



INDIANA-KENTUCKY ELECTRIC CORPORATION

3932 U. S. Route 23
P. O. Box 468
Piketon, Ohio 45661
740-289-7200

WRITER'S DIRECT DIAL NO:
740-289-7259

May 30, 2023

Delivered Electronically

Mr. Brian Rockensuess
Commissioner
Indiana Department of Environmental Management
100 N. Senate Avenue
Mail Code 50-01
Indianapolis, IN 46204-2251

**Re: Indiana-Kentucky Electric Corporation
Notification of Successful ASD - Clifty Creek Station Landfill Runoff
Collection Pond**

Dear Mr. Rockensuess:

As required by 40 CFR 257.94(e)(2), the Indiana-Kentucky Electric Corporation (IKEC) is providing notification to the Commissioner (State Director) of the Indiana Department of Environmental Management that a successful Alternate Source Demonstration (ASD) has been identified for Appendix IV constituent Arsenic at the Clifty Creek Station Landfill Runoff Collection Pond. The ASD report provides sufficient evidence that the Statistically Significant Increase (SSI) that was identified resulted from a programmatic error in the sampling method, and not from the Landfill Runoff Collection Pond.

A copy of the ASD report, certified by IKEC's Qualified Engineer, has been posted to the IKEC's publicly accessible internet site at:

<http://www.ovec.com/CCRCompliance.php>

If you have any questions, or require any additional information, please call me at (740) 289-7259.

Sincerely,

A handwritten signature in black ink that reads "Jeremy Galloway".

Jeremy Galloway
Environmental Specialist

JDG:tlf



Stantec Consulting Services Inc.
10200 Alliance Road Suite 300, Cincinnati OH 45242-4754

May 30, 2023
File: 175532014, 100.110

Indiana-Kentucky Electric Corporation
Attention: Mr. Jeremy Galloway
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

**Reference: Alternate Source Demonstration Report
September 2022 Assessment Monitoring Event
Landfill Runoff Collection Pond
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana**

Dear Mr. Galloway,

This letter documents Stantec Consulting Services Inc.'s (Stantec's) certification of the alternate source demonstration report for the September 2022 assessment monitoring event for the Indiana-Kentucky Electric Corporation (IKEC) Clifty Creek Station's Landfill Runoff Collection Pond (LRCP) groundwater system in accordance with 40 CFR 257.95(g)(3).

The *Disposal of Coal Combustion Residuals From Electric Utilities* rule (CCR Rule) was signed by the U.S. Environmental Protection Agency (EPA) Administrator on December 19, 2014 and published in the Federal Register on April 17, 2015. IKEC contracted Applied Geology and Environmental Science, Inc. (AGES) to administer the Clifty Creek Station's CCR Rule groundwater monitoring program based on AGES's history with the site and the Indiana groundwater program. IKEC enlisted Stantec to provide engineering support for the demonstrations required under the CCR Rule. Stantec has worked with the Clifty Creek Station since 2005 and is the design engineer and engineer of record for the station's CCR Landfill and CCR pond closures. Ongoing coordination for the three companies during the CCR Rule groundwater schedule has included biweekly conference calls and meetings.

Stantec personnel have reviewed the *Coal Combustion Residuals Regulation, Alternate Source Demonstration Report, September 2022 Assessment Monitoring Event, Landfill Runoff Collection Pond, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana* (AGES, May 2023).

I, Jacqueline S. Harmon, being a Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this report was prepared in accordance with the reasonable skill and diligence required by customarily accepted professional practices and procedures normally provided in the performance of the services at the time when and the location in which the services were performed and

May 30, 2023
Mr. Jeremy Galloway
Page 2 of 2

Reference: **Alternate Source Demonstration Report**
September 2022 Assessment Monitoring Event
Landfill Runoff Collection Pond
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana

2. that the alternate source demonstration for arsenic for the September 2022 assessment monitoring event at the IKEC Clifty Creek Station's CCR Landfill meets the requirements specified in 40 CFR 257.95(g)(3).

SIGNATURE *Jacqueline S. Harmon*

DATE 5/30/2023

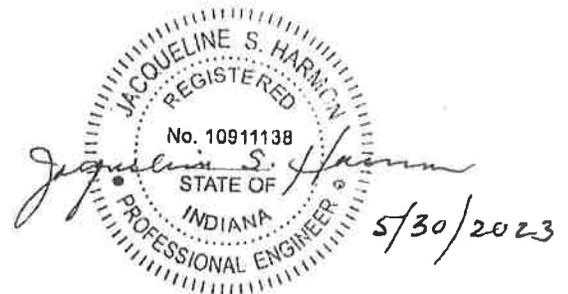
ADDRESS: Stantec Consulting Services Inc.
10200 Alliance Road, Suite 300
Cincinnati, Ohio 45242

TELEPHONE: (513) 842-8200

ATTACHMENTS: Applied Geology and Environmental Science, Inc. (AGES) (2023). Coal Combustion Residuals Regulation, Alternate Source Demonstration Report, September 2022 Assessment Monitoring Event, Landfill Runoff Collection Pond, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. May.

c. Matt Dagon, Matt Vaughan (Stantec)

jsh u:\175532014\technical_production\analysis\groundwater\asd 20230530\175532014_jet_20230530.docx





AGES

Applied Geology And Environmental Science, Inc.

2402 Hookstown Grade Road, Suite 200

Clinton, PA 15026

www.appliedgeology.net

P 412. 264. 6453

F 412. 264. 6567

**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2022 ASSESSMENT MONITORING EVENT
LANDFILL RUNOFF COLLECTION POND
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, JEFFERSON COUNTY, INDIANA**

MAY 2023

Prepared for:

INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC)

By:

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC.

**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2022 ASSESSMENT MONITORING EVENT
LANDFILL RUNOFF COLLECTION POND
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, JEFFERSON COUNTY, INDIANA**

MAY 2023

Prepared for:

INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC)

By:

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC.



