissioned or installed in the previous year. In addition, it contains the monitoring data summary, a narrative discussing any transitions between detection monitoring and assessment monitoring and the reasons for those transitions.

What the Report Is

This report describes the first step in a phased, prescriptive process for monitoring groundwater near CCR storage facilities. It is a snap shot in time, showing how the data obtained during the report year compare to all the background data that have been obtained to date, and whether further monitoring for additional substances should be performed based on that comparison.

What the Report Is Not

The report does not make any determinations regarding potential environmental impact to or contamination of groundwater, and neither the raw data nor the initial statistical analysis should be independently or collectively interpreted in that way.

Report Methodology

Data comparison is done through a test to determine if monitoring results from wells adjacent to the CCR facility are statistically higher than background levels for that site. Therefore, as the data set increases over time, so does the confidence that any one result represents a statistically significant increase (SSI) over the background data. Groundwater moves slowly and both natural and man-made sources can impact groundwater. Therefore, the federal rule uses a phased approach with data verification steps in between. In this initial annual report, if a data result yields an SSI, the groundwater monitoring effort transitions from the detection program (measuring substances that move most rapidly in groundwater to identify a potential impact) to the assessment program (measuring substances that are of more concern including several that have regulatory standards).

2017 ANNUAL CCR GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

COAL COMBUSTION BYPRODUCT LANDFILL

Ft. Martin Power Station
Monongalia County, West Virginia

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Tetra Tech Project No. 212C-SW-00068

January 2018

**2017 ANNUAL CCR GROUNDWATER MONITORING AND
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- 3-1 CCR Rule Groundwater Monitoring Analytical Results Summary

FIGURES

- 2-1 CCR Rule Groundwater Monitoring System

1.0 INTRODUCTION

This 2017 Annual Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of FirstEnergy (FE), for the Coal Combustion Byproduct Landfill (CCBL or “CCR unit”) at the Ft. Martin Power Station (hereinafter referred to as the “Station”). The Station is located in Monongalia County, West Virginia. The report was developed to comply with requirements of 40 CFR § 257.90(e).

1.1 BACKGROUND AND SITE CHARACTERISTICS

CCRs produced at the Station are placed in the facility’s captive CCBL, which is located approximately 0.75 miles northwest 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. WV0075752. A WVDEP groundwater monitoring program for the landfill has been in effect since 1993. The permitted landfill facility consists of two separate, active disposal areas, a haul road that also doubles as the primary station access road, a gypsum stack out/loading pad, five combined leachate/sedimentation ponds, one equalization/settling pond, and a variety of stormwater management controls (channels, culverts, slope drains, etc.). The two active disposal areas are separated by the haul road and consist of the Original landfill (approximately 70 acres in size and located south of the Haul Road) and the Expansion Area landfill (approximately 77 acres in size and located north of the haul road). The Original landfill has historically been the primary disposal area, is unlined, but was built with a bottom ash drainage blanket placed on original ground that serves as a leachate collection layer. The Expansion Area landfill was constructed in 2009, is underlain with a composite liner system (geomembrane and geosynthetic clay liner), and has both leachate collection and leak detection layers. The Expansion Area landfill is permitted to be developed in two construction phases, referred to as Phase 1 and Phase 2. At this time, the Phase 1 area (approximately 30 acres) has been constructed and represents the active portion of the Expansion Area landfill.

Groundwater in the CCBL area occurs primarily within fractured bedrock. The Connellsville sandstone has been identified as the uppermost aquifer for CCR Rule groundwater monitoring over most of the CCBL area, with the underlying Clarksburg units considered the uppermost aquifer in a few limited areas where monitoring is required but the Connellsville sandstone has eroded away. Due to the site’s location on a topographic high and its geologic setting, there is no shallow groundwater flow to the site from offsite areas. Historic and recent groundwater level

data indicate groundwater flow at the CCBL to be primarily radial, away from the disposal areas and to the local springs/seeps in the nearby stream valleys, and that both flow systems (Connellsville and Clarksburg) exhibit very little seasonal and temporal fluctuations. A representative set of water level data from the current reporting period (2017) were used for contouring groundwater flow patterns at the site as shown on Figure 2-1. A more detailed discussion of the site's geologic and hydrogeologic characteristics is provided in Section 2.0 of this report.

