Prepared for

**Dynegy Miami Fort, LLC**

Document type

**2019 Annual Groundwater Monitoring and Corrective Action Report**

Date

**January 31, 2020**

# 2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

# MIAMI FORT BASIN B, MIAMI FORT POWER STATION



RAMBOLL Bright ideas. Sustainable change.

# 2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
# MIAMI FORT BASIN B, MIAMI FORT POWER STATION

| | |
|---|---|
| Project name | **Miami Fort Power Station** |
| Project no. | **72759** |
| Recipient | **Dynegy Miami Fort, LLC** |
| Document type | **Annual Groundwater Monitoring and Corrective Action Report** |
| Version | **FINAL** |
| Date | **January 31, 2020** |
| Prepared by | **Kristen L. Theesfeld** |
| Checked by | **Nicole M. Pagano** |
| Approved by | **Eric J. Tlachac** |
| Description | **Annual Report in Support of the CCR Rule Groundwater Monitoring Program** |

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ASD | Alternate Source Demonstration |
| CCR | Coal Combustion Residuals |
| GWPS | Groundwater Protection Standard |
| SAP | Sampling and Analysis Plan |
| SSL | Statistically Significant Level |

# EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.90(e) for Miami Fort Basin B located at Miami Fort Power Station near North Bend, Ohio.

Groundwater is being monitored at Miami Fort Basin B in accordance with the Assessment Monitoring Program requirements specified in 40 C.F.R. § 257.95.

No changes were made to the monitoring system in 2019 (no wells were installed or decommissioned).

The following Statistically Significant Levels (SSLs) of 40 C.F.R. Part 257 Appendix IV parameters were determined during one or more sampling events in 2019:

- Arsenic at wells MW-2 and MW-10

Alternate Source Demonstrations (ASDs) were completed for the SSLs referenced above and Miami Fort Basin B remains in the Assessment Monitoring Program.

# 1. INTRODUCTION

This report has been prepared by Ramboll on behalf of Dynegy Miami Fort, LLC, to provide the information required by 40 C.F.R.§ 257.90(e) for Miami Fort Basin B located at Miami Fort Power Station near North Bend, Ohio.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the Annual 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 relative to background levels).
5. Other information required to be included in the Annual Report as specified in §§ 257.90 through 257.98.

This report provides the required information for Miami Fort Basin B for calendar year 2019.

# 2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the Monitoring Program status in calendar year 2019, and Miami Fort Basin B remains in the Assessment Monitoring Program in accordance with 40 C.F.R. § 257.95.

# 3. KEY ACTIONS COMPLETED IN 2019

The Assessment Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells is presented in Figure 1. No changes were made to the monitoring system in 2019 (no wells were installed or decommissioned). In general, one groundwater sample was collected from each background and downgradient well during each monitoring event.[1] All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (SAP) (AECOM, 2017). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2019 are presented in Tables 1 and 2. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017b) to determine any SSLs of Appendix IV parameters over Groundwater Protection Standards (GWPSs).

Statistical background values are provided in Table 3 and GWPSs in Table 4.

Analytical results for the May and September 2018 sampling events were provided in the 2018 Annual Groundwater Monitoring and Corrective Action Report.

Potential alternate sources were evaluated as outlined in the 40 C.F.R. § 257.95(g)(3)(ii). ASDs were completed and certified by a qualified professional engineer. The dates the ASDs were completed are provided in Table A. The ASDs completed in 2019 are included in Appendix A.



[1] Sampling was limited to MW-1 and MW-7 during the June 2019 sampling event due to their use as shared background wells with another unit.

**Table A – 2018-2019 Assessment Monitoring Program Summary**

| Sampling Dates | Analytical Data Receipt Date | Parameters Collected | SSL(s) | SSL(s) Determination Date | ASD Completion Date |
|---|---|---|---|---|---|
| May 7, 2018 | July 9, 2018 | Appendix III<br>Appendix IV | NA | NA | NA |
| September 18-20, 2018 | October 8, 2018 | Appendix III<br>Appendix IV Detected [1] | Arsenic (MW-2, MW-10) | January 7, 2019 | April 8, 2019 |
| March 13-14, 2019 | April 29, 2019 | Appendix III<br>Appendix IV | Arsenic (MW-2, MW-10) | July 29, 2019 | October 28, 2019 |
| September 9-10, 2019 | October 8, 2019 | Appendix III<br>Appendix IV Detected [1] | NA | TBD | TBD |



**Notes:**

NA: Not Applicable
TBD: To Be Determined
1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. § 257.95(d)(1).

# 4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2019. Groundwater samples were collected and analyzed in accordance with the SAP (AECOM, 2017), and all data were accepted.

# 5. KEY ACTIVITIES PLANNED FOR 2020

The following key activities are planned for 2020:

- Continuation of the Assessment Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2020.
- Complete evaluation of analytical data from the downgradient wells, using GWPSs to determine whether an SSL of Appendix IV parameters has occurred.
- If an SSL is identified, potential alternate sources (i.e., a source other than the CCR unit caused the SSL or that that SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated.
  - If an alternate source is demonstrated to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL determination and included in the 2020 Annual Groundwater Monitoring and Corrective Action Report.
  - If an alternate source(s) is not identified to be the cause of the SSL, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 (e.g., assessment of corrective measures) as may apply in 2020 will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

# 6. REFERENCES

AECOM, 2017. Sampling and Analysis Plan, CCR Rule Groundwater Monitoring, Basin B, Unit 112, Miami Fort Power Station, Cleves, Ohio, Job Number 60442412, Revision 0, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017, Statistical Analysis Plan, Miami Fort Power Station, Dynegy Miami Fort, LLC, October 17, 2017.

## TABLES

**TABLE 1.**
**2019 ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS**
**2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT**
MIAMI FORT POWER STATION
UNIT ID 112 - MIAMI FORT BASIN B
NORTH BEND, OHIO
ASSESSMENT MONITORING PROGRAM

| Well Identification Number | Latitude (Decimal Degrees) | Longitude (Decimal Degrees) | Date & Time Sampled | Depth to Groundwater (ft)[1] | Groundwater Elevation (ft NAVD88) | 40 C.F.R. Part 257 Appendix III | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Boron, total (mg/L) 6020A[2] | Calcium, total (mg/L) 6020A[2] | Chloride, total (mg/L) 9251[2] | Fluoride, total (mg/L) 9214[2] | pH (field) (S.U.) SM 4500 H+B[2] | Sulfate, total (mg/L) 9036[2] | Total Dissolved Solids (mg/L) SM 2540C[2] |
| **Background / Upgradient Monitoring Wells** | | | | | | | | | | | | |
| MW-1 | 39.114504 | -84.810237 | 3/13/2019 11:50 | 43.28 | 461.21 | 0.797 | 182 | 37.4 | <1.00 | 7.2 | 450 | 1010 |
| | | | 6/12/2019 12:00[3] | 47.92 | 456.57 | NA | 154 | 17.6 | NA | 7.2 | 284 | 779 |
| | | | 9/9/2019 14:05 | 50.29 | 454.20 | 0.700 | 164 | 23.3 | <1.00 | 6.8 | 407 | 895 |
| MW-7 | 39.115334 | -84.808157 | 3/13/2019 12:35 | 49.14 | 461.03 | 0.0828 | 108 | 4.29 | <1.00 | 7.2 | 50.4 | 449 |
| | | | 6/14/2019 6:45[3] | 54.48 | 455.69 | NA | 110 | 5.09 | NA | 6.9 | 43.6 | 476 |
| | | | 9/9/2019 13:00 | 56.74 | 453.43 | 0.267 | 112 | 5.02 | <1.00 | 6.8 | 46.9 | 470 |
| **Downgradient Monitoring Wells** | | | | | | | | | | | | |
| MW-2 | 39.112093 | -84.815736 | 3/13/2019 18:40 | 13.63 | 458.60 | 0.818 | 110 | 34.0 | <1.00 | 7.2 | 68.5 | 541 |
| | | | 9/9/2019 16:05 | 20.73 | 451.50 | 1.54 | 142 | 32.4 | <1.00 | 6.6 | 62.6 | 668 |
| MW-3A | 39.109855 | -84.812132 | 3/13/2019 14:55 | 12.47 | 460.76 | <0.0800 | 57.0 | 21.1 | <1.00 | 7.5 | 37.3 | 271 |
| | | | 9/10/2019 11:15 | 19.43 | 453.80 | 0.102 | 49.7 | 25.6 | <1.00 | 7.2 | 18.3 | 246 |
| MW-8 | 39.113525 | -84.813841 | 3/14/2019 10:20 | 33.87 | 459.56 | 0.906 | 120 | 40.5 | <1.00 | 7.4 | 258 | 676 |
| | | | 9/9/2019 14:45 | 40.89 | 452.54 | 1.00 | 123 | 40.2 | <1.00 | 7.0 | 258 | 666 |
| MW-9 | 39.113102 | -84.815710 | 3/13/2019 19:30 | 14.50 | 458.55 | 2.59 | 152 | 69.5 | <1.00 | 7.3 | 363 | 872 |
| | | | 9/9/2019 15:25 | 21.53 | 451.52 | 2.88 | 172 | 65.8 | <1.00 | 6.9 | 405 | 889 |
| MW-10 | 39.111306 | -84.814733 | 3/13/2019 17:00 | 14.00 | 459.80 | 0.115 | 58.2 | 955 | <1.00 | 7.8 | 9.18 | 301 |
| | | | 9/10/2019 9:15 | 20.76 | 453.04 | 0.102 | 47.5 | 24.4 | <1.00 | 7.5 | 18.8 | 232 |
| MW-11 | 39.110560 | -84.813555 | 3/13/2019 16:15 | 14.85 | 460.02 | 0.0814 | 48.0 | 591 | <1.00 | 7.9 | 30.4 | 265 |
| | | | 9/10/2019 9:55 | 21.67 | 453.20 | 0.102 | 47.5 | 21.1 | <1.00 | 7.4 | 34.9 | 230 |

[O: RAB 12/25/19, C: KLT 12/26/19]



**Notes:**
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NA = Not Analyzed
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
[1]All depths to groundwater were measured on the first day of the sampling event.
[2]4-digit numbers represent SW-846 analytical methods.
[3]Only SSL parameters were analyzed during this sampling event to delineate the extent of impact for Miami Fort Basin A. Basin A and Basin B share background wells.

**TABLE 2.**
**2019 ANALYTICAL RESULTS - APPENDIX IV PARAMETERS**
**2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT**
MIAMI FORT POWER STATION
UNIT ID 112 - MIAMI FORT BASIN B
NORTH BEND, OHIO
ASSESSMENT MONITORING PROGRAM

| Well Identification Number | Latitude (Decimal Degrees) | Longitude (Decimal Degrees) | Date & Time Sampled | 40 C.F.R. Part 257 Appendix IV | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Antimony, total (mg/L) 6020A[1] | Arsenic, total (mg/L) 6020A[1] | Barium, total (mg/L) 6020A[1] | Beryllium, total (mg/L) 6020A[1] | Cadmium, total (mg/L) 6020A[1] | Chromium, total (mg/L) 6020A[1] | Cobalt, total (mg/L) 6020A[1] | Fluoride, total (mg/L) 6020A[1] | Lead, total (mg/L) 6020A[1] | Lithium, total (mg/L) 6020A[1] | Mercury, total (mg/L) 7470A[1] | Molybdenum, total (mg/L) 6020A[1] | Radium 226/228, Combined (pCi/L) 903/904[1] | Selenium, total (mg/L) 6020A[1] | Thallium, total (mg/L) 6020A[1] |
| **Background / Upgradient Monitoring Wells** | | | | | | | | | | | | | | | | | | |
| MW-1 | 39.114504 | -84.810237 | 3/13/2019 11:50 | <0.00200 | <0.00100 | 0.0512 | <0.00100 | <0.00100 | <0.00200 | <0.000500 | <1.00 | <0.00100 | 0.0304 | <0.000200 | 0.0308 | 0.514 | <0.00500 | <0.00100 |
| | | | 6/12/2019 12:00[2] | NA | NA | NA | NA | NA | NA | <0.000500 | NA | NA | NA | NA | 0.0241 | NA | NA | NA |
| | | | 9/9/2019 14:05[3] | NA | <0.00100 | 0.0482 | <0.00100 | <0.00100 | 0.00289 | <0.000500 | <1.00 | <0.00100 | 0.0228 | <0.000200 | 0.0210 | 0.0553 | <0.00500 | <0.00100 |
| MW-7 | 39.115334 | -84.808157 | 3/13/2019 12:35 | <0.00200 | <0.00100 | 0.0942 | <0.00100 | <0.00100 | 0.00218 | <0.000500 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.337 | <0.00500 | <0.00100 |
| | | | 6/14/2019 6:45[2] | NA | NA | NA | NA | NA | NA | <0.000500 | NA | NA | NA | NA | <0.00500 | NA | NA | NA |
| | | | 9/9/2019 13:00[3] | NA | <0.00100 | 0.107 | <0.00100 | <0.00100 | 0.00313 | <0.000500 | <1.00 | <0.00100 | 0.00524 | <0.000200 | <0.00500 | 0.464 | <0.00500 | <0.00100 |
| **Downgradient Monitoring Wells** | | | | | | | | | | | | | | | | | | |
| MW-2 | 39.112093 | -84.815736 | 3/13/2019 18:40 | <0.00200 | 0.0224 | 0.331 | <0.00100 | <0.00100 | 0.00223 | 0.000977 | <1.00 | 0.00219 | <0.00500 | <0.000200 | <0.00500 | 0.599 | <0.00500 | <0.00100 |
| | | | 9/9/2019 16:05[3] | NA | 0.0232 | 0.501 | <0.00100 | <0.00100 | 0.00313 | 0.000626 | <1.00 | 0.00122 | <0.00500 | <0.000200 | <0.00500 | 0.704 | <0.00500 | <0.00100 |
| MW-3A | 39.109855 | -84.812132 | 3/13/2019 14:55 | <0.00200 | 0.00919 | 0.130 | <0.00100 | <0.00100 | 0.00244 | 0.00223 | <1.00 | 0.00414 | <0.00500 | <0.000200 | <0.00500 | 0.666 | <0.00500 | <0.00100 |
| | | | 9/10/2019 11:15[3] | NA | 0.00739 | 0.124 | <0.00100 | <0.00100 | 0.00258 | <0.000500 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.558 | <0.00500 | <0.00100 |
| MW-8 | 39.113525 | -84.813841 | 3/14/2019 10:20 | <0.00200 | <0.00100 | 0.0348 | <0.00100 | <0.00100 | <0.00200 | <0.000500 | <1.00 | <0.00100 | 0.0169 | <0.000200 | 0.00727 | 0.182 | <0.00500 | <0.00100 |
| | | | 9/9/2019 14:45[3] | NA | <0.00100 | 0.0442 | <0.00100 | <0.00100 | 0.00267 | <0.000500 | <1.00 | <0.00100 | 0.0108 | <0.000200 | 0.00756 | 0.591 | <0.00500 | <0.00100 |
| MW-9 | 39.113102 | -84.815710 | 3/13/2019 19:30 | <0.00200 | <0.00100 | 0.107 | <0.00100 | <0.00100 | <0.00200 | <0.000500 | <1.00 | <0.00100 | 0.0116 | <0.000200 | 0.0691 | 0.163 | <0.00500 | <0.00100 |
| | | | 9/9/2019 15:25[3] | NA | <0.00100 | 0.112 | <0.00100 | <0.00100 | 0.00283 | <0.000500 | <1.00 | <0.00100 | 0.00948 | <0.000200 | 0.0494 | 0.252 | <0.00500 | <0.00100 |
| MW-10 | 39.111306 | -84.814733 | 3/13/2019 17:00 | <0.00200 | 0.0169 | 0.164 | <0.00100 | <0.00100 | <0.00200 | <0.000500 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.978 | <0.00500 | <0.00100 |
| | | | 9/10/2019 9:15[3] | NA | 0.0221 | 0.163 | <0.00100 | <0.00100 | 0.00265 | <0.000500 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.860 | <0.00500 | <0.00100 |
| MW-11 | 39.110560 | -84.813555 | 3/13/2019 16:15 | <0.00200 | 0.00877 | 0.186 | <0.00100 | <0.00100 | <0.00200 | 0.000609 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.556 | <0.00500 | <0.00100 |
| | | | 9/10/2019 9:55[3] | NA | 0.0114 | 0.217 | <0.00100 | <0.00100 | 0.00270 | 0.000621 | <1.00 | <0.00100 | <0.00500 | <0.000200 | <0.00500 | 0.743 | <0.00500 | <0.00100 |

[O: RAB 12/25/19, C: KLT 12/26/19]



**Notes:**
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
NA = Not Analyzed
pCi/L = picoCuries per liter
< = concentration is less than concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Levels (SSLs) over Groundwater Protection Standards.
[1]4-digit numbers represent SW-846 analytical methods and 3-digit numbers represent Clean Water Act analytical methods.
[2]Only SSL parameters were analyzed during this sampling event to delineate the extent of impact for Miami Fort Basin A. Basin A and Basin B share background wells.
[3]Only the parameters detected during the previous sampling events were analyzed during this sampling event, in accordance with 40 C.F.R. § 257.95(d)(1).