Bethany Flaherty
Senior Scientist II



Robert W. King, L.P.G. #1237
President/Chief Hydrogeologist

**COAL COMBUSTION RESIDUALS REGULATION
 ALTERNATE SOURCE DEMONSTRATION REPORT
 SEPTEMBER 2022 ASSESSMENT MONITORING EVENT
 LANDFILL RUNOFF COLLECTION POND
 INDIANA-KENTUCKY ELECTRIC CORPORATION
 CLIFTY CREEK STATION
 MADISON, JEFFERSON COUNTY, INDIANA**

T A B L E O F C O N T E N T S

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Purpose of This Report	2
1.3 Technical Basis for ASD	2
2.0 DESCRIPTION OF THE LRCP	3
2.1 Unit Description.....	3
2.2 Hydrogeology	3
3.0 ALTERNATE SOURCE DEMONSTRATION	4
3.1 Arsenic Results for January 2016 through March 2022	5
3.2 Arsenic Results for September and December 2022	5
3.3 Arsenic Result for March 2023.....	6
3.4 Result of ASD	6
4.0 CONCLUSIONS AND RECOMMENDATIONS	6
5.0 REFERENCES	7

**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2022 ASSESSMENT MONITORING EVENT
LANDFILL RUNOFF COLLECTION POND
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, JEFFERSON COUNTY, INDIANA**

T A B L E O F C O N T E N T S

LIST OF TABLES

- 1 Summary of Arsenic GWPS Exceedances: Well CF-15-07
- 2 Groundwater Monitoring Network
- 3 Arsenic Analytical Results: Well CF-15-07
- 4 Turbidity Field Parameter Results: Well CF-15-07

LIST OF FIGURES

- 1 Monitoring Well Locations
- 2 Topographic Map
- 3 Generalized Geologic Cross-Section
- 4 Monitoring Well Locations and Generalized Groundwater Flow
- 5 Groundwater Flow - Uppermost Aquifer - September 2022

**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2022 ASSESSMENT MONITORING EVENT
LANDFILL RUNOFF COLLECTION POND
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, JEFFERSON COUNTY, INDIANA**

1.0 INTRODUCTION

On December 19, 2014, the United States Environmental Protection Agency (U.S. EPA) issued their final Coal Combustion Residuals (CCR) regulation which regulates CCR as a non-hazardous waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA) and became effective six (6) months from the date of its publication (April 2015) in the Federal Register, referred to as the “CCR Rule.”

The Indiana-Kentucky Electric Corporation (IKEC) contracted with Applied Geology and Environmental Science, Inc. (AGES) to administer the CCR Rule groundwater monitoring program at the Clifty Creek Station located in Madison, Jefferson County, Indiana. There are three (3) CCR units at the Clifty Creek Station (Figure 1):

- Type I Residual Waste Landfill (Type I Landfill);
- Landfill Runoff Collection Pond (LRCP); and,
- West Boiler Slag Pond (WBSP).

During the September 2022 Assessment Monitoring event, an Arsenic SSI was identified in one (1) well (CF-15-07) located downgradient of the LRCP; the SSI was confirmed in a resampling event in December 2022. Based on further research regarding CCR constituent concentrations in the well and resampling at the site, AGES has determined that the LRCP is not the source of the Arsenic exceedance. Therefore, AGES has prepared this Alternate Source Demonstration (ASD) Report to document these results.

Details regarding this evaluation are presented in this report.

1.1 Background

During the March 2018 Detection Monitoring event, Boron Statistically Significant Increases (SSIs) were confirmed in two (2) wells located downgradient of the LRCP and the CCR unit entered into Assessment Monitoring in September 2018. In accordance with §257.95 of the CCR Rule, IKEC completed the groundwater monitoring requirements of the Assessment Monitoring Program at the LRCP as described below.

The ninth round of Assessment Monitoring groundwater samples was collected between September 29 and October 6, 2022, from monitoring wells at the LRCP (Figure 1). All samples were collected in accordance with the Groundwater Monitoring Program Plan (GMPP) (AGES 2018b) and analyzed for all Appendix III and IV constituents.

Upon receipt, the groundwater monitoring data were statistically evaluated in accordance with §257.93(f) of the CCR Rule and the Clifty Creek Station CCR Statistical Analysis Plan (StAP) (Stantec 2021). The initial statistical evaluation identified a potential SSI for Arsenic in monitoring well CF-15-07 at the LRCP. The results of the statistical evaluation are summarized in Table 1.

In accordance with the StAP, IKEC resampled the well for Arsenic on December 27, 2022. Based on the result of the resampling event, the SSI for Arsenic was confirmed in monitoring well CF-15-07 (Table 1).

1.2 Purpose of This Report

The purpose of this report is to present an ASD and provide sufficient evidence that the SSI identified for Arsenic in well CF-15-07 resulted from **a programmatic error in the sampling method**, which lead to an alternate source, and not from the LRCP. The CCR Rule does not contain specific requirements for an ASD beyond what is stated, as follows, in §257.94(e)(2):

*“The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase **resulted from error in sampling**, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.”*

1.3 Technical Basis for ASD

From March 2019 through March 2022, well CF-15-07 had been sampled for analysis of Arsenic during a total of eight (8) Assessment Monitoring events. All Arsenic results for well CF-15-07 during these events were less than the GWPS of 10 micrograms per liter (ug/L). During the ninth Assessment Monitoring event in September 2022, Arsenic was detected at 12 ug/L, which

exceeded the GWPS. The exceedance was confirmed in a resampling event in December 2022, with Arsenic detected at 40 ug/L.