1.2 REGULATORY BASIS

As required by § 257.90(e), of the CCR Rule, Owners or Operators of existing CCR landfills and surface impoundments must prepare an Annual Groundwater Monitoring and Corrective Action Report no later than January 31, 2018 and annually thereafter. According to the subject section, "For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year."

This report has been developed to meet the general requirements above and the specific requirements of § 257.90(e)(1) through (5), which include:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit (see Figure 2-1);

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken (see Section 2.1.1);

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs (see Sections 2.1.3 and 2.1.5 and Table 3-1);

(4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels) (see Section 2.3); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.”

In addition, the Owner and Operator must place the report in the facility's operating record as required by § 257.105(h)(1), provide notification of the report's availability to the appropriate State Director within 30 days of placement in operating record as required by § 257.106(h)(1), and place the report on the facility's publically accessible website, also within 30 days of placing the report in the operating record.

1.3 OVERVIEW OF REPORT CONTENTS

Section 1.0 of this report provided an overview of the CCR unit characteristics, regulatory basis, and a summary of the requirements for CCR Annual Groundwater Monitoring and Corrective Action Reports. Section 2.0 summarizes the status of key actions pertaining to CCR groundwater monitoring completed during 2017 for the CCBL and plans for the upcoming year. Section 3.0 presents Detection Monitoring results from groundwater sampling events completed in 2017.

2.0 GENERAL INFORMATION

This section provides an overview of the status of the CCR groundwater monitoring program through 2017 and key activities planned for 2018.

2.1 STATUS OF THE GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM

During calendar years 2016 and 2017, the following key actions were completed with regard to the CCR groundwater monitoring program for the CCBL.

2.1.1 Establishing a CCR Groundwater Monitoring Well System

Tetra Tech was contracted by FirstEnergy to review existing groundwater monitoring system information and site hydrogeologic data for the CCBL to evaluate the suitability of the existing system, determine whether additional monitoring wells were needed, and to install and develop any new wells to establish a system that meets the applicable requirements and performance standards for groundwater monitoring under 40 CFR §257.91.

Upon completing this review, eleven additional groundwater monitoring wells were installed in June of 2016 to fill data gaps and to develop a network in compliance with CCR Rule requirements. The CCR monitoring well network consists of three background wells (MW-101, -127, and -128), eight downgradient wells for the Original landfill (MW-106, -107, -129, -130, -131, -132, -133, and -134), eight downgradient wells for the Expansion Area landfill (MW-121, -123, -125, -135, -136, -137, -138, and -139), and two downgradient wells positioned between the two landfills (MW-109 and -112), as summarized in attached Table 2-1 and shown on attached Figure 2-1. A CCR Groundwater Monitoring System Evaluation Report (Tetra Tech, Inc., October, 2017), which discusses the basis for development of the monitoring well network and includes detailed information on the site geology, hydrogeology, and well completion records, was placed in the facility's Operating Record.

As required by § 257.91(f), the CCR groundwater monitoring well network was certified by a Professional Engineer to be in compliance with the applicable requirements of § 257.91. The subject certification was placed in both the facility's Operating Record and on the publically accessible website (<http://ccrdocs.firstenergycorp.com/>) on October 17, 2017.

2.1.2 Development of a Groundwater Monitoring Plan

On behalf of FE, Tetra Tech prepared a “Groundwater Monitoring Plan” to comply with applicable requirements of the CCR Rule. The document provides the sampling and analytical methodologies and procedures for collecting and reporting representative groundwater quality data from CCR monitoring wells at the CCBL. As required by § 257.93(a), the document provides procedures and techniques for the following:

- Sample collection;
- Sample preservation and shipment;
- Analytical procedures;
- Chain-of-custody control; and
- Quality assurance (QA) and quality control (QC).

In addition, the document includes the statistical plan describing the process for evaluating groundwater monitoring data developed from the CCR sampling and analysis program [§ 257.93(f)].

