



OHIO VALLEY ELECTRIC CORPORATION

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

January 31, 2025

Delivered Electronically

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

**Re: Indiana-Kentucky Electric Corporation- Clifty Creek Station
2024 Annual Groundwater Monitoring and Corrective Actions
Report**

Dear Mr. Rockensuess and Incoming Commissioner:

As required by 40 CFR 257.106(h)(1), Indiana-Kentucky Electric Corporation (IKEC) is providing notification to the Commissioner of the Indiana Department of Environmental Management (IDEM) that the eighth Annual CCR Groundwater Monitoring and Corrective Actions Report has been completed in compliance with 40 CFR 257.90(e) for IKEC's Clifty Creek Station. The groundwater monitoring and corrective action report was prepared by AGES, Inc., the site's hydrogeologist, summarizing the findings for 2024. The report has been placed in the facility's operating record in accordance with 40 CFR 257.105(h)(1), as well as, on the company's publicly accessible internet site in accordance with 40 CFR 257.107(h)(1), which can be viewed at <http://www.ovec.com/CCRCCompliance.php>

If you have any questions, or require any additional information, please call me at (740) 289-7259, or you can contact Gabe Coriell at (740) 289-7267.

Sincerely,

A handwritten signature in black ink that reads "Jeremy Galloway". The signature is written in a cursive, flowing style.

Jeremy Galloway
Environmental Specialist

JDG: zsh



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

January 31, 2025

Project/File: 173410747

Mr. Jeremy Galloway

Ohio Valley Electric Corporation
Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

**Reference: 2024 Annual Groundwater Monitoring and Corrective Action Report
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Generating Station
Madison, Indiana**

Dear Mr. Galloway,

The EPA Final CCR Rule requires owners or operators of existing CCR landfills and surface impoundments to prepare an annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by 40 CFR 257.90(e). For the Indiana-Kentucky Electric Corporation (IKEC), this applies to the Clifty Creek Station's West Boiler Slag Pond, Landfill Runoff Collection Pond, and CCR Landfill.

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. At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

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;
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;
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;
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 level); and

January 31, 2025
Mr. Jeremy Galloway
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**Reference: 2023 Annual Groundwater Monitoring and Corrective Action Report
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Generating Station
Madison, Indiana**

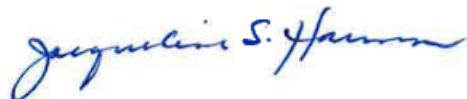
5. Other information required to be included in the annual report as specified in §§257.90 through 257.98.

IKEC has retained Applied Geology and Environmental Science, Inc. of Clinton, Pennsylvania (AGES) to perform the Clifty Creek Station's groundwater monitoring and corrective action support under the EPA Final CCR Rule. The 2024 CCR Regulation Groundwater Monitoring and Corrective Action Report (GWCAR) was prepared by AGES to present the annual groundwater monitoring at the West Boiler Slag Pond, Landfill Runoff Collection Pond, and CCR Landfill of the Clifty Creek Station. Stantec Consulting Services Inc. (Stantec) has reviewed AGES (2025), and it meets the requirements specified in 40 CFR 257.90(e).

Please contact us with any questions or concerns. We appreciate the opportunity to continue to work with the Clifty Creek Generating Station and the Indiana-Kentucky Electric Corporation.

Regards,

STANTEC CONSULTING SERVICES INC.



Jacqueline S. Harmon PE
Project Manager
Phone: (513) 842-8200 EXT 8220
jacqueline.harmon@stantec.com

Attachment: AGES (2025). Coal Combustion Residuals Regulation, 2024 Groundwater Monitoring and Corrective Action Report, Indiana-Kentucky Electric Corporation. Clifty Creek Station, Madison, Indiana, January.

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**COAL COMBUSTION RESIDUALS REGULATION
2024 GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT**

**INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, INDIANA**

JANUARY 2025

Prepared for:

INDIANA-KENTUCKY ELECTRIC CORPORATION

Prepared by:

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC.

**COAL COMBUSTION RESIDUALS REGULATION
2024 GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, INDIANA**

JANUARY 2025

Prepared for:

INDIANA-KENTUCKY ELECTRIC CORPORATION

Prepared by:

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC.



Bethany Flaherty
Project Scientist II



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

**COAL COMBUSTION RESIDUALS REGULATION
2024 GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
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CLIFTY CREEK STATION
MADISON, INDIANA**

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INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, INDIANA**

LIST OF ACRONYMS

ACM	Assessment of Corrective Measures
AGES	Applied Geology and Environmental Science, Inc.
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
GMPP	Groundwater Monitoring Program Plan
GWPS	Groundwater Protection Standard
IDEM	Indiana Department of Environmental Management
IKEC	Indiana-Kentucky Electric Corporation
LRCF	Landfill Runoff Collection Pond
MCL	Maximum Contaminant Level
MW	Megawatt
OVEC	Ohio Valley Electric Corporation
RCRA	Resource Conservation and Recovery Act
StAP	Statistical Analysis Plan
SSI	Statistically Significant Increase
Stantec	Stantec Consulting Services Inc.
Type I Landfill	Type I Residual Waste Landfill
S.U.	Standard Unit
ug/L	micrograms per liter
U.S. EPA	United States Environmental Protection Agency
WBSP	West Boiler Slag Pond

**COAL COMBUSTION RESIDUALS REGULATION
2024 GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, INDIANA**

EXECUTIVE SUMMARY

The Clifty Creek Station, located in Madison, Indiana, is a 1,304-megawatt (MW) coal-fired generating plant operated by the Indiana-Kentucky Electric Corporation (IKEC), a subsidiary of the Ohio Valley Electric Corporation (OVEC). The Clifty Creek Station has six (6) 217.26-MW generating units and has been in operation since 1955. Beginning in 1955, ash products were sluiced to disposal ponds located in the plant site. During the course of plant operations, Coal Combustion Residuals (CCRs) have been managed and disposed of in various units at the station. There are three (3) CCR units at the Clifty Creek Station:

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

Under the CCR program, IKEC installed a groundwater monitoring system at each unit in accordance with the requirements of the CCR Rule; the Type I Landfill and LRCP are included in a multi-unit monitoring system. The units are discussed separately in this executive summary.

A brief overview of the current status of groundwater monitoring and corrective action programs for the CCR units is provided below:

Type I Landfill

At the start of this 2024 reporting period, the Type I Landfill was operating under the Detection Monitoring program in accordance with §257.94 of the CCR Rule. The 12th round of Detection Monitoring was conducted in March 2024. Based on the sampling results, it was determined that there was a confirmed Appendix III Statistically Significant Increase (SSI) over background for Chloride in well CF-15-08 during the March 2024 Detection Monitoring Event. The Type I Landfill entered Assessment Monitoring in October 2024.

In accordance with §257.95 of the CCR Rule, the 1st round of Assessment Monitoring samples were collected in September 2024. Based on the sampling results, it was determined that there were Appendix III SSIs over background. SSIs were confirmed for in wells CF-15-08 (Boron, Calcium, Chloride, and Sulfate) and CF-15-09 (Boron) for the September 2024 Assessment

Monitoring Event. For this event, IKEC prepared an Alternate Source Demonstration (ASD) that indicated that the Boron detected in groundwater came from a source other than the Type I Landfill

Appendix IV constituents, Arsenic in well CF-15-07 and Molybdenum in well CF-15-08 exceeded the GWPS during the 1st Assessment Monitoring Event. Based on these exceedances of the Groundwater Protection Standards (GWPS) for Appendix IV constituents, an assessment of corrective measures (ACM) has been initiated and progress will continue into 2025.

Based on these results, the Type I Landfill will remain operating under the Assessment Monitoring program in accordance with §257.95 of the CCR Rule.

LRCP

At the start of this 2024 reporting period, the LRCP was operating under the Assessment Monitoring program in accordance with §257.95 of the CCR Rule. Based on exceedances of the GWP) for an Appendix IV constituent (Molybdenum at wells CF-15-08 and CF-15-09), an ACM was initiated on May 15, 2019. An ACM Report was completed on September 19, 2019 (Revision 1.0, November 2020); a public meeting was held on November 7, 2019.

In 2024, the 12th and 13th rounds of Assessment Monitoring were conducted in March and September, respectively. Based on the sampling results, it was determined that there were Appendix III SSIs over background. SSIs were confirmed in wells CF-15-08 (Boron and Chloride) and CF-15-09 (Boron) for the March 2024 Assessment Monitoring Event and in wells CF-15-08 (Boron, Calcium, Chloride, and Sulfate) and CF-15-09 (Boron) for the September 2024 Assessment Monitoring Event. Appendix IV constituents, Arsenic in well CF-15-07 and Molybdenum in well CF-15-08 exceeded the GWPS during both Assessment Monitoring Events.

Molybdenum did not exceed the GWPS in wells located at the property boundary downgradient of the LRCP indicating that Molybdenum exceedances are confined to the site. To support the selection of a remedy, field monitoring activities, including the collection of water level measurements and ongoing groundwater sampling, were performed during 2024. Although a remedy was not selected pursuant to §257.97 of the CCR Rule during this current annual reporting period, the continued evaluation of remedial activities pursuant to §257.97 and §257.98 of the CCR Rule will continue during the 2025 annual reporting period.

Based on the Arsenic exceedances, IKEC continues to conduct additional groundwater sampling to characterize the nature and extent of the release at the LRCP and has initiated an addendum to the ACM in accordance with §257.95(g).

Based on these results, the LRCP will remain operating under the Assessment Monitoring program in accordance with §257.95 of the CCR Rule.

WBSP

At the start of this 2024 reporting period, the WBSP was operating under the Assessment Monitoring program in accordance with §257.95 of the CCR Rule. In 2024, the 4th and 5th rounds of Assessment Monitoring were conducted in March and September, respectively. Based on the sampling results, it was determined that there was an Appendix III SSI over background for Fluoride in well WBSP-15-09 during the March 2024 Assessment Monitoring Event. Arsenic, an Appendix IV constituent, exceeded the GWPS in wells WBSP-15-07, WBSP-15-08, and WBSP-15-09 during both Assessment Monitoring events. Based on exceedances of the GWPS for an Appendix IV constituent (Arsenic), a site characterization was conducted and an ACM was initiated in May 2023. An ACM Report was completed on October 27, 2023.

Due to regulatory access issues, the property boundary wells (as required by the CCR Rule) could not be installed at the WBSP during the site characterization that was conducted in 2023. Therefore, during the first quarter of 2024, property boundary wells were installed at the unit and sampled. An Addendum to the ACM Report, which includes the property boundary well installation results, testing and sampling, and an update on the site characterization, is in progress. Arsenic at the unit will continue to be evaluated in accordance with §257.95 of the CCR Rule.

Based on these results, the WBSP will remain operating under the Assessment Monitoring program in accordance with §257.95 of the CCR Rule.

**COAL COMBUSTION RESIDUALS REGULATION
2024 GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, 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 Resource Conservation and Recovery Act (RCRA) and became effective six (6) months from the date of its publication (April 17, 2015) in the Federal Register, referred to as the “CCR Rule.” The rule applies to new and existing landfills, and surface impoundments used to dispose of or otherwise manage CCR generated by electric utilities and independent power producers. Because the rule was promulgated under Subtitle D of RCRA, it does not require regulated facilities to obtain permits, does not require state adoption, and cannot be enforced by U.S. EPA.

This Groundwater Monitoring and Corrective Action Report has been prepared in accordance with §257.90 (e) of the CCR Rule and documents the status of the groundwater monitoring and corrective action program for each CCR unit, summarizes the key actions completed during 2024, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year.

2.0 BACKGROUND

The Clifty Creek Station, located in Madison, Indiana, is a 1,304-megawatt (MW) coal-fired generating plant operated by the Indiana-Kentucky Electric Corporation (IKEC), a subsidiary of the Ohio Valley Electric Corporation (OVEC). The Clifty Creek Station has six (6) 217.26-MW generating units and has been in operation since 1955. Beginning in 1955, ash products were sluiced to disposal ponds located in the plant site. During the course of plant operations, CCRs have been managed and disposed of in various units at the station. 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).

A discussion of the status of the groundwater monitoring program for each CCR unit is presented in the following sections of this report. Under the CCR program, IKEC installed a groundwater monitoring system at each unit in accordance with the requirements of the CCR Rule; the Type I

Landfill and LRCP are included in a multi-unit monitoring system. The units are discussed separately in this report.

3.0 TYPE I LANDFILL

The Type I Landfill and LRCP occupy an approximately 160-acre area situated within an eroded bedrock channel (Figures 1 and 2). Beginning in 1955, ash products were sluiced to disposal ponds located in the plant site. To allow for more disposal capacity, an on-site fly ash pond was developed into a Type III Landfill in 1988. All required permits for the Type III Landfill were obtained from the Indiana Department of Environmental Management (IDEM) and the Type III Landfill went operational in 1991. In March 1994, IDEM approved a pH variance for the disposal of low-sulfur coal ash in the fly ash Type III Landfill. Emplacement of low-sulfur coal ash in the Type III Landfill began in January 1995. In April 2007, IKEC submitted a permit application to IDEM to upgrade the former landfill from a Type III landfill to a Type I landfill. The application was approved in 2008, and construction began that year. In 2013, IDEM issued a renewed permit and approved IKEC's request to upgrade the landfill to a Type I Landfill.

The Type I Landfill consists of approximately 109 acres and has been approved by IDEM as a Type I Residual Waste Landfill. The remaining 51 acres consist of the LRCP located at the southwest end of the Type I Landfill (17 acres) and 34 acres closed under the IDEM landfill permit requirements (Figures 1 and 2). The LRCP is discussed in Section 4.0.

3.1 Groundwater Monitoring Network

As detailed in the Monitoring Well Installation Report (Applied Geology and Environmental Science, Inc. [AGES] 2018), the CCR groundwater monitoring network for the Type I Landfill consists of the following eight (8) monitoring wells:

- CF-15-04 (Background);
- CF-15-05 (Background);
- CF-15-06 (Background);
- CF-15-07 (Downgradient);
- CF-15-08 (Downgradient);
- CF-15-09 (Downgradient);
- WBSP-15-01 (Background); and
- WBSP-15-02 (Background).

The locations of the wells in the groundwater monitoring network are shown on Figure 2. As listed above and shown on Table 3-1, the CCR groundwater monitoring network includes five (5) background and three (3) downgradient monitoring wells, which satisfies the requirements of the CCR Rule.

Groundwater levels measured in 2024 are included in Table A-1 of Appendix A. Groundwater flow maps for the two (2) monitoring events completed in 2024 are included in Appendix B. As shown on the figures, groundwater generally flows to the southwest toward the Ohio River.

3.2 Groundwater Sampling

In accordance with §257.94 of the CCR Rule, the 12th round of Detection Monitoring was conducted in March 2024. During the March 2024 Detection Monitoring Event, a SSI was confirmed (described in Section 3.3 below); therefore, the Type I Landfill entered Assessment Monitoring in October 2024. In accordance with §257.95 of the CCR Rule, the 1st round of Assessment Monitoring samples were collected in September 2024.

All groundwater samples were collected in accordance with the Groundwater Monitoring Program Plan (GMPP) (AGES 2024). The Detection Monitoring samples were analyzed for Appendix III constituents, and the Assessment Monitoring samples were analyzed for Appendix III and Appendix IV constituents; Appendix III and Appendix IV constituents are listed in Appendix C.

In accordance with §257.90(e)(3), Table 3-2 presents a sampling summary, including the number of groundwater samples collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection or Assessment Monitoring program. Table 3-3 summarizes the measurements of field parameters collected at the completion of purging, immediately prior to collection of each sample. All samples were shipped to an analytical laboratory to be analyzed.

3.3 Analytical Results

Upon receipt of the March and September 2024 analytical results, 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 Consulting Services Inc. [Stantec] 2021). Appendix D summarizes the analytical results for groundwater samples collected in 2024.

3.3.1 Analytical Results-Appendix III Constituents

The statistical evaluation of the data identified potential SSIs in wells CF-15-08 (Boron and Chloride) and CF-15-09 (Boron) for the March 2024 Detection Monitoring Event and in wells CF-15-08 (Boron, Calcium, Chloride, and Sulfate) and CF-15-09 (Boron) for the September 2024 Assessment Monitoring Event (Table 3-4). In accordance with the StAP, resampling for the potential SSIs was conducted in wells CF-15-08 and CF-15-09 in June and December 2024. Based on the resampling results, SSIs were confirmed in well CF-15-08 (Chloride) for the March 2024 Detection Monitoring Event and in wells CF-15-08 (Boron, Calcium, Chloride, and Sulfate) and CF-15-09 (Boron) for the September 2024 Assessment Monitoring Event (Table 3-4).

3.3.2 Analytical Results-Appendix IV Constituents (September 2024 Assessment Monitoring Event)

Based on detections of Appendix IV constituents in groundwater at the Type I Landfill, IKEC established a Groundwater Protection Standard (GWPS) for each detected Appendix IV constituent in accordance with the §257.95(h)(1) through §257.95(h)(3) as follows:

- (1) *For constituents for which the U.S. EPA has established a Maximum Contaminant Level (MCL), the GWPS shall be the MCL for that constituent.*
- (2) *On July 30, 2018, the U.S. EPA published alternate limits to be used for several constituents that did not have previously established MCLs to be used as the GWPS for those constituents.*
- (3) *For constituents for which the background level is higher than the MCL or the alternate limit, the background concentration shall be the GWPS for that constituent.*

Table 3-5 presents the list of GWPS values for the Assessment Monitoring program at the Type I Landfill that were developed in accordance with the above requirements.

It was confirmed that Arsenic exceeded the GWPS of 10 micrograms per liter (ug/L) in well CF-15-07 and Molybdenum exceeded the GWPS of 100 ug/L in well CF-15-08 during the 1st Assessment Monitoring Event conducted in September 2024 (Table 3-6).

3.4 Assessment of Corrective Measures (ACM) for Arsenic

Based on the Arsenic and Molybdenum exceedances, IKEC continues to conduct additional groundwater sampling to characterize the nature and extent of the release at the Type I Landfill and has initiated an ACM in accordance with §257.95(g).

3.5 Alternate Source Demonstration (ASD)

For the September 2024 Assessment Monitoring Event, IKEC prepared an ASD that indicated that the Boron detected in groundwater came from a source other than the Type I Landfill. The ASD is provided in Appendix E.

4.0 LRCP

The Type I Landfill and LRCP occupy an approximately 160-acre area situated within an eroded bedrock channel (Figures 1 and 2). The Type I Landfill, which is discussed above in Section 3.0, consists of approximately 109 acres, and the remaining 51 acres consist of the LRCP located at the southwest end of the Type I Landfill (17 acres) and 34 acres closed under the IDEM landfill permit requirements.

4.1 ACM Report: September 2019 (November 2020 Revision 1.0)

In 2019, IKEC conducted additional groundwater sampling to characterize the nature and extent of the release and an ACM in accordance with §257.95(g). As part of this assessment, in March 2019, two (2) additional wells (CF-19-14 and CF-19-15) were installed in the uppermost aquifer at the property boundary downgradient from the LRCP (Figure 2). Details regarding the installation of these wells and potential corrective measures are included in the ACM Report for the LRCP (AGES 2020a). All details regarding the monitoring and corrective action associated with this unit in 2019 are provided in the 2019 Groundwater Monitoring and Corrective Action Report (AGES 2020b).

4.2 Groundwater Monitoring Network

As detailed in the Monitoring Well Installation Report (AGES 2018) and 2019 Groundwater Monitoring and Corrective Action Report (AGES 2020), the CCR groundwater monitoring network for the LRCP consisted of the following ten (10) monitoring wells:

- CF-15-04 (Background);
- CF-15-05 (Background);
- CF-15-06 (Background);
- CF-15-07 (Downgradient);
- CF-15-08 (Downgradient);
- CF-15-09 (Downgradient);
- WBSP-15-01 (Background);
- WBSP-15-02 (Background);
- CF-19-14 (Downgradient/Boundary); and
- CF-19-15 (Downgradient/Boundary).

The locations of the wells in the groundwater monitoring network are shown on Figure 2. As listed above and shown on Table 4-1, the CCR groundwater monitoring network includes five (5) background and three (3) downgradient monitoring wells, which satisfies the requirements of the CCR Rule. Two (2) wells (CF-19-14 and CF-19-15) are located at the property boundary downgradient from the LRCP.

Groundwater levels measured in 2024 are included in Table A-2 of Appendix A. Groundwater flow maps for the two (2) monitoring events completed in 2024 are included in Appendix B. As shown on the figures, groundwater generally flows to the southwest toward the Ohio River.

4.3 Groundwater Sampling

In accordance with §257.95 of the CCR Rule, the 12th and 13th rounds of Assessment Monitoring were conducted in March and September 2024, respectively.

All groundwater samples were collected in accordance with the GMPP (AGES 2024). The Assessment Monitoring samples were analyzed for Appendix III and Appendix IV constituents, which are listed in Appendix C. In accordance with §257.90(e)(3), Table 4-2 presents a sampling summary, including the number of groundwater samples collected for analysis for each upgradient, background, downgradient and boundary well, the dates the samples were collected, and whether the sample was required by the Assessment Monitoring program. Table 4-3 summarizes the measurements of field parameters collected at the completion of purging, immediately prior to collection of each sample. All samples were shipped to an analytical laboratory to be analyzed.

4.4 Analytical Results

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 StAP (Stantec 2021). Appendix D summarizes the analytical results for groundwater samples collected in 2024.

4.4.1 Analytical Results-Appendix III Constituents

The statistical evaluation of the data identified potential SSIs in wells CF-15-08 (Boron and Chloride) and CF-15-09 (Boron) for the March 2024 Assessment Monitoring Event and in wells CF-15-08 (Boron, Calcium, Chloride, and Sulfate) and CF-15-09 (Boron) for the September 2024 Assessment Monitoring Event (Table 4-4). In accordance with the StAP, resampling for the potential SSIs was conducted in wells CF-15-08 and CF-15-09 in June and December 2024. Based on the resampling results, the potential SSIs were confirmed in wells CF-15-08 and CF-15-09 for both events (Table 4-4).

4.4.2 Analytical Results-Appendix IV Constituents

Based on previous detections of Appendix IV constituents in groundwater at the LRCP, IKEC established a GWPS for each detected Appendix IV constituent in accordance with the §257.95(h)(1) through §257.95(h)(3) as follows:

(4) For constituents for which the U.S. EPA has established a Maximum Contaminant Level (MCL), the GWPS shall be the MCL for that constituent.

(5) On July 30, 2018, the U.S. EPA published alternate limits to be used for several constituents that did not have previously established MCLs to be used as the GWPS for those constituents.

(6) For constituents for which the background level is higher than the MCL or the alternate limit, the background concentration shall be the GWPS for that constituent.

Table 4-5 presents the list of GWPS values for the Assessment Monitoring program at the LRCP that were developed in accordance with the above requirements.

It was confirmed that Arsenic exceeded the GWPS of 10 ug/L in well CF-15-07 and Molybdenum exceeded the GWPS of 100 ug/L in well CF-15-08 during the 12th (March 2024) and 13th (September 2024) Assessment Monitoring Events (Table 4-6). Molybdenum concentrations did not exceed the GWPS at the wells located at the property boundary downgradient from the LRCP (CF-19-14 and CF-19-15). These results indicate that Molybdenum concentrations in the uppermost aquifer exceeding the GWPS are confined to the site and are not reaching the Ohio River.

