Cynthia Vodopivec
Dynegy Miami Fort, LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

November 30, 2020

Sent via email

Mr. Andrew R. Wheeler, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code 5304-P
Washington, DC 20460

Re: Miami Fort Power Station Revised Alternative Closure Demonstration

Dear Administrator Wheeler:

Dynegy Miami Fort, LLC (Dynegy) submits this revised request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2) for the Miami Fort Pond System located at the Miami Fort Power Station near North Bend, Ohio. Dynegy is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(2) so that the Miami Fort Pond System may continue to receive CCR and non-CCR wastestreams after April 11, 2021, and complete closure no later than October 17, 2028.

The enclosed demonstration prepared by Burns & McDonnell replaces the demonstration that was previously submitted by Dynegy to EPA on September 29, 2020. This demonstration addresses all of the criteria in 40 C.F.R. § 257.103(f)(2)(i)-(iv) and contains the documentation required by 40 C.F.R. § 257.103(f)(2)(v). As allowed by the agency, in lieu of hard copies of these documents, electronic files were submitted to Kirsten Hillyer, Frank Behan, and Richard Huggins via email. The demonstration is also available on Dynegy's publicly available website: https://www.luminant.com/ccr/

Sincerely,

Cynthia Vodopivec
VP - Environmental Health & Safety

Enclosure

cc: Kirsten Hillyer
Frank Behan
Richard Huggins

CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Dynegy Miami Fort, LLC

Miami Fort Power Station
Project No. 122702

Revision 1
11/30/2020

CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

prepared for

Dynegy Miami Fort, LLC
Miami Fort Power Station
North Bend, Ohio

Project No. 122702

Revision 1
11/30/2020

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Dynegy Miami Fort, LLC
CCR Surface Impoundment
Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline
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Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Ohio, that the information in this document as noted in the above Report Index was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Dynegy Miami Fort, LLC or others without specific verification or adaptation by the Engineer.

Matthew D. Bleything, P.E.
Ohio License No. 82440

Date: 11/30/2020

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
AST	Above-ground Storage Tank
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
Dynegy	Dynegy Miami Fort, LLC
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	Environmental Protection Agency
Miami Fort	Miami Fort Power Station
RCRA	Resource Conservation and Recovery Act
SWPPP	Stormwater Pollution Prevention Plan

1.0 EXECUTIVE SUMMARY

Dynegy Miami Fort, LLC (Dynegy) submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2) —"Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain"— for the Miami Fort Pond System located at the Miami Fort Power Station (Miami Fort) in Ohio. The Miami Fort Pond System is a 51-acre CCR surface impoundment used to manage CCR and non-CCR wastestreams at Miami Fort. Units 1-6 have been retired. As discussed below, the remaining Unit 7 and Unit 8 boilers at the station will cease coal-fired operations no later than June 17, 2027, and the impoundment will complete closure no later than October 17, 2028. Therefore, Dynegy is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(2) so that the Miami Fort Pond System may continue to receive CCR and non-CCR wastestreams after April 11, 2021, and complete closure no later than October 17, 2028.

2.0 INTRODUCTION

Miami Fort is a 1,100-megawatt coal-fueled electric generating station near North Bend, Ohio. The Miami Fort facility includes a CCR unit (the Miami Fort Pond System) that is the subject of this demonstration. The Miami Fort Pond System is a 51-acre CCR surface impoundment comprised of two hydraulically connected cells (Basins A and B) which operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared separator dike. Miami Fort uses the Miami Fort Pond System to manage sluiced bottom ash and fly ash, as well as other non-CCR wastewaters. Basin A functions as a primary settling pond for the ash sluice flows and most of the non-CCR flows, which overflow to Basin B for additional residence time and settling prior to permitted discharge. The various non-CCR wastewaters originate from the coal pile runoff pond, FGD runoff pond, cooling tower blowdown, wastewater sumps (including boiler hopper overflows, air heater wash water, boiler blowdown, and miscellaneous plant drains), wastewater treatment effluent tank, boiler wash water, air heater wash water, and other stormwater sources. A site plan is provided on Figure 1 in Appendix A, and the plant water balance diagram is included in Appendix B. Note that Basin A is referred to as SPD-1 Pond-1 (Ash Pond A Cell-1 and Cell-2) on the water balance diagram, and Basin B is referred to as SPD-2 Pond-2 (Ash Pond B).

On April 17, 2015, the Environmental Protection Agency (EPA) issued the federal Coal Combustion Residual (CCR) Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fueled units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1) (85 Fed. Reg. 53,516 (Aug. 28, 2020)). Specifically, owners and operators of a CCR surface impoundment may continue to receive CCR and non-CCR wastestreams if the facility will cease operation of the coal-fired boiler(s) and complete closure of the impoundments within certain specified timeframes. 40 C.F.R. § 257.103(f)(2). To qualify for an alternative closure deadline under § 257.103(f)(2), a facility must meet the following four criteria:

1. **§ 257.103(f)(2)(i)** – No alternative disposal capacity is available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification.
2. **§ 257.103(f)(2)(ii) -** Potential risks to human health and the environment from the continued operation of the CCR surface impoundment have been adequately mitigated;
3. **§ 257.103(f)(2)(iii) -** The facility is in compliance with the CCR rule, including the requirement to conduct any necessary corrective action; and

4. **§ 257.103(f)(2)(iv) -** The coal-fired boilers must cease operation and closure of the impoundment must be completed within the following timeframes:
    a. For a CCR surface impoundment that is 40 acres or smaller, the coal-fired boiler(s) must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2023.
    b. For a CCR surface impoundment that is larger than 40 acres, the coal-fired boiler(s) must cease operation, and the CCR surface impoundment must complete closure no later than October 17, 2028.

Section 257.103(f)(2)(v) sets out the documentation that must be provided to EPA to demonstrate that the four criteria set out above have been met. Therefore, this demonstration is organized based on the documentation requirements of §§ 257.103(f)(2)(v)(A) – (D).

The facility originally identified each basin in the Miami Fort Pond System separately in CCR compliance documents, but it has always operated the basins collectively as a single wastewater treatment system as described above. Thus, consistent with the requirements of the CCR Rule, the compliance documents on Miami Fort's CCR public website have been clarified to reflect the fact that the Miami Fort Pond System is a single, multi-cell system for purposes of the CCR Rule. Accordingly, Dynegy is submitting this demonstration pursuant to § 257.103(f)(2) so the 51-acre Miami Fort Pond System may continue to receive the CCR and non-CCR wastestreams discussed below after April 11, 2021, and complete closure by October 17, 2028.

3.0 DOCUMENTATION OF NO ALTERNATIVE DISPOSAL CAPACITY

To demonstrate that the criteria in § 257.103(f)(2)(i) has been met, the following provides documentation that no alternative disposal capacity is currently available on-site or off-site for each CCR and non-CCR wastestream that Dynegy seeks to continue placing into the Miami Fort Pond System after April 11, 2021. Consistent with the regulations, neither an increase in costs nor the inconvenience of existing capacity was used to support qualification under this criteria. Instead, as EPA explained in the preamble to the proposed Part A revisions, "it would be illogical to require [] facilities [ceasing power generation] to construct new capacity to manage CCR and non-CCR wastestreams." 84 Fed. Reg. 65,941, 65,956 (Dec. 2, 2019). EPA again reiterated in the preamble to the final revisions that "[i]n contrast to the provision under § 257.103(f)(1), the owner or operator does not need to develop alternative capacity because of the impending closure of the coal fired boiler. Since the coal-fired boiler will shortly cease power generation, it would be illogical to require these facilities to construct new capacity to manage CCR and non-CCR wastestreams." 85 Fed. Reg. at 53,547. Thus, new construction or the development of new alternative disposal capacity was not considered a viable option for any wastestream discussed below.

3.1 Site-Layout and Wastewater Processes

The Miami Fort Pond System receives all CCR sluice flows and most of the non-CCR wastewater flows onsite before discharging to the Ohio River via Outfall 002 in accordance with NPDES Permit No. OH0009873. These wastestreams are discussed in more detail in the following sections. The remaining plant process flows (non-contact cooling water and the sanitary treatment flows) are routed to the Ohio River through separate permitted outfalls, as shown on the water balance diagram in Appendix B. The other onsite impoundments (the FGD runoff pond and coal pile runoff pond) are not authorized to receive the CCR sluice flows and are not large enough to independently treat the total volume of the plant process water flows. Miami Fort also owns and operates a CCR landfill at a separate facility, located approximately 3 miles from the station. This landfill is neither authorized nor capable of accepting wet-generated CCR and non-CCR wastestreams.

3.2 CCR Wastestreams

Dynegy evaluated each CCR wastestream placed in the Miami Fort Pond System. For the reasons discussed below in Table 3-1, each of the following CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site.

Table 3-1: Miami Fort CCR Wastestreams

CCR Wastestreams	Estimated Average Flow (GPD)	Alternative Disposal Capacity Available? YES/NO	Details
Fly Ash (and non-CCR Pyrite) Vacuum/Sluice	8,585,000 (sourced from Cooling Tower Blowdown)	NO	Fly ash is typically captured dry, however startup ash material is sluiced to the Miami Fort Pond System for safety and ash marketing reasons (preventing fires in the filter separator and oil contamination in silo). Dynegy must cease using this flow as ash transport water by December 31, 2023 to comply with ELG regulations. No additional vacuum capacity exists and the hydroveyor flow must remain in service to provide the motive force to convey fly ash to the ash pond; however, this water will no longer have direct contact with ash after modifications are made to the startup procedures. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.
Bottom Ash Sluice	672,000 (sourced from Cooling Tower Blowdown)	NO	There is not another potential disposal alternative onsite or offsite for this wet-generated CCR wastestream. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.

Currently, Dynegy utilizes a four-million gallon above-ground storage tank (AST) onsite to store boiler chemical cleaning wastewaters during periodic boiler maintenance. This AST is not a viable alternative for these sluiced CCR wastestreams because it is currently used for periodic boiler maintenance and cannot accommodate the volume of these sluiced CCR wastestreams.

Dynegy evaluated the following on-site and off-site alternative capacity options for these CCR wastestreams:

- Fly ash (and non-CCR pyrite) sluice (8,585,000 GPD and sourced from cooling tower blowdown):
  - On-site alternative capacity is currently not available and would need to be developed. As noted above, Dynegy does not have any alternative to create vacuum and convey fly ash

beyond the hydroveyor flow (which is sourced from Unit 7 and 8 cooling tower blowdown as shown on the water balance diagram in Appendix B). Even if Dynegy were to develop alternate vacuum capacity, Miami Fort would still need to treat and discharge the total volume of cooling tower blowdown. The other onsite impoundments (the FGD runoff pond and coal pile runoff pond) are non-CCR impoundments and are, therefore, not authorized to receive the CCR sluice flows. This on-site alternative capacity would require the reconfiguration of the existing wastestream system, and the design, permitting, and installation of a new treatment system, including CCR ponds, clarifiers, and/or storage tank(s), to provide the necessary retention time to meet the NPDES permit limits. The environmental permitting would include a modification to the current individual NPDES permit (to allow for the rerouting of this wastestream to another outfall), general NPDES stormwater construction permit, threatened and endangered species and historic preservation assessments, a construction & operating permit and a stormwater pollution prevention plan (SWPPP) at a minimum. The development of on-site alternative capacity would require a minimum of three years to implement.

- Fly ash transport water cannot be disposed offsite per 40 C.F.R. § 423.16(f). The sluicing system is currently used during startup events or to provide redundancy to the dry collection system; however, the same hydroveyor is used for the motive force to collect the dry fly ash. The Miami Fort Pond System is the only CCR surface impoundment onsite to receive this wastestream.
- Off-site alternative capacity (for the hydroveyor flow and not the sluice flow per preceding bullet) is currently not available and would need to be developed. Developed off-site alternative capacity would consist of both temporary on-site wet storage (frac tanks) and off-site transportation, via tanker trucks, would be needed. With an average daily flow of 8,585,000 GPD, approximately 410 frac tanks and 1,145 daily tanker trucks would be required, if a publicly owned treatment works (POTW) could be identified to receive it. The daily tanker truck traffic is not feasible and would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a Prevention of Significant Deterioration (PSD) permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions is over the PSD limits. Setting up arrangements for a local POTW to accept the wastewater would prove to be difficult since this amount of wastewater would most likely upset their treatment systems causing them to exceed their NPDES discharge limits. The potential for leaks/spills from the tank system or transportation of the wastewater offsite does exist.

Furthermore, the temporary wet storage needed to accommodate off-site disposal would require reconfiguration of the existing wastestream system, and the design, installation, and associated environmental permitting for the temporary, on-site, wet storage system. The development of off-site alternative capacity would require a minimum of two years to implement.

- Bottom ash sluice (672,000 GPD, sourced from cooling tower blowdown):
  - On-site alternative capacity is currently not available and would need to be developed. The other onsite impoundments (the FGD runoff pond and coal pile runoff pond) are non-CCR impoundments and are, therefore, not authorized to receive the CCR sluice flows. This on-site alternative capacity would require both the reconfiguration of the existing wastestream system and the design, permitting, and installation of dry ash handling systems or a new treatment system including CCR ponds, clarifiers, and/or storage tank(s), to provide the necessary retention time to meet the NPDES permit limits. The environmental permitting would include a modification to the current individual NPDES permit (to allow for the rerouting of this wastestream to another outfall), general NPDES stormwater construction permit, threatened and endangered species and historic preservation assessments, a construction & operating permit and a SWPPP at a minimum. Based on our experience, the development of on-site alternative capacity could require a minimum of three years to implement.
  - Off-site alternative capacity is currently not available and would need to be developed. Developed off-site alternative capacity would consist of both temporary on-site wet storage (frac tanks) and off-site transportation, via tanker trucks, would be needed. With an average daily flow of 672,000 GPD, approximately 32 frac tanks and 90 daily tanker trucks would be required, if a POTW could be identified to receive it. The daily tanker truck traffic would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a PSD permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions is over the PSD limits. Setting up arrangements for a local POTW to accept the wastewater would prove to be difficult since this amount of wastewater would most likely upset their treatment systems causing them to exceed their NPDES discharge limits. The potential for leaks/spills from the tank system or transportation of the wastewater offsite does exist. Furthermore, the temporary wet storage needed to accommodate off-site disposal would require reconfiguration of the existing wastestream system and design, installation, and

associated environmental permitting for the temporary wet storage system, which would require a minimum of two years to implement.

As stated previously, because Dynegy has elected to pursue the option to permanently cease coal-fired operations of the two remaining boilers at the station by no later than June 17, 2027, developing alternative disposal capacity is "illogical," to use EPA's words, and also counterproductive to the work to cease coal-fired operations of the boilers and close the impoundments. As long as Dynegy continues to wet handle the bottom ash and fly ash sluice flows, there are no other onsite CCR impoundments to receive and treat these flows and it is not feasible to dispose of the wet-handled material offsite. As EPA explained in the preamble of the 2015 rule, it is not possible for sites that sluice CCR material to an impoundment to eliminate the impoundment and dispose of the material offsite. *See* 80 Fed. Reg. 21,301, 21,423 (Apr. 17, 2015) ("[W]hile it is possible to transport dry ash off-site to [an] alternate disposal facility that is simply not feasible for wet-generated CCR. Nor can facilities immediately convert to dry handling systems."). As a result, the conditions at Miami Fort satisfy the demonstration requirement in § 257.103(f)(2)(i). Consequently, in order to continue to operate and generate electricity, Miami Fort must continue to use the 51-acre CCR surface impoundment to manage the CCR wastestreams discussed above.

3.3 Non-CCR Wastestreams

Dynegy evaluated each non-CCR wastestream placed in the Miami Fort Pond System. For the reasons discussed below in Table 3-2, each of the following CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site.

Table 3-2: Miami Fort Non-CCR Wastestreams

Non-CCR Wastestreams	Estimated Average Flow (GPD)	Alternative Disposal Capacity Currently Available? YES/NO	Details
Cooling Tower Blowdown (and non-CCR Pyrites Sluice)	9,257,000	NO	Source flow for CCR sluices listed above; however, this flow would remain even if alternate CCR handling methods were implemented. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.

Non-CCR Wastestreams	Estimated Average Flow (GPD)	Alternative Disposal Capacity Currently Available? YES/NO	Details
FGD Wastewater Treatment Effluent	216,000	NO	Would need to isolate from gypsum pile and coal pile runoff, install additional sump and piping, and discharge from effluent tank to outfall. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.
Gypsum Pile Runoff	64,917 (3,190,000 for 10-year, 24-hour storm event)	NO	Would need to develop a pond system or a clarifier system to remove TSS and discharge directly to Outfall 002 structure (bypassing current pond system) or a new permitted outfall. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.
Coal Pile Runoff	60,233 (1,240,000 for 10-year, 24-hour storm event)	NO	
Boiler Sump Discharge	754,000	NO	
Reverse Osmosis Discharge	114,000	NO	

Currently, Dynegy utilizes a four-million-gallon AST onsite to store boiler chemical cleaning wastewaters during periodic boiler maintenance. This AST is not a viable alternative for these sluiced non-CCR wastestreams because this AST must be made available for future boiler chemical cleanings. Furthermore, significant reconfiguration of the sluiced non-CCR wastestreams and supplemental treatment for TSS would be required to utilize this AST, which would require design, permitting, and construction efforts.

Dynegy evaluated the following on-site and off-site alternative capacity options for these non-CCR wastestreams:

- On-site alternative capacity is currently not available and would need to be developed for each of these six non-CCR wastestreams. This on-site alternative capacity would require both the reconfiguration of the existing wastestream system and the design, permitting, and installation of a new treatment system including CCR ponds, clarifiers, and/or storage tank(s), to provide the necessary retention time to meet the NPDES permit limits. The environmental permitting would include a modification to the current individual NPDES permit (to allow for the rerouting of this wastestream to another outfall), general NPDES stormwater construction permit (includes threatened and endangered species and historic preservation assessments), a construction & operating permit and a SWPPP at a minimum. Based on our experience, the development of on-site alternative capacity for each of these non-CCR wastestreams would require a minimum of three years to implement.

- Off-site alternative capacity is currently not available and would need to be developed for each of these six non-CCR wastestreams. Developed off-site alternative capacity would require both temporary on-site wet storage (frac tanks) and off-site transportation via tanker trucks, if a POTW could be identified to receive these wastestreams. The daily tanker truck traffic would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a PSD permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions is over the PSD limits. Setting up arrangements for a local POTW to accept the wastewater would prove to be difficult since this amount of wastewater would most likely upset their treatment systems causing them to exceed their NPDES discharge limits. Dynegy is continuing to have discussions with local POTW's to determine if they have the capacity and the infrastructure to handle these daily volumes of wastewater. This will also include efforts to characterize the wastestreams. Dynegy will update EPA in forthcoming progress reports if offsite disposal capacity becomes available. The potential for leaks/spills from the tank system or transportation of the wastewater offsite does exist. Furthermore, the temporary wet storage needed to accommodate off-site disposal would require reconfiguration of the current wastestream system and the design, installation, and associated environmental permitting for the temporary wet storage system, which would require a minimum of two years to implement. For all of these reasons, Dynegy concludes that offsite disposal is not feasible for these flows at Miami Fort at this time.

Table 3-3: Non-CCR Wastestream Offsite Disposal

Non-CCR Wastestreams	Estimated Flow (GPD)	No of Frac Tanks required (21,000 gallons each)	No of Trucks required per day (7,500 gallons each)
Cooling Tower Blowdown (and non-CCR Pyrites Sluice)	9,257,000	441	1,235
FGD Wastewater Treatment Effluent	216,000	11	29

Non-CCR Wastestreams	Estimated Flow (GPD)	No of Frac Tanks required (21,000 gallons each)	No of Trucks required per day (7,500 gallons each)
Gypsum Pile Runoff	64,917 - 3,190,000	NA	9 - 426
Coal Pile Runoff	60,233 - 1,240,000	NA	9 - 166
Boiler Sump Discharge	754,000	36	101
Reverse Osmosis Discharge	114,000	6	16
Total		**494**	**1,399 - 1,973**

As stated previously, because Dynegy has elected to pursue the option to permanently cease coal-fired operations of the boilers by no later than June 17, 2027, developing alternative disposal capacity is "illogical," to use EPA's words, and also counterproductive to the work to cease coal-fired operation of the boilers and close the impoundments. There is no currently available infrastructure at the plant to support reroute of these flows. For the reasons discussed above, each of the following non-CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site. Consequently, to continue to operate and generate electricity, Miami Fort must continue to use the 51-acre CCR surface impoundment to manage the non-CCR wastestreams discussed above.

4.0 RISK MITIGATION PLAN

To demonstrate that the criteria in § 257.103(f)(2)(ii) has been met, Dynegy has prepared and attached a Risk Mitigation Plan for the Miami Fort Pond System (see Attachment 1). Per § 257.103(f)(2)(v)(B), this Risk Mitigation Plan is only required for the specific CCR Unit(s) that are the subject of this demonstration.

5.0 DOCUMENTATION AND CERTIFICATION OF COMPLIANCE

In the Part A rule preamble, EPA reiterates that compliance with the CCR rule is a prerequisite to qualifying for an alternative closure extension, as it “provides some guarantee that the risks at the facility are properly managed and adequately mitigated.” 85 Fed. Reg. at 53,543. EPA further stated that it “must be able to affirmatively conclude that facility meets this criterion prior to any continued operation.” 85 Fed. Reg. at 53,543. Accordingly, EPA “will review a facility’s current compliance with the requirements governing groundwater monitoring systems.” 85 Fed. Reg. at 53,543. In addition, EPA will also “require and examine a facility’s corrective action documentation, structural stability documents and other pertinent compliance information.” 85 Fed. Reg. at 53,543. Therefore, EPA is requiring a certification of compliance and specific compliance documentation be submitted as part of the demonstration. 40 C.F.R. § 257.103(f)(2)(v)(C).

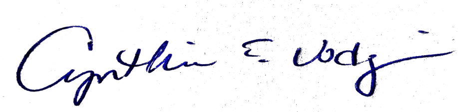
The Miami Fort facility has one CCR unit, known as the Miami Fort Pond System. The Miami Fort Power Station CCR Landfill referenced on the Miami Fort CCR compliance website is located approximately 3 miles from the Miami Fort site, with several residential landowners located between the plant and the landfill site. As this CCR unit is not located on contiguous land, this unit is part of a separate facility. 40 C.F.R. § 257.53. Consequently, Dynegy has not included compliance documents for this unit as part of this submittal for the Miami Fort facility.

To demonstrate that the criteria in § 257.103(f)(2)(iii) has been met, Dynegy is submitting the following information as required by § 257.103(f)(2)(v)(C):

5.1 Owner’s Certification of Compliance - § 257.103(f)(2)(v)(C)(1)

I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for Miami Fort, the facility is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. The Miami Fort CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

On behalf of Dynegy:



Cynthia Vodopivec
VP - Environmental Health & Safety
November 30, 2020

5.2 Visual representation of hydrogeologic information - § 257.103(f)(2)(v)(C)(2)

Consistent with the requirements of § 257.103(f)(2)(v)(C)(2)(i) – (iii), Dynegy has attached the following items to this demonstration:

- Map(s) of groundwater monitoring well locations in relation to the CCR unit (Attachment 2)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (Attachment 3)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (Attachment 4)

5.3 Groundwater monitoring results - § 257.103(f)(2)(v)(C)(3)

The Miami Fort Pond System groundwater monitoring system is comprised of seventeen wells: one background well (MW-7) and sixteen compliance wells (MW-1, MW-2, MW-3A, MW-4, MW-5, MW-6, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, and 4A). In August 2020, three additional wells (MW-17, MW-18, and MW-19) were installed to evaluate the groundwater flow direction northeast of the Pond System. Two of the three additional monitoring wells (MW-17 and MW-19) were installed into the Uppermost Aquifer to further evaluate background groundwater quality. Tables summarizing constituent concentrations at each groundwater monitoring well from through the first 2020 semi-annual monitoring period are included as Attachment 5.

5.4 Description of site hydrogeology including stratigraphic cross-sections - § 257.103(f)(2)(v)(C)(4)

A description of site hydrogeology and stratigraphic cross-sections of the site are included as Attachment 6.

5.5 Corrective measures assessment - § 257.103(f)(2)(v)(C)(5)

The Miami Fort Pond System initiated an assessment monitoring program on April 9, 2018. Assessment monitoring results identified statistically significant levels (SSLs) of Appendix IV parameters. The most recent Alternate Source Demonstration (ASD) was completed in accordance with 40 C.F.R. § 257.95(g)(3)(ii) on November 12, 2020 for the 2020 first semi-annual assessment monitoring sampling event at the Pond System. The sampling event indicated potential SSLs for arsenic, cobalt, and molybdenum. Successful ASDs were completed for arsenic and molybdenum. The following lines of evidence were used to demonstrate that another source was responsible for the arsenic and molybdenum SSLs:

- Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
- Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
- Naturally occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally occurring arsenic from the soils into groundwater.

The complete ASD, along with ASDs performed in April 2019, October 2019, and April 2019, are available in Attachment 1.

Accordingly, pursuant to § 257.96, a corrective measures assessment was prepared on September 5, 2019, and updated on November 12, 2020. The corrective action discussed in the initial report was specific to Basin A but will be implemented for the entire Miami Fort Pond System as discussed in the updated report. The updated report is included as Attachment 7.

5.6 Remedy selection progress report - § 257.103(f)(2)(v)(C)(6)

Pursuant to § 257.97(a), semi-annual remedy selection progress reports were prepared on March 5, 2020, and September 5, 2020, and are included as Attachment 8. Dynegy installed additional wells in August 2020 to bolster the conceptual site and flow modeling efforts and assist in evaluation of the feasibility of monitored natural attenuation. Two rounds of groundwater samples are planned to be collected by the end of 2020.

5.7 Structural stability assessment - § 257.103(f)(2)(v)(C)(7)

Pursuant to § 257.73(d), the initial structural stability assessments for Basin A and Basin B were prepared in October 2016 and are included as Attachment 9.

5.8 Safety factor assessment - § 257.103(f)(2)(v)(C)(8)

Pursuant to § 257.73(e), the initial safety factor assessments for Basin A and Basin B were prepared in October 2016 and are included as Attachment 10.

6.0 DOCUMENTATION OF CLOSURE COMPLETION TIMEFRAME

To demonstrate that the criteria in § 257.103(f)(2)(iv) has been met, "the owner or operator must submit the closure plan required by § 257.102(b) and a narrative that specifies and justifies the date by which they intend to cease receipt of waste into the unit in order to meet the closure deadlines." The closure plans, along with an addendum to the plans, are included as Attachment 11.

In order for a CCR surface impoundment over 40 acres to continue to receive CCR and non-CCR wastestreams after the initial April 11, 2021 deadline, the coal-fired boiler(s) at the facility must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2028. As discussed below, the remaining Unit 7 and Unit 8 boilers will cease coal-fired operations no later than June 17, 2027, and the Miami Fort Pond System will cease receipt of waste by August 17, 2027, in order for closure to be completed by this deadline.

Table 6-1 is included below to summarize the major tasks and durations associated with closing the Miami Fort Pond System in place. These durations are consistent with the durations experienced with the closure of approximately 500 acres of other CCR impoundments already completed by Dynegy and its affiliates to date as noted below:

- Baldwin Fly Ash Pond System – 230 acres closed in-place with an approximate 30-month construction schedule
- Hennepin West Ash Ponds System – 35 acres closed in-place with an approximate 24-month construction schedule (includes closure by removal of an adjacent 6-acre settling pond and installing a sheet pile wall)
- Hennepin East Ash Ponds 2 and 4 – 25 acres closed in-place with an approximate 6-month construction schedule
- Coffeen Ash Pond 2 – 60 acres closed in-place with an approximate 24-month construction schedule
- Duck Creek Ash Ponds 1 and 2 – 130 acres closed in-place with an approximate 24-month construction schedule

Each CCR impoundment closure indicated above utilized a closely coordinated passive or gravity pond dewatering method. This method consists of the use of trenches excavated to lower the phreatic surface in portions of the impoundment to obtain a stable ash surface to permit the safe construction of the final cover system. The phreatic water in the trenches flows by gravity to sumps constructed within the impoundment. The major benefit associated with this passive or gravity dewatering method is that the sumps are designed to provide holding time to allow the TSS to settle within the impoundment prior to discharge (an active dewatering method with wells would result higher contaminants and TSS). After TSS settling, the water is discharged through the NPDES outfall in compliance with permitted limits.

Construction progressed sequentially as the dewatering of an area stabilized the ash surface. The CCR was graded to subgrade level, then overlain with the compacted clay layers and/or geomembrane liners. Vegetative soil cover was then placed on top of the compacted clay. As each section of the impoundment was closed this sequencing progressed to the completion of the pond closure. A similar process will be utilized to close the Miami Fort Pond System in order to allow the impoundment to remain in operation until the pond ceases the receipt of waste on August 17, 2027. This would provide sufficient time for closure to be completed by October 17, 2028. In order to dewater the impoundment, Dynegy will likely release pond water through the existing Outfall 002.

Table 6-1: Miami Fort Pond System Closure Schedule

Action	Estimated Timeline (Months)
Spec, bid, and Award Engineering Services for CCR Impoundment Closure	3
Finalize CCR unit closure plan	12
Obtain environmental permits: • State Waste Pollution Control Construction/Operating Permit • NPDES Industrial Wastewater Permit Modification (*modification would be required to allow the associated ponded and subsurface free liquids generated before the pond closure to be discharged to Waters of the US and to allow reconfiguration of the various wastestreams to either other NPDES-permitted outfalls or newly-constructed NPDES-permitted outfalls*) • General NPDES Permit for Storm Water Discharges from Construction Site Activities and Storm Water Pollution Prevention Plan (SWPPP)	21
Spec, bid, and Award Construction Services for CCR Impoundment Closure	3
Date by Which Closure Construction Must be Initiated / Cease Coal-Fired Operations of Remaining Boiler Onsite (No later than)	June 17, 2027

Begin Dewatering Impoundment	2
Cease Placement of Waste (No Later Than, allowing for plant cleanup and dredging of impoundments following coal pile and plant closure)	August 17, 2027
Continue Dewatering Impoundment	1
Regrade CCR Material	10
Install Cover System*	8
Establish Vegetation, Perform Site Restoration Activities, Complete Closure, and Initiate Post-Closure Care	2
Total Estimated Time to Complete Closure	55 months
Date by Which Closure Must be Complete	October 17, 2028

* Activity expected to overlap with grading operations, finishing 1 month after grading is completed

7.0 CONCLUSION

Based upon the information included in and attached to this demonstration, Dynegy has demonstrated that the requirements of 40 C.F.R. § 257.103(f)(2) are satisfied for the 51-acre Miami Fort Pond System. This CCR surface impoundment is needed to continue to manage the CCR and non-CCR wastestreams identified in Section 3.2 and 3.3 above, is larger than 40 acres, the remaining Unit 7 and Unit 8 boilers at the station will cease coal-fired operations no later than June 17, 2027, and the Miami Fort Pond System will be closed by the October 17, 2028 deadline. Therefore, this CCR unit qualifies for the site-specific alternative deadline for the initiation of closure authorized by 40 C.F.R. § 257.103(f)(2).

Therefore, it is requested that EPA approve Dynegy's demonstration and authorize the Miami Fort Pond System to continue to receive CCR and non-CCR wastestreams notwithstanding the deadline in § 257.101(a)(1) and to grant the alternative deadline of October 17, 2028, by which to complete closure of the impoundment.

APPENDIX A – SITE PLAN

BURNS McDONNELL

date 04/13/2020

designed A. MYERS

LUMINANT

MIAMI FORT POWER STATION

SITE PLAN

project 122702

contract -

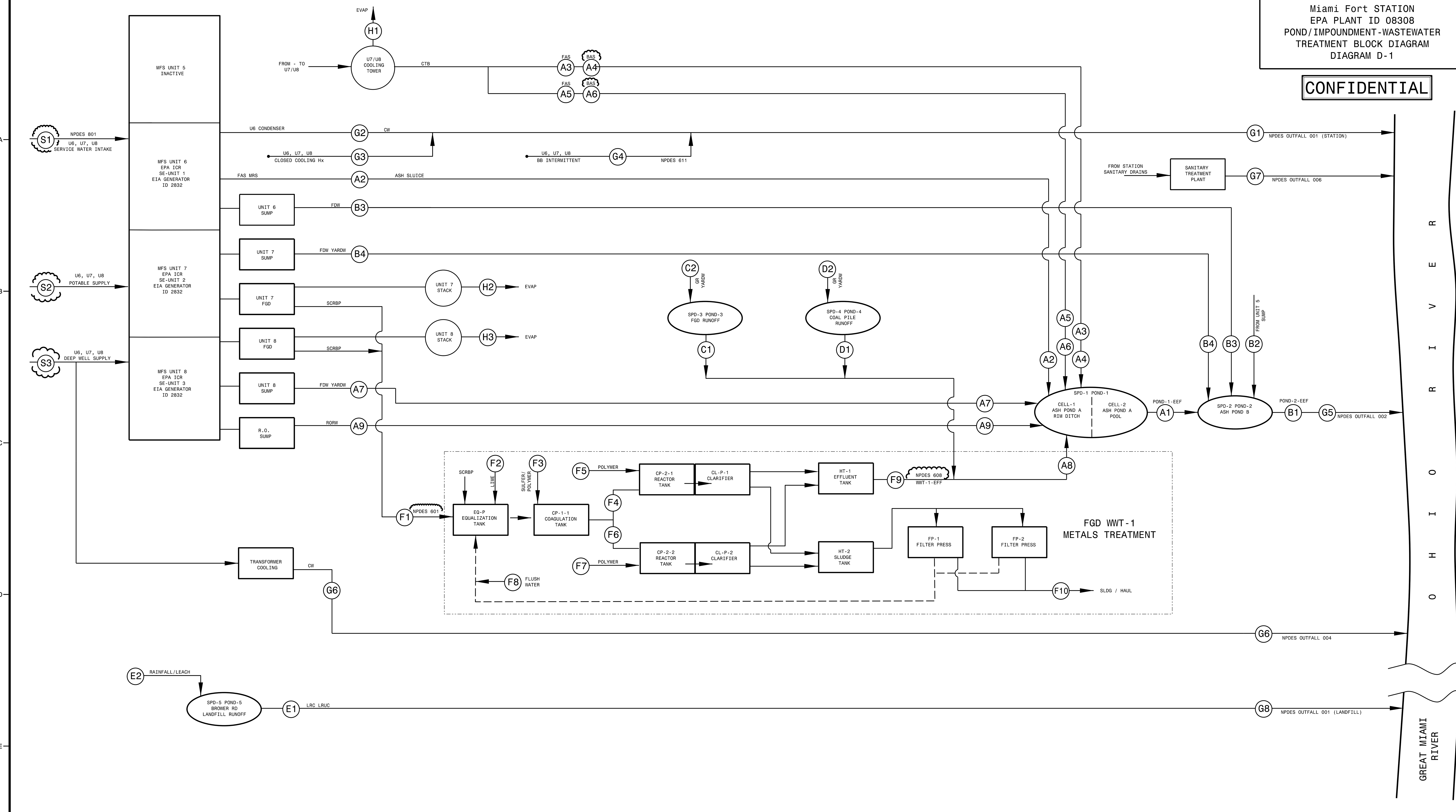
dwg **FIGURE 1**

APPENDIX B – WATER BALANCE DIAGRAM

M-2571 REV. 1

Miami Fort STATION
EPA PLANT ID 08308
POND/IMPOUNDMENT-WASTEWATER
TREATMENT BLOCK DIAGRAM
DIAGRAM D-1

CONFIDENTIAL



FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
S1	NPDES801	SERVICE WATER INTAKE (OHIO RIVER)	179,000,000 GPD
S2	POTABLE WATER	MUNICIPAL SUPPLY FROM BROWER RD.	216,000 GPD
S3	WELL	STATION WELL WATER	864,000 GPD
	SPD-1/POND-1	ASH POND A	
A1	POND-1-EFF	ASH POND A - DISCHARGE	11,793,000 GPD
A2	FAS/MRS	UNIT 6 FLY ASH SLUICE AND PYRITE SLUICE	2,015,000 GPD
A3	FAS/MRS/CTB	UNIT 7 FLY ASH AND PYRITE SLUICE	4,401,000 GPD
A4	BAS/CTB	UNIT 7 BOTTOM ASH SLUICE	305,000 GPD
A5	FAS/MRS/CTB	UNIT 8 FLY ASH AND PYRITE SLUICE	4,184,000 GPD
A6	BAS/CTB	UNIT 8 BOTTOM ASH SLUICE	367,000 GPD
A7	FDW/YARDW	UNIT 8 SUMP	193,000 GPD
A8	WWT-1-EFF/GPR/CPR	WASTE WATER EFFLUINT/FGDPOND/COAL PILE RUNOFF	214,000 GPD
A9	RORW	RO SUMP (REVERSE OSMOSIS DISCHARGE)	114,000 GPD
	SPD-2/POND-2	ASH POND B	
B1	POND-2-EFF/NPDES 002	DISCHARGE TO OHIO RIVER	12,354,000 GPD
B2	FDW	UNIT 5 IS INACTIVE-SUMP IS FOR MISCELLANEOUS DRAINS ONLY	0 GPD
B3	FDW	UNIT 6 SUMP	368,000 GPD
B4	FDW/YARDW	UNIT 7 SUMP	193,000 GPD
	SPD-3/POND-3	FGD RUNOFF POND	
C1	POND-3-EFF	FGD STORM WATER COLLECTION-COMMON LINE TO ASH POND A	64,917 GPD/ 126 DPY
C2	GR/YARDW	RAINFALL-FGD AREA EAST OF COAL TOWER	64,917 GPD/ 126 DPY

FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
	SPD-4/POND-4	COAL PILE RUNOFF DITCH	
D1	POND-4-EFF	COAL PILE SUMP DISCHARGE-COMMON LINE TO ASH POND A	60,233 GPD/ 126 DPY
D2	CPR/YARDW	COAL PILE RUNOFF	60,233 GPD/ 126 DPY
	SPD-5/POND-5	LANDFILL SEDIMENTATION POND	
E1	POND-5-EFF	LANDFILL POND DISCHARGE TO MIAMI RIVER	88,336 GPD/ 126 DPY
E2	LRC/LRUC	LANDFILL RUNOFF	88,336 GPD/ 126 DPY
		WASTEWATER TREATMENT SYSTEMS	
F1	WWT-1/SCRBP	INFLUENT-FROM U7 & U8 FGD HYDROCLONES	216,000 GPD
F2		LIME-EQUALIZATION TANK	9.1 TPD
F3		SULFIDE & POLYMER CHEMICAL FEED TO COAGULATION TANK	5.04 TPD
F4		U7 DENSADEG FEED	122,400 GPD
F5		POLYMER-FEED TO U7 DENSADEG CLARIFIER	3.67 GPD
F6		U8 DENSADEG FEED	122,400 GPD
F7		POLYMER-FEED TO U8 DENSADEG CLARIFIER	3.67 GPD
F8		SERVICE WATER-LINE FLUSHING/POLYMER ETC.	27,360 GPD
F9	WWT-1-EFF/SCRBP	WWT-1-EFF EFFLUENT-COMMON LINE TO ASH POND A	216,000 GPD
F10	SLDG/HAUL	SLUDGE-FILTER PRESS CAKE TO OFFSITE LANDFILL	75 WTPD (50% SOLIDS)

FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
		OUTFALLS	
G1	NPDES 001 (STATION)	DISCHARGE TUNNEL FLOWS SHOWN BELOW	140,688,000
G2		U6 CONDENSER COOLING WATER (129,600,000 GPD)	
G3		CLOSED COOLING WATER HEAT EXCHANGERS (10,800,000 GPD)	
G4	NPDES 611/BB	BOILER BLOWDOWN INTERMITTENT (504,000 GPD)	
	NPDES 612	BOILER TUBE CHEMICAL CLEANING (CONTRACT WASTE DISPOSAL)	NO DISCHARGE
G5/B1	NPDES 002	ASH TRANSPORT, FGD WWTP, COAL PILE RUNOFF	12,354,000 GPD
G6	NPDES 004/CW	TRANSFORMER COOLING WATER (OHIO RIVER)	590,000 GPD
G7	NPDES 006	TREATED SANITARY WATER (OHIO RIVER)	70,000 GPD
G8	NPDES 001 (LANDFILL)/LRC/LRUC	BROWER RD. LANDFILL RUNOFF POND (GREAT MIAMI RIVER)	
		EVAPORATION	
H1	EVAP	COOLING TOWER EVAPORATION	13,500,000 GPD
H2	EVAP	U7 BOILER AND FGD STACK EVAPORATION	1,900,000 GPD
H3	EVAP	U8 BOILER AND FGD STACK EVAPORATION	1,900,000 GPD

EPA AND STATION ABBREVIATIONS
AHCW - AIR HEATER CLEANING WATER
BAS - BOTTOM ASH SLUICE
BB - BOILER BLOWDOWN
CPR - COAL PILE RUNOFF
CTB - COOLING TOWER BLOWDOWN
EFF - EFFLUENT
EVAP - EVAPORATION
FAS - FLY ASH SLUICE
FDW - FLOOR DRAIN WASTEWATER
GPR - GYPSUM PILE RUNOFF
GR - GENERAL RUNOFF
HAUL - HAULED OFF SITE FOR DISPOSAL
LEACH - LEACHATE
LRC - LANDFILL RUNOFF-CAPPED LANDFILL
LRUC - LANDFILL RUNOFF-UNCAPPED LANDFILL
MGD - MILLION GALLONS PER DAY
MRS - MILL REJECT SLUICE
RECYC - RECYCLE FLOW
RORW - REVERSE OSMOSIS REJECT WATER
SCRBP - FGD SCRUBBER PURGE
SLDG - SLUDGE
SW - DISCHARGE TO SURFACE WATER
YARDW - YARD DRAIN WASTEWATER

REFERENCES

NPDES FORM 2C DECEMBER 2007
POND/IMPOUNDMENT WASTE WATER TREATMENT BLOCK DIAGRAM

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD
1	6/21/2011	MFS11CF004	RECORD	RAZ	RAZ		JGP	JGP

DESC: Water Balance Modifications

TITLE
WATER BALANCE AND
POND/IMPOUNDMENT WASTEWATER
TREATMENT BLOCK DIAGRAM

FOR
MIAMI FORT STATION - UNITS 6-8

Duke Energy®

SCALE: NONE	DES: JGN
DWG TYPE: ML	DFTR: JGN
JOB NO: MFS10CF001	CHKD: TLJ
DATE: 8-12-10	ENGR: JGP
FILENAME: MFS_00_S&L_M-2571.DGN	APPD: JGP

DWG SIZE	DRAWING NO.	REVISION
ARCH E1 30.0"x42.0"	M-2571	1

M-2571 REV. 1

ATTACHMENT 1 – RISK MITIGATION PLAN

RISK MITIGATION PLAN - 40 C.F.R. § 257.103(f)(2)(v)(B)

INTRODUCTION

To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(2)(ii) has been met, Dynegy Miami Fort, L.L.C. has prepared this Risk Mitigation Plan for the Miami Fort Pond System.

- EPA is requiring a risk mitigation plan to "address the potential risk of continued operation of the CCR surface impoundment while the facility moves towards closure of their coal-fired boiler(s), to be consistent with the court's holding in *USWAG* that RCRA requires EPA to set minimum criteria for sanitary landfills that prevent harm to either human health or the environment." 85 Fed. Reg. 53,516, 53,548 (Aug. 28, 2020).

As required by § 257.103(f)(2)(v)(B), the Risk Mitigation Plan must describe the "measures that will be taken to expedite any required corrective action," and contain the three following elements:

- First, "a discussion of any physical or chemical measures a facility can take to limit any future releases to groundwater during operation." 257.103(f)(2)(v)(B)(1). In promulgating this requirement, EPA explained that this "might include stabilization of waste prior to disposition in the impoundment or adjusting the pH of the impoundment waters to minimize solubility of contaminants [and that] [t]his discussion should take into account the potential impacts of these measures on Appendix IV constituents." 85 Fed. Reg. at 53,548.

- Second, "a discussion of the surface impoundment's groundwater monitoring data and any found exceedances; the delineation of the plume (if necessary based on the groundwater monitoring data); identification of any nearby receptors that might be exposed to current or future groundwater contamination; and how such exposures could be promptly mitigated." § 257.103(f)(2)(v)(B)(2).

- Third, "a plan to expedite and maintain the containment of any contaminant plume that is either present or identified during continued operation of the unit." § 257.103(f)(2)(v)(B)(3). In promulgating this final requirement, EPA explained that "the purpose of this plan is to demonstrate that a plume can be fully contained and to define how this could be accomplished in the most accelerated timeframe feasible to prevent further spread and eliminate any potential for exposures." 85 Fed. Reg. at 53,549. In addition, EPA stated that "this plan will be based on relevant site data, which may include groundwater chemistry, the variability of local hydrogeology, groundwater elevation and flow rates, and the presence of any surface water features that would influence rate and direction of contamination movement. For example, based on the rate and direction of groundwater flow and potential for diffusion of the plume, this plan could identify the design and spacing of extraction wells necessary to prevent further downgradient migration of contaminated groundwater." 85 Fed. Reg. at 53,549.

Consistent with these requirements and guidance, Dynegy Miami Fort, L.L.C. plans to continue to mitigate the risks to human health and the environment from the Miami Fort Pond System as detailed in this Risk Mitigation Plan.

1 OPERATIONAL MEASURES TO LIMIT FUTURE RELEASES TO GROUNDWATER – 40 C.F.R. § 257.101(F)(2)(V)(B)(1)

The Miami Fort Pond System is a 51-acre CCR surface impoundment comprised of two cells (Basins A and B) which operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared non-structural separator dike. Consistent with the requirements of the CCR rule, compliance documents on Miami Fort's CCR public website reflect the characterization of the Miami Fort Pond System as a single multi-unit system for purposes of groundwater monitoring and closure activities.

The Miami Fort CCR surface impoundment receives all CCR transport waters and most of the non-CCR wastewater flows onsite before discharging to the Ohio River via Outfall 002 in accordance with NPDES Permit No. OH0009873.

Fly ash is typically captured dry. Therefore, current operations already limit the addition of fly ash transport waters to the CCR Surface Impoundment.

Bottom ash is transported through the sluice lines into the CCR surface impoundment where it is dewatered and transported offsite for beneficial reuse.

Miami Fort's current physical and chemical treatment operation adequately limit current and future releases to groundwater during operation. Miami Fort will continue this treatment process for the CCR surface impoundment until such time as closure is required per 40 C.F.R. Part 257. The facility's current physical and chemical treatment process is discussed below, followed by a discussion of other treatment processes that could be implemented, as required per § 257.103(f)(2)(v)(B)(1).

1.1 Current Physical and Chemical Treatment Processes

The Flue Gas Desulfurization waste streams are currently treated in the physical and chemical wastewater treatment system (PC-WWT), where pH is adjusted with hydrated lime (see discussion below on lime softening) and coagulant and flocculant chemicals are added to further bind and settle contaminants out of the wastewater prior to entering the CCR impoundment.

The CCR surface impoundment is also a wastewater treatment settling system which allows the solids generated from the PC-WWT to settle further. As part of normal operations, ash is removed from the impoundment regularly and transported offsite for beneficial reuse.

The ash transport waters are treated prior to entering the CCR surface impoundment with both aluminum sulfate and a polymer (Nalclear 7763). The aluminum sulfate binds with target constituents, coagulating them into larger particles to promote settling. The polymer further promotes settling by attracting the enlarged suspended particles to each other, forming larger groups which eventually develop sufficient density to settle, leaving behind a clear liquid. This coagulation/flocculation process reduces the leaching of CCR constituents to groundwater.

Therefore, the current and future operation encompassing the PC-WWT, the physical removal of solids from the impoundment, and the chemical treatment of the ash transport waters limits current and future releases to groundwater during operation.

No potential safety impacts or exposure to human health or environmental receptors are expected to result from continued operation of the PC-WWT and the impoundment based on current physical and chemical treatment.

Miami Fort's current physical and chemical treatment operation adequately limits current and future release to groundwater during operation. Miami Fort will continue this treatment process for the CCR surface impoundment until such time as closure is required per 40 C.F.R. Part 257.

2 Groundwater Impacts, Receptors, and Potential Exposure Mitigation - 40 C.F.R. § 257.101(f)(2)(v)(B)(2)

The Miami Fort Pond System is currently in assessment monitoring, with the first statistically significant levels (SSLs) with groundwater protection standard (GWPS) exceedances reported in January 2019. The groundwater monitoring system was recertified for the Pond System was updated in May 2020 (Ramboll, 2020a) and included as Attachment 1 of this risk mitigation plan. As seen on Table 1, SSL exceedances above the GWPS have been reported for arsenic at two monitoring wells (MW-2 and MW-10), cobalt at MW-4, and molybdenum at MW-6 (see Figure 1 for well locations). Arsenic was also identified as an SSL exceedance at a third well (MW-13) for the first time during the most recent sampling event. Successful Alternate Source Demonstrations (ASDs) have been completed for arsenic following each SSL determination. A Corrective Measures Assessment (CMA) was completed for cobalt and molybdenum in September 2019, a public meeting presenting the results of the CMA held in December 2019, and semiannual remedy selection progress reports were completed in March 2020 and September 2020 (Ramboll, 2020b). The hydrogeologic monitoring plan for the Pond System was updated in May 2020 (Ramboll, 2020c). Revision 1 (Ramboll, 2020d) and 2 (Ramboll, 2020e) of the CMA, which are included as an attachment to the alternative closure demonstration, were completed in November 2020 and reference a successful ASDs for arsenic and molybdenum. As such, cobalt is the only Appendix IV parameter with an GWPS exceedance discussed in this revision of the risk mitigation plan. Successful ASDs for the Miami Fort Pond System have been included as Attachment 2 of this risk mitigation plan.

The current delineation of cobalt, identification of nearby receptors that might be exposed to groundwater impacts, progress on the feasibility stage evaluation of potential corrective measures, and potential exposure mitigation are each discussed in greater detail below.