Based on these unexpected results, IKEC conducted further research regarding the potential for suspended sediments to impact the concentrations of CCR constituents in groundwater. Concentrations of CCR constituents in total (unfiltered) groundwater samples are often highly correlated to the amount of suspended sediment present in the samples. A recent study noted that greater than 95% of Cobalt was irreversibly adsorbed to solids when exposed to groundwater (Hostetler, Rehm, Karkowski and Kron 2020). According to this paper, Total Cobalt concentrations are believed to be an artifact of stabilized turbidity and not a release of Cobalt from a source area. Due to the low level and micro-scale of the suspended sediment, it does not appear to impact the turbidity of the samples as measured in Nephelometric Turbidity units (NTUs). Based on recent experience at other CCR sites, this same type of issue is also observed for Arsenic. Additional sampling was required to fully evaluate this issue.

Presented below is a description of the LRCP followed by a technical justification for the ASD, conclusions, and a recommended revision to the purge method in the GMPP to address this issue.

2.0 DESCRIPTION OF THE LRCP

2.1 Unit Description

The Type I Landfill and LRCP occupy an approximately 200-acre area situated within an eroded bedrock channel (Figures 1 and 2). The LRCP is an unlined pond located at the southern edge of the Type I Landfill to the north, natural grade to the east and west, and by a dam to the south that runs along the bank of the Ohio River. Approximately 508 acres of both landfill contact water and stormwater runoff drain to the LRCP. The base of the LRCP consists of historic hydraulically-placed fly ash. The LRCP does not receive CCR and any CCR within the LRCP is not being actively managed. Therefore, the LRCP is identified as an inactive unit under the CCR Rule.

2.2 Hydrogeology

Based on information in the Hydrogeologic Study Report (AGES 2007), bedrock beneath the Type I Landfill and the closed Type III Landfill (northeast of the LRCP) consists of impermeable limestone and shale of the Ordovician Dillsboro formation which is overlain by approximately 20 to 35 feet of gray clay. The gray clay is directly overlain by fly ash that had been historically hydraulically placed in the area. A generalized cross section showing the Type I Landfill and the location and limits of the closed Type III Landfill, and the extent of the historic, hydraulically placed fly ash is presented in Figure 3.

A limestone ridge known as the Devil's Backbone runs northeast to southwest along the length of the Type I Landfill, LRCP and closed Type III Landfill. The Devil's Backbone acts as an impermeable barrier that forces groundwater passing beneath both of the landfills to flow either toward the northeast or toward the southwest. A detailed hydrogeologic study determined that a groundwater flow divide is present near the northeast end of the bedrock channel and that all groundwater beneath the active Type I Landfill flows toward the southwest toward the LRCP (AGES 2007) (Figure 4).

An aquifer is not present beneath the approximate 200-acre footprint of the Type I and Type III Landfills. Therefore, alluvial deposits located southwest of the LRCP are designated as the uppermost aquifer for the Type I Landfill and the LRCP. For groundwater monitoring of the LRCP, a fine to medium grained sand with gravel, silt and clay found within alluvial deposits located southwest of the LRCP, is designated as the uppermost aquifer.

In November and December 2015, eight (8) monitoring wells were installed for the CCR groundwater monitoring network at the LRCP (Figure 1). Three (3) monitoring wells (CF-15-07, CF-15-08 and CF-15-09) were installed in the alluvial deposits (uppermost aquifer) located southwest of the LRCP. Based on exploratory soil borings and historical data, there were no suitable upgradient locations for the Type I Landfill. Well CF-15-04 was installed northeast of and outside the hydrologic influence of the Type I Landfill and the closed Type III Landfill to serve as a background well for the LRCP. Wells CF-15-05 and CF-15-06 were installed in alluvial deposits along the Ohio River to serve as background monitoring wells. Wells WBSP-15-01 and WBSP-15-02 are located southeast of the impermeable Devil's Backbone and are hydraulically separated from groundwater at the Type I Landfill and LRCP. These two (2) wells were also designated as background wells for the LRCP. Two (2) additional wells (CF-19-14 and CF-19-15) were installed at the southwest end of the property during the characterization of the LRCP. Table 2 presents construction details for the monitoring wells in the groundwater monitoring network for the LRCP.

Based on groundwater levels collected at the LRCP since 1994, groundwater in the uppermost aquifer at the LRCP flows to the southwest, toward the Ohio River. Historic groundwater data also indicates that groundwater flow at the southwest end of the property is affected by the elevation of the adjacent Ohio River. Evidence of routine, brief flow reversals (i.e., groundwater flows from the Ohio River back toward the southwest end of the property) and periodic flooding of the southwest end of the property have also been observed. A groundwater contour map for the uppermost aquifer southwest of the LRCP in September 2022 is included in Figure 5.

3.0 ALTERNATE SOURCE DEMONSTRATION

Groundwater sampling under the CCR Program is conducted in general accordance with Revision 1 of the CCR GMMP, Clifty Creek Station (AGES 2018b). Per the plan, all wells are purged using the low flow method, with varied pumping rates. Each well is purged until the following field parameters stabilize:

- Temperature ($\pm 3\%$);
- Specific Conductivity ($\pm 3\%$);
- pH (± 0.01);
- Oxidation-Reduction Potential (ORP) (± 10 millivolts);
- Dissolved Oxygen (DO) ($+10\%$); and
- Turbidity ($\pm 10\%$).

Based on the results for Arsenic for well CF-15-07, this purge method sampling may allow for extremely low levels of sediment in the samples, which is believed to be the cause of the Arsenic exceedances.

To evaluate this issue, well CF-15-07 was sampled in March 2023 using a modified purge method that included the approved low flow purge method but for a total of four (4) hours prior to sampling (rather than until stabilization of field parameters). Based on results from similar sites, the use of a longer purge time appears to reduce the volume of micro-scale sediments that are believed to be the source of the Arsenic exceedances.

Presented below is a summary of Arsenic results for well CF-15-07 and a discussion of the Arsenic result using the modified purge method for the well.