**TABLE 3.**
**STATISTICAL BACKGROUND VALUES**
**2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT**
MIAMI FORT POWER STATION
UNIT ID 112 - MIAMI FORT BASIN B
NORTH BEND, OHIO
ASSESSMENT MONITORING PROGRAM

| Parameter | Statistical Background Value (UPL) |
|---|---|
| **40 C.F.R. Part 257 Appendix III** | |
| Boron (mg/L) | 1.90 |
| Calcium (mg/L) | 270 |
| Chloride (mg/L) | 71.5 |
| Fluoride (mg/L) | 0.373 |
| pH (S.U.) | 6.5 / 7.5 |
| Sulfate (mg/L) | 550 |
| Total Dissolved Solids (mg/L) | 1160 |

[O: RAB 12/25/19, C: KLT 12/26/19]

**Notes:**
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
S.U. = Standard Units
UPL = Upper Prediction Limit

**TABLE 4.**
**GROUNDWATER PROTECTION STANDARDS**
**2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT**
MIAMI FORT POWER STATION
UNIT ID 112 - MIAMI FORT BASIN B
NORTH BEND, OHIO
ASSESSMENT MONITORING PROGRAM

| Parameter | Groundwater Protection Standard[1] |
|---|---|
| **40 C.F.R. Part 257 Appendix IV** | |
| Antimony (mg/L) | 0.006 |
| Arsenic (mg/L) | 0.010 |
| Barium (mg/L) | 2 |
| Beryllium (mg/L) | 0.004 |
| Cadmium (mg/L) | 0.005 |
| Chromium (mg/L) | 0.10 |
| Cobalt (mg/L) | 0.006 |
| Fluoride (mg/L) | 4 |
| Lead (mg/L) | 0.015 |
| Lithium (mg/L) | 0.071 |
| Mercury (mg/L) | 0.002 |
| Molybdenum (mg/L) | 0.10 |
| Radium 226+228 (pCi/L) | 5 |
| Selenium (mg/L) | 0.05 |
| Thallium (mg/L) | 0.002 |

[O: RAB 12/25/19, C: KLT 12/26/19]

**Notes:**
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
pCi/L = picoCuries per liter
[1]Groundwater Protection Standard is the higher of the Maximum Contaminant Level / Health-Based Level or background.

## FIGURES


DOWNGRADIENT MONITORING WELL LOCATION
UPGRADIENT MONITORING WELL LOCATION
WATER LEVEL ONLY MONITORING WELL LOCATION
CCR MONITORED UNIT

Y:\Mapping\Projects\22\2285\MXD\2019_AnnualGWM_CAR\Figure 1_GWS_WellLoc_MiamiFort_BasinB.mxd

PROJECT: 169000XXXX | DATED: 1/29/2020 | DESIGNER: STOLZSD

## MONITORING WELL LOCATION MAP
## MIAMI FORT BASIN B
## UNIT ID:112

**2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT**
VISTRA CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

**FIGURE 1**

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

# APPENDIX A
# ALTERNATE SOURCE DEMONSTRATIONS

**40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION**
**MIAMI FORT BASIN B**
**APRIL 8, 2019**

April 8, 2019

Title 40 of the Code of Federal Regulations (C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of statistically significant levels (SSLs) over groundwater protection standards (GWPSs) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality ("alternate source demonstration").

This alternate source demonstration has been prepared on behalf of Dynegy Miami Fort, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll (OBG), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Basin B, located at Miami Fort Power Station (MFS) near North Bend, Ohio.

Initial baseline groundwater monitoring, consisting of a minimum of eight samples, as required under 40 C.F.R. § 257.94(b), was initiated in December 2015 and completed prior to October 17, 2017. Background groundwater quality observed in this time period was compared to concentrations of parameters observed in downgradient monitoring wells during the November 2017 Detection Monitoring Program sampling event; statistically significant increases (SSIs) were identified for one or more 40 C.F.R. Part 257 Appendix III parameters. Consequently, and in accordance with 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95, an assessment monitoring program was established by April 9, 2018, for the Miami Fort Basin B.

The first Assessment Monitoring sampling event was completed on May 8 through May 9, 2018. As stipulated in 40 C.F.R. § 257.95(d)(1), all wells were resampled on September 18 through September 20, 2018, for all Appendix III parameters and Appendix IV parameters detected during the first Assessment Monitoring sampling event. Groundwater data collected from the first Assessment Monitoring sampling event, in May 2018, and resampling event, in September 2018, are available in the 2018 Annual Groundwater Monitoring and Corrective Action Report for Miami Fort Basin B, completed January 31, 2019 (OBG, 2019). Analytical data from all sampling events, from December 2015 through the resampling event (September 2018), were evaluated in accordance with the statistical analysis plan (NRT/OBG, 2017), to determine any SSIs of Appendix III parameters over background concentrations, or statistically significant levels (SSLs) of Appendix IV parameters over Groundwater Protection Standards (GWPSs). That evaluation identified SSLs at downgradient monitoring wells as follows:

- Arsenic at wells MW-2 and MW-10

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Miami Fort Basin B were the cause of the SSLs listed above. This alternate source demonstration (ASD) was completed within 90 days of determination of the SSLs (January 7, 2019), as required by 40 C.F.R. § 257.95(g)(3)(ii).

## ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following lines of evidence (LOE):

1. Elevated background concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2 and MW-10 are located in southwestern Ohio, along the banks of the Great Miami River, where they are susceptible to geochemical conditions that can potentially mobilize naturally occurring arsenic from the soils into groundwater.
2. Ionic composition of the groundwater at wells MW-2 and MW-10 is different than the water in Basin B, indicating that Basin B is not the source of the groundwater in these wells.
3. Concentrations of CCR indicator parameters, boron and sulfate, are stable or decreasing, and below the Upper Prediction Limit (UPL) at MW-2 and MW-10, indicating that CCR is not the source of the observed impacts.

These LOEs are described and supported in greater detail below. Monitoring wells and Basin B water sample locations are shown on Figure 1 (attached).

### LOE #1: ELEVATED BACKGROUND CONCENTRATIONS OF ARSENIC ARE COMMONLY FOUND IN SOILS AND GROUNDWATER IN SOUTHWESTERN OHIO. MW-2 AND MW-10 ARE LOCATED IN SOUTHWESTERN OHIO, ALONG THE BANKS OF THE GREAT MIAMI RIVER, WHERE THEY ARE SUSCEPTIBLE TO GEOCHEMICAL CONDITIONS THAT CAN POTENTIALLY MOBILIZE NATURALLY OCCURRING ARSENIC FROM THE SOILS INTO GROUNDWATER.



Elevated background concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 feet below ground surface) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 feet northeast of Basin B, near Shawnee Lookout in Hamilton County Park, and analyzed for arsenic as part of a study to evaluate background soil concentrations of Resource Conservation and Recovery Act (RCRA) metals in the Cincinnati area (OEPA, 2015) (Figure 2). Results of the analysis indicated surficial terrace soils (clay) adjacent to Basin B have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg) and have a geometric mean of 6.56 mg/kg.

Background concentrations of arsenic are commonly elevated in southwestern Ohio aquifers. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to evaluate the aquifer characteristics associated with elevated arsenic concentrations in southwest Ohio (Thomas *et al*., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposit and glacial till with interbedded sand and gravel aquifers within the Great Miami River drainage basin, and included samples from domestic wells in Preble, Miami, and Shelby counties. The USGS reported that 37 percent of the samples analyzed had elevated concentrations of arsenic and elevated arsenic concentrations were found in all three aquifer types studied. Geochemical conditions were also evaluated and the USGS determined that elevated arsenic concentrations in the study area were associated with iron-reducing, sulfate-reducing, or methanic conditions, and all samples with elevated arsenic concentrations had iron concentrations that exceeded 1 milligrams per liter (mg/L).

Based on previous studies discussed above, elevated background concentrations of arsenic are known to exist in both soils and groundwater in the same region as Basin B. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 feet northeast) to Basin B. The USGS study showed that iron-reducing, sulfate-reducing, or methanic geochemical conditions needed to mobilize arsenic were common in southwestern Ohio aquifers. Reducing conditions are likely to occur at Basin B monitoring wells MW-2 and MW-10, where elevated arsenic concentrations were observed, as indicated by the following factors and discussed below:

- Elevated iron concentrations are present in groundwater at monitoring well MW-2
- Boring logs indicate organic materials are present in the soils
- MW-2 and MW-10 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potentials (ORP) at the site were observed

Elevated concentrations of dissolved iron were observed in groundwater at monitoring well MW-2 from 2008 to 2014, where concentrations ranged from 11.8 to 52.1 mg/L. Dissolved iron data was not available for MW-2 after 2014, and no dissolved iron data was available for analysis at MW-10. The USGS reported that elevated background arsenic concentrations in groundwater were associated with iron concentrations greater than 1 mg/L. The iron concentrations observed in MW-2 were at least an order of magnitude greater than 1 mg/L, indicating that groundwater at MW-2 is susceptible to iron-reducing geochemical conditions and elevated background arsenic concentrations in groundwater. The figure below illustrates the strong relationship between increased iron concentration and increased arsenic concentrations in groundwater at MW-2, where the coefficient of determination (R-squared) is 0.87.

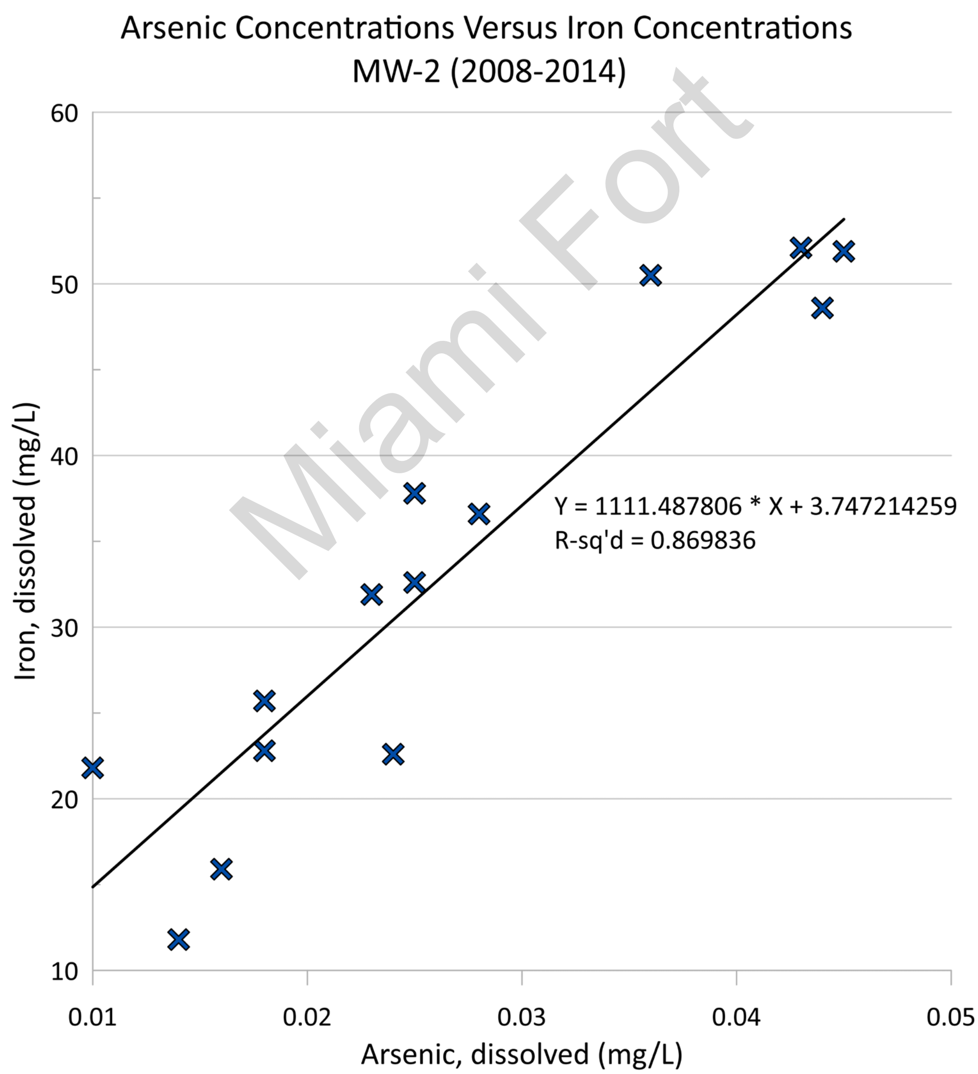


**Figure 2. Arsenic concentrations versus iron concentrations at well MW-2 (2008-2014)**

Arsenic is naturally present in groundwater and soils at variable concentrations. The arsenic is co-precipitated with iron oxyhydroxides and incorporated into the mineral structure of the soils, but can also be adsorbed to organic matter or the iron oxyhydroxides in the aquifer. Both of these sources of arsenic can be mobilized in groundwater by dissolution or desorption under reducing geochemical conditions, where organic carbon commonly acts as the reducing agent (Thomas *et al*., 2005; McCarthur *et al*., 2001). Arsenic-bearing soils are known to be present in the areas near Basin B (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the boring logs for monitoring wells located along the banks of the Great Miami River (see boring logs for wells MW-2, MW-3A, MW-10, and MW-11 in Attachment A). The presence of organic material and arsenic-bearing soils indicates there is potential for naturally occurring arsenic to become mobilized through reductive dissolution or desorption.

Reducing conditions sufficient to mobilize naturally occurring arsenic have also been observed along the bank of the Great Miami River as evidenced by elevated concentrations of dissolved iron, discussed above; and, low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, and MW-11 (presented in Figure 3 below).