<u>Cobalt Delineation</u>

For the assessment monitoring period from September 2018 through September 2020 (the latest sampling event completed), the only Appendix IV constituent with reported SSLs above the GWPS is cobalt. Groundwater quality data and statistical comparison values (values compared to the GWPS to determine SSLs) from the assessment monitoring period are presented on Table 2 with GWPSs highlighted for cobalt. Well locations with any observed GWPS have been illustrated on Figure 2 along with maximum comparison values from Table 2. This figure illustrates the maximum extent of cobalt GWPSs observed during the assessment monitoring period. There are four wells with observed cobalt GWPS exceedances (0.006 mg/L); however, MW-4 is the only well with SSLs on a consistent basis. The other wells with cobalt SSLs were recently added delineation wells that have fewer sample results. Two of those wells, MW-15 and MW-16, have not had an exceedance of the GWPS for cobalt in the latest two sampling events (September 2019 and April 2020).

Cobalt exceedances observed at well MW-4 are bounded laterally and vertically by monitoring wells with parameter concentrations below their respective GWPSs and oftentimes below the reporting limit for the parameter. Cobalt observed at MW-4 is bounded to the south by the Ohio River, as there is not enough space to safely install a separate monitoring well between MW-4 and the river.

Receptors

For constituents of potential concern (COPCs) found in groundwater to pose a risk to human health or the environment, a complete exposure pathway must be present to a receptor with elevated concentrations of COPCs via that pathway.

Cobalt exceedances in groundwater are limited in areal and vertical extent. For cobalt, or any other Appendix IV constituents that might have exceedances of GWPS's in the future, the two primary risks to human health and environmental receptors are via groundwater exposure and surface water exposure. Based on available information, neither the ingestion of groundwater and surface water, or dermal contact groundwater pathways are complete. Groundwater and surface water potentially impacted by CCR constituents from the Miami Fort Pond System that is used for residential purposes, including for drinking water, is likely an incomplete exposure pathway for the reasons discussed below. Impacted groundwater potentially migrating to nearby surface water bodies – specifically the Great Miami River and the Ohio River – could be an exposure pathway, but does not pose a risk concern for the reasons discussed below.

Groundwater near the Miami Fort Pond System is within the radius of influence of four industrial pumping wells located to the southeast of the pond (operated by Miami Fort Station) and three industrial wells located to the northwest of the pond (operated by Veolia North America) – see Figure 1. All groundwater pumped by the production wells is non-contact water and non-potable for industrial use only. All groundwater not captured by the industrial water wells flows towards the Great Miami River to the west or the Ohio River to the south. A review of the ODNR's interactive Water Well Map was performed to identify water supply wells located within 2,500 feet of the Pond System. The nearest residence is greater than 2,500 feet northeast and upgradient of Basin A. No public water supply (PWS) wells were identified between the Great Miami River and the Ohio River within a ten-mile radius of the MFS.

Elevated cobalt concentrations as observed in groundwater at monitoring well MW-4 are not expected to be within the radius of pumping influence of any industrial wells. Although MW-4 is located adjacent to the Ohio River, current conditions indicate that cobalt concentrations in excess of the GWPS in groundwater do not pose a risk concern to the Ohio River. Mixing calculations showing the effect of cobalt loading on the Ohio River at low flow (i.e. baseflow at the 90th percentile of daily mean low flow) show a slight cobalt concentration increase near-shore in the Ohio River of 0.00076 micrograms per Liter (µg/L), which is 100 times lower than the typical cobalt laboratory detection limit of 0.075 µg/L (Attachment 3) indicating that increases due to impacted groundwater discharge would not be detectable and the effects of cobalt loading to the Ohio River are negligible. An Ohio River Valley Water Sanitation Commission report from October 1998 indicates the nearest water supply intakes are located at river mile 463.2 upstream of the Pond System in the Cincinnati, Ohio metro area; and, at river mile 594.2 downstream of the Pond System in the Louisville, KY metro area. The Pond System is located near river mile 490, meaning the nearest downstream intake is over 100 river miles away. Thus, the intakes could not plausibly be affected by any potentially impacted surface water.

Ecological receptors present in the Ohio River near the MF Pond System could potentially be exposed to cobalt, or other COPCs, through ingestion or direct contact with impacted groundwater; however, should any surface water or sediment come into contact with impacted groundwater, the risk of exposure is likely low due to attenuation and dilution. For potential ecological receptors in the Ohio River, the exposure pathway was evaluated by comparing the results of the mixing calculation discussed in the preceding paragraph to available ecological screening levels. U.S. EPA Region 5, Resource Conservation and Recovery Act (RCRA) published Ecological

Screening Levels in a table dated August 22, 2003 which included a total cobalt screening level of 24 µg/l for water. The source for that screening level comes from Ohio water quality standards, Chapter 3745-1 of the Ohio Administrative Code[1]. Current Ohio water quality standards indicate the aquatic life risk screening level for cobalt remains 24 µg/l on tables dated January 12, 2015. As presented in the table below, the concentration of cobalt calculated using the mixing calculation (Attachment 1) does not exceed the ecological risk screening level, indicating the exposure pathway is incomplete for ecological receptors.

Aquatic Life Risk Screening Level (Tier II Outside Mixing Zone Area) – Cobalt (µg/l)	Concentration Increase Near-Shore – Cobalt (µg/l)
24	0.00076

Although current conditions do not pose a risk concern to human health or the environment, measures presented in the Contaminant Plume Containment Plan (Section 3.1 of this RMP) would address any future potential exposures and risks by containing potential groundwater impacts and mitigating impacts to potential receptors.

Exposure Mitigation

Mitigation of future potential exposures to groundwater contamination from continued operation of the Miami Fort Pond System is discussed in detail in the following section.

[1] Ohio water quality standards, Chapter 3745-1 of the Ohio Administrative Code, Dec. 30, 2002. Available at: http://www.epa.state.oh.us/dsw/rules/3745-1.html The water ESL data for endrin and parathion are Ohio aquatic life Tier I criteria from the Outside Mixing Zone Average (OMZA). Wildlife values are available for dioxin, DDT, mercury and PCB's. All of the remaining data are Ohio aquatic life Tier II values from the OMZA. See Ohio summary tables for water quality criteria and values along with reference on the development of Tier I criteria and Tier II values.

3 Contaminant Plume Containment: Options Evaluation and Plan - 40 C.F.R. § 257.101(f)(2)(v)(B)(3)

Appropriate corrective measure(s) to address impacted groundwater potentially associated with the Miami Fort Pond System are currently being evaluated as part of the Corrective Measures Assessment (CMA) Revision 2, which is included as an attachment to the alternative closure demonstration letter. The CMA (Ramboll, 2020e) evaluates the appropriate corrective measure(s) to address impacted groundwater in the Uppermost Aquifer associated with the Miami Fort Pond System. The evaluation criteria for the CMA are the following: performance; reliability; ease of implementation; potential impacts of the remedies (safety, cross-media, and control of exposure to residual contamination); time required to begin and complete the remedy; and, institutional requirements that may substantially affect implementation of the remedy(s), such as permitting, environmental or public health requirements. The hydrogeological information and conceptual site model (CSM) in support of the CMA process are in the description of hydrogeology attached to the alternative closure demonstration letter.

As discussed above, available information indicates that current conditions do not pose a risk to human health and the environment. As part of the CMA process, selection of the source control measures continues to be in the feasibility study phase and will incorporate groundwater flow and transport modeling that is in development, as discussed in the September 2020 semi-annual remedy selection report. Activities completed since March 5, 2020 include review of existing groundwater and source water data, identification and collection of additional groundwater and source water samples, identification of additional data collection needs to support development of a geochemical conceptual site model, and completion of additional monitoring wells and aquifer testing. Further discussion of short-term and long-term corrective measures under consideration, is also provided in Section 3.1.

Although future potential source control measures (e.g. closure in place, closure by removal to off-site landfill, in-situ solidification/stabilization) to mitigate groundwater impacts were considered as part of the CMA process upon closure of the Miami Fort Pond System, the shorter-term options considered for mitigating groundwater impacts relative to cobalt, as presented in the CMA are as follows:

- Groundwater Extraction
- Groundwater Cutoff Wall
- Permeable Reactive Barrier
- In-Situ Chemical Treatment
- Monitored Natural Attenuation (MNA)

One or more of these same groundwater remedial corrective measures developed for mitigating cobalt impacts to groundwater will also apply to other Appendix IV constituents that present a future risk to human health or the environment.

<u>Groundwater Extraction</u>

This corrective measure includes installation of a one or more groundwater pumping wells or trenches to control and extract impacted groundwater. Groundwater extraction captures and contains impacted groundwater and can limit plume expansion and/or off-site migration. Construction of a groundwater extraction system typically includes, but is not limited to, the following primary project components:

- Designing and constructing a groundwater extraction system consisting of a series of extraction wells or trenches located around the perimeter of the contaminant plume and operating at a rate to allow capture of CCR impacted groundwater.
- Designing a system to manage extracted groundwater, which may include modification to the existing NPDES permit, including treatment prior to discharge, if necessary.
- Ongoing inspection and maintenance of the groundwater extraction system.

Installation of a groundwater extraction system, whether wells or trenches, can be expedited with the assumption that there is a good conceptual site model (CSM) of the hydrogeological system around the CCR unit, groundwater flow and transport modeling, and aquifer testing. There is a CSM for the vicinity of the Miami Fort Pond System currently under refinement and a groundwater flow and transport model for evaluation of long-term remedial options, source control and groundwater corrective measures, is under development and will be completed in 2021.

A schematic of a typical groundwater extraction well is shown on Figure 3. Based on site specific hydrogeology and future potential plume width and depth, a groundwater extraction system would likely consist of one to three extraction wells with pitless adapter's manifolded together with HDPE conveyance pipe to a common tank or lined collection vault prior to treatment at the on-site wastewater treatment plant and discharge via the NPDES permitted outfall.

<u>Groundwater Cutoff Wall</u>

Vertical cutoff walls are used to control and/or isolate impacted groundwater. Low permeability cutoff walls can be used to prevent horizontal off-site migration of potentially impacted groundwater. Cutoff walls act as barriers to migration of impacted groundwater and can isolate soils that have been impacted by CCR to prevent contact with unimpacted groundwater. Cutoff walls are often used in conjunction with an interior pumping system to establish a reverse gradient within the cutoff wall. The reverse gradient imparted by the pumping system maintains an inward flow through the wall, keeping it from acting as a groundwater dam and controlling potential end-around or breakout flow of contaminated groundwater.

A commonly used cutoff wall construction technology is the slurry trench method, which consists of excavating a trench and backfilling it with a soil-bentonite mixture, often created with the soils excavated from the trench. The trench is temporarily supported with bentonite slurry that is pumped into the trench as it is excavated. Excavation for cutoff walls is conducted with conventional hydraulic excavators, hydraulic excavators equipped with specialized booms to extend their reach (*i.e.*, long-stick excavators), or chisels and clamshells, depending upon the depth of the trench and the material to be excavated.

This is a potential viable option for groundwater corrective measures, to be evaluated further, but is not a short-term solution that can be implemented expeditiously.

<u>Permeable Reactive Barrier</u>

Chemical, physical and biological treatment via a Permeable Reactive Barrier (PRB) is defined as an emplacement of reactive materials in the subsurface designed to intercept a contaminant plume, provide a flow path through the reactive media, and transform or otherwise render the contaminant(s) into environmentally acceptable forms to attain remediation concentration goals downgradient of the barrier (EPRI, 2006).

As groundwater passes through the PRB under natural gradients, dissolved constituents in the groundwater react with the media and are transformed or immobilized. A variety of media have been used or proposed for use in PRBs. Zero-valent iron has been shown to effectively immobilize CCR constituents, including arsenic, chromium, cobalt, molybdenum, selenium and sulfate. Zero-valent iron has not been proven effective for boron, antimony, or lithium (EPRI, 2006).

System configurations include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where barrier walls are installed to control groundwater flow through a permeable gate containing the reactive media. Continuous PRBs intersect the entire contaminant plume and do not materially impact the groundwater flow system. Design may or may not include keying the PRB into a low-permeability unit at depth. Funnel-and-gate systems utilize a system of barriers to groundwater flow (funnels) to direct the contaminant plume through the reactive gate. The barriers, typically some form of cutoff wall, are keyed into a low-permeability unit at depth to prevent short circuiting of the plume. Funnel-and-gate design must consider the residence time to allow chemical reactions to occur. Directing the contaminant plume through the reactive gate can significantly increase the flow velocity, thus reducing residence time.

Design of PRB systems requires rigorous site investigation to characterize the site hydrogeology and to delineate the contaminant plume. A thorough understanding of the geochemical and redox characteristics of the plume is critical to assess the feasibility of the process and select appropriate reactive media. Laboratory studies, including batch studies and column studies using samples of site groundwater, are needed to determine the effectiveness of the selected reactive media at the site (EPRI, 2006). Additional site investigation is currently underway in 2020 and the geochemical evaluations being conducted as part of the MNA evaluation, including additional field data collection and laboratory studies, will also be available for use in evaluating PRB as a groundwater remedial option.

This is a potential viable option for groundwater corrective measures, to be evaluated further, but is not a short-term solution that can be implemented expeditiously.

<u>In-Situ Chemical Treatment</u>

In-situ chemical treatment for inorganics are being tested and applied with increasing frequency. In-situ chemical treatment includes the targeted injection of reactive media into the subsurface to mitigate groundwater impacts. Inorganic contaminants are typically remediated through immobilization by reduction or oxidation followed by precipitation or adsorption (EPRI, 2006). Chemical reactants that have been applied or are in development for application in treating inorganic contaminants include ferrous sulfate, nanoscale zero-valent iron, organo-phosphorus nutrient mixture (PrecipiPHOS™) and sodium dithionite (EPRI, 2006). Zero-valent iron has been shown to effectively immobilize cobalt. Implementation of in-situ chemical treatment requires detailed technical analysis of field hydrogeological and geochemical conditions along with laboratory studies.

In-situ chemical treatment was not retained as a viable corrective measure to address SSLs of cobalt in the Uppermost Aquifer since its performance and reliability are unknown and the groundwater hydraulics are likely to require increased control provided by a PRB.

<u>Monitored Natural Attenuation (MNA)</u>

Currently, MNA is being evaluated with site-specific characterization data and geochemical analysis as a long term remedial option, combined with source control measures, through application of the USEPA's tiered approach to MNA (USEPA 1999, 2007 and 2015):

1. Demonstrate that the area of groundwater impacts is not expanding.
2. Determine the mechanisms and rates of attenuation.
3. Determine that the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform adequately.

Based on an independent evaluation of MNA provided in Appendix E of CMA Revision 2, MNA combined with source control appears to be a promising groundwater remedy at the Miami Fort Pond System when reviewed against the requirements in 40 C.F.R. § 257.96(c). Further investigation will be completed in 2021 to collect sufficient evidence to support the tiered MNA evaluation, which will include an analysis of the attenuation mechanism, rate, and aquifer capacity to establish multiple lines of evidence in accordance with USEPA guidance. MNA is not regarded as a short-term remedial option for contaminant plume containment, but as a potential long-term option following implementation of shorter term control measures.

3.1 Containment Plan

Based on the options evaluated for containment of a future potential groundwater contaminant plume originating from the Miami Fort Pond System for one or more Appendix IV constituents exceeding their GWPS(s), the most viable short-term option of those evaluated is a groundwater extraction system, which would allow for capture of impacted groundwater and prevent further plume migration towards potential receptors, which have been identified as the Great Miami River to the west and the Ohio River to the south. The only constituent with a current exceedance of its GWPS is cobalt. The nature and extent of the cobalt impact has been delineated vertically and laterally.

In circumstances where there is not an immediate concern of endangerment to human health or the environment - such as the current case for cobalt exceedances that have been defined vertically and laterally and are below risk screening levels for expected cobalt loading to surface water - other longer-term corrective measures (groundwater cutoff wall, permeable reactive barrier, and MNA) may be more viable and will continue to be evaluated through the CMA process as discussed in CMA Revision 2.

Depending on the location and plume geometry of any future potential Appendix IV exceedances of GWPSs, the specific constituent(s) with exceedances, and distance from potential receptors, the other groundwater corrective measures discussed as part of the corrective options evaluation – groundwater cutoff wall, permeable reactive barrier, and MNA – are all secondary remedial alternatives available for consideration following the current primary option under consideration, of groundwater extraction for short-term application.

4 References

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TABLES

TABLE 1. ASSESSMENT MONITORING PROGRAM SUMMARY
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
September 18-20, 2018	January 2, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 7, 2019	NA	Sept 5, 2019 (completed CMA)
			Arsenic (MW-2, MW-10)		April 8, 2019	NA
March 12-14, 2019	April 29, 2019	Appendix III	--	--	--	--
		Appendix IV	Cobalt (MW-4) Molybdenum (MW-6)	July 29, 2019	NA	ongoing
			Arsenic (MW-2, MW-10)		October 28, 2019	NA
June 12-14, 2019 (delineation event)[2]	July 1, 2019	Cobalt and Molybdenum	NA	NA	NA	NA
September 9-10, 2019	October 8, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 6, 2020	NA	Feasibility study phase of CMA; Public meeting held December 16, 2019
			Arsenic (MW-2, MW-10)		April 6, 2020	NA
April 6-7, 2020	May 4, 2020	Appendix III	--	--	--	--
		Appendix IV	Cobalt (4A, MW-4)	August 3, 2020	NA	March 5, 2020 (Semiannual remedy selection progress report)
			Molybdenum (MW-6)		November 12, 2020	
			Arsenic (MW-2, MW-10, MW-13)			September 5, 2020 (Semiannual remedy selection progress report)
September 14-15, 2020	October 20, 2020	Appendix III	--	--	--	--
		Appendix IV Detected[1]	TBD	TBD	TBD	November 30, 2020 (revised CMA)

[O: RAB 9/11/20; C: EJT 9/16/20][U: BGH 11/18/20][U:KLT 11/24/20, C: RAB 11/24/2020]

Notes:
-- = SSL evaluation not apply to Appendix III parameters
ASD = Alternate Source Demonstration
CMA = Corrective Measures Assessment
NA = Not Applicable
SSL = Statistically Significant Level
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. Part 257.95(d)(1).
2. June 12-14, 2019 samples were collected as part of a delineation event and analytical results were not statistically evaluated for SSLs. Individual monitoring well exceedances of the GWPS are presented.

TABLE 2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Monitoring Well ID	GWPS	9/18-20/2018		3/12-14/2019		6/12-14/2019		8/9/2019	
		Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.006	--	--	--	--	--	--	0.00200	0.00200
MW-1	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NS	NS
MW-2	0.006	NS	0.00050	0.00098	0.00050	NS	NS	NS	NS
MW-3A	0.006	NS	0.00022	0.00223	0.00050	NS	NS	NS	NS
MW-4	0.006	0.01870	**0.00762**	0.00588	**0.00727**	0.0083	**0.0083**	NS	NS
MW-5	0.006	<0.0005	0.00050	<0.0005	0.00050	0.00066	0.00066	NS	NS
MW-6	0.006	0.00473	0.00255	0.00258	0.00253	0.0033	0.0033	NS	NS
MW-7	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NS	NS
MW-8	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS
MW-9	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS
MW-10	0.006	NS	0.00116	<0.0005	0.00095	NS	NS	NS	NS
MW-11	0.006	NS	0.00211	0.00061	-0.00457	NS	NS	NS	NS
MW-12	0.006	0.00193	0.00183	0.00194	0.00183	0.0023	0.0023	NS	NS
MW-13	0.006	<0.0005	-0.01049	<0.0005	-0.01040	<0.0005	<0.0005	NS	NS
MW-14	0.006	NI	NI	NI	NI	0.00099	0.00099	NS	NS
MW-15	0.006	NI	NI	NI	NI	0.0065	**0.0065**	NS	NS
MW-16	0.006	NI	NI	NI	NI	0.00960	**0.00960**	NS	NS
MW-17	0.006	NI	NI	NI	NI	NI	NI	NI	NI
MW-18	0.006	NI	NI	NI	NI	NI	NI	NI	NI
MW-19	0.006	NI	NI	NI	NI	NI	NI	NI	NI

[O: KLT 9/1/20, C: RAB 9/2/2020][U:KLT 9/14/20, C:MGP 9/16/20, U: BGH 11/18/20][U: KLT 11/23/20, C: RAB 11/23/2020]

Notes:
Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated
< = Not Detected at Reporting Limit
-- = No sample; monitoring well not part of CCR program during sampling event
GWPS = Groundwater Protection Standard
mg/L = milligrams per liter
NI = Not Installed
NS = Not Sampled
1. Negative comparison values are the result of the Lower Confidence Band around a negative slope.
2. Comparison Values are presented on plume maps.

TABLE 2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Monitoring Well ID	GWPS	9/9-10/2019		4/6-7/2020		6/12/2020		9/14-15/2020	
		Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.006	--	--	0.00908	**0.00908**	0.012	**0.012**	0.0109	TBD
MW-1	0.006	<0.0005	<0.0005	<0.002	<0.002	NS	NS	<0.002	TBD
MW-2	0.006	0.00063	0.00051	<0.002	0.00052	NS	NS	<0.002	TBD
MW-3A	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-4	0.006	0.01710	**0.00795**	0.02240	**0.00844**	NS	NS	0.0149	TBD
MW-5	0.006	0.00052	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-6	0.006	0.00296	0.00263	0.00263	0.00262	NS	NS	0.00266	TBD
MW-7	0.006	<0.0005	<0.0005	<0.002	<0.002	NS	NS	<0.002	<0.002
MW-8	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-9	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-10	0.006	<0.0005	-0.00599	<0.002	0.00073	NS	NS	<0.002	TBD
MW-11	0.006	0.00062	-0.00420	<0.002	-0.00382	NS	NS	<0.002	TBD
MW-12	0.006	0.00256	0.00193	0.00259	0.00193	NS	NS	0.00245	TBD
MW-13	0.006	<0.0005	-0.00836	<0.002	-0.00887	NS	NS	<0.002	TBD
MW-14	0.006	0.00069	0.00069	<0.002	<0.002	NS	NS	<0.002	TBD
MW-15	0.006	0.00360	0.00360	0.00386	0.00386	NS	NS	0.00379	TBD
MW-16	0.006	0.00267	0.00267	0.00217	0.00217	NS	NS	0.00347	TBD
MW-17	0.006	NI	NI	NI	NI	NI	NI	<0.002	<0.002
MW-18	0.006	NI	NI	NI	NI	NI	NI	NS	NS
MW-19	0.006	NI	NI	NI	NI	NI	NI	0.0145	**0.0145**

[O: KLT 9/1/20, C: RAB 9/2/2020][U:KLT 9/14/20, C:MGP 9/16/20, U: BGH 11/18/20][U: KLT 11/23/20, C: RAB 11/23/2020]

Notes:

Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated
< = Not Detected at Reporting Limit
-- = No sample; monitoring well not part of CCR program during sampling event
GWPS = Groundwater Protection Standard
mg/L = milligrams per liter
NI = Not Installed
NS = Not Sampled
1. Negative comparison values are the result of the Lower Confidence Band around a negative slope.
2. Comparison Values are presented on plume maps.

FIGURES

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Part A\Figure 1_Well Locations BasinAandB.mxd

PROJECT: 72799 | DATED: 11/25/2020 | DESIGNER: MARRAMJ

DOWNGRADIENT CCR MONITORING WELL
BACKGROUND CCR MONITORING WELL
MONITORING WELL
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

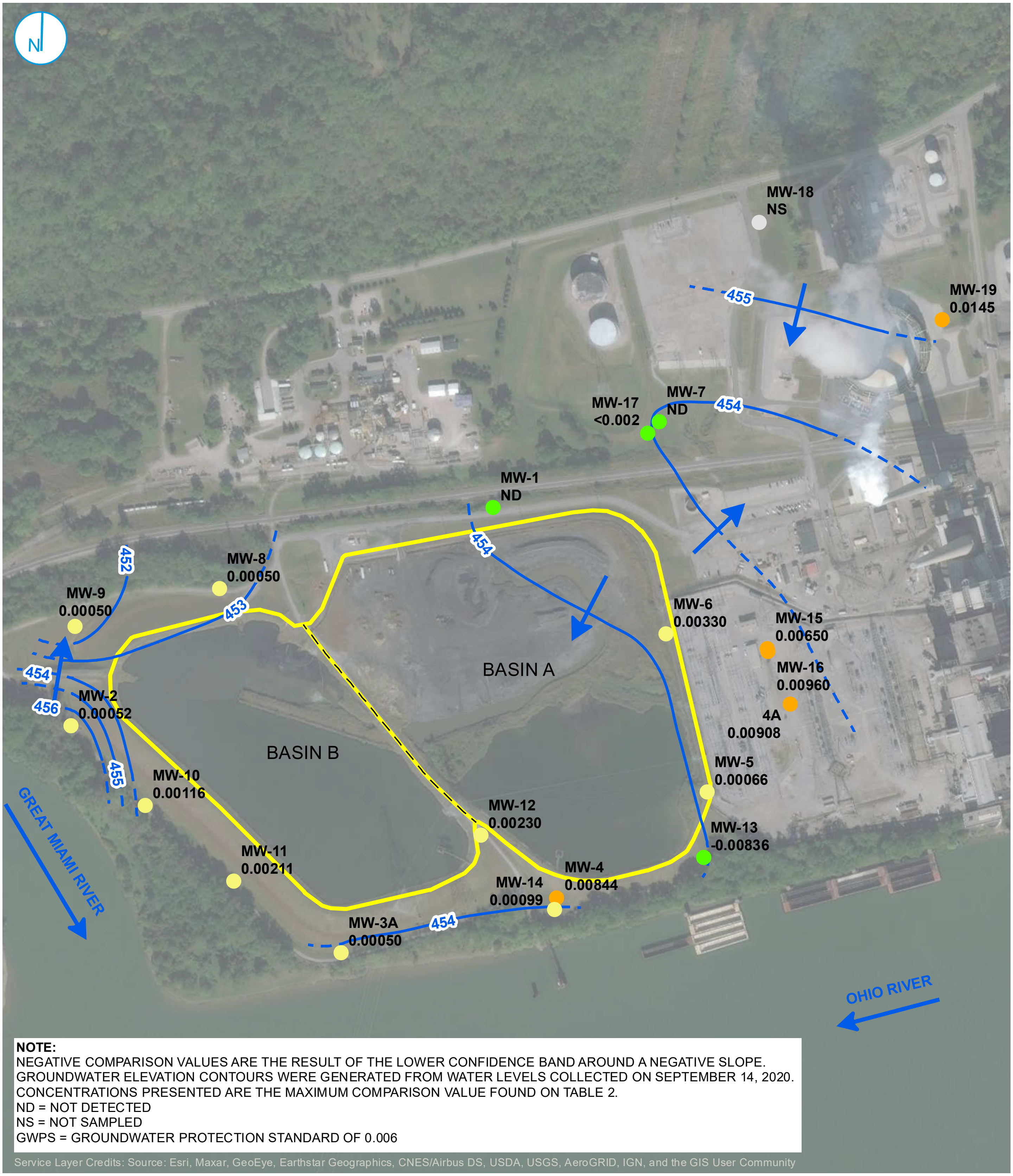
0 250 500 Feet

SITE AND WELL LOCATION MAP
POND SYSTEM
(MULTI-UNIT ID: 115)

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



NOTE:
NEGATIVE COMPARISON VALUES ARE THE RESULT OF THE LOWER CONFIDENCE BAND AROUND A NEGATIVE SLOPE.
GROUNDWATER ELEVATION CONTOURS WERE GENERATED FROM WATER LEVELS COLLECTED ON SEPTEMBER 14, 2020.
CONCENTRATIONS PRESENTED ARE THE MAXIMUM COMPARISON VALUE FOUND ON TABLE 2.
ND = NOT DETECTED
NS = NOT SAMPLED
GWPS = GROUNDWATER PROTECTION STANDARD OF 0.006

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Part A\Figure 2_MF_BasinAB_GW_Cobalt Plume Map_2004.mxd

PROJECT: 72799 | DATED: 11/30/2020 | DESIGNER: MARRAMJ

COBALT, TOTAL (mg/L)
- NON-DETECT
- DETECTED
- DETECTED, >GWPS
- WATER LEVEL ONLY WELL
- CCR MONITORED MULTI-UNIT
- BERM
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- RIVER FLOW DIRECTION

0 250 500 Feet

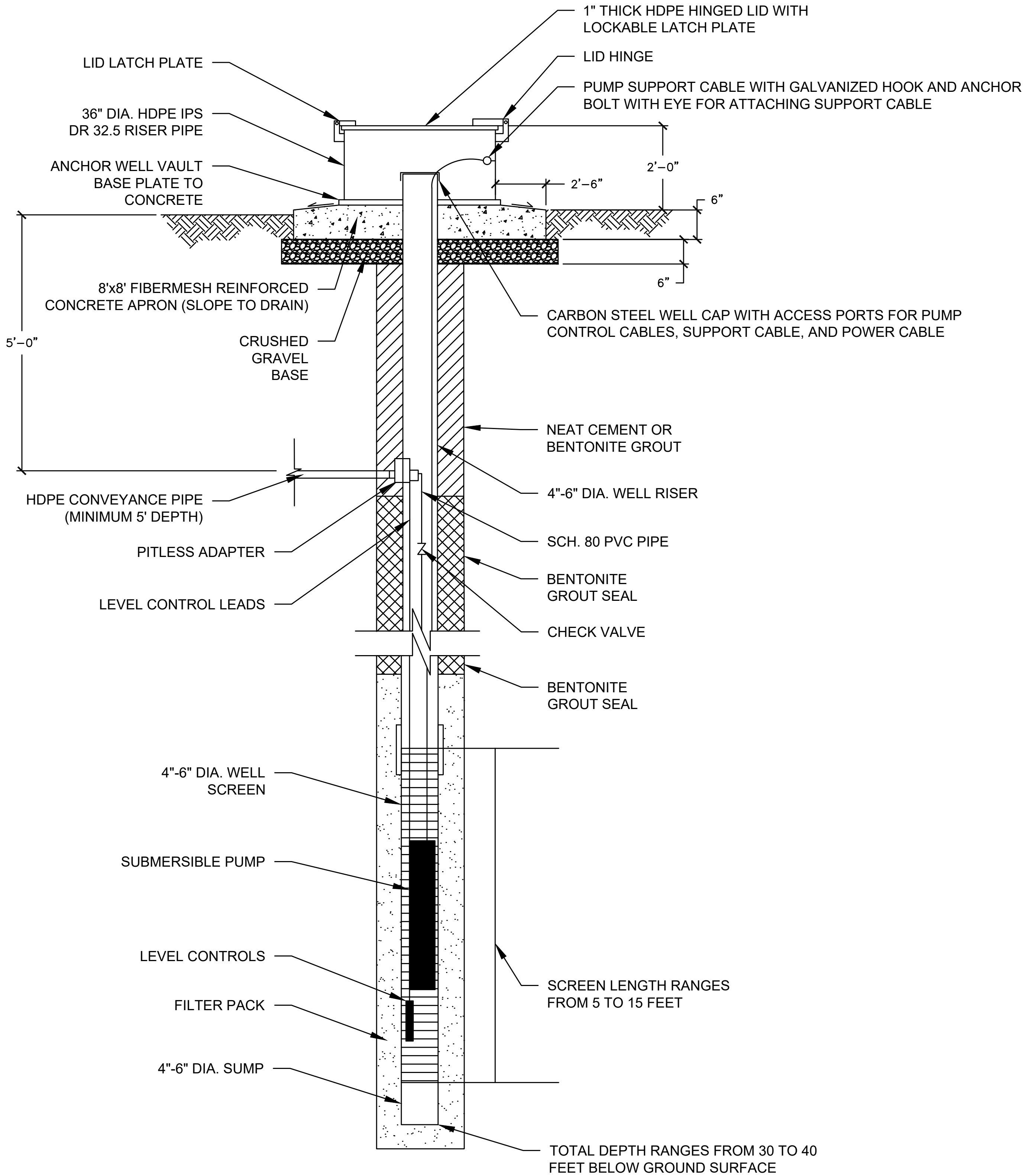
TOTAL COBALT PLUME MAP

FIGURE 2

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

\\ramboll.sharepoint.com@SSL\DavWWWRoot\sites\vistra\Shared Documents\-CCR GW\Drawings\CAD\Gradient Control Well.dwg
PROJECT: RAMBOLL PROJECT NUMBER DATED: 9/10/2020 5:12 PM DESIGNER: ENGELHSA



NOTES
1. NOT TO SCALE

TYPICAL HYDRAULIC GRADIENT CONTROL WELL DETAIL

FIGURE 3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

DYNEGY MIAMI FORT L.L.C
MIAMI FORT POND SYSTEM
NORTH BEND, OHIO

RAMBOLL

ATTACHMENT 1
GROUNDWATER MONITORING SYSTEM CERTIFICATION

40 C.F.R. § 257.91(f) Groundwater Monitoring System Certification
CCR Unit: Dynegy Miami Fort, LLC; Miami Fort Power Station; Miami Fort Pond System

In accordance with 40 C.F.R. § 257.91(f), the owner or operator of a coal combustion residual (CCR) unit must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR unit has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91. If the groundwater monitoring system includes the minimum number of monitoring wells specified in 40 C.F.R. § 257.91(c)(1), the certification must document the basis supporting use of the minimum number of monitoring wells. Further, in accordance with 40 C.F.R. § 257.91(e)(1), when completing the groundwater monitoring system certification, the qualified professional engineer must be given access to documentation regarding the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices.

The individual groundwater monitoring systems designed and constructed for Basins A and B include more than the minimum number of downgradient monitoring wells specified in 40 C.F.R. § 257.91(c)(1). The combined groundwater monitoring system for the Miami Fort Pond System is equally as capable of detecting monitored constituents downgradient at the waste boundary of the CCR multiunit as the individual monitoring systems for Basins A and B, as required by 40 C.F.R. § 257.91(d)1.

Further evaluation of the groundwater conceptual site model and flow conditions, including a groundwater model, is currently in progress to support remedy selection as part of the corrective measures assessment process, in addition to identifying location(s) for additional background monitoring well(s). Site constraints may limit the options for locating additional background monitoring wells.

The undersigned has been given access to the documentation regarding the design, installation, development, piezometers and other measurement, sampling, and analytical devices concerning the monitoring system for the Miami Fort Pond System.

I, Nicole Pagano, a qualified professional engineer in good standing in the State of Ohio, certify that the groundwater monitoring system at the Miami Fort Pond System has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.

____
Nicole M. Pagano
Qualified Professional Engineer
E-85428
Ohio
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: May 22, 2020

STATE OF OHIO
NICOLE M. PAGANO
E-85428
REGISTERED
PROFESSIONAL ENGINEER

I, Brian Hennings, certify that the groundwater monitoring system at the Miami Fort Pond System has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.

____
Brian G. Hennings
Managing Hydrogeologist
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: May 22, 2020

ATTACHMENT 2
ALTERNATE SOURCE DEMONSTRATIONS

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 1). 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.

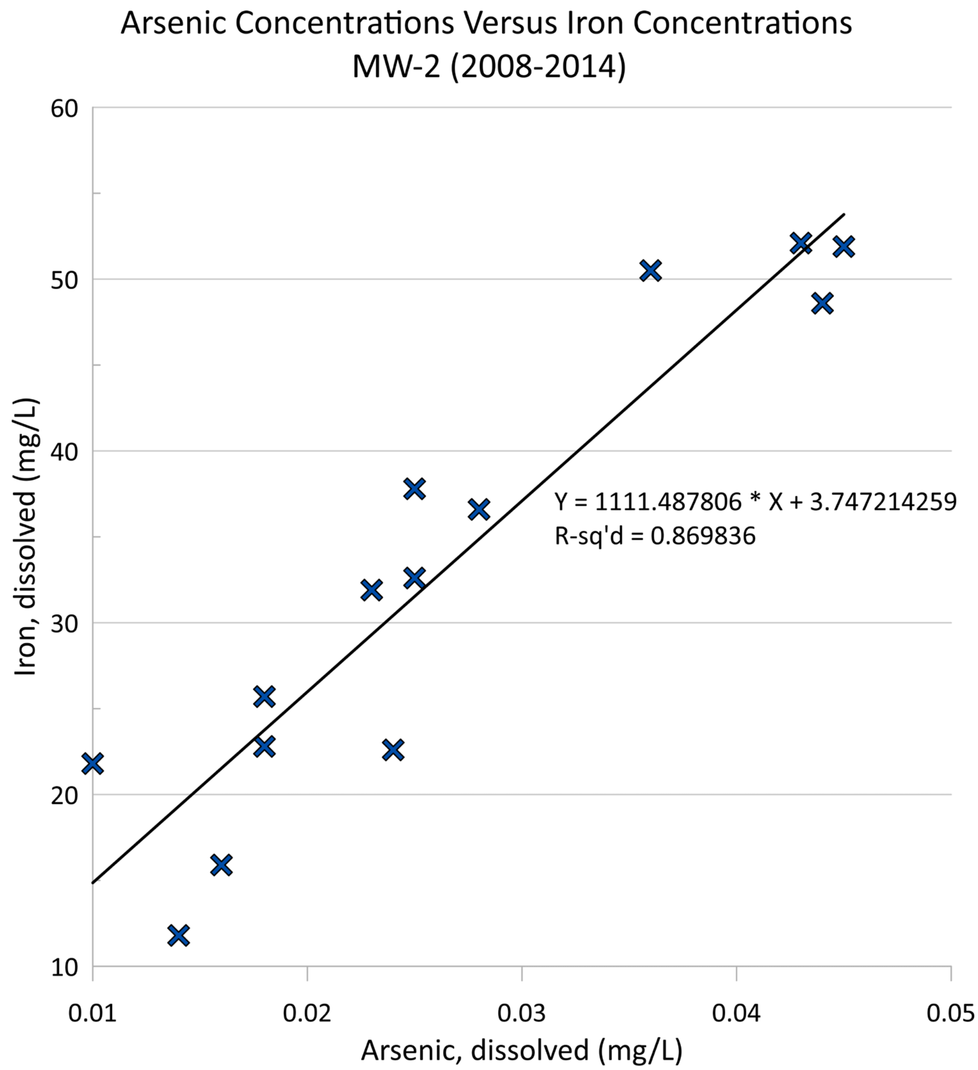


Figure 2. Arsenic concentrations versus iron concentrations at well MW-2 (2008-2014)

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).

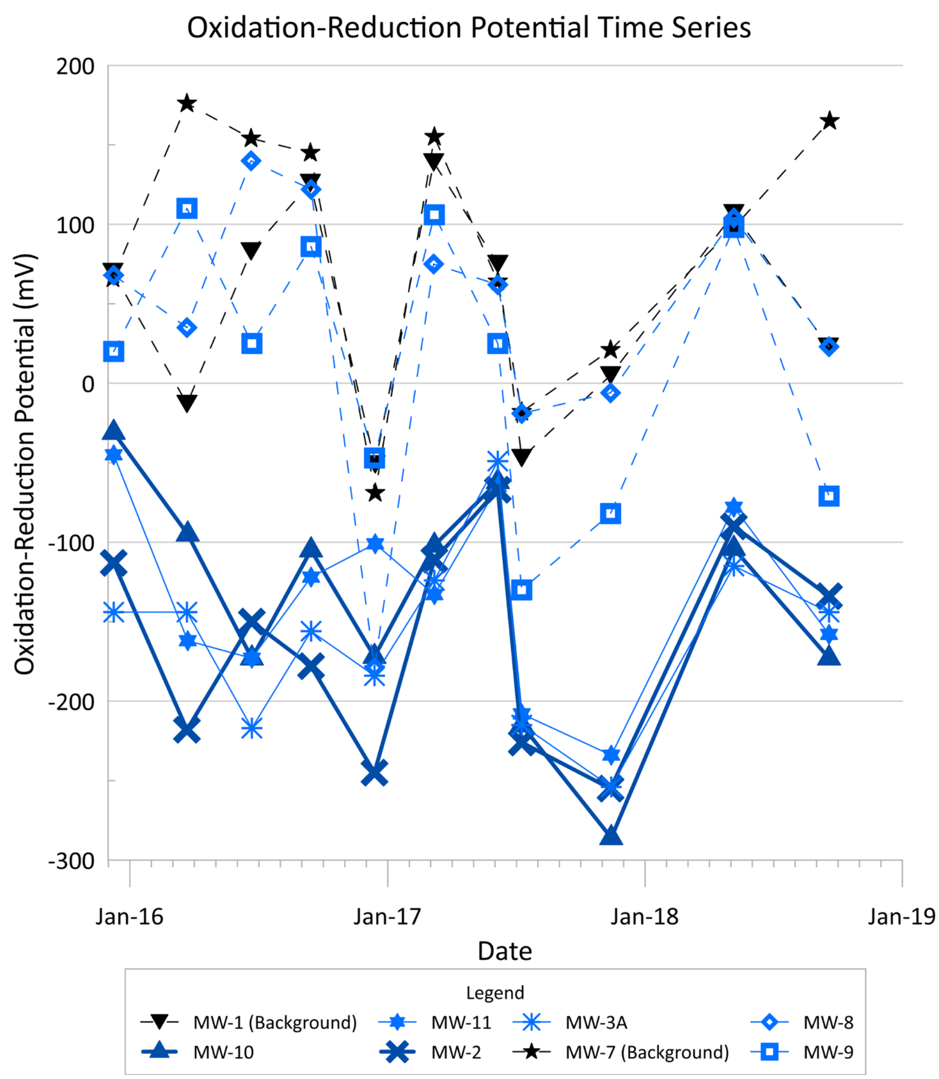


Figure 3. Oxidation reduction potential time-series for groundwater samples (MW-1 (background), MW-2, MW-3A, MW-7 (background), MW-8, MW-9, MW-10, and MW-11)

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.

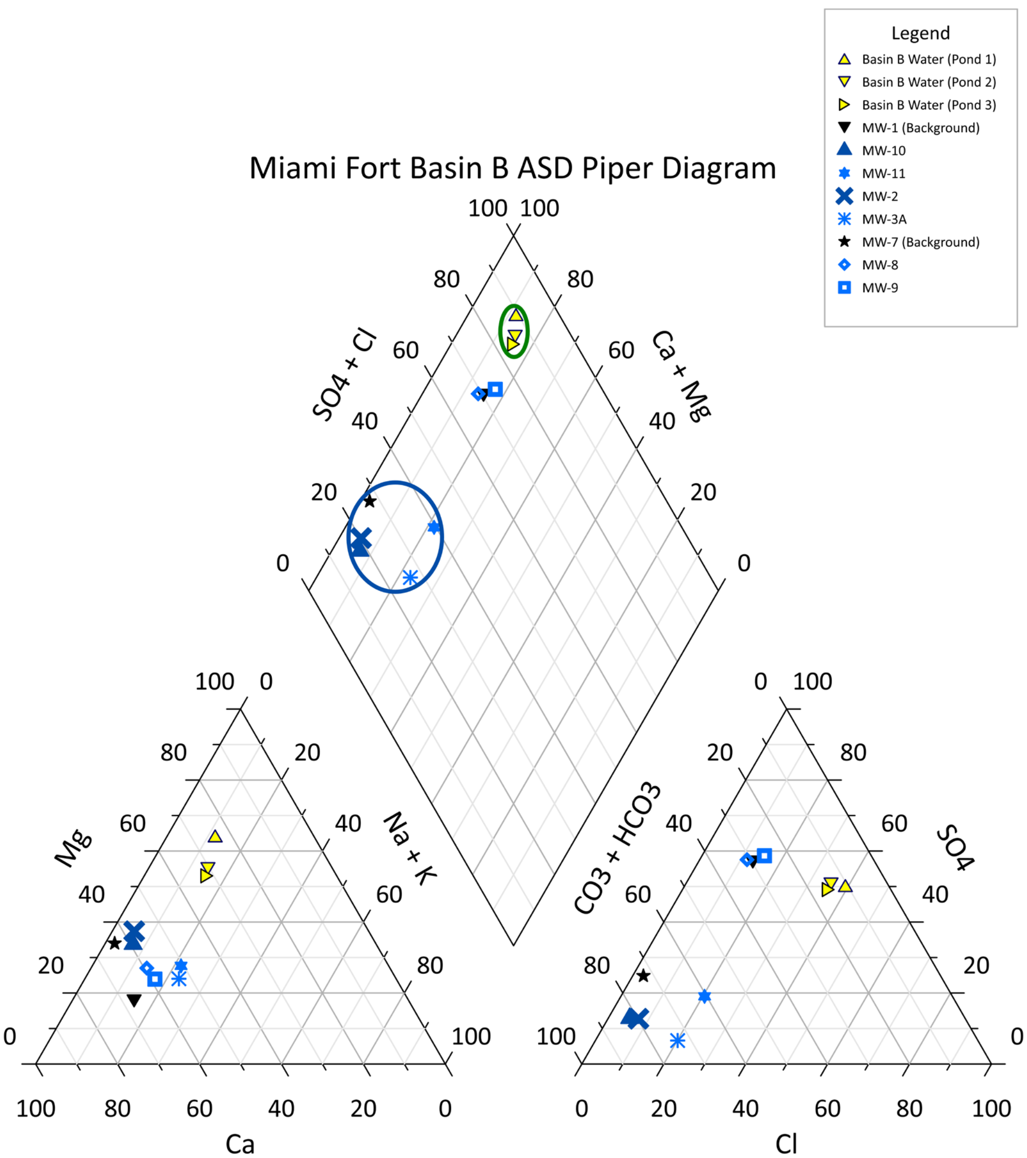


Figure 4. Piper diagram showing ionic composition of samples of Basin B water and groundwater

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.

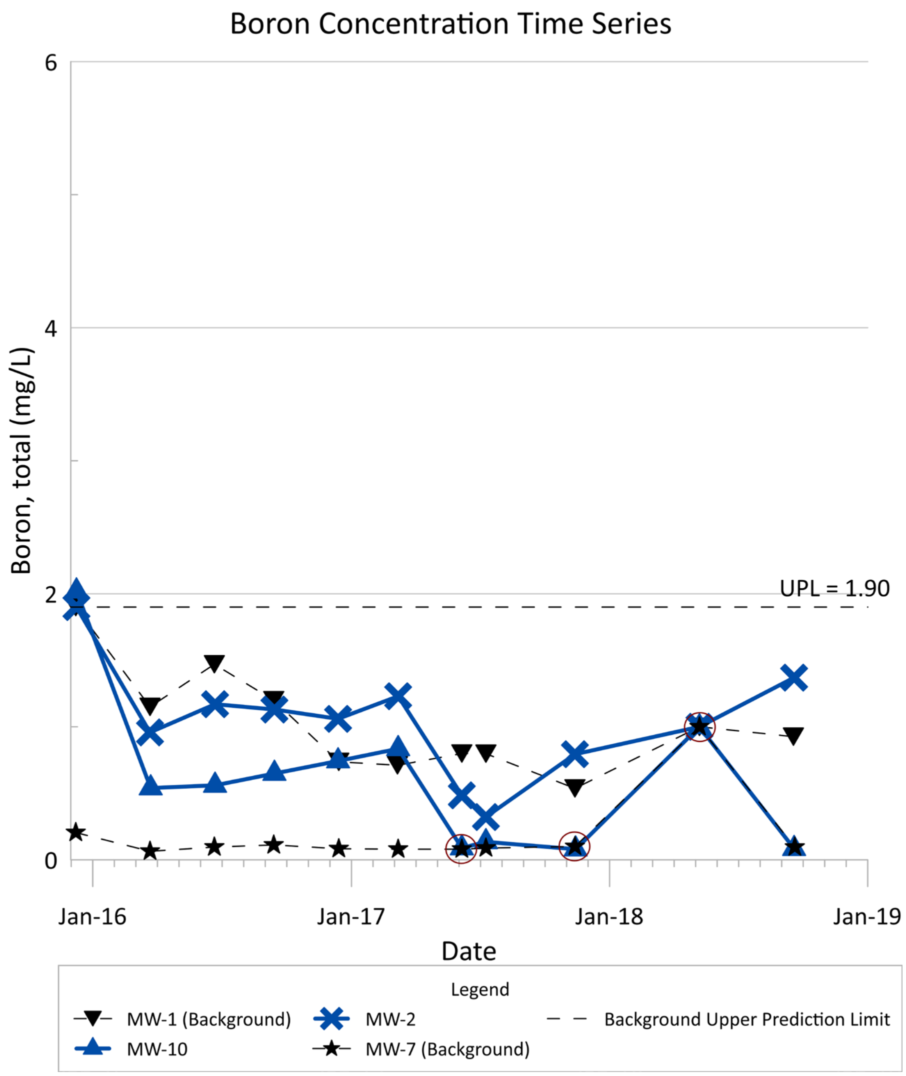


Figure 5. Boron concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10 *(note: non-detect analysis results for all wells are shown with red circles)*

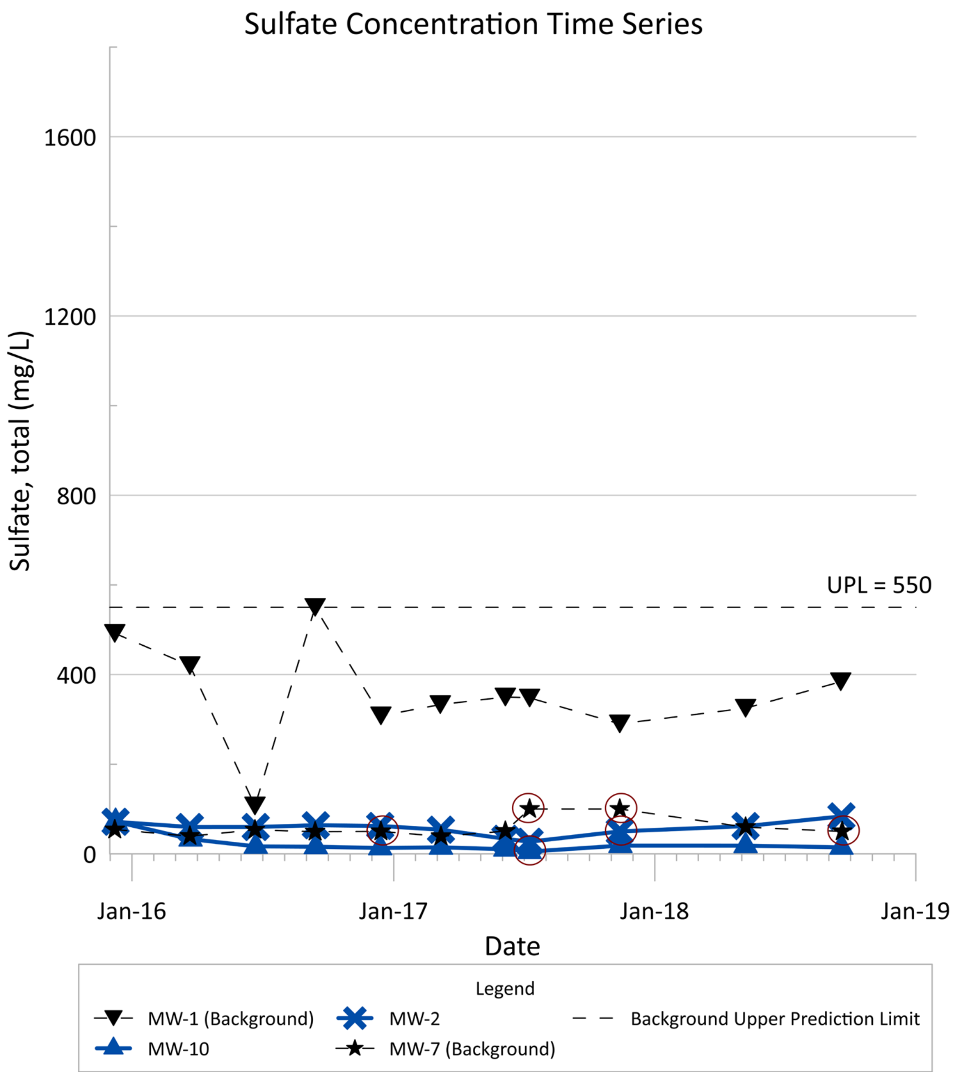


Figure 6. Sulfate concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10 ***(note: non-detect analysis results for all wells are shown with red circles)***

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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O'Brien & Gere Engineers, Inc. (OBG), 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: 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.