2.1.3 Completion of Background Groundwater Sampling

To fulfill the applicable requirements of § 257.94(b), eight independent rounds of background groundwater samples for analyzing all Appendix III and IV parameters from each of the CCR monitoring wells were collected prior to October 17, 2017. The sampling events were conducted on the following dates:

Sampling Event	Dates
1	8/29 to 9/14/16
2	11/29 to 12/19/16
3	2/1 to 2/23/17
4	3/29 to 4/4/17
5	4/27 to 5/8/17
6	6/5 to 6/12/17
7	7/5 to 7/12/17
8	8/3 to 8/15/17

2.1.4 Selection of Statistical Methods

Based on the attributes of the data set from the eight rounds of background sampling, statistical methods were selected among the available methods referenced in § 257.93(f) which met the performance standards referenced in § 257.93(g). Data from the first eight rounds of groundwater

analytical results collected at the background and downgradient CCR network wells at the site were evaluated in terms of percent non-detects and data distributions to select the appropriate statistical method for each parameter to identify any Statistically Significant Increases (SSIs) over background concentrations [§ 257.93(h)].

As required by § 257.91(f)(6), the statistical method selection was certified by a Professional Engineer as currently appropriate for evaluating the groundwater monitoring data for the CCBL at the Ft. Martin Power Station and as meeting the applicable requirements of § 257.93(f). The subject certification was placed in both the facility's Operating Record and on the publically accessible website on October 17, 2017.

2.1.5 Initial Detection Monitoring Sampling Event

In accordance with § 257.94, FirstEnergy collected the first round of Detection Monitoring samples from the background and downgradient CCR groundwater monitoring wells from September 13 to September 25, 2017 as summarized in the table below. The samples were analyzed for Appendix III parameters, with the laboratory analyses completed by October 5, 2017. The laboratory results are discussed in Section 3.0 of this report.

Monitoring Well	Location	Date Sampled	Purpose
MW-101	Background	9/14/17	Detection Monitoring
MW-127		9/14/17	Detection Monitoring
MW-128		9/14/17	Detection Monitoring
MW-106	Downgradient – Original Landfill	9/21/17	Detection Monitoring
MW-107		9/21/17	Detection Monitoring
MW-129		9/25/17	Detection Monitoring
MW-130		9/25/17	Detection Monitoring
MW-131		9/21/17	Detection Monitoring
MW-132		9/13/17	Detection Monitoring
MW-133		9/13/17	Detection Monitoring
MW-134		9/21/17	Detection Monitoring
MW-121		Downgradient – Expansion Area Landfill	9/19/17
MW-123	9/13/17		Detection Monitoring
MW-125	9/13/17		Detection Monitoring
MW-135	9/19/17		Detection Monitoring
MW-136	9/13/17		Detection Monitoring
MW-137	9/13/17		Detection Monitoring
MW-138	9/18/17		Detection Monitoring
MW-139	9/18/17		Detection Monitoring

Monitoring Well	Location	Date Sampled	Purpose
MW-109	Downgradient – Both Landfills	9/19/17	Detection Monitoring
MW-112		9/18/17	Detection Monitoring

2.2 PROBLEMS ENCOUNTERED/RESOLVED

There were no significant problems (e.g., insufficient groundwater yields for sampling, quality control issues, etc.) encountered during 2017 with regard to the CCR groundwater monitoring program.

2.3 TRANSITION BETWEEN MONITORING PROGRAMS (IF ANY)

During 2016 and 2017, the eight rounds of background sampling for all Appendix III and IV parameters were conducted followed by initiation of Detection Monitoring with collection of the first Detection Monitoring samples in September 2017. There was no transition between monitoring programs (e.g., Detection to Assessment Monitoring) during 2017.