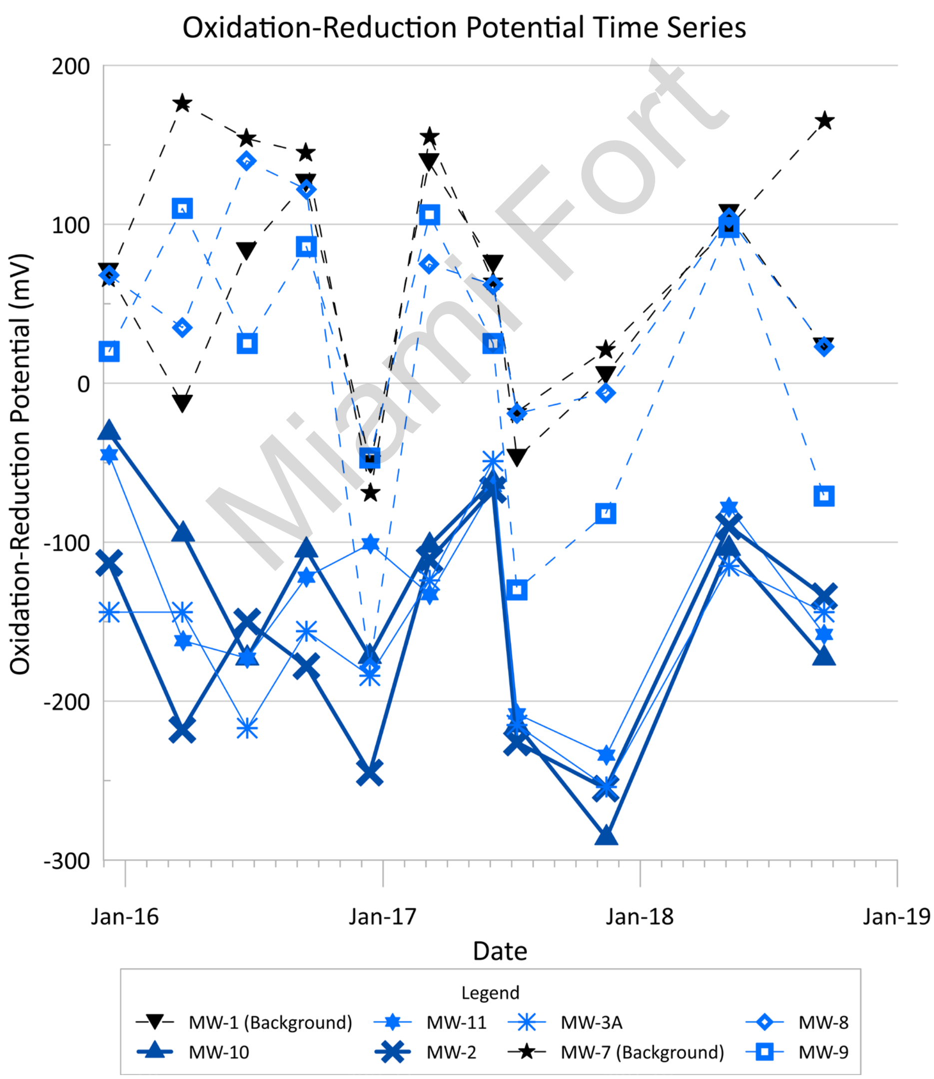


**Figure 3. Oxidation reduction potential time-series for groundwater samples (MW-1 (background), MW-2, MW-3A, MW-7 (background), MW-8, MW-9, MW-10, and MW-11)**

The presence of elevated concentrations of arsenic in background soil and groundwater in surrounding areas, as well as the presence of geochemical conditions (*i.e.* reducing conditions) necessary to mobilize arsenic in groundwater, suggests that elevated concentrations of arsenic at monitoring wells MW-2 and MW-10, are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

## LOE #2: BASIN B WATER HAS A DIFFERENT IONIC COMPOSITION THAN GROUNDWATER AT WELLS MW-2 AND MW-10.

Piper diagrams graphically represent ionic composition of aqueous solutions. The figure below is a Piper diagram that displays representative ionic compositions of groundwater including samples from MW-2 and MW-10, and Basin B water. There are two distinct groups identified by green and blue ellipses. These are discussed in more detail below.

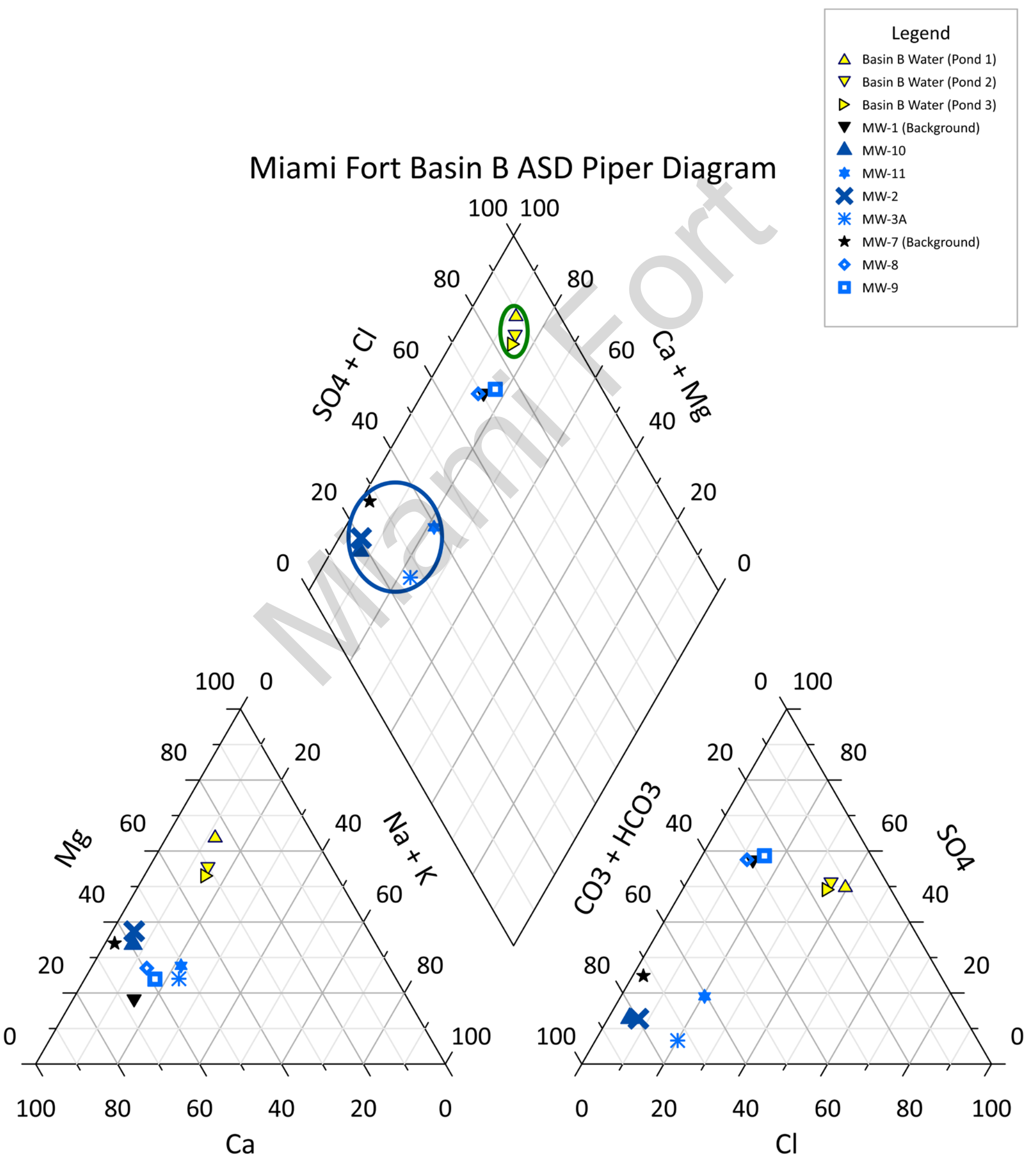


**Figure 4. Piper diagram showing ionic composition of samples of Basin B water and groundwater**

The ionic characteristics of these samples are provided in Table 1 below:

| Grouping | Green | Blue |
|---|---|---|
| **Locations** | **Basin B Water** | **Groundwater** |
| **Dominant Cation** | High Magnesium | High Calcium |
| **Dominant Anion** | High Sulfate | High Carbonate-Bicarbonate |

**Table 1. Summary of Ionic Classification**

The results can be categorized into two distinct groups. The Basin B water (green group) is high in magnesium cations and high in sulfate anions. The groundwater (blue group) is high in calcium cations and high in carbonate-bicarbonate anions. The blue group is comprised of both background and downgradient monitoring wells, indicating that wells MW-2 and MW-10 share similar characteristics to background water quality. The separation between Basin B water and downgradient groundwater collected from monitoring wells MW-2 and MW-10 demonstrates that there is no impact to groundwater from the Basin B water at these monitoring wells with elevated arsenic concentrations.

### LOE #3: CONCENTRATIONS OF CCR INDICATOR PARAMETERS, BORON AND SULFATE, ARE STABLE OR DECREASING, AND BELOW THE UPPER PREDICTION LIMIT AT MW-2 AND MW-10, INDICATING THAT CCR IS NOT THE SOURCE OF THE OBSERVED IMPACTS.

Boron and sulfate are primary indicators of CCR impacts to groundwater. Concentrations of boron and sulfate in monitoring wells MW-2 and MW-10 are stable or decreasing, and below UPLs established using background monitoring wells (*i.e.*, statistically significant increase [SSI] limits), as illustrated in the boron and sulfate time-series plots below.

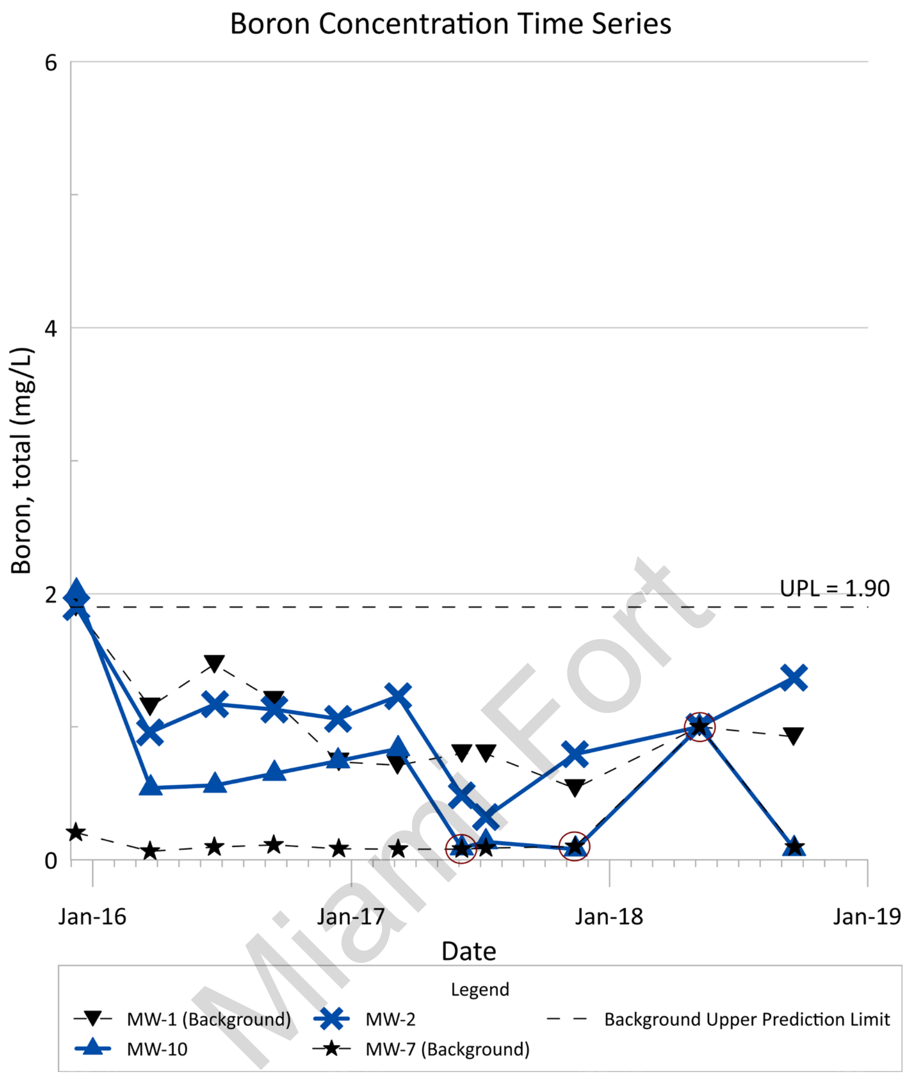


**Figure 5. Boron concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10** ***(note: non-detect analysis results for all wells are shown with red circles)***

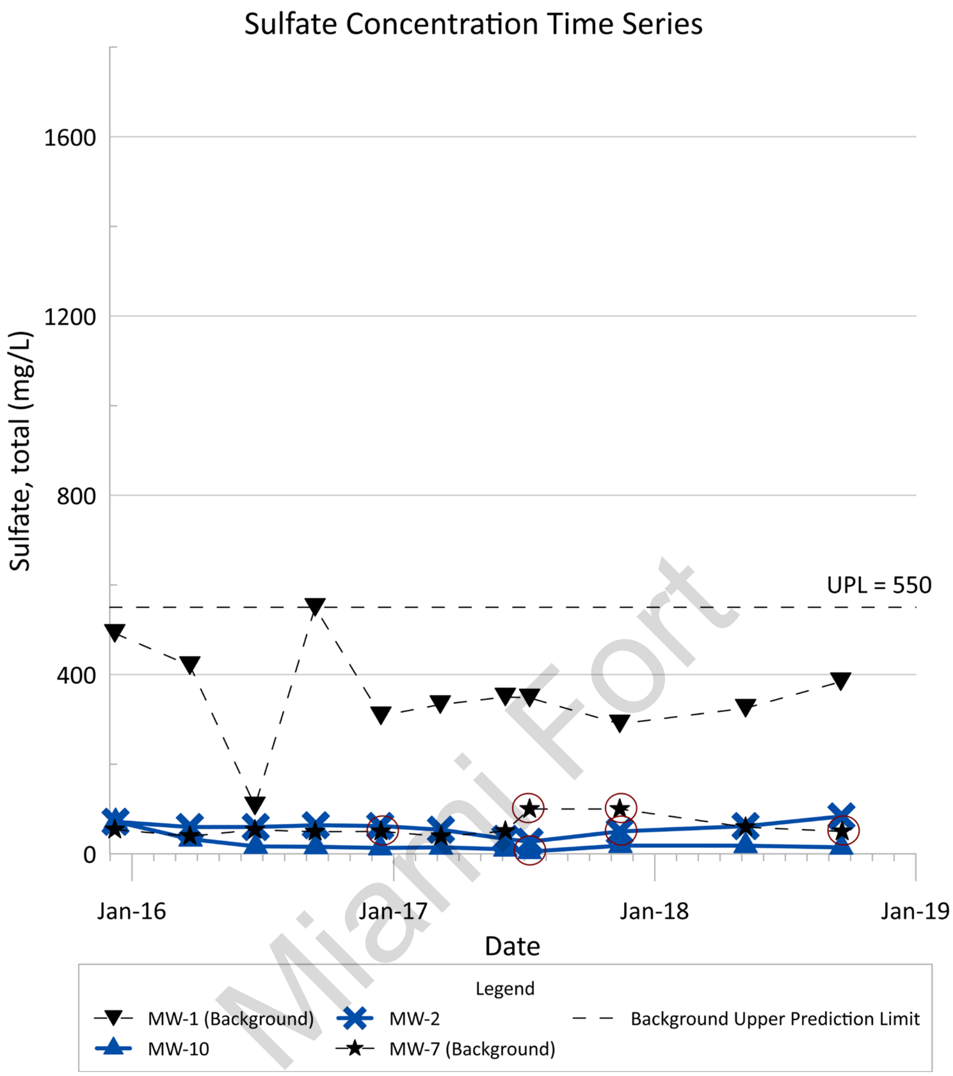




**Figure 6. Sulfate concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10** ***(note: non-detect analysis results for all wells are shown with red circles)***

From Figure 5 and Figure 6, above, the following observations can be made:

- Boron and sulfate are stable or decreasing. Mann-Kendall trend analyses (Attachment B) were performed to determine whether the concentration trend for wells MW-2 and MW-10 are statistically significant. Most trends were determined not to be statistically significant with the exception of the sulfate trend at MW-10, which was determined to be decreasing.
- Boron concentrations in well MW-2 range from 0.322 to 1.9 mg/L from December 2015 through September 2018. Boron concentrations in well MW-10 range from non-detect (less than 0.08 mg/L) to 2.02 mg/L. Boron concentrations in background wells range from 0.0645 to 1.9 mg/L. Overall median boron concentration in wells MW-2 and MW-10 were 1.06 mg/L and 0.56 mg/L, respectively, versus 0.624 mg/L in background wells.