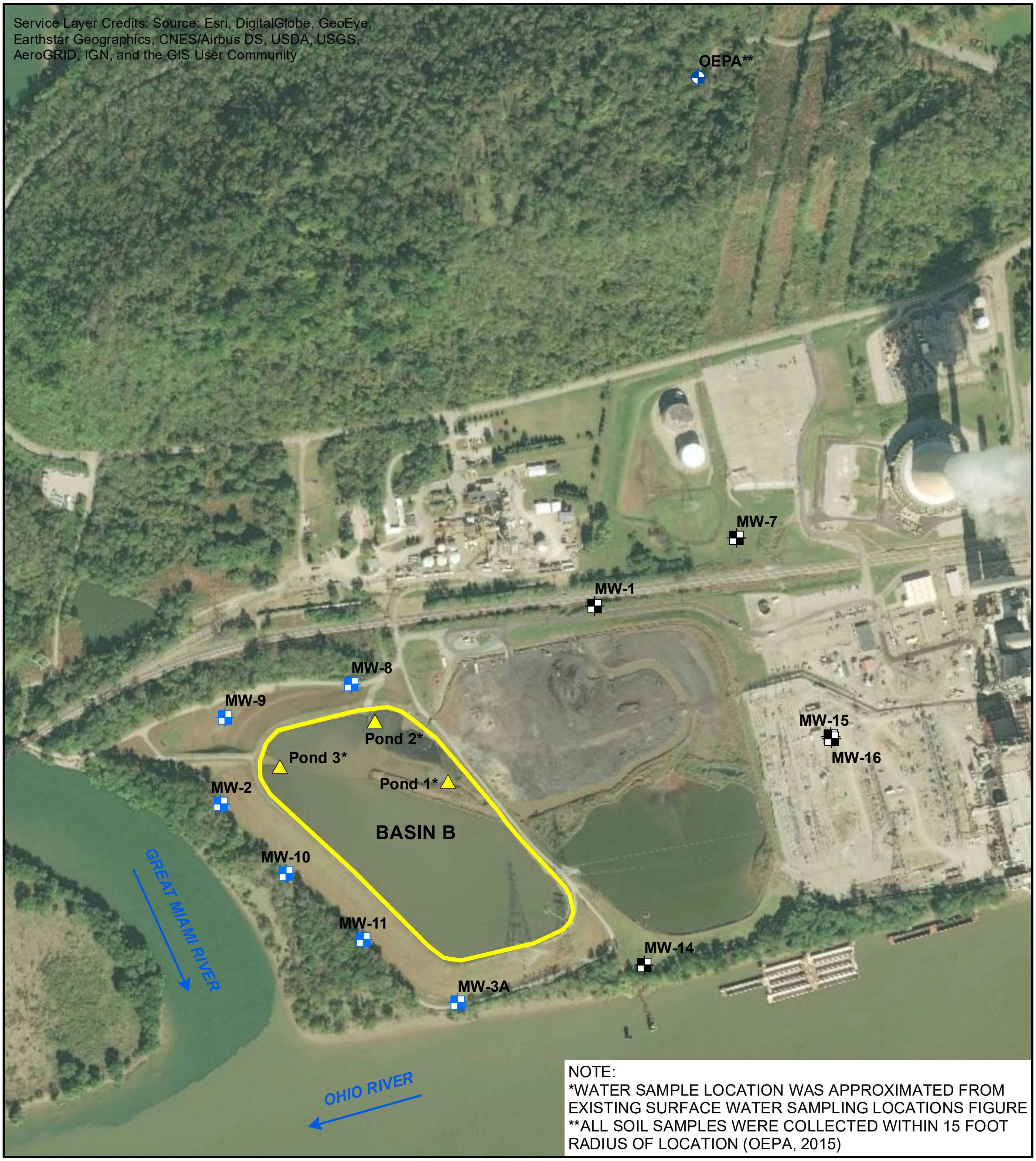
STATE OF OHIO
RICHARD
H. WEBER
71678
REGISTERED
PROFESSIONAL ENGINEER

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

Figure 1

Monitoring Well and Sampling Location Map

FIGURE 1



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

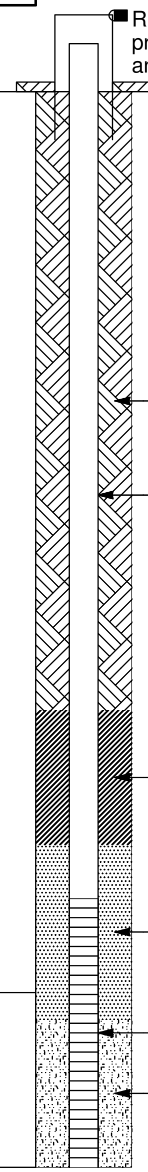
C:\Users\galarnmc\OneDrive - Ramboll\desktop\WAH\2285\MXD\Miami_Fort\Figure 1_Monitoring Well and Sampling Locations.mxd

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				

WELL CONSTRUCTION DETAIL



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.

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

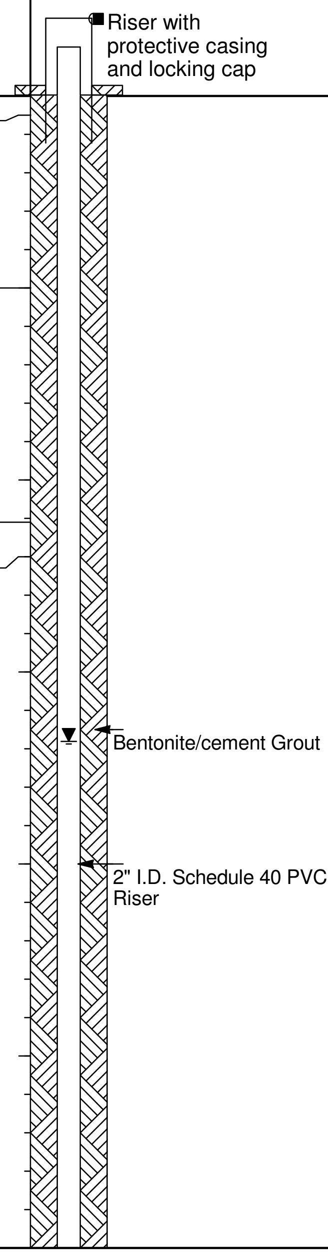
MONITORING WELL
MW-2

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

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

WELL CONSTRUCTION DETAILS



Project: Duke Energy	Monitoring Well MW-3A
Project Location: Miami Fort Station	Sheet 2 of 2
Project Number: 14948624	

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

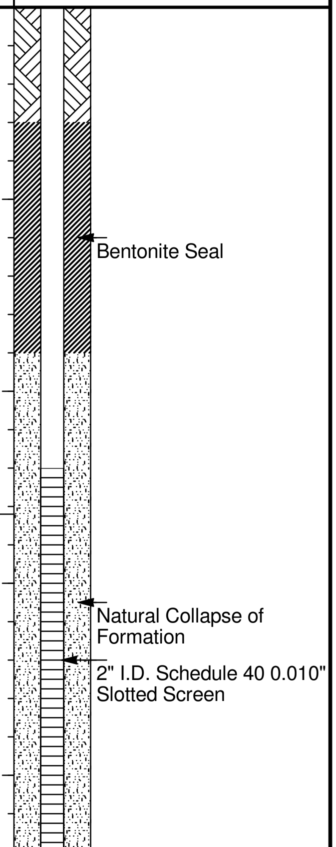
grades with trace organcis, less sand, increasing silt

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



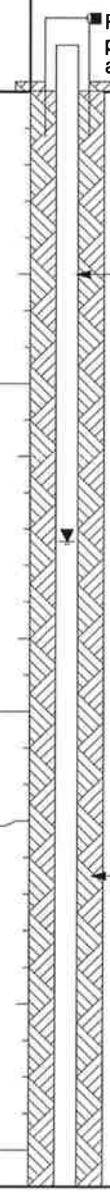
URS

Project: Dynegy	**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
470	0		74		Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist
					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
	30		88		Gray and brown fine SAND, with trace silt, loose, moist

WELL CONSTRUCTION DETAILS



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

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Percent Recovery	SAMPLES Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
440						
	35				Grades with some medium sand	
435						
					Grades to medium sand	
			58		Grades wet	
	40					
430						
					Grades with silt, more dense	
	45				Grades with fine and coarse sand	Bentonite Seal
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	**Monitoring Well**
Project Location: Miami Fort Station	**MW-11**
Project Number: 60442412	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: 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

Riser with protective casing and locking cap

2" I.D. Schedule 40 PVC Riser

Bentonite/cement Grout

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

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					
					Grades brown and gray	Bentonite Seal
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**

<u>Trend Analysis</u>

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	

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 1). 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.

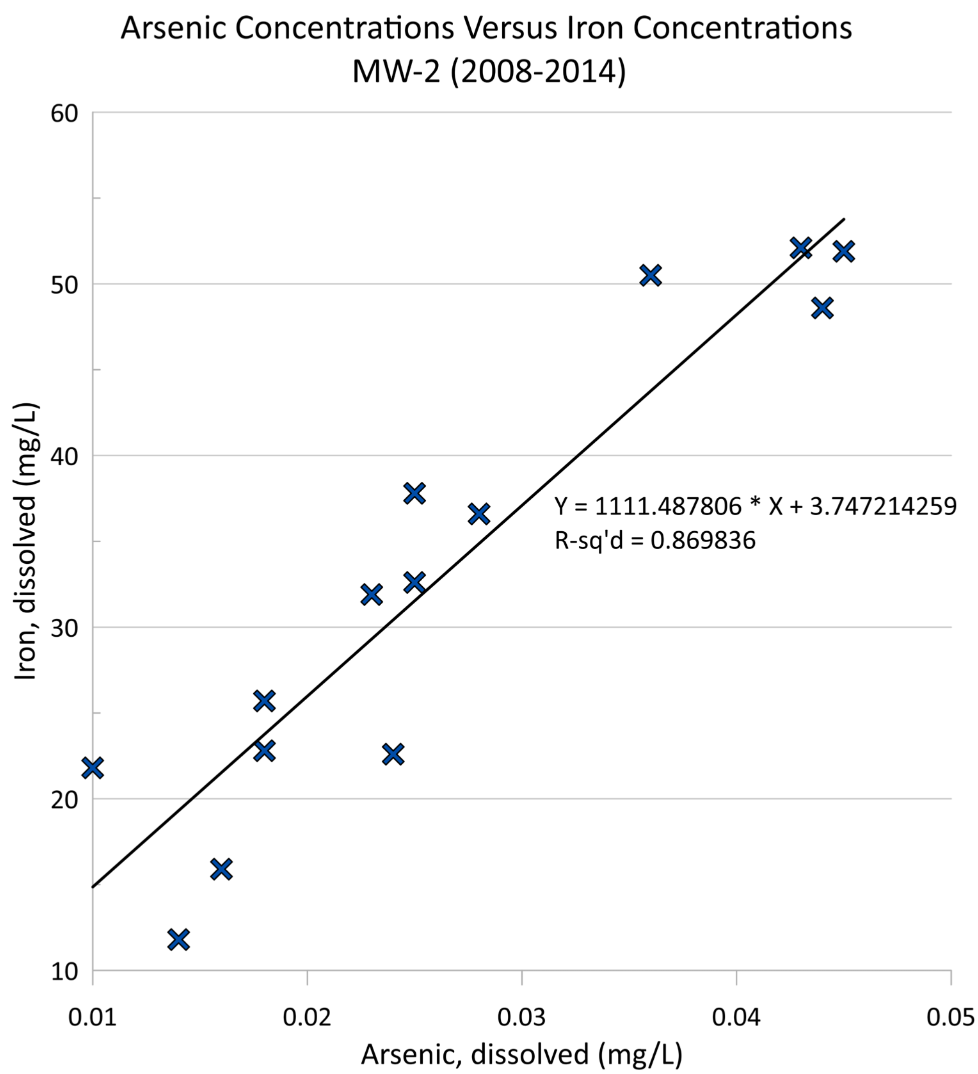


Figure 2. Arsenic concentrations versus iron concentrations at well MW-2 (2008-2014)

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).

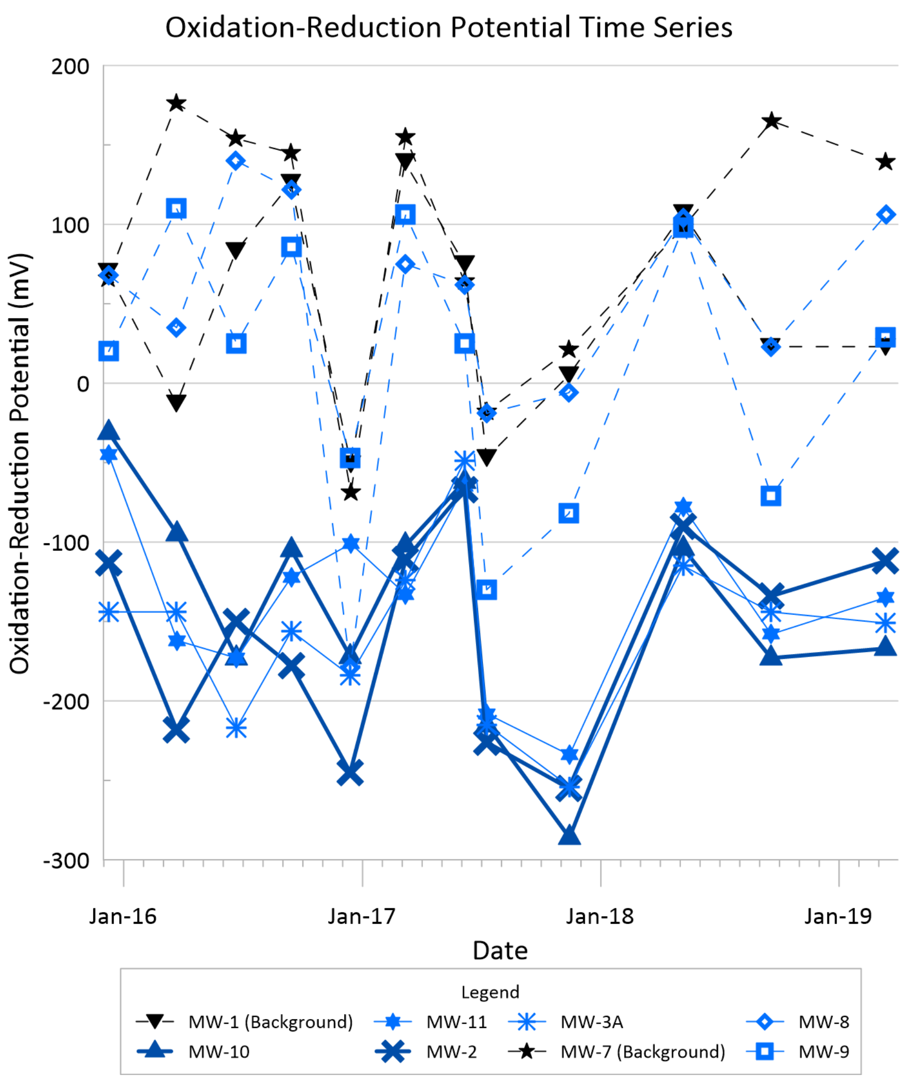


Figure 3. Oxidation reduction potential time-series for groundwater samples (MW-1 (background), MW-2, MW-3A, MW-7 (background), MW-8, MW-9, MW-10, and MW-11)

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.

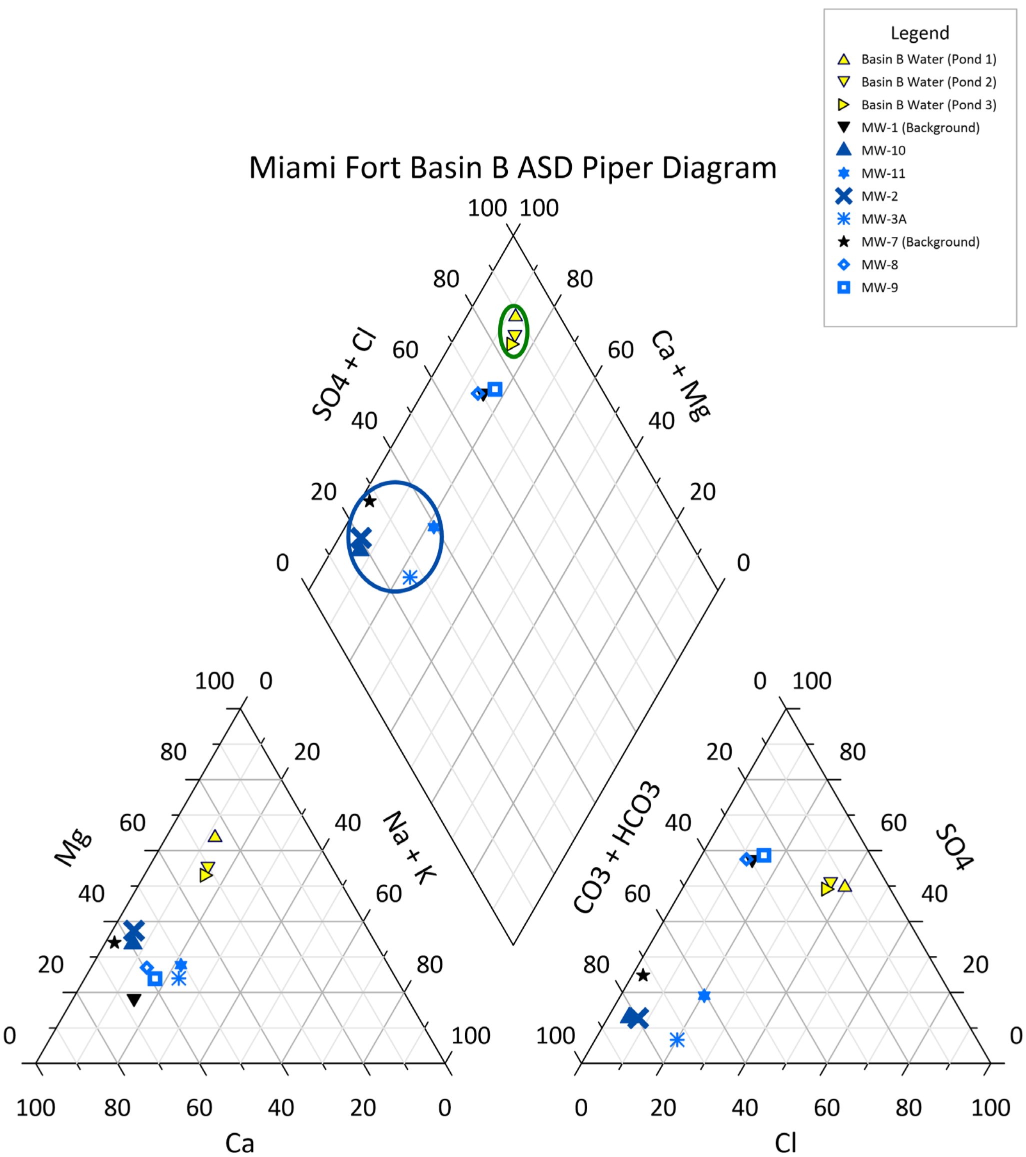


Figure 4. Piper diagram showing ionic composition of samples of Basin B water and groundwater

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.

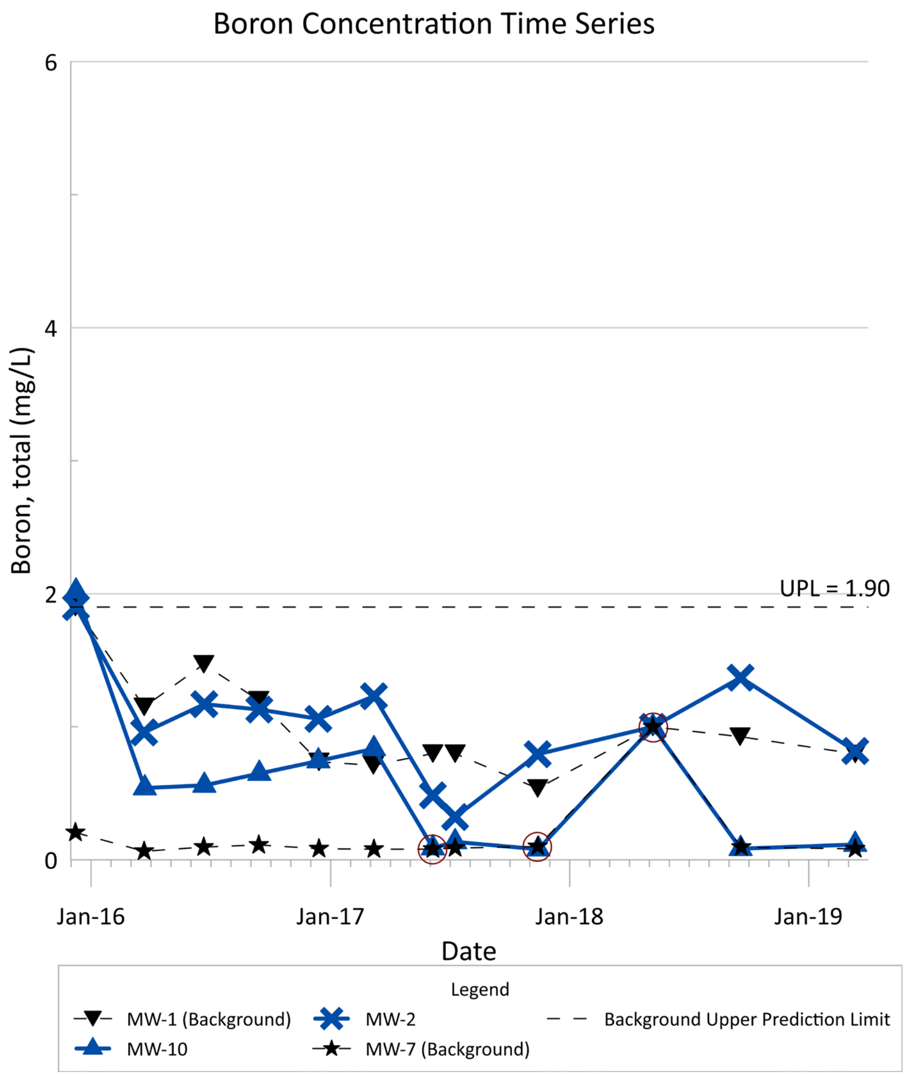


Figure 5. Boron concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10 *(note: non-detect analysis results for all wells are shown with red circles)*

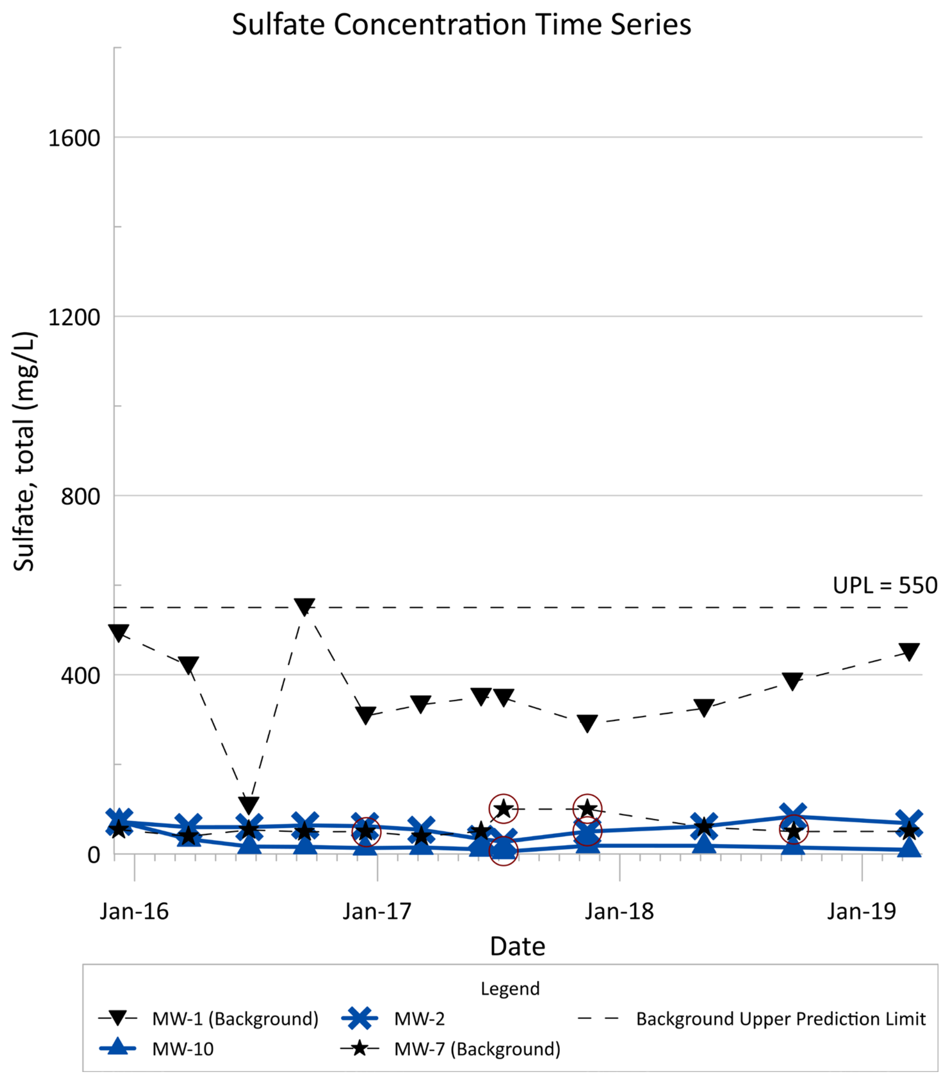


Figure 6. Sulfate concentration time-series for groundwater samples collected from monitoring wells MW-1 (background), MW-2, MW-7 (background), and MW-10 ***(note: non-detect analysis results for all wells are shown with red circles)***

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

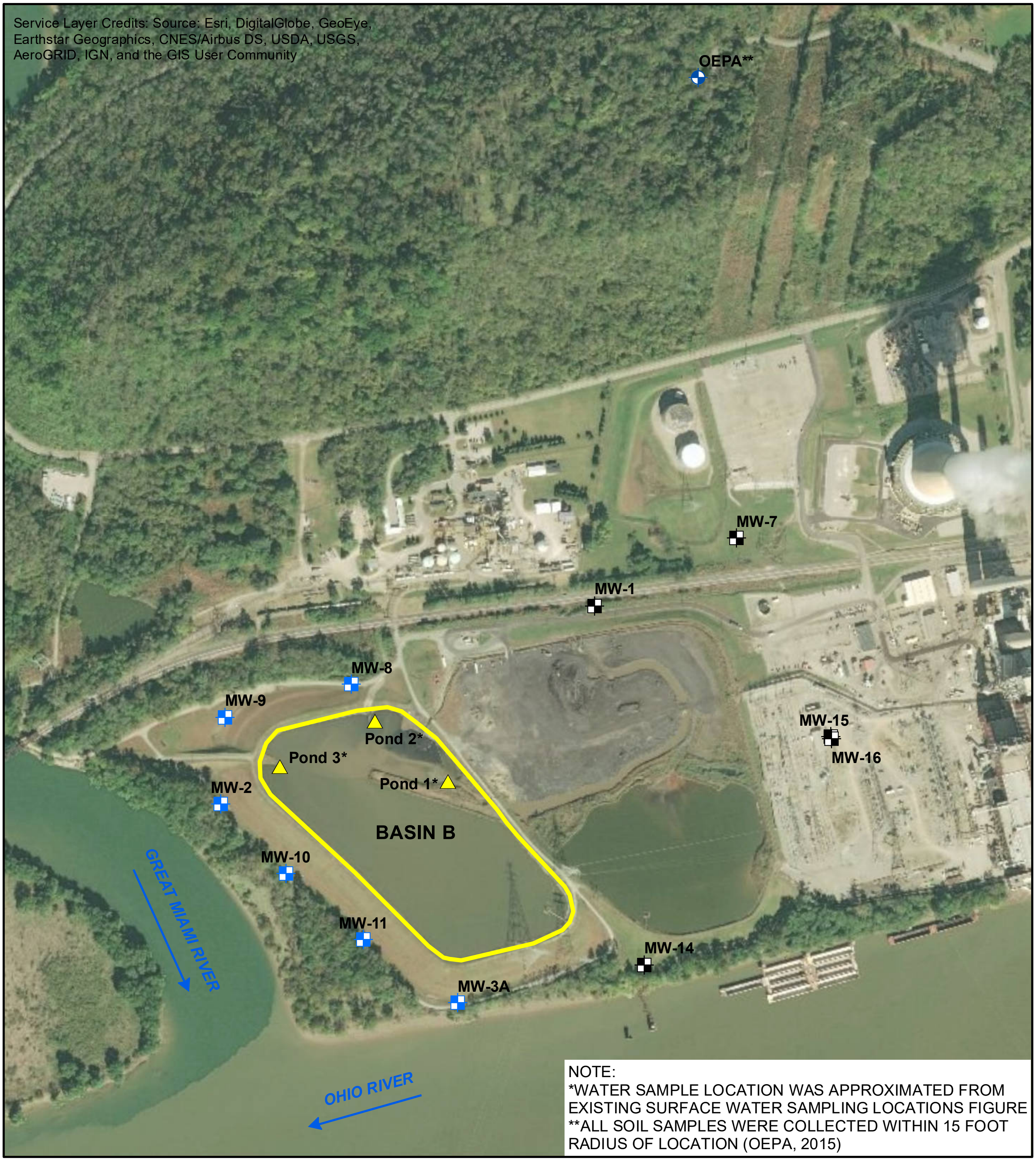
I, Richard H. Weber, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations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

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

Attachment A

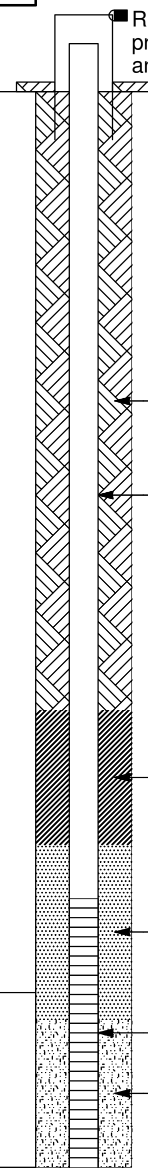
Boring Logs for Monitoring Wells MW-2, MW-3A, MW-10 and MW-11

DESCRIPTION OF SUBSURFACE MATERIALS

WELL CONSTRUCTION DETAIL

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

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.



LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded

URS

JOB NO. 14947868

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

MONITORING WELL MW-2

Project: Duke Energy	Monitoring Well
Project Location: Miami Fort Station	MW-3A
Project Number: 14948624	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	Samples: Blows per 1-foot Interval	Samples: Percent Recovery	MATERIAL DESCRIPTION
	0	12	83	Yellowish red CLAY TOPSOIL, moist Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
470		19	100	
		6	83	grades brownish yellow with increasing clay
465	5	3	100	Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist
		3	83	grades with increasing fine to medium sand, without organics, with iron staining grades with medium to coarse grained sand lenses, without staining
460	10	3	75	grades high plasticity, very moist to wet
		2	100	Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet
		1	100	
455	15	1	100	grades wet with increasing fine sand grades with fine grained sand lenses
		2	100	grades brown with increasing fine sand
450	20	2	100	
		2	100	grades with gray to reddish gray lenses, decreasing sand, without sand lenses
		**	100	grades gray, without gray to reddish gray lenses, medium plasticity grades high plasticity
445	25	3	100	grades with increasing sand grades with organics, sulphur odor, decreasing sand
		2	100	grades without sand, without odor grades with fine sand lenses, without organics
	30			

WELL CONSTRUCTION DETAILS

Riser with protective casing and locking cap

Bentonite/cement Grout

2" I.D. Schedule 40 PVC Riser

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

Monitoring Well MW-3A

Depth, feet	Elevation, feet	Sample Type	Blows per 1-foot Interval	Percent Recovery	Material Description
30–32		X	1	100	grades without sand, with trace organics
32–34	440	X	4	100	grades with sand, without organics
34–36		X	4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity; grades with increasing sand, without organics
36–38	435	X	3	100	grades with increasing silt, trace sand, very low plasticity, stiff
38–40		X	6	100	grades with sand, plastic, very soft; grades stiff, very low plasticity, very moist
40–42	430	X	4	100	grades with trace organcis, less sand, increasing silt
42–44		X	8	100	Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet
44–46		X	14	42	
46–48	425	X	7	100	
48–50		X	22	63	grades with increasing diameter gravel
50–52	420	X	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.

WELL CONSTRUCTION DETAILS

- Bentonite Seal
- Natural Collapse of Formation
- 2" I.D. Schedule 40 0.010" Slotted Screen

URS

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

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	
	5					2" I.D. Schedule 40 PVC Riser
465					Grades without gravel and more clay, very stiff, moist	
					Brown CLAY, with silt, medium stiff, moist	
	10		48			
460						
	15					
455						
					Brown SILT, with some clay and very fine sand, soft, moist	
			93		Grades with less silt and more fine sand	
	20				Brown fine SAND, with silt and clay, loose, soft, moist	
450						Bentonite/cement Grout
					Grades with less silt and clay	
	25					
445						
					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					

DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

AECOM

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

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** 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

Riser with protective casing and locking cap

2" I.D. Schedule 40 PVC Riser

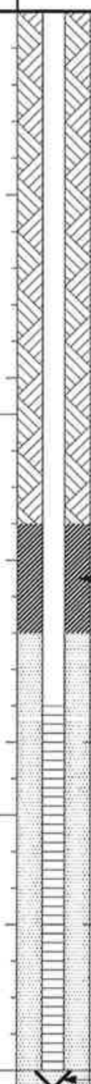
Bentonite/cement Grout

DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

AECOM

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					
					Grades brown and gray	Bentonite Seal
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**

Trend Analysis

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**

Trend Analysis

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

Intended for
Dynegy Miami Fort, LLC

Date
April 6, 2020

Project No.
74922

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

MIAMI FORT BASIN B

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

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
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 6, 2020

I, Nicole M. Pagano, 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.

____
Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 6, 2020

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ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
ft	feet
gpm	gallons per minute
GWPSs	Groundwater Protection Standards
IDNR	Indiana Division of Natural Resources
LOEs	lines of evidence
MCD	Miami Conservancy District
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
msl	above mean sea level North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OBG	O’Brien & Gere Engineers, Inc., part of Ramboll
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
ORP	oxidation-reduction potential
RCRA	Resource Conservation and Recovery Act
Site	Miami Fort Power Station
SI	Surface Impoundment
SSIs	Statistically Significant Increases
SSLs	Statistically Significant Levels
UPL	Upper Prediction Limit
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 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 [ASD]).

This ASD has been prepared on behalf of Dynegy Miami Fort, LLC, by O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Basin B located near North Bend, Ohio.

The most recent Assessment Monitoring sampling event (A2D) was completed on September 9 through September 10, 2019 and analytical data were received on October 31, 2019. Analytical data from all sampling events, from December 2015 through A2D, were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPSs. That evaluation identified one SSL 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 arsenic SSLs listed above. This ASD was completed by April 6, 2020, within 90 days of determination of the SSLs (January 6, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

Miami Fort Power Station (Site) is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River. Basin B is located in the southwest corner of the Site near the confluence (Figure 1).

2.2 Description of Basin B CCR Unit

Basin B is an unlined surface impoundment (SI) approximately 20 acres in size. Basin B was constructed between 1979 and 1981 (AECOM, 2017). The unlined SI Basin A CCR Unit, approximately 30 acres, lies immediately adjacent to and east of Basin B. The basins are bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Site electric switch yard to the east. Veolia's production wells are located northwest of Basin B and Site production wells are located east of Basin A (AECOM, 2017). Basin B CCR monitoring well locations, production well locations, and surface water sampling locations are shown in Figure 1.

2.3 Geology and Hydrogeology

The geologic units present beneath Basin B at the Site include fill, alluvial deposits, glacial outwash (Uppermost Aquifer) and bedrock, as described below:

- Fill Unit – (CCR within Basin B). The CCR consists primarily of bottom ash, fly ash, and other non-CCR waste streams. This unit also includes man made berms constructed of a variety of locally available materials.
- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits range in depth from approximately 20 to 60 feet below the present ground surface. A silty, sandy clay layer is the primary component of the alluvial deposits. The clay ranges in elevation from 428 feet (ft) above mean sea level North American Vertical Datum of 1988 (msl) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft msl beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Site and thickens towards the Ohio River. The clay is thickest beneath the southern half of Basin A and Basin B, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.
- Glacial Outwash (Uppermost Aquifer) - Deposits consisting of sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits is approximately 100 feet; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally on top of the outwash deposits and ranges in thickness from 4 ft to 30 ft; however, it is not present below the entirety of Basin A and Basin B.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 feet below ground surface (bgs) dependent on proximity to the edge of the valley wall north of the basins. Due to the

relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

The glacial outwash deposits (Uppermost Aquifer) underlying Basin B are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently back-filled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. Buried valley aquifers such as the Uppermost Aquifer are Ohio's most productive water-bearing formations. Estimates of transmissivity are in excess of 50,000 gallons per day per foot (USGS, 1997).

Regionally, yields for high-capacity wells in the Uppermost Aquifer range from 450 gallons per minute (gpm) to 3,000 gpm with one well tested as high as 6,000 gpm. (IDNR, 2006). The majority of the water withdrawn by high capacity wells near the Site is from induced flow from the Ohio River (ODNR, undated). The Site operates four production wells east-southeast of Basin A for cooling water. Pumping rates measured at the cooling water production wells range from 1,000 gpm to 1,500 gpm. Additionally. three production wells, located northwest of Basin B, are operated by Veolia for process (non-potable) water.

The aquifer receives most of its recharge from infiltration of precipitation on the valley floor; however, secondary recharge also comes from bank storage from the Great Miami River and Ohio River during flood stages. Recharge to the aquifer from bank storage is periodic and short-lived.

Groundwater elevations across the Site ranged from approximately 451 to 460 ft msl during A2D, coincident with an approximate Ohio River pool elevation of 455 ft msl. The groundwater elevation contours shown on Figure 2 are based on groundwater measurements collected on September 9, 2019, the first day of a combined sampling event at the Site for Basin A and Basin B. Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

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

1. Ionic composition of the groundwater at wells MW-2 and MW-10 is different than the ionic composition of surface water in Basin B, indicating that Basin B is not the source of the groundwater in these wells.
2. Naturally-occurring 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 mobilize naturally-occurring arsenic from the soils into groundwater.
3. Concentrations of CCR indicator parameters, boron and sulfate, are below the Upper Prediction Limit (UPL) at MW-2 and MW-10, and stable or decreasing, indicating that CCR is not the source of the observed detections.

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

3.1 LOE #1: Ionic Composition of the Groundwater at Wells MW-2 and MW-10 is Different Than the Ionic Composition of Surface Water in Basin B, Indicating that Basin B is Not the Source of the Groundwater in These Wells.

Piper diagrams graphically represent ionic composition of aqueous solutions. A Piper diagram displays the position of water samples with respect to their major cation and anion content on the two lower triangular portions of the diagram, providing the information which, when combined on the central, diamond-shaped portion of the diagram, identify composition categories or groupings (hydrochemical facies). Figure A, below, is a Piper diagram that displays the ionic composition of groundwater samples from background monitoring wells, downgradient monitoring wells (including MW-2 and MW-10 where SSLs of arsenic were detected), and Basin B water.

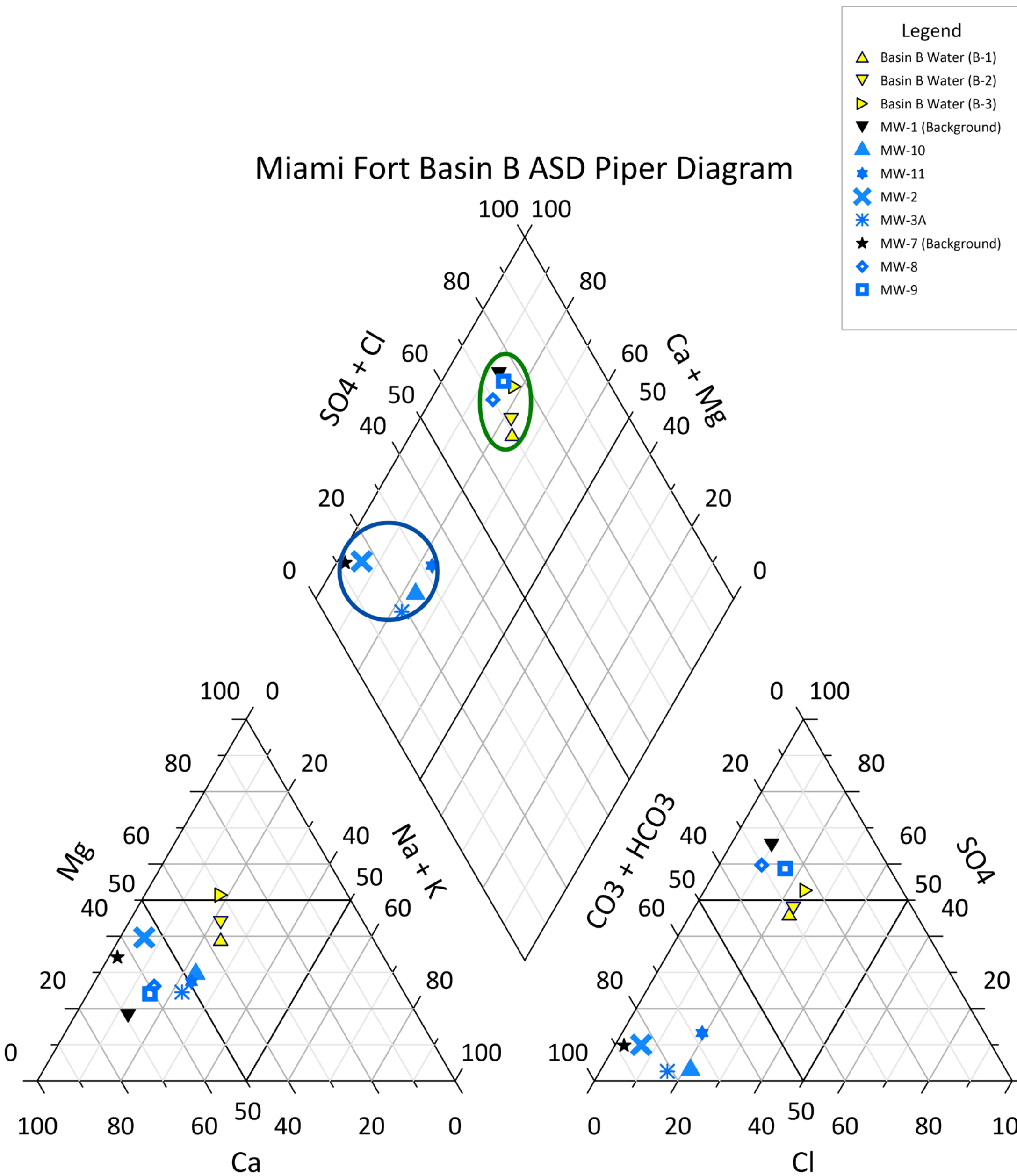

Figure A. Piper Diagram Showing Ionic Composition of Samples of Basin B Water and Groundwater

It is evident from the Piper diagram (Figure A) that Basin B water and upland monitoring wells MW-1 (background), MW-8 and MW-9 (green grouping) are in the calcium-sulfate hydrochemical facies. The remaining groundwater samples, including MW-2 and MW-10, and upgradient well MW-7 (blue grouping) are in the calcium-bicarbonate hydrochemical facies. Wells MW-2 and MW-10 share similar characteristics to both background and downgradient water composition. The dissimilarity between Basin B water and downgradient groundwater collected from monitoring wells MW-2 and MW-10 suggests that the Basin B water is not the source of groundwater impacts (elevated arsenic concentrations) at these monitoring wells.

3.2 LOE #2: Naturally-Occurring 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 Mobilize Naturally-Occurring Arsenic from the Soils into Groundwater.

Naturally-occurring 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 (Figure 1), 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). 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).

Arsenic occurs naturally in southwestern Ohio glacial buried-valley deposit aquifers like the Uppermost Aquifer. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to increase understanding of arsenic occurrence 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 (greater than or equal to 10 micrograms per liter [μg/L]) 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), indicating the potential for the reduction of arsenic-bearing iron oxides present in soil.

Based on previous studies discussed above, naturally-occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer) 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 indicating the potential for arsenic mobilization are likely to occur at Basin B monitoring wells MW-2 and MW-10, where arsenic SSLs were determined, as indicated by the following factors discussed below:

- 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.
- Dissolved iron concentrations present in groundwater at monitoring well MW-2 correlate with dissolved arsenic concentrations.

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, and 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 Appendix 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 the low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, and MW-11 (presented in Figure B below; monitoring wells adjacent to the riverbank are illustrated with solid lines, upland wells are illustrated with dashed lines).

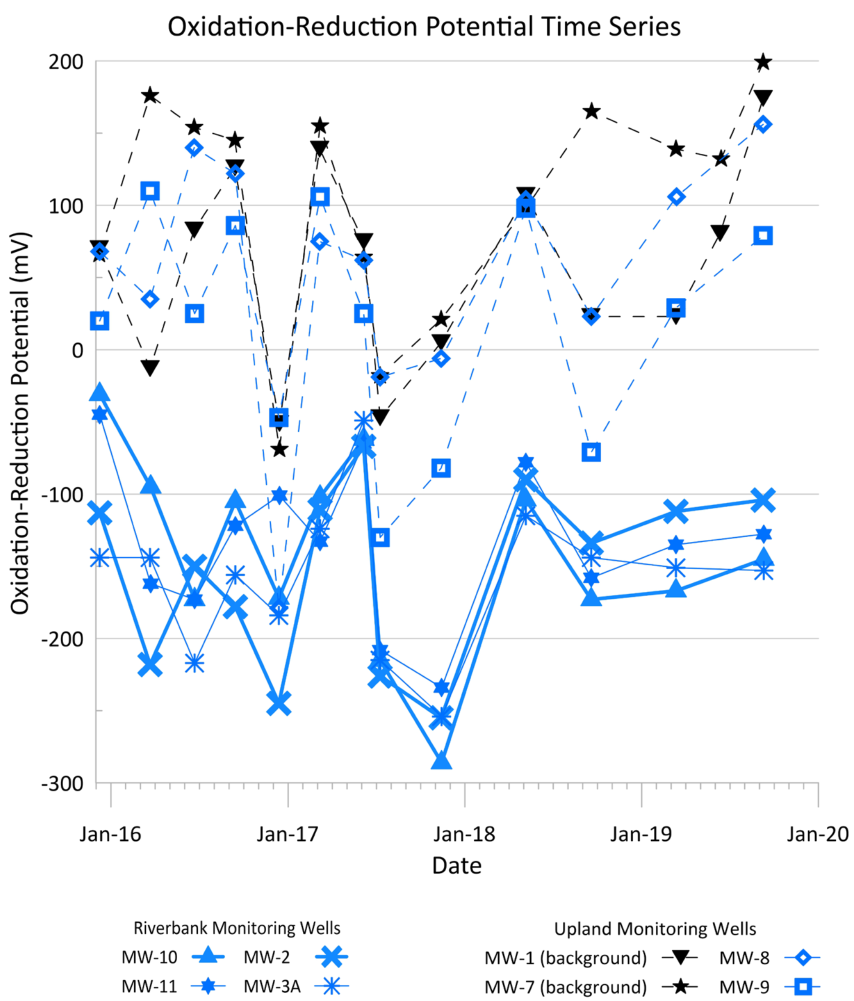

Figure B. Oxidation Reduction Potential Time-Series for Groundwater Samples (MW-1 (Background), MW-2, MW-3A, MW-7 (Background), MW-8, MW-9, MW-10, and MW-11; Monitoring Wells Adjacent to the Riverbank are Illustrated with Solid Lines, Upland Wells are Illustrated with Dashed Lines)

Available data indicated that concentrations of dissolved iron observed in groundwater at monitoring well MW 2 from 2008 to 2014 correlate with dissolved arsenic concentrations. Dissolved iron concentrations ranged from 11.8 to 52.1 mg/L, at least an order of magnitude greater than the 1 mg/L reported by the USGS as being indicative of iron-reducing geochemical conditions. Figure C below illustrates the relationship between dissolved iron concentrations and dissolved arsenic concentrations in groundwater at MW-2, where the coefficient of determination (R-squared) is 0.87.