3.1 Arsenic Results for January 2016 through March 2022

Under the CCR Program, well CF-15-07 has been sampled for Arsenic a total of 17 times using the above procedure from January 2016 through March 2022. Arsenic analytical results are included in Table 3. Arsenic results have ranged from non-detect (March 2021) to 7.6 ug/L in September 2020. The total purge times and purge volumes for the well have varied based on time required for stabilization of field parameters. The final turbidity values prior to sampling are presented in Table 4. For these events, final turbidity values averaged 5.0 NTUs and ranged from 2.12 to 21.0 NTUs.

3.2 Arsenic Results for September and December 2022

During the September 2022 Assessment Monitoring event, well CF-15-07 was purged at a rate of 50 milliliters per minute for 90 minutes; a total of approximately 1.25 gallons of groundwater were purged. At this point, all field parameters had stabilized within the limits listed above. The final turbidity value was 3.62 NTUs. For this event, the Arsenic concentration (12 ug/L) exceeded the applicable GWPS of 10 ug/L.

In accordance with the StAP, well CF-15-07 was resampled for Arsenic analysis in December 2022. During this resampling event, the well was purged at a rate of 200 milliliters per minute; a total of approximately seven (7) gallons of groundwater were purged. At this point, all field

parameters had stabilized within the limits listed above. The final turbidity value was 3.97 NTUs. For this event, the Arsenic concentration (40 ug/L) also exceeded the applicable GWPS of 10 ug/L.

3.3 Arsenic Result for March 2023

During the March 2023 sampling event, well CF-15-07 was purged at a rate of 125 milliliters per minute for four (4) hours (240 minutes); a total of approximately 10 gallons of groundwater were purged. At this point, all field parameters had also stabilized within the limits listed above. The final turbidity value was 11.2 NTUs. For this event, the Arsenic concentration (8.6 ug/L) was less than the applicable GWPS of 10 ug/L.

3.4 Result of ASD

Based on the results above, the use of a modified purge time of four (4) hours reduced the volume of micro-scale sediment, which was the alternate source of Arsenic, in the samples. As a result, the Arsenic concentration at well CF-15-07 is once again less than the GWPS of 10 ug/L.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The ASD has been completed in general accordance with CCR Rule, which allows for a successful ASD in the case of an error in the sampling. In this case, the purge method allowed for the presence of micro-scale sediment in the samples, which became an alternate source of the Arsenic. Based on this demonstration presented above, the LRCP is not the source of the Arsenic detected in CCR monitoring well CF-15-07. Therefore, it is recommended that the LRCP remain in Assessment Monitoring.

To further address this issue, it is recommended that the GMPP be revised to include the potential use of a four (4) hour purge time for confirmation re-sampling of any wells that exhibit an SSI during an initial sampling round. This modification to the purge method will ensure that micro-scale sediment is not an alternate source of any CCR constituent in groundwater.

5.0 REFERENCES

Applied Geology and Environmental Science, Inc. (AGES), 2018a. Coal Combustion Residuals Regulation Monitoring Well Installation Report. Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Indiana. October 2016, Revision 1.0 November 2018a.

Applied Geology and Environmental Science, Inc. (AGES), 2018b. Coal Combustion Residuals Regulation Groundwater Monitoring Program Plan. Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Indiana. September 2016, Revision 1.0 November 2018b.

Applied Geology and Environmental Science, Inc. (AGES), 2007. Hydrogeologic Study Report, Clifty Creek Coal Ash Landfill Modification, Clifty Creek Station, Madison, Indiana. November 2007.

Hostetler, C., Rehm, B. Karwoski, T., and Kron, N., 2020. Groundwater Monitoring Plan Considerations for Corrective Action Sites, SCS Engineers, Inc.: www.scsengineers.com.

Stantec Consulting Services, Inc. (Stantec), 2021. Coal Combustion Residuals Regulation Statistical Analysis Plan, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. July 2021.

TABLES

TABLE 1
SUMMARY OF ARSENIC GWPS EXCEEDANCES: WELL CF-15-07
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential Exceedance Parameter (Units)	9th Assessment Monitoring Sampling Event September 2022		9th Assessment Monitoring Resampling Event December 2022	
		Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)
CF-15-07	Arsenic (ug/L)	12	10	40	Yes

Notes:

1. GWPS: Groundwater Protection Standard.
2. µg/L: Micrograms per liter.

**TABLE 2
GROUNDWATER MONITORING NETWORK
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA**

Monitoring Well ID	Designation	Date of Installation	Coordinates		Ground Elevation (ft) ²	Top of Casing Elevation (ft) ²	Top of Screen Elevation (ft)	Base of Screen Elevation (ft)	Total Depth From Top of Casing (ft)
			Northing	Easting					
CF-15-04	Background	12/3/2015	451482.81	569307.19	465.55	468.03	439.55	429.55	38.48
CF-15-05	Background	12/1/2015	447491.91	565533.64	439.85	442.58	422.85	412.85	29.73
CF-15-06	Background	11/30/2015	447026.92	565190.31	437.49	440.40	431.49	421.49	18.91
CF-15-07	Downgradient	11/23/2015	443135.08	562259.25	438.61	441.11	432.61	422.61	18.50
CF-15-08	Downgradient	11/19/2015	443219.57	562537.29	460.33	462.79	430.33	420.33	42.46
CF-15-09	Downgradient	11/25/2015	443445.96	562871.69	456.73	459.45	447.73	442.73	16.72
WBSP-15-01	Background	11/30/2015	449072.27	566322.12	466.93	469.36	458.93	448.93	20.43
WBSP-15-02	Background	11/11/2015	449803.91	566987.30	473.83	476.76	457.83	452.83	23.93

Notes:

1. The Well locations are referenced to the North American Datum (NAD83), east zone coordinate system.
2. Elevations are referenced to the North American Vertical Datum (NAVD) 1988.