- Sulfate concentrations in well MW-2 range from 27.1 to 83.5 mg/L from December 2015 through September 2018. Sulfate concentrations in well MW-10 range from non-detect (less than 5.0 mg/L) to 72 mg/L. Sulfate concentrations in background wells range from 39.1 to 550 mg/L. Overall median sulfate concentration in wells MW-2 and MW-10 were 60.85 mg/L and 15.8 mg/L, respectively, versus 103.5 mg/L in background wells.

Based on the observations above, Basin B is not impacting the groundwater at monitoring wells MW-2 and MW-10. The absence of co-occurring impacts from primary CCR indicator parameters, boron and sulfate, with arsenic, indicates that Basin B is not the source of arsenic in MW-2 and MW-10.

***Based on these three lines of evidence, it has been demonstrated that Basin B has not caused the SSL in MW-2 and MW-10.***

This information serves as the written alternate source demonstration, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the SSL observed during the assessment monitoring program was not due to the CCR unit, but was from a combination of naturally occurring conditions and potential upgradient anthropogenic impacts. Therefore, a corrective measures assessment is not required and Basin B will remain in assessment monitoring.

| | |
|---|---|
| Figure 1 | Monitoring Well and Sampling Location Map |
| Attachment A | Boring Logs for Monitoring Wells MW-2, MW-3A, MW-10 and MW-11 |
| Attachment B | Boron and Sulfate Mann-Kendall Trend Analysis Results for Monitoring Wells MW-2 and MW-10 |



## REFERENCES

McCarthur, J.M., Ravenscroft, R., Safiulla, S., and Thirwall, M.F., 2001, Arsenic in groundwater—Testing pollution mechanisms for sedimentary aquifers in Bangladesh: Water Resources Research, v. 37, no. 1, p. 109–117.

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Ohio Environmental Protection Agency (OEPA), 2015, Evaluation of Background Metal Soil Concentrations in Hamilton County – Cincinnati Area, Developed in Support of the Ohio Voluntary Action Program, Summary Report, May 2015.

Thomas, M.A., Schumann, T.L., and Pletsch, B.A., 2005, Arsenic in ground water in selected parts of southwestern Ohio, 2002–03: U.S. Geological Survey Scientific Investigations Report 2005–5138, 30 p.

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Jacob J. Walczak
Senior Hydrogeologist
OBG, part of Ramboll
Date: April 8, 2019

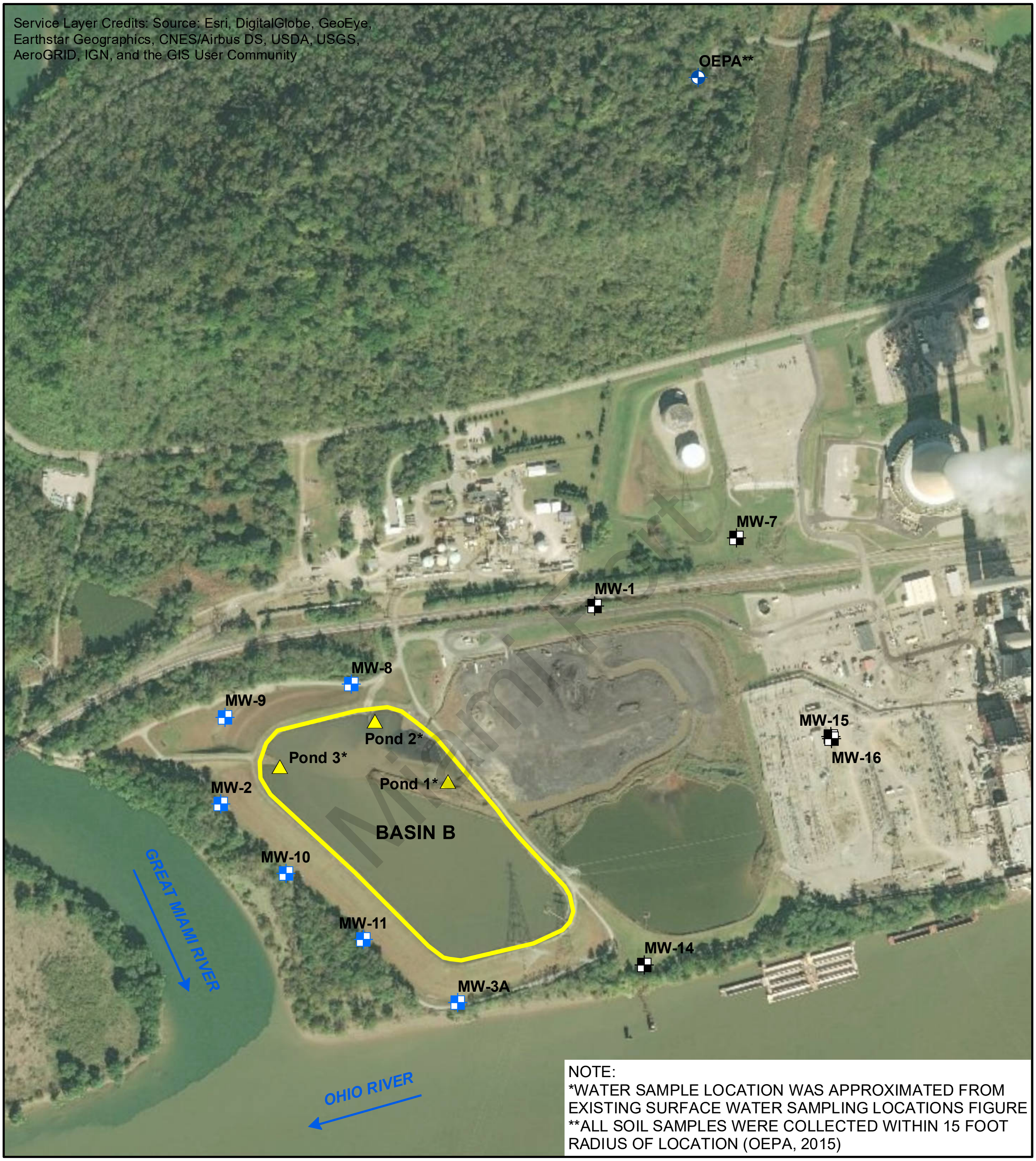
I, Richard H. Weber, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Richard H. Weber
Qualified Professional Engineer
71678
Ohio
OBG, part of Ramboll
Date: April 8, 2019

STATE OF OHIO
RICHARD
H. WEBER
71678
REGISTERED
PROFESSIONAL ENGINEER

# Figure 1

## Monitoring Well and Sampling Location Map




NOTE:
*WATER SAMPLE LOCATION WAS APPROXIMATED FROM EXISTING SURFACE WATER SAMPLING LOCATIONS FIGURE
**ALL SOIL SAMPLES WERE COLLECTED WITHIN 15 FOOT RADIUS OF LOCATION (OEPA, 2015)

LEGEND
- BASIN B UNIT BOUNDARY
- BASIN B WATER SAMPLE LOCATION
- OEPA SOIL SAMPLE LOCATION
- BASIN B DOWNGRADIENT MONITORING WELL
- BACKGROUND MONITORING WELL

DYNEGY MIAMI FORT, LLC
MIAMI FORT POWER STATION
MIAMI FORT BASIN B ALTERNATE SOURCE DEMONSTRATION
NORTH BEND, OHIO

MONITORING WELL AND SAMPLING LOCATION MAP

0 150 300 600
Feet

N

OBG
Part of Ramboll

C:\Users\galarnmc\OneDrive - Ramboll\desktop\WAH\2285\MXD\Miami_Fort\Figure 1_Monitoring Well and Sampling Locations.mxd

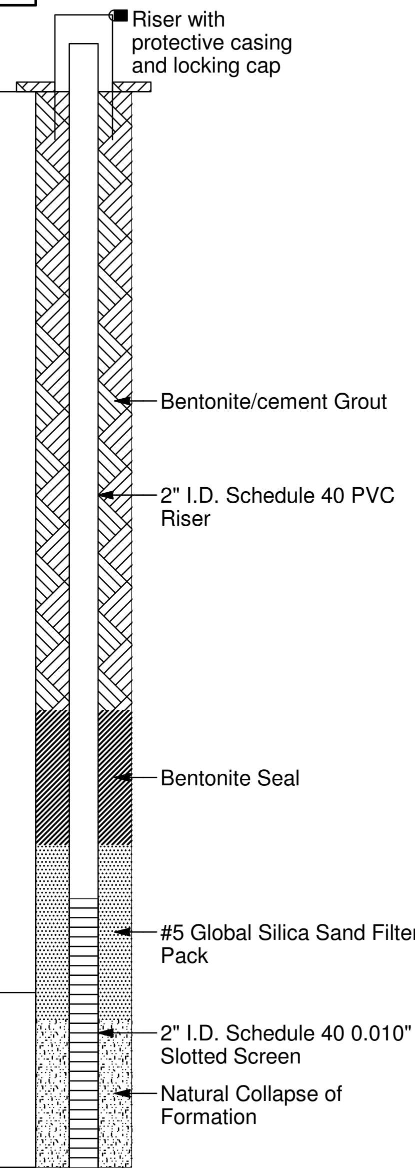
# Attachment A

## Boring Logs for Monitoring Wells MW-2, MW-3A, MW-10 and MW-11

| Depth (Feet) | Sample Location | Percent Recovery | USCS Symbol | DESCRIPTION OF SUBSURFACE MATERIALS |
|---|---|---|---|---|
| 0 | | | | Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist |
| | | 76 | | |
| 5 | | | | |
| | | | | grades with organics |
| | | 80 | | grades with less sand, pebbles, and gravel, stiff, no plasticity |
| 10 | | | | |
| | | | | grades with increasing sand and pebbles, single 3" cobble grades soft, plastic, very moist |
| | | 60 | | |
| 15 | | | | grades brownish yellow to brown, without organics |
| | | 70 | | grades medium stiff to stiff, very slight plasticity to no plasticity |
| 20 | | | | grades with increasing fine sand, plastic, soft |
| | | 100 | | |
| 25 | | | | grades gray to dark gray, with increasing silt and sand |
| | | 100 | | |
| 30 | | | | grades wet |
| | | 100 | | |
| | | | | Gray fine to coarse SAND and rounded GRAVEL, very loose, poorly sorted, wet |
| 35 | | | | |
| | | 0 | | |
| 40 | | | | |

Boring terminated 40' bgs on 12/11/2007.
2" I.D. Schedule 40 PVC monitoring well installed 40' bgs with 10' 0.010" slotted screen.

## WELL CONSTRUCTION DETAIL




LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded



Duke Energy - 14947868 - North Bend, OH

DUKE ENERGY MIAMI FORT STATION MIAMI FORT STATION.GPJ 2/5/08

URS

JOB NO. 14947868

**Duke Energy**
Miami Fort Station
11021 Brower Road
North Bend, OH

**MONITORING WELL**
**MW-2**

| Project: Duke Energy<br>Project Location: Miami Fort Station<br>Project Number: 14948624 | **Monitoring Well MW-3A**<br>Sheet 1 of 2 |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | **2/25/2009** | Logged By | **K. Pritchard** | Checked By | **M. Wagner** |
| Drilling Method | **4.25 in. Hollow Stem Auger** | Drilling Contractor | **Belasco Drilling Services** | Total Depth of Borehole | **52.0 feet** |
| Drill Rig Type | **Truck-Mounted Auger** | Sampler Type | **Split Spoon** | Surface Elevation | **471.17 feet, msl** |
| Groundwater Elevation(s) | **456.42 ft, msl** | Hammer Weight and Drop | **140 lb, Dropped 30-inches** | Top of PVC Elevation | **473.23 feet, msl** |
| Diameter of Hole (inches) | **8.25** / Diameter of Well (inches) **2** | Type of Well Casing | **Schedule 40 PVC** | Screen Perforation | **0.010-Inch** |
| Type of Sand Pack | **Natural Collapse** | Well Completion at Ground Surface | **Riser, With Locking Cap** | | |
| Comments | **** Split spoon sampler advanced through interval under weight of hammer and rods only** | | | | |

| Elevation, feet | Depth, feet | Type | Blows per 1-foot Interval | Percent Recovery | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| | 0 | X | 12 | 83 | Yellowish red CLAY TOPSOIL, moist | Riser with protective casing and locking cap |
| 470 | | | | | Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist | |
| | | X | 19 | 100 | | |
| | | X | 6 | 83 | grades brownish yellow with increasing clay | |
| | 5 | | | | Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist | |
| 465 | | X | 3 | 100 | | |
| | | | | | grades with increasing fine to medium sand, without organics, with iron staining | |
| | | X | 3 | 83 | grades with medium to coarse grained sand lenses, without staining | |
| | 10 | | | | grades high plasticity, very moist to wet | |
| | | X | 3 | 75 | | |
| 460 | | | | | Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet | |
| | | X | 2 | 100 | Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet | |
| | | X | 1 | 100 | | |
| | 15 | | | | grades wet with increasing fine sand | |
| 455 | | X | 1 | 100 | | Bentonite/cement Grout |
| | | | | | grades with fine grained sand lenses | |
| | | X | 2 | 100 | grades brown with increasing fine sand | |
| | 20 | X | 2 | 100 | | 2" I.D. Schedule 40 PVC Riser |
| 450 | | | | | | |
| | | X | 2 | 100 | grades with gray to reddish gray lenses, decreasing sand, without sand lenses | |
| | | | | | grades gray, without gray to reddish gray lenses, medium plasticity | |
| | | X | ** | 100 | grades high plasticity | |
| | 25 | | | | grades with increasing sand | |
| 445 | | X | 3 | 100 | | |
| | | | | | grades with organics, sulphur odor, decreasing sand | |
| | | X | 2 | 100 | grades without sand, without odor | |
| | | | | | grades with fine sand lenses, without organics | |
| | 30 | | | | | |