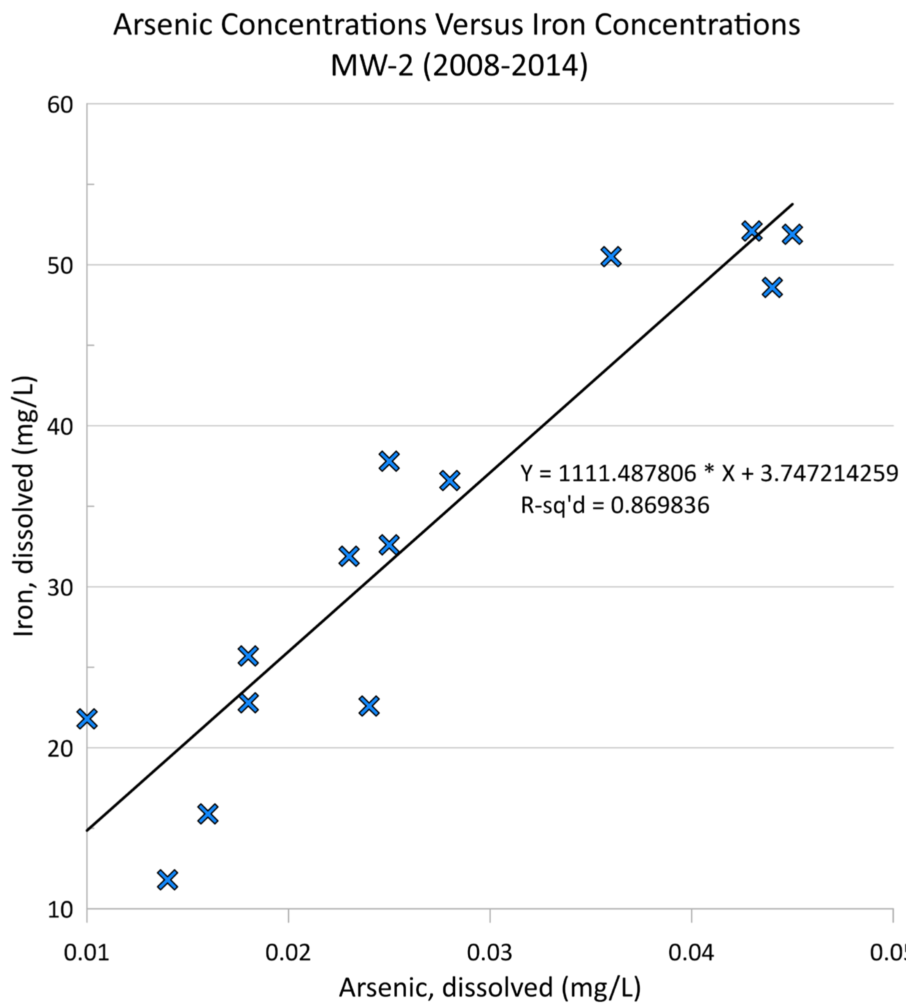

Figure C. Arsenic Concentrations Versus Iron Concentrations at Well MW-2 (2008-2014)

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 from soil to groundwater indicate 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.

3.3 LOE #3: Concentrations of CCR Indicator Parameters, Boron and Sulfate, are Below the Upper Prediction Limit (UPL) at MW-2 and MW-10, and Stable or Decreasing, Indicating that CCR is Not the Source of the Observed Detections.

The time-series plots below (Figure D and Figure E) illustrate the concentrations of primary CCR indicator parameters boron and sulfate relative to UPLs (i.e. statistically significant increase [SSI] limits established using background monitoring wells [MW-1 and MW-7]) at downgradient monitoring wells MW-2 and MW-10.

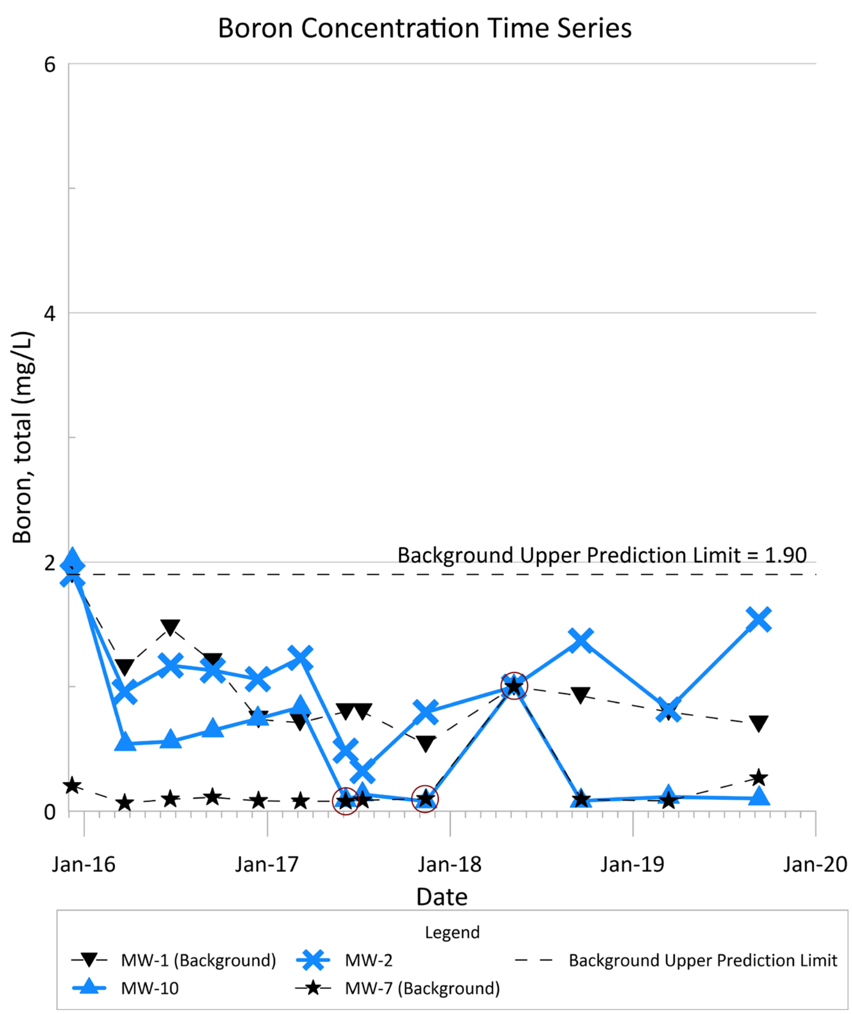

Figure D. Boron Concentration Time-Series for Groundwater Samples Collected from Monitoring Wells MW-1 (Background), MW-2, MW-7 (Background), and MW-10 (note: non-detect analysis results for all wells are shown with red circles)

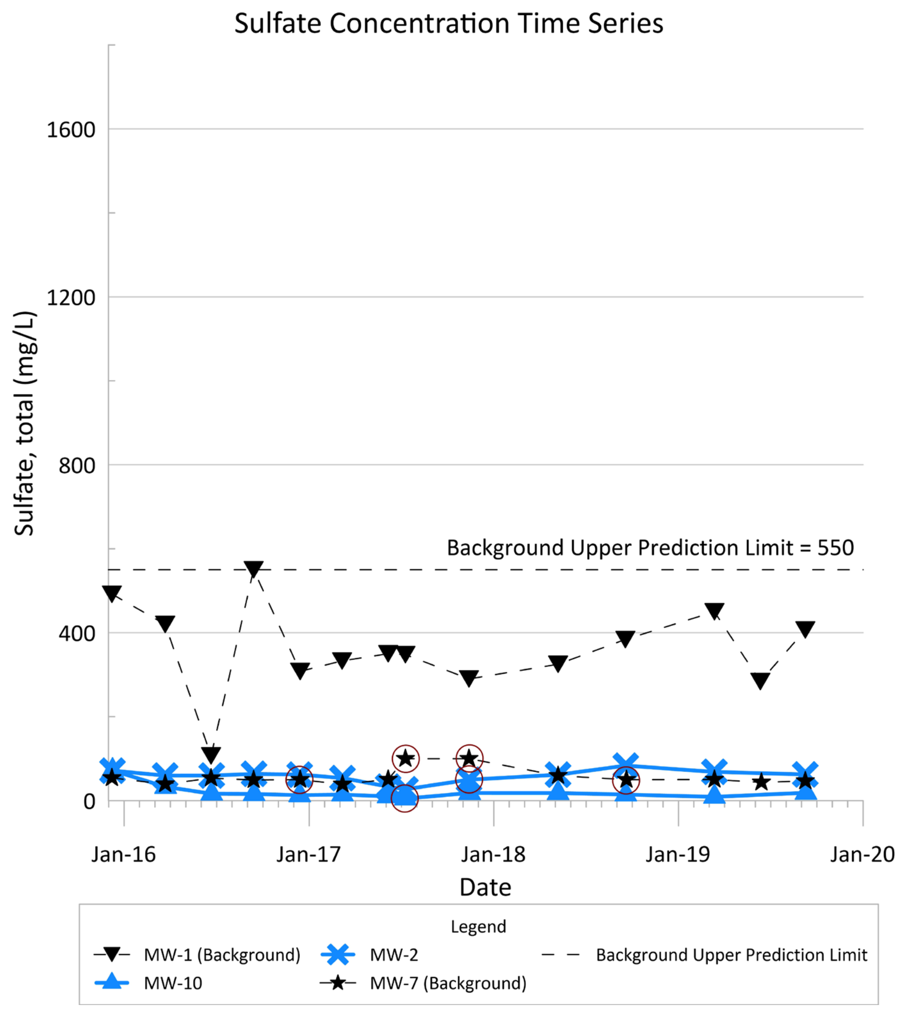

Figure E. Sulfate Concentration Time-Series for Groundwater Samples Collected from Monitoring Wells MW-1 (Background), MW-2, MW-7 (Background), and MW-10 (note: non-detect analysis results for all wells are shown with red circles)

Boron concentrations in well MW-2 ranged from 0.322 to 1.9 mg/L between December 2015 and September 2019 with a median concentration of 1.06 mg/L (Table A below), and were below the UPL for boron of 1.9 mg/L following the first sampling event in December 2015 as shown in Figure D above. Boron concentrations in well MW-10 ranged from non-detectable levels (less than 0.08 mg/L) to 2.02 mg/L with a median concentration of 0.54 mg/L (Table A below) during the same time period and were below the UPL for boron following the first sampling event in December 2015 as shown in Figure D.

Table A – Summary Statistics and Mann-Kendall Trend Analysis Results for Boron in Groundwater at MW-2 and MW-10 (December 2015 to September 2019).

Monitoring Well	Boron (mg/L)			
	Minimum	Maximum	Median	Mann-Kendall Trend Analysis Result
MW-2	0.322	1.9	1.06	None
MW-10	<0.08	2.02	0.54	Downward

Sulfate concentrations in well MW-2 ranged from 27.1 to 83.5 mg/L between December 2015 and September 2019 with a median concentration of 61.8 mg/L (Table B below), and were below the UPL for sulfate of 550 mg/L as shown in Figure E above. Sulfate concentrations in well MW-10 ranged from non-detect (less than 5.0 mg/L) to 72 mg/L with a median concentration of 15.8 mg/L (Table B below) during the same time period and were below the UPL for sulfate as shown in Figure E.

Table B – Summary Statistics and Mann-Kendall Trend Analysis Results for Sulfate in Groundwater at MW-2 and MW-10 (December 2015 to September 2019).

Monitoring Well	Sulfate (mg/L)			
	Minimum	Maximum	Median	Mann-Kendall Trend Analysis Result
MW-2	27.1	83.5	61.8	None
MW-10	<5.0	72	15.8	None

Mann-Kendall trend analyses were performed to determine whether the concentration trends for boron (Table A above) and sulfate (Table B above) at downgradient wells MW-2 and MW-10 are statistically significant at the 95% confidence level. A decreasing trend in boron at MW-10 was determined to be statistically significant; no other trends were determined to be statistically significant and are stable.

Basin B is not impacting the groundwater at monitoring wells MW-2 and MW 10 as indicated by the absence of impacts from primary CCR indicator parameters boron and sulfate, where boron and sulfate concentrations are below their respective UPLs, and trends are stable or decreasing.

4. CONCLUSIONS

Based on the following three lines of evidence, it has been demonstrated that the arsenic SSLs at MW-2 and MW-10 are not due to Miami Fort Basin B but are from a source other than the CCR unit being monitored:

1. Ionic composition of the groundwater at wells MW-2 and MW-10 is different than the ionic composition of surface water in Basin B, indicating that Basin B is not the source of the groundwater in these wells.
2. Naturally-occurring 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 mobilize naturally-occurring arsenic from the soils into groundwater.
3. Concentrations of CCR indicator parameters, boron and sulfate, are below the Upper Prediction Limit (UPL) at MW-2 and MW-10, and stable or decreasing, indicating that CCR is not the source of the observed detections.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSLs observed during the A2D sampling event was not due to Basin B. Therefore, a corrective measures assessment is not required and Miami Fort Basin B will remain in assessment monitoring.

5. REFERENCES

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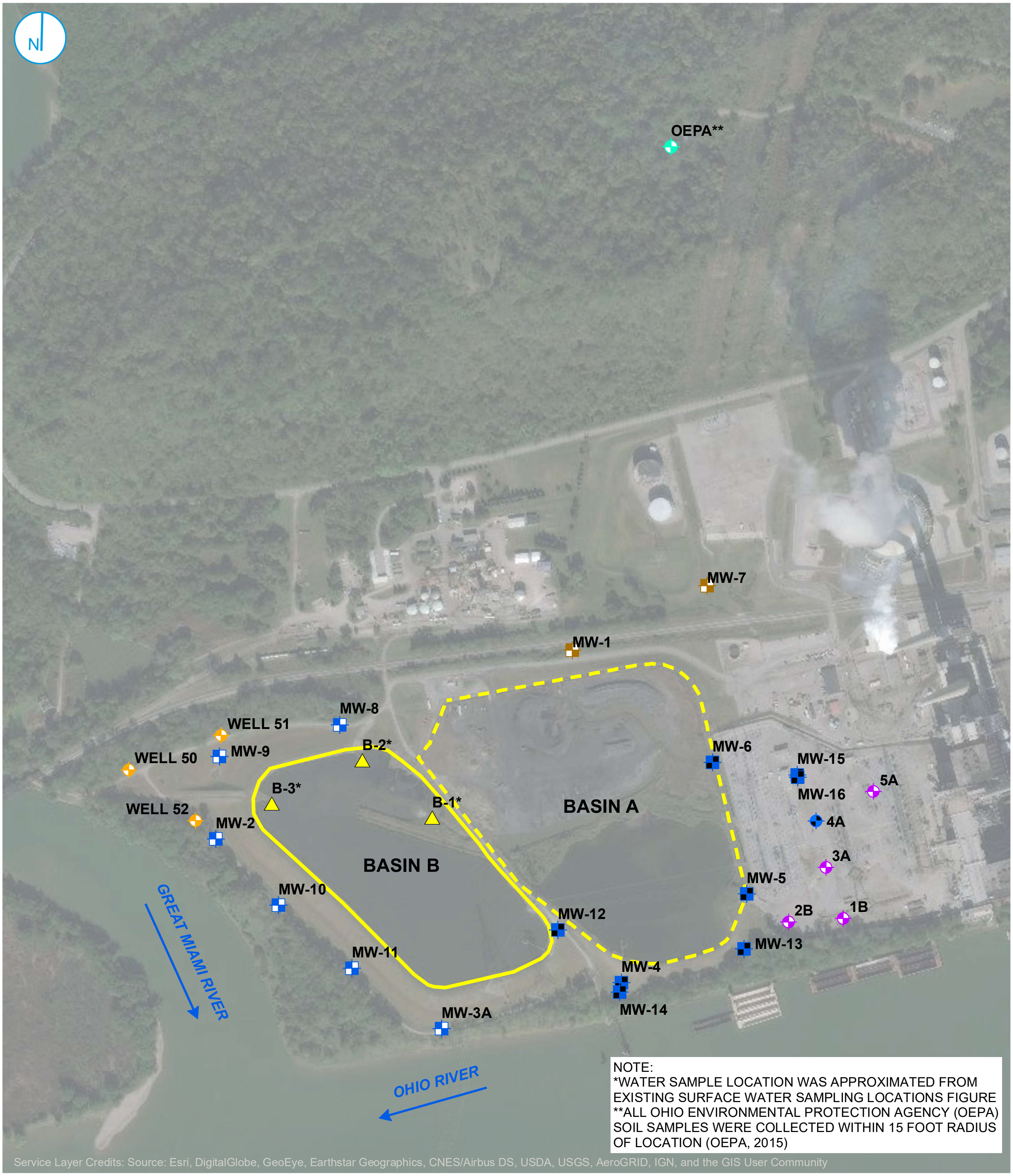
FIGURES



Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\Figure 1_Monitoring Well and Sampling Locations.mxd

PROJECT: 169000XXXX | DATED: 3/25/2020 | DESIGNER: galarnmc

BASIN B CCR MONITORING WELL LOCATION
BASIN A CCR MONITORING WELL LOCATION
PRODUCTION WELL AND BASIN A CCR MONITORING LOCATION
BASIN A AND BASIN B BACKGROUND CCR MONITORING WELL LOCATION
BASIN B WATER SAMPLE LOCATION
OEPA SOIL SAMPLE LOCATION
PRODUCTION WELL
VEOLIA PRODUCTION WELL
BASIN B UNIT BOUNDARY
BASIN A UNIT BOUNDARY

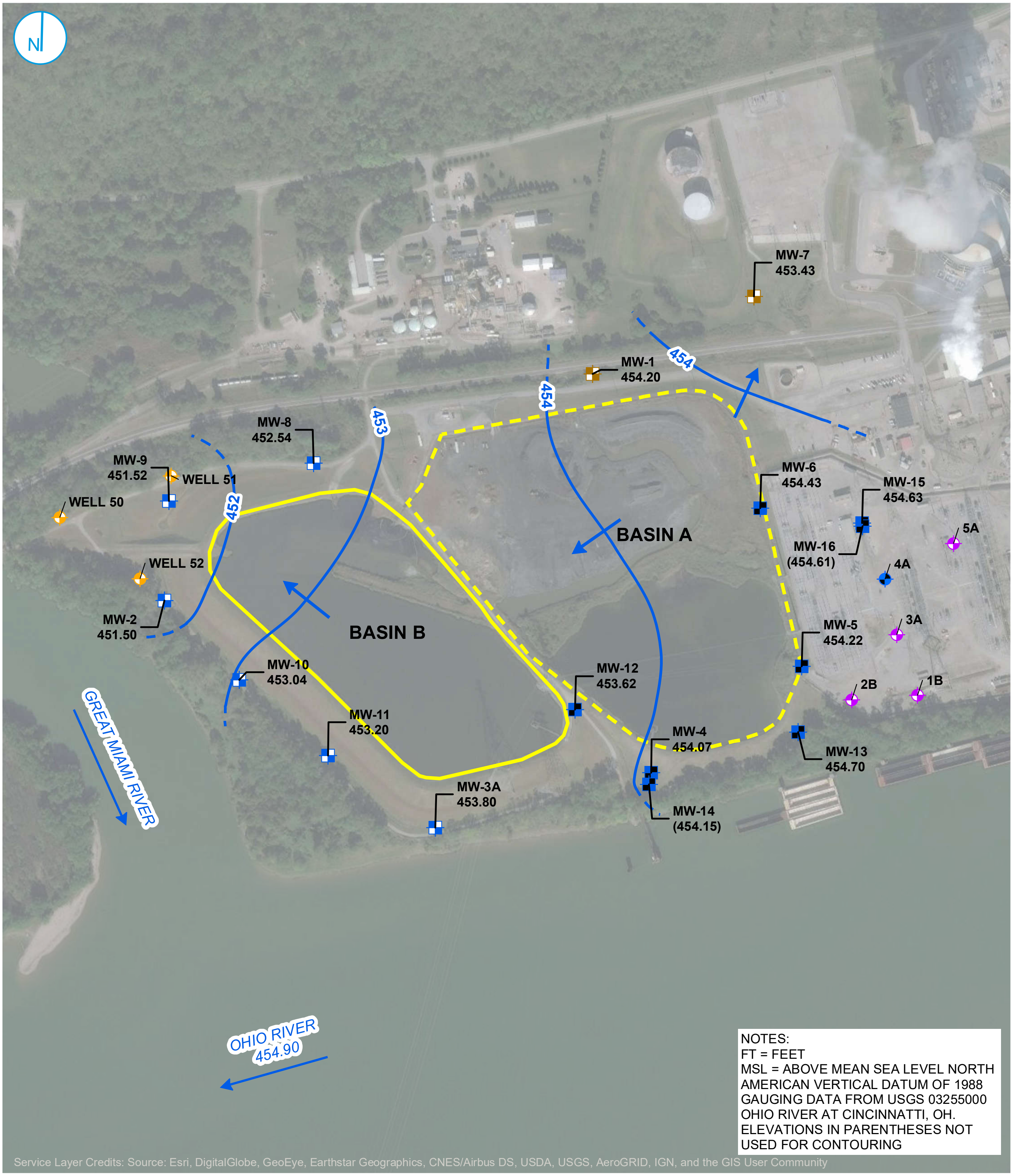
0 300 600 Feet

MONITORING WELL AND SAMPLING LOCATION MAP

FIGURE 1

MIAMI FORT BASIN B (UNIT ID:112)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\Figure 2_GW Elev Contour Map.mxd

PROJECT: 169000XXXX | DATED: 3/25/2020 | DESIGNER: galarnmc

BASIN B CCR MONITORING WELL LOCATION
BASIN A CCR MONITORING WELL LOCATION
PRODUCTION WELL AND BASIN A CCR MONITORING LOCATION
BASIN A AND BASIN B BACKGROUND CCR MONITORING WELL LOCATION
PRODUCTION WELL
VEOLIA PRODUCTION WELL
GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, FT MSL)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
BASIN B UNIT BOUNDARY
BASIN A UNIT BOUNDARY

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 9, 2019

MIAMI FORT BASIN B (UNIT ID:112)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 2

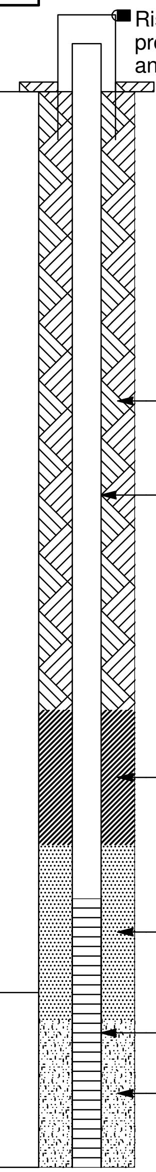
RAMBOLL US CORPORATION
A RAMBOLL COMPANY

APPENDIX 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		
				grades brownish yellow to brown, without organics
15				
		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:

(symbol)	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

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

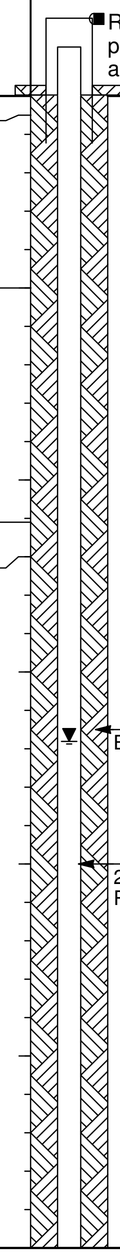
MONITORING WELL
MW-2

Project: Duke Energy **Project Location:** Miami Fort Station **Project Number:** 14948624	# Monitoring Well MW-3A 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	SAMPLES: Type	SAMPLES: Blows per 1-foot Interval	SAMPLES: Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		12	83		Yellowish red CLAY TOPSOIL, moist
470						Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
			19	100		
			6	83		grades brownish yellow with increasing clay
	5					Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist
465			3	100		
						grades with increasing fine to medium sand, without organics, with iron staining
			3	83		grades with medium to coarse grained sand lenses, without staining
	10					grades high plasticity, very moist to wet
			3	75		
460						Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet
			2	100		Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet
			1	100		
	15					grades wet with increasing fine sand
455			1	100		
						grades with fine grained sand lenses
			2	100		grades brown with increasing fine sand
	20		2	100		
450						
			2	100		grades with gray to reddish gray lenses, decreasing sand, without sand lenses
						grades gray, without gray to reddish gray lenses, medium plasticity
			**	100		grades high plasticity
	25					grades with increasing sand
445			3	100		
						grades with organics, sulphur odor, decreasing sand
			2	100		grades without sand, without odor grades with fine sand lenses, without organics
	30					

WELL CONSTRUCTION DETAILS



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

URS

Project: Duke Energy	Monitoring Well MW-3A
Project Location: Miami Fort Station	Sheet 2 of 2
Project Number: 14948624	

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Blows per 1-foot Interval	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
440	30	X	1	100	grades without sand, with trace organics	
		X	4	100	grades with sand, without organics	
435	35	X	4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity grades with increasing sand, without organics	
		X	3	100		Bentonite Seal
		X	6	100	grades with increasing silt, trace sand, very low plasticity, stiff grades with sand, plastic, very soft grades stiff, very low plasticity, very moist	
430	40	X	4	100	grades with trace organcis, less sand, increasing silt	
		X	8	100		
		X	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	X	7	100		Natural Collapse of Formation 2" I.D. Schedule 40 0.010" Slotted Screen
		X	22	63	grades with increasing diameter gravel	
420	50	X	13	50		
	52				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					

URS

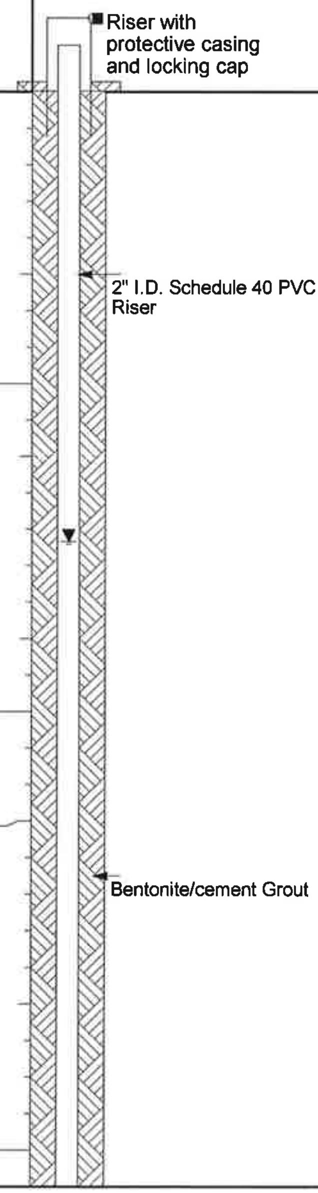
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

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
	5				
465					Grades without gravel and more clay, very stiff, moist
					Brown CLAY, with silt, medium stiff, moist
	10		48		
460					
	15				
455					
					Brown SILT, with some clay and very fine sand, soft, moist
			93		Grades with less silt and more fine sand
	20				Brown fine SAND, with silt and clay, loose, soft, moist
450					
					Grades with less silt and clay
	25				
445					
					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	Monitoring Well
Project Location: Miami Fort Station	MW-10
Project Number: 60442412	Sheet 2 of 2

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	**Monitoring Well**
Project Location: Miami Fort Station	**MW-11**
Project Number: 60442412	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
					Brown with red mottled fine SAND, soft, moist
	5				
					Dark gray SILT with some clay, stiff, moist, trace organci matter
465					
					Grades with more clay
					Gray and brown CLAY, with some silt, soft, moist
	10		42		
					Gray and brown SILT, with fine sand and some clay, soft, moist
460					
	15				
					Grades with less clay
455					
			56		
	20				Grades gray without clay
450					
					Gray very fine SAND with silt, soft, moist
	25				
445					
			53		
	30				Grades with dark gray and black wood fragments

WELL CONSTRUCTION DETAILS

- Riser with protective casing and locking cap
- 2" I.D. Schedule 40 PVC Riser
- Bentonite/cement Grout

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

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					
					Grades brown and gray	Bentonite Seal
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					

DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

AECOM

Intended for
Dynegy Miami Fort, LLC

Date
November 12, 2020

Project No.
1940074922

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

MIAMI FORT POND SYSTEM

Bright ideas. Sustainable change.

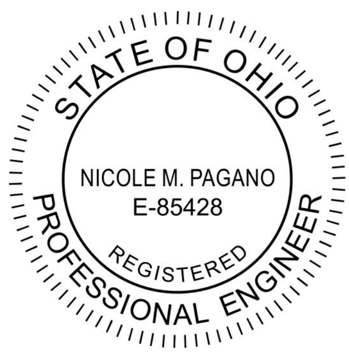
CERTIFICATIONS

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
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

I, Nicole M. Pagano, 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.

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020



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CONTENTS

FIGURES (IN TEXT)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
CMP	corrugated metal pipe
FGD	Flue Gas Desulfurization
f/k/a	formerly known as
ft	feet
GWPS	Groundwater Protection Standards
HDPE	high density polyethylene
LOEs	lines of evidence
MCD	Miami Conservancy District
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OEPA	Ohio Environmental Protection Agency
ORP	oxidation-reduction potential
Ramboll	Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
RCRA	Resource Conservation and Recovery Act
Site	Miami Fort Power Station
SSIs	Statistically Significant Increases
SSLs	Statistically Significant Levels
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 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 (GWPS) 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 [ASD]).

This ASD has been prepared on behalf of Dynegy Miami Fort, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc.(Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Pond System located near North Bend, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 6 through April 7, 2020 and analytical data were received on May 4, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPS. That evaluation identified the following SSLs at downgradient monitoring wells:

- Arsenic at wells MW-2, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

In accordance with the Statistical Analysis Plan, wells MW-13 and 4A were resampled on June 12, 2020 and analyzed only for arsenic and cobalt, respectively, to confirm the SSLs. Following evaluation of analytical data from the resample event, the SSLs listed above for MW-13 and 4A were confirmed.

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence (LOEs) demonstrate that sources other than the Miami Fort Pond System were the cause of the arsenic and molybdenum SSLs listed above. This ASD was completed by November 2, 2020, within 90 days of determination of the SSLs (August 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii). This ASD does not address cobalt SSLs at downgradient monitoring wells MW-4 and 4A which is addressed by the Corrective Measures Assessment for the Pond System.

2. BACKGROUND

2.1 Site Location and Description

Miami Fort Power Station (Site) is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River (Figure 1). The Miami Fort Pond System (Pond System) is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Miami Fort electric switch yard to the east. The Miami Fort production wells are located east of Basin A and Veolia's production wells are located northwest of Basin B. Pond System CCR monitoring well locations, production well locations, and source water sampling locations are shown in Figure 1.

2.2 Description of the CCR Multi-Unit

The Pond System is a CCR Multi-Unit consisting of Basins A and B (CCR Multi-Unit ID 115). The Multi-Unit covers a total area of approximately 51 acres and is located in the southwest corner of the Site property as shown in Figure 1.

Basin A (formerly Unit 111) receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization (FGD) effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The Basin A normal pool level is typically between elevations of 495 and 498 ft. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert sliplined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM, 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the permitted outfall structure in Basin B. Miscellaneous yard drainage is also currently discharged directly to Basin B (AECOM, 2017).

2.3 Geology and Hydrogeology

The native geologic materials present beneath the Pond System at the Site include alluvial deposits, glacial outwash (Uppermost Aquifer), and bedrock, as described below:

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits are present at a depth ranging from approximately 20 to 60 ft below ground surface (bgs). A silty, sandy clay layer is the primary component of the alluvial deposits. The top of clay elevation ranges from 428 ft referenced to the North American Vertical Datum of 1988 (NAVD88) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Pond System and thickens towards the Ohio River. The clay is thickest beneath the southern half of the

Pond System, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.

- Glacial Outwash (Uppermost Aquifer) - The Uppermost Aquifer consists of glacial outwash sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits beneath the Site is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally overlying the outwash deposits and ranges in thickness from 4 to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel, and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 ft and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence.

Groundwater elevations across the Site ranged from approximately 456 to 460 ft during A3, coincident with an approximate Ohio River pool elevation of 461 ft. The groundwater elevation contours shown on Figure 2 are based on groundwater measurements collected on April 6, 2020, the day prior to A3 analytical sampling. Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following LOEs:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

These LOEs are described and supported in greater detail below. Monitoring wells and Pond System source water sample locations are shown on Figure 1.

3.1 LOE #1: Median Arsenic and Molybdenum Concentrations in the Pond System Source Water Are Lower Than the Median Arsenic and Molybdenum Concentrations Observed in Downgradient Wells with Arsenic and Molybdenum SSLs.

Box-and-whisker plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of (*i.e.*, below and above the box). The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers. The number in parentheses below each plot is the number of observations (i.e. samples) represented in that dataset.

Figure A below provides a box-and-whisker plot of the total arsenic concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2, and B-3 (monitoring well and source water [pond] sampling locations are shown on Figure 1). Total arsenic concentrations obtained in source water samples and presented in Figure A were pooled to provide a median concentration for comparison to arsenic concentrations in monitoring wells.

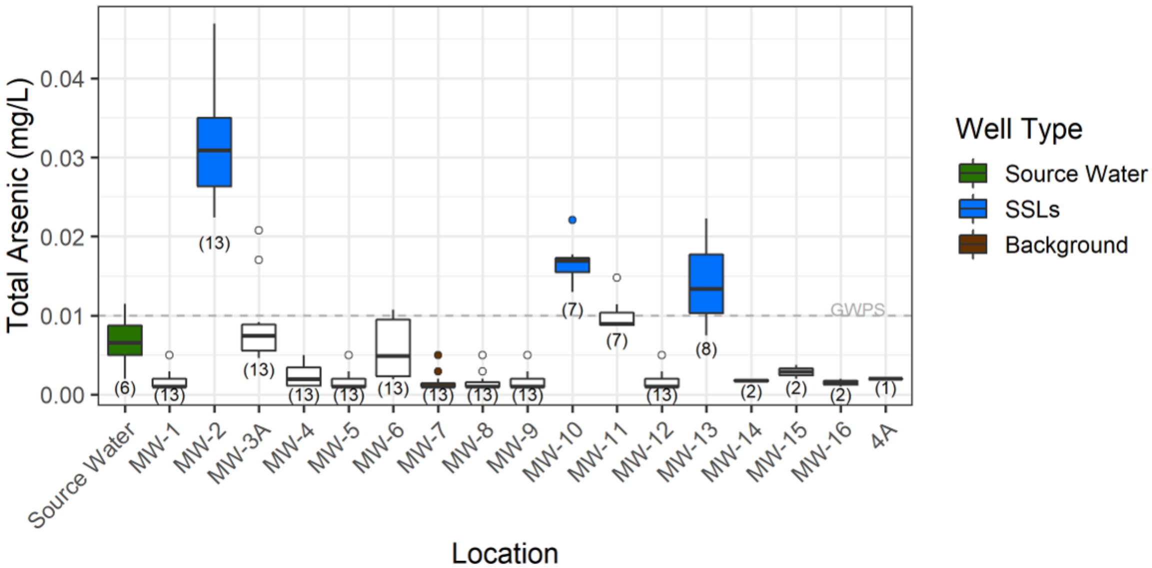

Figure A. Distribution of Arsenic Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure A) shows the arsenic concentrations in wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13) have median arsenic concentrations greater than the median arsenic concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of arsenic in downgradient groundwater at wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13), Pond System source water concentrations would be higher than the groundwater concentrations at those wells. Therefore, the Pond System is not the source of the arsenic in the downgradient groundwater.

Figure B below provides a box-and-whisker plot of the molybdenum concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2 and B-3 (monitoring well and source water sampling locations are shown on Figure 1).

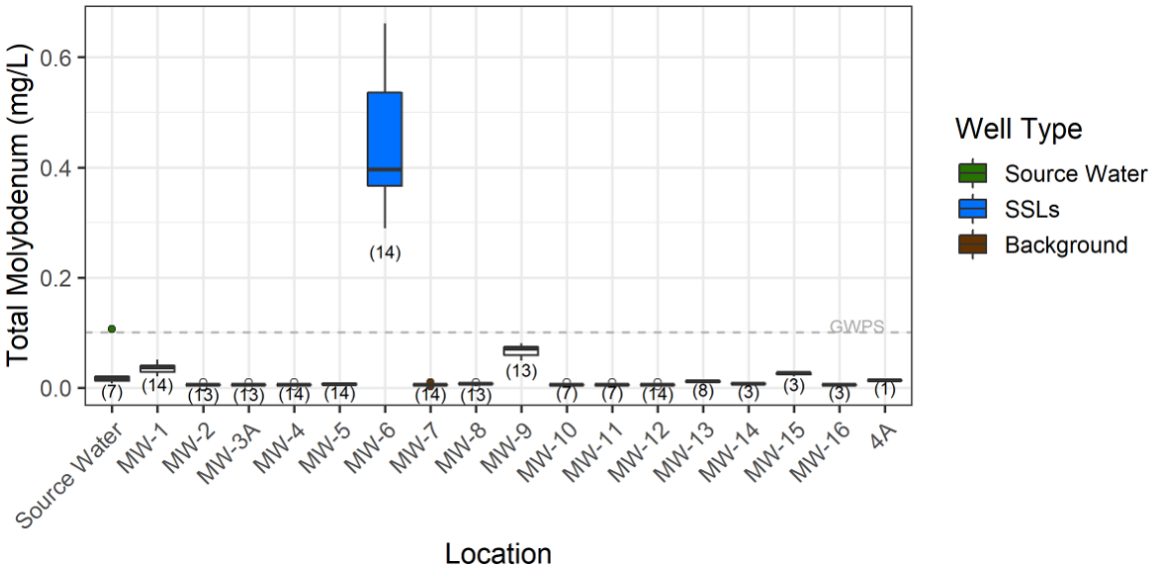

Figure B. Distribution of Molybdenum Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure B) shows the median molybdenum concentration in the well with a molybdenum SSL (*i.e.*, MW-6) is greater than the median molybdenum concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of molybdenum in downgradient groundwater at the well with a molybdenum SSL (*i.e.*, MW-6), Pond System source water concentrations would be higher than the groundwater concentrations at that well. Therefore, the Pond System is not the source of the molybdenum in the downgradient groundwater.

3.2 LOE #2: Arsenic and Molybdenum Concentrations Associated with Monitoring Wells MW-2, MW-10 and MW-13, and MW-6, respectively, are Not Correlated with Boron Concentrations, a Common Indicator for CCR Impacts to Groundwater.

Boron is a common indicator of CCR impacts to groundwater due to its leachability from CCR and mobility in groundwater. If a CCR constituent is identified as an SSL but boron is not correlated with that constituent, it is unlikely that the CCR unit is the source of the SSL.

Figure C below provides a scatter plot of arsenic versus boron concentrations (collected between 2015 and 2020) in downgradient groundwater at wells with arsenic SSLs, along with the results of a Kendall correlation test for non-parametric data. The results of the test at each well are described by the p-value and tau (Kendall's correlation coefficient) included in each plot. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship. The range of tau falls between -1 and 1, with a perfect correlation equal to -1 or 1. The closer tau is to 0, the less of a correlation exists in the data.

The results of the correlation analyses indicated that groundwater concentrations of arsenic observed at monitoring wells MW 2, MW-10, and MW-13 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure C below illustrates the lack of a relationship between arsenic concentrations and boron concentrations in groundwater at MW-2, MW-10, and MW-13, where the p-values are greater than 0.05 and tau is close to 0.

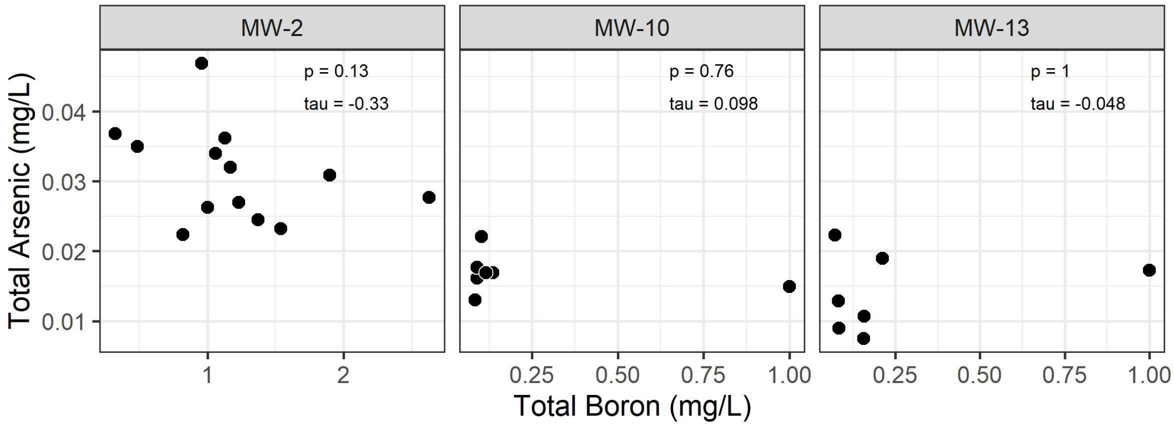

Figure C. Arsenic Concentrations Versus Boron Concentrations at Wells MW-2, MW-10, and MW-13 (2015-2020).

Figure D below provides a scatter plot of molybdenum versus boron concentrations (collected between 2015-2020) in downgradient groundwater at the only well with a molybdenum SSL, MW-6, along with the results of Kendall correlation analysis at MW-6 as described by the p-values and tau correlation coefficients included in the plot. The results of the Kendall correlation analysis indicated that groundwater molybdenum concentrations observed at monitoring well MW-6 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure D below illustrates the lack of a relationship between molybdenum concentrations and boron concentrations in groundwater at MW-6, where the p-value is greater than 0.05 and tau is close to 0.

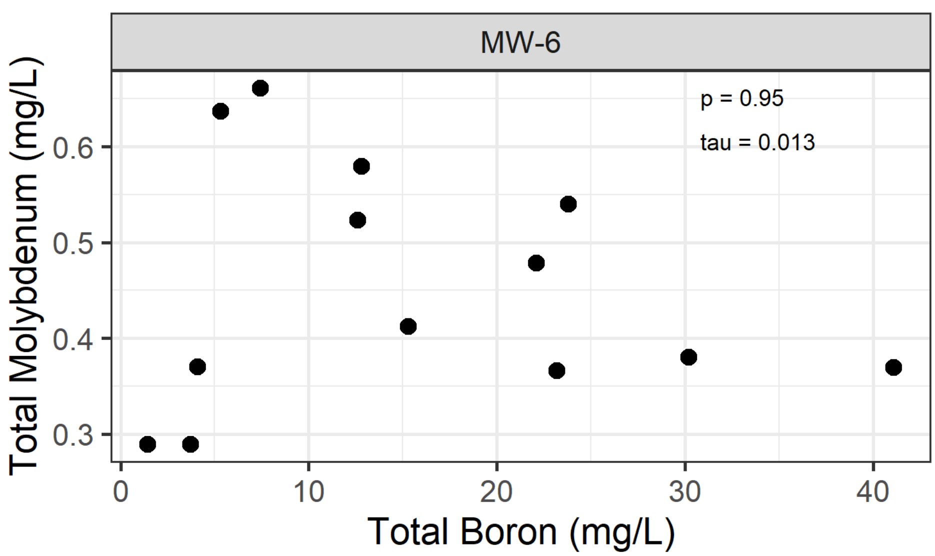

Figure D. Molybdenum Concentrations Versus Boron Concentrations at Well MW-6 (2015-2020).

Arsenic and molybdenum concentrations do not correlate with boron concentrations in downgradient monitoring wells with arsenic and molybdenum SSLs, indicating the Pond System is not the source of CCR constituents detected in the downgradient monitoring wells.

3.3 LOE #3: Naturally-Occurring Concentrations of Arsenic are Commonly Found in Soils and Groundwater in Southwestern Ohio. MW-2, MW-10, and MW-13 are Located in Southwestern Ohio, Along the Banks of the Great Miami River and Ohio River, Where They are Susceptible to Geochemical Conditions that can Mobilize Naturally-Occurring Arsenic from the Soils into Groundwater.

Naturally-occurring concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 ft bgs) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 ft northeast of the Pond System (Figure 1), 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). Results of the analysis indicated surficial terrace soils (clay) adjacent to the Pond System have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg).

Arsenic occurs naturally in southwestern Ohio glacial buried-valley deposit aquifers like the Uppermost Aquifer. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to increase understanding of arsenic occurrence in southwest Ohio (Thomas et al., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposits 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 (greater than or equal to 10 micrograms per liter [μg/L]) 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), indicating the potential for the reduction of arsenic-bearing iron oxides present in soil.

Based on previous studies discussed above, naturally-occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer) as the Pond System. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 ft northeast) to the Pond System. 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 indicating the potential for arsenic mobilization are likely to occur at the Pond System monitoring wells MW-2, MW-10, and MW-13, where arsenic SSLs were determined, as indicated by the following factors discussed below:

- Most riverbank boring logs indicate organic materials are present in the soils.
- MW-2, MW-10, and MW-13 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potential (ORP) at the Site were observed.

- Dissolved iron concentrations present in groundwater at monitoring well MW-2 correlate with dissolved arsenic concentrations.

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, and 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; McArthur et al., 2001). Arsenic-bearing soils are known to be present in the areas near the Pond System (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the most riverbank boring logs for monitoring wells located along the banks of the Great Miami River and Ohio River (see boring logs for wells MW-2, MW-3A, MW-4, MW-10, and MW-11 in Appendix 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 riverbanks of the Great Miami River and Ohio River as evidenced by the low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, MW-11, MW-13 and MW-14 (presented in Figure E below; monitoring wells adjacent to the riverbank are illustrated with solid lines, upland wells are illustrated with dashed lines).

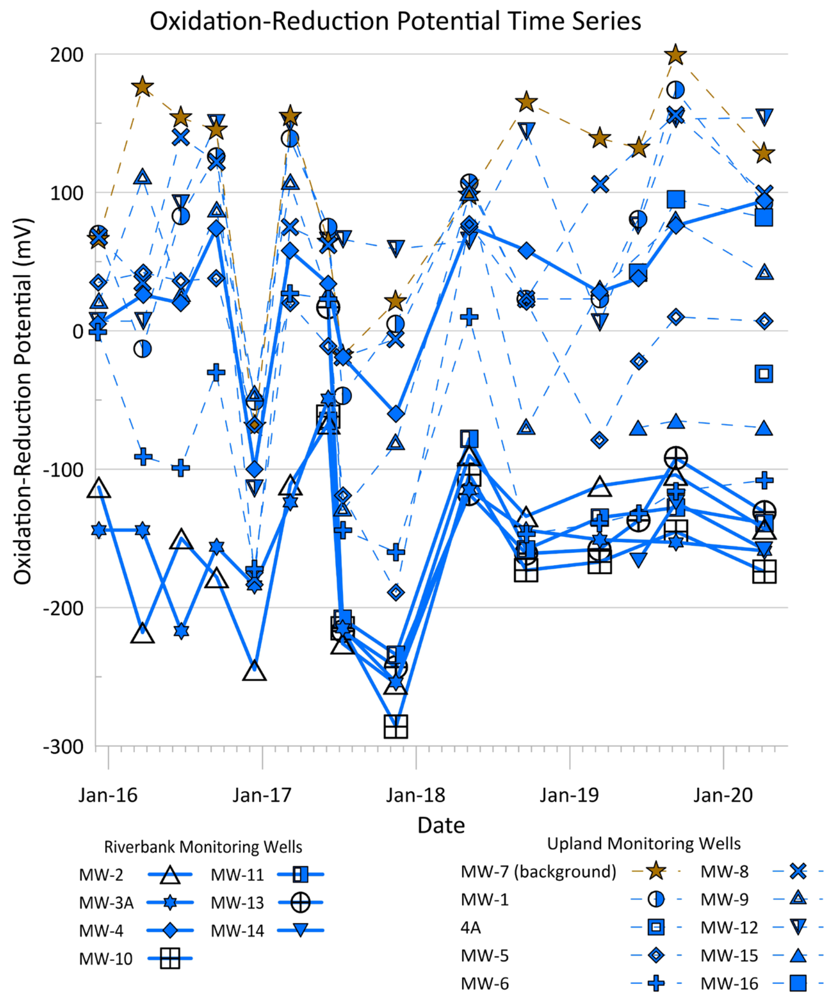

Figure E. Oxidation Reduction Potential Time-Series for Groundwater Samples (Monitoring Wells Adjacent to the Riverbank are Illustrated with Solid Lines, Upland Wells are Illustrated with Dashed Lines).

Available data indicated that concentrations of dissolved iron observed in groundwater at monitoring well MW-2 from 2008 to 2014 correlate with dissolved arsenic concentrations. Dissolved iron concentrations ranged from 11.8 to 52.1 mg/L at monitoring well MW-2 from 2008 to 2014, at least an order of magnitude greater than the 1 mg/L reported by the USGS as being indicative of iron-reducing geochemical conditions. Dissolved iron concentrations were also near or greater than 1 mg/L in A3 for MW-2, MW-10, and MW-13 at 45, 2.5 and 0.91 mg/L, respectively. Figure F below illustrates the relationship between dissolved iron concentrations and dissolved arsenic concentrations in groundwater at MW-2, where the R-squared value is 0.87, indicating a good correlation between dissolved iron and dissolved arsenic.

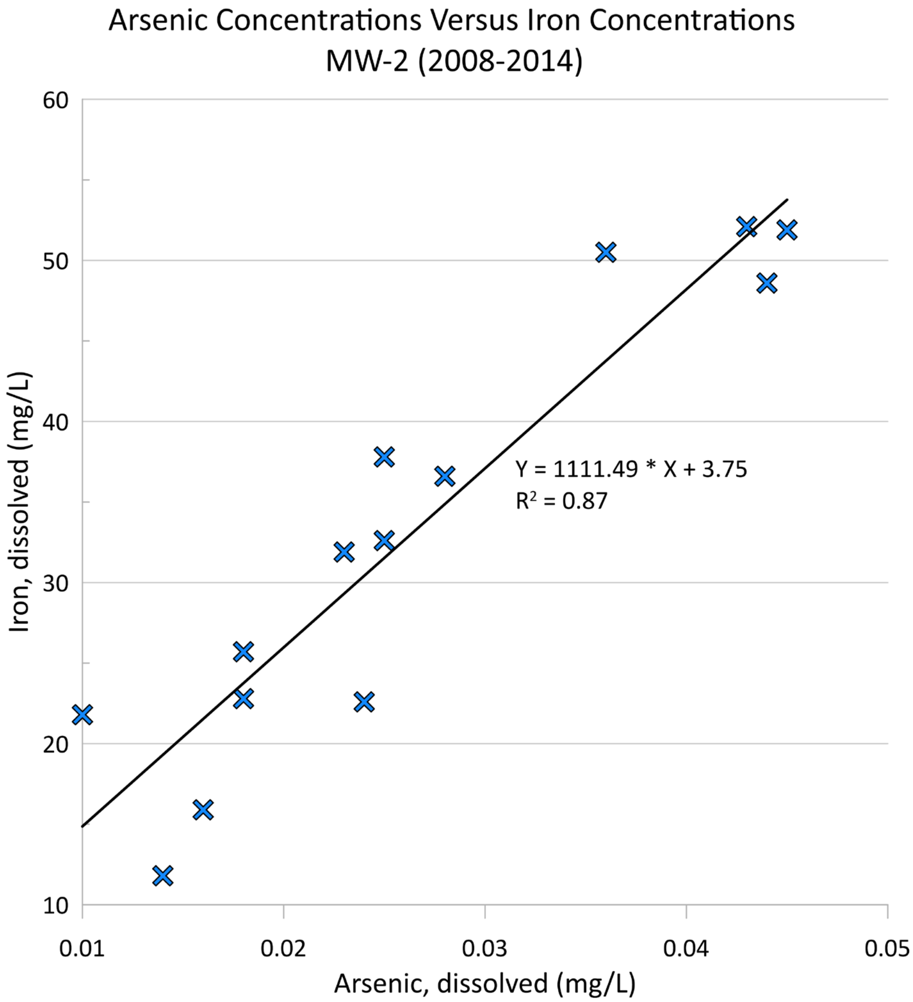

Figure F. Arsenic Concentrations Versus Iron Concentrations at Well MW-2 (2008-2014).