4.5 ACM for Arsenic

Based on the Arsenic exceedances, IKEC continues to conduct additional groundwater sampling to characterize the nature and extent of the release at the LRCP and has initiated an update to the ACM in accordance with §257.95(g).

5.0 WBSP

The WBSP currently serves as a settling facility for sluiced boiler slag produced at the plant. The pond is formed by natural grade to the north, east and west and a southern dike that runs along the bank of the Ohio River. The Devil's Backbone borders the northern side of the WBSP (Figures 1 and 3).

5.1 ACM Report: October 2023

Based on the Arsenic exceedances identified in Assessment Monitoring, IKEC initiated additional groundwater sampling to characterize the nature and extent of the release and prepared an ACM in accordance with §257.95(g). The ACM Report (AGES 2023) provided an assessment of the effectiveness of potential corrective measures in achieving the criteria provided in §257.96(c). The ACM report for the Clifty Creek WBSP was placed in the facility's operating record, as well as uploaded it to IKEC's CCR Rule Compliance internet site, in October 2023.

Due to regulatory access issues, the property boundary wells (as required by the CCR Rule) could not be installed at the WBSP during the site characterization that was conducted in 2023. Therefore, during the first quarter of 2024, property boundary wells were installed at the unit and sampled. An Addendum to the ACM Report, which includes the property boundary well installation results, testing and sampling, and an update on the site characterization, is in progress.

5.2 Groundwater Monitoring Network

As detailed in the Monitoring Well Installation Report (AGES 2018) and the 2021 Annual Report, the CCR groundwater monitoring network for the WBSP includes the following 13 wells:

- CF-15-04 (Background);
- CF-15-05 (Background);

- CF-15-06 (Background);
- WBSP-15-01 (Upgradient);
- WBSP-15-02 (Upgradient);
- WBSP-15-03 (Upgradient);
- WBSP-15-04a (Downgradient);
- WBSP-15-05a (Downgradient);
- WBSP-15-06a (Downgradient);
- WBSP-15-07 (Downgradient);
- WBSP-15-08 (Downgradient);
- WBSP-15-09 (Downgradient); and
- WBSP-15-10 (Downgradient).

The locations of the wells in the groundwater monitoring network are shown on Figures 2 and 3. As listed above and shown on Table 5-1, the CCR groundwater monitoring network for the WBSP includes six (6) background and upgradient wells and seven (7) downgradient wells, which satisfies the requirements of the CCR Rule.

Results from the recent sampling events indicate that wells WBSP-15-04a, WBSP-15-05a and WBSP-15-06a may not be a representative replacement for the original wells WBSP-15-04, WBSP-15-05 and WBSP-15-06, respectively, and the facility currently is evaluating whether the sampling results are the result of an error in accordance with §257.95(g)(3)(ii). The results are included in Appendix D.

Groundwater levels measured in 2024 are included in Table A-3 of Appendix A. Groundwater flow maps for the two (2) monitoring events completed in 2024 are included in Appendix B. As background wells WBSP-15-01, WBSP-15-02, and WBSP-15-03 are not screened in the uppermost aquifer at the unit, groundwater flow directions are based on the groundwater elevations in downgradient wells and the typical elevation of the nearby Ohio River. As shown on the figures in Appendix B, groundwater generally flows to the southeast toward the Ohio River.

5.3 Groundwater Sampling

In accordance with §257.95 of the CCR Rule, the 4th and 5th rounds of Assessment Monitoring were conducted in March and September 2024, respectively.

All groundwater samples were collected in accordance with the GMPP (AGES 2024). The Assessment Monitoring samples were analyzed for Appendix III and Appendix IV constituents, which are listed in Appendix C. In accordance with §257.90(e)(3), Table 5-2 presents a sampling summary, including the number of groundwater samples collected for analysis for each upgradient, background and downgradient well, the dates the samples were collected, and whether the sample was required by the Assessment Monitoring program. Table 5-3 summarizes the measurements of

field parameters collected at the completion of purging, immediately prior to collection of each sample. All samples were shipped to an analytical laboratory to be analyzed.

5.4 Analytical Results

Upon receipt of the March and September 2024 analytical results, the groundwater monitoring data were statistically evaluated in accordance with §257.93(f) of the CCR Rule and the Clifty Creek Station CCR StAP (Stantec 2021). Appendix D summarizes the analytical results for groundwater samples collected in 2024.

5.4.1 Analytical Results-Appendix III Constituents

Potential SSIs in well WBSP-15-09 (Fluoride) were identified in the March 2024 and September 2024 Assessment Monitoring Events (Table 5-4). In accordance with the StAP, resampling for the potential SSIs was conducted in well WBSP-15-09 in June and December 2024. Based on the resampling results, a SSI was confirmed for Fluoride in well WBSP-15-09 for the March 2024 Assessment Monitoring Event (Table 5-4).

5.4.2 Analytical Results-Appendix IV Constituents

IKEC established a GWPS for each detected Appendix IV constituent in accordance with the §257.95(h)(1) through §257.95(h)(3) as follows:

(7) *For constituents for which the U.S. EPA has established a Maximum Contaminant Level (MCL), the GWPS shall be the MCL for that constituent.*

(8) *On July 30, 2018, the U.S. EPA published alternate limits to be used for several constituents that did not have previously established MCLs to be used as the GWPS for those constituents.*

(9) *For constituents for which the background level is higher than the MCL or the alternate limit, the background concentration shall be the GWPS for that constituent.*

Table 5-5 presents the list of GWPS values for the Assessment Monitoring program at the WBSP that were developed in accordance with the above requirements.

During the 4th (March 2024) and 5th (September 2024) rounds of Assessment Monitoring, it was confirmed that Arsenic in wells WBSP-15-07, WBSP-15-08, and WBSP-15-09 exceeded the GWPS of 10 ug/L (Table 5-6).

5.5 ACM for Arsenic

Based on the Arsenic exceedances, IKEC continues to conduct additional groundwater sampling to characterize the nature and extent of the release at the WBSP and has initiated an Addendum to the ACM Report in accordance with §257.95(g).

6.0 PROBLEMS ENCOUNTERED

Wells CF-15-06 (September 2024), WBSP-15-01 (March and September 2024), and WBSP-15-02 (September 2024) were dry and samples could not be collected.

There were no other problems encountered during the 2024 groundwater monitoring program at Clifty Creek Station.

7.0 PROJECTED ACTIVITIES FOR 2025

The Type I Landfill will remain in Assessment Monitoring and continue to be sampled on a semi-annual basis. As described above, an ACM will be prepared for this unit for Arsenic and Molybdenum.

The LRCP will remain in Assessment Monitoring and continue to be sampled on a semi-annual basis. As described above, an ACM has been completed for this unit for Molybdenum and the process of the selection of remedy for the LRCP will continue. Based on the Arsenic exceedances noted in this report, IKEC will prepare an addendum to the ACM to include this constituent.

The WBSP will remain in Assessment Monitoring and continue to be sampled on a semi-annual basis. As described above, an ACM has been completed for this unit for Arsenic and IKEC will prepare an Addendum to the ACM Report to present information regarding the property boundary wells and updated assessment.

8.0 REFERENCES

Applied Geology and Environmental Science, Inc. (AGES) 2024. Coal Combustion Residuals Regulation Groundwater Monitoring Program Plan, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. Revision 2.0. January 2024.

Applied Geology and Environmental Science, Inc. (AGES) 2023. Coal Combustion Residuals Regulation Assessment of Corrective Measures Report for the West Boiler Slag Pond, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. October 2023.

Applied Geology and Environmental Science, Inc. (AGES) 2020b. Coal Combustion Residuals Regulation 2019 Groundwater Monitoring and Corrective Action Report, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. January 2020.

Applied Geology and Environmental Science, Inc. (AGES) 2020a. Coal Combustion Residuals Regulation Assessment of Corrective Measures Report Landfill Runoff Collection Pond, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Jefferson County, Indiana. Revision 1.0. November 2020.

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

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 3-1
GROUNDWATER MONITORING NETWORK
TYPE I RESIDUAL WASTE LANDFILL
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 3-2
SUMMARY OF SAMPLES COLLECTED DURING 2024
TYPE I RESIDUAL WASTE LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Designation	Mar-24	Jun-24	Sep-24	Dec-24
CF-15-04	Background	DM	NS	AM	NS
CF-15-05	Background	DM	NS	AM	NS
CF-15-06	Background	DM	NS	Dry	NS
CF-15-07	Downgradient	DM	NS	AM	AM
CF-15-08	Downgradient	DM	DM	AM	AM
CF-15-09	Downgradient	DM	DM	AM	AM
WBSP-15-01	Background	Dry	NS	Dry	NS
WBSP-15-02	Background	DM	NS	Dry	NS

Notes:

1. AM: Assessment Monitoring.
2. DM: Detection Monitoring.
3. Dry: Well Dry and Not Sampled.
4. NS: Not Sampled.

TABLE 3-3
SUMMARY OF MEASURED FIELD PARAMETERS DURING 2024
TYPE I RESIDUAL WASTE LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Sample ID	Date	Temperature (°C)	Conductivity (µohms/cm)	pH (S.U.)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)
CF-15-04	Mar-24	15.28	562	7.41	294	14.17	3.89
CF-15-05	Mar-24	10.05	1100	7.02	390	2.7	3.36
CF-15-06	Mar-24	8.29	1060	7.35	378	3.93	3.36
CF-15-07	Mar-24	11.72	1030	6.94	345	2.88	4.3
CF-15-08	Mar-24	12.71	1190	7.09	405	6.24	3.95
CF-15-09	Mar-24	8.53	1040	7.02	397	4.05	3.38
WBSP-15-01	WELL DRY						
WBSP-15-02	Mar-24	14.51	1680	7.73	308	9.46	3.67
CF-15-07	Jun-24	21.20	1130	7.03	-118	0.32	4.32
CF-15-08	Jun-24	14.98	1490	6.74	371	2.6	3.89
CF-15-04	Sep-24	15.78	550	7.27	618	1.39	4.01
CF-15-05	Sep-24	21.05	810	6.49	436	0.91	4.55
CF-15-06	WELL DRY						
CF-15-07	Sep-24	24.19	1090	6.41	-61	2.86	20.2
CF-15-08	Sep-24	20.42	1940	6.52	308	15.02	0.45
CF-15-09	Sep-24	16.28	1130	7.03	117	1.18	4.33
WBSP-15-01	WELL DRY						
WBSP-15-02	WELL DRY						
CF-15-07	Dec-24	8.9	1130	7.03	-111	0.65	3.95
CF-15-08	Dec-24	8.04	1020	6.45	335	1.95	2.19
CF-15-09	Dec-24	11.09	1120.00	7.05	119	1.21	4.32

Notes:

1. °C: Degrees Celsius.
2. µohms/cm: Micro-ohms per centimeter.
3. S.U.: Standard Units.
4. mV: Millivolts.
5. mg/L: Milligrams per liter.
6. NTUs: Nephelometric Turbidity Units.

TABLE 3-4
SUMMARY OF POTENTIAL AND CONFIRMED APPENDIX III SSIs
TYPE I RESIDUAL WASTE LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential SSI Parameter (Units)	12th Detection Monitoring Sampling Event March 2024		12th Detection Monitoring Resampling Event June 2024		1st Assessment Monitoring Sampling Event September 2024		1st Assessment Monitoring Resampling Event December 2024	
		Potential SSI Result	UPL	Potential SSI Result	Confirmed SSI (Yes/No)	Potential SSI Result	UTL	Potential SSI Result	Confirmed SSI (Yes/No)
CF-15-08	Boron (mg/L)	8.5	4.9	3.9	No	7.6	0.19	6.5	Yes
	Calcium (mg/L)	NA	NA	NA	NA	320	284	360	Yes
	Chloride (mg/L)	72	51.0	72	Yes	120	66	150	Yes
	Sulfate (mg/L)	NA	NA	NA	NA	910	558	940	Yes
CF-15-09	Boron (mg/L)	5.7	4.9	4.7	No	6	0.19	4.9	Yes

Notes:

1. SSI: Statistically Significant Increase.
2. UPL: Upper Prediction Limit (Maximum Interwell UPL).
3. UTL: Upper Tolerance Limit
4. mg/L: Milligrams per liter.
5. NA: Not Applicable

TABLE 3-5
GROUNDWATER PROTECTION STANDARDS
TYPE I LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Appendix IV Constituents			
Constituent (Units)	Background	MCL/SMCL	GWPS
Antimony, Sb (µg/L)	2	6	6
Arsenic, As (µg/L)	5	10	10
Barium, Ba (µg/L)	99	2000	2000
Beryllium, Be (µg/L)	1.1	4	4
Cadmium, Cd (µg/L)	1	5	5
Chromium, Cr (µg/L)	3	100	100
Cobalt, Co (µg/L)	1.5	6*	6
Fluoride, F (mg/L)	0.56	4	4
Lead, Pb (µg/L)	1.1	15*	15
Lithium, Li (µg/L)	0.1	40*	40
Mercury, Hg (µg/L)	1.2	2	2
Molybdenum, Mo (µg/L)	6	100*	100
Radium 226 & 228 (combined) (pCi/L)	8	5	8
Selenium, Se (µg/L)	5	50	50
Thallium, Tl (µg/L)	1	2	2

Notes:

1. MCL: Maximum Contaminant Level.
2. SMCL: Secondary Maximum Contaminant Level.
3. *: Established by U.S. EPA as part of 2018 decision.
4. GWPS: Groundwater Protection Standard.
5. µg/L: Micrograms per liter.
6. mg/L: Milligrams per liter.
7. pCi/L: Picocuries per liter.

TABLE 3-6
SUMMARY OF GWPS EXCEEDANCES
TYPE I LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential Exceedance Parameter (Units)	1st Assessment Monitoring Sampling Event September 2024		1st Assessment Monitoring Resampling Event December 2024	
		Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)
CF-15-07	Arsenic (ug/L)	12	10	44	Yes
CF-15-08	Molybdenum (ug/L)	280	100	230	Yes

Notes:

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

**TABLE 4-1
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
CF-19-14	Downgradient	3/8/2019	443401.75	562901.93	452.29	454.88	440.05	430.05	24.83
CF-19-15	Downgradient	3/13/2019	442704.78	562483.02	441.10	443.61	415.19	405.19	38.42

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 4-2
SUMMARY OF SAMPLES COLLECTED DURING 2024
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Designation	Mar-24	Jun-24	Sep-24	Dec-24
CF-15-04	Background	AM	NS	AM	NS
CF-15-05	Background	AM	NS	AM	NS
CF-15-06	Background	AM	NS	Dry	NS
CF-15-07	Downgradient	AM	NS	AM	AM
CF-15-08	Downgradient	AM	AM	AM	AM
CF-15-09	Downgradient	AM	AM	AM	AM
WBSP-15-01	Background	Dry	NS	Dry	NS
WBSP-15-02	Background	AM	NS	Dry	NS
CF-19-14	Downgradient	AM	NS	AM	NS
CF-19-15	Downgradient	AM	NS	AM	NS

Notes:

1. AM: Assessment Monitoring.
2. NS: Not Sampled.

TABLE 4-3
SUMMARY OF MEASURED FIELD PARAMETERS DURING 2024
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Sample ID	Date	Temperature (°C)	Conductivity (µohms/cm)	pH (S.U.)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)
CF-15-04	Mar-24	15.28	562	7.41	294	14.17	3.89
CF-15-05	Mar-24	10.05	1100	7.02	390	2.7	3.36
CF-15-06	Mar-24	8.29	1060	7.35	378	3.93	3.36
CF-15-07	Mar-24	11.72	1030	6.94	345	2.88	4.3
CF-15-08	Mar-24	12.71	1190	7.09	405	6.24	3.95
CF-15-09	Mar-24	8.53	1040	7.02	397	4.05	3.38
WBSP-15-01	WELL DRY						
WBSP-15-02	Mar-24	14.51	1680	7.73	308	9.46	3.67
CF-19-14	Mar-24	12.91	725	6.9	414	6.35	3.81
CF-19-15	Mar-24	12.92	1080	6.94	393	2.11	3.12
CF-15-07	Jun-24	21.20	1130	7.03	-118	0.32	4.32
CF-15-08	Jun-24	14.98	1490	6.74	371	2.6	3.89
CF-15-04	Sep-24	15.78	550	7.27	618	1.39	4.01
CF-15-05	Sep-24	21.05	810	6.49	436	0.91	4.55
CF-15-06	WELL DRY						
CF-15-07	Sep-24	24.19	1090	6.41	-61	2.86	20.2
CF-15-08	Sep-24	20.42	1940	6.52	308	15.02	0.45
CF-15-09	Sep-24	16.28	1130	7.03	117	1.18	4.33
WBSP-15-01	WELL DRY						
WBSP-15-02	WELL DRY						
CF-19-14	Sep-24	22.83	827	6.65	420	1.07	3.79
CF-19-15	Sep-24	19.65	1440	6.14	239	2.75	4.53
CF-15-07	Dec-24	8.90	1130	7.03	-111	0.65	3.95
CF-15-08	Dec-24	8.04	1020	6.45	335	1.95	2.19
CF-15-09	Dec-24	11.09	1120	7.05	119	1.21	4.32

Notes:

1. °C: Degrees Celsius.
2. µohms/cm: Micro-ohms per centimeter.
3. S.U.: Standard Units.
4. mV: Millivolts.
5. mg/L: Milligrams per liter.
6. NTUs: Nephelometric Turbidity Units.

TABLE 4-4
SUMMARY OF POTENTIAL AND CONFIRMED APPENDIX III SSIs
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential SSI Parameter (Units)	12th Assessment Monitoring Sampling Event March 2024		12th Assessment Monitoring Resampling Event June 2024		13th Assessment Monitoring Sampling Event September 2024		13th Assessment Monitoring Resampling Event December 2024	
		Potential SSI Result	UTL	Potential SSI Result	Confirmed SSI (Yes/No)	Potential SSI Result	UTL	Potential SSI Result	Confirmed SSI (Yes/No)
CF-15-08	Boron (mg/L)	8.5	0.19	3.9	Yes	7.6	0.19	6.5	Yes
	Calcium (mg/L)	NA	NA	NA	NA	320	284	360	Yes
	Chloride (mg/L)	72	50.20	72	Yes	120	66	150	Yes
	Sulfate (mg/L)	NA	NA	NA	NA	910	558	940	Yes
CF-15-09	Boron (mg/L)	5.7	0.19	4.7	Yes	6	0.19	4.9	Yes

Notes:

1. SSI: Statistically Significant Increase.
2. UTL: Upper Tolerance Limit (Pooled Interwell UTL).
3. mg/L: Milligrams per liter.
4. NA: Not Applicable—no SSI.

TABLE 4-5
GROUNDWATER PROTECTION STANDARDS
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Appendix IV Constituents			
Constituent (Units)	Background	MCL/SMCL	GWPS
Antimony, Sb (µg/L)	2	6	6
Arsenic, As (µg/L)	5	10	10
Barium, Ba (µg/L)	99	2000	2000
Beryllium, Be (µg/L)	1.1	4	4
Cadmium, Cd (µg/L)	1	5	5
Chromium, Cr (µg/L)	3	100	100
Cobalt, Co (µg/L)	1.5	6*	6
Fluoride, F (mg/L)	0.56	4	4
Lead, Pb (µg/L)	1.1	15*	15
Lithium, Li (µg/L)	0.1	40*	40
Mercury, Hg (µg/L)	1.2	2	2
Molybdenum, Mo (µg/L)	6	100*	100
Radium 226 & 228 (combined) (pCi/L)	8	5	8
Selenium, Se (µg/L)	5	50	50
Thallium, Tl (µg/L)	1	2	2

Notes:

1. MCL: Maximum Contaminant Level.
2. SMCL: Secondary Maximum Contaminant Level.
3. *: Established by U.S. EPA as part of 2018 decision.
4. GWPS: Groundwater Protection Standard.
5. µg/L: Micrograms per liter.
6. mg/L: Milligrams per liter.
7. pCi/L: Picocuries per liter.