Miami Fort

URS

DUKE MIAMI FORT STATION MARCH 2009 MIAMI FORT STATION MW-3A.GPJ 4/28/09

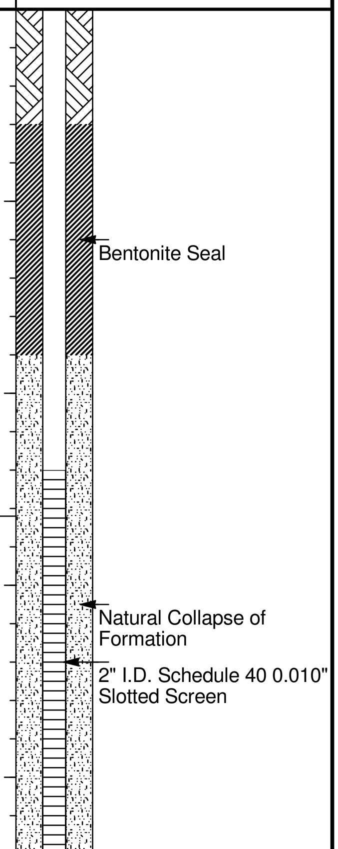
**Project:** Duke Energy
**Project Location:** Miami Fort Station
**Project Number:** 14948624

# Monitoring Well MW-3A



| Elevation, feet | Depth, feet | SAMPLES: Type | Blows per 1-foot Interval | Percent Recovery | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 440 | 30 | | 1 | 100 | grades without sand, with trace organics |
| | | | 4 | 100 | grades with sand, without organics |
| | | | 4 | 100 | grades with trace fine sand and increasing silt, without sand lenses, medium plasticity |
| 435 | 35 | | | | grades with increasing sand, without organics |
| | | | 3 | 100 | grades with increasing silt, trace sand, very low plasticity, stiff |
| | | | 6 | 100 | grades with sand, plastic, very soft |
| | | | | | grades stiff, very low plasticity, very moist |
| 430 | 40 | | 4 | 100 | grades with trace organcis, less sand, increasing silt |
| | | | 8 | 100 | |
| | | | 14 | 42 | Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet |
| 425 | 45 | | 7 | 100 | |
| | | | 22 | 63 | grades with increasing diameter gravel |
| 420 | 50 | | 13 | 50 | |
| | | | | | Boring terminated 52' bgs on 2/25/2009. 2" I.D. Schedule 40 PVC monitoring well installed 52' bgs with 10' 0.010" slotted screen. |
| 415 | 55 | | | | |
| 410 | 60 | | | | |
| 405 | 65 | | | | |
| | 70 | | | | |

## WELL CONSTRUCTION DETAILS



| Project: Dynegy | Monitoring Well MW-10 |
|---|---|
| Project Location: Miami Fort Station | Sheet 1 of 2 |
| Project Number: 60442412 | |

| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | 4/10/2017 | Logged By | J. Alten | Checked By | M. Wagner |
| Drilling Method | Rotosonic | Drilling Contractor | Frontz Drilling | Total Depth of Borehole | 59.0 feet |
| Drill Rig Type | Rotosonic | Sampler Type | Sonic Sleeve | Surface Elevation | 470.90 feet, msl |
| Depth to Groundwater | 12.34 ft bgs | Seal Material | Hydrated 3/8-inch Bentonite Chips | Top of PVC Elevation | 473.35 feet, msl |
| Diameter of Hole (inches) | 6.0 / Diameter of Well (inches) 2 | Type of Well Casing | Schedule 40 PVC | Screen Perforation | 0.010-Inch |
| Type of Sand Pack | #5 Silica Sand | Well Completion at Ground Surface | Riser, With locking cap and protective casing. | | |
| Comments | | | | | |

| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| | 0 | | 74 | | Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist | Riser with protective casing and locking cap |
| 470 | | | | | Grades with more clay and gravel, medium stiff | |
| 465 | 5 | | | | Grades without gravel and more clay, very stiff, moist | 2" I.D. Schedule 40 PVC Riser |
| | | | | | Brown CLAY, with silt, medium stiff, moist | |
| 460 | 10 | | 48 | | | |
| 455 | 15 | | | | Brown SILT, with some clay and very fine sand, soft, moist | |
| | | | 93 | | Grades with less silt and more fine sand | |
| 450 | 20 | | | | Brown fine SAND, with silt and clay, loose, soft, moist | Bentonite/cement Grout |
| 445 | 25 | | | | Grades with less silt and clay | |
| | | | | | Grades gray and brown | |
| | | | | | Grades with trace silt and without clay, few pieces of organic matter | |
| | 30 | | 88 | | Gray and brown fine SAND, with trace silt, loose, moist | |

| Project: Dynegy | Monitoring Well MW-10 |
|---|---|
| Project Location: Miami Fort Station | Sheet 2 of 2 |
| Project Number: 60442412 | |

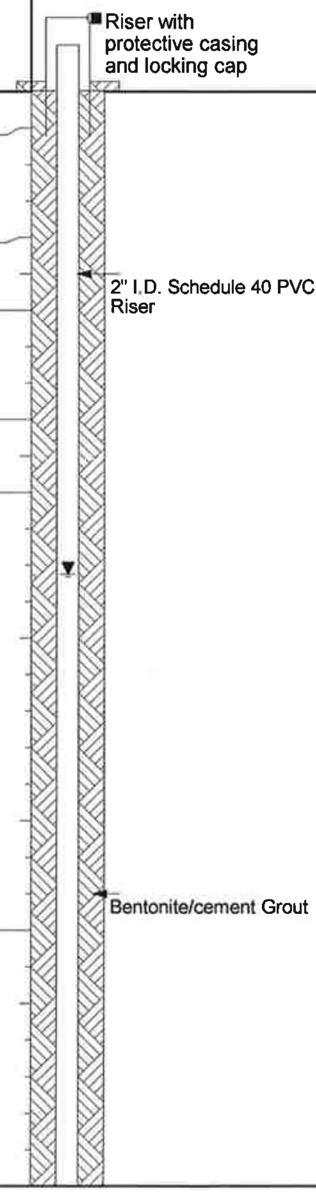
| Elevation, feet | Depth, feet | SAMPLES Type | Percent Recovery | Graphic Log | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| 440 | 30 | | | | | |
| 435 | 35 | | | | Grades with some medium sand | |
| | | | | | Grades to medium sand | |
| 430 | 40 | | 58 | | Grades wet | |
| | | | | | Grades with silt, more dense | |
| 425 | 45 | | | | Grades with fine and coarse sand | Bentonite Seal |
| | | | | | Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet | |
| 420 | 50 | | 88 | | | #5 Global Silica Sand Filter Pack |
| | | | | | Brown medium SAND, loose, wet | |
| 415 | 55 | | | | | 2" I.D. Schedule 40 0.010" Slotted Screen |
| | | | | | | End Cap |
| 410 | 60 | | | | End of boring at 59' | |
| 405 | 65 | | | | | |
| | 70 | | | | | |

| | |
|---|---|
| **Project:** Dynegy<br>**Project Location:** Miami Fort Station<br>**Project Number:** 60442412 | **Monitoring Well**<br>**MW-11**<br>Sheet 1 of 2 |

| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | 4/11/2017 | Logged By | J. Alten | Checked By | M. Wagner |
| Drilling Method | Rotosonic | Drilling Contractor | Frontz Drilling | Total Depth of Borehole | 59.0 feet |
| Drill Rig Type | Rotosonic | Sampler Type | Sonic Sleeve | Surface Elevation | 471.81 feet, msl |
| Depth to Groundwater | 13.25 ft bgs | Seal Material | Hydrated 3/8-inch Bentonite Chips | Top of PVC Elevation | 474.45 feet, msl |
| Diameter of Hole (inches) | 6.0 / Diameter of Well (inches) 2 | Type of Well Casing | Schedule 40 PVC | Screen Perforation | 0.010-Inch |
| Type of Sand Pack | #5 Silica Sand | Well Completion at Ground Surface | Riser, With locking cap and protective casing. | | |
| Comments | | | | | |

| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| | 0 | | 69 | | Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL) |
| 470 | | | | | Brown and tan with reddish mottled SILT with trace fine gravel, very stiff, moist |
| | | | | | Grades with fine sand |
| | 5 | | | | Brown with red mottled fine SAND, soft, moist |
| 465 | | | | | Dark gray SILT with some clay, stiff, moist, trace organci matter |
| | | | | | Grades with more clay |
| | 10 | | 42 | | Gray and brown CLAY, with some silt, soft, moist |
| 460 | | | | | Gray and brown SILT, with fine sand and some clay, soft, moist |
| | 15 | | | | |
| 455 | | | | | Grades with less clay |
| | 20 | | 56 | | Grades gray without clay |
| 450 | | | | | |
| | | | | | Gray very fine SAND with silt, soft, moist |
| | 25 | | | | |
| 445 | | | | | |
| | 30 | | 53 | | Grades with dark gray and black wood fragments |

**WELL CONSTRUCTION DETAILS**



**Project:** Dynegy
**Project Location:** Miami Fort Station
**Project Number:** 60442412

# Monitoring Well MW-11



| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| | 30 | | | | | |
| 440 | | | | | Grades without wood fragments | |
| | 35 | | | | | |
| 435 | | | | | Grades with less silt | |
| | | | 83 | | | |
| | 40 | | | | | |
| | | | | | Gray fine to coarse SAND with rounded fine gravel, loose, moist | |
| 430 | | | | | | |
| | | | | | Grades to fine sand and without gravel | |
| | 45 | | | | | Bentonite Seal |
| | | | | | Grades brown and gray | |
| 425 | | | | | | |
| | | | | | Grades fine to coarse sand with rounded fine to medium gravel | |
| | | | 80 | | | |
| | 50 | | | | Grades wet | #5 Global Silica Sand Filter Pack |
| 420 | | | | | | |
| | | | | | Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet | |
| | 55 | | | | | 2" I.D. Schedule 40 0.010" Slotted Screen |
| 415 | | | | | | |
| | | | | | Boring terminated at 59' | End Cap |
| | 60 | | | | | |
| 410 | | | | | | |
| | 65 | | | | | |
| 405 | | | | | | |
| | 70 | | | | | |

# Attachment B

# Boron and Sulfate Mann-Kendall Trend Analysis Results for Monitoring Wells MW-2 and MW-10

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-2** | **Parameter Code:** | **01022** |
| **Location Class:** | **Downgradient** | **Parameter:** | **B, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 12/31/2018** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.000440 | mg/L per day |
| R-Squared error of fit: | 0.108816 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.000522 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.001580 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.000388 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -0.7785 |
| Z test: | 1.6449 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-10** | **Parameter Code:** | **01022** |
| **Location Class:** | **Downgradient** | **Parameter:** | **B, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 12/31/2018** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.000976 | mg/L per day |
| R-Squared error of fit: | 0.295149 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.000769 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.001912 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.000508 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -1.0899 |
| Z test: | 1.6449 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-2** | **Parameter Code:** | **00945** |
| **Location Class:** | **Downgradient** | **Parameter:** | **SO4, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 12/31/2018** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.000641 | mg/L per day |
| R-Squared error of fit: | 0.000165 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.016306 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.057274 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.019033 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -0.623 |
| Z test: | 1.645 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-10** | **Parameter Code:** | **00945** |
| **Location Class:** | **Downgradient** | **Parameter:** | **SO4, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 12/31/2018** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.032598 | mg/L per day |
| R-Squared error of fit: | 0.324815 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.020110 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.052426 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.000070 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -1.640 |
| Z test: | 1.645 |
| At the 95.0 % Confidence Level (One-Sided Test): | Downward |

# 40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION
# MIAMI FORT BASIN B
# OCTOBER 28, 2019

October 28, 2019

Title 40 of the Code of Federal Regulations (C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of statistically significant levels (SSLs) over groundwater protection standards (GWPSs) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality ("alternate source demonstration").

This alternate source demonstration has been prepared on behalf of Dynegy Miami Fort, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll (OBG), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Basin B, located at Miami Fort Power Station (MFS) near North Bend, Ohio.

Initial baseline groundwater monitoring, consisting of a minimum of eight samples, as required under 40 C.F.R. § 257.94(b), was initiated in December 2015 and completed prior to October 17, 2017. Background groundwater quality observed in this time period was compared to concentrations of parameters observed in downgradient monitoring wells during the November 2017 Detection Monitoring Program sampling event; statistically significant increases (SSIs) were identified for one or more 40 C.F.R. Part 257 Appendix III parameters. Consequently, and in accordance with 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95, an assessment monitoring program was established by April 9, 2018, for the Miami Fort Basin B.

The second Assessment Monitoring sampling event was completed on March 13 through March 14, 2019. Groundwater data collected from the second Assessment Monitoring sampling event, in March 2019, will be available in the 2019 Annual Groundwater Monitoring and Corrective Action Report for Miami Fort Basin B. Analytical data from all sampling events, from December 2015 through the second Assessment Monitoring sampling event (March 2019), were evaluated in accordance with the statistical analysis plan (NRT/OBG, 2017), to determine any SSIs of Appendix III parameters over background concentrations, or statistically significant levels (SSLs) of Appendix IV parameters over GWPSs. That evaluation identified SSLs at downgradient monitoring wells as follows:

- Arsenic at wells MW-2 and MW-10

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Miami Fort Basin B were the cause of the SSLs listed above. This alternate source demonstration (ASD) was completed within 90 days of determination of the SSLs (July 29, 2019), as required by 40 C.F.R. § 257.95(g)(3)(ii).

## ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following lines of evidence (LOE):

1. Elevated background concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2 and MW-10 are located in southwestern Ohio, along the banks of the Great Miami River, where they are susceptible to geochemical conditions that can potentially mobilize naturally occurring arsenic from the soils into groundwater.
2. Ionic composition of the groundwater at wells MW-2 and MW-10 is different than the water in Basin B, indicating that Basin B is not the source of the groundwater in these wells.
3. Concentrations of CCR indicator parameters, boron and sulfate, are stable or decreasing, and below the Upper Prediction Limit (UPL) at MW-2 and MW-10, indicating that CCR is not the source of the observed impacts.

These LOEs are described and supported in greater detail below. Monitoring wells and Basin B water sample locations are shown on Figure 1 (attached).

### LOE #1: ELEVATED BACKGROUND CONCENTRATIONS OF ARSENIC ARE COMMONLY FOUND IN SOILS AND GROUNDWATER IN SOUTHWESTERN OHIO. MW-2 AND MW-10 ARE LOCATED IN SOUTHWESTERN OHIO, ALONG THE BANKS OF THE GREAT MIAMI RIVER, WHERE THEY ARE SUSCEPTIBLE TO GEOCHEMICAL CONDITIONS THAT CAN POTENTIALLY MOBILIZE NATURALLY OCCURRING ARSENIC FROM THE SOILS INTO GROUNDWATER.

Elevated background concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 feet below ground surface) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 feet northeast of Basin B, near Shawnee Lookout in Hamilton County Park, and analyzed for arsenic as part of a study to evaluate background soil concentrations of Resource Conservation and Recovery Act (RCRA) metals in the Cincinnati area (OEPA, 2015) (Figure 2). Results of the analysis indicated surficial terrace soils (clay) adjacent to Basin B have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg) and have a geometric mean of 6.56 mg/kg.



Background concentrations of arsenic are commonly elevated in southwestern Ohio aquifers. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to evaluate the aquifer characteristics associated with elevated arsenic concentrations in southwest Ohio (Thomas *et al*., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposit and glacial till with interbedded sand and gravel aquifers within the Great Miami River drainage basin, and included samples from domestic wells in Preble, Miami, and Shelby counties. The USGS reported that 37 percent of the samples analyzed had elevated concentrations of arsenic and elevated arsenic concentrations were found in all three aquifer types studied. Geochemical conditions were also evaluated and the USGS determined that elevated arsenic concentrations in the study area were associated with iron-reducing, sulfate-reducing, or methanic conditions, and all samples with elevated arsenic concentrations had iron concentrations that exceeded 1 milligrams per liter (mg/L).