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 from soil to groundwater indicate that elevated concentrations of arsenic at monitoring wells MW-2, MW-10, and MW-13 are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

4. CONCLUSIONS

Based on the following three LOEs, it has been demonstrated that the arsenic SSLs at MW-2, MW-10, and MW-13, and the molybdenum SSL at MW-6 are not due to Miami Fort Pond System but are from a source other than the CCR unit being monitored:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSLs for arsenic and molybdenum observed during the A3 sampling event were not due to the Pond System. Therefore, a corrective measures assessment is not required for arsenic and molybdenum at the Miami Fort Pond System.

5. REFERENCES

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McArthur, 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.

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.

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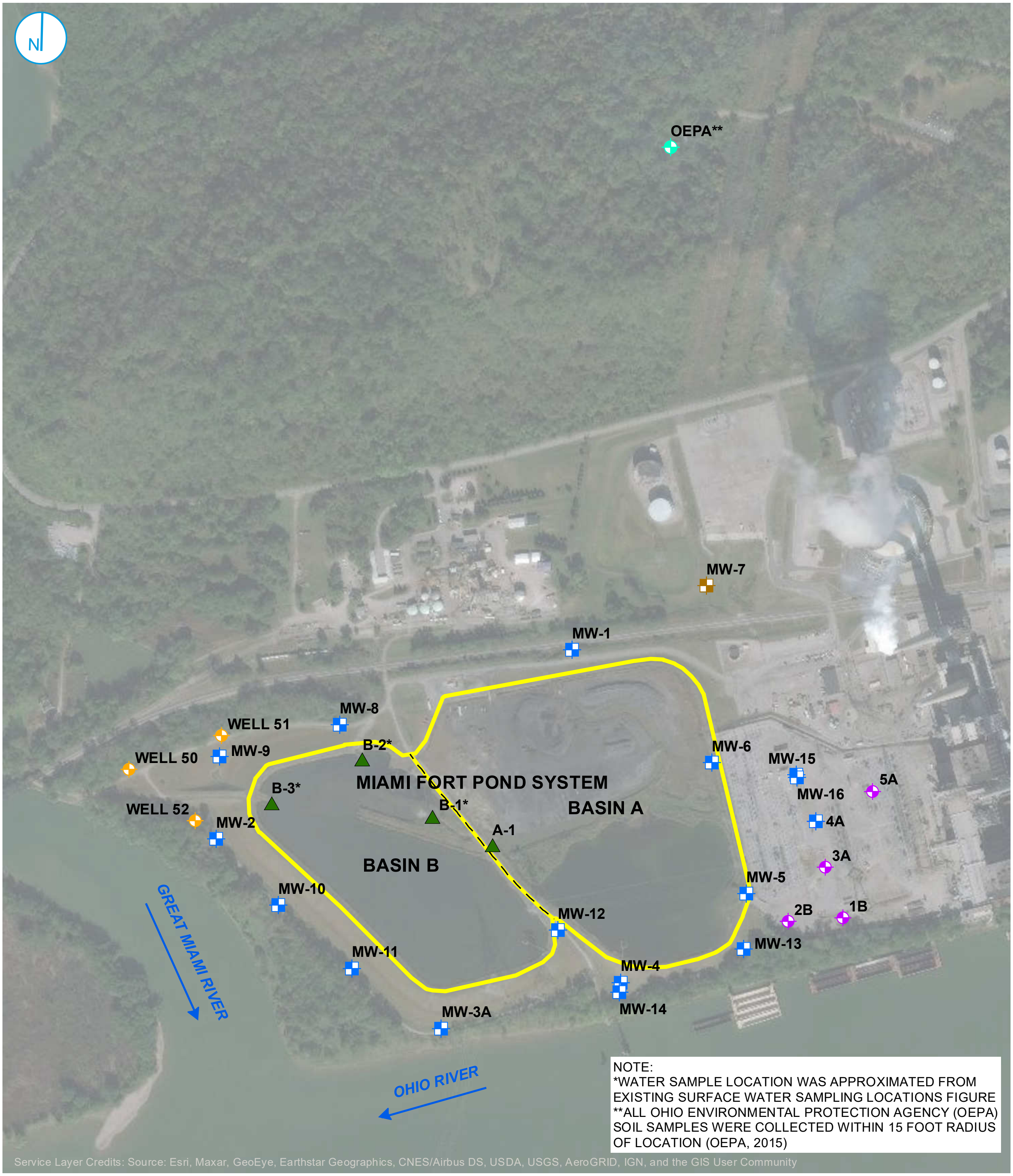
FIGURES



Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 1_Monitoring Well and Sampling Locations.mxd

PROJECT: 169000XXXX | DATED: 10/20/2020 | DESIGNER: galarnmc

DOWNGRADIENT CCR MONITORING WELL LOCATION
BACKGROUND CCR MONITORING WELL LOCATION
SOURCE WATER SAMPLING LOCATION
OEPA SOIL SAMPLE LOCATION
MIAMI FORT PRODUCTION WELL
VEOLIA PRODUCTION WELL
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 300 600 Feet

MONITORING WELL AND SAMPLING LOCATION MAP

FIGURE 1

MIAMI FORT POND SYSTEM (UNIT ID:115)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION
SURFACE WATER FEATURE
GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

MIAMI FORT POND SYSTEM (UNIT ID: 115)
ALTERNATE SOURCE DEMONSTRATION
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

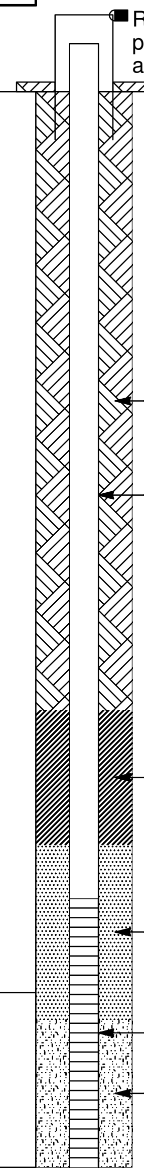
APPENDIX A
BORING LOGS FOR MONITORING WELLS
MW-2, MW-3A, MW-4, MW-10, AND MW-11

DESCRIPTION OF SUBSURFACE MATERIALS

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

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

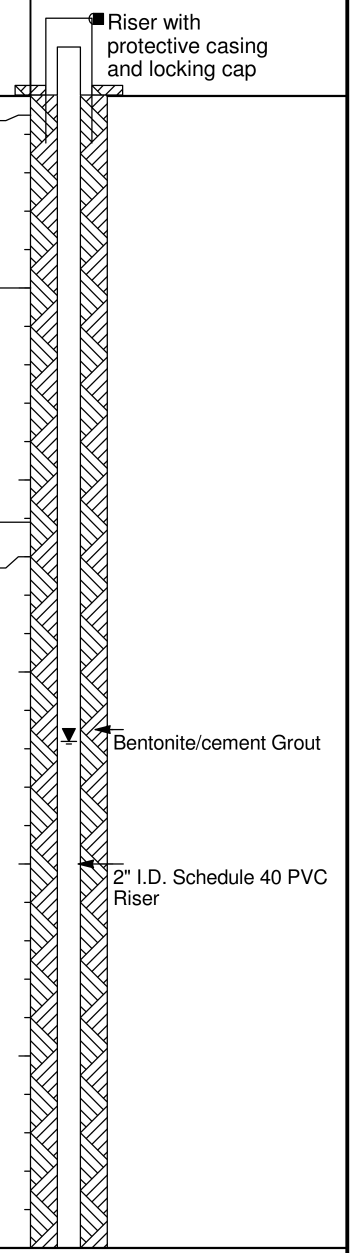
Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

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	MATERIAL DESCRIPTION
	0	Split spoon	12	83	Yellowish red CLAY TOPSOIL, moist
470					Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
		Split spoon	19	100	
		Split spoon	6	83	grades brownish yellow with increasing clay
	5				Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist
465		Split spoon	3	100	
					grades with increasing fine to medium sand, without organics, with iron staining
		Split spoon	3	83	grades with medium to coarse grained sand lenses, without staining
	10				grades high plasticity, very moist to wet
		Split spoon	3	75	
460					Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet
		Split spoon	2	100	Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet
		Split spoon	1	100	
	15				grades wet with increasing fine sand
455		Split spoon	1	100	
					grades with fine grained sand lenses
		Split spoon	2	100	grades brown with increasing fine sand
	20	Split spoon	2	100	
450					
		Split spoon	2	100	grades with gray to reddish gray lenses, decreasing sand, without sand lenses
					grades gray, without gray to reddish gray lenses, medium plasticity
		Split spoon	**	100	grades high plasticity
	25				grades with increasing sand
445		Split spoon	3	100	
					grades with organics, sulphur odor, decreasing sand
		Split spoon	2	100	grades without sand, without odor
					grades with fine sand lenses, without organics
	30				

WELL CONSTRUCTION DETAILS



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

Monitoring Well MW-3A

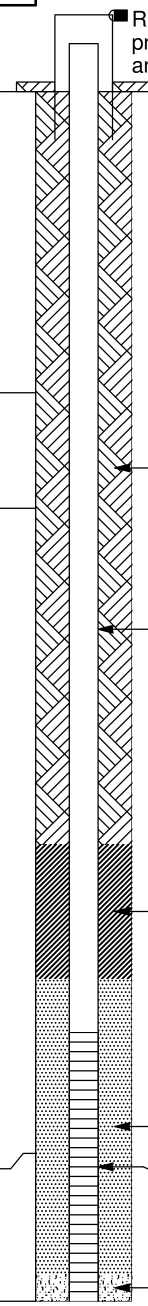
Elevation, feet	Depth, feet	Type	Blows per 1-foot Interval	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		1	100		grades without sand, with trace organics	
440			4	100		grades with sand, without organics	
			4	100		grades with trace fine sand and increasing silt, without sand lenses, medium plasticity	
	35					grades with increasing sand, without organics	
435			3	100		grades with increasing silt, trace sand, very low plasticity, stiff	Bentonite Seal
			6	100		grades with sand, plastic, very soft	
						grades stiff, very low plasticity, very moist	
	40		4	100		grades with trace organcis, less sand, increasing silt	
430			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	
	45						Natural Collapse of Formation
425			7	100			2" I.D. Schedule 40 0.010" Slotted Screen
			22	63		grades with increasing diameter gravel	
	50		13	50			
420						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.	
	55						
415							
	60						
410							
	65						
405							
	70						

URS

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0		100		Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist
5		50		grades very hard to brittle (FILL) with glass piece grades dry, very loose with angular clasts (FILL)
10		62		Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist grades soft
15		80		Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained) grades loose, with increasing sand grades soft
20		80		grades sandy clay/clayey sand (increasing sand), very moist to wet
25		80		grades very moist grades with less sand, with red staining and organics, medium stiff
30		40		grades with increasing sand grades with less sand
35		100		grades gray grades with increasing sand (clayey sand), very moist large wood piece through core sample
40		0		Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet NO RECOVERY 40-45 feet bgs
45				

Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' 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

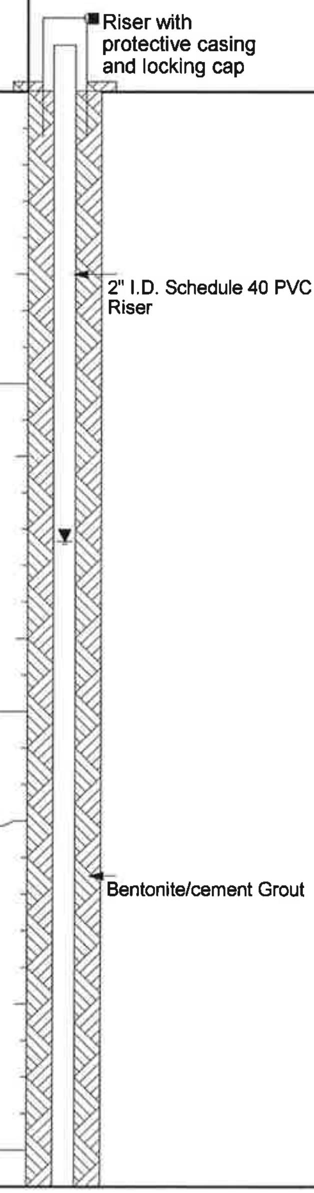
MONITORING WELL
MW-4

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

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
					Grades with more clay and gravel, medium stiff
					Grades without gravel and more clay, very stiff, moist
					Brown CLAY, with silt, medium stiff, moist
			48		
					Brown SILT, with some clay and very fine sand, soft, moist
			93		
					Grades with less silt and more fine sand
					Brown fine SAND, with silt and clay, loose, soft, moist
					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** Sheet 2 of 2

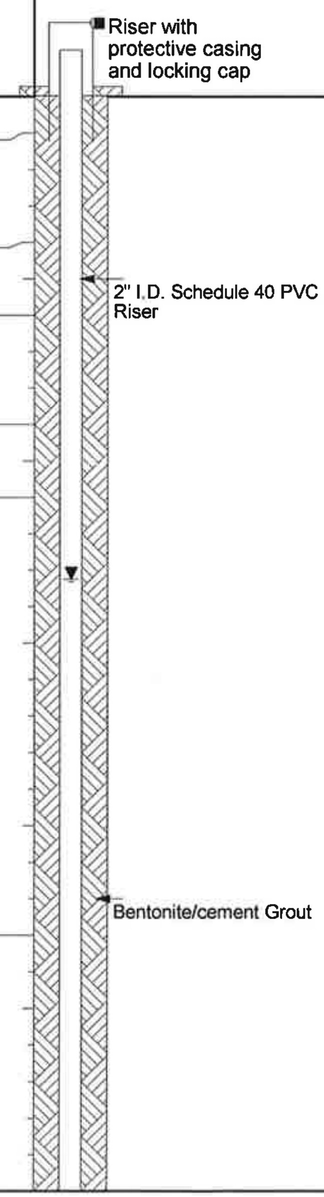
Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
440						
					Grades with some medium sand	
	35					
435						
					Grades to medium sand	
			58		Grades wet	
	40					
430						
					Grades with silt, more dense	
	45					Bentonite Seal
					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	Monitoring Well
Project Location: Miami Fort Station	MW-11
Project Number: 60442412	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	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
				Brown with red mottled fine SAND, soft, moist
	5			
465				Dark gray SILT with some clay, stiff, moist, trace organci matter
				Grades with more clay
				Gray and brown CLAY, with some silt, soft, moist
	10		42	
460				Gray and brown SILT, with fine sand and some clay, soft, moist
	15			
455				Grades with less clay
			56	
	20			Grades gray without clay
450				
				Gray very fine SAND with silt, soft, moist
	25			
445				
			53	
	30			Grades with dark gray and black wood fragments

WELL CONSTRUCTION DETAILS



DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				
440				Grades without wood fragments	
	35				
435				Grades with less silt	
			83		
	40				
430				Gray fine to coarse SAND with rounded fine gravel, loose, moist	
				Grades to fine sand and without gravel	
	45				
				Grades brown and gray	Bentonite Seal
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 3
MIXING CALCULATIONS

Mixing Calculation Showing Effect of Cobalt Loading on Ohio River Quality at Low Flow

Baseflow (90th percentile daily mean low flow)		22,697	cfs	Source[1]: ORSANCO, calculated as the 90th percentile low
	=	5.6E+10	L/day	of estimated daily mean discharge rates (11/1986-2/2016) at
				river mile 483.5 provided by U.S. Army Corps' CASCADE model
Cobalt loading rate				
Maximum Cobalt Concentration in Groundwater		0.0187	mg/L	Maximum Concentration Well MW-4 - 9/2018
Maximum Hydraulic Conductivity (Uppermost Aquifer)		0.123	cm/s	Source[2]: USGS, maximum hydraulic conductivity (350 ft/d)
				based on area aquifer tests conducted in alluvial deposits
Hydraulic Gradient		0.0008		Calculated based on June 2019 groundwater elevations
Basin A Discharge Zone Thickness		64	ft	Estimated maximum depth of impacts in Uppermost Aquifer[3]
Basin A Discharge Zone Length		890	ft	Estimated maximum length of impacts in Uppermost Aquifer[4]
Q = KIA				
K = Max Hydraulic Conductivity		0.0041	ft/s	
I = Hydraulic Gradient		0.0008		
A = Cross-Sectional Area		56,960	ft^2	
Q (per second)		0.17	cfs	
Q (per day)		423,400	L/day	
Loading Rate (L)		7,900	mg/day	$= C_{max} * Q$
	L =	0.02	lb/day	
Cobalt concentration increase in Ohio River at low flow due to loading from Basin A				
	d_B =	0.00000014	mg/L	$= L/Q_{90th\ low}$
Cobalt concentration increase near-shore in Ohio River at low flow due to loading from the Basin A				
Assumes loading distributed within 328 feet (100 meters) of shoreline		0.00000076	mg/L	River is approximately 1750 ft wide
Typical Cobalt laboratory detection limit		0.000075	mg/L	Source: Test America Report for 9/2018 Sampling Event

Conclusion:

The calculated cobalt concentration increase in the Ohio River at ***low flow*** due to groundwater loading from the Basin A is less than the typical cobalt detection limit, indicating that increases due to impacted discharge would not be detectable. These calculations indicate that the effects of cobalt loading in groundwater discharge to the Ohio River are negligible.

Notes

[1]Ohio River Valley Water Sanitation Commission (ORSANCO), 2019. Historical Flow Data. Prepared by U.S. Army Corps of Engineers. Accessed August 28, 2019. http://www.orsanco.org/data/flow/

[2]United States Geological Survey (USGS), 1999. Hydrogeology and Simulation of Ground-Water Flows in the Ohio River Alluvial Aquifer Near Carrollton, Kentucky, Report 98-4215. Prepared by M.D. Unkthank, in cooperation with the Carrol County Water-Supply Board.1999.

[3]Upper limit estimated as average June 2019 groundwater elevations from MW-12, MW-4 and MW-13 . Lower limit estimated as base of MW-14 well screen elevation.

[4]Estimated as linear distance from MW-12 to MW-4 to MW-13.

ATTACHMENT 2 – MAP OF GROUNDWATER MONITORING WELL LOCATIONS

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Figure 1_Well Locations BasinAandB.mxd

PROJECT: 72799 | DATED: 9/23/2020 | DESIGNER: STOLZSD

DOWNGRADIENT CCR MONITORING LOCATION
BACKGROUND CCR MONITORING LOCATION
PREVIOUSLY MONITORED CCR LOCATION (12/8/2015-3/8/2017)
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 250 500 Feet

SITE AND WELL LOCATION MAP
POND SYSTEM
(MULTI-UNIT ID: 115)

FIGURE 1

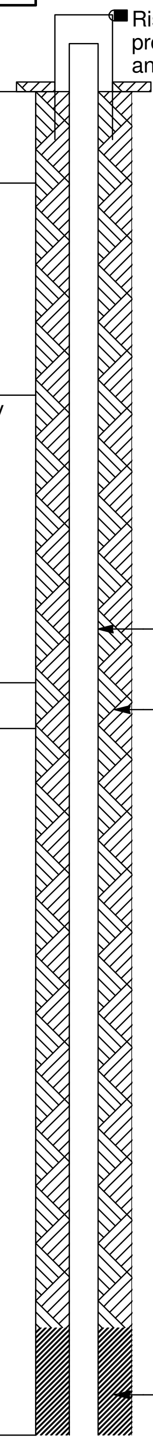
RAMBOLL US CORPORATION
A RAMBOLL COMPANY

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

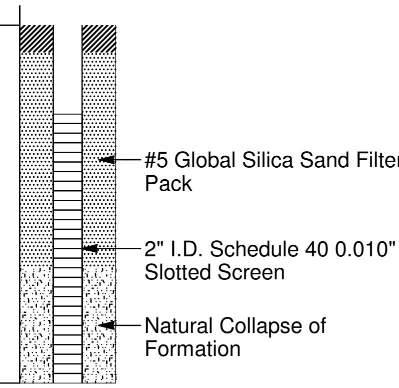
ATTACHMENT 3 – WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Gray to dark gray TOPSOIL and sand and gravel FILL, loose, poorly sorted, moist to very moist
		100		Brownish yellow silty CLAY, soft to very slightly stiff, moist
5				grades soft, plastic
		100		grades with fine sand
10				Brownish yellow silty fine SAND with trace clay, loose, well sorted, very slightly moist
		66		
15				
20				grades brown with fine to coarse sand, with angular pebbles and gravel, poorly sorted (fill)
		80		Brown CLAY with trace silt and sand, stiff, very slightly moist
				Brown fine to coarse SAND with angular to rounded pebbles, loose, dry
25				
30		40		grades with clay grades without clay grades with angular gravel
35				
40		50		grades with black organics grades without organics grades brown to light brown grades with less gravel and pebbles NO RECOVERY 45-63.3 feet bgs
45				
50				

WELL CONSTRUCTION DETAIL



Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS	WELL CONSTRUCTION DETAIL
50		0			
55					
60		0			



Boring terminated 63' 3" bgs on 12/10/2007.
2" I.D. Schedule 40 PVC monitoring well installed 63' 3" bgs with 10' 0.010" slotted screen.

LEGEND:

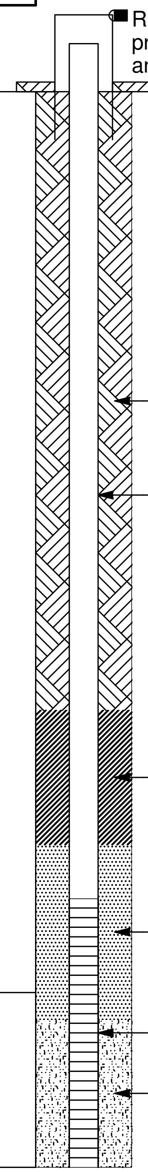
Rotosonic

bgs Below ground surface

NR Not recorded

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

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JOB NO. 14947868

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

MONITORING WELL MW-2

Project: Duke Energy

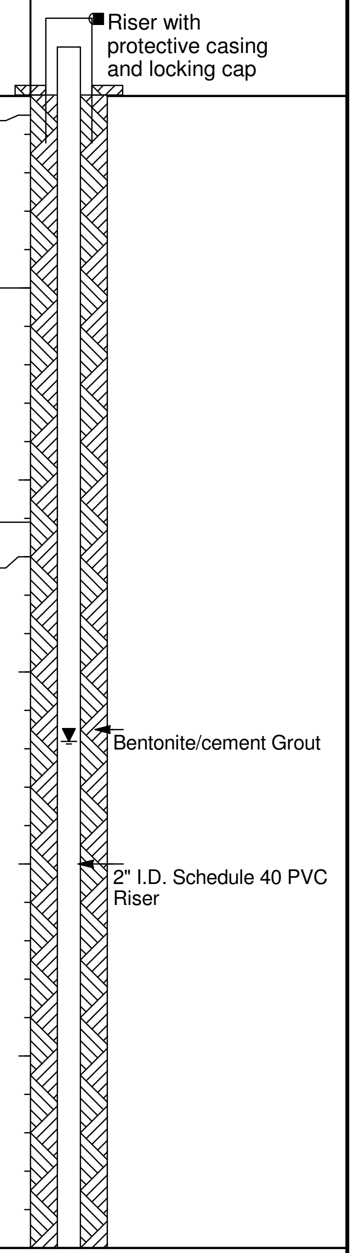
Project Location: Miami Fort Station

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

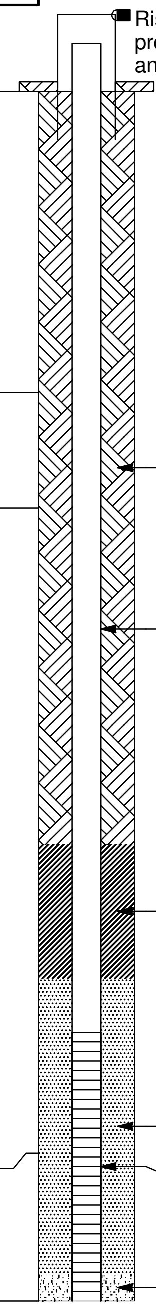


Elevation, feet	Depth, feet	Samples: Type	Samples: Blows per 1-foot Interval	Samples: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		1	100	grades without sand, with trace organics	
440			4	100	grades with sand, without organics	
			4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity	
	35				grades with increasing sand, without organics	
435			3	100		Bentonite Seal
					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	
	40		4	100		
430					grades with trace organcis, less sand, increasing silt	
			8	100		
					Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet	
			14	42		
	45					
425			7	100		Natural Collapse of Formation
						2" I.D. Schedule 40 0.010" Slotted Screen
			22	63	grades with increasing diameter gravel	
	50		13	50		
420						
					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.	
	55					
415						
	60					
410						
	65					
405						
	70					

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist
		100		
5				grades very hard to brittle (FILL) with glass piece
				grades dry, very loose with angular clasts (FILL)
		50		
10				
				Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist
		62		grades soft
15				Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained)
		80		grades loose, with increasing sand
				grades soft
20				
		80		grades sandy clay/clayey sand (increasing sand), very moist to wet
25				grades very moist
		80		grades with less sand, with red staining and organics, medium stiff
30				grades with increasing sand
				grades with less sand
		40		
35				
				grades gray
		100		grades with increasing sand (clayey sand), very moist
				large wood piece through core sample
40				Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet
		0		NO RECOVERY 40-45 feet bgs
45				

Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded

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Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-4

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Gray to olive gray sand and gravel FILL with trace organics, loose, very moist
		80		Brownish yellow CLAY with silt and trace organics, very stiff, slightly moist
5				
		60		grades without organics
				grades with abundant gray lenses
10				
		34		grades with trace sand and pebbles
15				grades without gray lenses
		50		Dark gray fine to coarse SAND and angular GRAVEL (FILL), poorly sorted, loose, dry
20		100		grades coarse gravel concrete in core barrel
		100		Black to dark gray fine to medium SAND, loose, well sorted, wet NO RECOVERY 25-35 feet bgs (at the bottom of the sample run -- sampler rods dropped into ground approxiamtely 7 feet -- suspected void or area of very soft sediment)
25				
30		0		
35				
40		70		Yellowish brown silty CLAY with trace sand, medium stiff to stiff, slightly moist
				grades gray to yellowish brown with gray lenses and organics
45				
				grades yellowish brown with increasing sand and silt, moist to very moist
50				

WELL CONSTRUCTION DETAIL

- Flush-mounted casing with locking cap
- Benseal Bentonite Granules
- 2" I.D. Schedule 40 PVC Riser
- Bentonite/cement Grout

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Miami Fort Station
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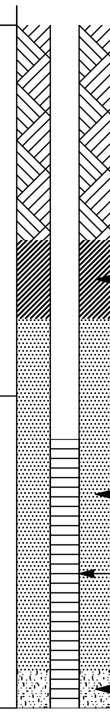
North Bend, OH

MONITORING WELL
MW-5

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
50		70		
55				
				grades with red staining, very soft, very moist
60		100		
				grades medium stiff with less sand
				Yellowish brown fine to coarse SAND and sub-rounded to rounded GRAVEL, poorly sorted, loose, wet
65				
				grades with less gravel, becoming homogenous sand and pebbles
70		100		
75				

Boring terminated 75' 4" bgs on 12/14/2007.
2" I.D. Schedule 40 PVC monitoring well installed 75' 4" bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



Bentonite Seal

#5 Global Silica Sand Filter Pack

2" I.D. Schedule 40 0.010" Slotted Screen

Natural Collapse of Formation

LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Brown silty CLAY (TOPSOIL), soft, moist
		60		Brownish yellow silty CLAY, stiff, dry to slightly moist
5				grades with trace sand and pebbles and with organics, very stiff
		70		
10				grades without pebbles and sand
		80		
15				Dark gray fine to coarse SAND and rounded to sub-rounded GRAVEL, loose, poorly sorted, wet
				grades dry
		100		grades dark gray with greenish gray to brownish red lenses, wet
20				
				grades with more sand
				grades dark gray to black with less sand, with increasing pebbles and rounded gravel
25		100		
30				
35		100		
				Brownish yellow to yellowish red CLAY with trace silt, organics, red staining and gray lenses, very stiff, very slightly moist
40				
				grades without staining and organics
45		70		
				grades with increasing sand
				grades with trace rounded gravel
50				

WELL CONSTRUCTION DETAIL

Flush-mounted casing with locking cap

Bentonite/cement Grout

2" I.D. Schedule 40 PVC Riser

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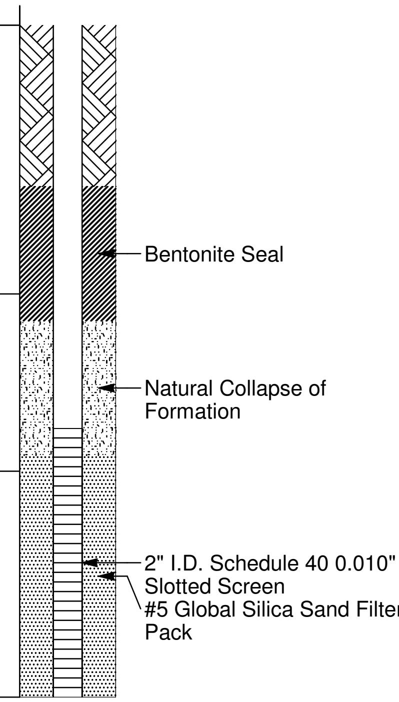
Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL MW-6

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
50				NO RECOVERY 50-60 feet bgs
55		0		
60				Brown to brownish yellow fine to coarse SAND and rounded GRAVEL, poorly sorted, loose, wet
65		90		Brownish yellow fine to medium SAND, well sorted, loose, wet
70		0		
75				

Boring terminated 75' bgs on 12/13/2007.
2" I.D. Schedule 40 PVC monitoring well installed 75' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

Rotosonic

bgs Below ground surface

NR Not recorded

Project: Dynegy	Monitoring Well MW-7
Project Location: Miami Fort Station	
Project Number: 60442412	Sheet 1 of 2

Date(s) Drilled	10/23/2015	Logged By	B. Smolenski	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz	Total Depth of Borehole	64.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	507.86 feet, msl
Depth to Groundwater	57.99 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	510.17 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	Well Construction Details
	0		100	Light brown SILT with trace fine gravel, medium stiff, slightly moist to dry	Riser with protective casing and locking cap
505				grades without gravel, with clay, trace oxidation staining	
			40		
	5			grades stiff to very stiff	
500				grades with trace fine subrounded gravel	
	10			grades clayey, with more fine to medium gravel	2" I.D. Schedule 40 PVC Riser
495				grades sandy with fine to coarse sand	
	15			Light brown fine to coarse SAND, with trace fines and fine subrounded to round gravel, loose to medium dense, slightly moist	
				grades more coarse, with fine to medium gravel	
490			65		
	20			Light brown fine to medium sandy GRAVEL, with fines, dense, dry	
				Light brown fine to coarse SAND, with fines and fine subrounded to round gravel, very dense, dry	
				grades gravelly, more coarse	
485				Light brown well graded SAND and GRAVEL, fine to coarse sand, fine to medium subrounded to round gravel, with fines, very dense, dry grades without medium gravel	
	25			Light brown gravelly fine to coarse SAND, fine to medium gravel, with fines, very dense, dry	Bentonite/cement Grout
480				grades to fine gravel	
			65	grades brown, with less gravel	
	30				

URS

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

Monitoring Well MW-7

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
475					Brown medium SAND, with some coarse sand, loose to medium dense, slightly moist	
	35				grades to fine sand without coarse sand, with silt	
					grades fine to medium sand, without silt	
470			70			
	40					
465					Brown silt layer, soft, moist	
	45				Brown fine to medium and with black lamina spaced approximately 0.1" apart, medium dense, moist grades without lamina	
460					grades very fine to fine, silty	
					grades wet	
	50					Bentonite Seal
					Brown sandy SILT, very fine sand, soft, wet	
455					Brown silty very fine to fine SAND, soft, wet	
	55				grades withouth silt, medium sand	
450						#5 Global Silica Sand Filter Pack 2" I.D. Schedule 40 0.010" Slotted Screen
	60				grades with trace black lamina	
445					grades fine grained grades very fine grained, silty	
					Brown very fine sandy SILT, with gray to black curved lamina spaced 1.0-2.0" apart, soft, wet	End Cap
	65				End of boring at 64' bgs	
440						
	70					

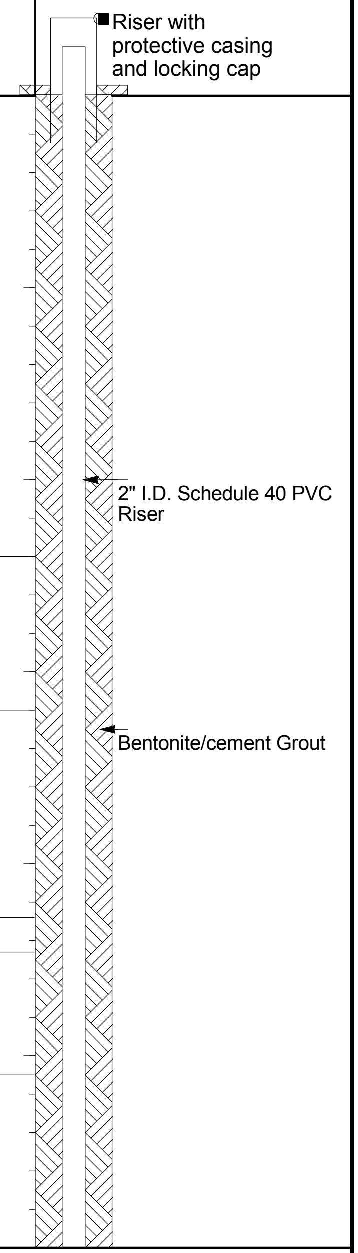
URS

Project: Dynegy **Project Location: Miami Fort Station** **Project Number: 60442412**	**Monitoring Well MW-8** Sheet 1 of 2

Date(s) Drilled	**10/20/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**50.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**491.60 feet, msl**
Depth to Groundwater	**39.53 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**493.43 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	Percent Recovery	MATERIAL DESCRIPTION
	0		100	Dark brown SILT, with clay and trace gravel, medium stiff to stiff, slightly moist
490				grades dark gray to black, with sand, medium stiff
	5		73	
485				
				grades with more medium to coarse subrounded gravel
	10			
480				Brown silty CLAY, with fine to medium subrounded to round gravel, stiff, slightly moist
	15			
475				Brown gravelly fine to coarse SAND, with fines, angular to subrounded gravel, medium dense, slightly moist
	20		77	
470				Brown silty CLAY layer, medium stiff, moist
				Brown clayey fine to medium subrounded GRAVEL, with sand, dense, slightly moist
	25			Brown fine to medium SAND with trace fine gravel, loose, slightly moist
465				grades to very fine to fine silty sand, with laminations and ripple marks, medium dense
	30			

WELL CONSTRUCTION DETAILS



URS

Monitoring Well MW-8

Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		92	Brown very fine sandy SILT, with clay, medium stiff, moist to very moist	
				Brown fine SAND with clay, medium dense, wet	
460				Brown very fine sandy SILT, with clay, medium stiff, moist to very moist	
					Bentonite Seal
				Brown fine to medium SAND, medium dense, moist	
	35				
455					
				Brown very fine sandy SILT, with clay, medium stiff, very moist	
	40		83	Brown sandy fine to coarse subrounded GRAVEL, with fines, loose, wet	
450					#5 Global Silica Sand Filter Pack
					2" I.D. Schedule 40 0.010" Slotted Screen
	45			Brown fine to coarse SAND with trace fine to medium subrounded gravel, loose, wet	
445				Brown fien to medium SAND, medium dense, wet	End Cap
	50			End of boring at 50' bgs	
440					
	55				
435					
	60				
430					
	65				
425					
	70				

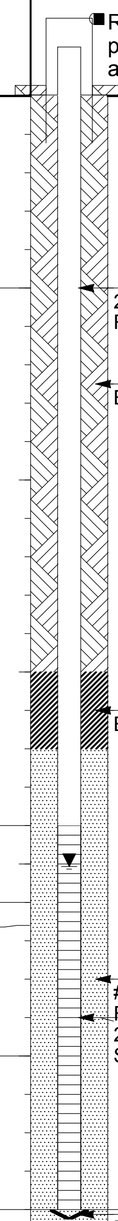
URS

Project: Dynegy Project Location: Miami Fort Station Project Number: 60442412	**Monitoring Well MW-9** Sheet 1 of 1

Date(s) Drilled	**10/20/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**470.54 feet, msl**
Depth to Groundwater	**20.07 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.05 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
470	0		100	Dark brown SILT with clay, and trace fine subrounded gravel, stiff, slightly moist
				grades dark gray to black
			93	
465	5			Dark gray silty CLAY, very stiff to hard, dry, trace black wood fragments
				grades brown to reddish brown, without wood fragments
460	10			
455	15			
			93	Brown medium to coarse SAND with fine to medium subrounded gravel, loose, wet
450	20			
				Brown silty clay layer, stiff, moist
				Brown medium to coarse SAND, with fine to medium subrounded gravel, loose, wet
				grades to coarse sand with abundant fine gravel, and trace medium to coarse gravel
445	25			Brown fine to medium subrounded to round GRAVEL, with fine to coarse sand, and trace coarse gravel, loose, wet
				End of boring at 29' bgs
	30			

WELL CONSTRUCTION DETAILS



URS

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

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	
			88		Gray and brown fine SAND, with trace silt, loose, moist	
	30					

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	
	45					Bentonite Seal
					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					

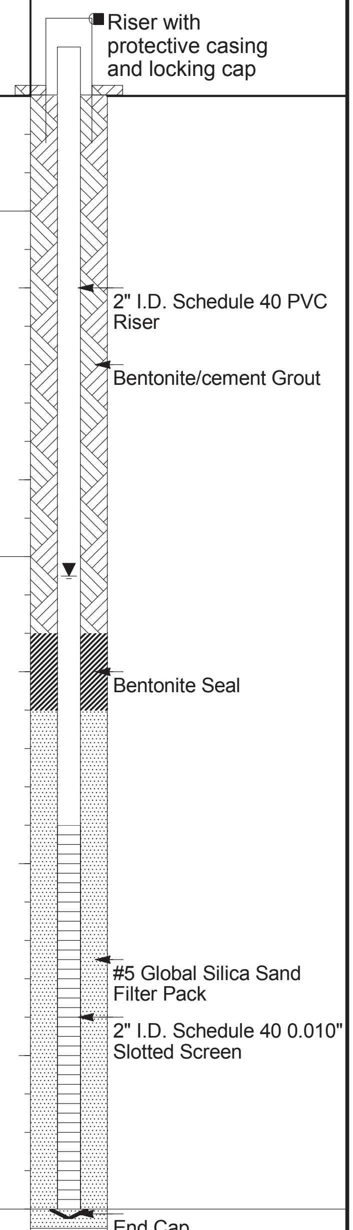
AECOM

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

Date(s) Drilled	**10/21/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**471.31 feet, msl**
Depth to Groundwater	**12.51 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.51 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		100	Brown SILT, with clay, stiff, slightly moist, with oxidation staining
470				
				Dark gray silty CLAY, stiff, slightly moist
			68	
465	5			
460	10			
				Medium to dark brown SILTY with clay, very soft to soft, moist to wet
455	15			
			100	
450	20			
				grades gray with black mottling
				grades sandy, very fine to fine grained
445	25			
				End of boring at 29' bgs
	30			

WELL CONSTRUCTION DETAILS



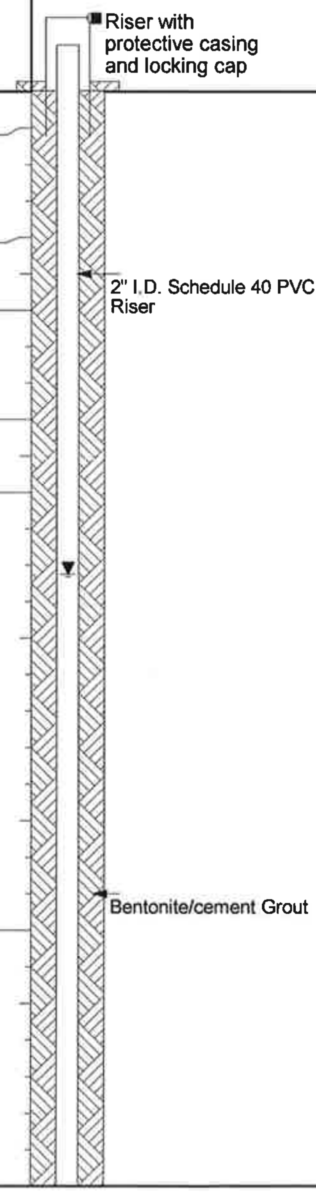
URS

Project: Dynegy	# Monitoring Well MW-11
Project Location: Miami Fort Station	
Project Number: 60442412	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: 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
			Gray and brown CLAY, with some silt, soft, moist
	10	42	
460			Gray and brown SILT, with fine sand and some clay, soft, moist
	15		
455			Grades with less clay
		56	
	20		Grades gray without clay
450			
			Gray very fine SAND with silt, soft, moist
	25		
445			
		53	
	30		Grades with dark gray and black wood fragments

WELL CONSTRUCTION DETAILS



AECOM

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

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					

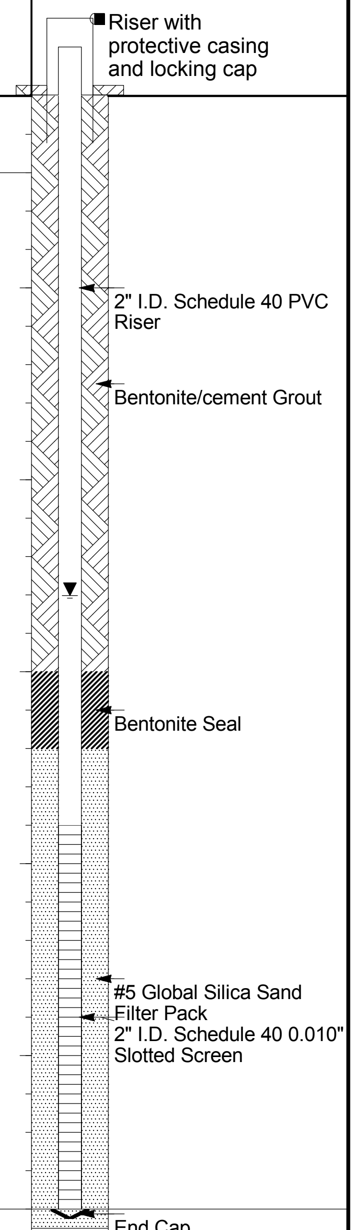
AECOM

Project: Dynegy **Project Location:** Miami Fort Station **Project Number:** 60442412	**Monitoring Well MW-11S** Sheet 1 of 1

Date(s) Drilled	**10/22/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**471.83 feet, msl**
Depth to Groundwater	**13.02 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.64 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		100		Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL)
470					Dark gray SILT with clay and trace fine to coarse angular to subrounded gravel, very stiff, dry to slightly moist, with oxidation staining grades yellowish-brown, medium stiff to stiff
			0		No recovery from 4.0-19.0' Lithology inferred
	5				
465					
	10				
460					
	15				
455					
			100		Gray clayey SILT, very soft to soft, wet, with trace black wood fragments, and trace fine sand lamina
	20				
450					
	25				
445					
					End of boring at 29' bgs.
	30				

WELL CONSTRUCTION DETAILS



URS

Project: Dynegy **Project Location:** Miami Fort Station **Project Number:** 60442412	**Monitoring Well MW-12** Sheet 1 of 2

Date(s) Drilled	**10/21/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**64.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**506.01 feet, msl**
Depth to Groundwater	**53.51 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**508.44 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	WELL CONSTRUCTION DETAILS
	0		100	Dark brown SILT with some clay and fine gravel, loose, slightly moist	Riser with protective casing and locking cap
505				Reddish brown silty CLAY, with trace fine to medium subrounded gravel, stiff, slightly moist, with trace dark gray mottling	
			63		
	5				
500					
				grades very stiff	
	10			grades hard, dry, with light brown banding	
495					
	15				
490					
			100		
	20			grades gray and brown mottled	2" I.D. Schedule 40 PVC Riser
485					
				Black sandy SILT, with trace gravel and glassy black angular gravel, medium stiff, moist	
	25			Black fine to medium SAND, with trace angualr, glassy gravel, loose, moist	Bentonite/cement Grout
480					
				red brick fragment Gray SILT, very hard, dry	
			100	Brown silty CLAY, hard, dry to slightly moist, with gray mottling and trace	
	30				

URS

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

Monitoring Well MW-12

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				black mottling	
475						
	35				grades with fine sand	
470						
			100			
	40				grades medium stiff, moist	
465						
	45					
460					grades soft	
					grades sandy	
			100			
	50					
455						Bentonite Seal
					Brown clayey, silty, fine SAND	
	55				grades with black staining and oxidation banding	
					Brown sandy SILT, with clay, soft to medium stiff, very mosit, with black mottling and oxidation staining	
450					grades with lamination, and sandy seams spaced approximately 6" apart	
					Brown sandy fine to medium subrounded-round GRAVEL, with fines, medium dense, wet	#5 Global Silica Sand Filter Pack
			66			2" I.D. Schedule 40 0.010" Slotted Screen
	60					
445						
					Brown medium to coarse SAND, with trace fine to medium subrounded to round gravel, loose, wet	
					Brown fine to medium GRAVEL, with trace sand, loose, wet	
					End of boring at 64' bgs	End Cap
	65					
440						
	70					

URS

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

Monitoring Well MW-13

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	478.13 feet, msl
Depth to Groundwater	18.2 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	480.70 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: Percent Recovery	MATERIAL DESCRIPTION
	0	68	Brown SILT with coarse sand and trace gravel, medium stiff, moist
			Grades softer
475			Grades stiff
	5		Grades very stiff
			Grades with more gravel
			Brown and gray SAND with rounded gravel, loose, moist
470			
	10	95	Grades very dark brown
			Medium brown and gray GRAVEL with silt and clay, soft, moist
			Gray and brown silty CLAY with some fine to coarse sand, stiff, moist
465			
	15		Grades with more silt, brown
			Brown SILT with trace clay and fine sand, soft, moist
460			Medium brown fine SAND with silt, soft, moist
	20	64	Grades reddish brown, very soft
455			
	25		
450			Red and brown mottled CLAY, stiff, moist
		69	Gray fine SAND with silt and trace clay, very soft, moist
	30		

WELL CONSTRUCTION DETAILS

- Riser with protective casing and locking cap
- 2" I.D. Schedule 40 PVC Riser
- Bentonite/cement Grout

AECOM

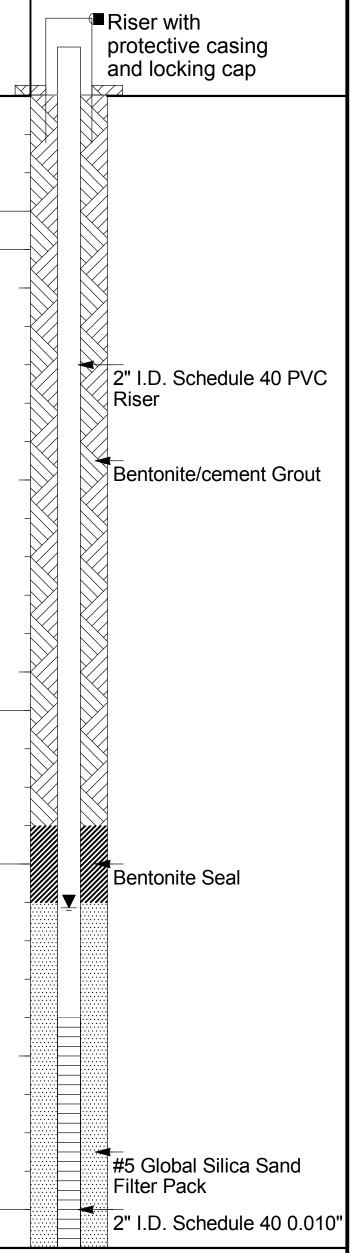
Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	Samples: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				Grades without clay	
445						
	35				Grades with trace fine gravel, less silt	
					Grades with some medium sand	
440						
			63		Grades fine to coarse sand, brown and gray, loose, wet	
	40					
435						
					Grades gray with some fine to coarse gravel	
	45					
					Grades with few brown silt lenses	Bentonite Seal
					Grades without silt	
430						
			70			
	50					#5 Global Silica Sand Filter Pack
425						
	55					2" I.D. Schedule 40 0.010" Slotted Screen
420						
					Boring terminated at 59'	End Cap
	60					
415						
	65					
410						
	70					

Project: Dynegy	**Monitoring Well MW-13S**
Project Location: Miami Fort Station	
Project Number: 60442412	Sheet 1 of 2

Date(s) Drilled	**10/21/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**34.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**477.55 feet, msl**
Depth to Groundwater	**21.14 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**479.88 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		100	Reddish brown silty CLAY, trace fine angular coal fragments, very stiff, dry, with black mottling
475				Black coarse SAND, with fine to medium angular gravel, loose, wet
			60	Gray silty CLAY, stiff, slightly moist, with trace black mottling
	5			
470				
				grades reddish brown
	10			
465				
	15			
				Reddish brown very fine to fine sandy SILT, with clay, soft, moist
460				
			45	
	20			Reddish brown clayey, silty, fine SAND, very soft, wet
455				
				grades with black mottling and oxidation staining
	25			
				grades fine to medium grained, with less fines
450				
			100	Reddish brown CLAY, with silt, medium stiff to stiff, slightly moist, with fine to
	30			

WELL CONSTRUCTION DETAILS



URS

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				medium grained sand layers spaced approximately 6" apart, black mottling, and oxidation staining	Slotted Screen
445						
					End of boring at 34' bgs	End Cap
	35					
440						
	40					
435						
	45					
430						
	50					
425						
	55					
420						
	60					
415						
	65					
410						
	70					

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-14

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/29/2019	5/29/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-14	Feet (NAVD88)	476.83 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 412,784.14 N, 1,313,291.31 E E / W
1/4 of 1/4 of Section , T N, R
Lat 39° 6' 37.2444"
Long -84° 48' 33.6901"
Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Hamilton	OH	North Bend

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1.5 3.0 4.5 6.0 7.5 9.0 10.5	0 - 11.5' **FILL, WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark gray (10YR 4/1), angular to subangular fine to coarse sand, trace to little clay, little roots, moist. 1.5' no roots. 6.5' grades to reddish yellow, increase in clay content, moist.	(FILL) (SW)g									
2 CS	120 60		12.0 13.5 15.0 16.5	11.5 - 17.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace fine to medium sand, trace subrounded gravel, medium plasticity, stiff, moist.	CL/ML				1.5 1.5 1.5 1.5					
			18.0 19.5	17.5 - 40' **SANDY LEAN CLAY:** s(CL), reddish yellow to reddish brown (5YR 5/4), very fine to fine sand, trace subrounded fine gravel, low plasticity, firm, moist to wet.	s(CL)									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-14

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
3 CS	120 120			17.5 - 40' **SANDY LEAN CLAY:** s(CL), reddish yellow to reddish brown (5YR 5/4), very fine to fine sand, trace subrounded fine gravel, low plasticity, firm, moist to wet. *(continued)* 20' sand content increases.					0.25					
			21.0						0.5					
			22.5						0.75					
									0.5					
			24.0						0.25					
			25.5	25' sand content decreases.					0.5					
									0.25					
			27.0						0.5					
			28.5						0.75					
									0.5					
4 CS	120 120		30.0	30' sand content increases.	s(CL)				0.5					
			31.5						0.25					
									0.5					
			33.0						0.75					
			34.5	34.5' sand content decreases.					0.5					
									0.25					
			36.0	36' grades to gray.					0.5					
			37.5	37.5' sand content increases.					0.25					
									0.5					
			39.0						0.5					
5 CS	120 120		40.5	40 - 85' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium, little fine to coarse subrounded to rounded gravel, loose, wet.										
			42.0											
			43.5											
			45.0											
			46.5		(SP)g									
			48.0	48' - 50' some rounded medium to coarse gravel.										
			49.5											
6 CS	120 120		51.0											Began pumping water due to heaving sand.
			52.5											

RAMBOLL

Boring Number MW-14

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	40 - 85' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium, little fine to coarse subrounded to rounded gravel, loose, wet. *(continued)*										
			55.5											
			57.0											
			58.5	58' - 60' grades to very fine to fine sand.										
7 CS	120 120		60.0	60' - grades to fine to medium sand, little subrounded to rounded fine to coarse gravel.										
			61.5											
			63.0											
			64.5											
			66.0	65' - 67' grades to medium to coarse sand.										
			67.5	67' grades to fine to medium sand, little rounded fine to coarse gravel.										
			69.0		(SP)g									
8 CS	120 120		70.5											
			72.0											
			73.5											
			75.0											
			76.5											
			78.0											
			79.5											
9 CS	60 60		81.0											
			82.5											
			84.0											
				85' End of Boring.										