TABLE 3
ARSENIC ANALYTICAL RESULTS: WELL CF-15-07
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Sampling Event Date	Arsenic Result (ug/L)
Jan-16	4.08
Mar-16	2.51
May-16	4.47
Jul-16	4.83
Aug-16	5.4
Nov-16	6.12
Feb-17	6.22
Jun-17	5.07
Aug-17	5.32
Oct-18	6.81
Mar-19	4.6 J
Oct-19	7.5
Mar-20	3.7 J
Sep-20	7.6
Mar-21	5 U
Sep-21	7.3
Mar-22	6.7
Sep-22	12
Dec-22	40
Mar-23	8.6

Notes:

1. µg/L: Micrograms per liter.
2. J: Estimated value.
3. U: Result non-detect.

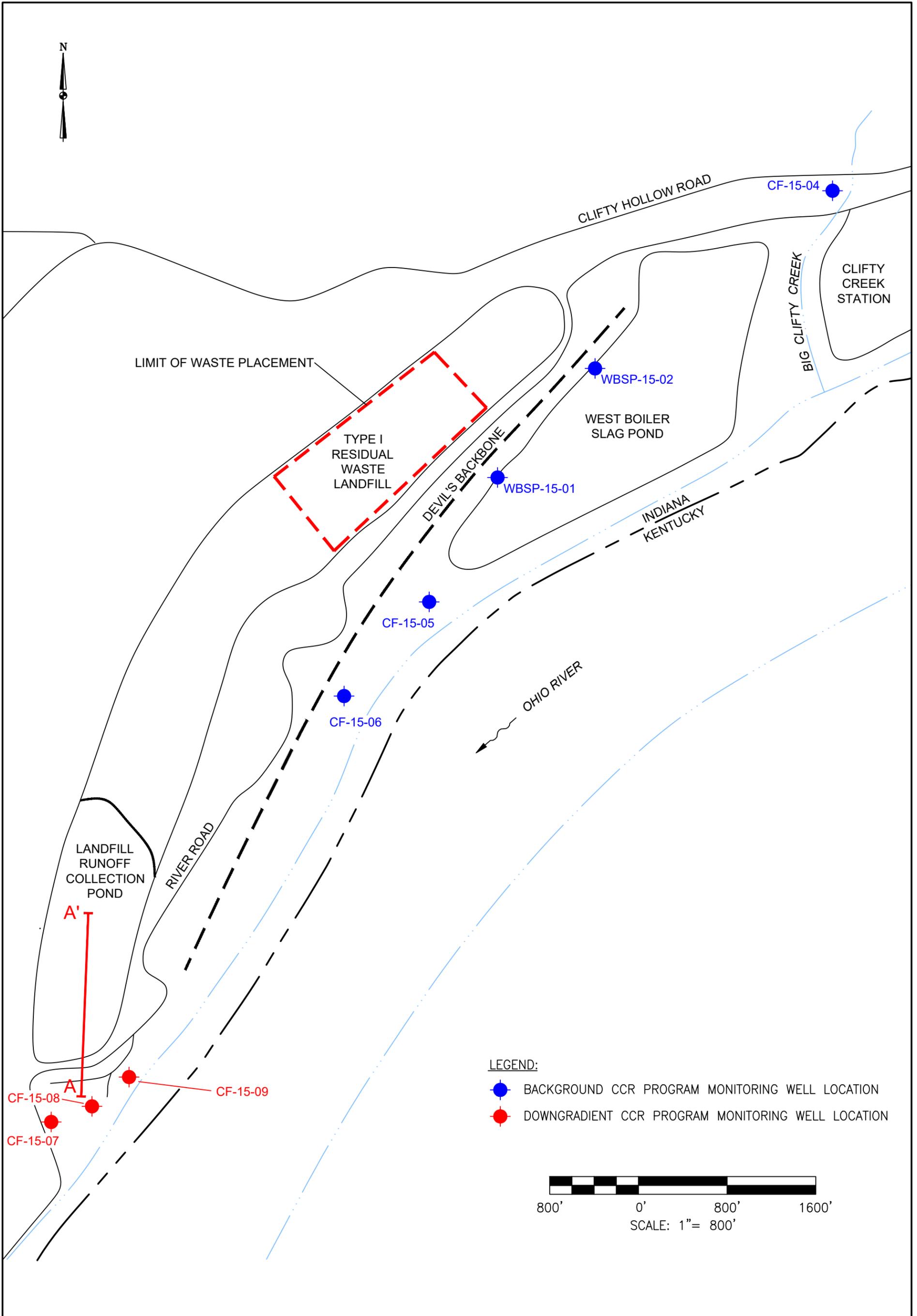
TABLE 4
TURBIDITY FIELD PARAMETER RESULTS: WELL CF-15-07
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Sampling Event Date	Turbidity Result (NTUs)
Jan-16	4.63
Mar-16	4.63
May-16	4.11
Jul-16	4.36
Aug-16	2.87
Nov-16	3.82
Feb-17	3.02
Jun-17	3.98
Aug-17	3.92
Oct-18	4.38
Mar-19	4.89
Oct-19	4.08
Mar-20	3.01
Sep-20	4.09
Mar-21	2.36
Sep-21	2.12
Mar-22	21.0
Sep-22	3.62
Dec-22	3.97
Mar-23	11.20

Notes:

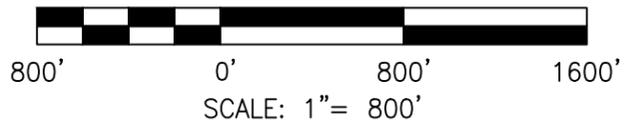
1. NTUs: Nephelometric Turbidity units.