Based on previous studies discussed above, elevated background concentrations of arsenic are known to exist in both soils and groundwater in the same region as Basin B. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 feet northeast) to Basin B. The USGS study showed that iron-reducing, sulfate-reducing, or methanic geochemical conditions needed to mobilize arsenic were common in southwestern Ohio aquifers. Reducing conditions are likely to occur at Basin B monitoring wells MW-2 and MW-10, where elevated arsenic concentrations were observed, as indicated by the following factors and discussed below:

- Elevated iron concentrations are present in groundwater at monitoring well MW-2
- Boring logs indicate organic materials are present in the soils
- MW-2 and MW-10 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potentials (ORP) at the site were observed

Elevated concentrations of dissolved iron were observed in groundwater at monitoring well MW-2 from 2008 to 2014, where concentrations ranged from 11.8 to 52.1 mg/L. Dissolved iron data was not available for MW-2 after 2014, and no dissolved iron data was available for analysis at MW-10. The USGS reported that elevated background arsenic concentrations in groundwater were associated with iron concentrations greater than 1 mg/L. The iron concentrations observed in MW-2 were at least an order of magnitude greater than 1 mg/L, indicating that groundwater at MW-2 is susceptible to iron-reducing geochemical conditions and elevated background arsenic concentrations in groundwater. The figure below illustrates the strong relationship between increased iron concentration and increased arsenic concentrations in groundwater at MW-2, where the coefficient of determination (R-squared) is 0.87.

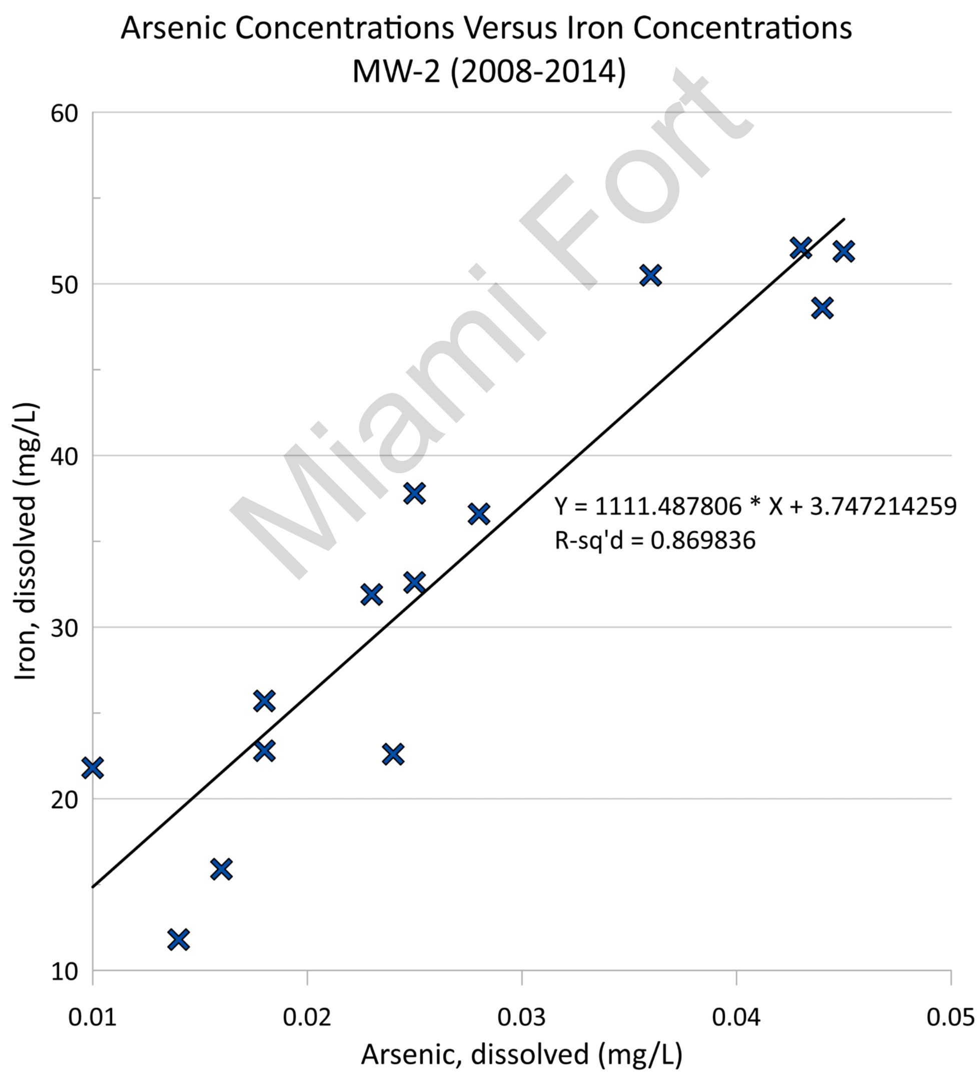



**Figure 2. Arsenic concentrations versus iron concentrations at well MW-2 (2008-2014)**

Arsenic is naturally present in groundwater and soils at variable concentrations. The arsenic is co-precipitated with iron oxyhydroxides and incorporated into the mineral structure of the soils, but can also be adsorbed to organic matter or the iron oxyhydroxides in the aquifer. Both of these sources of arsenic can be mobilized in groundwater by dissolution or desorption under reducing geochemical conditions, where organic carbon commonly acts as the reducing agent (Thomas *et al*., 2005; McCarthur *et al*., 2001). Arsenic-bearing soils are known to be present in the areas near Basin B (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the boring logs for monitoring wells located along the banks of the Great Miami River (see boring logs for wells MW-2, MW-3A, MW-10, and MW-11 in Attachment A). The presence of organic material and arsenic-bearing soils indicates there is potential for naturally occurring arsenic to become mobilized through reductive dissolution or desorption.

Reducing conditions sufficient to mobilize naturally occurring arsenic have also been observed along the bank of the Great Miami River as evidenced by elevated concentrations of dissolved iron, discussed above; and, low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, and MW-11 (presented in Figure 3 below).

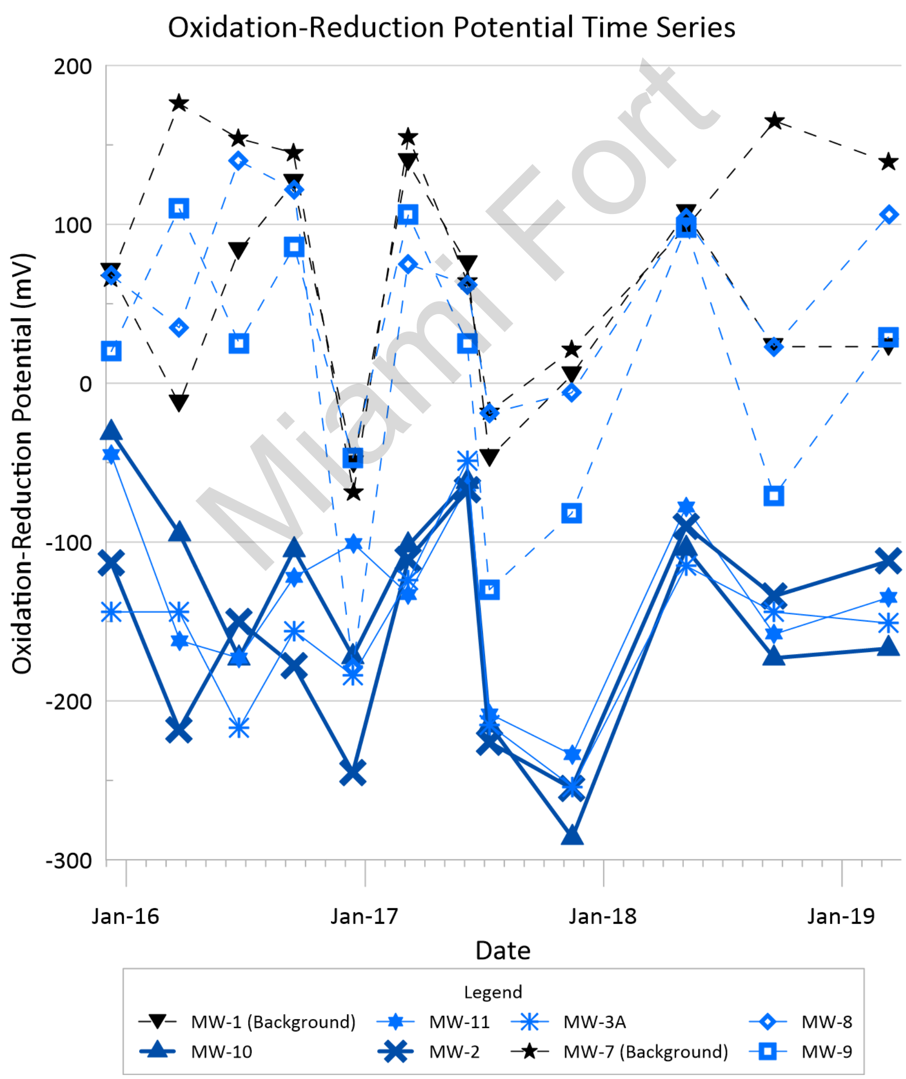



**Figure 3. Oxidation reduction potential time-series for groundwater samples (MW-1 (background), MW-2, MW-3A, MW-7 (background), MW-8, MW-9, MW-10, and MW-11)**

The presence of elevated concentrations of arsenic in background soil and groundwater in surrounding areas, as well as the presence of geochemical conditions (*i.e.* reducing conditions) necessary to mobilize arsenic in groundwater, suggests that elevated concentrations of arsenic at monitoring wells MW-2 and MW-10, are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

## LOE #2: BASIN B WATER HAS A DIFFERENT IONIC COMPOSITION THAN GROUNDWATER AT WELLS MW-2 AND MW-10.

Piper diagrams graphically represent ionic composition of aqueous solutions. The figure below is a Piper diagram that displays representative ionic compositions of groundwater including samples from MW-2 and MW-10, and Basin B water. There are two distinct groups identified by green and blue ellipses. These are discussed in more detail below.

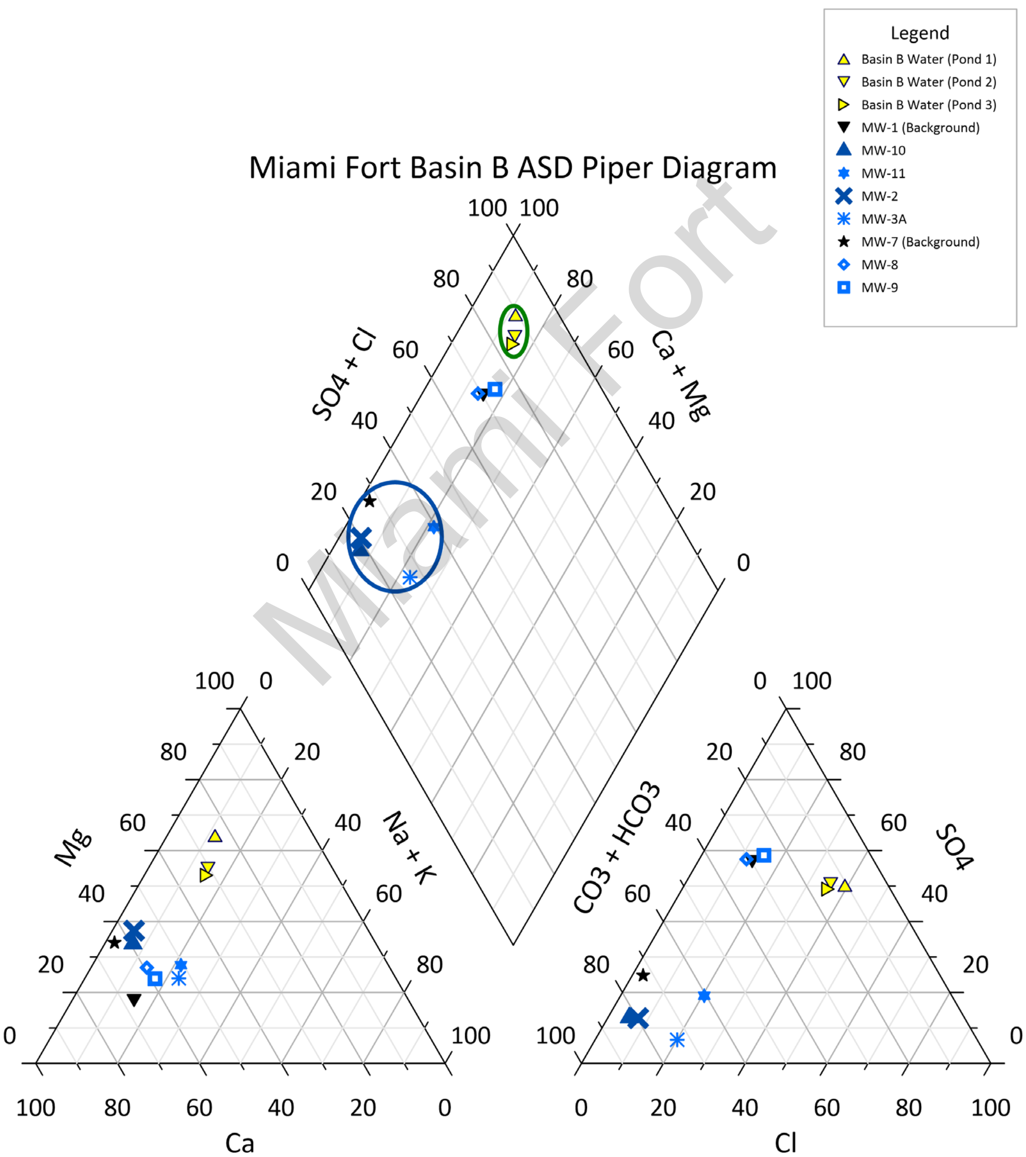



**Figure 4. Piper diagram showing ionic composition of samples of Basin B water and groundwater**

The ionic characteristics of these samples are provided in Table 1 below:

| Grouping | Green | Blue |
|---|---|---|
| **Locations** | **Basin B Water** | **Groundwater** |
| **Dominant Cation** | High Magnesium | High Calcium |
| **Dominant Anion** | High Sulfate | High Carbonate-Bicarbonate |

**Table 1. Summary of Ionic Classification**

The results can be categorized into two distinct groups. The Basin B water (green group) is high in magnesium cations and high in sulfate anions. The groundwater (blue group) is high in calcium cations and high in carbonate-bicarbonate anions. The blue group is comprised of both background and downgradient monitoring wells, indicating that wells MW-2 and MW-10 share similar characteristics to background water quality. The separation between Basin B water and downgradient groundwater collected from monitoring wells MW-2 and MW-10 demonstrates that there is no impact to groundwater from the Basin B water at these monitoring wells with elevated arsenic concentrations.

### LOE #3: CONCENTRATIONS OF CCR INDICATOR PARAMETERS, BORON AND SULFATE, ARE STABLE OR DECREASING, AND BELOW THE UPPER PREDICTION LIMIT AT MW-2 AND MW-10, INDICATING THAT CCR IS NOT THE SOURCE OF THE OBSERVED IMPACTS.

Boron and sulfate are primary indicators of CCR impacts to groundwater. Concentrations of boron and sulfate in monitoring wells MW-2 and MW-10 are stable or decreasing, and below UPLs established using background monitoring wells (*i.e.*, statistically significant increase [SSI] limits), as illustrated in the boron and sulfate time-series plots below.