2.4 KEY ACTIVITIES PLANNED FOR THE UPCOMING YEAR

The following are the key CCR groundwater compliance activities planned for 2018:

- Complete the statistical evaluation of the initial round of Detection Monitoring data to determine if there are any Appendix III parameter concentrations in downgradient wells exhibiting SSIs above background.
- If there are no SSIs, then continue with Detection Monitoring by conducting two semi-annual rounds of sampling and analysis for Appendix III constituents [per § 257.94(c)].
- If any SSIs are identified, then potentially conduct an Alternate Source Determination (ASD) [per § 257.94(e)(2)] to determine if a source other than the CCR unit may be causing the SSIs.
- If any SSI's are identified and an ASD indicates that an alternate source is not responsible for all the SSI's identified, then initiate Assessment Monitoring for Appendix IV constituents [per § 257.94(e)(1)].

3.0 DETECTION MONITORING INFORMATION

3.1 GROUNDWATER ANALYTICAL RESULTS SUMMARY

As referenced above, the CCR groundwater sampling and analysis program implemented through the end of 2017 consists of the eight background sampling rounds conducted between August 2016 and August 2017 for all Appendix III and IV parameters, and the initial Detection Monitoring round of sampling conducted in September 2017 for all Appendix III parameters. Table 3-1 presents the analytical results for these events. As previously noted, statistical evaluation of the Appendix III Detection Monitoring data in Table 3-1 remains in-progress as of the end of the 2017 reporting period (lab results were received in the fourth quarter of 2017 and a 90 day period is allowed by the CCR Rule for statistical evaluation which falls in the first quarter of 2018). If any Appendix III SSIs are identified, ASD or Assessment Monitoring activities will be undertaken as appropriate, and associated recordkeeping, notification, and reporting will be performed in accordance with the applicable requirements of 40 CFR §§ 257.94, 95, 105, 106, and 10