FIGURES



LEGEND:

-  BACKGROUND CCR PROGRAM MONITORING WELL LOCATION
-  DOWNGRAIDENT CCR PROGRAM MONITORING WELL LOCATION

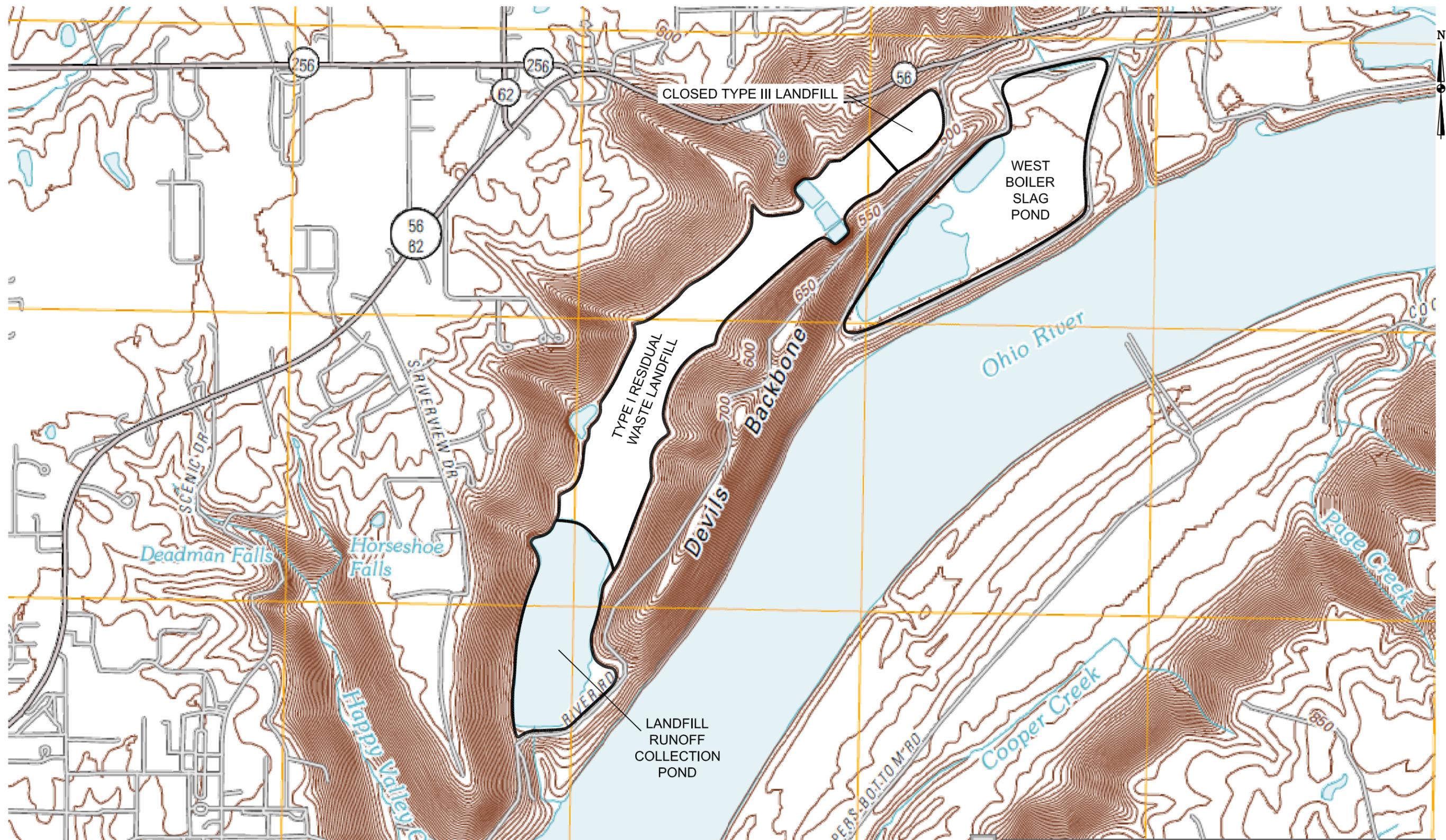


DRAWN BY	AB
DATE	
CHECKED BY	
JOB NO.	2017114-CLI
DWG FILE	IKEC_Clifty_ASD_MW Locs_b03.dwg
DRAWING SCALE	NOT TO SCALE



AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA LANDFILL RUNOFF COLLECTION POND MONITORING WELL LOCATIONS	
DRAWING NAME	FIGURE 1
REV.	0



SOURCE: USGS MADISON WEST 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, 2010.