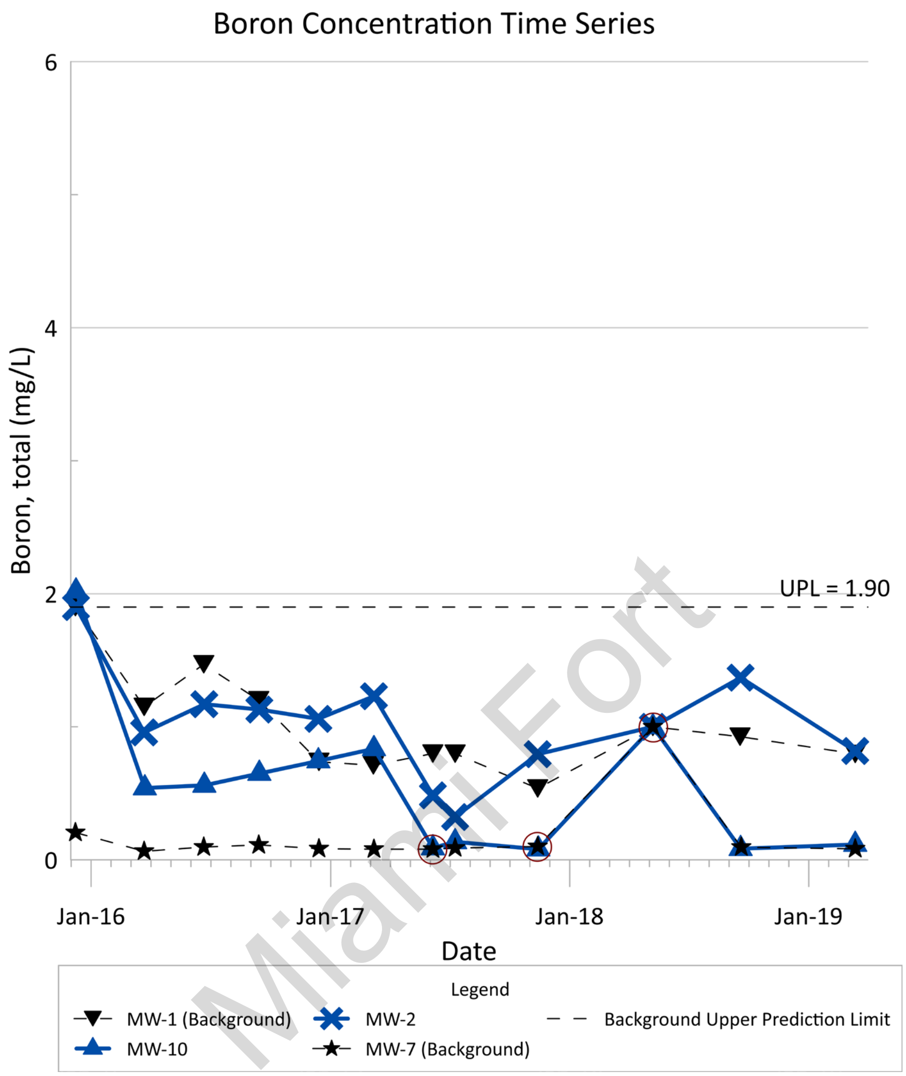



**Figure 5. Boron concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10 *(note: non-detect analysis results for all wells are shown with red circles)***

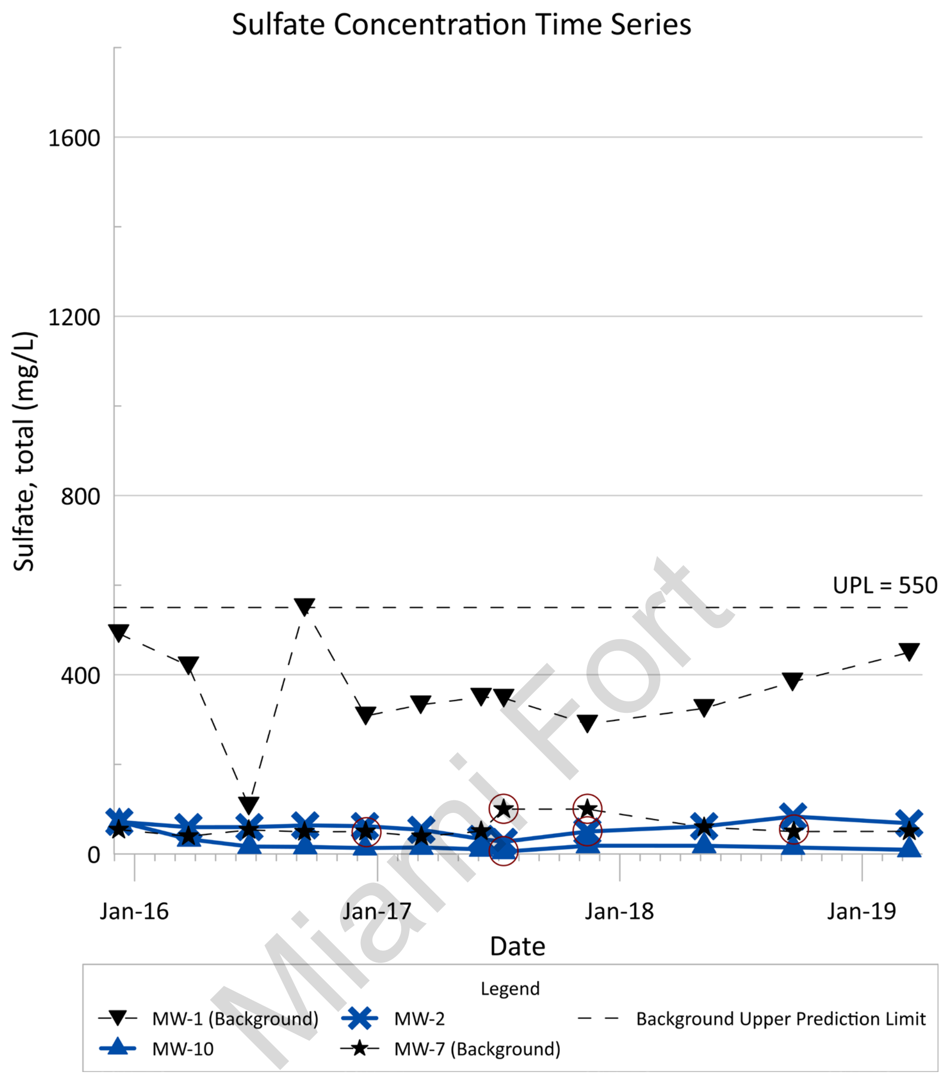



**Figure 6. Sulfate concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10** ***(note: non-detect analysis results for all wells are shown with red circles)***

From Figure 5 and Figure 6, above, the following observations can be made:

- Boron and sulfate are stable or decreasing. Mann-Kendall trend analyses (Attachment B) were performed to determine whether the concentration trend for wells MW-2 and MW-10 are statistically significant. Most trends were determined not to be statistically significant with the exception of the sulfate trend at MW-10, which was determined to be decreasing.
- Boron concentrations in well MW-2 range from 0.322 to 1.9 mg/L from December 2015 through March 2019. Boron concentrations in well MW-10 range from non-detect (less than 0.08 mg/L) to 2.02 mg/L. Boron concentrations in background wells range from 0.0645 to 1.9 mg/L. Overall median boron concentration in wells MW-2 and MW-10 were 1.03 mg/L and 0.55 mg/L, respectively, versus 0.624 mg/L in background wells.

- Sulfate concentrations in well MW-2 range from 27.1 to 83.5 mg/L from December 2015 through March 2019. Sulfate concentrations in well MW-10 range from non-detect (less than 5.0 mg/L) to 72 mg/L. Sulfate concentrations in background wells range from 39.1 to 550 mg/L. Overall median sulfate concentration in wells MW-2 and MW-10 were 60.85 mg/L and 15.15 mg/L, respectively, versus 103.5 mg/L in background wells.

Based on the observations above, Basin B is not impacting the groundwater at monitoring wells MW-2 and MW-10. The absence of co-occurring impacts from primary CCR indicator parameters, boron and sulfate, with arsenic, indicates that Basin B is not the source of arsenic in MW-2 and MW-10.

***Based on these three lines of evidence, it has been demonstrated that Basin B has not caused the SSL in MW-2 and MW-10.***

This information serves as the written alternate source demonstration, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the SSL observed during the assessment monitoring program was not due to the CCR unit, but was from a combination of naturally occurring conditions and potential upgradient anthropogenic impacts. Therefore, a corrective measures assessment is not required and Basin B will remain in assessment monitoring.

| | |
|---|---|
| Figure 1 | Monitoring Well and Sampling Location Map |
| Attachment A | Boring Logs for Monitoring Wells MW-2, MW-3A, MW-10 and MW-11 |
| Attachment B | Boron and Sulfate Mann-Kendall Trend Analysis Results for Monitoring Wells MW-2 and MW-10 |



## REFERENCES

McCarthur, J.M., Ravenscroft, R., Safiulla, S., and Thirwall, M.F., 2001, Arsenic in groundwater—Testing pollution mechanisms for sedimentary aquifers in Bangladesh: Water Resources Research, v. 37, no. 1, p. 109–117.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017, Statistical Analysis Plan, Miami Fort Power Station, Dynegy Miami Fort, LLC, October 17, 2017.

O’Brien & Gere Engineers, Inc. (OBGa), 2019, 2018 Annual Groundwater Monitoring and Corrective Action Report, Miami Fort Basin B – CCR Unit ID 112, Miami Fort Power Station, Dynegy Miami Fort, LLC, January 31, 2019.

Ohio Environmental Protection Agency (OEPA), 2015, Evaluation of Background Metal Soil Concentrations in Hamilton County – Cincinnati Area, Developed in Support of the Ohio Voluntary Action Program, Summary Report, May 2015.

Thomas, M.A., Schumann, T.L., and Pletsch, B.A., 2005, Arsenic in ground water in selected parts of southwestern Ohio, 2002–03: U.S. Geological Survey Scientific Investigations Report 2005–5138, 30 p.

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Jacob J. Walczak
Senior Hydrogeologist
OBG, part of Ramboll
Date: October 28, 2019

I, Richard H. Weber, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Richard H. Weber
Qualified Professional Engineer
71678
Ohio
OBG, part of Ramboll
Date: October 28, 2019

STATE OF OHIO
RICHARD
H. WEBER
71678
REGISTERED
PROFESSIONAL ENGINEER

# Figure 1

## Monitoring Well and Sampling Location Map


NOTE:
*WATER SAMPLE LOCATION WAS APPROXIMATED FROM EXISTING SURFACE WATER SAMPLING LOCATIONS FIGURE
**ALL SOIL SAMPLES WERE COLLECTED WITHIN 15 FOOT RADIUS OF LOCATION (OEPA, 2015)

LEGEND
- BASIN B UNIT BOUNDARY
- BASIN B WATER SAMPLE LOCATION
- OEPA SOIL SAMPLE LOCATION
- BASIN B DOWNGRADIENT MONITORING WELL
- BACKGROUND MONITORING WELL

DYNEGY MIAMI FORT, LLC
MIAMI FORT POWER STATION
MIAMI FORT BASIN B ALTERNATE SOURCE DEMONSTRATION
NORTH BEND, OHIO

MONITORING WELL AND SAMPLING LOCATION MAP

N

0 150 300 600
Feet

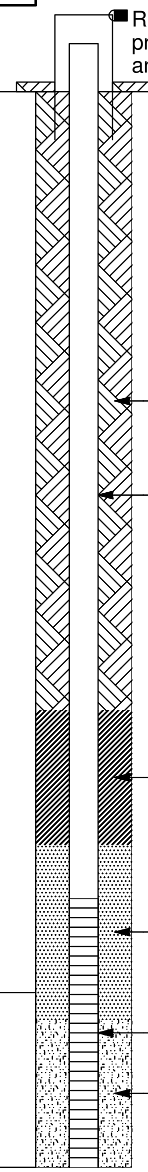
OBG
Part of Ramboll

# Attachment A

## Boring Logs for Monitoring Wells MW-2, MW-3A, MW-10 and MW-11

| Depth (Feet) | Sample Location | Percent Recovery | USCS Symbol | DESCRIPTION OF SUBSURFACE MATERIALS |
|---|---|---|---|---|
| 0 | | | | Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist |
| | | 76 | | |
| 5 | | | | |
| | | | | grades with organics |
| | | 80 | | |
| | | | | grades with less sand, pebbles, and gravel, stiff, no plasticity |
| 10 | | | | |
| | | | | grades with increasing sand and pebbles, single 3" cobble<br>grades soft, plastic, very moist |
| | | 60 | | |
| 15 | | | | grades brownish yellow to brown, without organics |
| | | 70 | | |
| | | | | grades medium stiff to stiff, very slight plasticity to no plasticity |
| 20 | | | | |
| | | | | grades with increasing fine sand, plastic, soft |
| | | 100 | | |
| 25 | | | | grades gray to dark gray, with increasing silt and sand |
| | | 100 | | |
| 30 | | | | grades wet |
| | | 100 | | |
| | | | | Gray fine to coarse SAND and rounded GRAVEL, very loose, poorly sorted, wet |
| 35 | | | | |
| | | 0 | | |
| 40 | | | | Boring terminated 40' bgs on 12/11/2007.<br>2" I.D. Schedule 40 PVC monitoring well installed 40' bgs with 10' 0.010" slotted screen. |