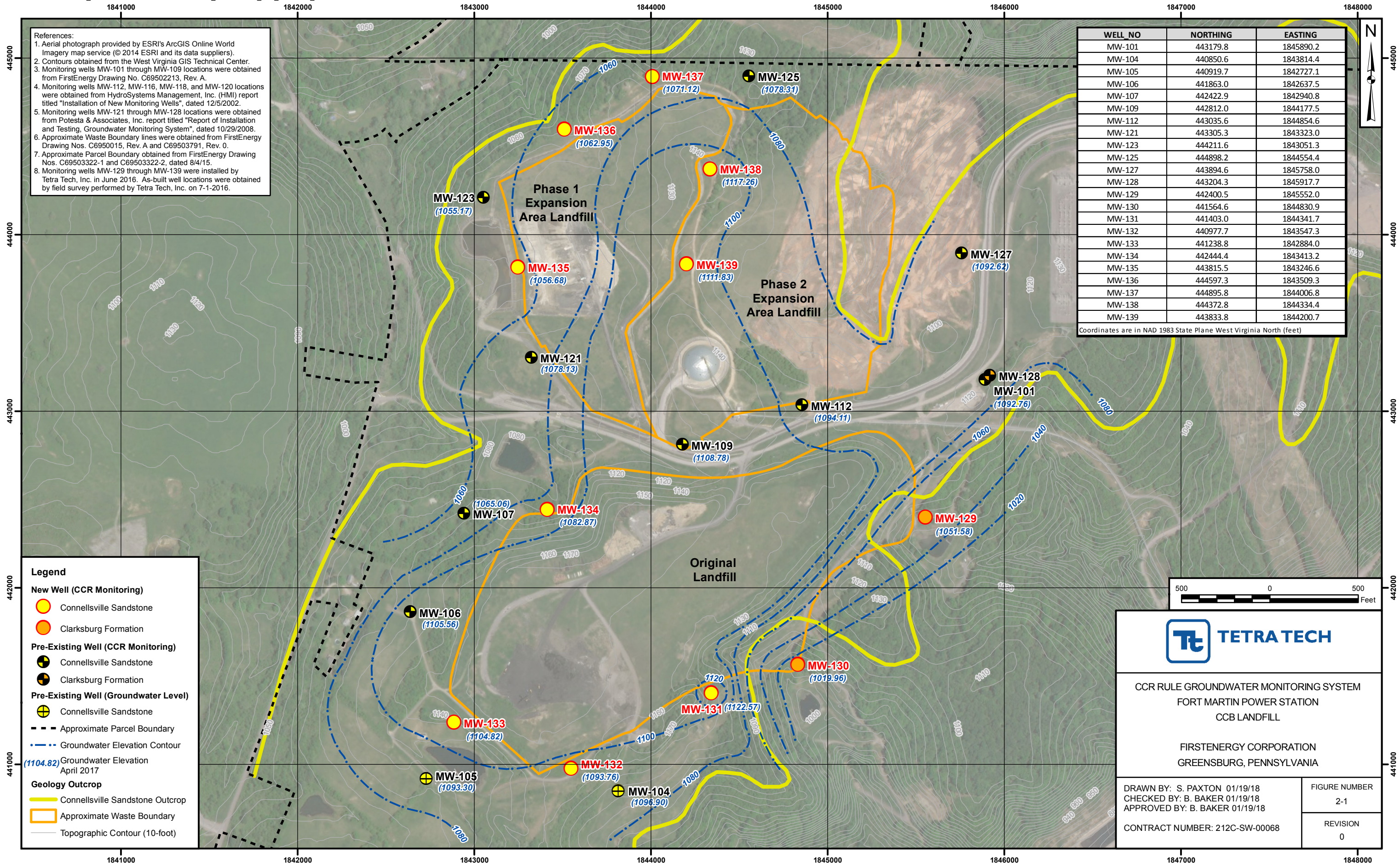
TABLES

TABLE 2-1
CCR RULE GROUNDWATER MONITORING SYSTEM WELL SUMMARY
FT. MARTIN CCB LANDFILL – 2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

Well	Year Installed	Formation Monitored	Ground Surface Elevation (ft MSL)	Total Well Depth (ft bgs)	Monitored Interval (ft bgs)	Monitored Interval (ft MSL)	Casing ID and Material
Background							
MW-101	1993	Connellsville SS	1113.05	34.0	24.0 – 34.0	1079.05 – 1089.05	2" - Sch. 40 PVC
MW-127	2008	Connellsville SS	1112.00	37.0	27.0 – 37.0	1075.00 – 1085.00	2" - Sch. 40 PVC
MW-128	2008	Clarksburg	1114.00	97.5	77.5 – 97.5	1016.50 – 1036.50	2" - Sch. 40 PVC
Original Landfill - Downgradient							
MW-106	1993	Connellsville SS	1111.51	44.0	24.0 – 44.0	1067.51 – 1087.51	2" - Sch. 40 PVC
MW-107	1993	Connellsville SS	1107.28	55.5	45.5 – 55.5	1051.78 – 1061.78	2" - Sch. 40 PVC
MW-129	2016	Clarksburg	1057.84	29.4	19.4 – 29.4	1028.40 – 1038.40	2" - Sch. 40 PVC
MW-130	2016	Clarksburg	1034.29	33.3	23.3 – 33.3	1001.03 – 1011.03	2" - Sch. 40 PVC
MW-131	2016	Connellsville SS	1033.45	25.5	15.5 – 25.5	1107.95 – 1117.95	2" - Sch. 40 PVC
MW-132	2016	Connellsville SS	1155.72	77.5	67.5 – 77.5	1078.27 – 1088.27	2" - Sch. 40 PVC
MW-133	2016	Connellsville SS	1130.70	45.3	35.3 – 45.3	1085.45 – 1095.45	2" - Sch. 40 PVC
MW-134	2016	Connellsville SS	1088.67	23.8	13.8 – 23.8	1064.91 – 1074.91	2" - Sch. 40 PVC
Expansion Area Landfill - Downgradient							
MW-121	2008	Connellsville SS	1098.00	39.0	29.0 – 39.0	1059.00 – 1069.00	2" - Sch. 40 PVC
MW-123	2008	Connellsville SS	1084.00	35.5	25.5 – 35.5	1048.50 – 1058.50	2" - Sch. 40 PVC
MW-125	2008	Connellsville SS	1140.41	75.0	55.0 – 75.0	1065.41 – 1085.41	2" - Sch. 40 PVC
MW-135	2016	Connellsville SS	1081.36	37.5	27.5 – 37.5	1043.82 – 1053.82	2" - Sch. 40 PVC
MW-136	2016	Connellsville SS	1075.59	22.5	12.5 – 22.5	1053.12 – 1063.12	2" - Sch. 40 PVC
MW-137	2016	Connellsville SS	1094.53	37.9	27.9 – 37.9	1056.64 – 1066.64	2" - Sch. 40 PVC
MW-138	2016	Connellsville SS	1150.12	49.9	39.9 – 49.9	1100.25 – 1110.25	2" - Sch. 40 PVC
MW-139	2016	Connellsville SS	1127.26	42.8	32.8 – 42.8	1084.48 – 1094.48	2" - Sch. 40 PVC
Both Landfills - Downgradient							
MW-109	1993	Connellsville SS	1122.79	54.5	34.5 – 54.5	1068.29 – 1088.29	2" - Sch. 40 PVC
MW-112	2002	Connellsville SS	1124.11	50.0	40.0 – 50.0	1074.11 – 1084.11	2" - Sch. 40 PVC