TABLE 4-6
SUMMARY OF GWPS EXCEEDANCES
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential Exceedance Parameter (Units)	12th Assessment Monitoring Sampling Event March 2024		12th Assessment Monitoring Resampling Event June 2024		13th Assessment Monitoring Sampling Event September 2024		13th Assessment Monitoring Resampling Event December 2024	
		Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)	Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)
CF-15-07	Arsenic (ug/L)	13	10	15	Yes	12	10	44	Yes
CF-15-08	Molybdenum (ug/L)	270	100	420	Yes	280	100	230	Yes

Notes:

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

**TABLE 5-1
GROUNDWATER MONITORING NETWORK
WEST BOILER SLAG 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
WBSP-15-01	Upgradient	11/30/2015	449072.27	566322.12	466.93	469.36	458.93	448.93	20.43
WBSP-15-02	Upgradient	11/11/2015	449803.91	566987.30	473.83	476.76	457.83	452.83	23.93
WBSP-15-03	Upgradient	12/4/2015	451181.98	568093.60	484.91	488.03	476.91	471.91	16.12
WBSP-15-04a	Downgradient	7/28/2021	450669.20	568855.3	472.03	474.47	418.47	408.47	68.44
WBSP-15-05a	Downgradient	8/4/2021	450072.00	568895.20	473.66	476.20	413.20	402.20	76.54
WBSP-15-06a	Downgradient	8/6/2021	449478.8	568659.8	471.96	475.12	399.12	389.12	89.16
WBSP-15-07	Downgradient	11/23/2015	448947.93	567946.39	468.82	471.31	426.82	416.82	54.49
WBSP-15-08	Downgradient	11/25/2015	448625.46	567343.24	468.56	471.06	415.76	405.76	65.30
WBSP-15-09	Downgradient	1/6/2016	448359.31	566711.13	471.21	470.69	421.21	410.21	59.48
WBSP-15-10	Downgradient	1/5/2016	448125.51	566225.21	471.21	470.69	425.21	435.21	55.48

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 5-2
SUMMARY OF SAMPLES COLLECTED DURING 2024
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Designation	Mar-24	Jun-24	Sep-24	Dec-24
CF-15-04	Background	AM	NS	AM	NS
CF-15-05	Background	AM	NS	AM	NS
CF-15-06	Background	AM	NS	Dry	NS
WBSP-15-01	Upgradient	Dry	NS	Dry	NS
WBSP-15-02	Upgradient	AM	NS	Dry	NS
WBSP-15-03	Upgradient	AM	NS	AM	NS
WBSP-15-04a	Downgradient	AM	NS	AM	AM
WBSP-15-05a	Downgradient	AM	NS	AM	AM
WBSP-15-06a	Downgradient	AM	NS	AM	AM
WBSP-15-07	Downgradient	AM	AM	AM	AM
WBSP-15-08	Downgradient	AM	AM	AM	AM
WBSP-15-09	Downgradient	AM	AM	AM	AM
WBSP-15-10	Downgradient	AM	NS	AM	NS

Notes:

1. AM: Assessment Monitoring.
2. NS: Not Sampled.

TABLE 5-3
SUMMARY OF MEASURED FIELD PARAMETERS DURING 2024
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Sample ID	Date	Temperature (°C)	Conductivity (µohms/cm)	pH (S.U.)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)
CF-15-04	Mar-24	15.28	562	7.41	294	14.17	3.89
CF-15-05	Mar-24	10.05	1100	7.02	390	2.7	3.36
CF-15-06	Mar-24	8.29	1060	7.35	378	3.93	3.36
WBSP-15-01	WELL DRY						
WBSP-15-02	Mar-24	14.51	1680	7.73	308	9.46	3.67
WBSP-15-03	Mar-24	12.69	1100	7.95	297	12.21	3.89
WBSP-15-04a	Mar-24	14.03	1040	7.94	282	11.81	4.87
WBSP-15-05a	Mar-24	19.49	1040	7.6	196	14.6	4.72
WBSP-15-06a	Mar-24	17.74	996	7.18	130	12.93	39.1
WBSP-15-07	Mar-24	7.37	1480	7.67	39	10.74	33.6
WBSP-15-08	Mar-24	11.52	797	7.47	31	11.36	>1000
WBSP-15-09	Mar-24	14.23	618	7.4	-69	4.13	44.2
WBSP-15-10	Mar-24	21.88	698	7.23	56	2.49	4.89
WBSP-15-04a	Jun-24	18.56	876	7.2	326	0.91	4.81
WBSP-15-05a	Jun-24	22.75	843	7.32	152	1.08	3.92
WBSP-15-06a	Jun-24	17.62	830	7.09	-24	4.41	4.9
WBSP-15-07	Jun-24	22.93	1490	6.73	-222	0.36	4.64
WBSP-15-08	Jun-24	21.75	797	6.29	-107	3.71	104.8
WBSP-15-09	Jun-24	17.8	625	6.53	-166	1.67	4.22
CF-15-04	Sep-24	15.78	550	7.27	618	1.39	4.01
CF-15-05	Sep-24	21.05	810	6.49	436	0.91	4.55
CF-15-06	WELL DRY						
WBSP-15-01	WELL DRY						
WBSP-15-02	WELL DRY						
WBSP-15-03	Sep-24	18.2	1230	6.26	155	1.89	1.83
WBSP-15-04a	Sep-24	27.3	895	6.55	63	3.18	4.03
WBSP-15-05a	Sep-24	22.57	982	7.21	64	4.1	3.75
WBSP-15-06a	Sep-24	17.92	861	7.04	248	1.01	3.48
WBSP-15-07	Sep-24	22.43	1280	6.45	-69	4.15	19.8
WBSP-15-08	Sep-24	20.52	799	6.22	-51	5.04	73.6
WBSP-15-09	Sep-24	20.22	607	6.45	-115	1.94	32.2
WBSP-15-10	Sep-24	18.56	89	6.14	4	4.17	65
WBSP-15-04a	Dec-24	9.22	1020	6.94	192	0	4.7
WBSP-15-05a	Dec-24	10.24	1080	7.06	349	2.24	4.6
WBSP-15-06a	Dec-24	11.72	898	7.23	-94	0	24.02
WBSP-15-07	Dec-24	9.23	1370	7.03	-76	1.15	87.9
WBSP-15-08	Dec-24	11.36	763	6.88	-33	4.49	>1000
WBSP-15-09	Dec-24	12.62	648	6.9	-75	1.01	51.6

Notes:

- | | |
|---|---|
| 1. °C: Degrees Celsius. | 4. mV: Millivolts. |
| 2. µohms/cm: Micro-ohms per centimeter. | 5. mg/L: Milligrams per liter. |
| 3. S.U.: Standard Units. | 6. NTUs: Nephelometric Turbidity Units. |

TABLE 5-4
SUMMARY OF POTENTIAL AND CONFIRMED APPENDIX III SSIs
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential SSI Parameter (Units)	4th Assessment Monitoring Sampling Event March 2024		4th Assessment Monitoring Resampling Event June 2024		5th Assessment Monitoring Sampling Event September 2024		5th Assessment Monitoring Resampling Event December 2024	
		Potential SSI Result	UTL	Potential SSI Result	Confirmed SSI (Yes/No)	Potential SSI Result	UTL	Potential SSI Result	Confirmed SSI (Yes/No)
WBSP-15-09	Fluoride (mg/L)	0.61	0.53	0.7	Yes	0.64	0.62	0.59	No

Notes:

1. SSI: Statistically Significant Increase.
2. UTL: Upper Tolerance Limit (Pooled Interwell UTL).
3. s.u.: Standard units.
4. mg/L: Milligrams per liter.

TABLE 5-5
GROUNDWATER PROTECTION STANDARDS
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Appendix IV Constituents			
Constituent (Units)	Background	MCL/SMCL	GWPS
Antimony, Sb (µg/L)	0.02	6	6
Arsenic, As (µg/L)	5.1	10	10
Barium, Ba (µg/L)	112	2000	2000
Beryllium, Be (µg/L)	0.1	4	4
Cadmium, Cd (µg/L)	0.1	5	5
Chromium, Cr (µg/L)	2	100	100
Cobalt, Co (µg/L)	1.1	6*	6
Fluoride, F (mg/L)	0.51	4	4
Lead, Pb (µg/L)	1.0	15*	15
Lithium, Li (µg/L)	0.05	40*	40
Mercury, Hg (µg/L)	1.2	2	2
Molybdenum, Mo (µg/L)	6	100*	100
Radium 226 & 228 (combined) (pCi/L)	2	5	5
Selenium, Se (µg/L)	0.5	50	50
Thallium, Tl (µg/L)	0.2	2	2

Notes:

1. MCL: Maximum Contaminant Level.
2. SMCL: Secondary Maximum Contaminant Level.
3. *: Established by U.S. EPA as part of 2018 decision.
4. GWPS: Groundwater Protection Standard.
5. µg/L: Micrograms per liter.
6. mg/L: Milligrams per liter.
7. pCi/L: Picocuries per liter.

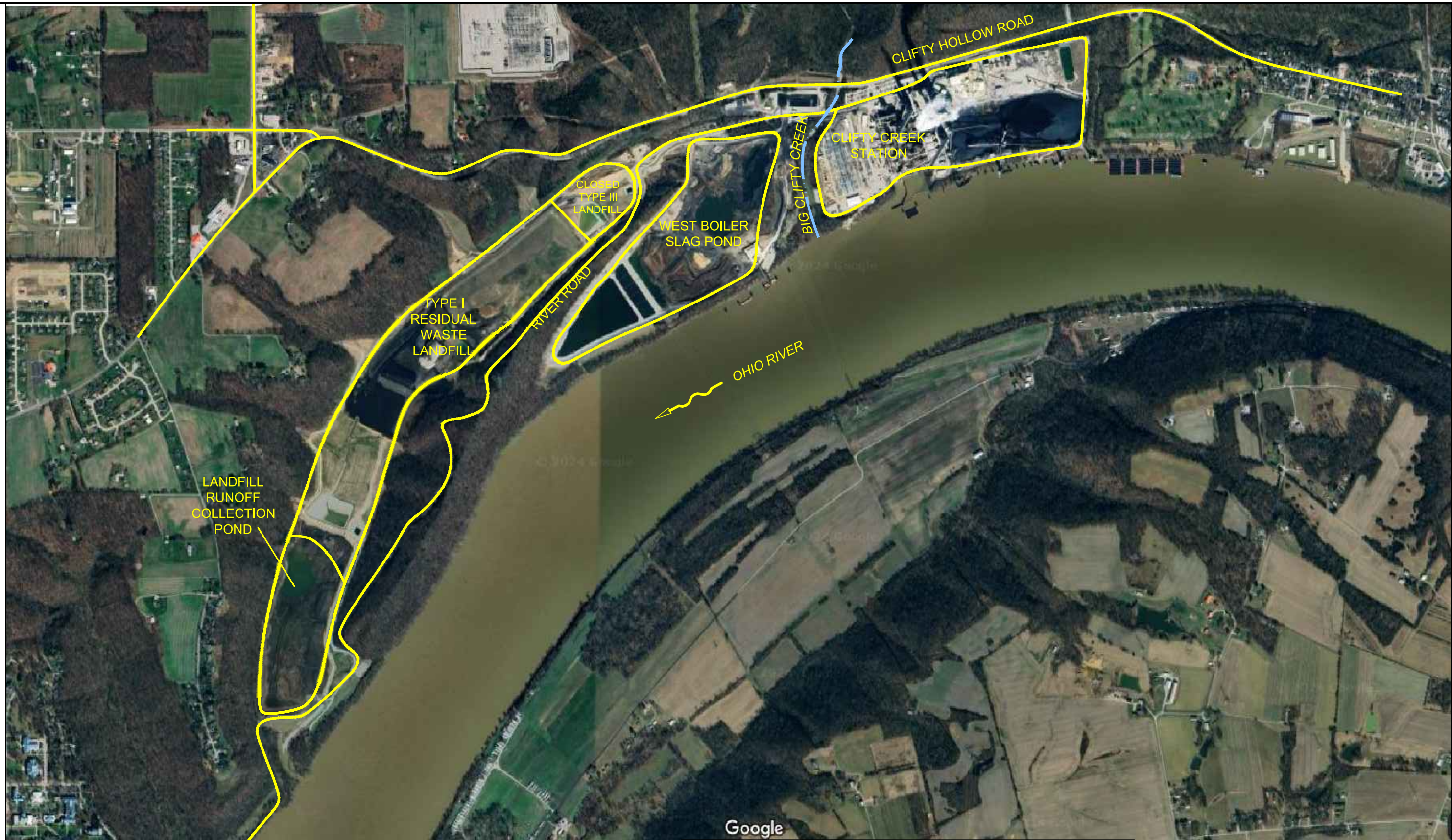
TABLE 5-6
SUMMARY OF GWPS EXCEEDANCES
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential Exceedance Parameter (Units)	4th Assessment Monitoring Sampling Event March 2024		4th Assessment Monitoring Resampling Event June 2024		5th Assessment Monitoring Sampling Event September 2024		5th Assessment Monitoring Resampling Event December 2024	
		Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)	Potential Exceedance Result	GWPS	Potential Exceedance Result	Confirmed Exceedance (Yes/No)
WBSP-15-07	Arsenic (ug/L)	14	10	59	Yes	42	10	36	Yes
WBSP-15-08		58		65	Yes	82		56	Yes
WBSP-15-09		16		21	Yes	19		14	Yes

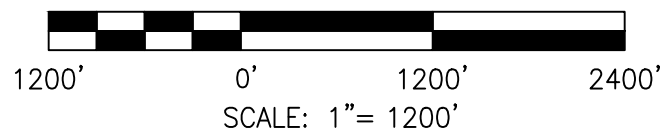
Notes:

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

FIGURES



Google



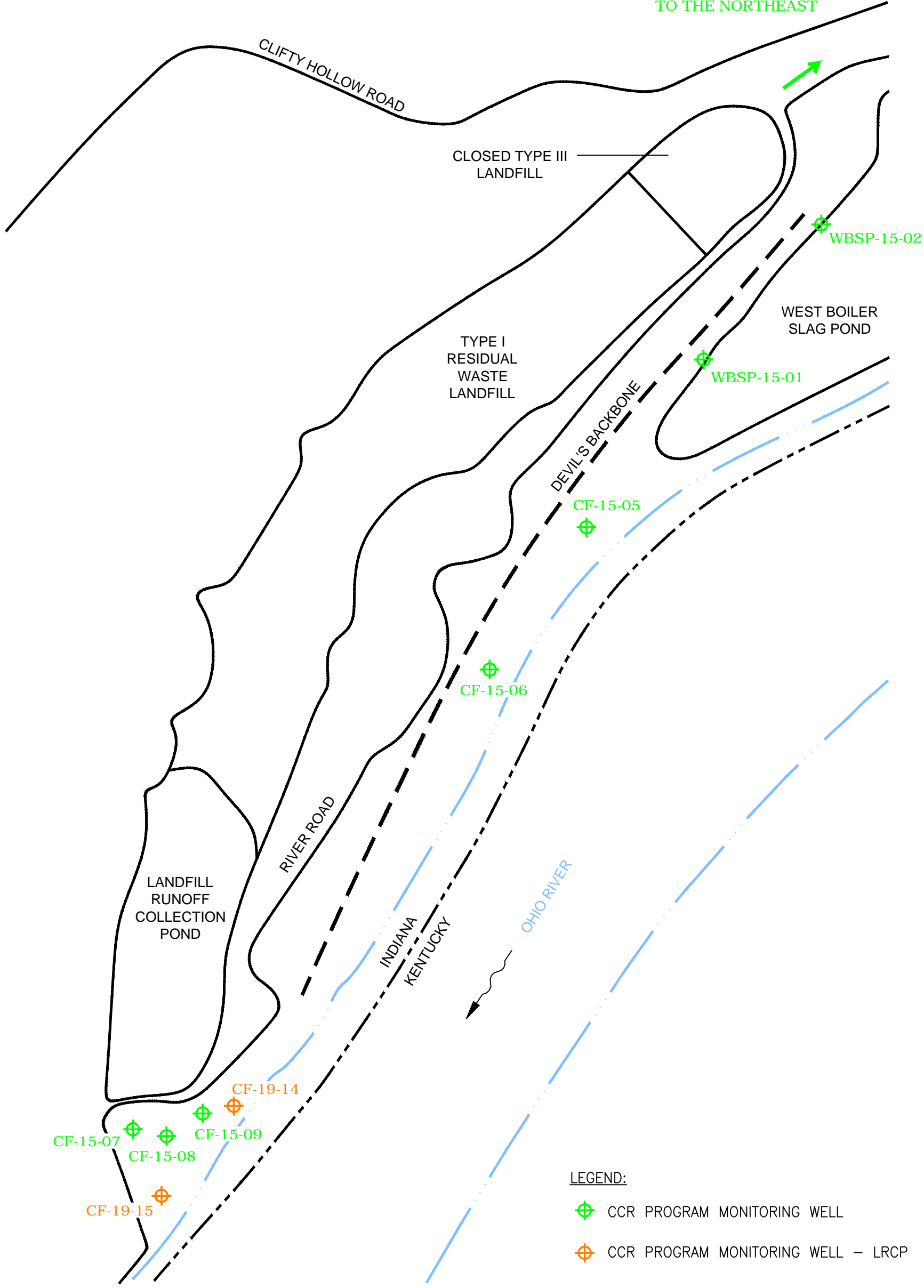
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DATE	
CHECKED BY	
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DRAWING SCALE	AS SHOWN

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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA SITE LOCATION MAP	
DRAWING NAME	FIGURE 1
REV.	0



WELL CF-15-04 IS
LOCATED ~2,800 FEET
TO THE NORTHEAST



LEGEND:

-  CCR PROGRAM MONITORING WELL
-  CCR PROGRAM MONITORING WELL – LRCP

NOTE:
WELLS CF-19-14 AND CF-19-15 WERE
INSTALLED IN MARCH 2019.

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2020010-CLIFTY
DWG FILE	2_2020_IKEC_Clifty_GW MW LOCs_LANDFILL b01.dwg
DRAWING SCALE	NOT TO SCALE



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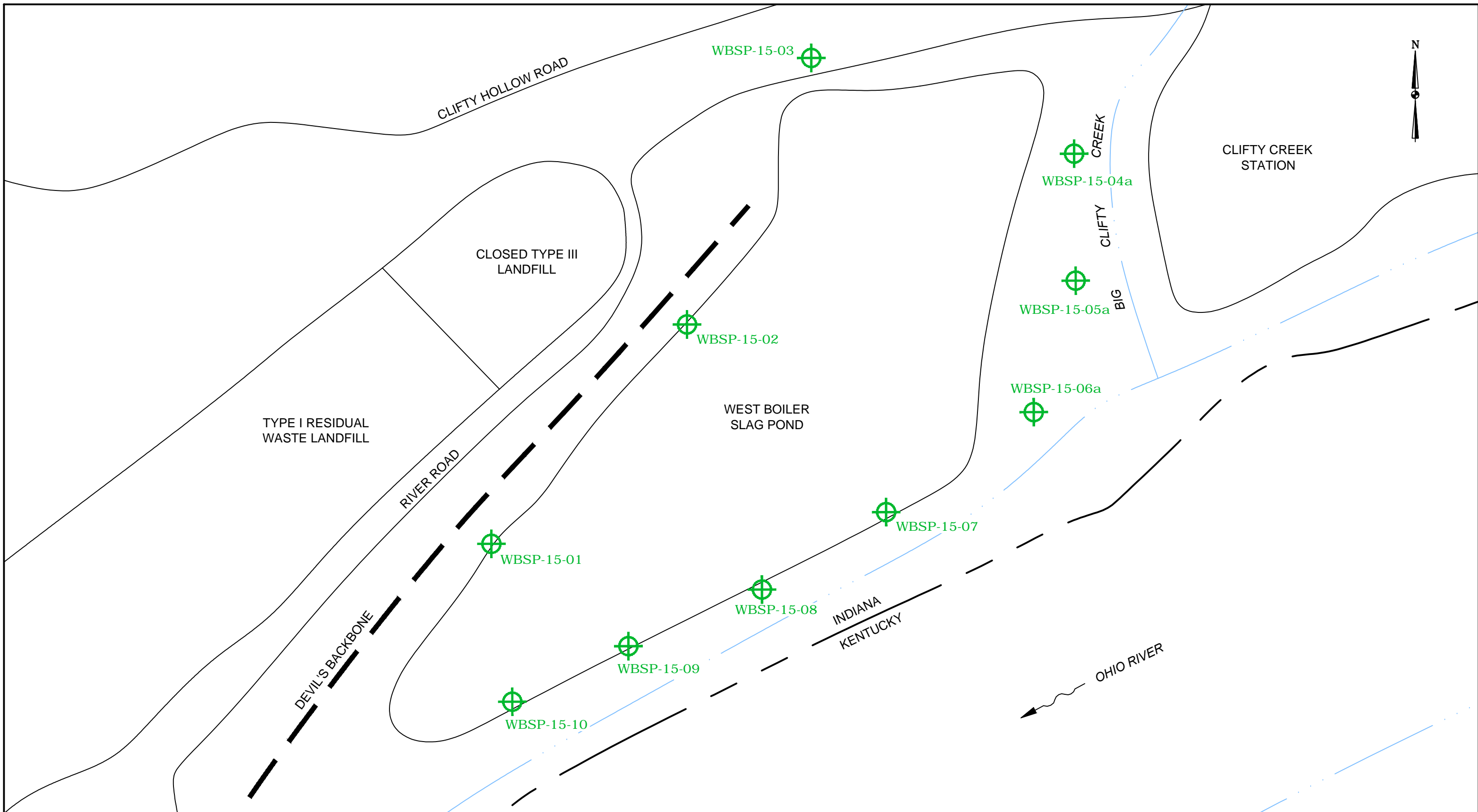
CLIFTY CREEK STATION
MADISON, INDIANA
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
MONITORING WELL LOCATION MAP

DRAWING NAME

FIGURE 2

REV.

0



LEGEND:
 CCR PROGRAM MONITORING WELL

400' 0' 400' 800'
 SCALE: 1" = 400'

DATE	
CHECKED BY	
JOB NO.	2022013-CLI
DWG FILE	3_2022_IKEC-IDEM_WBSP_2022_GW+CA_rpt_MWs.dwg
DRAWING SCALE	AS SHOWN

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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA WEST BOILER SLAG POND MONITORING WELL LOCATION MAP	
DRAWING NAME	FIGURE 3
REV.	0

APPENDIX A

GROUNDWATER ELEVATIONS

TABLE A-1
SUMMARY OF GROUNDWATER ELEVATION DATA DURING 2024
TYPE I RESIDUAL WASTE LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Mar-24	Jun-24	Sep-24	Dec-24
	Groundwater Elevation (feet)			
CF-15-04	437.48	436.78	454.12	NM
CF-15-05	432.57	431.53	428.14	NM
CF-15-06	428.50	427.35	DRY	NM
CF-15-07	436.40	436.81	436.88	437.28
CF-15-08	443.16	446.79	447.22	447.36
CF-15-09	447.15	447.00	445.43	447.90
WBSP-15-01	452.75	451.61	DRY	NM
WBSP-15-02	465.73	459.06	462.15	NM

Notes:

1. NM: Not Measured

TABLE A-2
SUMMARY OF GROUNDWATER ELEVATION DATA DURING 2024
LANDFILL RUNOFF COLLECTION POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Mar-24	Jun-24	Sep-24	Dec-24
	Groundwater Elevation (feet)			
CF-15-04	437.48	436.78	454.12	NM
CF-15-05	432.57	431.53	428.14	NM
CF-15-06	428.50	427.35	DRY	NM
CF-15-07	436.40	436.81	436.88	437.28
CF-15-08	443.16	446.79	447.22	447.36
CF-15-09	447.15	447.00	445.43	447.90
WBSP-15-01	452.75	451.61	DRY	NM
WBSP-15-02	465.73	459.06	462.15	NM
CF-19-14	442.76	443.38	441.94	444.98
CF-19-15	429.24	427.86	419.71	420.76

Notes:

1. NM: Not Measured

TABLE A-3
SUMMARY OF GROUNDWATER ELEVATION DATA DURING 2024
WEST BOILER SLAG POND
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Mar-24	Jun-24	Sep-24	Dec-24
	Groundwater Elevation (feet)			
CF-15-04	437.48	436.78	454.12	NM
CF-15-05	432.57	431.53	428.14	NM
CF-15-06	428.50	427.35	DRY	NM
WBSP-15-01	452.75	451.61	DRY	NM
WBSP-15-02	465.73	459.06	462.15	NM
WBSP-15-03	476.32	475.03	476.60	NM
WBSP-15-04a	425.73	417.68	417.35	419.28
WBSP-15-05a	428.09	420.00	419.75	420.58
WBSP-15-06a	428.48	420.22	420.08	421.64
WBSP-15-07	427.32	428.81	427.76	426.81
WBSP-15-08	430.46	431.41	429.69	429.47
WBSP-15-09	427.94	428.34	426.69	427.89
WBSP-15-10	428.32	429.09	426.94	NM

Notes:

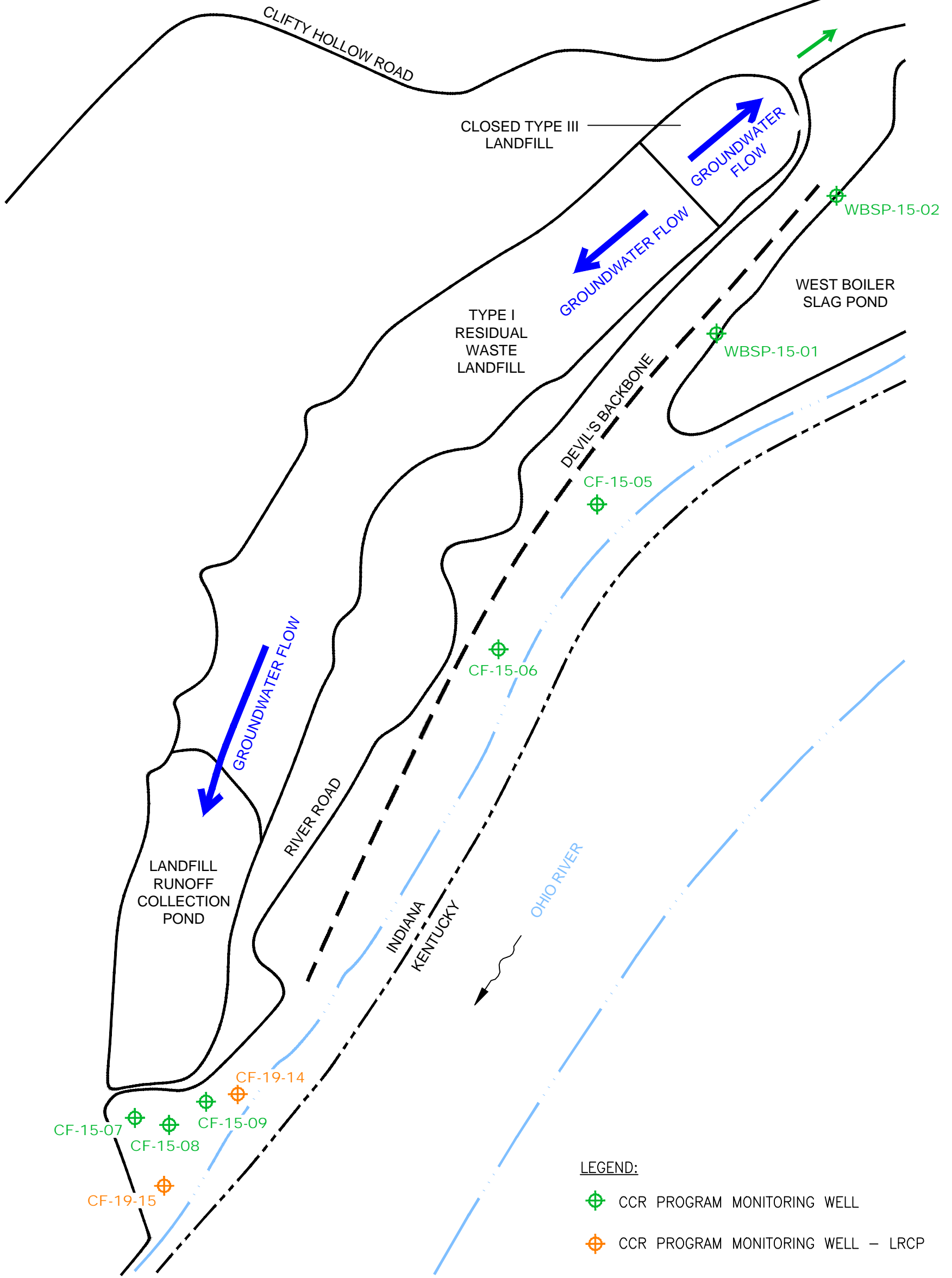
1. NM: Not Measured

APPENDIX B



GROUNDWATER FLOW MAPS



WELL CF-15-04 IS
LOCATED ~2,800 FEET
TO THE NORTHEAST



LEGEND:

-  CCR PROGRAM MONITORING WELL
-  CCR PROGRAM MONITORING WELL - LRCP

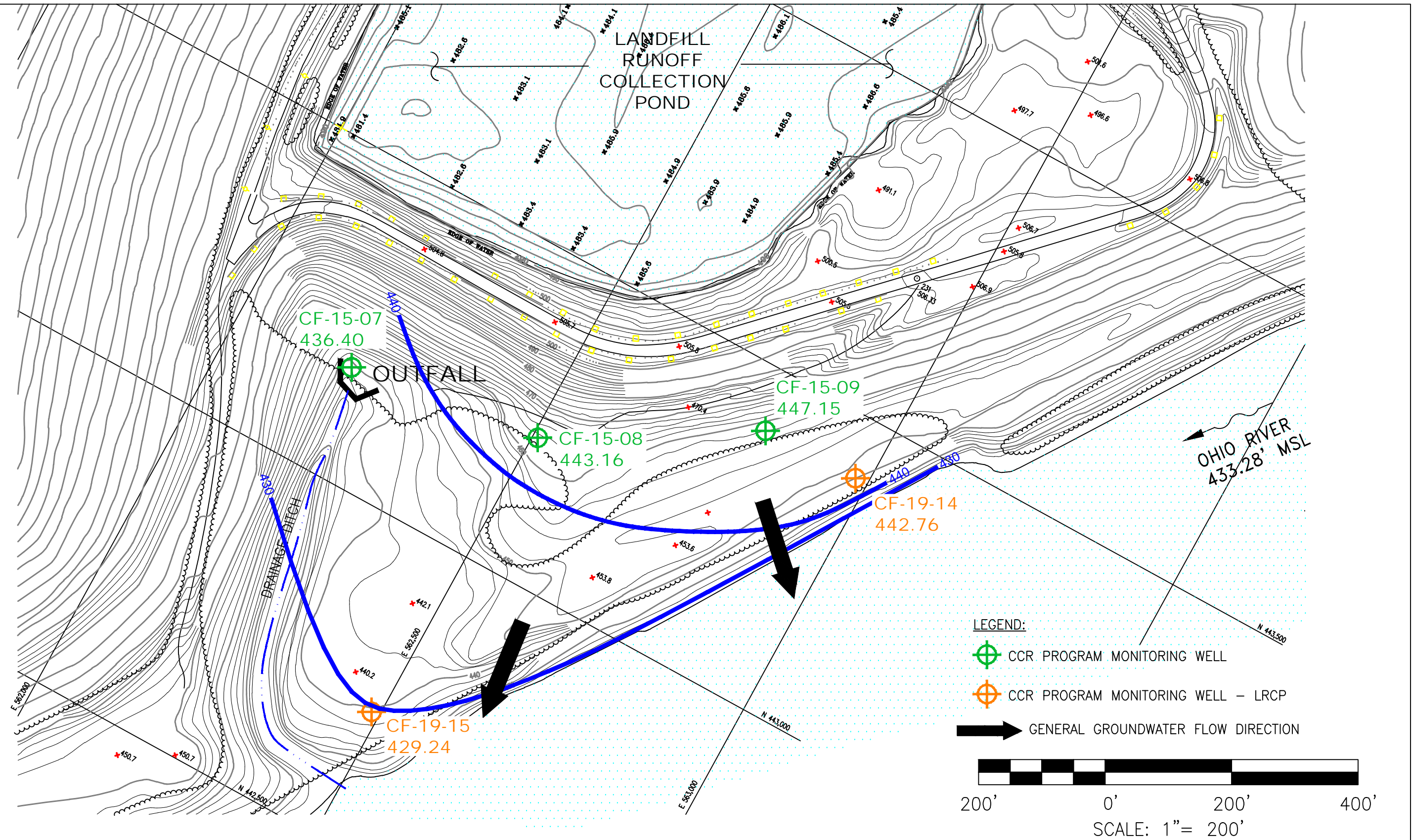
NOTE:
WELLS CF-19-14 AND CF-19-15 WERE
INSTALLED IN MARCH 2019.

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DATE	12-26-2024
CHECKED BY	
JOB NO.	2024009
DWG FILE	2024009_B-1_IKEC_CLIFTY_GW_FLOW_APPX_B_2024-GRM.DWG
DRAWING SCALE	NOT TO SCALE



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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA TYPE I RESIDUAL WASTE LANDFILL AND LANDFILL RUNOFF COLLECTION POND GENERALIZED GROUNDWATER FLOW UPPERMOST AQUIFER - MARCH 2024/SEPTEMBER 2024	
DRAWING NAME	FIGURE B-1
REV.	0



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

DRAWN BY	GRM
DATE	12-26-2024
CHECKED BY	
JOB NO.	2024009
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DRAWING SCALE	AS SHOWN

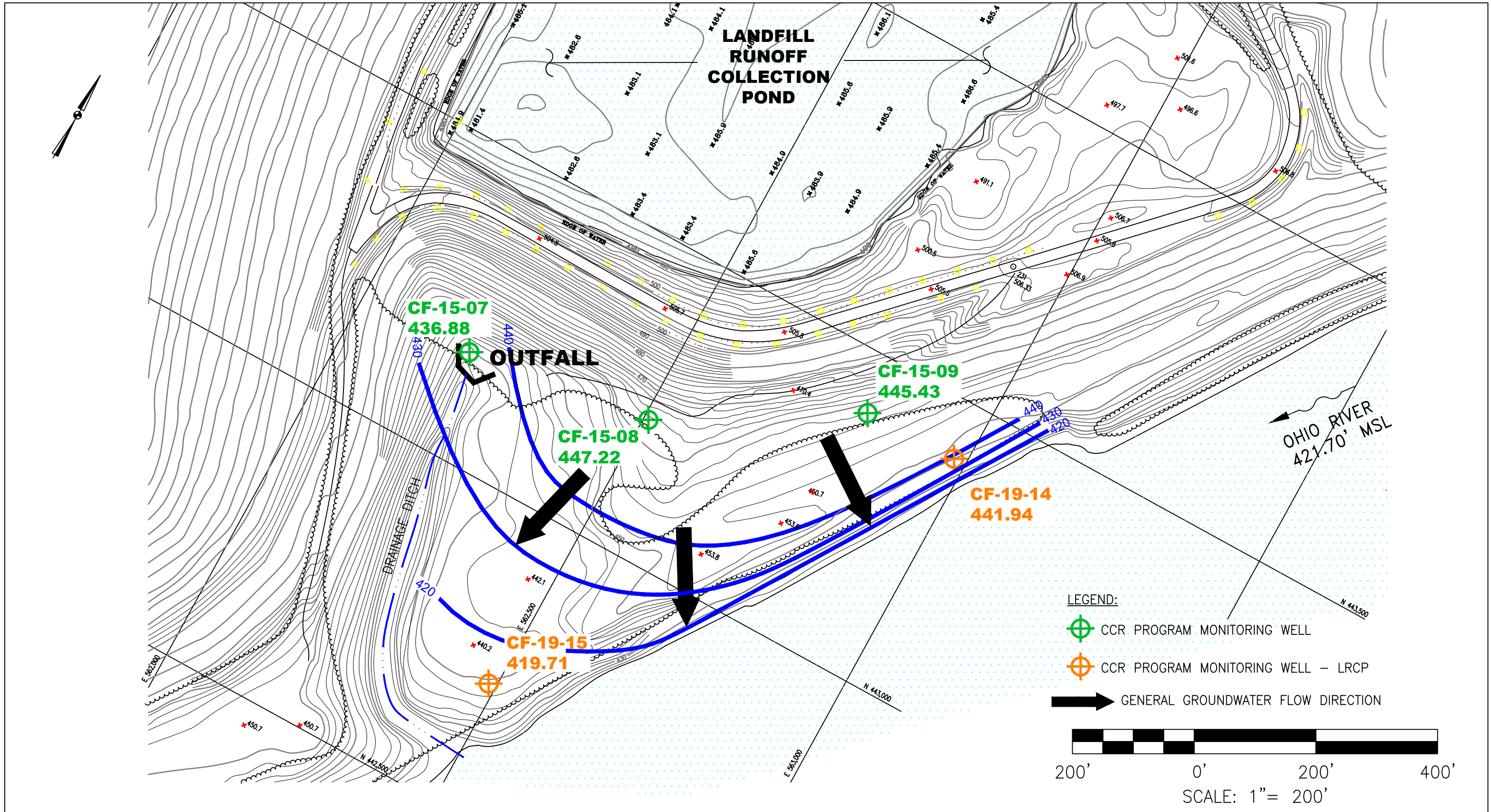


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INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
CCR PROGRAM
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
GROUNDWATER FLOW - UPPERMOST AQUIFER
MARCH 2024

DRAWING NAME	FIGURE B-2	REV.	0
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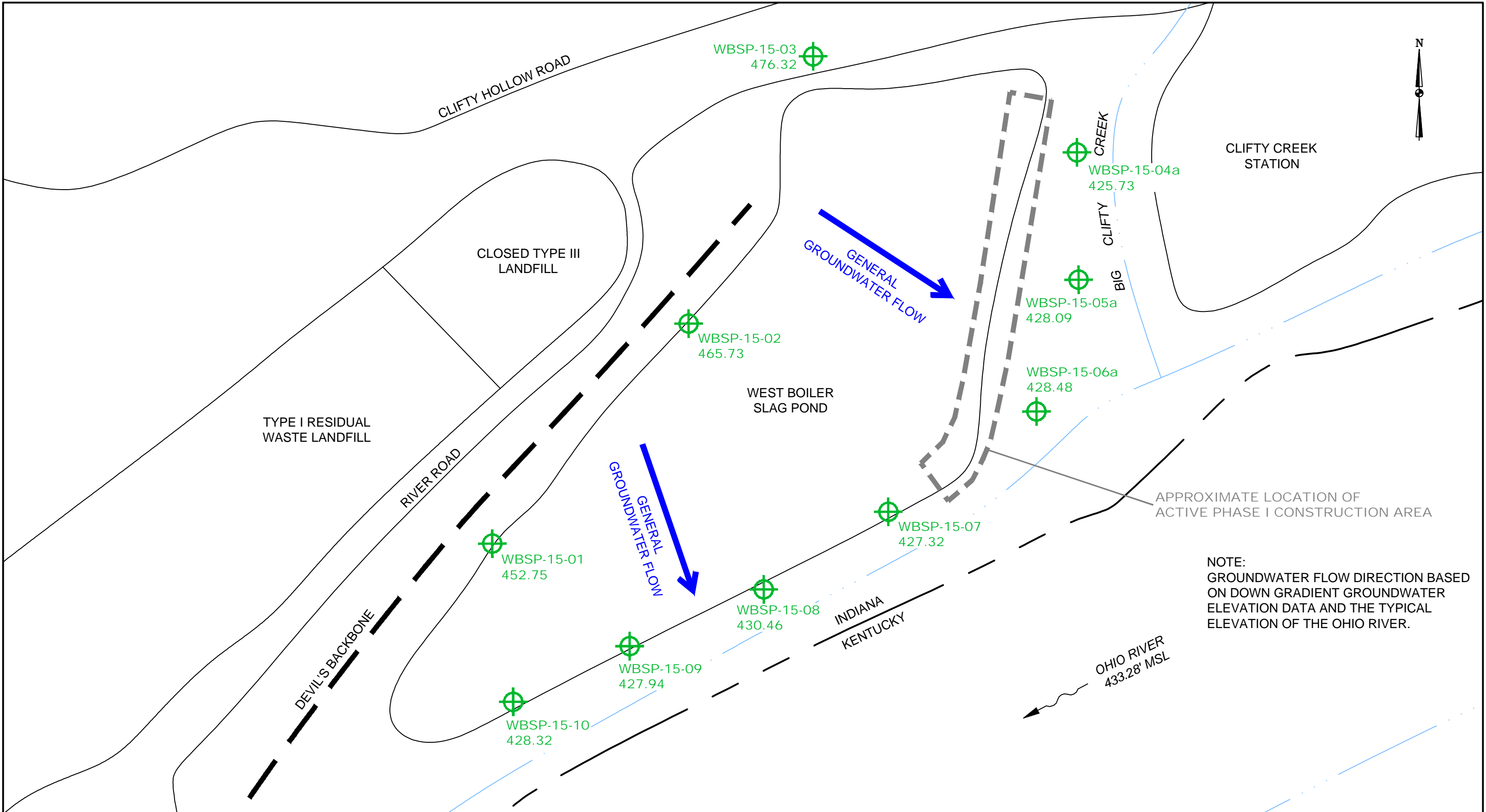
NOTE:
WELLS CF-19-14 AND CF-19-15 WERE INSTALLED IN MARCH 2019 DURING THE CHARACTERIZATION OF THE LRCP.

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CHECKED BY	
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DRAWING SCALE	AS SHOWN

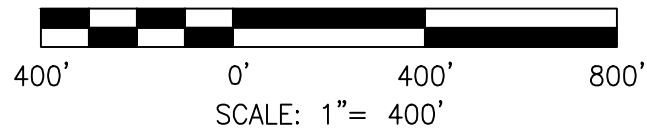


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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA CCR PROGRAM	
TYPE I RESIDUAL WASTE LANDFILL AND LANDFILL RUNOFF COLLECTION POND GROUNDWATER FLOW - UPPERMOST AQUIFER SEPTEMBER 2024	
DRAWING NAME	FIGURE B-3
REV.	0



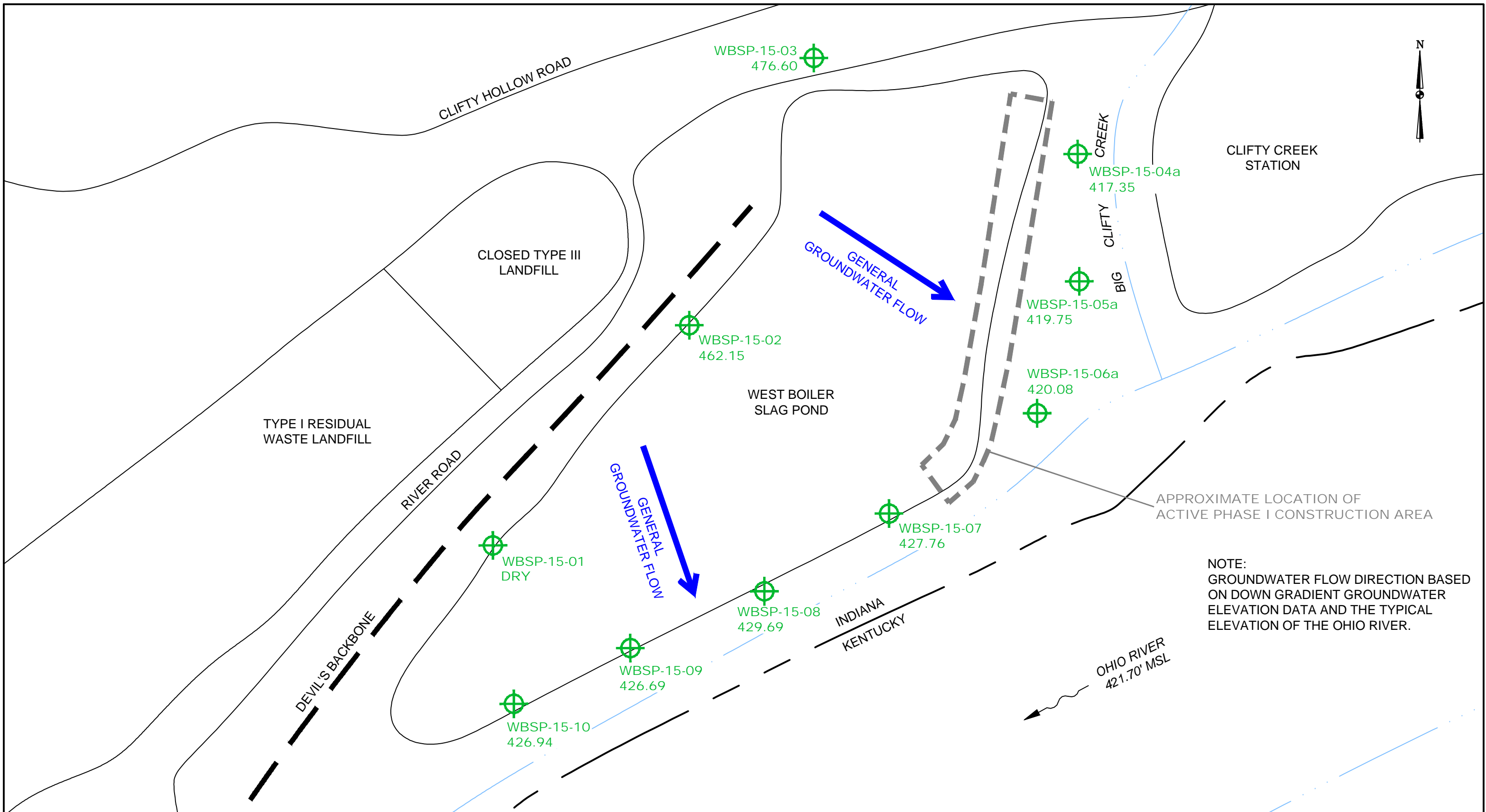
LEGEND:
 CCR PROGRAM MONITORING WELL
 GROUNDWATER FLOW DIRECTION





DATE	GRM
CHECKED BY	12-26-2024
JOB NO.	2024009
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DRAWING SCALE	AS SHOWN

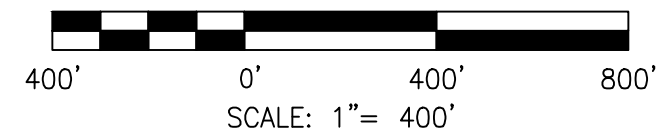
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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA WEST BOILER SLAG POND GROUNDWATER LEVELS AND FLOW DIRECTION MARCH 2024	
DRAWING NAME	FIGURE B-4
REV.	0



NOTE:
GROUNDWATER FLOW DIRECTION BASED
ON DOWN GRADIENT GROUNDWATER
ELEVATION DATA AND THE TYPICAL
ELEVATION OF THE OHIO RIVER.

LEGEND:
 CCR PROGRAM MONITORING WELL
 GROUNDWATER FLOW DIRECTION



DATE	GRM
CHECKED BY	12-26-2024
JOB NO.	2024009
DWG FILE	2024009_B-5_IKEC-CLIFTY_GW_FLOW_APPX_B_ANNUAL_GW_RPT_2024-GRM.DWG
DRAWING SCALE	AS SHOWN



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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA WEST BOILER SLAG POND GROUNDWATER LEVELS AND FLOW DIRECTION SEPTEMBER 2024	
DRAWING NAME	FIGURE B-5
REV.	0

APPENDIX C

APPENDIX III AND APPENDIX IV CONSTITUENTS

**APPENDIX III AND APPENDIX IV CONSTITUENTS
 TYPE I RESIDUAL WASTE LANDFILL AND LANDFILL RUNOFF COLLECTION POND
 AND WEST BOILER SLAG POND
 CLIFTY CREEK STATION
 MADISON, INDIANA**

Appendix III Constituents
Boron, B
Calcium, Ca
Chloride, Cl
Fluoride, F
pH (units=SU)
Sulfate, SO4
Total Dissolved Solids (TDS)
Appendix IV Constituents
Antimony, Sb
Arsenic, As
Barium, Ba
Beryllium, Be
Cadmium, Cd
Chromium, Cr
Cobalt, Co
Fluoride, F
Lithium, Li
Lead, Pb
Mercury, Hg
Molybdenum, Mo
Radium 226 & 228 (combined)(units=pCi/L)
Selenium, Se
Thallium, Tl

APPENDIX D
ANALYTICAL RESULTS

CF-15-04
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	0.024	0.06
Calcium, Ca	mg/L	64	68
Chloride, Cl	mg/L	34	34
Fluoride, F	mg/L	0.17	0.13
pH	s.u.	7.41	7.27
Sulfate, SO4	mg/L	32	38
Total Dissolved Solids (TDS)	mg/L	280	320
Appendix IV Constituents			
Antimony, Sb	ug/L	1 U	1 U
Arsenic, As	ug/L	0.35J	0.39J
Barium, Ba	ug/L	38	43
Beryllium, Be	ug/L	0.7 U	0.7 U
Cadmium, Cd	ug/L	0.5 U	0.5 U
Chromium, Cr	ug/L	0.75JB	1.2J
Cobalt, Co	ug/L	0.16J	0.22J
Fluoride, F	mg/L	0.17	0.13
Lead, Pb	ug/L	1 U	1 U
Lithium, Li	mg/L	0.004U	0.0014J
Mercury, Hg	ug/L	0.2U	0.2U
Molybdenum, Mo	ug/L	0.71J	1.7
Radium 226 & 228 (combined)	pCi/L	5 U	5U
Selenium, Se	ug/L	1 U	1 U
Thallium, Tl	ug/L	0.2 U	0.2 U

CF-15-05
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	0.13	0.12
Calcium, Ca	mg/L	120	110
Chloride, Cl	mg/L	33	43
Fluoride, F	mg/L	0.47	0.63
pH	s.u.	7.02	6.49
Sulfate, SO4	mg/L	49	62
Total Dissolved Solids (TDS)	mg/L	520	550
Appendix IV Constituents			
Antimony, Sb	ug/L	1 U	1 U
Arsenic, As	ug/L	0.88J	1.2
Barium, Ba	ug/L	54B	48
Beryllium, Be	ug/L	0.039J	0.7 U
Cadmium, Cd	ug/L	0.5 U	0.5 U
Chromium, Cr	ug/L	0.71J	2.9
Cobalt, Co	ug/L	0.73	1.2
Fluoride, F	mg/L	0.47	0.63
Lead, Pb	ug/L	0.45J	0.99J
Lithium, Li	mg/L	0.017	0.019
Mercury, Hg	ug/L	0.2U	0.2 U
Molybdenum, Mo	ug/L	0.41J	0.42J
Radium 226 & 228 (combined)	pCi/L	1.13	5 U
Selenium, Se	ug/L	1 U	1 U
Thallium, Tl	ug/L	0.2 U	0.2U

Notes:

NS: Well not sampled.