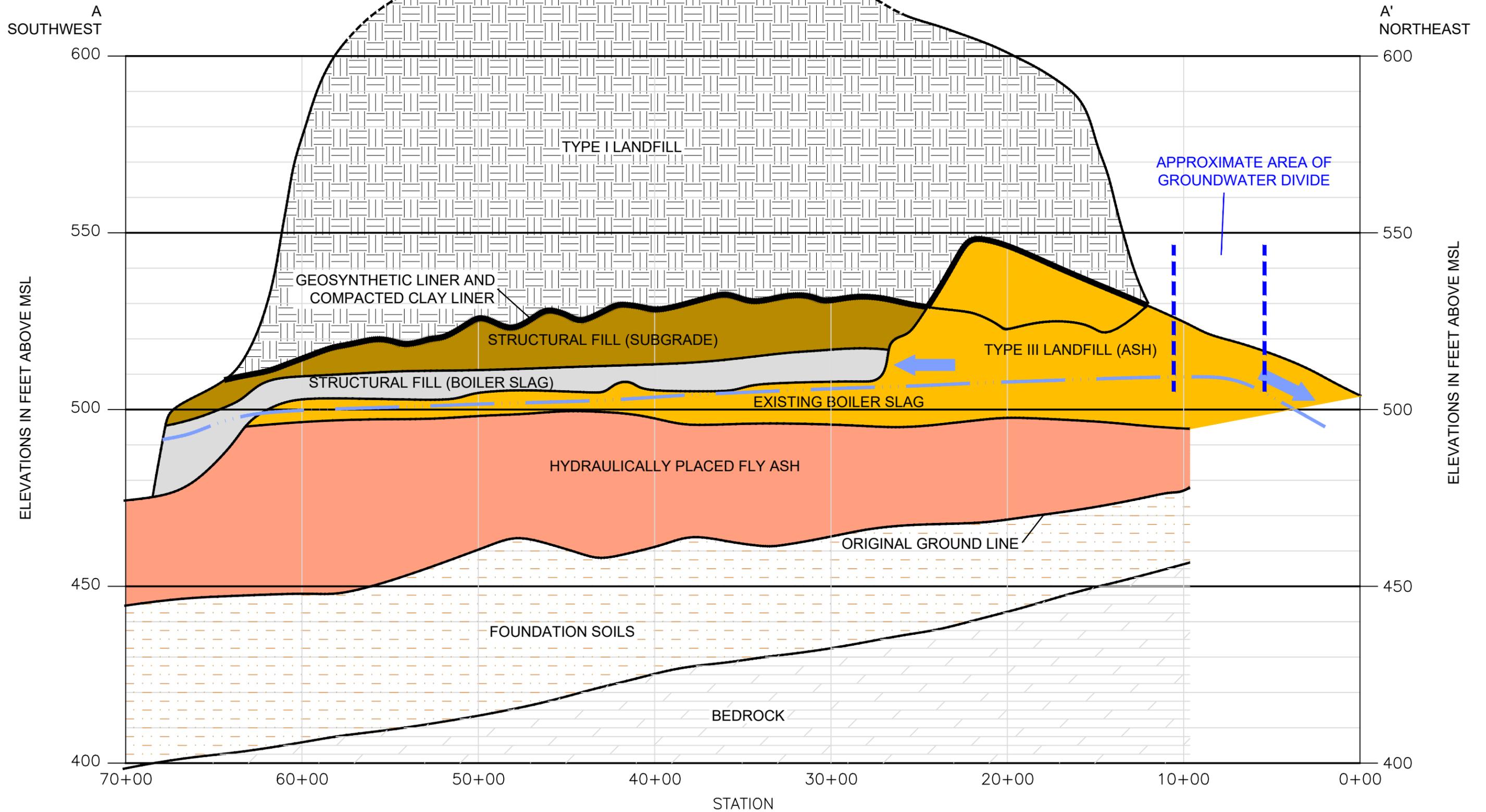
DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2015067-CLIF
DWG FILE	IKEC_Clifty MW Install_USGS TOPO b05.dwg
DRAWING SCALE	NOT TO SCALE

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
TOPOGRAPHIC MAP

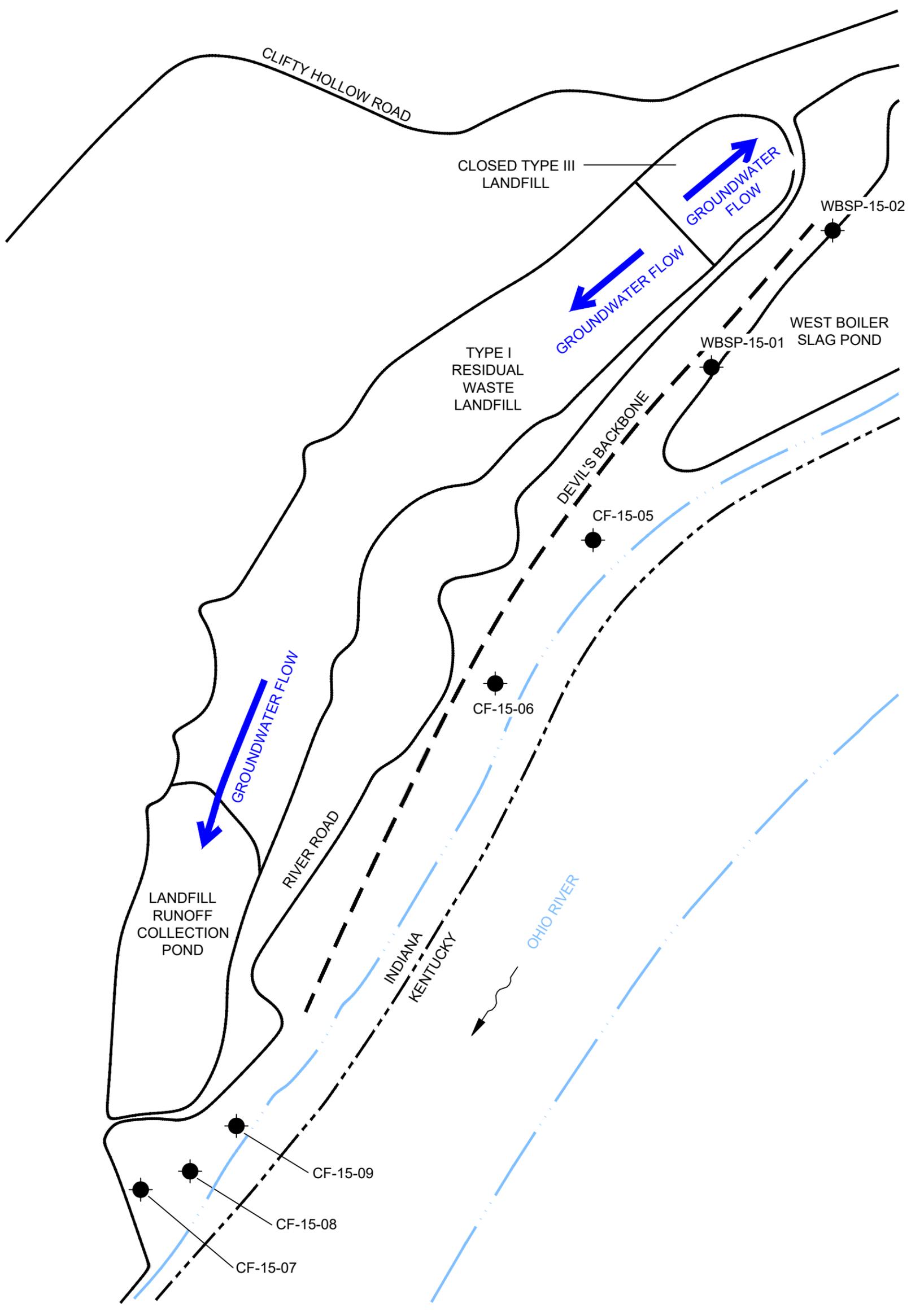
DRAWING NAME	FIGURE 2	REV.	0
--------------	----------	------	---



DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2018070-2-CLI
DWG FILE	IKEC_Clifty MW Install_Cross Sec b08.dwg
DRAWING SCALE	NOT TO SCALE

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA	
TYPE I RESIDUAL WASTE LANDFILL GENERALIZED GEOLOGIC CROSS-SECTION A-A' (SOUTHWEST-NORTHEAST)	
DRAWING NAME	REV.
FIGURE 3	0



LEGEND:

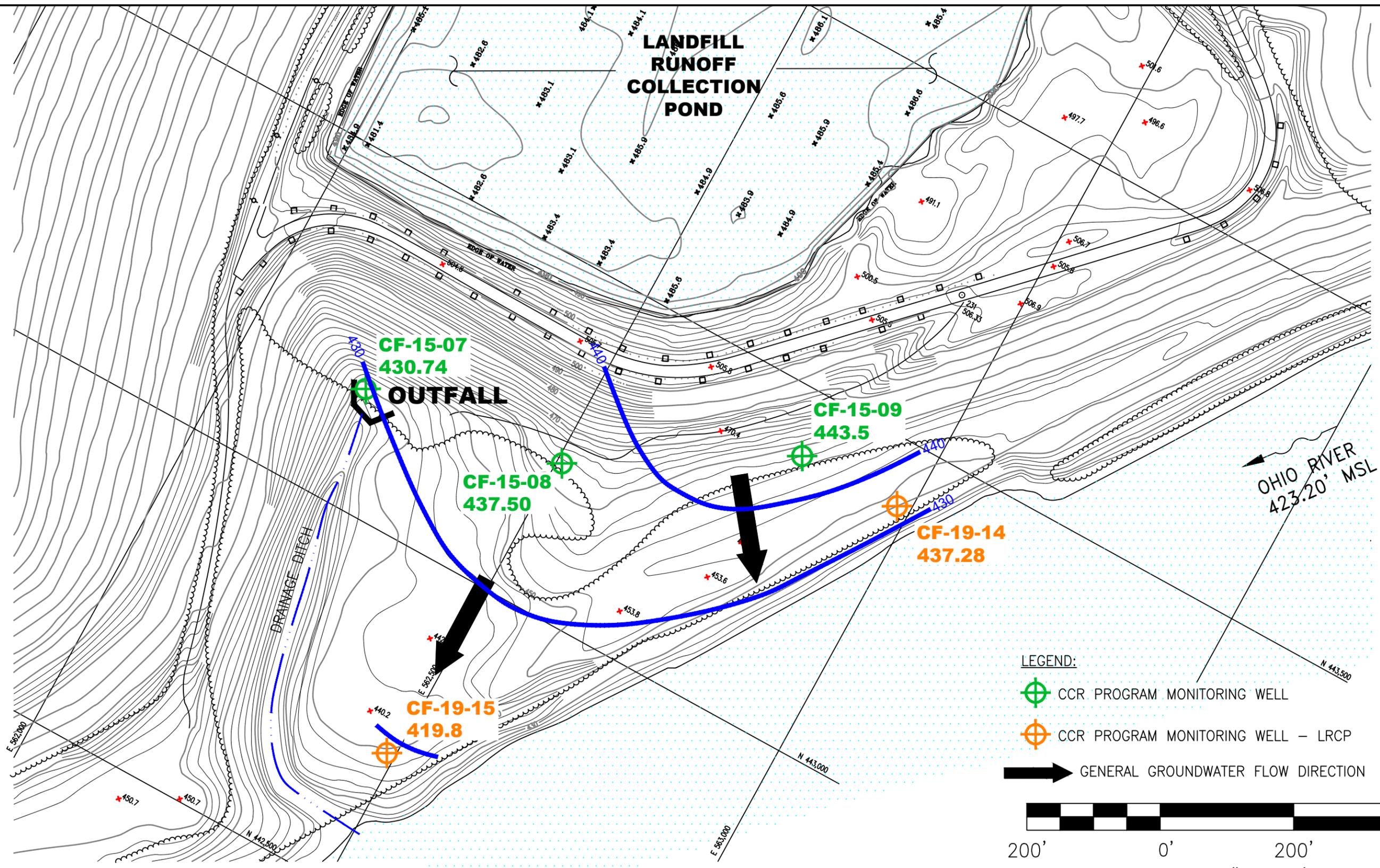
● MONITORING WELL LOCATION

NOTE:
SEE FIGURE 1 FOR LOCATION OF BACKGROUND WELL CF-15-04.

DRAWN BY	AB
DATE	
CHECKED BY	
JOB NO.	2015067-CLIF
DWG FILE	IKEC_Clifty MWs_LANDFILL b01.dwg
DRAWING SCALE	NOT TO SCALE

AGES
Applied Geology And Environmental Science, Inc.
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA LANDFILL RUNOFF COLLECTION POND MONITORING WELL LOCATIONS AND GENERALIZED GROUNDWATER FLOW	
DRAWING NAME	FIGURE 4
REV.	0



NOTE:
WELLS CF-19-14 AND CF-19-15 WERE INSTALLED IN
MARCH 2019 DURING THE CHARACTERIZATION OF THE LRCP.

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2022013-CLIFTY
DWG FILE	B-3_IKEC_Clifty_GW Flow_Appx B_LRCP_SEPT 2022.dwg
DRAWING SCALE	AS SHOWN

**Applied Geology and
Environmental
Science, Inc.**
2402 Hookstown Grade Road, Suite 200
Clinton, PA 15026
412.264.6453

INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA CCR PROGRAM TYPE I RESIDUAL WASTE LANDFILL AND LANDFILL RUNOFF COLLECTION POND GROUNDWATER FLOW - UPPERMOST AQUIFER SEPTEMBER 2022	
DRAWING NAME	FIGURE 5
REV.	0