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-15

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/28/2019	5/29/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-15	Feet (NAVD88)	494.29 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 413,749.32 N, 1,314,079.25 E E / W
1/4 of 1/4 of Section , T N, R

Lat 39° 6' 46.9805"
Long -84° 48' 24.0094"

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Hamilton	OH	North Bend

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1.5	0 - 2.5' **FILL, WELL-GRADED GRAVEL WITH SAND:** (GW)s, gray (10YR 6/1), angular to subangular, fine to coarse, dry.	(FILL) (GW)s									
			3.0 4.5	2.5 - 6' **SILTY CLAY** CL/ML, reddish brown (5YR 4/3), trace subrounded fine to coarse gravel, trace fine to coarse sand, medium plasticity, stiff, dry to moist.	CL/ML				1.75 1.5 1.5 1.75					
2 CS	120 84		6.0 7.5 9.0 10.5 12.0	6 - 13.5' **SANDY LEAN CLAY:** s(CL), reddish brown (5YR 4/3) with gray mottling, fine to medium sand, trace subrounded to rounded fine to coarse gravel, low plasticity, firm, moist.	s(CL)				0.5 0.5 0.5 0.5 0.5 0.5 0.5					
			13.5 15.0 16.5 18.0 19.5	13.5 - 45.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, firm, moist.	CL/ML				0.5 2.5 2.5 2.5					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-15

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
3 CS	120 84			13.5 - 45.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, firm, moist. *(continued)*										
			21.0						1.5					
									2					
			22.5						2					
									1.75					
			24.0											
									1.5					
			25.5						2					
									1.5					
			27.0											
			28.5											
			30.0											
4 CS	120 120			30' firm to stiff.										
									0.75					
			31.5						0.75					
			33.0		CL/ML				0.75					
									0.5					
			34.5						0.75					
			36.0						0.5					
									0.75					
			37.5						0.75					
			39.0						1					
									0.75					
5 CS	120 120		40.5	40' soft.					0.5					
			42.0						0.5					
									0.5					
			43.5						0.5					
			45.0						0.5					
				45.5 - 46.5' **WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark yellowish brown (10YR 4/4), subrounded to rounded, fine to coarse, wet.	(SW)g				0.5					
			46.5	46.5 - 75' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet.										
			48.0											
			49.5											
6 CS	120 120				(SP)g									
			51.0											
			52.5											

RAMBOLL

Boring Number MW-15

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	46.5 - 75' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			55.5											
			57.0											
			58.5											
7 CS	120 120		60.0											Began pumping water due to heaving sand.
			61.5											
			63.0											
			64.5		(SP)g									
			66.0											
			67.5											
			69.0											
8 CS	60 60		70.5											
			72.0											
			73.5											
			75.0	75' End of Boring..										

SOIL BORING LOG INFORMATION

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-16

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/24/2019	5/28/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-16	Feet (NAVD88)	494.12 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 413,739.21 N, 1,314,081.83 E E / W
1/4 of 1/4 of Section , T N, R
Lat 39° 6' 46.8813"
Long -84° 48' 23.9734"
Local Grid Location: Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Hamilton	OH	North Bend

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 96		1.5	0 - 2.5' **FILL, WELL-GRADED GRAVEL WITH SAND:** (GW)s, gray (10YR 6/1), angular to subangular fine to coarse sand, dry.	(FILL) (GW)s									
			3.0	2.5 - 5.2' **SILTY CLAY** CL/ML, reddish brown (5YR 4/3), trace subrounded fine to coarse gravel, trace fine to coarse sand, medium plasticity, stiff, moist.	CL/ML				1.5					
									1.5					
			4.5						1.5					
			6.0	5.2 - 14.5' **SANDY LEAN CLAY:** s(CL), reddish brown (5YR 4/3) with gray mottling, fine to medium sand, trace subrounded to rounded medium to coarse gravel, low plasticity, firm, moist.	s(CL)				0.5					
			7.5						0.5					
									0.5					
			9.0											
2 CS	120 90		10.5						0.5					
			12.0						0.5					
									0.5					
			13.5						0.5					
			15.0	14.5 - 45' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, stiff to very stiff, moist.	CL/ML				2					
			16.5						2.75					
									2.5					
			18.0											
			19.5											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-16

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
3 CS	120 96			14.5 - 45' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, stiff to very stiff, moist. *(continued)*										
			21.0						1.5					
									2					
			22.5						1.5					
			24.0						1.5					
									2.5					
			25.5						2					
			27.0						1.5					
									1.5					
			28.5											
			30.0											
4 CS	120 120			30' firm to stiff.					0.75					
			31.5						0.5					
			33.0		CL/ML				0.75					
									0.5					
			34.5						1					
			36.0						1					
									0.75					
			37.5						0.75					
			39.0						1					
									0.75					
5 CS	120 120		40.5	40' soft.					0.5					
			42.0						0.5					
									0.5					
			43.5	43.5' grades to gray.					0.5					
			45.0						0.5					
				45 - 47.6' **WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark yellowish brown (10YR 4/4), subrounded to rounded, fine to coarse, wet. 45.5' black laminae (1" thick layer).										
			46.5		(SW)g									
			48.0	47.5' black laminae (2" thick layer).										
			49.5	47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. 48.5' black laminae (1" thick layer).										
6 CS	120 120				(SP)g									
			51.0											
			52.5											

Boring Number MW-16

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			55.5											
			57.0											
			58.5											
7 CS	120 120		60.0											
			61.5											
			63.0											
			64.5											
			66.0											
			67.5											
			69.0											
8 CS	120 120		70.5		(SP)g									Began pumping water due to heaving sand.
			72.0											
			73.5											
			75.0											
			76.5											
			78.0											
			79.5											
9 CS	120 120		81.0											
			82.5											
			84.0											
			85.5											

RAMBOLL

Boring Number MW-16

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			87.0	47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			88.5											
10 CS	120 120		90.0											
			91.5											
			93.0											
			94.5											
			96.0	96' grades to medium to coarse sand, little subrounded to rounded gravel.										
			97.5											
			99.0		(SP)g									
11 CS	120 96		100.5	100' grades to fine to medium sand, trace subrounded to rounded gravel.										
			102.0											
			103.5											
			105.0											
			106.5											
			108.0											
			109.5											
				110' End of Boring..										

Pumping Test Report

4A

Well No. 4 Pump Head No. ______

Date 08/20/2014 Project No. 3114-H

Foreman Steve Colburn

Helper Tim Crowe

Customer: DUKE Energy, Location: Miami Fort Generating Station

Column/Drop Pipe: dia. 8", lengths 90', connections T & C, coating ______

Lineshaft: dia./lengths 1 ½" w/ 1 11/16" sleeves, threads 8, material ______

Bowl: make Layne & Bowler, model 15DRHC, stages 6, material CI / Brz.

Suction Pipe: dia. 8", lengths 23', bowl connection Threaded, material PVC

Motor: type VHS, make GE, hp. 100, rpm 1180, volts 2200, frame N6311

Well: dia. 38" x 26", depth 129', screen dia./length 26" / 30', screen material SS, static 51' 3"

Orifice Size: 8" x 6", Water discharged 100 feet from well, into Grass / Weeds.

Elapsed Time	Orifice Reading	GPM	Pumping Level	Drawdown	Discharge Lbs.	Pressure Feet	Pumping Head	Specific Capacity	Running Amps	Comments
		0	51.3	0	120	277.2	328.5			
5	34.0		91.0							Dirty
10	34.0		91.3							Dirty
15	34.0		91.4							Clear
20	34.0	923	91.5	40.3	90	207.9	299.4	22.9		Clear
5	53.5		97.2							Clear
10	53.5		97.0							Clear
15	53.5		96.8							Clear
20	53.5	1158	96.3	45.0	60	138.6	234.9	25.7	31 - 29 - 30	Clear
5	67.0		102.7							
10	67.0		101.8							
15	67.0		101.2							
20	67.0	1295	101.0	49.8	30	69.3	170.3	26.0	32 - 31 - 29	
5	89.0		118.0							Dirty
			Broke	Suction						

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ft. ☐ N. ☐ S. ____ft. ☐ E. ☐ W.	Well Name
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 37.2" Long. -84° 48' 33.7" or	MW-14
Facility ID	St. Plane 412,784 ft. N, 1,313,291 ft. E. E /W	Date Well Installed: 05/29/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm): Rick Tustin, Cascade Drilling
Distance from Waste/ Source ft. / State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ______ ft. (NAVD88)

B. Well casing, top elevation 479.89 ft. (NAVD88)

C. Land surface elevation 476.8 ft. (NAVD88)

D. Surface seal, bottom 475.8 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐; Hollow Stem Auger ☐; Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2; Air ☐; Drilling Mud ☐ 0 3; None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required):
Distilled water from power station

E. Bentonite seal, top 406.8 ft. (NAVD88) or 70.0 ft.

F. Fine sand, top ______ ft. (NAVD88) or ______ ft.

G. Filter pack, top 403.8 ft. (NAVD88) or 73.0 ft.

H. Screen joint, top 401.8 ft. (NAVD88) or 75.0 ft.

I. Well bottom 391.8 ft. (NAVD88) or 85.0 ft.

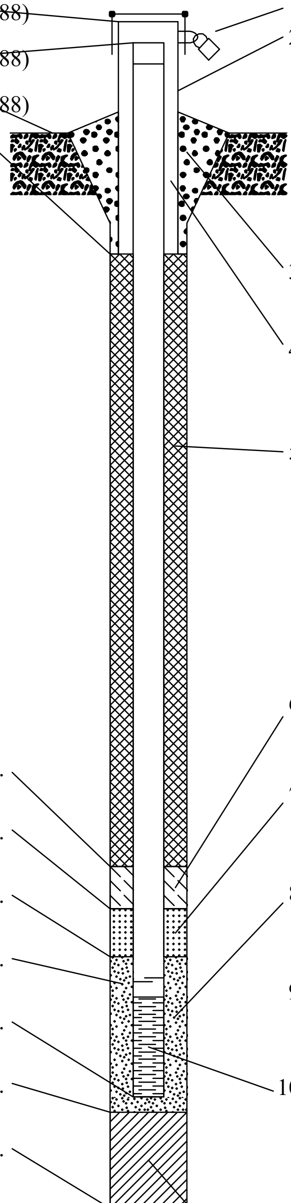
J. Filter pack, bottom 391.8 ft. (NAVD88) or 85.0 ft.

K. Borehole, bottom 391.8 ft. (NAVD88) or 85.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒; Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐; Concrete ☒; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐; Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____% Bentonite . . . Bentonite-cement grout ☐
   e. 12.04 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐; Tremie pumped ☒; Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ______ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ______ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐
10. Screen material: Schedule 40 PVC
   a. Screen Type: Factory cut ☒; Continuous slot ☐; Other ☐
   b. Manufacturer Johnson
   c. Slot size: 0.010 in.
   d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 6/19/2019

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-15
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 47.0" Long. -84° 48' 24.0" or	
Facility ID	St. Plane 413,749 ft. N, 1,314,079 ft. E. E/W	Date Well Installed: 05/29/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Rick Tustin, Cascade Drilling
Distance from Waste/Source ____ ft. / State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 497.52 ft. (NAVD88)

C. Land surface elevation 494.3 ft. (NAVD88)

D. Surface seal, bottom 493.3 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Distilled water from power station

E. Bentonite seal, top 434.3 ft. (NAVD88) or 60.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 431.3 ft. (NAVD88) or 63.0 ft.

H. Screen joint, top 429.3 ft. (NAVD88) or 65.0 ft.

I. Well bottom 419.3 ft. (NAVD88) or 75.0 ft.

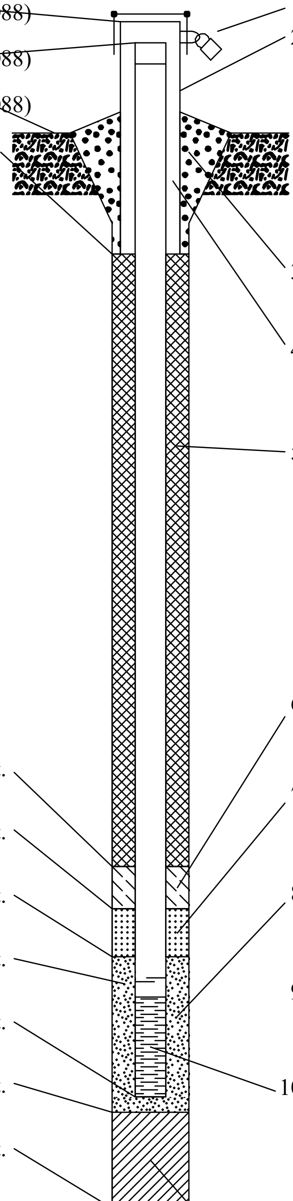
J. Filter pack, bottom 419.3 ft. (NAVD88) or 75.0 ft.

K. Borehole, bottom 419.3 ft. (NAVD88) or 75.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 10.29 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
    b. Manufacturer Johnson
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 6/19/2019

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

MONITORING WELL CONSTRUCTION

RAMBOLL

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 46.9" Long. -84° 48' 24.0" or	MW-16
Facility ID	St. Plane 413,739 ft. N, 1,314,082 ft. E. E /W	Date Well Installed: 05/28/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Rick Tustin Cascade Drilling
Distance from Waste/ Source ft. / State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 497.29 ft. (NAVD88)

C. Land surface elevation 494.1 ft. (NAVD88)

D. Surface seal, bottom 493.1 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Distilled water from power station

E. Bentonite seal, top 399.1 ft. (NAVD88) or 95.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 396.1 ft. (NAVD88) or 98.0 ft.

H. Screen joint, top 394.1 ft. (NAVD88) or 100.0 ft.

I. Well bottom 384.1 ft. (NAVD88) or 110.0 ft.

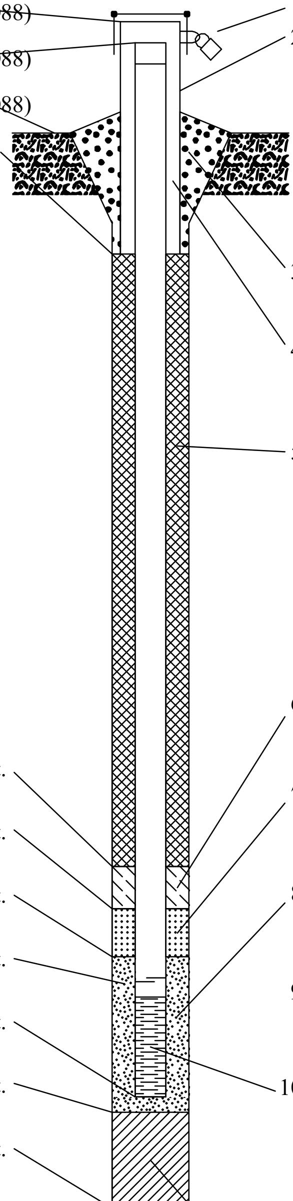
J. Filter pack, bottom 384.1 ft. (NAVD88) or 110.0 ft.

K. Borehole, bottom 384.1 ft. (NAVD88) or 110.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



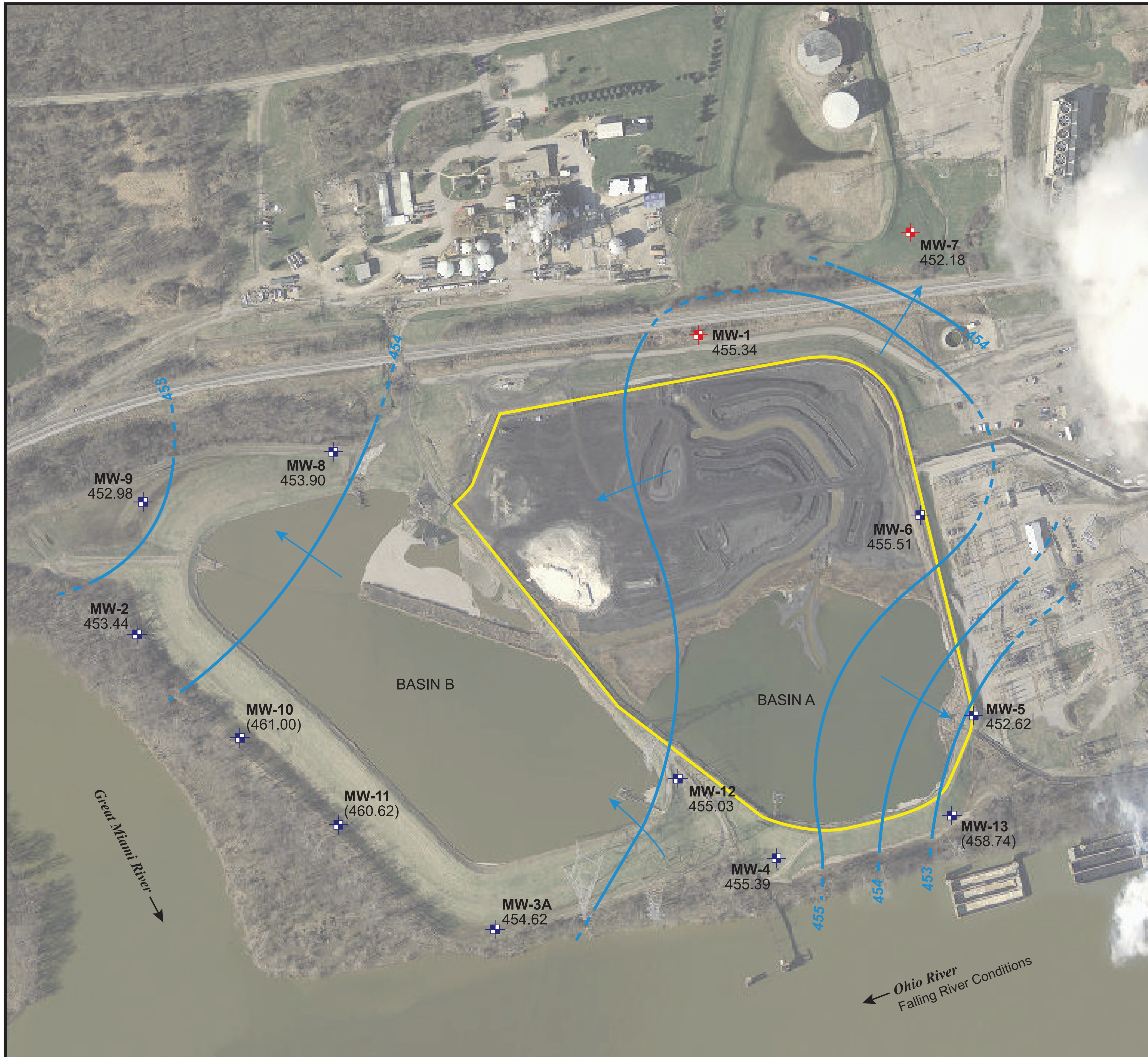
1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 16.41 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
    b. Manufacturer Johnson
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 6/19/2019

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

ATTACHMENT 4 – MAPS OF THE DIRECTION OF GROUNDWATER FLOW



UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.51 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 8, 2015

(458.74) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED DECEMBER 8, 2015

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 8, 2015
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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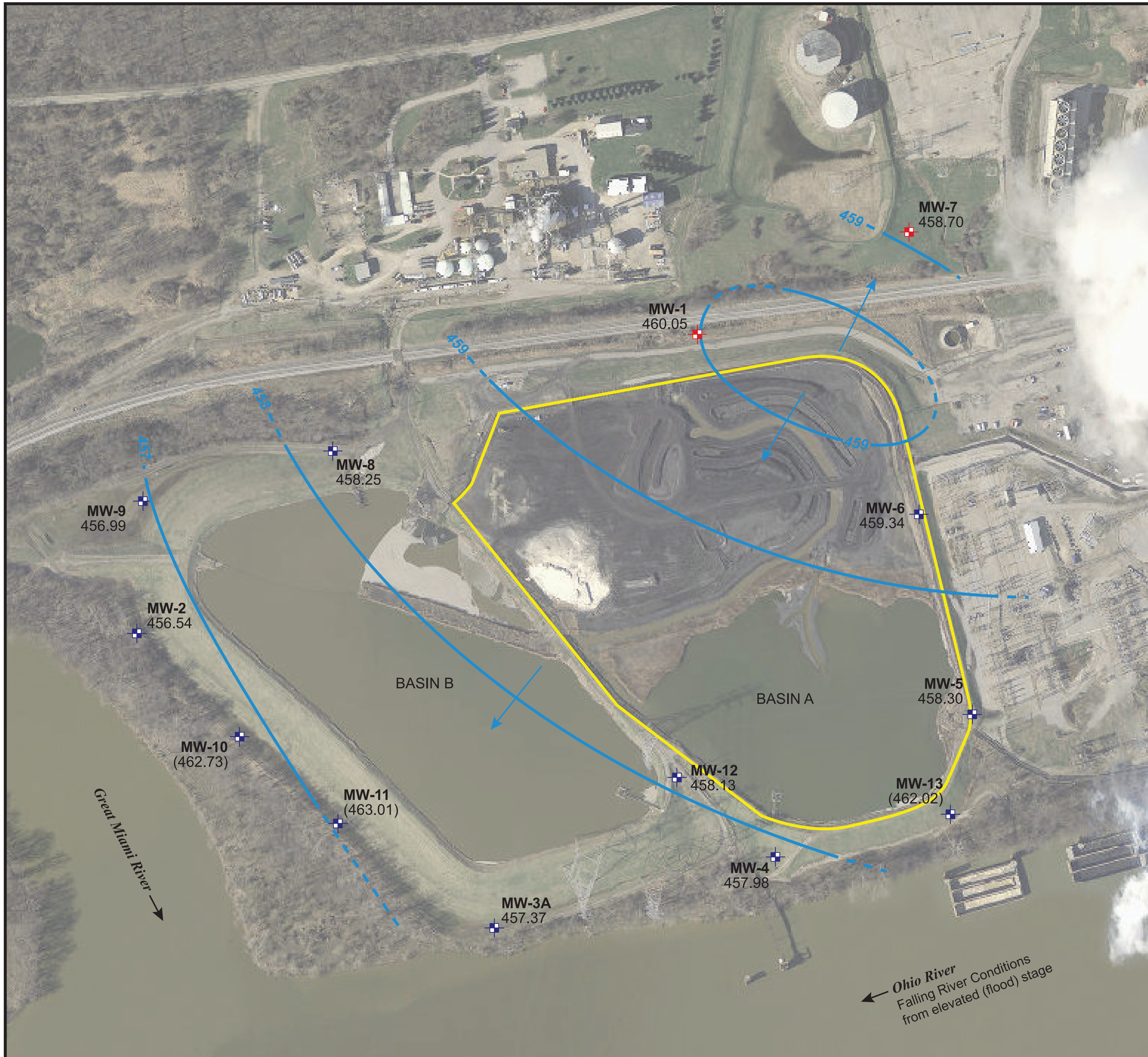

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

458.70 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED MARCH 21, 2016

(462.02) GROUNDWATER ELEVATION (FEET, MSL)
NOT USED IN CONTOUR INTERPOLATION,
MEASURED MARCH 21, 2016

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 21, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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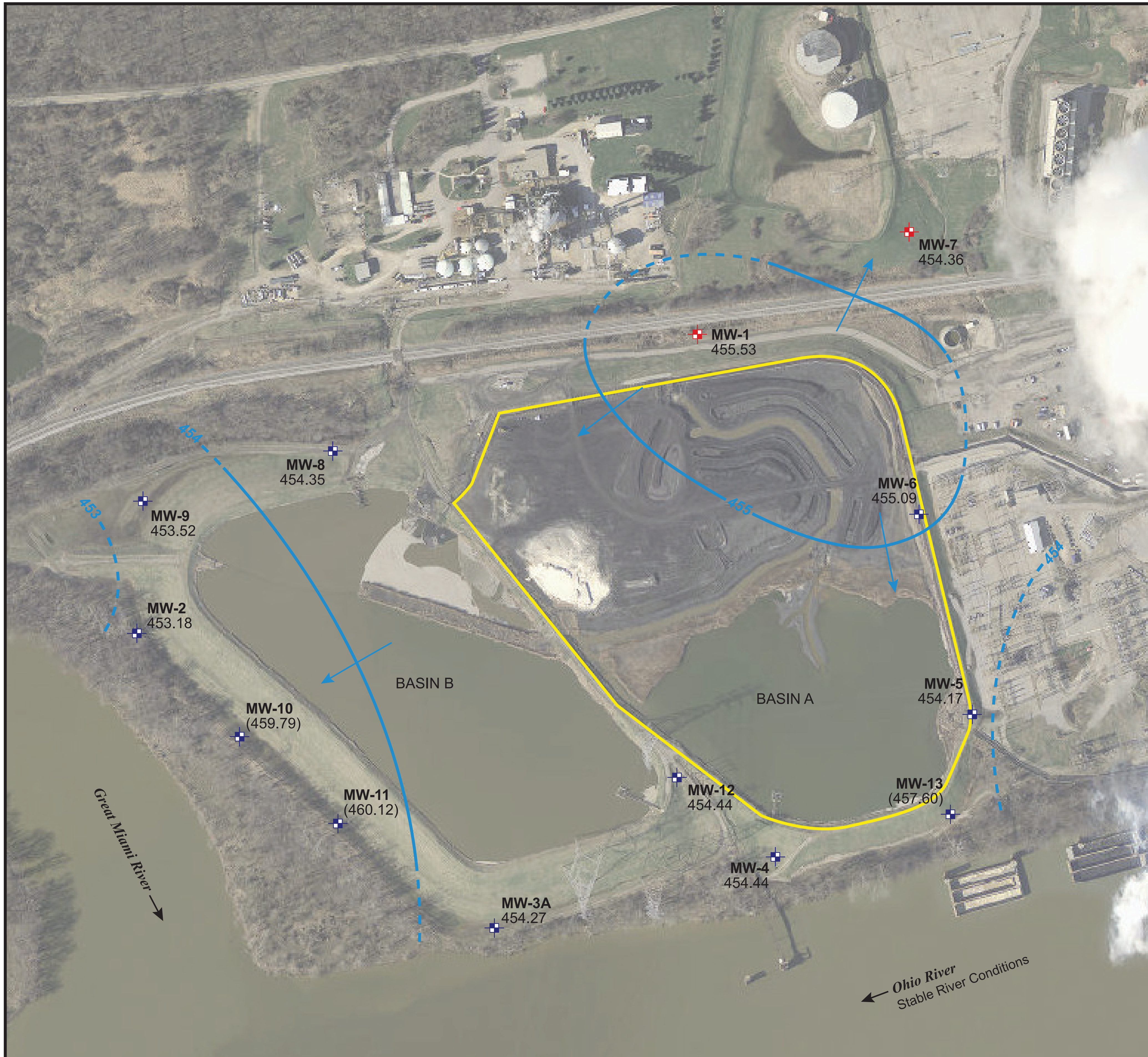

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

454.36 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JUNE 20, 2016

(457.60) GROUNDWATER ELEVATION (FEET, MSL)
NOT USED IN CONTOUR INTERPOLATION,
MEASURED JUNE 20, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 20, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

453.46 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED SEPTEMBER 12, 2016

(459.64) GROUNDWATER ELEVATION (FEET, MSL)
NOT USED IN CONTOUR INTERPOLATION,
MEASURED SEPTEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

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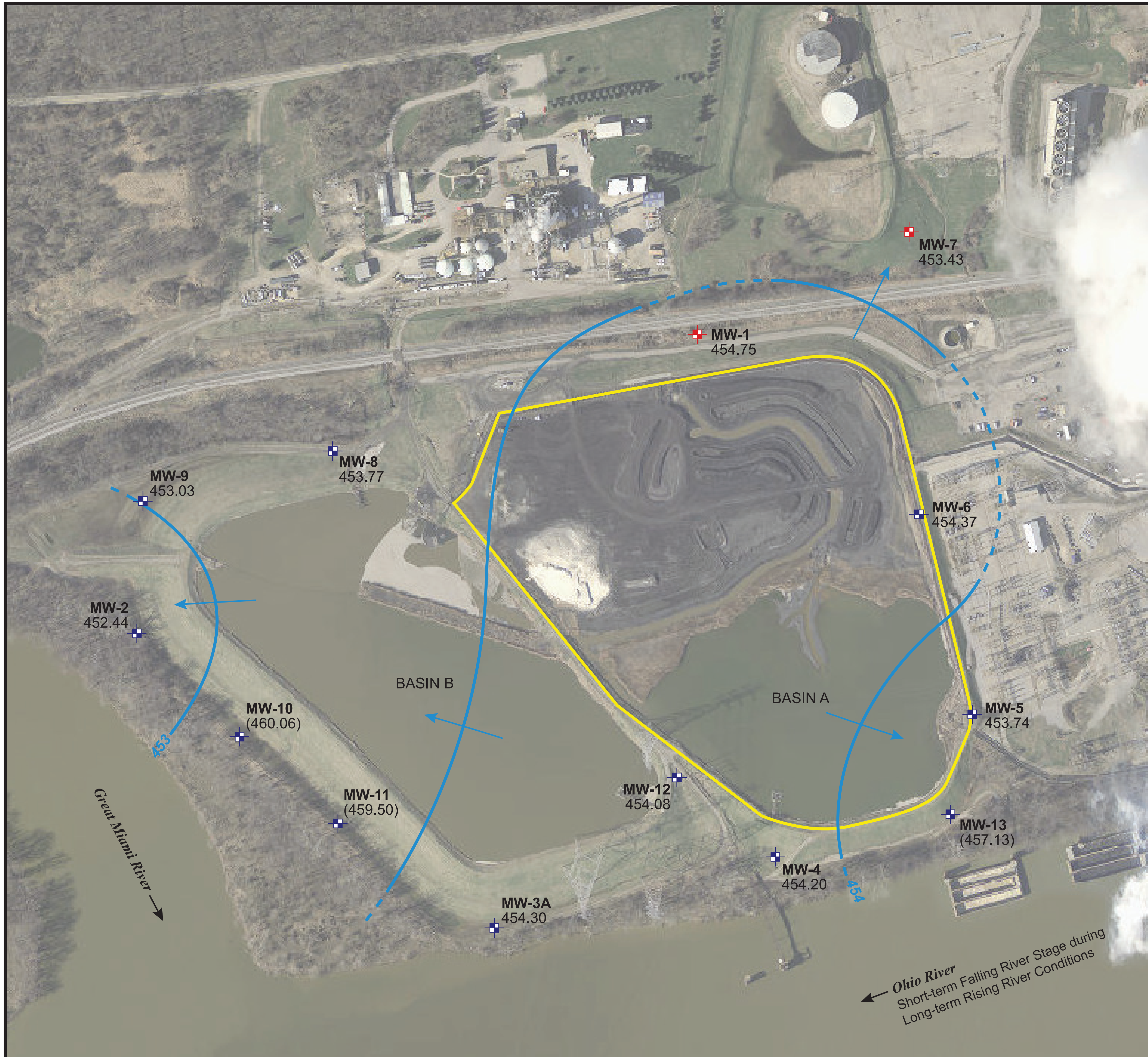

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

453.43 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

(459.50) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED DECEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE ____________

DATE ____________

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

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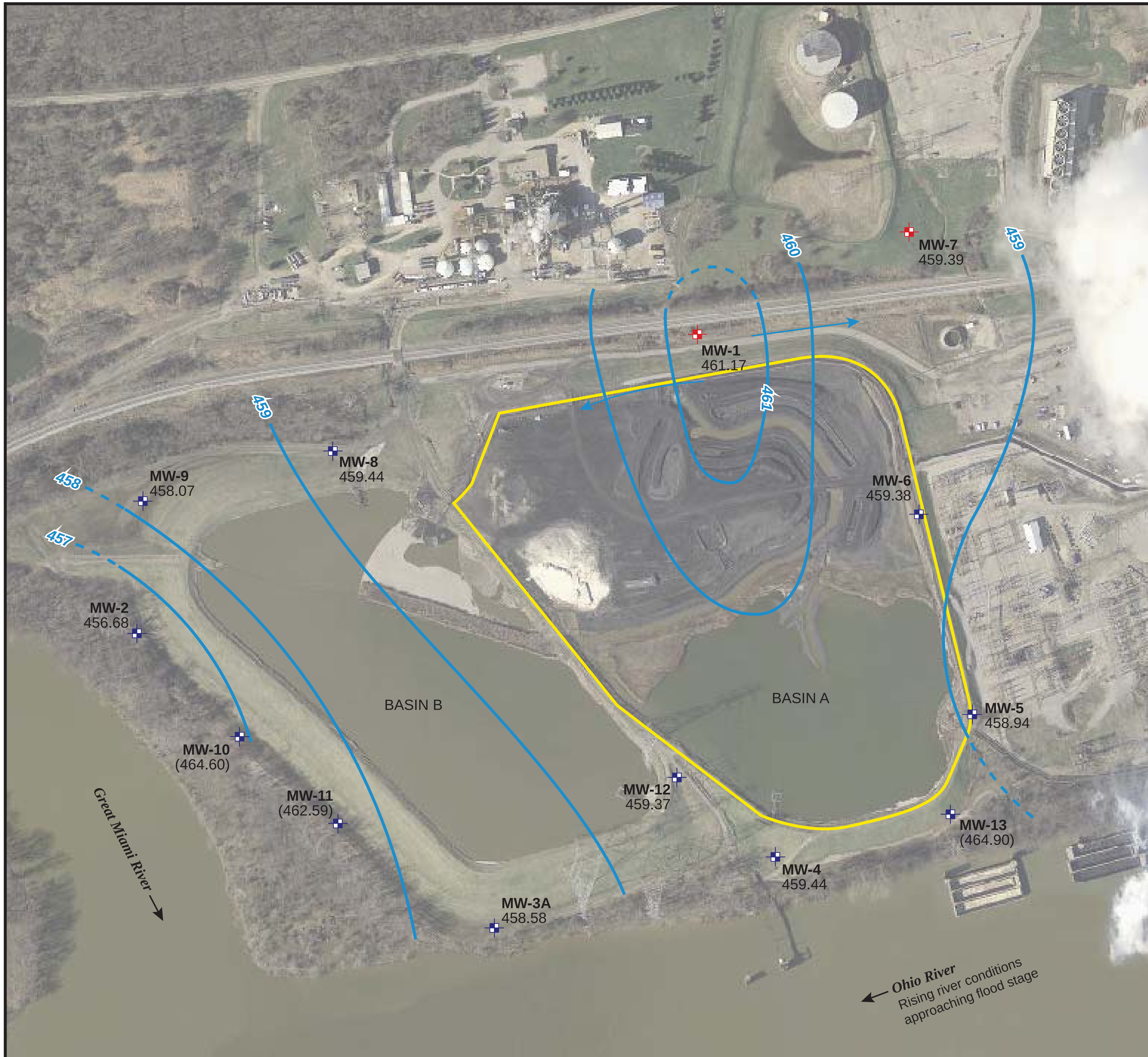

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

459.38 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED MARCH 7, 2017

(464.90) GROUNDWATER ELEVATION (FEET, MSL)
NOT USED IN CONTOUR INTERPOLATION,
MEASURED MARCH 7, 2017

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 7, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/09/17	0	ALW	MAW

JOB NO. 60442412

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.94 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 5, 2017

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 5, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

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UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.14 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JULY 10, 2017

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 10, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

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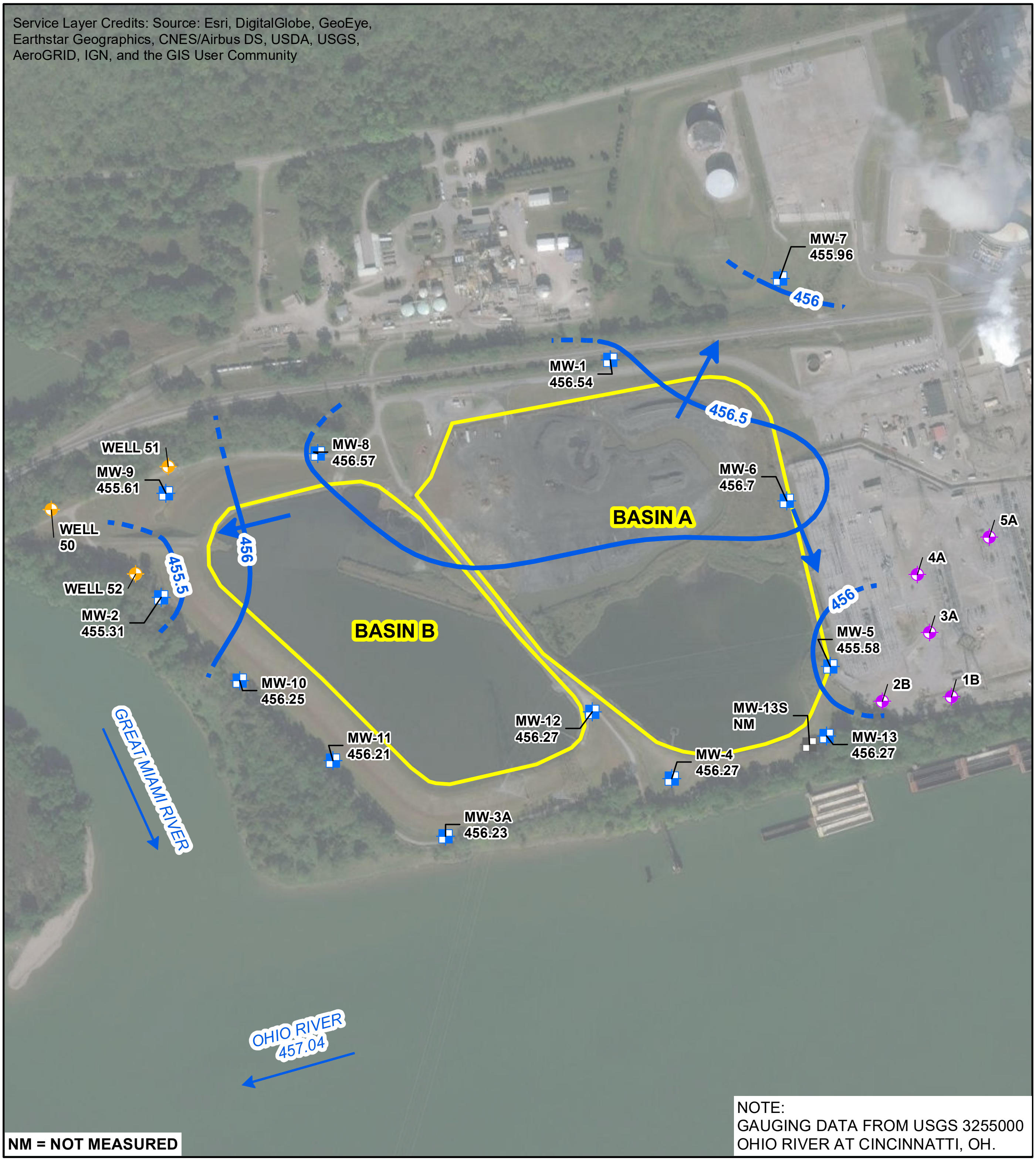

CCR MONITORING WELL LOCATION
NON-CCR UNIT MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL, NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14-15, 2017

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

O'BRIEN & GERE ENGINEERS, INC.

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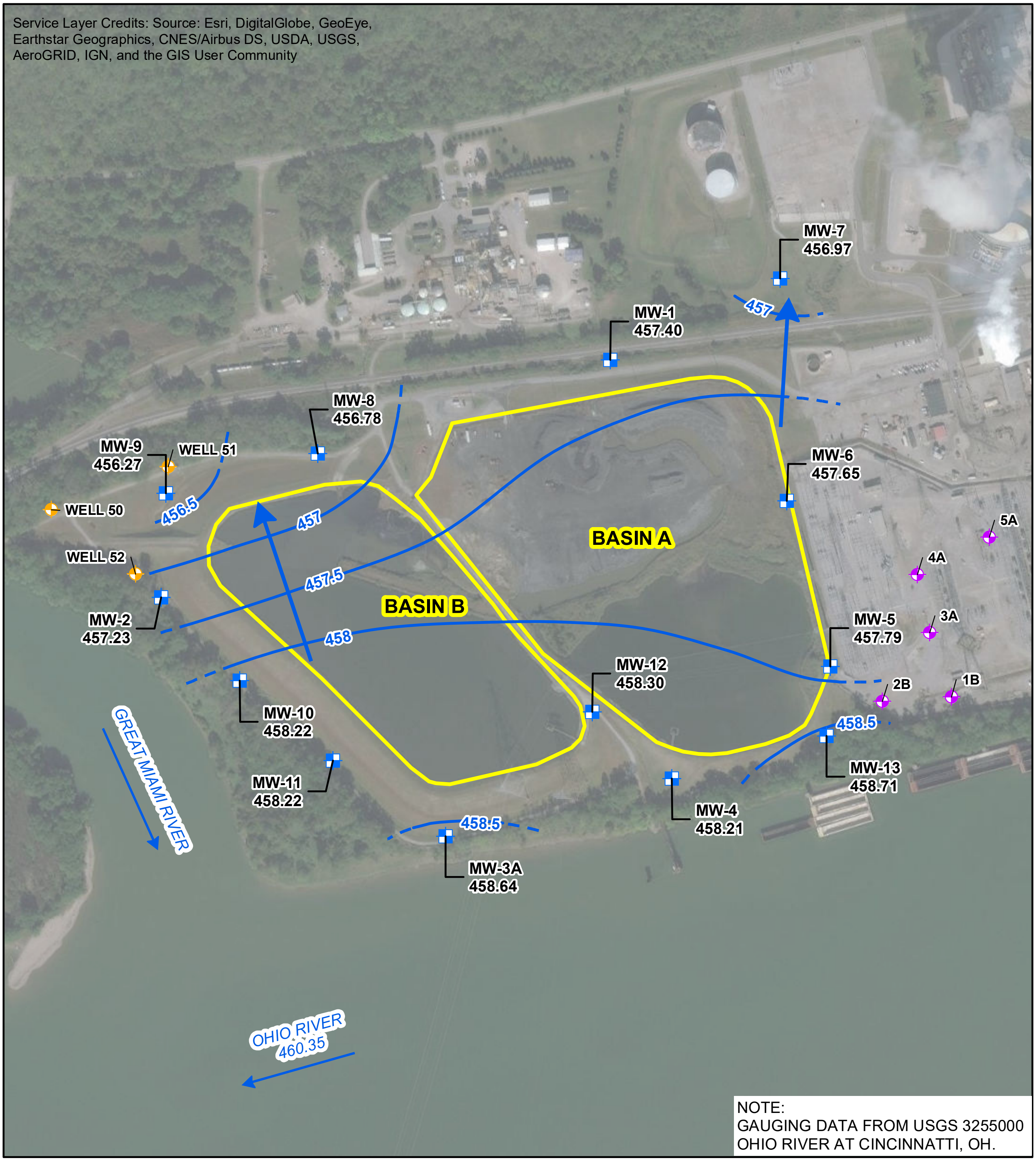


CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL. NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

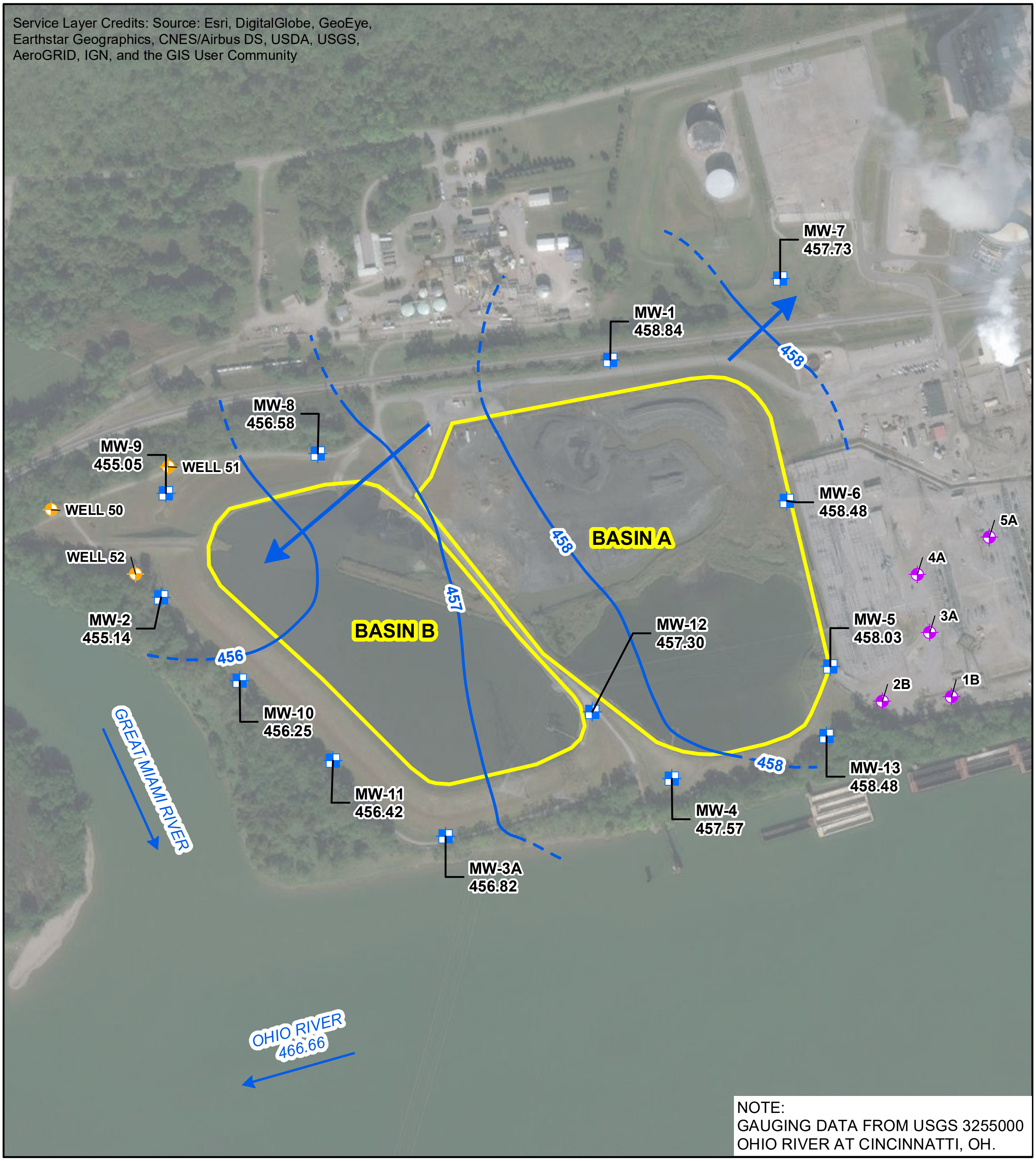
MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



NOTE:
GAUGING DATA FROM USGS 3255000
OHIO RIVER AT CINCINNATTI, OH.

CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION
GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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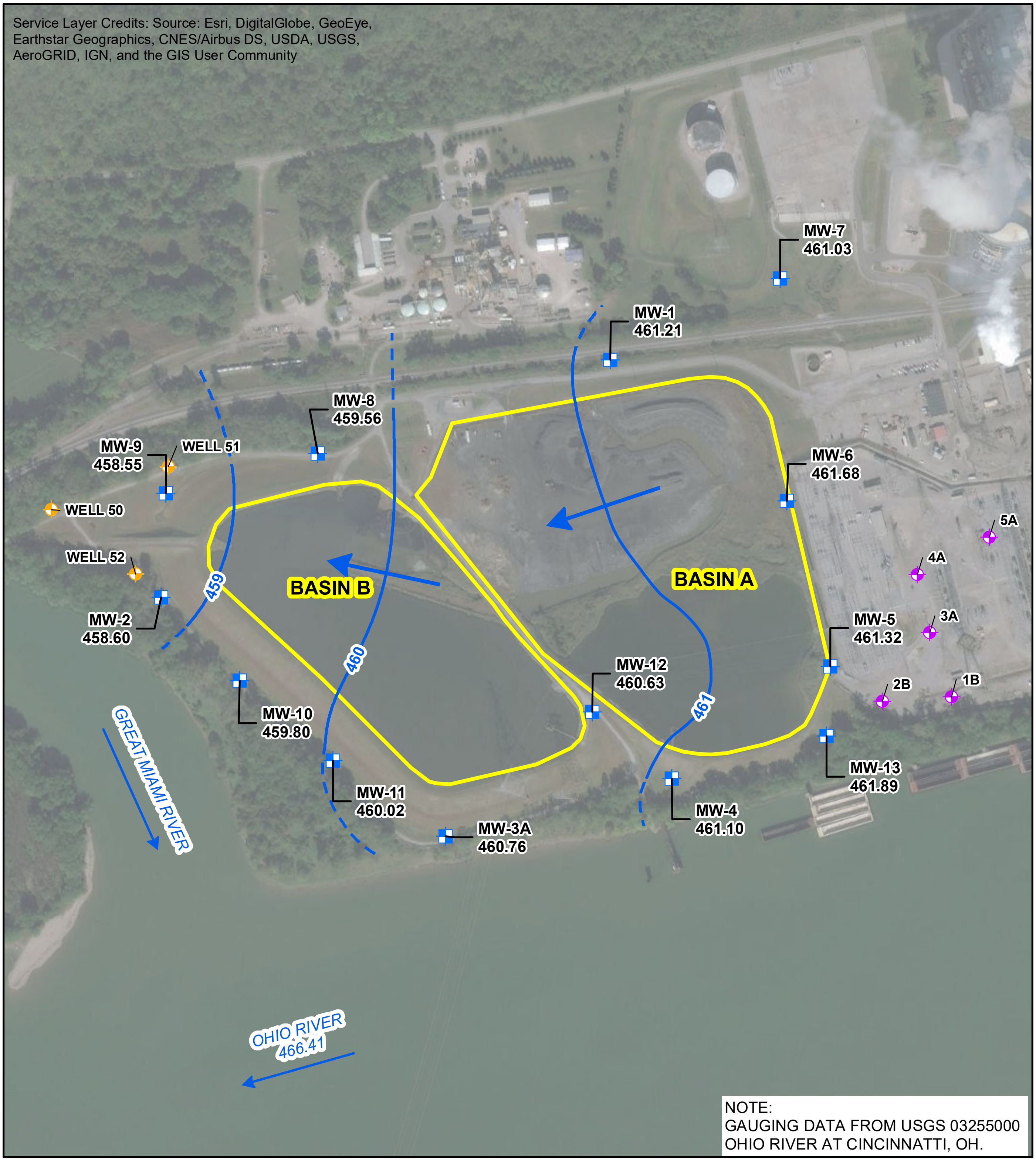

LEGEND

- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 11, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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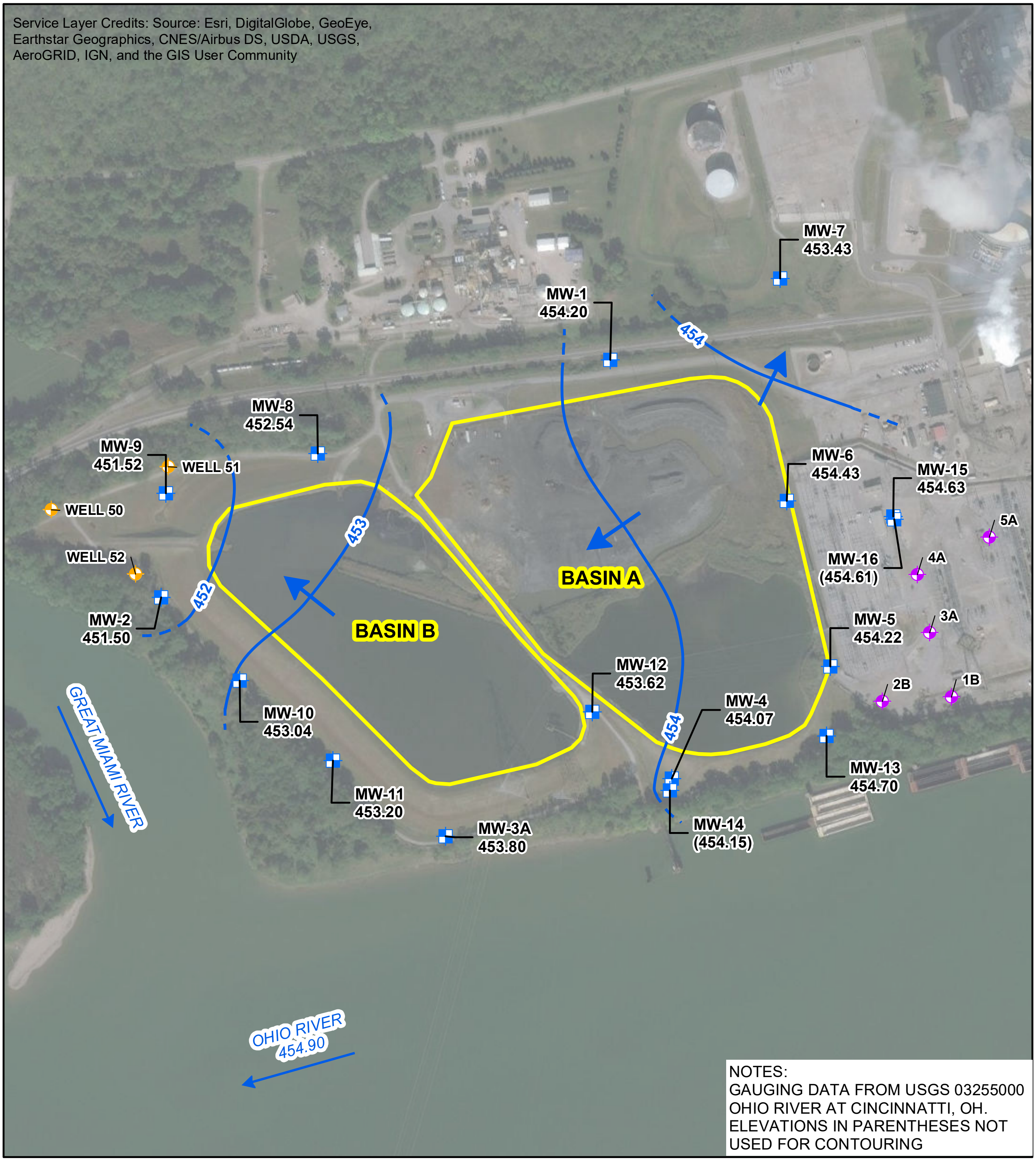

LEGEND
- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 9, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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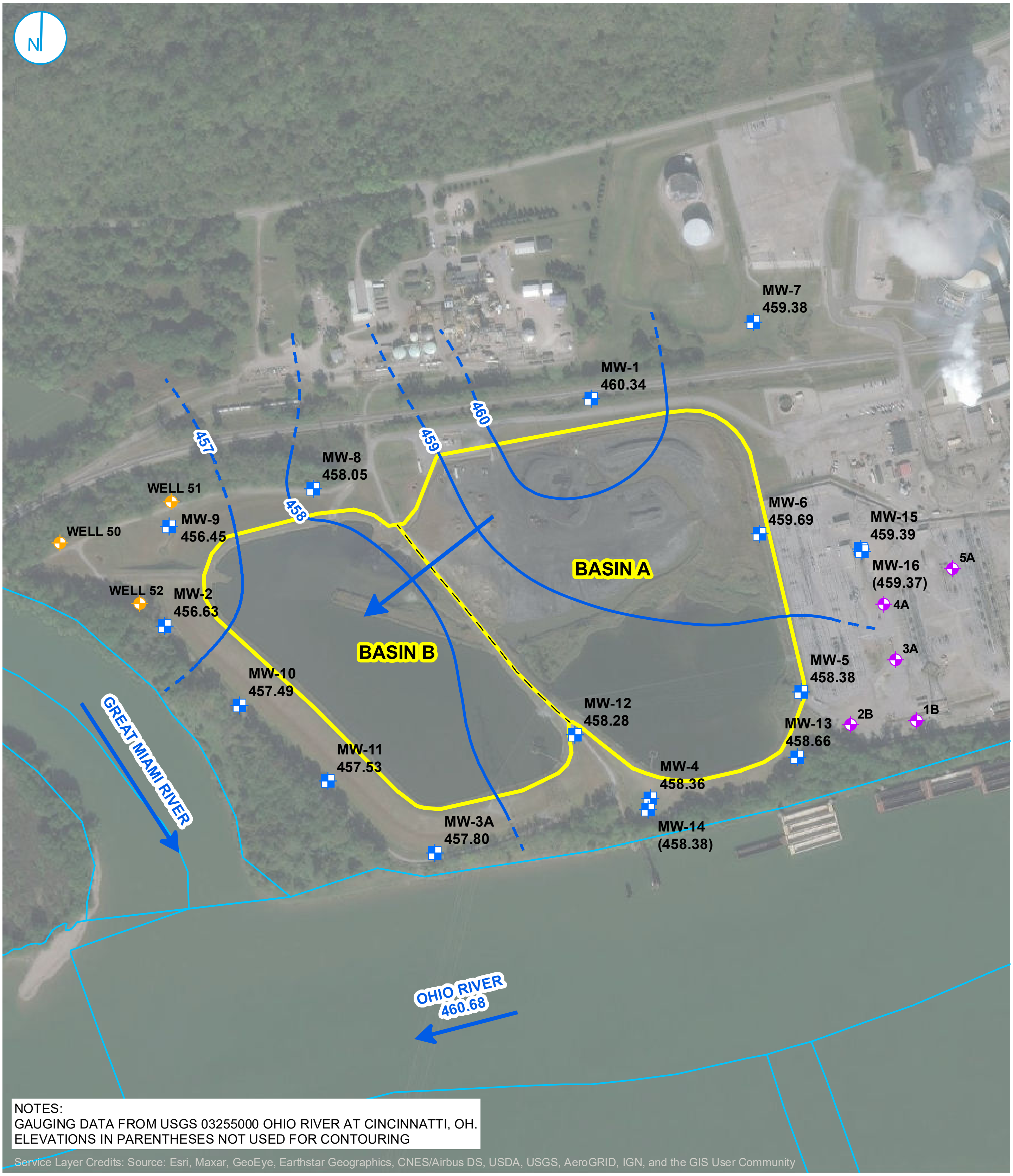

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PROJECT: 72799 | DATED: 8/31/2020 | DESIGNER: STOLZSD

CCR MONITORING WELL LOCATION

MIAMI FORT PRODUCTION WELLS

VEOLIA PRODUCTION WELLS

CCR MONITORED MULTI-UNIT

CCR UNIT

RIVER FLOW DIRECTION

SURFACE WATER FEATURE

GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 5

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

ATTACHMENT 5 – TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-7	12/8/2015	0.205	130	10.3	0.119	7.1	54.2	519
MW-7	3/22/2016	0.0645	159	4.73	0.128	6.8	39.4	468
MW-7	6/21/2016	0.0961	120	<30	<10	7.0	53.6	478
MW-7	9/13/2016	0.112	109	7.14	<1	6.9	49.3	494
MW-7	12/14/2016	0.0837	118	5.98	<1	7.0	<50	456
MW-7	3/8/2017	0.0803	104	6.46	<1	9.4	39.1	450
MW-7	6/6/2017	<0.08	102	6.15	<1	7.6	50.6	476
MW-7	7/10/2017	0.0887	108	7.84	<1	6.7	<100	474
MW-7	11/13/2017	0.100	121	7.48	<1	6.7	<100	483
MW-7	5/7/2018	NA	NA	NA	NA	7.0	NA	NA
MW-7	5/8/2018	<1	116	6.85	<1	NA	59.5	517
MW-7	9/20/2018	0.0949	111	4.91	<1	6.6	<50	453
MW-7	3/13/2019	0.0828	108	4.29	<1	7.2	50.4	449
MW-7	6/14/2019	NA	110	5.09	NA	6.9	43.6	476
MW-7	9/9/2019	0.267	112	5.02	<1	6.8	46.9	470
MW-7	4/6/2020	0.076	106	7.56	<0.15	6.5	38.2	458
Downgradient Wells								
MW-1	12/8/2015	1.90	217	54.6	0.333	7.0	492	1050
MW-1	3/22/2016	1.15	274	48.2	0.373	7.1	420	989
MW-1	6/21/2016	1.47	203	<30	<1	7.0	107	988
MW-1	9/13/2016	1.20	237	50.8	<1	7.0	550	1160
MW-1	12/14/2016	0.737	181	<60	<1	7.1	308	819
MW-1	3/7/2017	0.711	162	57.3	<1	8.1	333	852
MW-1	6/6/2017	0.799	187	71.5	<1	7.3	350	876
MW-1	7/10/2017	0.798	168	<60	<1	6.9	348	836
MW-1	11/13/2017	0.537	125	54.3	<1	6.7	290	589
MW-1	5/7/2018	NA	NA	NA	NA	7.0	NA	NA
MW-1	5/8/2018	<1	135	39.9	<1	NA	325	828
MW-1	9/18/2018	0.926	193	45.6	<1	7.0	384	925
MW-1	3/13/2019	0.797	182	37.4	<1	7.2	450	1010
MW-1	6/12/2019	NA	154	17.6	NA	7.2	284	779
MW-1	9/9/2019	0.700	164	23.3	<1	6.8	407	895
MW-1	4/6/2020	0.721	175	46.8	0.328	7.0	364	863
MW-2	12/9/2015	1.90	147	30.8	0.115	6.8	71.5	651
MW-2	3/22/2016	0.958	185	25.9	0.184	6.8	59.8	641
MW-2	6/22/2016	1.17	140	27.6	<1	6.6	59.9	655
MW-2	9/14/2016	1.13	139	32.4	<1	6.7	63.8	645
MW-2	12/13/2016	1.06	139	29.8	<1	6.7	62.2	652
MW-2	3/8/2017	1.23	138	23.1	<1	8.5	53.8	690
MW-2	6/6/2017	0.485	148	<30	<1	6.7	33.5	695
MW-2	7/10/2017	0.322	134	28.1	<1	6.6	27.1	690
MW-2	11/13/2017	0.794	135	31.3	<1	6.2	<50	595
MW-2	5/7/2018	NA	NA	NA	NA	6.8	NA	NA
MW-2	5/8/2018	<1	116	33.0	<1	NA	61.8	643
MW-2	9/19/2018	1.37	144	35.9	<1	6.6	83.5	663
MW-2	3/13/2019	0.818	110	34.0	<1	7.2	68.5	541
MW-2	9/9/2019	1.54	142	32.4	<1	6.6	62.6	668
MW-2	4/7/2020	2.63	126	29.3	<0.15	6.1	30.4	592
MW-2	6/12/2020	0.911	NA	NA	NA	NA	NA	NA

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-3A	12/9/2015	0.144	50.0	29.0	0.169	7.3	16.1	243
MW-3A	3/22/2016	0.0512	69.0	27.6	0.203	7.0	7.40	264
MW-3A	6/22/2016	0.0640	48.9	26.6	<1	7.1	12.7	256
MW-3A	9/14/2016	0.0885	49.4	29.3	<1	7.3	16.6	238
MW-3A	12/13/2016	0.0629	49.1	<30	<1	7.4	14.0	256
MW-3A	3/8/2017	<0.08	43.0	28.7	<1	9.1	12.8	248
MW-3A	6/6/2017	<0.08	56.7	<30	<1	7.0	6.56	289
MW-3A	7/10/2017	<0.08	54.1	28.8	<1	6.9	11.6	251
MW-3A	11/14/2017	<0.08	47.0	26.8	<1	7.0	8.32	255
MW-3A	5/7/2018	NA	NA	NA	NA	7.3	NA	NA
MW-3A	5/9/2018	<1	56.4	25.6	<1	NA	23.3	314
MW-3A	9/19/2018	<0.08	52.0	37.0	<1	7.1	13.5	252
MW-3A	3/13/2019	<0.08	57.0	21.1	<1	7.5	37.3	271
MW-3A	9/10/2019	0.102	49.7	25.6	<1	7.2	18.3	246
MW-3A	4/7/2020	0.0378	70.3	21.3	<0.15	6.6	34.4	325
MW-4	12/7/2015	0.359	135	29.7	0.245	6.7	338	756
MW-4	3/24/2016	0.332	271	21.4	0.265	6.1	639	1150
MW-4	6/21/2016	0.378	198	25.9	<1	6.1	726	1140
MW-4	9/13/2016	0.323	182	24.1	<1	6.2	505	991
MW-4	12/13/2016	0.264	146	25.4	<1	6.3	420	788
MW-4	3/7/2017	0.329	216	23.1	<1	7.1	680	1180
MW-4	6/6/2017	0.563	367	19.0	<1	6.0	<2500	2240
MW-4	7/11/2017	0.599	317	19.3	<1	5.8	1270	1930
MW-4	11/14/2017	0.259	153	27.3	<1	6.1	432	840
MW-4	5/7/2018	NA	NA	NA	NA	5.9	NA	NA
MW-4	5/9/2018	<1	221	24.0	<1	NA	992	1300
MW-4	9/20/2018	0.750	370	17.4	<1	5.5	1470	2070
MW-4	3/12/2019	0.267	145	28.7	<1	6.5	355	738
MW-4	6/13/2019	NA	183	25.9	NA	6.2	523	1010
MW-4	9/10/2019	0.582	350	<15	<5	5.5	1450	2250
MW-4	4/7/2020	0.774	439	16.1	<0.15	5.3	1610	2170
4A	8/9/2019	NA	190	110	NA	NA	310	860
4A	4/6/2020	5.31	155	134	<0.15	7.2	316	<20
MW-5	12/8/2015	4.82	155	138	0.131	7.4	235	783
MW-5	3/24/2016	3.06	192	135	0.179	7.3	247	710
MW-5	6/21/2016	14.6	294	398	<1	7.2	620	1630
MW-5	9/13/2016	19.9	363	430	<1	7.1	640	2120
MW-5	12/13/2016	17.7	308	317	<1	7.3	574	1660
MW-5	3/8/2017	4.85	172	134	<1	9.1	320	849
MW-5	6/6/2017	4.41	195	<150	<1	7.5	274	852
MW-5	7/11/2017	5.17	184	137	<1	7.2	335	893
MW-5	11/14/2017	5.37	180	175	<1	7.0	302	811
MW-5	5/7/2018	NA	NA	NA	NA	7.2	NA	NA
MW-5	5/9/2018	4.19	171	115	<1	NA	327	845
MW-5	9/20/2018	2.92	131	42.1	<1	6.6	177	573
MW-5	3/12/2019	4.08	171	939	<1	7.5	233	781
MW-5	6/14/2019	NA	432	521	NA	7.0	735	2240
MW-5	9/10/2019	19.5	370	510	<5	6.8	566	2670
MW-5	4/7/2020	34.6	366	535	<0.15	6.5	535	1790

Analytical Results - Appendix III
Miami Fort Pond System

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-6	12/7/2015	23.8	98.7	612	0.922	7.2	38.4	1480
MW-6	3/24/2016	22.1	87.4	481	1.27	6.9	55.6	1050
MW-6	6/21/2016	12.8	53.1	218	1.60	7.2	6.38	627
MW-6	9/13/2016	7.42	43.3	131	1.53	7.3	16.1	526
MW-6	12/13/2016	5.32	44.3	125	1.56	7.3	24.3	478
MW-6	3/7/2017	12.6	82.4	307	1.37	7.9	187	990
MW-6	6/6/2017	30.2	123	571	1.36	7.0	<250	1680
MW-6	7/11/2017	23.2	93.7	456	1.35	7.1	126	1380
MW-6	11/14/2017	23.3	116	503	1.28	6.8	311	1640
MW-6	5/7/2018	NA	NA	NA	NA	7.1	NA	NA
MW-6	5/9/2018	41.1	129	102	<1	NA	44.1	2260
MW-6	9/20/2018	15.3	69.5	269	1.28	6.9	92.3	1050
MW-6	3/12/2019	4.10	40.6	135	1.21	7.6	20.5	534
MW-6	6/14/2019	NA	44.5	119	NA	7.3	14.2	557
MW-6	9/10/2019	1.46	46.7	166	1.03	7.1	6.44	572
MW-6	4/7/2020	3.71	52.9	193	0.777	6.8	22.4	590
MW-8	12/9/2015	2.04	125	52.2	0.200	7.2	349	816
MW-8	3/22/2016	4.99	269	43.6	0.178	7.1	437	1010
MW-8	6/21/2016	2.04	147	<150	<1	7.1	371	843
MW-8	9/14/2016	1.23	123	48.5	<1	7.1	272	691
MW-8	12/13/2016	1.65	159	43.6	<1	7.1	363	833
MW-8	3/7/2017	1.77	151	47.2	<1	8.0	401	910
MW-8	6/6/2017	3.84	159	48.2	<1	6.7	383	822
MW-8	7/10/2017	3.07	139	47.8	<1	7.0	323	751
MW-8	11/13/2017	2.63	136	46.9	<1	6.6	295	733
MW-8	5/7/2018	NA	NA	NA	NA	7.2	NA	NA
MW-8	5/8/2018	<1	110	43.0	<1	NA	233	641
MW-8	9/19/2018	1.81	155	40.0	<2	7.2	342	800
MW-8	3/14/2019	0.906	120	40.5	<1	7.4	258	676
MW-8	9/9/2019	1.00	123	40.2	<1	7.0	258	666
MW-8	4/7/2020	1.54	137	40.4	0.187	6.5	288	711
MW-9	12/9/2015	4.81	144	77.2	0.509	7.3	379	876
MW-9	3/22/2016	3.36	163	69.5	0.445	7.1	341	848
MW-9	6/22/2016	3.50	139	65.6	<1	7.1	342	806
MW-9	9/14/2016	3.87	161	77.0	<1	7.1	399	854
MW-9	12/13/2016	5.16	184	84.2	<1	7.2	410	815
MW-9	3/8/2017	2.98	142	63.6	<1	9.0	383	814
MW-9	6/6/2017	2.71	176	62.3	<1	6.9	515	849
MW-9	7/10/2017	2.50	175	58.8	<1	6.9	381	866
MW-9	11/13/2017	2.44	157	64.5	<1	6.7	396	839
MW-9	5/7/2018	NA	NA	NA	NA	7.1	NA	NA
MW-9	5/8/2018	2.14	148	59.5	<1	NA	375	829
MW-9	9/19/2018	4.14	179	74.5	<5	7.0	380	886
MW-9	3/13/2019	2.59	152	69.5	<1	7.3	363	872
MW-9	9/9/2019	2.88	172	65.8	<1	6.9	405	889
MW-9	4/7/2020	2.57	172	65.2	0.345	6.5	410	899

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-10S[2]	12/9/2015	2.02	142	21.5	0.150	6.8	72.0	682
MW-10S[2]	3/23/2016	0.540	196	11.3	0.224	6.6	32.8	629
MW-10S[2]	6/22/2016	0.560	138	11.9	<1	6.7	16.6	624
MW-10S[2]	9/14/2016	0.649	137	12.5	<1	6.7	15.8	614
MW-10S[2]	12/13/2016	0.743	167	11.8	<1	6.9	13.1	648
MW-10S[2]	3/8/2017	0.835	150	11.5	<1	8.6	14.5	703
MW-10	6/6/2017	0.0895	67.1	53.5	<1	7.1	10.3	360
MW-10	7/10/2017	0.135	72.7	45.7	<1	7.1	<5	351
MW-10	11/14/2017	<0.08	51.5	31.7	<1	7.2	18.3	298
MW-10	5/7/2018	NA	NA	NA	NA	7.6	NA	NA
MW-10	5/8/2018	<1	55.4	37.1	<1	NA	18.2	318
MW-10	9/19/2018	0.0839	53.1	30.5	<1	7.4	14.5	275
MW-10	3/13/2019	0.115	58.2	955	<1	7.8	9.18	301
MW-10	9/10/2019	0.102	47.5	24.4	<1	7.5	18.8	232
MW-10	4/7/2020	0.0901	64.7	46.2	0.227	7.0	25.3	358
MW-11S[2]	12/9/2015	0.161	145	15.1	0.266	7.0	15.2	648
MW-11S[2]	3/23/2016	0.0417	211	8.42	0.400	6.9	2.64	651
MW-11S[2]	6/22/2016	0.0492	157	9.87	<1	6.9	<5	651
MW-11S[2]	9/14/2016	0.0738	161	9.73	<1	7.0	<5	645
MW-11S[2]	12/14/2016	0.0466	160	8.89	<1	7.0	<5	646
MW-11S[2]	3/8/2017	<0.08	156	18.7	<1	8.8	15.8	758
MW-11	6/6/2017	<0.08	58.5	38.0	<1	7.3	35.5	321
MW-11	7/10/2017	0.0917	55.3	39.5	<1	7.4	<50	314
MW-11	11/14/2017	0.0824	54.8	34.6	<1	7.3	<50	306
MW-11	5/7/2018	NA	NA	NA	NA	7.8	NA	NA
MW-11	5/8/2018	<1	55.5	38.8	<1	NA	31.9	303
MW-11	9/19/2018	0.0872	53.0	27.1	<1	7.8	42.5	276
MW-11	3/13/2019	0.0814	48.0	591	<1	7.9	30.4	265
MW-11	9/10/2019	0.102	47.5	21.1	<1	7.4	34.9	230
MW-11	4/7/2020	0.0656	73.1	61.3	<0.15	7.0	36.1	408
MW-12	12/7/2015	5.86	160	155	0.091	6.4	377	926
MW-12	3/24/2016	4.49	226	141	0.163	6.2	364	908
MW-12	6/21/2016	5.75	164	159	<1	5.9	443	979
MW-12	9/13/2016	6.02	184	168	<1	5.9	432	992
MW-12	12/13/2016	6.46	187	163	<1	6.0	452	1060
MW-12	3/7/2017	5.97	185	172	<1	7.0	525	1120
MW-12	6/6/2017	7.48	216	190	<1	6.3	544	1240
MW-12	7/11/2017	7.30	197	213	<1	5.4	603	1250
MW-12	11/14/2017	8.37	203	214	<1	5.3	617	1240
MW-12	5/7/2018	NA	NA	NA	NA	6.1	NA	NA
MW-12	5/8/2018	7.30	197	166	<1	NA	508	1090
MW-12	9/20/2018	8.28	193	161	<1	5.6	458	1080
MW-12	3/13/2019	6.48	197	166	<1	6.3	460	1030
MW-12	6/12/2019	NA	209	193	NA	6.0	502	1220
MW-12	9/10/2019	7.80	167	174	<1	5.5	<5	1110
MW-12	4/7/2020	9.31	166	159	<0.15	5.2	472	894

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-13S[2]	12/8/2015	1.11	288	33.1	0.0708	6.2	947	1680
MW-13S[2]	3/24/2016	0.689	394	23.9	0.0702	5.5	1060	1620
MW-13S[2]	6/21/2016	0.795	265	<30	<1	6.0	1060	1600
MW-13S[2]	9/13/2016	0.826	270	25.0	<1	7.0	1070	1590
MW-13S[2]	12/13/2016	0.845	251	24.4	<1	5.6	949	1490
MW-13S[2]	3/7/2017	0.665	244	25.0	<1	6.7	976	1480
MW-13	6/6/2017	0.0828	52.7	<30	<1	6.8	58.4	289
MW-13	7/11/2017	0.156	42.3	26.3	<1	7.0	56.7	264
MW-13	11/14/2017	0.124	40.5	26.5	<1	7.2	<250	247
MW-13	5/7/2018	NA	NA	NA	NA	7.9	NA	NA
MW-13	5/9/2018	<1	41.0	15.2	<1	NA	61.2	249
MW-13	9/19/2018	0.0814	38.3	27.5	<2	7.6	47.2	234
MW-13	3/12/2019	0.157	43.4	30.6	<1	8.0	51.2	261
MW-13	6/13/2019	NA	46.6	29.6	NA	7.6	56.3	268
MW-13	9/10/2019	0.211	45.1	30.3	<1	7.1	64.5	242
MW-13	4/7/2020	0.0716	41.3	28.7	<0.15	7.0	51.2	464
MW-14	6/13/2019	NA	39.7	28.4	NA	8.0	41.9	245
MW-14	9/10/2019	0.161	40.7	29.7	<1	7.9	39.8	195
MW-14	4/6/2020	0.0723	41.6	32.6	<0.15	7.2	39.8	235
MW-15	6/12/2019	NA	114	189	NA	7.3	14.5	653
MW-15	9/10/2019	0.453	103	191	<1	7.0	13.6	688
MW-15	4/6/2020	0.366	113	165	0.215	7.2	59.0	659
MW-16	6/12/2019	NA	200	118	NA	6.9	220	1010
MW-16	9/10/2019	0.119	170	55.8	<1	6.7	118	1010
MW-16	4/6/2020	0.104	186	126	<0.15	6.8	89.2	912

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; s.u. - standard units.
2. Previously monitored CCR locations MW-10S, MW-11S, and MW-13S were replaced by CCR monitoring locations MW-10, MW-11 and MW-13, respectively, which are screened deeper into the uppermost aquifer.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-7	12/8/2015	<0.0005	0.00143	0.0997	<0.001	<0.0004	0.000574	<0.0005	0.119	<0.0002	0.0082	<0.0001	0.00231	0.448	0.000740	<0.0005
MW-7	3/22/2016	<0.00418	<0.00295	0.133	<0.000875	<0.00025	<0.0025	<0.000543	0.128	<0.000433	0.00949	<0.0001	<0.0025	0.464	<0.00398	<0.00138
MW-7	6/21/2016	<0.002	<0.001	0.111	<0.001	<0.001	<0.002	<0.0005	<10	<0.001	<0.05	<0.0002	<0.005	0.383	<0.005	<0.001
MW-7	9/13/2016	<0.002	<0.001	0.0997	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.670	<0.005	<0.001
MW-7	12/14/2016	<0.002	<0.001	0.0996	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-7	3/8/2017	<0.002	<0.001	0.0874	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.411	<0.005	<0.001
MW-7	6/6/2017	<0.002	<0.001	0.0969	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.504	<0.005	<0.001
MW-7	7/10/2017	<0.002	<0.001	0.0903	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.386	<0.005	<0.001
MW-7	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-7	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.386	<0.01	<0.002
MW-7	9/20/2018	NA	<0.001	0.0983	NA	NA	<0.002	<0.0005	<1	NA	NA	NA	<0.005	0.567	NA	NA
MW-7	3/13/2019	<0.002	<0.001	0.0942	<0.001	<0.001	0.00218	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.337	<0.005	<0.001
MW-7	6/14/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-7	9/9/2019	NA	<0.001	0.107	<0.001	<0.001	0.00313	<0.0005	<1	<0.001	0.00524	<0.0002	<0.005	0.464	<0.005	<0.001
MW-7	4/6/2020	<0.004	<0.002	0.088	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00421	<0.0002	<0.005	1.07	<0.002	<0.002
Downgradient Wells																
MW-1	12/8/2015	<0.0005	0.00229	0.0484	<0.001	<0.0004	<0.0005	<0.0005	0.333	0.000222	0.0707	<0.0001	0.0405	0.564	<0.0006	<0.0005
MW-1	3/22/2016	<0.00418	<0.00295	0.0602	<0.000875	<0.00025	<0.0025	<0.000543	0.373	<0.000433	0.0616	<0.0001	0.0513	0.394	<0.00398	<0.00138
MW-1	6/21/2016	<0.002	<0.001	0.0452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0353	0.237	<0.005	<0.001
MW-1	9/13/2016	<0.002	<0.001	0.0515	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.053	<0.0002	0.0405	0.556	<0.005	<0.001
MW-1	12/14/2016	<0.002	<0.001	0.0371	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.059	<0.0002	0.0502	0.0493	<0.005	<0.001
MW-1	3/7/2017	<0.002	<0.001	0.0339	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0406	0.186	<0.005	<0.001
MW-1	6/6/2017	<0.002	<0.001	0.0373	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0357	0.178	<0.005	<0.001
MW-1	7/10/2017	<0.002	<0.001	0.0358	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.039	0.112	<0.005	<0.001
MW-1	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-1	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0276	0.400	<0.01	<0.002
MW-1	9/18/2018	NA	<0.001	0.0512	NA	NA	<0.002	<0.0005	<1	NA	NA	NA	0.0383	0.344	NA	NA
MW-1	3/13/2019	<0.002	<0.001	0.0512	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0304	<0.0002	0.0308	0.514	<0.005	<0.001
MW-1	6/12/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	0.0241	NA	NA	NA
MW-1	9/9/2019	NA	<0.001	0.0482	<0.001	<0.001	0.00289	<0.0005	<1	<0.001	0.0228	<0.0002	0.021	0.0553	<0.005	<0.001
MW-1	4/6/2020	<0.004	<0.002	0.0424	<0.002	<0.001	<0.002	<0.002	0.328	<0.005	0.0258	<0.0002	0.0273	1.87	<0.002	<0.002
MW-2	12/9/2015	<0.0005	0.0309	0.516	<0.001	<0.0004	0.00288	0.00167	0.115	0.00315	0.00495	<0.0001	0.000942	1.54	0.000677	<0.0005
MW-2	3/22/2016	<0.00418	0.0469	0.620	<0.000875	<0.00025	<0.0025	0.00073	0.184	0.0013	0.00436	<0.0001	<0.0025	2.19	<0.00398	<0.00138
MW-2	6/22/2016	<0.002	0.0320	0.462	<0.001	<0.001	<0.002	0.00206	<1	<0.001	<0.05	<0.0002	<0.005	0.705	<0.005	<0.001
MW-2	9/14/2016	<0.002	0.0362	0.464	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.929	<0.005	<0.001
MW-2	12/13/2016	<0.002	0.0340	0.444	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.58	<0.005	<0.001
MW-2	3/8/2017	<0.002	0.0270	0.416	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.752	<0.005	<0.001
MW-2	6/6/2017	<0.002	0.0350	0.474	<0.001	<0.001	<0.002	0.000763	<1	0.00165	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-2	7/10/2017	0.0024	0.0368	0.438	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.586	<0.005	<0.001

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-2	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-2	5/8/2018	<0.003	0.0263	0.345	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.596	<0.01	<0.002
MW-2	9/19/2018	NA	0.0245	0.480	NA	NA	0.00205	NA	<1	NA	NA	NA	<0.005	0.915	NA	NA
MW-2	3/13/2019	<0.002	0.0224	0.331	<0.001	<0.001	0.00223	0.000977	<1	0.00219	<0.005	<0.0002	<0.005	0.599	<0.005	<0.001
MW-2	9/9/2019	NA	0.0232	0.501	<0.001	<0.001	0.00313	0.000626	<1	0.00122	<0.005	<0.0002	<0.005	0.704	<0.005	<0.001
MW-2	4/7/2020	<0.004	0.0277	0.440	<0.002	<0.001	0.00203	<0.002	<0.15	<0.005	<0.02	<0.0002	<0.005	1.66	<0.002	<0.002
MW-3A	12/9/2015	<0.0005	0.00540	0.124	<0.001	<0.0004	0.000822	0.000717	0.169	0.000936	<0.004	<0.0001	0.00147	0.575	<0.0006	<0.0005
MW-3A	3/22/2016	<0.00167	0.00888	0.186	<0.00035	<0.0001	<0.001	0.000222	0.203	0.000588	0.00363	<0.0001	<0.001	0.899	<0.00159	<0.00055
MW-3A	6/22/2016	<0.002	0.00614	0.135	<0.001	<0.001	<0.002	0.000989	<1	0.00118	<0.05	<0.0002	<0.005	0.366	<0.005	<0.001
MW-3A	9/14/2016	<0.002	0.00531	0.127	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.146	<0.005	<0.001
MW-3A	12/13/2016	<0.002	0.00552	0.123	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.912	<0.005	<0.001
MW-3A	3/8/2017	<0.002	0.00459	0.109	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.581	<0.005	<0.001
MW-3A	6/6/2017	<0.002	0.00847	0.152	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.617	<0.005	<0.001
MW-3A	7/10/2017	0.00204	0.00732	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.455	<0.005	<0.001
MW-3A	5/9/2018	<0.003	0.017	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.477	<0.01	<0.002
MW-3A	9/19/2018	NA	0.00854	0.126	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.400	NA	NA
MW-3A	3/13/2019	<0.002	0.00919	0.130	<0.001	<0.001	0.00244	0.00223	<1	0.00414	<0.005	<0.0002	<0.005	0.666	<0.005	<0.001
MW-3A	9/10/2019	NA	0.00739	0.124	<0.001	<0.001	0.00258	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.558	<0.005	<0.001
MW-3A	4/7/2020	<0.004	0.0208	0.138	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.0033	<0.0002	<0.005	1.19	<0.002	<0.002
MW-4	12/7/2015	<0.0005	0.00345	0.0159	<0.001	0.000481	0.00446	0.00503	0.245	0.00144	0.0058	<0.0001	0.00504	0.480	0.000772	<0.0005
MW-4	3/24/2016	<0.00418	0.00482	0.0300	<0.000875	0.00086	0.00263	0.0139	0.265	0.0042	0.00736	<0.0001	<0.0025	0.598	<0.00398	<0.00138
MW-4	6/21/2016	<0.002	0.00163	0.0576	<0.001	<0.001	<0.002	0.0121	<1	0.00101	<0.05	<0.0002	<0.005	0.34	<0.005	<0.001
MW-4	9/13/2016	<0.002	<0.001	0.0148	<0.001	<0.001	<0.002	0.0082	<1	<0.001	<0.05	<0.0002	<0.005	0.476	<0.005	<0.001
MW-4	12/13/2016	<0.002	0.0011	0.0128	<0.001	<0.001	<0.002	0.00642	<1	<0.001	<0.05	<0.0002	<0.005	0.393	<0.005	<0.001
MW-4	3/7/2017	<0.002	0.0010	0.0270	<0.001	<0.001	<0.002	0.00839	<1	<0.001	<0.05	<0.0002	<0.005	0.0878	<0.005	<0.001
MW-4	6/6/2017	0.00226	0.00193	0.0199	<0.001	<0.001	<0.002	0.015	<1	0.00111	<0.05	<0.0002	<0.005	0.528	<0.005	<0.001
MW-4	7/11/2017	<0.002	0.00188	0.0202	<0.001	<0.001	<0.002	0.0182	<1	0.00112	<0.05	<0.0002	<0.005	0.621	<0.005	<0.001
MW-4	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-4	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	0.0127	<1	<0.005	<0.04	<0.0002	<0.01	0.186	<0.01	<0.002
MW-4	9/20/2018	NA	0.00206	0.0370	NA	NA	NA	0.0187	<1	NA	NA	NA	<0.005	0.611	NA	NA
MW-4	3/12/2019	<0.002	0.00205	0.0118	<0.001	<0.001	0.00313	0.00588	<1	0.00131	0.00596	<0.0002	<0.005	0.369	<0.005	<0.001
MW-4	6/13/2019	NA	NA	NA	NA	NA	NA	0.00827	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-4	9/10/2019	NA	<0.001	0.0197	<0.001	0.00102	0.00296	0.0171	<5	<0.001	0.0068	<0.0002	<0.005	0.382	<0.005	<0.001
MW-4	4/7/2020	<0.004	0.00478	0.0337	<0.002	0.00193	0.00358	0.0224	<0.15	<0.005	0.00897	<0.0002	<0.005	2.97	0.00222	<0.002
4A	4/6/2020	<0.004	<0.002	0.104	<0.002	<0.001	0.00225	0.00908	<0.15	<0.005	0.00802	<0.0002	0.0136	2	<0.002	<0.002
4A	6/12/2020	NA	NA	NA	NA	NA	NA	0.0120	NA	NA	NA	NA	NA	NA	NA	NA

Analytical Results - Appendix IV
Miami Fort Pond System

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-5	12/8/2015	<0.0005	0.00205	0.0559	<0.001	<0.0004	0.000792	0.000671	0.131	0.000742	0.00724	<0.0001	0.00581	0.323	<0.0006	<0.0005
MW-5	3/24/2016	<0.00418	<0.00295	0.0685	<0.000875	<0.00025	<0.0025	<0.000543	0.179	<0.000433	0.00625	<0.0001	0.0055	0.796	<0.00398	<0.00138
MW-5	6/21/2016	<0.002	<0.001	0.0826	<0.001	<0.001	<0.002	0.000696	<1	<0.001	<0.05	<0.0002	<0.005	0.211	<0.005	<0.001
MW-5	9/13/2016	<0.002	0.00164	0.0783	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.295	<0.005	<0.001
MW-5	12/13/2016	<0.002	<0.001	0.0714	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00603	0.389	<0.005	<0.001
MW-5	3/8/2017	<0.002	<0.001	0.0389	<0.001	0.00105	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00751	0.100	<0.005	<0.001
MW-5	6/6/2017	<0.002	0.00105	0.0454	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00606	0.915	<0.005	<0.001
MW-5	7/11/2017	<0.002	<0.001	0.0380	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00796	0.384	<0.005	<0.001
MW-5	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-5	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.0498	<0.01	<0.002
MW-5	9/20/2018	NA	<0.001	0.0458	NA	NA	NA	<0.0005	<1	NA	NA	NA	0.009	0.721	NA	NA
MW-5	3/12/2019	<0.002	<0.001	0.0734	<0.001	<0.001	0.00274	<0.0005	<1	<0.001	0.00674	<0.0002	0.00761	0.195	<0.005	<0.001
MW-5	6/14/2019	NA	NA	NA	NA	NA	NA	0.000661	NA	NA	NA	NA	0.00616	NA	NA	NA
MW-5	9/10/2019	NA	<0.001	0.120	<0.001	<0.001	0.00264	0.000522	<5	<0.001	<0.05	<0.0002	0.00543	0	<0.005	<0.001
MW-5	4/7/2020	<0.004	<0.002	0.0935	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.0118	<0.0002	0.00561	1.81	<0.002	<0.002
MW-6	12/7/2015	<0.0005	0.00251	0.474	<0.001	<0.0004	<0.0005	0.00472	0.922	0.000296	0.0208	<0.0001	0.54	0.997	0.000606	<0.0005
MW-6	3/24/2016	<0.00418	<0.00295	0.460	<0.000875	<0.00025	<0.0025	0.00472	1.27	<0.000433	0.0155	<0.0001	0.478	0.445	<0.00398	<0.00138
MW-6	6/21/2016	<0.002	0.00231	0.346	<0.001	<0.001	<0.002	0.00378	1.60	<0.001	<0.05	<0.0002	0.579	0.252	<0.005	<0.001
MW-6	9/13/2016	<0.002	0.00193	0.257	<0.001	<0.001	<0.002	0.00202	1.53	<0.001	<0.05	<0.0002	0.661	0.762	<0.005	<0.001
MW-6	12/13/2016	<0.002	0.00224	0.235	<0.001	<0.001	<0.002	0.00173	1.56	<0.001	<0.05	<0.0002	0.637	0.347	<0.005	<0.001
MW-6	3/7/2017	<0.002	0.00214	0.249	<0.001	<0.001	<0.002	0.00342	1.37	<0.001	<0.05	<0.0002	0.523	0.440	<0.005	<0.001
MW-6	6/6/2017	<0.002	0.00485	0.292	<0.001	<0.001	<0.002	0.00738	1.36	<0.001	<0.05	<0.0002	0.38	0.357	<0.005	<0.001
MW-6	7/11/2017	<0.002	0.0051	0.272	<0.001	<0.001	<0.002	0.00758	1.35	<0.001	<0.05	<0.0002	0.366	0.582	<0.005	<0.001
MW-6	11/14/2017	NA	NA	NA	NA	NA	NA	NA	1.28	NA	NA	NA	NA	NA	NA	NA
MW-6	5/9/2018	<0.003	0.0101	0.250	<0.004	<0.005	<0.005	0.0113	<1	<0.005	<0.04	<0.0002	0.369	0.532	<0.01	<0.002
MW-6	9/20/2018	NA	0.0107	0.632	NA	NA	NA	0.00473	1.28	NA	NA	NA	0.412	0.905	NA	NA
MW-6	3/12/2019	<0.002	0.00946	0.357	<0.001	<0.001	0.00272	0.00258	1.21	<0.001	0.00925	<0.0002	0.37	0.532	<0.005	<0.001
MW-6	6/14/2019	NA	NA	NA	NA	NA	NA	0.00330	NA	NA	NA	NA	0.344	NA	NA	NA
MW-6	9/10/2019	NA	0.0104	0.787	<0.001	<0.001	0.00261	0.00296	1.03	<0.001	0.00936	<0.0002	0.289	0.846	<0.005	<0.001
MW-6	4/7/2020	<0.004	0.00851	0.390	<0.002	<0.001	0.00253	0.00263	0.777	<0.005	0.00884	<0.0002	0.289	0.675	<0.002	<0.002
MW-8	12/9/2015	<0.0005	0.00153	0.0324	<0.001	<0.0004	<0.0005	0.000568	0.200	<0.0002	0.0124	<0.0001	<0.0005	0.873	<0.0006	<0.0005
MW-8	3/22/2016	<0.00418	<0.00295	0.0456	<0.000875	<0.00025	<0.0025	<0.000543	0.178	<0.000433	0.0344	<0.0001	0.00974	0.862	<0.00398	<0.00138
MW-8	6/21/2016	<0.002	<0.001	0.0374	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00938	0.527	<0.005	<0.001
MW-8	9/14/2016	<0.002	<0.001	0.0389	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00753	0.374	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0440	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00765	0.638	<0.005	<0.001
MW-8	3/7/2017	<0.002	<0.001	0.0341	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00573	0.645	<0.005	<0.001
MW-8	6/6/2017	<0.002	<0.001	0.0352	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00674	0.698	<0.005	<0.001
MW-8	7/10/2017	<0.002	<0.001	0.0347	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00688	0.476	<0.005	<0.001
MW-8	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-8	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	0.0066	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.439	<0.01	<0.002
MW-8	9/19/2018	NA	<0.001	0.0508	NA	NA	<0.002	NA	<2	NA	NA	NA	0.00668	1.03	NA	NA
MW-8	3/14/2019	<0.002	<0.001	0.0348	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0169	<0.0002	0.00727	0.182	<0.005	<0.001
MW-8	9/9/2019	NA	<0.001	0.0442	<0.001	<0.001	0.00267	<0.0005	<1	<0.001	0.0108	<0.0002	0.00756	0.591	<0.005	<0.001
MW-8	4/7/2020	<0.004	<0.002	0.0345	<0.002	<0.001	<0.002	<0.002	0.187	<0.005	0.0179	<0.0002	0.00656	1.97	0.00202	<0.002

Analytical Results - Appendix IV
Miami Fort Pond System

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-9	12/9/2015	<0.0005	0.00232	0.137	<0.001	<0.0004	0.000776	0.00071	0.509	0.000644	0.0141	<0.0001	0.0772	0.388	<0.0006	<0.0005
MW-9	3/22/2016	<0.00418	<0.00295	0.113	<0.000875	<0.00025	<0.0025	<0.000543	0.445	<0.000433	0.011	<0.0001	0.0557	0.309	<0.00398	<0.00138
MW-9	6/22/2016	<0.002	<0.001	0.118	<0.001	<0.001	<0.002	0.000761	<1	<0.001	<0.05	<0.0002	0.0795	0.348	<0.005	<0.001
MW-9	9/14/2016	<0.002	<0.001	0.119	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0743	0.479	<0.005	<0.001
MW-9	12/13/2016	<0.002	<0.001	0.119	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0803	0.306	<0.005	<0.001
MW-9	3/8/2017	<0.002	<0.001	0.0773	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.054	0.236	<0.005	<0.001
MW-9	6/6/2017	<0.002	<0.001	0.0895	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0715	0.168	<0.005	<0.001
MW-9	7/10/2017	<0.002	<0.001	0.116	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0704	0.227	<0.005	<0.001
MW-9	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-9	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0595	0.235	<0.01	<0.002
MW-9	9/19/2018	NA	<0.001	0.133	NA	NA	<0.002	NA	<5	NA	NA	NA	0.0734	0.536	NA	NA
MW-9	3/13/2019	<0.002	<0.001	0.107	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	0.0691	0.163	<0.005	<0.001
MW-9	9/9/2019	NA	<0.001	0.112	<0.001	<0.001	0.00283	<0.0005	<1	<0.001	0.00948	<0.0002	0.0494	0.252	<0.005	<0.001
MW-9	4/7/2020	<0.004	<0.002	0.0928	<0.002	<0.001	<0.002	<0.002	0.345	<0.005	<0.01	<0.0002	0.0591	2.32	<0.002	<0.002
MW-10S[2]	12/9/2015	0.000637	0.00427	0.295	<0.001	<0.0004	0.000854	0.00941	0.150	0.000488	0.00432	<0.0001	0.00395	0.742	0.00067	<0.0005
MW-10S[2]	3/23/2016	<0.00418	0.0368	0.569	<0.000875	<0.00025	<0.0025	0.00811	0.224	0.000505	0.0044	<0.0001	0.00755	1.79	<0.00398	<0.00138
MW-10S[2]	6/22/2016	<0.002	0.0353	0.437	<0.001	<0.001	<0.002	0.00373	<1	<0.001	<0.05	<0.0002	0.00501	1.10	<0.005	<0.001
MW-10S[2]	9/14/2016	<0.002	0.0373	0.429	<0.001	<0.001	<0.002	0.00320	<1	<0.001	<0.05	<0.0002	<0.005	1.06	<0.005	<0.001
MW-10S[2]	12/13/2016	<0.002	0.0481	0.468	<0.001	<0.001	<0.002	0.00408	<1	<0.001	<0.05	<0.0002	0.00627	0.890	<0.005	<0.001
MW-10S[2]	3/8/2017	<0.002	0.0245	0.350	<0.001	<0.001	<0.002	0.00355	<1	<0.001	<0.05	<0.0002	<0.005	0.831	<0.005	<0.001
MW-10	6/6/2017	<0.002	0.0161	0.196	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.08	<0.005	<0.001
MW-10	7/10/2017	<0.002	0.0169	0.200	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.14	<0.005	<0.001
MW-10	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-10	5/8/2018	<0.003	0.0149	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.293	<0.01	<0.002
MW-10	9/19/2018	NA	0.0130	0.145	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.595	NA	NA
MW-10	3/13/2019	<0.002	0.0169	0.164	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.978	<0.005	<0.001
MW-10	9/10/2019	NA	0.0221	0.163	<0.001	<0.001	0.00265	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.860	<0.005	<0.001
MW-10	4/7/2020	<0.004	0.0177	0.175	<0.002	<0.001	<0.002	<0.002	0.227	<0.005	0.00226	<0.0002	0.00546	0.684	<0.002	<0.002
MW-11S[2]	12/9/2015	<0.0005	0.00896	0.325	<0.001	<0.0004	0.00104	0.00694	0.266	0.00072	<0.004	<0.0001	0.00569	0.680	0.00107	<0.0005
MW-11S[2]	3/23/2016	<0.00418	0.0492	0.486	<0.000875	<0.00025	<0.0025	0.00803	0.400	0.00114	0.00357	<0.0001	0.00568	1.44	<0.00398	<0.00138
MW-11S[2]	6/22/2016	<0.002	0.0377	0.353	<0.001	<0.001	0.00253	0.00630	<1	0.00191	<0.05	<0.0002	0.00651	1.73	<0.005	<0.001
MW-11S[2]	9/14/2016	<0.002	0.0538	0.349	<0.001	<0.001	<0.002	0.00504	<1	0.00132	<0.05	<0.0002	0.00552	0.969	<0.005	<0.001
MW-11S[2]	12/14/2016	<0.002	0.0502	0.353	<0.001	<0.001	0.00287	0.00481	<1	0.00225	<0.05	<0.0002	<0.005	2.42	<0.005	<0.001
MW-11S[2]	3/8/2017	<0.002	0.0584	0.384	<0.001	<0.001	0.00288	0.00511	<1	0.00272	<0.05	0.000577	0.00532	1.37	<0.005	<0.001
MW-11	6/6/2017	<0.002	0.00874	0.224	<0.001	<0.001	<0.002	0.000854	<1	<0.001	<0.05	<0.0002	<0.005	0.811	<0.005	<0.001
MW-11	7/10/2017	<0.002	0.00926	0.211	<0.001	<0.001	<0.002	0.00122	<1	<0.001	<0.05	<0.0002	<0.005	0.654	<0.005	<0.001
MW-11	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-11	5/8/2018	<0.003	0.00884	0.241	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.68	<0.01	<0.002
MW-11	9/19/2018	NA	0.00894	0.220	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.654	NA	NA
MW-11	3/13/2019	<0.002	0.00877	0.186	<0.001	<0.001	<0.002	0.000609	<1	<0.001	<0.005	<0.0002	<0.005	0.556	<0.005	<0.001
MW-11	9/10/2019	NA	0.0114	0.217	<0.001	<0.001	0.0027	0.000621	<1	<0.001	<0.005	<0.0002	<0.005	0.743	<0.005	<0.001
MW-11	4/7/2020	<0.004	0.0148	0.313	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00366	<0.0002	<0.005	1.74	<0.002	<0.002