CF-15-06
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	0.12	NS
Calcium, Ca	mg/L	140	NS
Chloride, Cl	mg/L	7.5	NS
Fluoride, F	mg/L	0.23	NS
pH	s.u.	7.35	NS
Sulfate, SO4	mg/L	93	NS
Total Dissolved Solids (TDS)	mg/L	570	NS
Appendix IV Constituents			
Antimony, Sb	ug/L	1 U	NS
Arsenic, As	ug/L	0.53J	NS
Barium, Ba	ug/L	30B	NS
Beryllium, Be	ug/L	0.043J	NS
Cadmium, Cd	ug/L	0.5U	NS
Chromium, Cr	ug/L	0.81J	NS
Cobalt, Co	ug/L	0.8	NS
Fluoride, F	mg/L	0.23	NS
Lead, Pb	ug/L	0.83J	NS
Lithium, Li	mg/L	0.024	NS
Mercury, Hg	ug/L	0.2U	NS
Molybdenum, Mo	ug/L	0.48J	NS
Radium 226 & 228 (combined)	pCi/L	5U	NS
Selenium, Se	ug/L	1 U	NS
Thallium, Tl	ug/L	0.2U	NS

Notes:

NS: Well not sampled.

CF-15-07
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	24-Dec
Appendix III Constituents					
Boron, B	mg/L	0.035	NA	0.043	NA
Calcium, Ca	mg/L	180	NA	160	NA
Chloride, Cl	mg/L	5.2	NA	5.3	NA
Fluoride, F	mg/L	0.37	NA	0.36	NA
pH	s.u.	6.94	NA	6.41	NA
Sulfate, SO4	mg/L	3.4J	NA	3.7J	NA
Total Dissolved Solids (TDS)	mg/L	640	NA	650B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1 U	NA	1U	NA
Arsenic, As	ug/L	13	15	12	44
Barium, Ba	ug/L	90B	NA	89	NA
Beryllium, Be	ug/L	0.7 U	NA	0.7U	NA
Cadmium, Cd	ug/L	0.5 U	NA	0.5U	NA
Chromium, Cr	ug/L	1.5U	NA	1.3J	NA
Cobalt, Co	ug/L	3	NA	2.8	NA
Fluoride, F	mg/L	0.37	NA	0.36	NA
Lead, Pb	ug/L	1 U	NA	0.22J	NA
Lithium, Li	mg/L	0.0013J	NA	0.0019J	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	5.2	NA	5.3	NA
Radium 226 & 228 (combined)	pCi/L	5 U	NA	5U	NA
Selenium, Se	ug/L	1 U	NA	1U	NA
Thallium, Tl	ug/L	0.2 U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.

Due to access restrictions (construction) in September, well CF-15-07 was sampled in November and resampling occurred in January 2024.

CF-15-08
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	8.5	3.9	7.6	6.5
Calcium, Ca	mg/L	200	NA	320	360
Chloride, Cl	mg/L	72	72	120	150
Fluoride, F	mg/L	0.39	NA	0.35	NA
pH	s.u.	7.09	NA	6.52	NA
Sulfate, SO4	mg/L	330	NA	910	940
Total Dissolved Solids (TDS)	mg/L	890	NA	1700B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1 U	NA	1 U	NA
Arsenic, As	ug/L	0.68J	NA	0.43J	NA
Barium, Ba	ug/L	71B	NA	57	NA
Beryllium, Be	ug/L	0.7U	NA	0.7 U	NA
Cadmium, Cd	ug/L	0.21J	NA	0.18JB	NA
Chromium, Cr	ug/L	1.5U	NA	1.3J	NA
Cobalt, Co	ug/L	0.49	NA	0.56	NA
Fluoride, F	mg/L	0.39	NA	0.35	NA
Lead, Pb	ug/L	1 U	NA	1 U	NA
Lithium, Li	mg/L	0.021	NA	0.027	NA
Mercury, Hg	ug/L	0.2U	NA	0.2 U	NA
Molybdenum, Mo	ug/L	270	420	280	230
Radium 226 & 228 (combined)	pCi/L	0.94	NA	5 U	NA
Selenium, Se	ug/L	1 U	NA	0.65J	NA
Thallium, Tl	ug/L	0.2 U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.

CF-15-09
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	5.7	4.7	6	4.9
Calcium, Ca	mg/L	180	NA	190	NA
Chloride, Cl	mg/L	4.1	NA	5.4	NA
Fluoride, F	mg/L	0.41	NA	0.26	NA
pH	s.u.	7.02	NA	7.03	NA
Sulfate, SO4	mg/L	200	NA	10U	NA
Total Dissolved Solids (TDS)	mg/L	630	NA	710	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1 U	NA	1 U	NA
Arsenic, As	ug/L	0.35J	NA	3.6	NA
Barium, Ba	ug/L	21	NA	44	NA
Beryllium, Be	ug/L	0.7U	NA	0.29J	NA
Cadmium, Cd	ug/L	0.5U	NA	0.080J	NA
Chromium, Cr	ug/L	1.4JB	NA	14	NA
Cobalt, Co	ug/L	0.28J	NA	4.9	NA
Fluoride, F	mg/L	0.41	NA	0.26	NA
Lead, Pb	ug/L	1U	NA	4.3	NA
Lithium, Li	mg/L	0.01	NA	0.02	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	90	NA	85	NA
Radium 226 & 228 (combined)	pCi/L	0.589	NA	2	NA
Selenium, Se	ug/L	1 U	NA	1 U	NA
Thallium, Tl	ug/L	0.2U	NA	0.074J	NA

Notes:

NA: Sampling not required for this parameter.

CF-19-14
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix IV Constituents			
Molybdenum, Mo	ug/L	24	52

CF-19-15
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix IV Constituents			
Molybdenum, Mo	ug/L	0.65J	0.47J

WBSP-15-01
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	NS	NS
Calcium, Ca	mg/L	NS	NS
Chloride, Cl	mg/L	NS	NS
Fluoride, F	mg/L	NS	NS
pH	s.u.	NS	NS
Sulfate, SO4	mg/L	NS	NS
Total Dissolved Solids (TDS)	mg/L	NS	NS
Appendix IV Constituents			
Antimony, Sb	ug/L	NS	NS
Arsenic, As	ug/L	NS	NS
Barium, Ba	ug/L	NS	NS
Beryllium, Be	ug/L	NS	NS
Cadmium, Cd	ug/L	NS	NS
Chromium, Cr	ug/L	NS	NS
Cobalt, Co	ug/L	NS	NS
Fluoride, F	mg/L	NS	NS
Lead, Pb	ug/L	NS	NS
Lithium, Li	mg/L	NS	NS
Mercury, Hg	ug/L	NS	NS
Molybdenum, Mo	ug/L	NS	NS
Radium 226 & 228 (combined)	pCi/L	NS	NS
Selenium, Se	ug/L	NS	NS
Thallium, Tl	ug/L	NS	NS

Notes:

NS: Well not sampled.

WBSP-15-02
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	3.8	NS
Calcium, Ca	mg/L	270	NS
Chloride, Cl	mg/L	11	NS
Fluoride, F	mg/L	0.41	NS
pH	s.u.	7.73	NS
Sulfate, SO4	mg/L	570	NS
Total Dissolved Solids (TDS)	mg/L	1200	NS
Appendix IV Constituents			
Antimony, Sb	ug/L	0.5J	NS
Arsenic, As	ug/L	0.47J	NS
Barium, Ba	ug/L	25	NS
Beryllium, Be	ug/L	0.7U	NS
Cadmium, Cd	ug/L	0.5U	NS
Chromium, Cr	ug/L	0.98JB	NS
Cobalt, Co	ug/L	0.45	NS
Fluoride, F	mg/L	0.41	NS
Lead, Pb	ug/L	1U	NS
Lithium, Li	mg/L	0.07	NS
Mercury, Hg	ug/L	0.2U	NS
Molybdenum, Mo	ug/L	2.9	NS
Radium 226 & 228 (combined)	pCi/L	0.747	NS
Selenium, Se	ug/L	1U	NS
Thallium, Tl	ug/L	0.2U	NS

WBSP-15-03
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	0.07	0.14
Calcium, Ca	mg/L	140	190
Chloride, Cl	mg/L	64	32
Fluoride, F	mg/L	0.23	0.23J
pH	s.u.	7.95	6.26
Sulfate, SO4	mg/L	180	200
Total Dissolved Solids (TDS)	mg/L	630	780
Appendix IV Constituents			
Antimony, Sb	ug/L	1 U	1U
Arsenic, As	ug/L	1 U	1U
Barium, Ba	ug/L	12	17
Beryllium, Be	ug/L	0.7U	0.7U
Cadmium, Cd	ug/L	0.5U	0.5U
Chromium, Cr	ug/L	0.66JB	1.5U
Cobalt, Co	ug/L	0.19J	0.28J
Fluoride, F	mg/L	0.23	0.23J
Lead, Pb	ug/L	1U	1U
Lithium, Li	mg/L	0.011	0.013
Mercury, Hg	ug/L	0.2U	0.2U
Molybdenum, Mo	ug/L	1.3	0.70J
Radium 226 & 228 (combined)	pCi/L	5U	0.743
Selenium, Se	ug/L	1U	1U
Thallium, Tl	ug/L	0.2U	0.2U

Notes:

NA: Sampling not required for this parameter.

WBSP-15-04a
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Nov-24
Appendix III Constituents					
Boron, B	mg/L	0.4	0.41	0.39	0.42
Calcium, Ca	mg/L	140	NA	140	NA
Chloride, Cl	mg/L	25	NA	24	NA
Fluoride, F	mg/L	0.22J	NA	0.13	NA
pH	s.u.	7.94	NA	6.55	NA
Sulfate, SO4	mg/L	94	NA	91	NA
Total Dissolved Solids (TDS)	mg/L	540	NA	570B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1U	NA	1U	NA
Arsenic, As	ug/L	0.47J	NA	1U	NA
Barium, Ba	ug/L	86	NA	79	NA
Beryllium, Be	ug/L	0.033J	NA	0.7U	NA
Cadmium, Cd	ug/L	0.15J	NA	0.15JB	NA
Chromium, Cr	ug/L	1.2JB	NA	1.3J	NA
Cobalt, Co	ug/L	7.9	7.5	7.9	7.6
Fluoride, F	mg/L	0.22J	NA	0.13	NA
Lead, Pb	ug/L	0.48J	NA	0.27J	NA
Lithium, Li	mg/L	0.0021J	NA	0.0024J	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	0.21J	NA	0.29J	NA
Radium 226 & 228 (combined)	pCi/L	0.562	NA	0.513	NA
Selenium, Se	ug/L	0.5J	NA	0.49J	NA
Thallium, Tl	ug/L	0.2U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.
The facility is evaluating whether the sampling results provided above are the result of an error in accordance with 40 C.F.R. § 257.95(g)(3)(ii).

WBSP-15-05a
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	2.5	2	2.4	2.6
Calcium, Ca	mg/L	150	NA	170	NA
Chloride, Cl	mg/L	25	NA	23	NA
Fluoride, F	mg/L	0.32	NA	0.21J	NA
pH	s.u.	7.6	NA	7.21	NA
Sulfate, SO4	mg/L	340	NA	370	NA
Total Dissolved Solids (TDS)	mg/L	660	NA	740	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	0.51J	NA	1U	NA
Arsenic, As	ug/L	0.8J	NA	0.53J	NA
Barium, Ba	ug/L	110	NA	110	NA
Beryllium, Be	ug/L	0.044J	NA	0.7U	NA
Cadmium, Cd	ug/L	0.5U	NA	0.5U	NA
Chromium, Cr	ug/L	2.6B	NA	1.5U	NA
Cobalt, Co	ug/L	2	NA	1.3	NA
Fluoride, F	mg/L	0.32	NA	0.21J	NA
Lead, Pb	ug/L	0.35J	NA	1U	NA
Lithium, Li	mg/L	0.067	NA	0.014	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	34	NA	29	NA
Radium 226 & 228 (combined)	pCi/L	0.792	NA	5U	NA
Selenium, Se	ug/L	1U	NA	1U	NA
Thallium, Tl	ug/L	0.061J	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.
The facility is evaluating whether the sampling results provided above are the result of an error in accordance with 40 C.F.R. § 257.95(g)(3)(ii).

WBSP-15-06a
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	3	1.4	1.1	2.3
Calcium, Ca	mg/L	110	NA	93	NA
Chloride, Cl	mg/L	81	NA	34	NA
Fluoride, F	mg/L	0.35	NA	0.26	NA
pH	s.u.	7.18	NA	7.04	NA
Sulfate, SO4	mg/L	150	NA	22	NA
Total Dissolved Solids (TDS)	mg/L	560	NA	410B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1U	NA	1U	NA
Arsenic, As	ug/L	9.6	NA	23	12
Barium, Ba	ug/L	220	NA	270	NA
Beryllium, Be	ug/L	0.12J	NA	0.21J	NA
Cadmium, Cd	ug/L	0.5U	NA	0.11J	NA
Chromium, Cr	ug/L	3.6B	NA	5.7	NA
Cobalt, Co	ug/L	2.3	NA	2.3	NA
Fluoride, F	mg/L	0.35	NA	0.26	NA
Lead, Pb	ug/L	1.3	NA	2.3	NA
Lithium, Li	mg/L	0.0055	NA	0.0068	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	54	NA	23	NA
Radium 226 & 228 (combined)	pCi/L	5U	NA	5U	NA
Selenium, Se	ug/L	1U	NA	1U	NA
Thallium, Tl	ug/L	0.2U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.

The facility is evaluating whether the sampling results provided above are the result of an error in accordance with 40 C.F.R. § 257.95(g)(3)(ii).

WBSP-15-07
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	0.025	NA	0.02	NA
Calcium, Ca	mg/L	190	NA	180	NA
Chloride, Cl	mg/L	12	NA	12	NA
Fluoride, F	mg/L	0.4	NA	0.35	NA
pH	s.u.	7.67	NA	6.45	NA
Sulfate, SO4	mg/L	7.6J	NA	15	NA
Total Dissolved Solids (TDS)	mg/L	710	NA	750B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1U	NA	1U	NA
Arsenic, As	ug/L	14	59	42	36
Barium, Ba	ug/L	330B	NA	360	NA
Beryllium, Be	ug/L	0.087J	NA	0.7U	NA
Cadmium, Cd	ug/L	0.5U	NA	0.5U	NA
Chromium, Cr	ug/L	1.1J	NA	1.5U	NA
Cobalt, Co	ug/L	2.8	NA	2.6	NA
Fluoride, F	mg/L	0.4	NA	0.35	NA
Lead, Pb	ug/L	0.68J	NA	1U	NA
Lithium, Li	mg/L	0.0023J	NA	0.0029J	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	17	NA	5.4	NA
Radium 226 & 228 (combined)	pCi/L	1.89	NA	1.52	NA
Selenium, Se	ug/L	1U	NA	1U	NA
Thallium, Tl	ug/L	0.2U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.

WBSP-15-08
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	0.029	NA	0.027	NA
Calcium, Ca	mg/L	83	NA	83	NA
Chloride, Cl	mg/L	17	NA	17	NA
Fluoride, F	mg/L	0.24	NA	0.19	NA
pH	s.u.	7.47	NA	6.22	NA
Sulfate, SO4	mg/L	0.75J	NA	4U	NA
Total Dissolved Solids (TDS)	mg/L	320	NA	320	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1U	NA	1U	NA
Arsenic, As	ug/L	58	65	82	56
Barium, Ba	ug/L	290B	NA	350	NA
Beryllium, Be	ug/L	0.078J	NA	0.7U	NA
Cadmium, Cd	ug/L	0.5U	NA	0.5U	NA
Chromium, Cr	ug/L	1.5	NA	2.1	NA
Cobalt, Co	ug/L	1.7	NA	1.6	NA
Fluoride, F	mg/L	0.24	NA	0.19	NA
Lead, Pb	ug/L	0.84J	NA	0.60J	NA
Lithium, Li	mg/L	0.002J	NA	0.0017J	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	1.1	NA	1.9	NA
Radium 226 & 228 (combined)	pCi/L	5U	NA	5U	NA
Selenium, Se	ug/L	1U	NA	1U	NA
Thallium, Tl	ug/L	0.2U	NA	0.15J	NA

Notes:

NA: Sampling not required for this parameter.

WBSP-15-09
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Jun-24	Sep-24	Dec-24
Appendix III Constituents					
Boron, B	mg/L	0.016J	NA	0.02U	NA
Calcium, Ca	mg/L	69	NA	76	NA
Chloride, Cl	mg/L	4.3	NA	5.4	NA
Fluoride, F	mg/L	0.61	NA	0.64	0.59
pH	s.u.	7.4	NA	6.45	NA
Sulfate, SO4	mg/L	4U	NA	4U	NA
Total Dissolved Solids (TDS)	mg/L	270	NA	320B	NA
Appendix IV Constituents					
Antimony, Sb	ug/L	1U	NA	1U	NA
Arsenic, As	ug/L	16	21	19	14
Barium, Ba	ug/L	160B	NA	170	NA
Beryllium, Be	ug/L	0.7U	NA	0.7U	NA
Cadmium, Cd	ug/L	0.5U	NA	0.5U	NA
Chromium, Cr	ug/L	1.5U	NA	1.3J	NA
Cobalt, Co	ug/L	0.29J	NA	0.35	NA
Fluoride, F	mg/L	0.61	NA	0.64	0.59
Lead, Pb	ug/L	0.25J	NA	1U	NA
Lithium, Li	mg/L	0.004U	NA	0.004U	NA
Mercury, Hg	ug/L	0.2U	NA	0.2U	NA
Molybdenum, Mo	ug/L	9.6	NA	8.9	NA
Radium 226 & 228 (combined)	pCi/L	5U	NA	0.585	NA
Selenium, Se	ug/L	1U	NA	1U	NA
Thallium, Tl	ug/L	0.2U	NA	0.2U	NA

Notes:

NA: Sampling not required for this parameter.

WBSP-15-10
SUMMARY OF 2024 ANALYTICAL RESULTS
Indiana-Kentucky Electric Corporation
Clifty Creek Station
Madison, Indiana

Parameter	Units	Mar-24	Sep-24
Appendix III Constituents			
Boron, B	mg/L	0.021	0.021
Calcium, Ca	mg/L	90	95
Chloride, Cl	mg/L	23	22
Fluoride, F	mg/L	0.28	0.23
pH	s.u.	7.23	6.14
Sulfate, SO4	mg/L	67	71
Total Dissolved Solids (TDS)	mg/L	380	400B
Appendix IV Constituents			
Antimony, Sb	ug/L	1U	1U
Arsenic, As	ug/L	3.1	7.7
Barium, Ba	ug/L	200	280
Beryllium, Be	ug/L	0.067J	0.24J
Cadmium, Cd	ug/L	0.5U	0.092J
Chromium, Cr	ug/L	1.6B	5.2
Cobalt, Co	ug/L	3.4	4.9
Fluoride, F	mg/L	0.28	0.23
Lead, Pb	ug/L	0.42J	2
Lithium, Li	mg/L	0.0024J	0.0048
Mercury, Hg	ug/L	0.2U	0.2U
Molybdenum, Mo	ug/L	1.5	1.8
Radium 226 & 228 (combined)	pCi/L	5U	1.67
Selenium, Se	ug/L	1U	1U
Thallium, Tl	ug/L	0.2U	0.2U

Notes:

NA: Sampling not required for this parameter.

APPENDIX E

**ALTERNATE SOURCE DEMONSTRATION SEPTEMBER 2024
TYPE I LANDFILL**



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**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2024 ASSESSMENT MONITORING EVENT
TYPE I RESIDUAL WASTE LANDFILL
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK PLANT
MADISON, JEFFERSON COUNTY, INDIANA**

JANUARY 2025

Prepared for:

INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC)

Prepared by:

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC. (AGES)

**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2024 ASSESSMENT MONITORING EVENT
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APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC. (AGES)



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Senior Scientist II



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Chief Hydrogeologist

**COAL COMBUSTION RESIDUALS REGULATION
 ALTERNATE SOURCE DEMONSTRATION REPORT
 SEPTEMBER 2024 ASSESSMENT MONITORING EVENT
 TYPE I RESIDUAL WASTE LANDFILL
 INDIANA-KENTUCKY ELECTRIC CORPORATION
 CLIFTY CREEK PLANT
 MADISON, JEFFERSON COUNTY, INDIANA**

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**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
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TYPE I RESIDUAL WASTE LANDFILL
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK PLANT
MADISON, JEFFERSON COUNTY, INDIANA**

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**COAL COMBUSTION RESIDUALS REGULATION
ALTERNATE SOURCE DEMONSTRATION REPORT
SEPTEMBER 2024 ASSESSMENT MONITORING EVENT
TYPE I RESIDUAL WASTE LANDFILL
INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK PLANT
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).

Under the CCR program, the Type I Landfill and LRCP are being monitored under one (1) multi-unit groundwater monitoring system. During the March 2018 Detection Monitoring event, Boron Statistically Significant Increases (SSIs) were confirmed in two (2) wells located downgradient of the Type I Landfill and LRCP and these CCR units entered into Assessment Monitoring in September 2018. Based on a successful Alternate Source Demonstration (ASD) (AGES 2019a), IKEC determined that the Type I Landfill was not the source of the Boron. Therefore, the Type I Landfill returned to Detection Monitoring in January 2019. During the March 2019, October 2019, March 2020, September 2020, March 2021, September 2021, March 2022, September 2022, March 2023, and September 2023 Detection Monitoring sampling events, SSIs for Boron were again confirmed in wells located downgradient of the unit. Based on successful ASDs for these nine (9) Detection Monitoring events (AGES 2019b, AGES 2020a, AGES 2020b, AGES 2021a, AGES 2021b, AGES 2022a, AGES 2022b, AGES 2023b, AGES 2023a and AGES 2024b), the Type I Landfill remained in Detection Monitoring. As an alternate source for Boron at the LRCP could not be established, the LRCP remains in Assessment Monitoring.