Notes: SS = sandstone MSL = mean sea level bgs = below ground surface ID = inside diameter PVC = polyvinyl chloride

FIGURES



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. Monitoring wells MW-101 through MW-109 locations were obtained from FirstEnergy Drawing No. C69502213, Rev. A.
4. Monitoring wells MW-112, MW-116, MW-118, and MW-120 locations were obtained from HydroSystems Management, Inc. (HMI) report titled "Installation of New Monitoring Wells", dated 12/5/2002.
5. Monitoring wells MW-121 through MW-128 locations were obtained from Potesta & Associates, Inc. report titled "Report of Installation and Testing, Groundwater Monitoring System", dated 10/29/2008.
6. Approximate Waste Boundary lines were obtained from FirstEnergy Drawing Nos. C6950015, Rev. A and C69503791, Rev. 0.
7. Approximate Parcel Boundary obtained from FirstEnergy Drawing Nos. C69503322-1 and C69503322-2, dated 8/4/15.
8. Monitoring wells MW-129 through MW-139 were installed by Tetra Tech, Inc. in June 2016. As-built well locations were obtained by field survey performed by Tetra Tech, Inc. on 7-1-2016.

WELL_NO	NORTHING	EASTING
MW-101	443179.8	1845890.2
MW-104	440850.6	1843814.4
MW-105	440919.7	1842727.1
MW-106	441863.0	1842637.5
MW-107	442422.9	1842940.8
MW-109	442812.0	1844177.5
MW-112	443035.6	1844854.6
MW-121	443305.3	1843323.0
MW-123	444211.6	1843051.3
MW-125	444898.2	1844554.4
MW-127	443894.6	1845758.0
MW-128	443204.3	1845917.7
MW-129	442400.5	1845552.0
MW-130	441564.6	1844830.9
MW-131	441403.0	1844341.7
MW-132	440977.7	1843547.3
MW-133	441238.8	1842884.0
MW-134	442444.4	1843413.2
MW-135	443815.5	1843246.6
MW-136	444597.3	1843509.3
MW-137	444895.8	1844006.8
MW-138	444372.8	1844334.4
MW-139	443833.8	1844200.7

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

Legend

New Well (CCR Monitoring)

- Connellsville Sandstone
- Clarksburg Formation

Pre-Existing Well (CCR Monitoring)

- Connellsville Sandstone
- Clarksburg Formation

Pre-Existing Well (Groundwater Level)

- Connellsville Sandstone

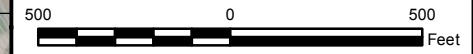
--- Approximate Parcel Boundary

- - - Groundwater Elevation Contour

(1104.82) Groundwater Elevation April 2017

Geology Outcrop

- Connellsville Sandstone Outcrop
- Approximate Waste Boundary
- Topographic Contour (10-foot)



TETRA TECH

CCR RULE GROUNDWATER MONITORING SYSTEM
FORT MARTIN POWER STATION
CCB LANDFILL

FIRSTENERGY CORPORATION
GREENSBURG, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/19/18 CHECKED BY: B. BAKER 01/19/18 APPROVED BY: B. BAKER 01/19/18	FIGURE NUMBER 2-1
CONTRACT NUMBER: 212C-SW-00068	REVISION 0