## WELL CONSTRUCTION DETAIL






LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded

Duke Energy - 14947868 - North Bend, OH

DUKE ENERGY MIAMI FORT STATION MIAMI FORT STATION.GPJ 2/5/08

URS

JOB NO. 14947868

**Duke Energy**
Miami Fort Station
11021 Brower Road
North Bend, OH

**MONITORING WELL MW-2**

**Project: Duke Energy**
**Project Location: Miami Fort Station**
**Project Number: 14948624**

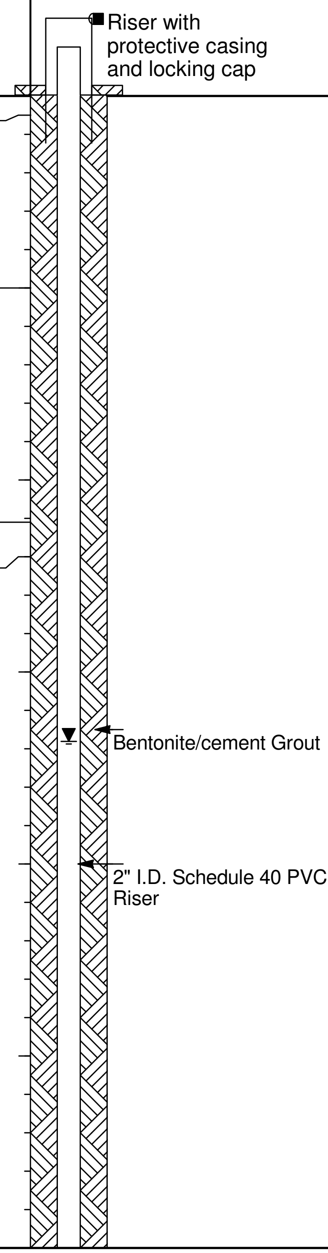
# Monitoring Well MW-3A



| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | **2/25/2009** | Logged By | **K. Pritchard** | Checked By | **M. Wagner** |
| Drilling Method | **4.25 in. Hollow Stem Auger** | Drilling Contractor | **Belasco Drilling Services** | Total Depth of Borehole | **52.0 feet** |
| Drill Rig Type | **Truck-Mounted Auger** | Sampler Type | **Split Spoon** | Surface Elevation | **471.17 feet, msl** |
| Groundwater Elevation(s) | **456.42 ft, msl** | Hammer Weight and Drop | **140 lb, Dropped 30-inches** | Top of PVC Elevation | **473.23 feet, msl** |
| Diameter of Hole (inches) | **8.25** / Diameter of Well (inches) **2** | Type of Well Casing | **Schedule 40 PVC** | Screen Perforation | **0.010-Inch** |
| Type of Sand Pack | **Natural Collapse** | Well Completion at Ground Surface | **Riser, With Locking Cap** | | |
| Comments | **** Split spoon sampler advanced through interval under weight of hammer and rods only** | | | | |

| Elevation, feet | Depth, feet | SAMPLES: Type | Blows per 1-foot Interval | Percent Recovery | Graphic Log | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|---|
| | 0 | X | 12 | 83 | | Yellowish red CLAY TOPSOIL, moist<br>Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist |
| 470 | | X | 19 | 100 | | |
| | | X | 6 | 83 | | grades brownish yellow with increasing clay |
| 465 | 5 | X | 3 | 100 | | Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist |
| | | X | 3 | 83 | | grades with increasing fine to medium sand, without organics, with iron staining<br>grades with medium to coarse grained sand lenses, without staining |
| | 10 | X | 3 | 75 | | grades high plasticity, very moist to wet |
| 460 | | X | 2 | 100 | | Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet<br>Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet |
| | | X | 1 | 100 | | |
| 455 | 15 | X | 1 | 100 | | grades wet with increasing fine sand<br>grades with fine grained sand lenses |
| | | X | 2 | 100 | | grades brown with increasing fine sand |
| 450 | 20 | X | 2 | 100 | | |
| | | X | 2 | 100 | | grades with gray to reddish gray lenses, decreasing sand, without sand lenses<br>grades gray, without gray to reddish gray lenses, medium plasticity |
| | 25 | X | ** | 100 | | grades high plasticity<br>grades with increasing sand |
| 445 | | X | 3 | 100 | | grades with organics, sulphur odor, decreasing sand |
| | | X | 2 | 100 | | grades without sand, without odor<br>grades with fine sand lenses, without organics |
| | 30 | | | | | |

WELL CONSTRUCTION DETAILS






URS

**Project:** Duke Energy
**Project Location:** Miami Fort Station
**Project Number:** 14948624

# Monitoring Well MW-3A



| Elevation, feet | Depth, feet | SAMPLES Type | Blows per 1-foot Interval | Percent Recovery |
|---|---|---|---|---|
| | 30 | | 1 | 100 |
| 440 | | | 4 | 100 |
| | | | 4 | 100 |
| 435 | 35 | | 3 | 100 |
| | | | 6 | 100 |
| 430 | 40 | | 4 | 100 |
| | | | 8 | 100 |
| | | | 14 | 42 |
| 425 | 45 | | 7 | 100 |
| | | | 22 | 63 |
| 420 | 50 | | 13 | 50 |
| 415 | 55 | | | |
| 410 | 60 | | | |
| 405 | 65 | | | |
| | 70 | | | |

## MATERIAL DESCRIPTION

grades without sand, with trace organics

grades with sand, without organics

grades with trace fine sand and increasing silt, without sand lenses, medium plasticity

grades with increasing sand, without organics

grades with increasing silt, trace sand, very low plasticity, stiff

grades with sand, plastic, very soft

grades stiff, very low plasticity, very moist

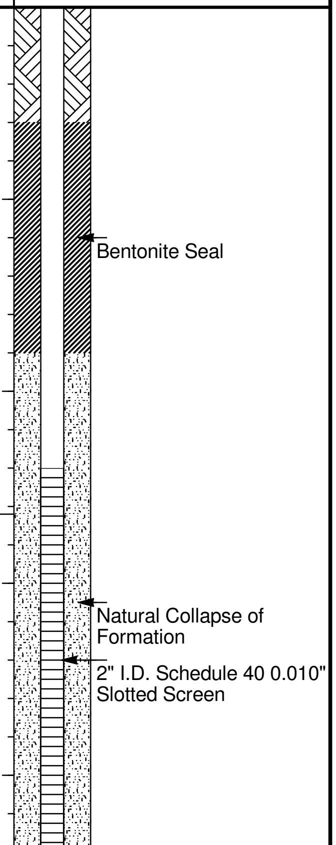
grades with trace organcis, less sand, increasing silt

Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet

grades with increasing diameter gravel

Boring terminated 52' bgs on 2/25/2009.
2" I.D. Schedule 40 PVC monitoring well installed 52' bgs with 10' 0.010" slotted screen.

## WELL CONSTRUCTION DETAILS








URS

**Project:** Dynegy
**Project Location:** Miami Fort Station
**Project Number:** 60442412

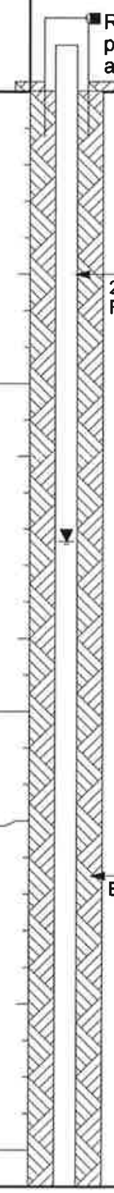
# Monitoring Well MW-10



| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | 4/10/2017 | Logged By | J. Alten | Checked By | M. Wagner |
| Drilling Method | Rotosonic | Drilling Contractor | Frontz Drilling | Total Depth of Borehole | 59.0 feet |
| Drill Rig Type | Rotosonic | Sampler Type | Sonic Sleeve | Surface Elevation | 470.90 feet, msl |
| Depth to Groundwater | 12.34 ft bgs | Seal Material | Hydrated 3/8-inch Bentonite Chips | Top of PVC Elevation | 473.35 feet, msl |
| Diameter of Hole (inches) | 6.0 / Diameter of Well (inches) 2 | Type of Well Casing | Schedule 40 PVC | Screen Perforation | 0.010-Inch |
| Type of Sand Pack | #5 Silica Sand | Well Completion at Ground Surface | Riser, With locking cap and protective casing. | | |
| Comments | | | | | |

| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| | 0 | | 74 | | Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist |
| 470 | | | | | Grades with more clay and gravel, medium stiff |
| 465 | 5 | | | | Grades without gravel and more clay, very stiff, moist |
| | | | | | Brown CLAY, with silt, medium stiff, moist |
| 460 | 10 | | 48 | | |
| 455 | 15 | | | | Brown SILT, with some clay and very fine sand, soft, moist |
| | | | 93 | | Grades with less silt and more fine sand |
| 450 | 20 | | | | Brown fine SAND, with silt and clay, loose, soft, moist |
| 445 | 25 | | | | Grades with less silt and clay |
| | | | | | Grades gray and brown |
| | | | | | Grades with trace silt and without clay, few pieces of organic matter |
| | | | 88 | | Gray and brown fine SAND, with trace silt, loose, moist |
| | 30 | | | | |

## WELL CONSTRUCTION DETAILS



| Project: | Dynegy |
|---|---|
| Project Location: | Miami Fort Station |
| Project Number: | 60442412 |

# Monitoring Well MW-10



| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| | 30 | | | | | |
| 440 | | | | | | |
| | | | | | Grades with some medium sand | |
| | 35 | | | | | |
| 435 | | | | | | |
| | | | | | Grades to medium sand | |
| | | | 58 | | Grades wet | |
| | 40 | | | | | |
| 430 | | | | | | |
| | | | | | Grades with silt, more dense | |
| | | | | | | Bentonite Seal |
| | 45 | | | | Grades with fine and coarse sand | |
| 425 | | | | | Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet | |
| | | | 88 | | | |
| | 50 | | | | | #5 Global Silica Sand Filter Pack |
| 420 | | | | | | |
| | | | | | Brown medium SAND, loose, wet | |
| | 55 | | | | | 2" I.D. Schedule 40 0.010" Slotted Screen |
| 415 | | | | | | |
| | | | | | | End Cap |
| | | | | | End of boring at 59' | |
| | 60 | | | | | |
| 410 | | | | | | |
| | 65 | | | | | |
| 405 | | | | | | |
| | 70 | | | | | |

**Project:** Dynegy
**Project Location:** Miami Fort Station
**Project Number:** 60442412

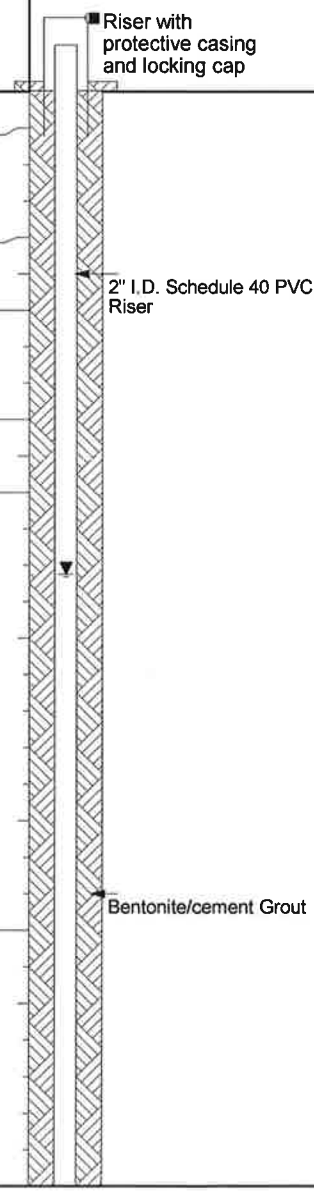
# Monitoring Well MW-11



| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | 4/11/2017 | Logged By | J. Alten | Checked By | M. Wagner |
| Drilling Method | Rotosonic | Drilling Contractor | Frontz Drilling | Total Depth of Borehole | 59.0 feet |
| Drill Rig Type | Rotosonic | Sampler Type | Sonic Sleeve | Surface Elevation | 471.81 feet, msl |
| Depth to Groundwater | 13.25 ft bgs | Seal Material | Hydrated 3/8-inch Bentonite Chips | Top of PVC Elevation | 474.45 feet, msl |
| Diameter of Hole (inches) 6.0 | Diameter of Well (inches) 2 | Type of Well Casing | Schedule 40 PVC | Screen Perforation | 0.010-Inch |
| Type of Sand Pack | #5 Silica Sand | Well Completion at Ground Surface | Riser, With locking cap and protective casing. | | |
| Comments | | | | | |

| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | MATERIAL DESCRIPTION |
|---|---|---|---|---|
| | 0 | | 69 | Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL) |
| 470 | | | | Brown and tan with reddish mottled SILT with trace fine gravel, very stiff, moist |
| | | | | Grades with fine sand |
| | 5 | | | Brown with red mottled fine SAND, soft, moist |
| 465 | | | | Dark gray SILT with some clay, stiff, moist, trace organci matter |
| | | | | Grades with more clay |
| | 10 | | 42 | Gray and brown CLAY, with some silt, soft, moist |
| 460 | | | | Gray and brown SILT, with fine sand and some clay, soft, moist |
| | 15 | | | |
| 455 | | | | Grades with less clay |
| | 20 | | 56 | Grades gray without clay |
| 450 | | | | Gray very fine SAND with silt, soft, moist |
| | 25 | | | |
| 445 | | | | |
| | 30 | | 53 | Grades with dark gray and black wood fragments |

## WELL CONSTRUCTION DETAILS



| Project: Dynegy | Monitoring Well MW-11 |
|---|---|
| Project Location: Miami Fort Station | Sheet 2 of 2 |
| Project Number: 60442412 | |

| Elevation, feet | Depth, feet | SAMPLES: Type | SAMPLES: Percent Recovery | SAMPLES: Graphic Log | MATERIAL DESCRIPTION | WELL CONSTRUCTION DETAILS |
|---|---|---|---|---|---|---|
| | 30 | | | | | |
| 440 | | | | | Grades without wood fragments | |
| | 35 | | | | | |
| 435 | | | | | Grades with less silt | |
| | | | 83 | | | |
| | 40 | | | | | |
| | | | | | Gray fine to coarse SAND with rounded fine gravel, loose, moist | |
| 430 | | | | | | |
| | | | | | Grades to fine sand and without gravel | |
| | 45 | | | | | Bentonite Seal |
| | | | | | Grades brown and gray | |
| 425 | | | | | | |
| | | | | | Grades fine to coarse sand with rounded fine to medium gravel | |
| | | | 80 | | | |
| | 50 | | | | Grades wet | #5 Global Silica Sand Filter Pack |
| 420 | | | | | | |
| | | | | | Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet | |
| | 55 | | | | | 2" I.D. Schedule 40 0.010" Slotted Screen |
| 415 | | | | | | |
| | | | | | Boring terminated at 59' | End Cap |
| | 60 | | | | | |
| 410 | | | | | | |
| | 65 | | | | | |
| 405 | | | | | | |
| | 70 | | | | | |

# Attachment B

# Boron and Sulfate Mann-Kendall Trend Analysis Results for Monitoring Wells MW-2 and MW-10

## Miami Fort
## Mann-Kendall Trend Analysis

### User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-2** | **Parameter Code:** | **01022** |
| **Location Class:** | **Downgradient** | **Parameter:** | **B, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 04/01/2019** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

### Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.000396 | mg/L per day |
| R-Squared error of fit: | 0.127005 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.000415 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.001072 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.000250 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -1.0286 |
| Z test: | 1.6449 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-10** | **Parameter Code:** | **01022** |
| **Location Class:** | **Downgradient** | **Parameter:** | **B, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 04/01/2019** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## Trend Analysis

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.000883 | mg/L per day |
| R-Squared error of fit: | 0.333094 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.000676 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.001348 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.000072 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -1.3029 |
| Z test: | 1.6449 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-2** | **Parameter Code:** | **00945** |
| **Location Class:** | **Downgradient** | **Parameter:** | **SO4, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 04/01/2019** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## <u>Trend Analysis</u>

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | 0.004672 | mg/L per day |
| R-Squared error of fit: | 0.012305 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.001652 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.032458 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | 0.019992 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -0.069 |
| Z test: | 1.645 |
| At the 95.0 % Confidence Level (One-Sided Test): | None |

# Miami Fort
# Mann-Kendall Trend Analysis

## User Supplied Information

| | | | |
|---|---|---|---|
| **Location ID:** | **MW-10** | **Parameter Code:** | **00945** |
| **Location Class:** | **Downgradient** | **Parameter:** | **SO4, tot** |
| **Location Type:** | | **Units:** | **mg/L** |
| **Confidence Level:** | **95.00%** | **Period Length:** | **1 month(s)** |
| **Date Range: 12/07/2015 to 04/01/2019** | | **Limit Name:** | |
| | | **Averaged:** | **No** |

## <u>Trend Analysis</u>

Trend of the least squares straight line

| | | |
|---|---|---|
| Slope (fitted to data): | -0.027382 | mg/L per day |
| R-Squared error of fit: | 0.324993 | |

Sen's Non-parametric estimate of the slope (One-Sided Test)

| | | |
|---|---|---|
| Median Slope: | -0.018829 | mg/L per day |
| Lower Confidence Limit of Slope, M1: | -0.038665 | mg/L per day |
| Upper Confidence Limit of Slope, M2+1: | -0.001796 | mg/L per day |

Non-parametric Mann-Kendall Test for Trend

| | |
|---|---|
| S Statistic: | -2.062 |
| Z test: | 1.645 |
| At the 95.0 % Confidence Level (One-Sided Test): | Downward |