During the March 2024 Detection Monitoring sampling event, Boron SSIs were not identified; however, a SSI was confirmed in well CF-15-08 for Chloride. The Type I Landfill entered Assessment Monitoring in October 2024.

During the September 2024 sampling event, Boron SSIs were confirmed in wells CF-15-08 and CF-15-09 located downgradient of the Type I Landfill; SSIs for Calcium, Chloride, and Sulfate were also confirmed in well CF-15-08. IKEC has prepared this ASD to show that the Type I Landfill is not the source of the Boron. Details regarding this evaluation are presented in this report.

1.1 Background

In accordance with §257.91(d) of the CCR Rule, as detailed in the Well Installation Report (AGES 2018), because the LRCP is directly adjacent to the southwest (downgradient) of the Type I Landfill, and because of the hydrogeologic conditions of the site, IKEC installed a multi-unit groundwater monitoring system to monitor groundwater quality directly downgradient of the Type I Landfill and LRCP. As described above, the Type I Landfill has remained in Detection Monitoring based on previous successful ASDs; the LRCP remains in Assessment Monitoring. In accordance with §257.95 of the CCR Rule, IKEC completed the groundwater monitoring requirements of the Assessment Monitoring Program at the Type I Landfill as described below.

The 1st round of Assessment Monitoring groundwater samples was collected between September 17 and 23, 2024 from monitoring wells at the Type I Landfill (Figure 1). All samples were collected in accordance with the Groundwater Monitoring Program Plan (GMPP) (AGES 2024a) and analyzed for Appendix III and Appendix 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 potential SSIs for Boron in monitoring wells CF-15-08 and CF-15-09 at the Type I Landfill. The results of the statistical evaluation are summarized in Table 1.

In accordance with the StAP, IKEC resampled the well for Boron on June 11, 2024. Based on the result of the resampling event, the SSIs for Boron were confirmed in monitoring wells CF-15-08 and CF-15-09 (Table 1).

1.2 Purpose of This Report

The purpose of this report is to present an ASD and provide sufficient evidence that the SSIs identified for Boron in wells CF-15-08 and CF-15-09 resulted from a source other than the Type I Landfill.

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.”

In addition to the above requirements of the CCR Rule, this ASD has been conducted and presented using guidance and documentation recommendations included in the U.S. EPA document Solid Waste Disposal Facility Criteria Technical Manual EPA 530-R-93-017 (U.S. EPA 1993).

A detailed discussion of the confirmed SSIs and a technical justification that the exceedance results are from a source other than the Type I Landfill are presented in the following sections of this report.

2.0 DESCRIPTION OF THE TYPE I LANDFILL

2.1 Unit Description

The Type I Landfill and LRCP occupy an approximately 160-acre area situated within an eroded bedrock channel. The Type I Landfill consists of approximately 109 acres that were approved as a Type I residual waste landfill by the Indiana Department of Environmental Management (IDEM) in 2007. The remaining 51 acres consist of the LRCP located at the southwest end of the Type I Landfill (17 acres) and 34 acres closed under the IDEM landfill permit requirements (Figures 1 and 2).

Beginning in 1955, ash products were sluiced to a disposal pond located in the bedrock channel at the plant site. To allow for more disposal capacity, an on-site fly ash pond was developed into a Type III residual landfill in 1988. All required permits for the Type III Residual Waste Landfill (Type III Landfill) were obtained from IDEM. The Type III Landfill was permitted to be constructed and to serve as closure for the historic fly ash pond. The Type III Landfill is located at the northeast end of the bedrock channel and went operational in 1991.

After IDEM approval, IKEC upgraded the Type III Landfill to a Type I residual waste landfill (Type I Landfill). As a result, the Type III Landfill was closed and the Type I Landfill was designed and constructed to serve as the cap for the closed Type III Landfill. The Type I Landfill, which went operational in 2010, is completely separated from the closed Type III Landfill by a geosynthetic clay liner and an engineered clay liner on top of the Type III Landfill to serve as a cap.

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 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 proposed final limits of the Type I Landfill & LRCP, 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 the 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 (AGES 2007) (Figure 4). As detailed in the Monitoring Well Installation Report (AGES 2018), an aquifer does not exist beneath either of the landfills. Therefore, alluvial deposits located southwest of the LRCP are designated as the uppermost aquifer for the Type I Landfill & LRCP.

The Type I Landfill was constructed using a geosynthetic clay liner to prevent water from the Type I Landfill from entering the underlying layers. Water in the Type I Landfill is collected by a leachate system and discharged into the low volume waste treatment system.

In November and December 2015, groundwater monitoring wells were installed for the CCR groundwater monitoring network at the site. The CCR groundwater monitoring network for the Type I Landfill consists of eight (8) monitoring wells (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 monitoring well. Wells CF-15-05 and CF-15-06 were also 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 flowing beneath the Type I Landfill. Because these wells are outside the hydraulic influence of the Type I Landfill, these wells were designated as background wells.

Table 2 presents construction details for the monitoring wells in the groundwater monitoring network for the Type I Landfill. Two (2) additional wells (CF-19-14 and CF-19-15) were installed southwest of the Type I Landfill during the characterization of the LRCP and are now also part of the monitoring system for the Type I Landfill. Groundwater elevation data from the wells has been used to support the development of flow maps for the area.

Based on groundwater levels collected at the site since 1994, groundwater in the uppermost aquifer southwest (downgradient) of the Type I Landfill typically 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.

Groundwater contour maps for the uppermost aquifer southwest of the Type I Landfill in September 2024 (Assessment Monitoring Event) and December 2024 (Resampling Event) are included in Appendix A (Figures A-1 and A-2). Groundwater generally flows to the southwest toward the Ohio River.

3.0 ALTERNATE SOURCE DEMONSTRATION

As noted above, Boron was identified as a confirmed SSI in wells CF-15-08 and CF-15-09 downgradient of the Type I Landfill. Based on a review of the current and historic data, AGES/IKEC have determined that the active Type I Landfill is not the source of the Boron SSIs reported in the CCR monitoring wells and that historic fly ash that had been sluiced into the valley beginning in 1955 is the alternate source for the Boron SSIs. As discussed in detail below, this conclusion is based on the following lines of evidence:

- Ash that was historically sluiced into the bedrock valley in the 1950s is a known source of Boron and is hydraulically connected to groundwater downgradient of the Type I Landfill;
- Boron has been detected in groundwater downgradient from the hydraulically-placed ash (and the Type I Landfill) in IDEM program wells CF-9405, CF-9406 and CF-9407 (located near wells CF-15-08 and CF-15-09) since 1994, which is 17 years prior to operation of the Type I Landfill; and
- Given the extremely low groundwater flow velocity at the landfill, the travel time for a release of Boron from the Type I Landfill to reach wells CF-15-08 and CF-15-09 is estimated at 120 years. As the Type I Landfill has only been in operation for 12 years, the landfill cannot be the source of the Boron.

Details to support these conclusions are presented below.

3.1 Alternate Source Demonstration Method

The evaluation of the alternate source for Boron in wells CF-15-08 and CF-15-09 was assessed in general accordance with guidelines presented in the Solid Waste Disposal Facility Criteria Technical Manual (U.S. EPA 1993) using the following methods:

- Identify a potential alternate source;
- Establish that a hydraulic connection exists between the alternate source and the wells with the confirmed SSIs;
- Establish that constituents of concern are present at the alternate source; and
- Establish that the concentrations observed in the compliance wells could not have resulted from the CCR unit given the hydrogeologic conditions at the site.

3.2 Alternate Source Identification

The initial groundwater investigation conducted for the former Type III Landfill (beginning in 1994) focused on the fly ash that had been hydraulically placed in the bedrock channel beginning in 1955. The Type III Landfill was permitted to serve as the closure for the hydraulically placed fly ash.

After IDEM approval, IKEC upgraded the Type III Landfill to a Type I Landfill and the Type I Landfill was permitted as the closure for the Type III Landfill. The active Type I Landfill was constructed with a geosynthetic liner and an engineered clay liner on top of the Type III Landfill to serve as a cap. The two (2) liners prevent migration of groundwater from the active Type I Landfill to the closed Type III Landfill. The closed Type III Landfill is not subject to regulation under the CCR Rule.

Both landfills were constructed on top of the historic, hydraulically placed fly ash which extends the length of the bedrock channel (Figure 3) beneath the LRCP to the embankment at the southwestern end of the LRCP (Figure 5). Although the base of the LRCP contains historic, hydraulically placed fly ash, the LRCP does not receive CCR and the existing historic CCR is not actively managed. Therefore, the LRCP is considered an inactive CCR unit.

Due to the age and extent of the historic, hydraulically placed ash, this material was identified as the alternate source for the Boron detected in wells CF-15-08 and CF-15-09.

3.3 Establish a Hydraulic Connection

A review of the permit drawings, construction drawings, and a figure from the Initial Structural Stability Assessment Landfill Runoff Collection Pond Report (Stantec 2016) (Appendix B) indicated that material from the closed Type III Landfill and the historic, hydraulically placed fly ash are located beneath the active Type I Landfill & LRCP (Figure 3). The base of the layer of

“hydraulically placed fly ash” is located between elevations 445 feet mean sea level (ft msl) and 500 ft msl.

When the fly ash was originally emplaced in the bedrock channel, there were no impermeable liners constructed to separate the fly ash from the underlying “foundation soils.” The CCR and IDEM groundwater monitoring wells are screened in these “foundation soils,” which consist of alluvial deposits of silt, sand and gravel. These alluvial deposits extend from beneath the LRCP and the hydraulically placed fly ash southwest to the Ohio River and provide a direct hydraulic connection between the historic, hydraulically placed fly ash and the groundwater monitoring wells (Figure 5).

3.4 Constituents Are Present at the Alternate Source

Both the closed Type III Landfill and the Type I Landfill are currently being monitored under an IDEM groundwater monitoring program. In 1994, three (3) monitoring wells (CF-9405, CF-9406 and CF-9407) were installed south of the LRCP as a condition of a pH variance for the former Type III Landfill granted by IDEM. From June 1994 through February 1995, 17 biweekly background events were conducted. Since June 1995, routine quarterly and semi-annual monitoring of these wells has been conducted.

In 2009, three (3) additional wells (CF-07-06D, CF-07-08 and CF-07-09) were installed per IDEM to monitor groundwater quality during the year prior to the start of operations of the Type I Landfill in 2011. Wells in the IDEM groundwater monitoring network are located south of the LRCP and screened in the same “foundation soils” as the wells in the CCR monitoring network (Figure 6).

During quarterly and semi-annual sampling events from June 1995 through 2011, Boron was detected in well CF-9406 (adjacent to well CF-15-08) at concentrations ranging from 9.9 milligrams per liter (mg/L) to 18 mg/L and in well CF-9407 (adjacent to well CF-15-09) at concentrations ranging from 1.19 mg/L to 7.5 mg/L (Table 3 and Figure 7). This demonstrates that Boron was present in groundwater downgradient of the eventual location of the Type I Landfill 17 years prior to its operation. Boron concentrations in downgradient CCR wells have ranged from 3.9 mg/L to 13 mg/L in well CF-15-08, and from 3.8 mg/L to 7.59 mg/L in well CF-15-09 (Table 3 and Figure 7). These concentrations are similar to historic Boron concentrations observed in wells CF-9406 and CF-9407 from June 1995 through 2011.

Because Boron concentrations similar to those observed in CCR wells CF-15-08 and CF-15-09 were detected in IDEM wells CF-9406 and CF-9407 prior to construction of the Type I Landfill, the historic, hydraulically placed ash is the source of the detected Boron.

3.5 Hydrogeologic Conditions and Groundwater Flow Velocity

As presented in the Evaluation of Potential Risk to Supply Well Fields Report (AGES 2006), a groundwater flow velocity of 45 feet per year (ft/yr) was calculated for alluvial deposits, which are designated as the uppermost aquifer for these CCR units. Based on the most recent topographical survey conducted of the Type I Landfill (Appendix C), the current limit of waste for the active Type I Landfill is located approximately 5,400 feet (more than one [1] mile) northeast of the three (3) CCR groundwater monitoring wells (CF-15-07, CF-15-08 and CF-15-09) (Figure 8). Based on this data, it was calculated that it will take 120 years for groundwater to flow from the current limit of waste in the Type I Landfill to the CCR monitoring wells. Waste placement in the Type I Landfill began in early 2011. Given the two (2) constructed liners, the distance and the flow rate, water from the Type I Landfill should not be able to enter the groundwater, and groundwater has not had enough time to reach the CCR monitoring wells.

Based on the calculations presented above, the active Type I Landfill cannot be the source of Boron detected in the CCR monitoring wells.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The ASD has been completed in general accordance with guidelines presented in the Solid Waste Disposal Facility Criteria Technical Manual (U.S. EPA 1993).

Based on a review of the current and historic data, AGES/IKEC have determined that the Type I Landfill is not the source of Boron detected in the CCR monitoring wells CF-15-08 and CF-15-09. This conclusion is supported by the following evidence:

- “Foundation soils” that extend from beneath the LRCP and the hydraulically placed fly ash southwest to the Ohio River provide a direct hydraulic connection between the historic, hydraulically placed fly ash and the CCR groundwater monitoring wells CF-15-08 and CF-15-09.
- Historic data from the IDEM groundwater monitoring program indicate that Boron concentrations similar to those observed in CCR wells CF-15-08 and CF-15-09 were detected in IDEM wells CF-9406 and CF-9407 for 17 years prior to operation of the Type I Landfill, indicating that the Boron is associated with the historic, hydraulically placed fly ash.
- Using the previously calculated groundwater flow velocity of 45 ft/yr, it is estimated that it would take 120 years for groundwater flowing beneath the Type I Landfill to reach the CCR monitoring wells.

Based on the demonstration presented above, the Type I Landfill is not the source of the Boron detected in CCR monitoring wells CF-15-08 and CF-15-09.

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United States Environmental Protection Agency (U.S. EPA) 1993. Solid Waste Disposal Criteria Technical Manual, EPA 530-R-93-017. November 1993.

TABLES

TABLE 1
SUMMARY OF POTENTIAL AND CONFIRMED APPENDIX III SSIs
TYPE I RESIDUAL WASTE LANDFILL
CCR GROUNDWATER MONITORING PROGRAM
CLIFTY CREEK STATION
MADISON, INDIANA

Well ID	Potential SSI Parameter (Units)	1st Assessment Monitoring Sampling Event September 2024		1st Assessment Monitoring Resampling Event December 2024	
		Potential SSI Result	UPL	Potential SSI Result	Confirmed SSI (Yes/No)
CF-15-08	Boron (mg/L)	7.6	0.19	6.5	Yes
	Calcium (mg/L)	320	284	360	Yes
	Chloride (mg/L)	120	66	150	Yes
	Sulfate (mg/L)	910	558	940	Yes
CF-15-09	Boron (mg/L)	6	0.19	4.9	Yes

Notes:

1. SSI: Statistically Significant Increase.
2. UTL: Upper Tolerance Limit (Pooled Interwell UTL).
3. mg/L: Milligrams per liter.

TABLE 2
GROUNDWATER MONITORING NETWORK
TYPE I RESIDUAL WASTE LANDFILL
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
HISTORIC BORON CONCENTRATIONS: IDEM WELLS CF-9406 & CF-9407 AND
CCR WELLS CF-15-08 & CF-15-09
CLIFTY CREEK STATION
MADISON, INDIANA

Boron Concentrations in IDEM Wells (1994 through 2015)					
Date	CF-9406	CF-9407	Date	CF-9406	CF-9407
6/8/1994	10	2.9	11/19/2002	16.2	5.92
6/22/1994	9.8	4.7	5/14/2003	13.7	3.83
7/6/1994	11	6.3	11/12/2003	14.7	5.4
7/20/1994	12	8.4	5/11/2004	14.2	3.86
8/3/1994	10	6.3	11/9/2004	17.1	5.28
8/17/1994	9	6.4	5/9/2005	15.2	7.16
8/31/1994	12	7.7	11/8/2005	14.3	DRY
9/14/1994	9.8	6.9	5/17/2006	12.8	7.4
9/28/1994	9.7	5.9	11/15/2006	15	5.69
10/12/1994	12	7.3	5/9/2007	13.7	4.71
10/26/1994	12	6.8	11/14/2007	14.6	DRY
11/9/1994	11	6.7	5/13/2008	15	3.21
11/30/1994	11	5	11/12/2008	15.6	DRY
12/7/1994	10	3.6	5/19/2009	14.7	4.75
12/21/1994	11	2.5	11/16/2009	14.7	7.23
1/18/1995	11	3	12/16/2009	NM	NM
2/22/1995	13	3.6	01/14/2010	NM	NM
6/14/1995	13	4.5	02/23/2010	NM	NM
12/21/1995	14	4.7	03/16/2010	NM	NM
6/26/1996	14	3.3	04/15/2010	NM	NM
12/23/1996	12	5.3	5/19/2010	14.1	6.77
4/30/1997	9.9	6.9	06/23/2010	NM	NM
6/30/1997	12	5.9	07/15/2010	NM	NM
10/7/1997	15	DRY	08/24/2010	NM	NM
12/16/1997	14	7.5	09/14/2010	NM	NM
4/16/1998	14	6.5	10/19/2010	NM	NM
6/24/1998	13	6.5	11/3/2010	16.9	DRY
9/23/1998	14	DRY	Type I Landfill Operational		
1/21/1999	13	5.1	5/17/2011	12.3	4.21
3/31/1999	12	4.3	11/28/2011	16.2	1.19
6/30/1999	13	7.5	5/7/2012	14.5	5.09
10/7/1999	DRY	DRY	11/13/2012	15.9	DRY
1/6/2000	15	4.4	3/30/2013	15	5.25
6/6/2000	15	7.2	9/23/2013	14.2	DRY
1/10/2001	16	7.4	5/21/2014	12.63	5.646
5/15/2001	15	6.6	11/11/2014	14.58	DRY
11/26/2001	18	7.3	5/9/2015	15.47	DRY
5/15/2002	13.5	5.1	11/3/2015	13.8	DRY

TABLE 3
HISTORIC BORON CONCENTRATIONS: IDEM WELLS CF-9406 & CF-9407 AND
CCR WELLS CF-15-08 & CF-15-09
CLIFTY CREEK STATION
MADISON, INDIANA

Boron Concentrations in IDEM and CCR Wells (2016 through 2024)				
Date	CF-9406	CF-9407	CF-15-08	CF-15-09
January 2016	NM	NM	8.64	6.86
March 2016	NM	NM	8.24	5.78
May 2016	10.6	2.48	9.34	6.58
July 2016	NM	NM	9.65	7.01
August 2016	NM	NM	9.63	6.73
November 2016	15.3	DRY	10.9	DRY
March 2017	NM	NM	9.29	6.78
May 2017	7.46	5.4	NM	NM
June 2017	NM	NM	7.62	6.3
August 2017	NM	NM	9.04	6.81
November 2017	11.7	7.58	NM	NM
March 2018	NM	NM	8.5	5.86
May 2018	13.8	7.25	8.6	6.1
October 2018	NM	NM	11.9	7.59
November 2018	14.7	3.27	NM	NM
December 2018	NM	NM	11.9	7.41
March 2019	NM	NM	9.8	6.7
May 2019	13.9	6.56	NM	NM
June 2019	NM	NM	8.5	6.5
October 2019	NM	NM	11.0	DRY
November 2019	17	DRY	9.0	NM
March 2020	NM	NM	8.2	5.7
April 2020	8.1	2.5	NM	NM
June 2020	NM	NM	9.6	5.9
September 2020	15	7	10	6.9
December 2020	NM	NM	11	6.4
March 2021	9.6	2.8	11	6.0
June 2021	NM	NM	10	6.2
September 2021	13	5.1	13	DRY
December 2021	NM	NM	12	NM
March 2022	9.3	6.9	12	6.2
June 2022	NM	NM	11	5.9
September 2022	14	4.2	10	3.8
December 2022	NM	NM	13	NM
March 2023	12	4.8	12	5.1
June 2023	NM	NM	11	5.5

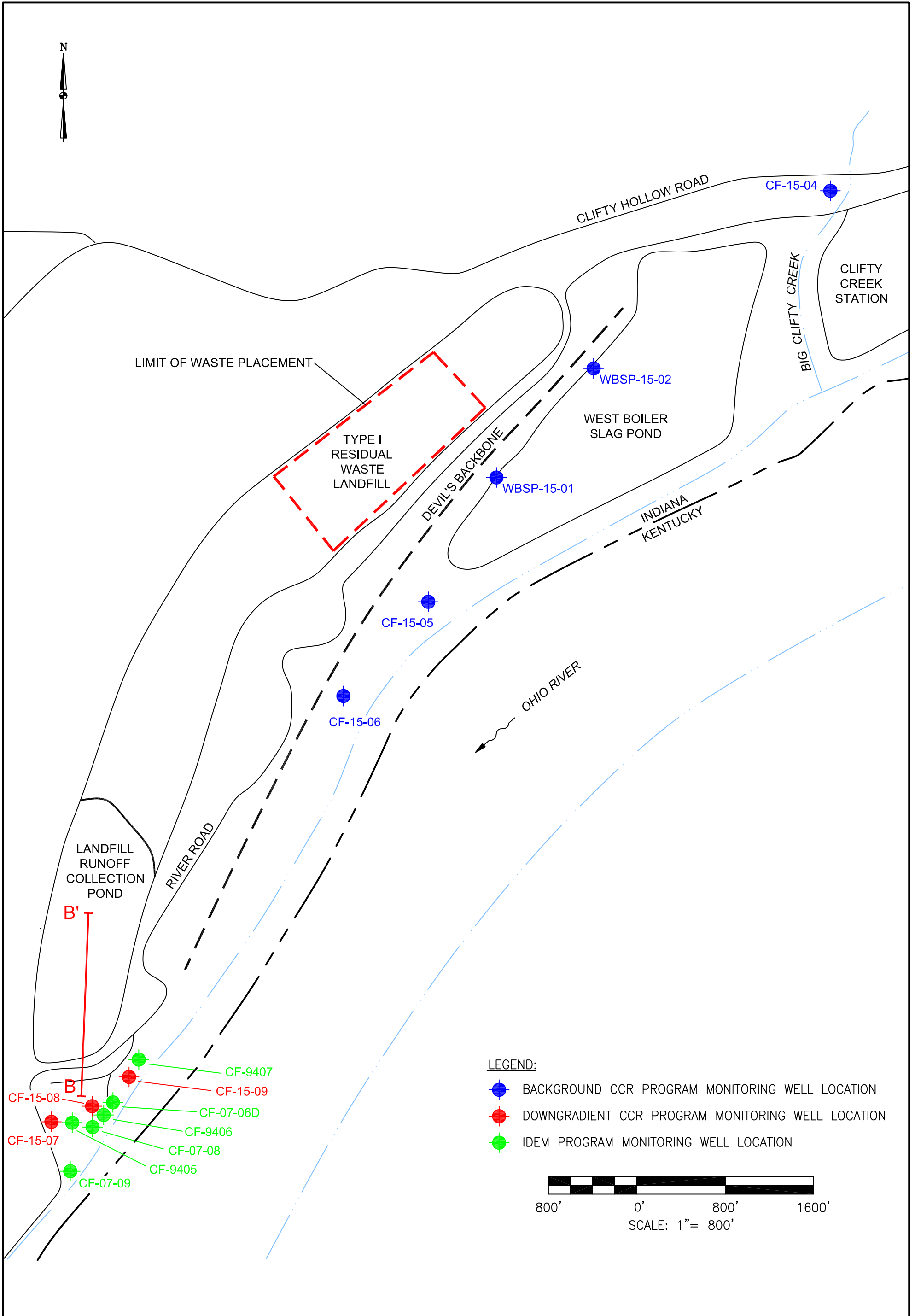
**TABLE 3
 HISTORIC BORON CONCENTRATIONS: IDEM WELLS CF-9406 & CF-9407 AND
 CCR WELLS CF-15-08 & CF-15-09
 CLIFTY CREEK STATION
 MADISON, INDIANA**

Boron Concentrations in IDEM and CCR Wells (2016 through 2024) Continued				
Date	CF-9406	CF-9407	CF-15-08	CF-15-09
September 2023	15	1	11	5.4
November 2023	NM	NM	12	7
March 2024	13	NM	8.5	5.7
June 2024	NM	NM	3.9	4.7
September 2024	9.8	0.52	7.6	6.0
December 2024	NM	NM	6.5	4.9

Notes:

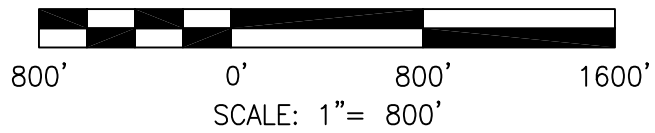
1. All concentrations are mg/L.
2. NM = Well was not monitored on this date.
3. DRY = Well was dry and not able to be sampled.
4. Maximum and minimum Boron results for IDEM wells (June 1995 through 2011 only) and CCR wells are shown in **Bold**.

FIGURES



LEGEND:

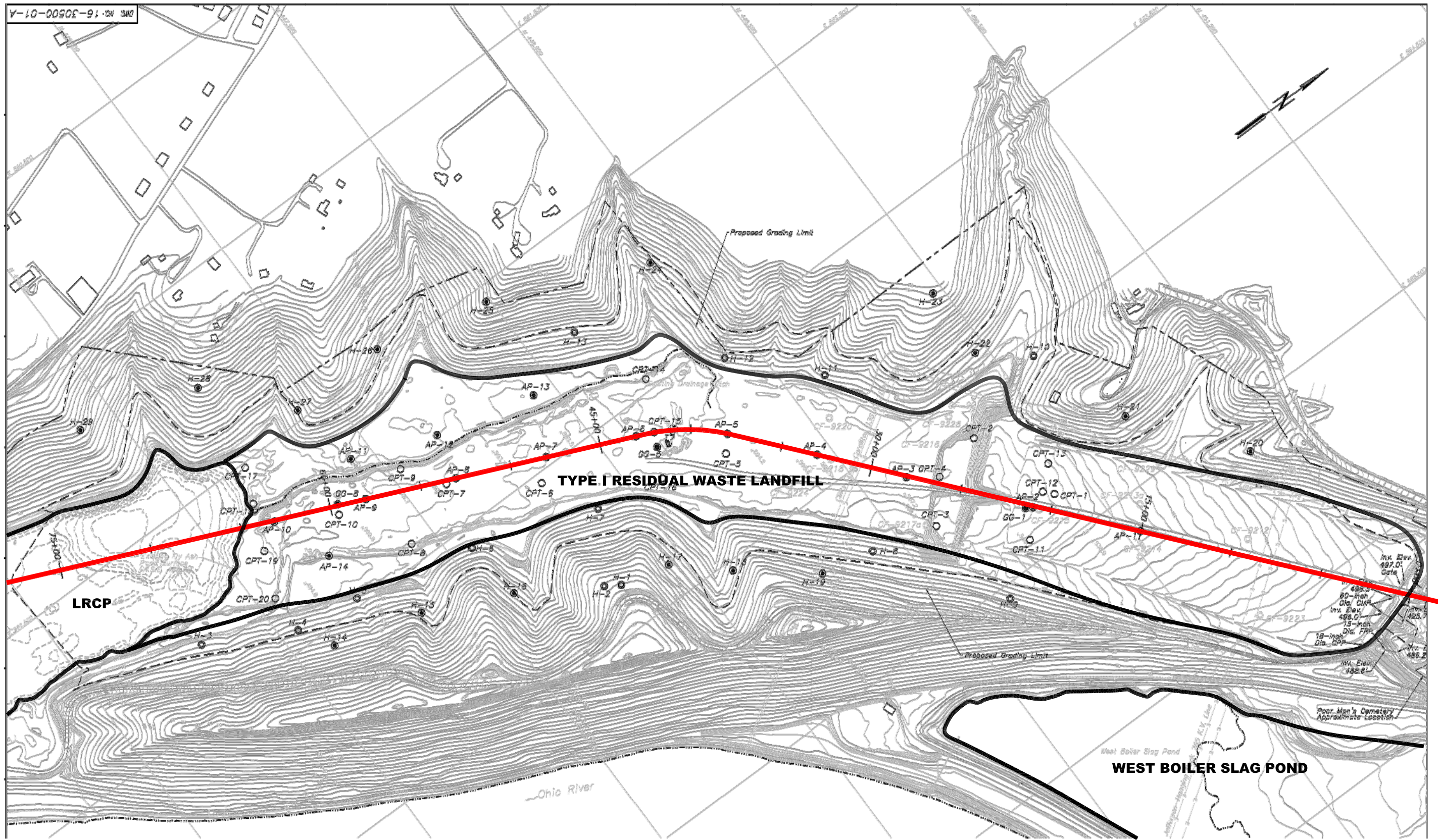
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- DOWNGRADIENT CCR PROGRAM MONITORING WELL LOCATION
- IDEM PROGRAM MONITORING WELL LOCATION



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

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 MONITORING WELL LOCATIONS	
DRAWING NAME	FIGURE 1
REV.	0



A

A'

LEGEND:
A-A' CROSS SECTION TRANSECT

SOURCE: CLIFTY CREEK PERMIT DRAWINGS (FMSM, NOVEMBER 2006)

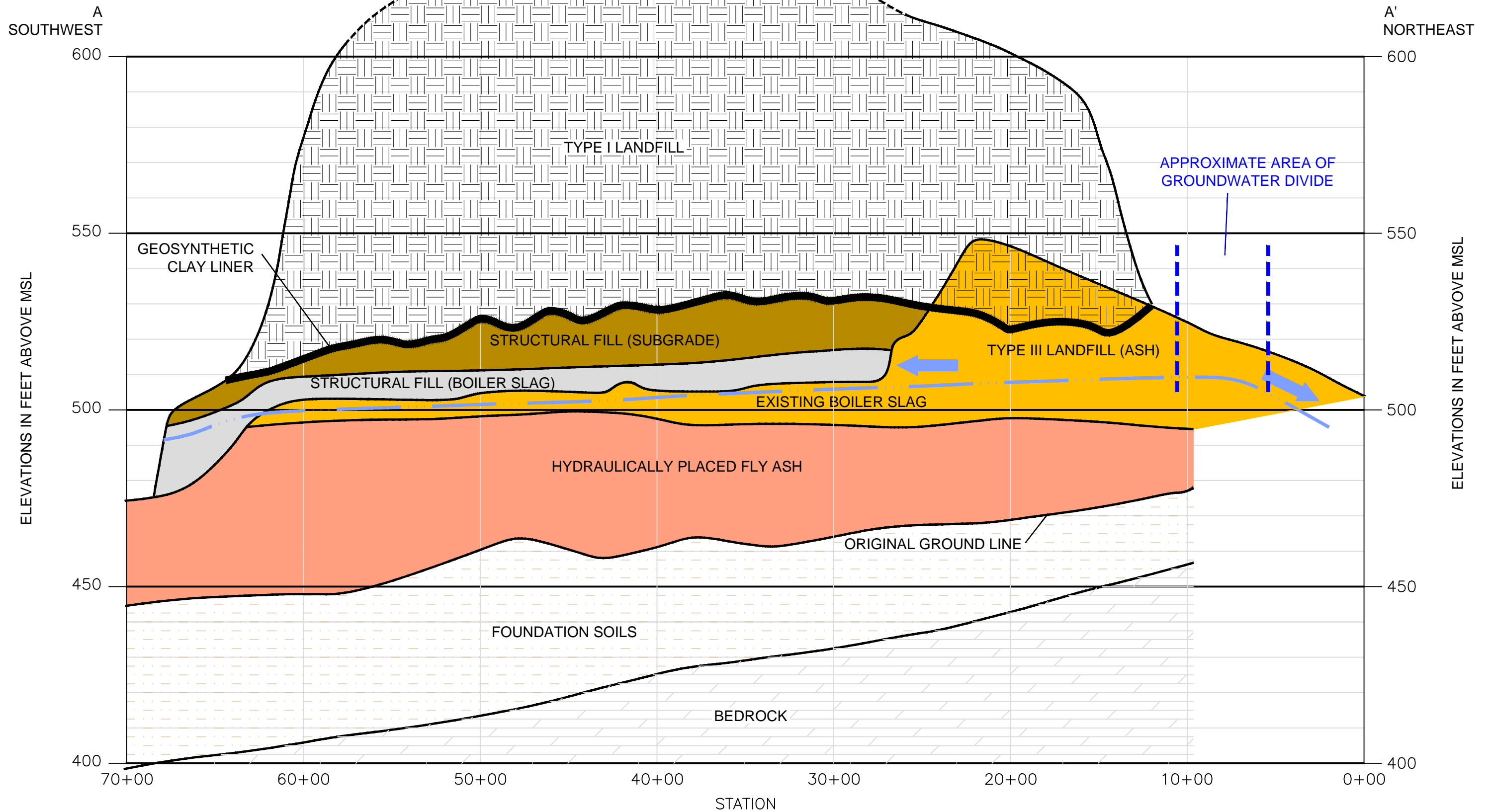
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DWG FILE	Clifty_ASD_Boring Plan b04.dwg
DRAWING SCALE	NOT TO SCALE

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INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
OVERVIEW OF TYPE I LANDFILL AND LRCP

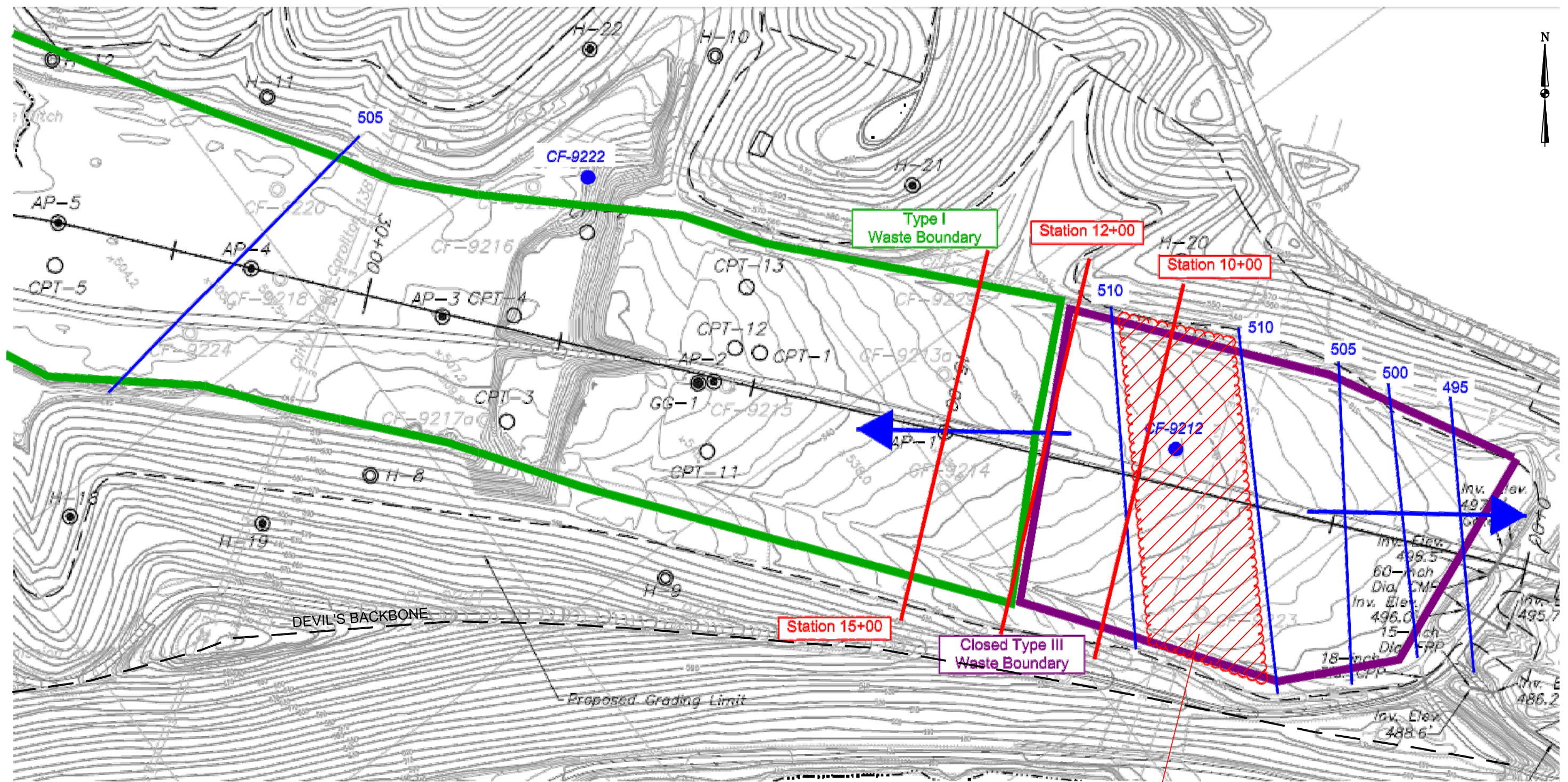
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AGES
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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA TYPE I RESIDUAL WASTE LANDFILL GENERALIZED GEOLOGIC CROSS-SECTION A-A' (SOUTHWEST-NORTHEAST)	
DRAWING NAME	FIGURE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



APPROXIMATE LOCATION OF GROUNDWATER DIVIDE,
BETWEEN STATIONS 7+00 AND 10+00.

505 → January 2006 Groundwater Contour
 → Groundwater Flow Direction

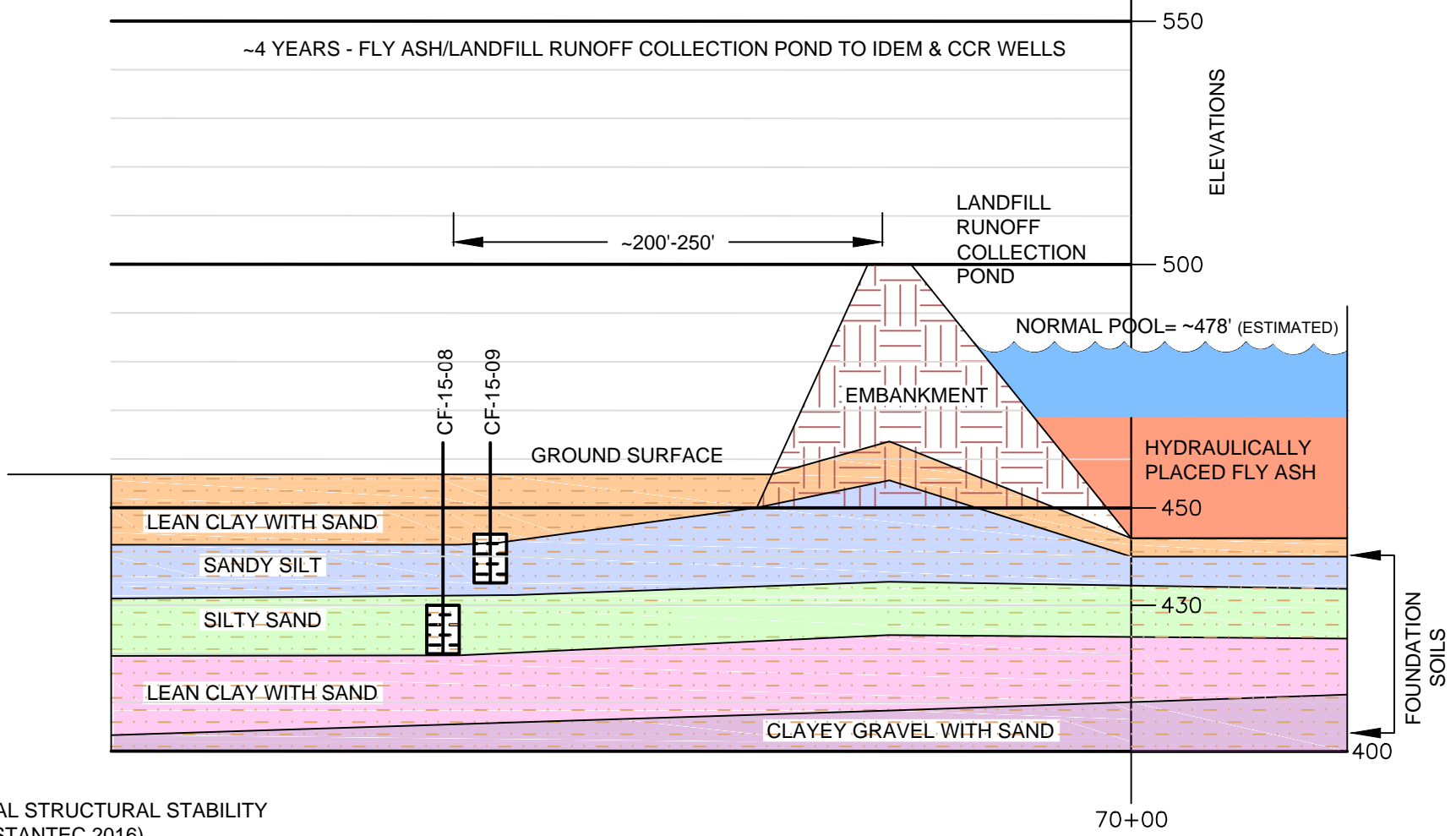
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DATE	
CHECKED BY	
JOB NO.	2017116-CLI
DWG FILE	Clifty_GW Divide b01.dwg
DRAWING SCALE	NOT TO SCALE

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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA GROUNDWATER FLOW AT NORTHEAST END OF BEDROCK CHANNEL	
DRAWING NAME	FIGURE 4
REV.	0

SOUTHWEST
B'

NORTHEAST
B



NOTES:
BASED ON INITIAL STRUCTURAL STABILITY
ASSESSMENT (STANTEC 2016).

DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2021037-CLI
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DRAWING SCALE	NOT TO SCALE



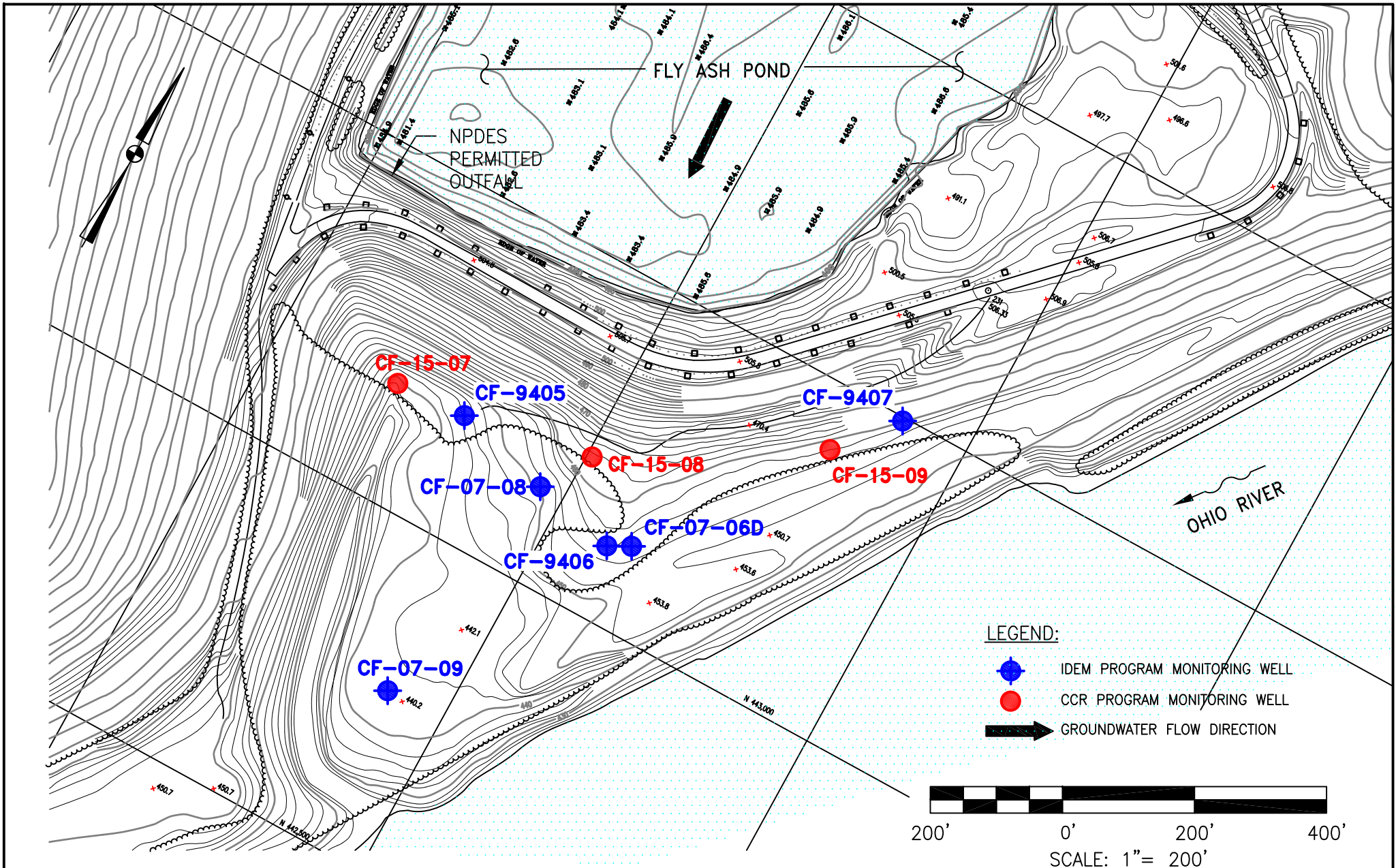
AGES
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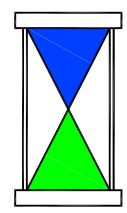
INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
GENERALIZED CROSS-SECTION
LANDFILL RUNOFF COLLECTION POND TO
CCR MONITORING WELLS

DRAWING NAME	FIGURE 5	REV.	0
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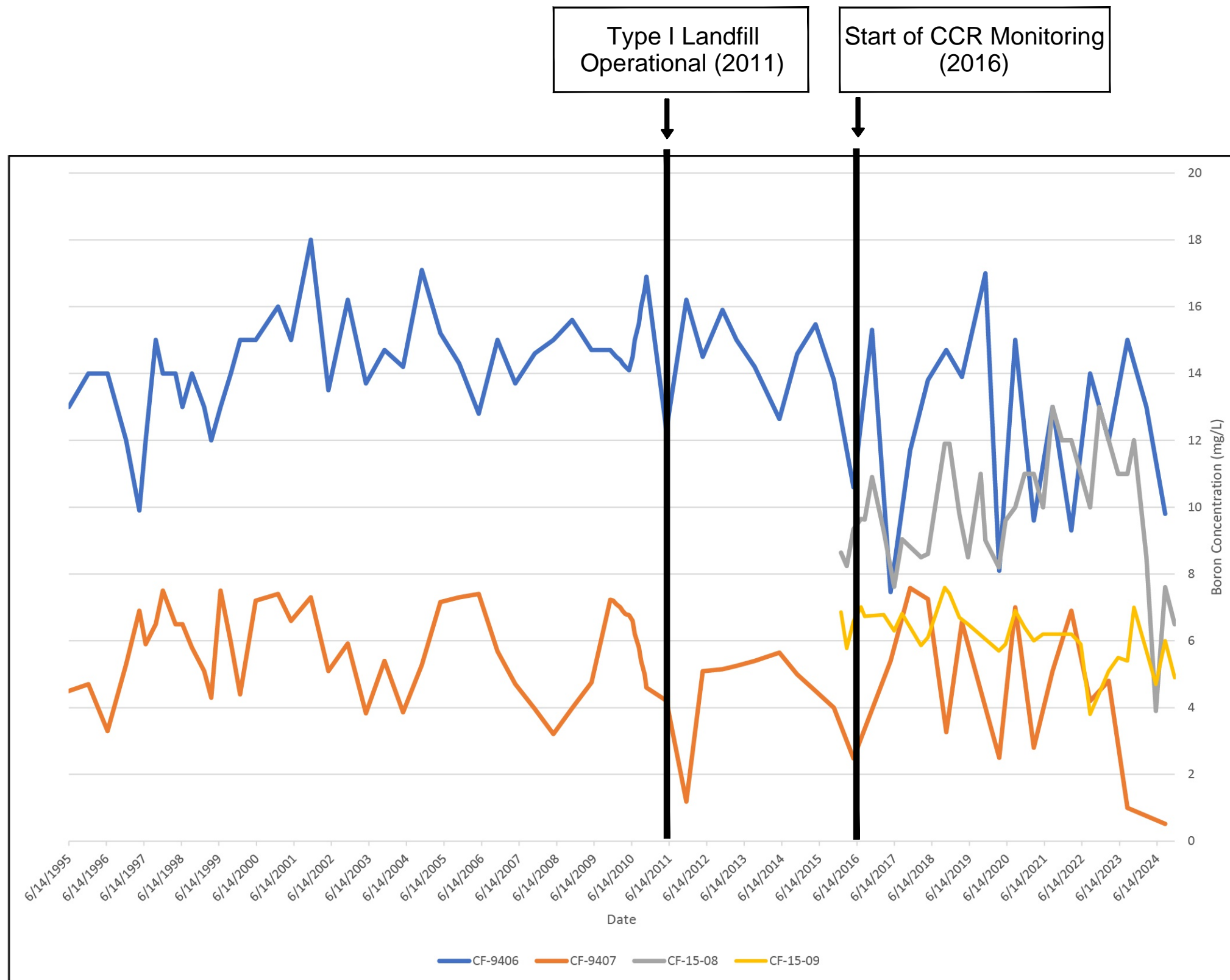


DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2017116-CLI
DWG FILE	CLIFTY Well Locations a03 R2.dwg
DRAWING SCALE	AS SHOWN



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and
Environmental
Science, Inc.**
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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK PLANT MADISON, INDIANA CCR PROGRAM AND IDEM PROGRAM MONITORING WELL LOCATION MAP	
DRAWING NAME	FIGURE 6
REV.	0



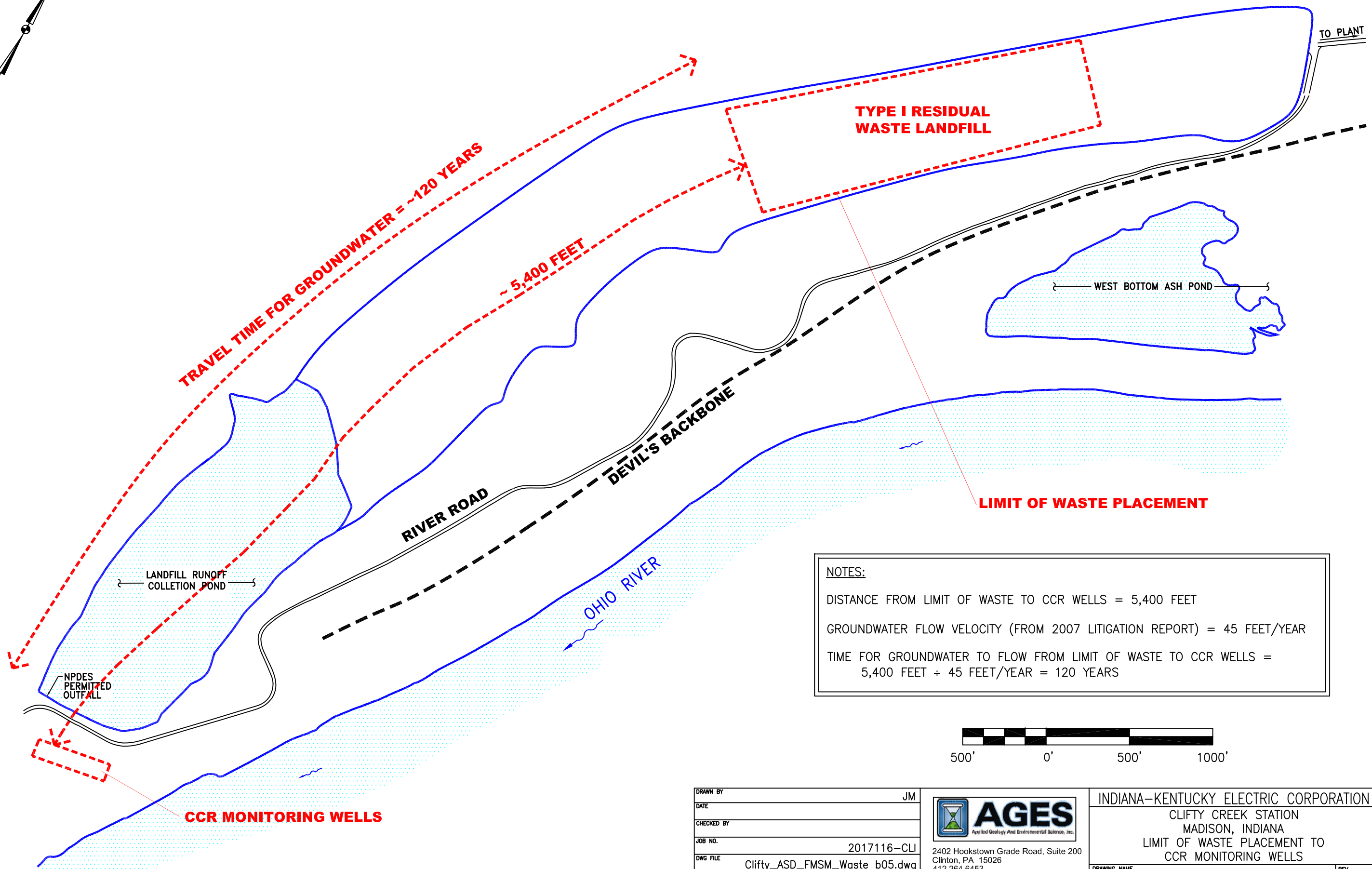
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DATE	
CHECKED BY	
JOB NO.	2024008
DWG FILE	2024008_7_IKEC_CLIFTY_ASD 9 LRCP_BORON-TIME_GRAPH_2024-GRM.DWG
DRAWING SCALE	NOT TO SCALE



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INDIANA-KENTUCKY ELECTRIC CORPORATION
CLIFTY CREEK STATION
MADISON, INDIANA
TIME SERIES DATA FOR BORON (mg/L)
CF-9406, CF-9407, CF-15-08 AND CF-15-09
DECEMBER 2024

DRAWING NAME	FIGURE 7	REV.	0
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NOTES:
 DISTANCE FROM LIMIT OF WASTE TO CCR WELLS = 5,400 FEET
 GROUNDWATER FLOW VELOCITY (FROM 2007 LITIGATION REPORT) = 45 FEET/YEAR
 TIME FOR GROUNDWATER TO FLOW FROM LIMIT OF WASTE TO CCR WELLS =
 $5,400 \text{ FEET} \div 45 \text{ FEET/YEAR} = 120 \text{ YEARS}$



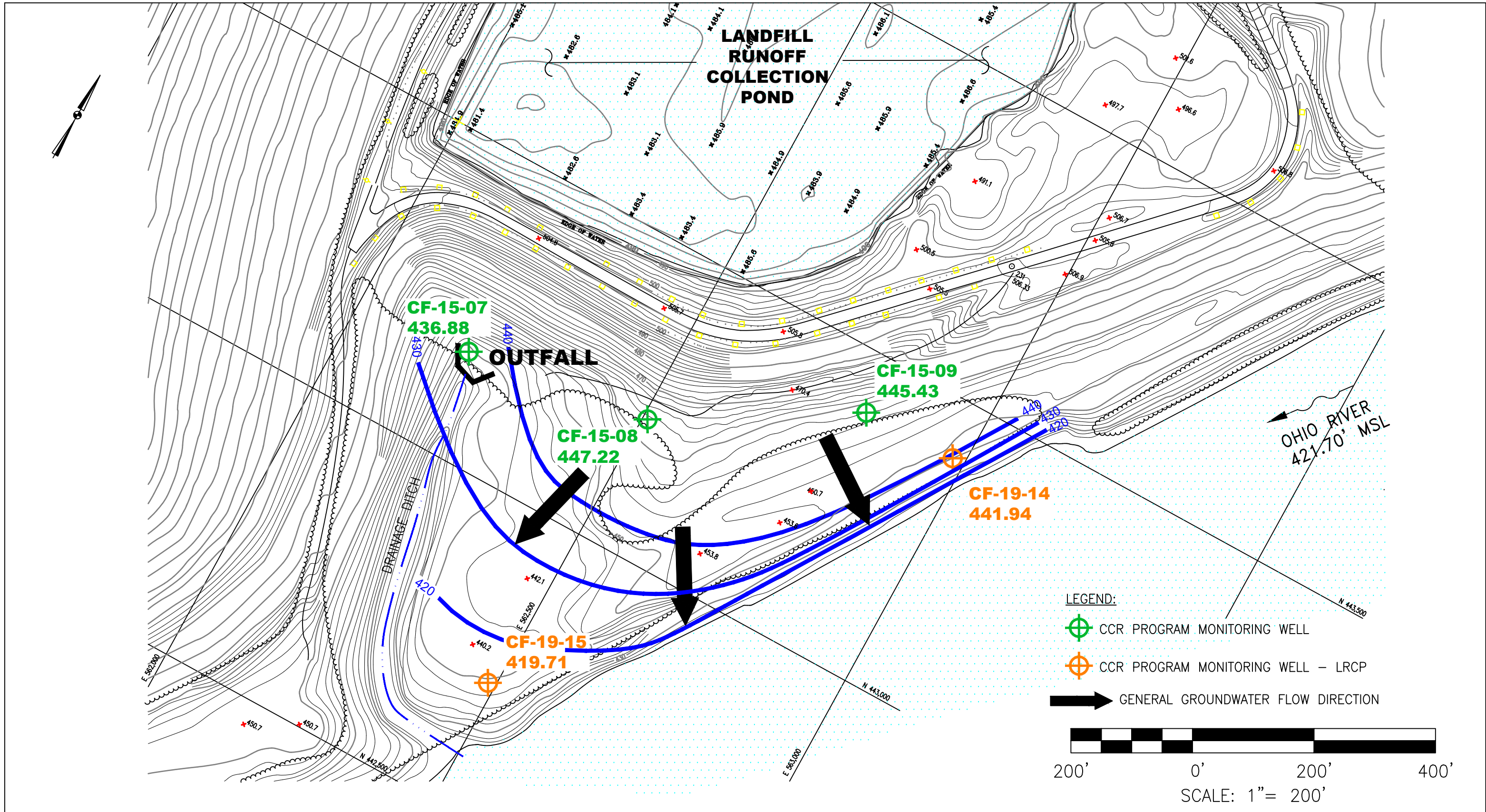
DRAWN BY	JM
DATE	
CHECKED BY	
JOB NO.	2017116-CLI
DWG FILE	Clifty_ASD_FMSM_Waste_b05.dwg
DRAWING SCALE	1" = 555'

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INDIANA-KENTUCKY ELECTRIC CORPORATION	
CLIFTY CREEK STATION MADISON, INDIANA	
LIMIT OF WASTE PLACEMENT TO CCR MONITORING WELLS	
DRAWING NAME	FIGURE 8
REV.	0

APPENDIX A

**GROUNDWATER FLOW MAPS
(SEPTEMBER AND DECEMBER 2024)**



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

DRAWN BY	GRM
DATE	12-26-2024
CHECKED BY	
JOB NO.	2024008
DWG FILE	2024008_A-1_IKEC_CLIFTY_ASD 9 LRCP_GW_FLOW_2024-GRM.DWG
DRAWING SCALE	AS SHOWN

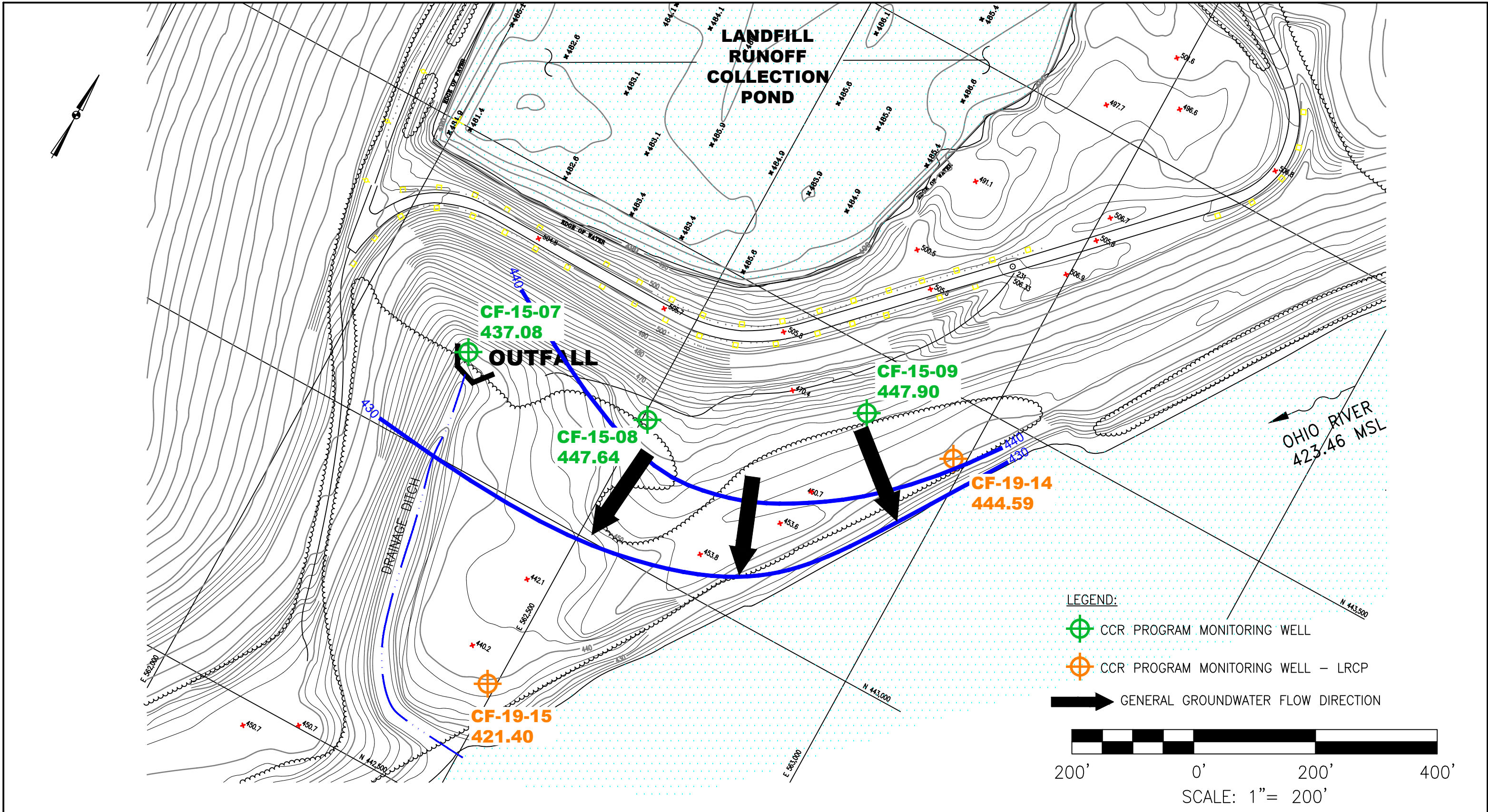


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INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK STATION
MADISON, INDIANA
CCR PROGRAM
TYPE I RESIDUAL WASTE LANDFILL AND
LANDFILL RUNOFF COLLECTION POND
GROUNDWATER FLOW – UPPERMOST AQUIFER
SEPTEMBER 2024

DRAWING NAME	FIGURE A-1	REV.	0
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NOTE:
WELLS CF-19-14 AND CF-19-15 WERE INSTALLED IN MARCH 2019 DURING THE CHARACTERIZATION OF THE LRCP.

DRAWN BY	GRM
DATE	12-26-2024
CHECKED BY	
JOB NO.	2024008
DWG FILE	2024008_A-2_IKEC_CLIFTY_ASD 9 LRCP_GW_FLOW_2024-GRM.DWG
DRAWING SCALE	AS SHOWN



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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
DECEMBER 2024

DRAWING NAME	FIGURE A-2	REV.	0
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APPENDIX B

**FIGURE FROM LRCP DAM STABILITY ASSESSMENT REPORT
(Stantec 2016)**

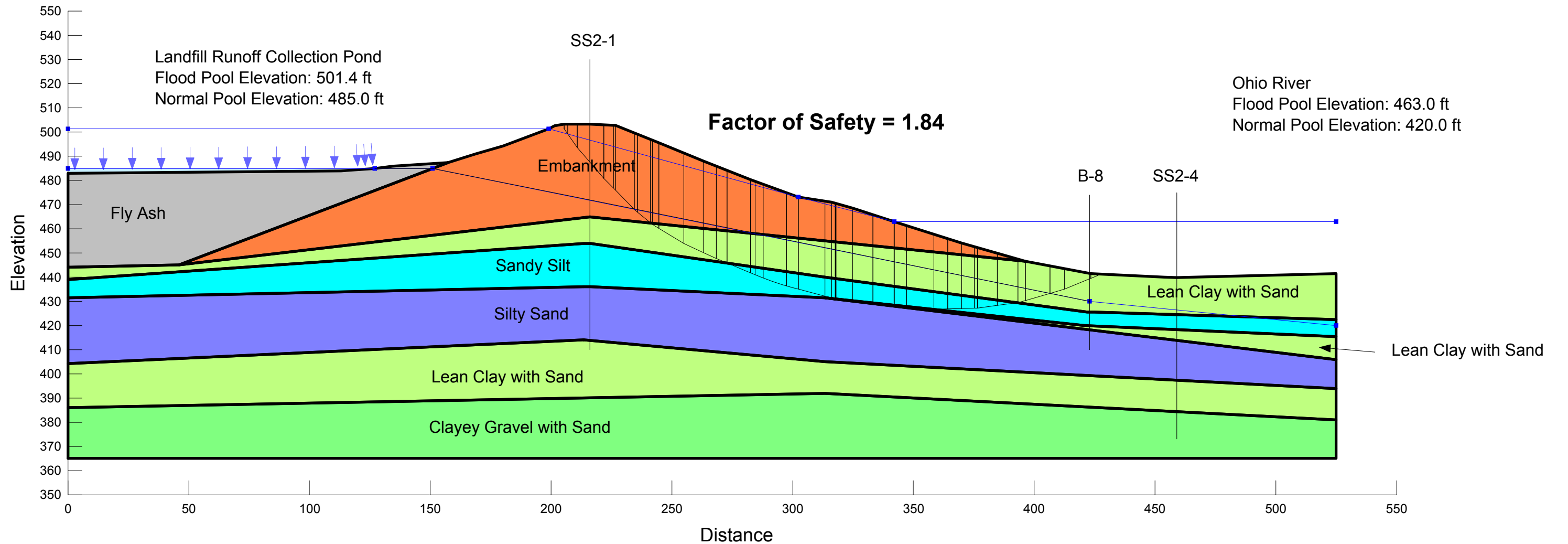
**Indiana-Kentucky Electric Corporation
Clifty Creek Station
Landfill Runoff Collection Pond Dam
Madison, Indiana
Section D-D'**

**Existing Geometry
Sudden Drawdown
Undrained, Sudden Drawdown Strengths**

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.





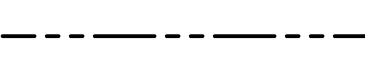


Sudden Drawdown

Material Type	Unit Weight	Effective - c'	Effective - phi	Total - c	Total - phi
Embankment (SDD)	129 pcf	198 psf	27.5 °	1400 psf	21 °
Lean Clay with Sand (SDD)	127 pcf	206 psf	28 °	1200 psf	17 °
Sandy Silt (SDD)	125 pcf	0 psf	30 °	0 psf	30 °
Silty Sand (SDD)	94 pcf	0 psf	30 °	0 psf	30 °
Clayey Gravel with Sand (SDD)	130 pcf	0 psf	35 °	0 psf	35 °
Fly Ash (SDD)	115 pcf	0 psf	25 °	0 psf	25 °



APPENDIX C

**PHASE 1, 2 AND 3 EXISTING CONDITIONS
TOPOGRAPHIC MAP
(Stantec 2024)**

- LEGEND**
-  UTILITY POLE
 - TRANSMISSION LINE
 -  TRANSMISSION TOWER
 -  VEGETATION
 -  EDGE OF WATER
 -  PROPERTY LINE
 -  WASTE BOUNDARY
 -  GRADING LIMITS

MAPPING SOURCE NOTE:
 TOPOGRAPHIC, BATHYMETRIC, AND PLANIMETRIC SURVEY INFORMATION FOR THE PLANS WERE OBTAINED FROM MAPPING PROVIDED BY INDIANA-KENTUCKY ELECTRIC CORPORATION (IKEC) AND AMERICAN ELECTRIC POWER (AEP). DATE OF MAPPING IS DECEMBER 16, 2023. THE ACTIVE LANDFILL REFLECTS THE QUARTERLY TOPOGRAPHY FROM APRIL 2024 PROVIDED BY IKEC AND ADVANCED DRONE SOLUTIONS. HORIZONTAL DATUM IS NAD27 AND VERTICAL DATUM IS NAVD88.

- NOTES:**
1. PHASE 1 PLACEMENT ONGOING, PHASE 2 SUBGRADE UNDER CONSTRUCTION, PHASE 3 SHOWS MINOR LANDFILL MODIFICATION TEMPORARY CONDITIONS.
 2. AREAS WITH TEMPORARY SOIL COVER ARE MULCHED AND SEEDED.
 3. MINOR LANDFILL PERMIT MODIFICATION TO THE LEACHATE AND STORMWATER MANAGEMENT ARE SHOWN IN THE PHASE 3 RWS TYPE 1 FOOTPRINT AND THE RWS TYPE III FOOTPRINT.