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum , total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium , total (mg/L)	Thallium, total (mg/L)
MW-12	12/7/2015	<0.0005	0.0022	0.0322	<0.001	0.00127	0.000904	0.00200	0.091	0.000664	0.00719	<0.0001	0.00263	0.656	0.000639	<0.0005
MW-12	3/24/2016	<0.00418	<0.00295	0.0228	<0.000875	0.00217	<0.0025	0.00210	0.163	<0.000433	0.00754	<0.0001	<0.0025	0.324	<0.00398	<0.00138
MW-12	6/21/2016	<0.002	<0.001	0.0196	<0.001	0.00218	<0.002	0.00208	<1	<0.001	<0.05	<0.0002	<0.005	0.223	<0.005	<0.001
MW-12	9/13/2016	<0.002	<0.001	0.0195	<0.001	0.00114	<0.002	0.00183	<1	<0.001	<0.05	<0.0002	<0.005	0.385	<0.005	<0.001
MW-12	12/13/2016	<0.002	<0.001	0.0231	<0.001	0.00422	<0.002	0.00178	<1	<0.001	<0.05	<0.0002	<0.005	0.398	<0.005	<0.001
MW-12	3/7/2017	<0.002	<0.001	0.0173	<0.001	0.00277	<0.002	0.00206	<1	<0.001	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-12	6/6/2017	<0.002	<0.001	0.0171	<0.001	0.00285	<0.002	0.00214	<1	<0.001	<0.05	<0.0002	<0.005	0.19	<0.005	<0.001
MW-12	7/11/2017	<0.002	<0.001	0.0154	<0.001	0.00179	<0.002	0.00263	<1	<0.001	<0.05	<0.0002	<0.005	0.387	<0.005	<0.001
MW-12	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-12	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.219	<0.01	<0.002
MW-12	9/20/2018	NA	<0.001	0.0202	NA	NA	NA	0.00193	<1	NA	NA	NA	<0.005	0.352	NA	NA
MW-12	3/13/2019	<0.002	<0.001	0.0198	<0.001	0.00106	0.00227	0.00194	<1	<0.001	0.00642	0.000248	<0.005	0.360	<0.005	<0.001
MW-12	6/12/2019	NA	NA	NA	NA	NA	NA	0.00227	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-12	9/10/2019	NA	<0.001	0.0162	<0.001	0.00179	0.00337	0.00256	<1	<0.001	0.00706	0.001	<0.005	0.0927	<0.005	<0.001
MW-12	4/7/2020	<0.004	<0.002	<0.02	<0.002	0.00165	<0.002	0.00259	<0.15	<0.005	0.00433	0.000369	<0.005	0	<0.002	<0.002
MW-13S[2]	12/8/2015	<0.0005	0.00303	0.0341	<0.001	0.000689	0.000881	0.0168	0.0708	0.000612	0.0103	<0.0001	<0.0005	0.473	0.000781	<0.0005
MW-13S[2]	3/24/2016	<0.00418	<0.00295	0.0247	<0.000875	0.00111	<0.0025	0.0132	0.0702	<0.000433	0.00916	<0.0001	<0.0025	0.609	<0.00398	<0.00138
MW-13S[2]	6/21/2016	<0.002	0.00239	0.0298	<0.001	0.00119	0.004	0.0114	<1	0.00218	<0.05	<0.0002	<0.005	1.13	<0.005	<0.001
MW-13S[2]	9/13/2016	<0.002	0.00123	0.0178	<0.001	0.00167	<0.002	0.00589	<1	<0.001	<0.05	<0.0002	<0.005	0.376	<0.005	<0.001
MW-13S[2]	12/13/2016	<0.002	<0.001	0.0140	<0.001	0.00216	<0.002	0.00506	<1	<0.001	<0.05	<0.0002	<0.005	0.329	<0.005	<0.001
MW-13S[2]	3/7/2017	<0.002	0.00107	0.0160	<0.001	0.00194	<0.002	0.00427	<1	<0.001	<0.05	<0.0002	<0.005	0.724	<0.005	<0.001
MW-13	6/6/2017	<0.002	0.00897	0.179	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00974	1.06	<0.005	<0.001
MW-13	7/11/2017	<0.002	0.00749	0.163	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0101	0.584	<0.005	<0.001
MW-13	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-13	5/9/2018	<0.003	0.0173	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0123	0.746	<0.01	<0.002
MW-13	9/19/2018	NA	0.0129	0.132	NA	NA	NA	<0.0005	<2	NA	NA	NA	0.0122	0.913	NA	NA
MW-13	3/12/2019	<0.002	0.0107	0.161	<0.001	<0.001	0.00261	<0.0005	<1	<0.001	0.00647	<0.0002	0.0113	0.415	<0.005	<0.001
MW-13	6/13/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	0.0123	NA	NA	NA
MW-13	9/10/2019	NA	0.019	0.206	<0.001	<0.001	0.00301	<0.0005	<1	<0.001	0.00674	<0.0002	0.0126	0.373	<0.005	<0.001
MW-13	4/7/2020	<0.004	0.0223	0.205	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00554	<0.0002	0.0106	0.854	<0.002	<0.002
MW-14	6/13/2019	NA	NA	NA	NA	NA	NA	0.000986	NA	NA	NA	NA	0.00896	NA	NA	NA
MW-14	9/10/2019	NA	0.00154	0.0430	<0.001	<0.001	0.00326	0.000685	<1	<0.001	0.00526	<0.0002	0.00712	0.330	<0.005	<0.001
MW-14	4/6/2020	<0.004	<0.002	0.0371	<0.002	<0.001	0.00212	<0.002	<0.15	<0.005	0.00415	<0.0002	0.00689	0.120	<0.002	<0.002
MW-15	6/12/2019	NA	NA	NA	NA	NA	NA	0.00652	NA	NA	NA	NA	0.0206	NA	NA	NA
MW-15	9/10/2019	NA	0.00373	0.0815	<0.001	<0.001	0.00302	0.00360	<1	<0.001	0.00799	<0.0002	0.0269	0.589	<0.005	<0.001
MW-15	4/6/2020	<0.004	<0.002	0.0964	<0.002	<0.001	<0.002	0.00386	0.215	<0.005	0.0074	<0.0002	0.0291	0.607	<0.002	<0.002
MW-16	6/12/2019	NA	NA	NA	NA	NA	NA	0.00957	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-16	9/10/2019	NA	<0.001	0.0901	<0.001	<0.001	0.00287	0.00267	<1	<0.001	0.011	<0.0002	<0.005	0.0761	<0.005	<0.001
MW-16	4/6/2020	<0.004	<0.002	0.0997	<0.002	<0.001	0.00202	0.00217	<0.15	<0.005	0.0114	<0.0002	<0.005	0.672	<0.002	<0.002

Notes:

1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter;
2. Previously monitored CCR locations MW-10S, MW-11S, and MW-13S were replaced by CCR monitoring locations MW-10, MW-11 and MW-13, respectively, which are screened deeper into the uppermost aquifer.

ATTACHMENT 6 – SITE HYDROGEOLOGY AND STRATIGRAPHIC CROSS-SECTIONS OF THE SITE

CONCEPTUAL SITE MODEL AND DESCRIPTION OF SITE HYDROGEOLOGY (MIAMI FORT POND SYSTEM)

The Miami Fort Power Station (Miami Fort) conceptual site model (CSM) and Description of Site Hydrogeology for the Miami Fort Pond System (Pond System) located near North Bend, Ohio are described in the following sections.

REGIONAL SETTING

Miami Fort Power Station is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River (see monitoring well location map attached to this demonstration). The Pond System is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Miami Fort electric switch yard to the east. The Miami Fort production wells are located east of Basin A and Veolia's production wells are located northwest of Basin B.

Geologic units present at the Site include unlithified geologic materials (alluvial deposits, glacial outwash [Uppermost Aquifer]) and Ordovician-aged bedrock.

The Site is located adjacent to the convergence of the Great Miami River drainage basin and Ohio River, near the southern border of the Glacial Plains and the northern border of the Interior Low Plateau at the southern edge of the glacial drift deposits. The local geologic conditions within the basin area consists of an alluvial silt, clay and/or sand deposited by Ohio River floodwaters, and glacial outwash deposits consisting of fine sand, silts and clays that were mainly deposited during the Illinoian and Wisconsinan stages of the Pleistocene. The thickness of the outwash deposits is approximately 120 feet (ft) above bedrock. A thick silt cap is also present locally on top of the outwash deposits. Cross-sections were prepared illustrating the lithology beneath Basins A and B and attached to this demonstration.

The bedrock immediately underlying the glacial deposits is of sedimentary origin and belongs to the Cincinnatian series (blue-gray limestone of the Fairview and Kope formations). The dominant sediments are the Richmond shales, the Maysville limestone, and the Eden shales. These rock units average approximately 800 ft in thickness. Situated near the crest of the Cincinnati arch, these bedrock units have a regional dip of about 10 ft per mile to the west (Burgess & Niple, Limited Engineers and Architects, 1988). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft below ground surface (bgs) dependent on proximity to the edge of the valley wall north of the basins. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

SITE GEOLOGY

The geology of the Site was evaluated during previous investigations. Deposits include the following units (beginning at ground surface):

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits range in depth from approximately 20 to 60 ft below the present ground surface. A silty, sandy clay layer is the primary component of the alluvial deposits. The clay ranges in elevation from 428 ft above mean sea level North American Vertical Datum of 1988 (msl) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to

495 ft msl beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Site and thickens towards the Ohio River. The clay is thickest beneath the southern half of Basin A and Basin B, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.

- Glacial Outwash (Uppermost Aquifer) - Deposits consisting of sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally on top of the outwash deposits and ranges in thickness from 4 ft to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs dependent on proximity to the edge of the valley wall north of the basins. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

SITE HYDROGEOLOGY

The Pond System CCR groundwater monitoring system consists of seventeen monitoring wells installed in the uppermost aquifer and adjacent to the Pond System (MW-1, MW-2, MW-3A, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, 4A). (see Monitoring Well Location Map, and Well Construction Diagrams and Drilling Logs attached to this demonstration). The Pond System utilizes one background monitoring well (MW-7) as part of the CCR groundwater monitoring system.

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently back-filled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 feet and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence.

Well yields from the Great Miami River aquifer, ranging up to 3,000 gallons per minute (gpm), are possible (Spieker, 1968) due in part to induced infiltration from the river. Transmissivities in this aquifer generally range between 3×10^5 to 5×10^5 gallons per day per foot (gpd/ft) near the Great Miami River (Spieker, 1968), with a storage coefficient of around 0.2. Pumping rates measured from four of Miami Fort's production wells range from 1,000 to 1,500 gpm.

The lower confining unit underlying the Pond System is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. Depth-to-bedrock beneath the site varies between approximately 110 to 120 ft bgs dependent on proximity to the edge of the valley wall north of Basin A and Basin B. These low-yielding shale and limestone formations average around 800 ft in thickness (Burgess & Niple, Limited Engineers and Architects, 1988).

Hydraulic Conductivity

Hydraulic conductivity testing has not been conducted at the Pond System because typical aquifer testing methods, such as slug testing, are ineffective in highly transmissive aquifers like the Uppermost Aquifer.

Groundwater Elevations and Flow Direction

Groundwater elevations vary coincidentally with the elevation of the Ohio River pool elevation. Groundwater elevations in the Uppermost Aquifer typically range from approximately 450 to 465 ft msl. Groundwater elevation contour maps based on groundwater measurements collected at the Pond System from September 2018 through September 2019 are presented included in the groundwater flow maps attached to this demonstration.

Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia's production wells, and south towards the Ohio River. The minimal variation in groundwater flow direction is primarily influenced by extreme flood events or long period of sustained pool-stage conditions in the Ohio River and Miami River. Horizontal hydraulic gradients were calculated using groundwater elevations measured from September 2018 to September 2019. Across Basin A, the horizontal hydraulic gradient ranged from approximately 0.0010 to 0.0026 feet per foot (ft/ft). Across Basin B, the horizontal hydraulic gradient was between 0.0018 and 0.0028 ft/ft.

Vertical hydraulic gradient was calculated across the Uppermost Aquifer using nested well pairs MW-4/MW-14 and MW-15/MW-16 for groundwater measurements for September 2019. East of Basin A, at well pair MW-15/MW-16, the vertical hydraulic gradient was calculated as an upward gradient at -0.0020 ft/ft. South of the divider dike, at well pair MW-4/MW-14, the vertical hydraulic gradient was calculated as a downward 0.0006 ft/ft.

Site-specific hydraulic conductivity values are not available; therefore, groundwater flow velocity was not calculated.

REFERENCES

AECOM, 2017. *Hydrogeologic Characterization Report, CCR Management Units 111 (Basin A) and 112 (Basin B)*. Prepared for Dynegy Miami Fort, LLC by AECOM. October 11, 2017.

Burgess & Niple, Limited Engineers and Architects, January 1988. *Cincinnati Gas & Electric Company Miami Fort Station Lawrenceburg Road Ash Landfill*.

Spieker, Andrew M., 1968. *Ground Water Hydrology and Geology of the Lower Great Miami River Aquifer, Ohio.* U.S. Geological Survey Prof. Paper 605-A.

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

A —— A′ GEOLOGIC CROSS-SECTION LOCATION

RIVER FLOW DIRECTION

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

SITE AND GEOLOGIC
CROSS-SECTION LOCATION MAP

DATE	REV NO.	DWG. BY	CHKD. BY
03/21/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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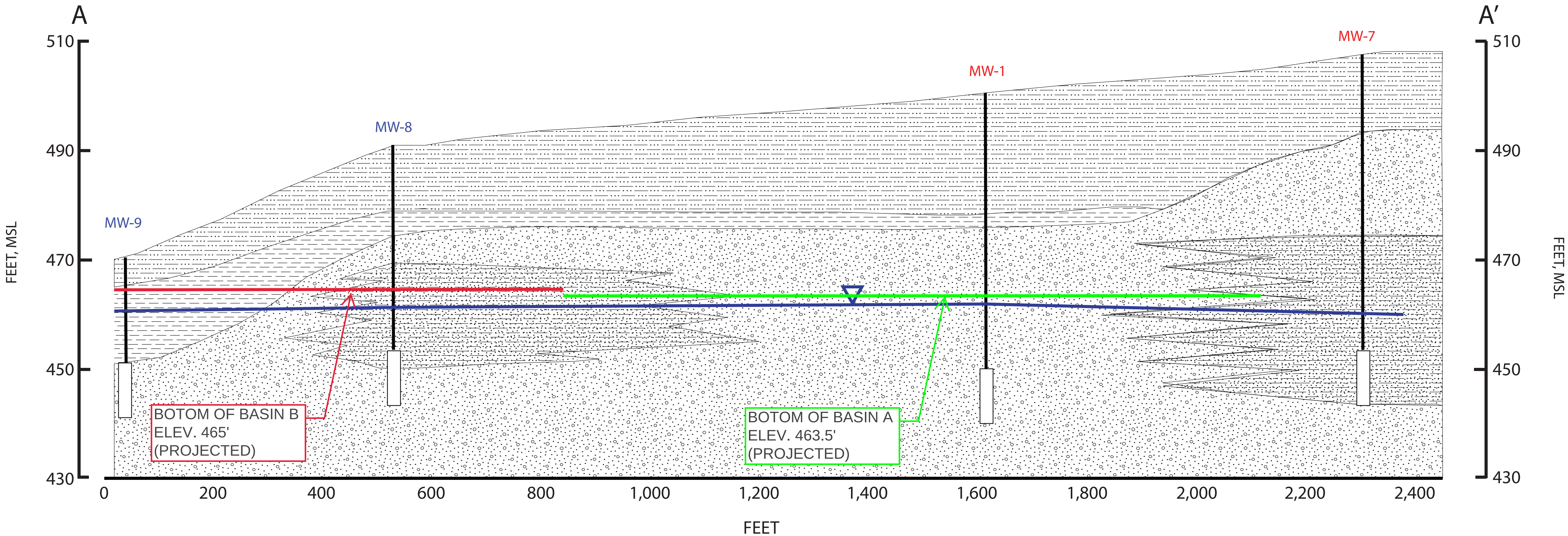

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A (ELEVATION 463.5'). RED LINE DEPICTS BOTTOM OF BASIN B (ELEVATION 465'). (RAMBOLL, 9/9/2020)

LEGEND

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-7 UPGRADIENT MONITORING WELL LOCATION

MW-8 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION A-A'

DATE	REV NO.	DWG. BY	CHKD. BY
03/21/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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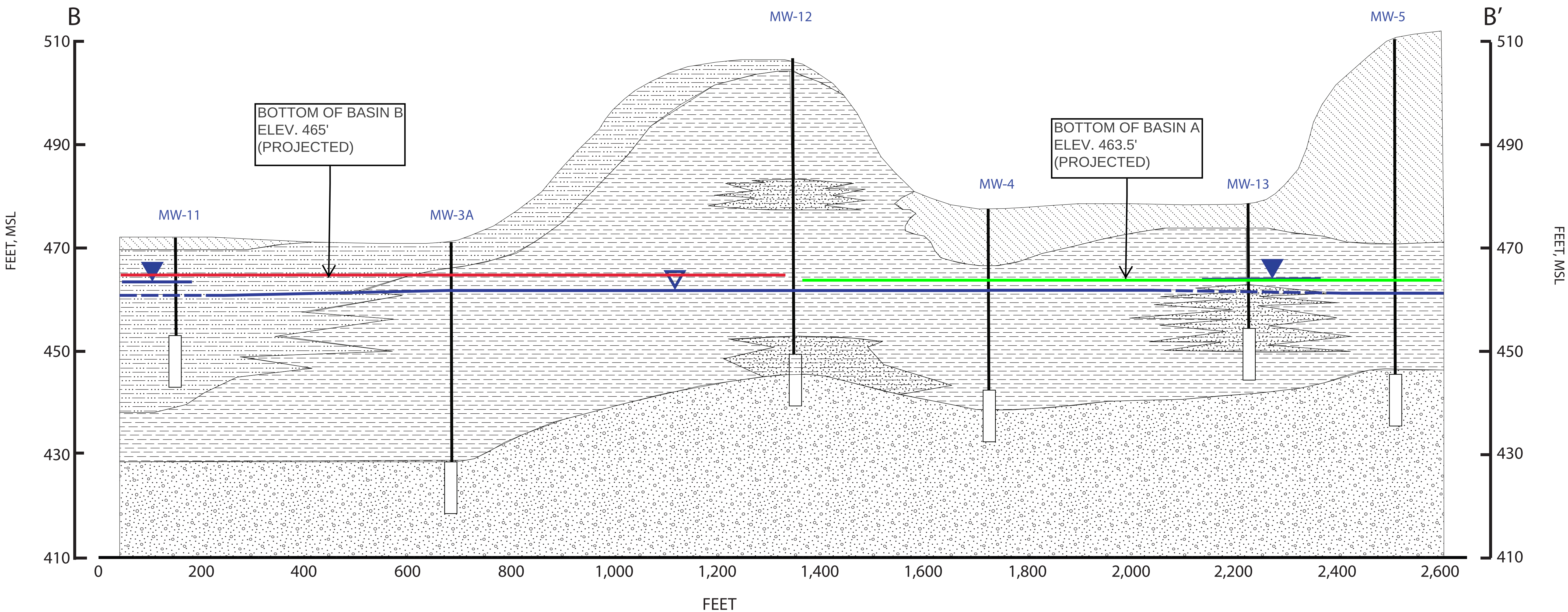

LEGEND

GRAVEL / SAND / CLAY FILL

SAND

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A (ELEVATION 463.5'). RED LINE DEPICTS BOTTOM OF BASIN B (ELEVATION, 465'). (RAMBOLL, 9/9/2020)

MW-11 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16 (DASHED WHERE INFERRED)

PERCHED POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION B-B'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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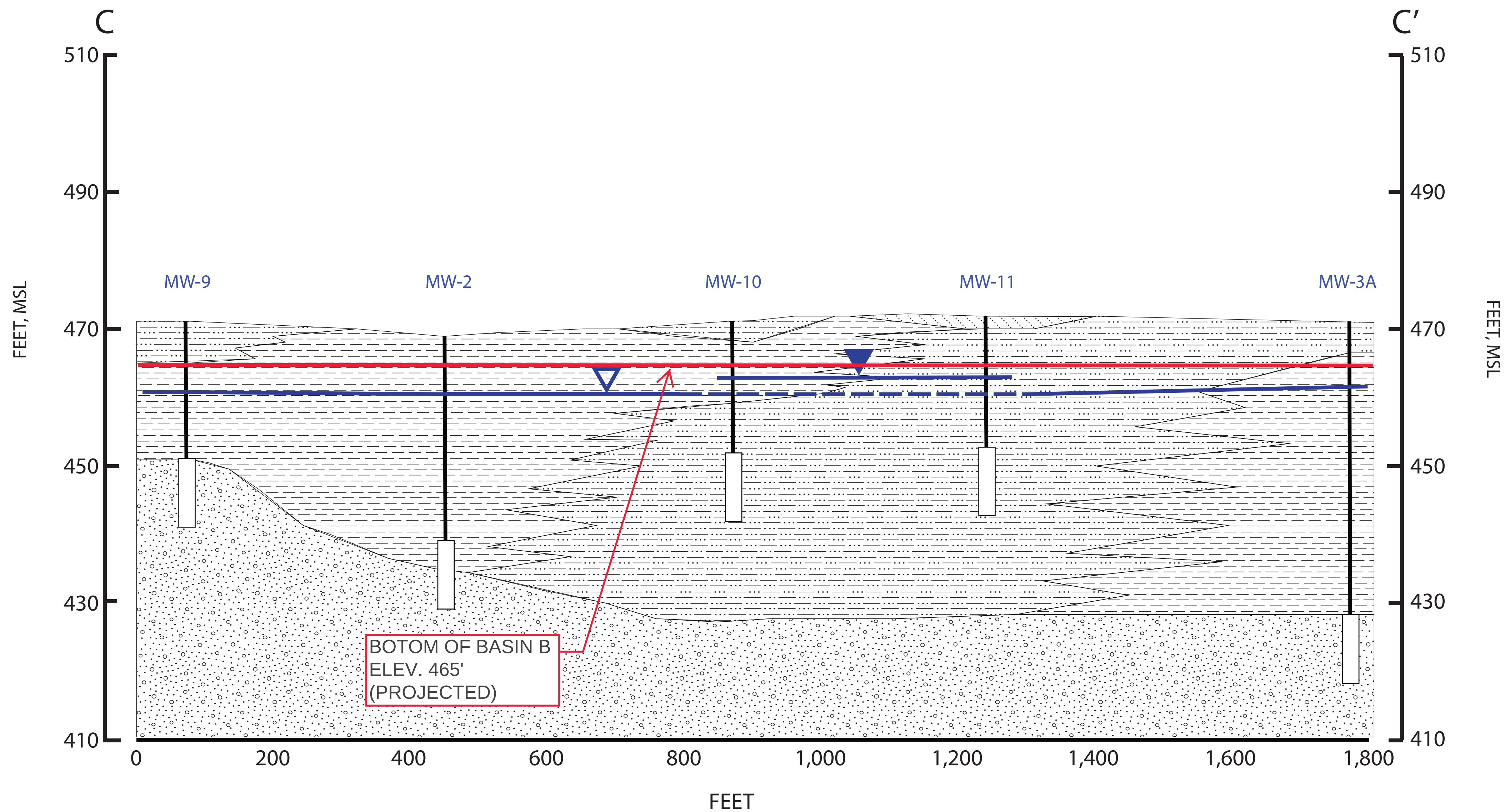

REVISION NOTE:
RED LINE DEPICTS BOTTOM OF BASIN B
(ELEVATION 465').
(RAMBOLL, 9/9/2020)

LEGEND

GRAVEL FILL

SILT

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-9 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16
(DASHED WHERE INFERRED)

PERCHED POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION C-C'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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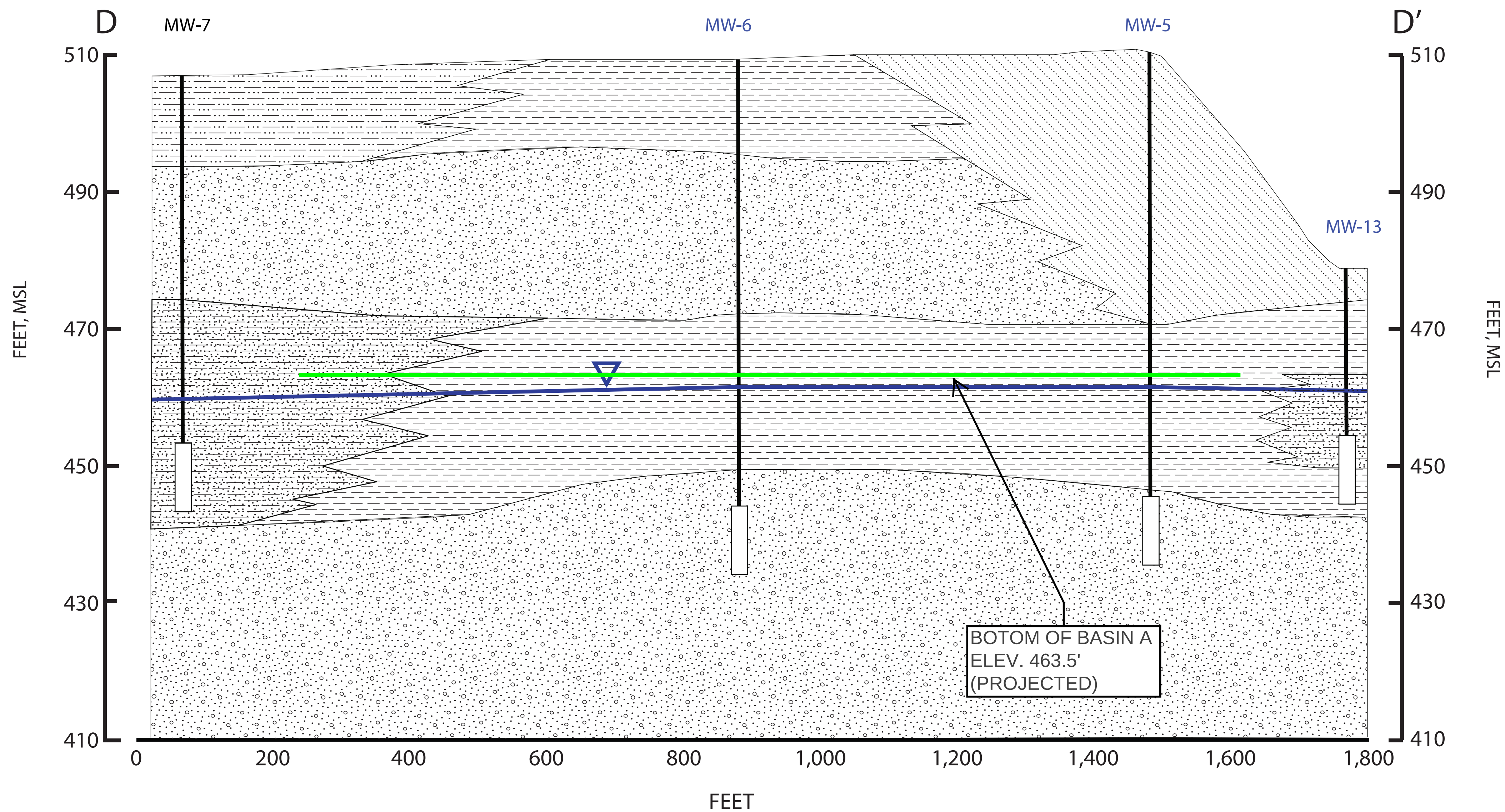

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A
(ELEVATION 463.5').
(RAMBOLL, 9/9/2020)

LEGEND

GRAVEL FILL

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-7 UPGRADIENT MONITORING WELL LOCATION

MW-6 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION D-D'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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ATTACHMENT 7 – CORRECTIVE MEASURES ASSESSMENT

Intended for
Dynegy Miami Fort, LLC

Date
November 30, 2020

Project No.
1940074922

CORRECTIVE MEASURES ASSESSMENT REVISION 2

MIAMI FORT POND SYSTEM

MIAMI FORT POWER STATION
11021 BROWER ROAD
NORTH BEND, OHIO

RAMBOLL Bright ideas. Sustainable change.

CORRECTIVE MEASURES ASSESSMENT REVISION 2
MIAMI FORT POND SYSTEM

Project name	**Miami Fort Pond System**
Project no.	**1940074922**
Recipient	**Dynegy Miami Fort, LLC**
Document type	**Corrective Measures Assessment**
Revision	**2**
Date	**November 30, 2020**

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DOCUMENT REVISION RECORD

Issue No.	Date	Details of Revisions
Revision 0	September 5, 2019	Original Document (prepared by O'Brien & Gere Engineers, Inc., part of Ramboll)
Revision 1	November 12, 2020	Revised to reflect the characterization of the Miami Fort Pond System as a single multi-unit, including an Alternate Source Demonstration for statistically significant levels of arsenic and molybdenum for the Pond System
Revision 2	November 30, 2020	Revised as follows: • Section 2 – added additional geology/hydrogeology information including: cross-sections (Appendix B), groundwater contour maps (Appendix C), vertical and horizontal hydraulic gradients (Appendix D), and summary of monitoring (Table 1), plume delineation information (Table 2; Figures 3 and 4). • Section 4 – focused on application of evaluation criteria to potential corrective measures described in Section 3. Added Appendix E with independent evaluation of MNA. • Section 5 – focused on application of potential source control and groundwater corrective measures referenced in Sections 3 and 4. • Table 3 – focused on application of evaluation criteria to corrective measures referenced in Section 3.

CONTENTS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

Ramboll Americas Engineering Solutions Inc., formerly known as O'Brien & Gere Engineers, Inc (Ramboll), has prepared this revision of the Corrective Measures Assessment (CMA) for the Miami Fort Pond System (Coal Combustion Residuals [CCR] Multi-Unit ID 115) located at the Miami Fort Power Station (MFS) in North Bend, Ohio. The Pond System is a CCR Multi-Unit comprised of two hydraulically connected cells (Basins A and B).

This CMA report complies with the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, Subpart D Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (CCR Rule). Under the CCR Rule, owners and operators of existing CCR surface impoundments (SIs) must initiate a CMA, in accordance with 40 C.F.R. § 257.96, when one or more Appendix IV constituents are detected at statistically significant levels (SSLs) above groundwater protection standards (GWPS) in the Uppermost Aquifer, and the owner or operator has not completed an alternate source demonstration (ASD) demonstrating that a source other than the CCR unit has caused the contamination.

As stated in the related notification for the Pond System dated August 13, 2020, SSLs for the following parameters were determined after the most recent Assessment Monitoring sampling event (A3) completed April 6 through April 7, 2020:

- Arsenic
- Cobalt
- Molybdenum

An Alternate Source Demonstration (ASD) has been completed for the arsenic and molybdenum SSLs (Appendix A), as allowed by 40 C.F.R. § 257.95(g)(3)(ii). This CMA is responsive to the 40 C.F.R. § 257.96 and § 257.97 requirements for assessing potential corrective measures to address the cobalt SSL.

This CMA is the next step in developing a long-term corrective action plan and has been prepared to evaluate applicable remedial measures to address cobalt SSLs in the Uppermost Aquifer. The results of the CMA will be used to select a remedy for the Uppermost Aquifer, consistent with 40 C.F.R. § 257.96 and § 257.97 requirements.

1.1 Corrective Measures Assessment Objectives and Methodology

The objective of this CMA is to evaluate appropriate corrective measure(s) to address impacted groundwater in the Uppermost Aquifer potentially associated with the Pond System at the MFS. The CMA evaluates the effectiveness of the corrective measures in meeting the requirements and objectives of the remedy, as described under 40 C.F.R. § 257.96(c), by addressing the following evaluation criteria:

- Performance
- Reliability
- Ease of implementation
- Potential impacts of appropriate potential remedies (safety impacts, cross-media impacts, and control of exposure to any residual contamination)

- Time required to begin and complete the remedy
- Institutional requirements that may substantially affect implementation of the remedy(s) (permitting, environmental or public health requirements)

The CMA provides a systematic, rational method for evaluating potential corrective measures. The assessment process documented herein: a) identifies the site-specific conditions that will influence the effectiveness of the potential corrective measures (Section 2); b) identifies applicable corrective measures (Section 3); c) assesses the corrective measures against the evaluation criteria to select potentially feasible corrective measures (Section 4); and d) summarizes the remedy selection process and future actions (Section 5).

1.2 Evaluation Criteria

This evaluation included qualitative and/or semi-quantitative screening of the corrective measures relative to their general performance, reliability, and ease of implementation characteristics, and their potential impacts, timeframes, and institutional requirements. Evaluations were at a generalized level of detail in order to screen out corrective measures that were not expected to meet 40 C.F.R. § 257.97 design criteria, while retaining corrective measures that would meet the design criteria.

The evaluation considered the elements qualitatively, applying engineering judgement with respect to known site conditions, to provide a reasoned set of corrective measures that could be used, either individually or in combination, to achieve GWPS in the most effective and protective manner.

1.2.1 Performance

The performance of potentially applicable corrective measures was evaluated for the:

1. Potential to ensure that any environmental releases to groundwater, surface water, soil, and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors.
2. Degree to which the corrective measure isolates, removes, or contains SSLs identified in the Uppermost Aquifer.
3. Ability of the corrective measure to achieve GWPS within the Uppermost Aquifer at the compliance boundaries.

1.2.2 Reliability

The reliability of the corrective measure is a description of its ability to function as designed until the GWPS are achieved in the Uppermost Aquifer at the compliance boundaries. Evaluation of the reliability included considering:

1. Type and degree of long-term management required, including monitoring, operation, and maintenance.
2. Long-term reliability of the engineering and institutional controls associated with the corrective measure.
3. Potential need for replacement of the corrective measure.

1.2.3 Ease of Implementation

The ease or difficulty of implementing a given corrective measure was evaluated by considering:

1. Degree of difficulty associated with constructing the corrective measure.
2. Expected operational reliability of the corrective measure.
3. Need to coordinate with and obtain necessary approvals and permits.
4. Availability of necessary equipment and specialists.
5. Available capacity and location of needed treatment, storage, and disposal services.

1.2.4 Potential Impacts of the Remedy

Potential impacts associated with a given corrective measure included consideration of impacts on the distribution and/or transport of contaminants, safety impacts (the short-term risks that might be posed to the community or the environment during implementation), cross-media impacts (increased traffic, noise, fugitive dust) and control of potential exposure of humans and environmental receptors to remaining wastes.

1.2.5 Time Required to Begin, Implement, and Complete the Remedy

Evaluating the time required to begin the remedy focused on the site-specific conditions that could require additional or extended timeframes to characterize, design, and/or field test a corrective measure to verify its applicability and effectiveness. The length of time that would be required to begin and implement the remedy was considered to be the total time to: 1) verify applicability and effectiveness; 2) design and obtain permits; and 3) complete construction of the corrective measure.

The time required to complete the remedy considered the total time after the corrective measure was implemented until GWPS would be achieved in the Uppermost Aquifer at the compliance boundaries.

1.2.6 Institutional, Environmental or Public Health Requirements

Institutional, environmental and public health requirements considered state, local, and site-specific permitting or other requirements that could substantially affect construction or implementation of a corrective measure.

2. SITE HISTORY AND CHARACTERIZATION

2.1 Site Description and History

The MFS is owned and operated by Dynegy Miami Fort, LLC. The MFS is located in the southwest corner of the State of Ohio on the north shore of the Ohio River, at the confluence with the Great Miami River, as shown in Figure 1. The facility is located within Hamilton County, Miami Township, approximately 5 miles southwest of the village of North Bend, Ohio. The state boundary with Indiana is approximately 1,900 feet to the west of MFS and the boundary with the State of Kentucky lies just offshore to the south, within the Ohio River.

The MFS has two coal-fired units, Units 7 and 8, constructed in 1975 and 1978 with a total capacity of 1,100 megawatts (MW) and four oil-fired facilities constructed in 1971 with a total capacity of 78 MW. The Pond System (Multi-unit 115) covers a total area of approximately 51 acres and is located in the southwest corner of the Miami Fort Power Station property as shown in Figure 1.

Basin A (formerly Unit 111) receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization (FGD) effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The Basin A normal pool level is typically between elevations of 495 and 498 ft. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert slip-lined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM, 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the permitted outfall structure in Basin B. Miscellaneous yard drainage is currently discharged directly to Basin B (AECOM, 2017).

2.1 Geology

Geologic units present at the Site include unlithified geologic materials (alluvial deposits, glacial outwash [Uppermost Aquifer]) and Ordovician-aged bedrock.

2.1.1 Regional Setting

The Site is located adjacent to the convergence of the Great Miami River drainage basin and Ohio River, near the southern border of the Glacial Plains and the northern border of the Interior Low Plateau at the southern edge of the glacial drift deposits. The local geologic conditions within the basin area consists of an alluvial silt, clay and/or sand deposited by Ohio River floodwaters, and glacial outwash deposits consisting of fine sand, silts and clays that were mainly deposited during the Illinoian and Wisconsinan stages of the Pleistocene. The thickness of the outwash deposits is approximately 120 feet above bedrock. A thick silt cap is also present locally on top of the outwash deposits. As depicted in the attached Appendix B, geologic cross-sections were prepared illustrating the lithology beneath Basins A and B (AECOM, 2017).

The bedrock immediately underlying the glacial deposits is of sedimentary origin and belongs to the Cincinnatian series (blue-gray limestone of the Fairview and Kope formations). The dominant sediments are the Richmond shales, the Maysville limestone, and the Eden shales. These rock units average approximately 800 feet in thickness. Situated near the crest of the Cincinnati arch, these bedrock units have a regional dip of about 10 feet per mile to the west (Burgess & Niple, Limited Engineers and Architects, 1988). Depth to bedrock beneath the Site varies between approximately 110 to 120 feet bgs dependent on proximity to the edge of the valley wall north of the basins. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

2.1.2 Site Geology

The geology of the Site was evaluated during previous investigations. Deposits include the following units:

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits range in depth from approximately 20 to 60 feet below the present ground surface. A silty, sandy clay layer is the primary component of the alluvial deposits. The clay ranges in elevation from 428 feet (ft) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft referenced to North American Vertical Datum of 1988, beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Site and thickens towards the Ohio River. The clay is thickest beneath the southern half of Basin A and Basin B, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.
- Glacial Outwash (Uppermost Aquifer) - The Uppermost Aquifer consists of glacial outwash sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits beneath the Site is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally overlying the outwash deposits and ranges in thickness from 4 to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

2.2 Hydrogeology

The hydrogeologic conceptual site model (CSM) is detailed in the sections below. The Miami Fort Pond System monitoring system is shown in Figure 2.

2.2.1 Uppermost Aquifer

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 ft and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence. Buried valley aquifers such as the Uppermost Aquifer are Ohio's most productive water-bearing formations. Estimates of transmissivity are in excess of 50,000 gallons per day per foot (USGS, 1997).

Regionally, yields for high-capacity wells in the Uppermost Aquifer range from 450 gallons per minute (gpm) to 3,000 gpm with one well tested as high as 6,000 gpm. (IDNR, 2006). The majority of the water withdrawn by high capacity wells near the Site is from induced flow from the Ohio River (ODNR, undated). The Site operates four production wells east-southeast of Basin A for cooling water. Pumping rates measured at the cooling water production wells range from 1,000 to 1,500 gpm. Additionally. three production wells, located northwest of the Pond System, are operated by Veolia for process (non-potable) water.

The aquifer receives most of its recharge from infiltration of precipitation on the valley floor; however, secondary recharge also comes from bank storage from the Great Miami River and Ohio River during flood stages. Recharge to the aquifer from bank storage is periodic and short-lived.

2.2.2 Lower Limit of Aquifer

The lower confining unit underlying the Pond System is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. Depth-to-bedrock beneath the site varies between approximately 110 to 120 feet bgs dependent on proximity to the edge of the valley wall north of the Pond System. These low-yielding shale and limestone formations average around 800 feet in thickness (Burgess & Niple, Limited Engineers and Architects, 1988).

Groundwater yields from the bedrock strata in this region are quite limited. Generally, the bedrock is not tapped for water due to its low permeability. Those wells which do tap the bedrock aquifers generally draw water from the bedding planes and fracture zones. Due to the relatively impermeable nature of the shales and limestone underlying this region, water yields are generally insufficient for domestic use. Fresh water does not typically occur at depths greater than 500 feet bgs.

2.2.3 Hydraulic Conductivity

Hydraulic conductivity testing has not been conducted in the Uppermost Aquifer at the Pond System because typical aquifer testing methods, such as slug testing, are ineffective in highly transmissive aquifers. Hydraulic conductivity testing was completed at wells screened in alluvial deposits overlying the Uppermost Aquifer as part of ongoing site investigation activities completed in the fall of 2020. Testing results are in currently in review.

2.2.4 Groundwater Elevations, Flow Direction, and Velocity

Groundwater elevations vary coincidentally with the elevation of the Ohio River pool elevation. Groundwater elevations in the Uppermost Aquifer typically range from approximately 450 to 465 ft. Groundwater elevation contour maps based on groundwater measurements collected on the first day of sampling at the Pond System from December 2015 through September 2020 are included in Appendix C.

Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River as shown on Figure 3. The minimal variation in groundwater flow direction is primarily influenced by extreme flood events or long period of sustained pool-stage conditions in the Ohio River and Miami River.

Horizontal hydraulic gradients were calculated using groundwater elevations measured from September 2018 to September 2019 (Appendix D, Table 1). Across Basin A, the horizontal hydraulic gradient ranged from approximately 0.0010 to 0.0026 feet per foot (ft/ft). Across Basin B, the horizontal hydraulic gradient was between 0.0018 and 0.0028 ft/ft.

Vertical hydraulic gradient was calculated across the Uppermost Aquifer using nested well pairs MW-4/MW-14 and MW-15/MW-16 for groundwater measurements for September 2019 (Appendix D, Table 2). East of Basin A, at well pair MW-15/MW-16, the vertical hydraulic gradient was calculated as an upward gradient at -0.0020 ft/ft. South of the divider dike, at well pair MW-4/MW-14, the vertical hydraulic gradient was calculated as a downward 0.0006 ft/ft.

Site-specific hydraulic conductivity values are not available; therefore, groundwater flow velocity was not calculated.

2.3 Groundwater Quality and Plume Delineation – 257.95(g)

Detection monitoring in the Uppermost Aquifer, per 40 C.F.R. § 257.90, was initiated in October 2017; statistically significant increases (SSIs) of Appendix III parameters over background concentrations were detected in October 2017. Monitoring well locations are shown on Figure 2. Alternate source evaluations were inconclusive for one or more of the SSIs. Therefore, in accordance with 40 C.F.R. § 257.94(e)(2), an Assessment Monitoring Program was established for the Pond System on April 9, 2018 (Table 1). Assessment Monitoring results identified statistically significant levels (SSLs) of the following Appendix IV parameters over the GWPS:

- Arsenic at wells MW-2, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

An ASD has been completed for the arsenic and molybdenum SSLs (Appendix A), as allowed by 40 C.F.R. § 257.95(g)(3)(ii). This CMA has been completed to comply with the 40 C.F.R. § 257.96 and § 257.97 requirements for assessing potential corrective measures to address the cobalt SSL.

SSLs for total cobalt were identified in downgradient monitoring wells MW-4 and MW-4A where concentrations ranged from 0.00503 mg/L to 0.0187 mg/L.

In accordance with the Statistical Analysis Plan for MFS (NRT, 2017), SSLs are based on based on a Lower Confidence Limit (LCL) calculated from all observed concentrations for each Appendix IV parameter at each monitoring well (2015 through the current sampling event) compared to the GWPS. Maximum LCL concentrations associated with the cobalt SSLs at MW-4 and 4A are 0.00844 milligrams per liter (mg/L) and 0.012 mg/L, respectively (Table 2).

Well locations with observed exceedances of the GWPS have been illustrated on Figure 3 along with maximum LCL concentrations from Table 2. This figure illustrates the maximum extent of cobalt exceedances of the GWPS observed during the assessment monitoring period. There are five wells with observed cobalt exceedances of the GWPS (0.006 mg/L); however, MW-4 is the only well with SSLs on a consistent basis. The other wells with cobalt exceedances were recently added plume delineation wells that have fewer sample results. Wells 4A, MW-15, and MW-16 are located east of the Pond System, wells MW-6 and MW-5 have not exceeded the GWPS for cobalt and are located between the Pond System and these three wells with cobalt exceedances. Two of those wells, MW-15 and MW-16, have not had an exceedance of the GWPS for cobalt in the latest two sampling events (September 2019 and April 2020). Further, the recently completed well MW-19, located upgradient of the Pond System, had the highest observed cobalt concentration within the monitoring network indicating there may be an alternate source of cobalt upgradient of the Pond System. Additional data is being collected on a monthly basis to evaluate potential changes to background concentrations of cobalt.

Cobalt exceedances observed at well MW-4 are bounded laterally and vertically by monitoring wells with parameter concentrations below their respective GWPSs and oftentimes below the reporting limit for the parameter. Cobalt observed at MW-4 is bounded to the south by the Ohio River, as there is not enough space to safely install a separate monitoring well between MW-4 and the river. Timeseries for cobalt is shown in Figure 4. Mann-Kendall analysis of cobalt concentrations observed in MW-4 indicate there is not a significant increasing trend in concentrations (Appendix E).

Elevated cobalt concentrations in groundwater at monitoring well MW-4, are not expected to be within the radius of pumping influence of any industrial wells. Currently, elevated cobalt concentrations in groundwater would only have a potential impact on surface water of the Ohio River. Mixing calculations showing the effect of cobalt loading on the Ohio River at low flow (i.e. baseflow at the 90th percentile of daily mean low flow) show that the cobalt concentration increase near-shore in the Ohio River due to possible groundwater loading from the east portion of the Pond System (i.e. Basin A) is 0.00000076 mg/L, which is 100 times lower than the typical cobalt laboratory detection limit of 0.000075 mg/L. An Ohio River Valley Water Sanitation Commission report from October 1998 indicates the nearest water supply intakes are located at river mile 463.2 upstream of the Pond System in the Cincinnati, Ohio metro area; and, at river mile 594.2 downstream of the Pond System in the Louisville, KY metro area. The Pond System is located near river mile 490, meaning the nearest downstream intake is over 100 river miles away.

2.4 Well Survey

Groundwater near the Miami Fort Pond System is within the radius of influence of four industrial pumping wells located to the southeast of the pond (operated by Miami Fort Station) and three industrial wells located to the northwest of the pond (operated by Veolia North America) – see Figure 2. All groundwater pumped by the production wells is non-contact water and non-potable for industrial use only. All groundwater not captured by the industrial water wells flows towards the Great Miami River to the west or the Ohio River to the south. A review of the ODNR’s interactive Water Well Map was performed to identify water supply wells located within 2,500 feet of the Pond System. The nearest residence is greater than 2,500 feet northeast and upgradient of Basin A. No public water supply (PWS) wells were identified between the Great Miami River and the Ohio River within a ten-mile radius of the MFS.

3. DESCRIPTION OF CORRECTIVE MEASURES

The corrective measures described below are frequently used to mitigate impacts from contaminants. The corrective measures are identified as either potential source control or groundwater corrective measures. Each measure is summarized in Table 3, Corrective Measures Assessment Matrix.

3.1 Objectives of the Corrective Measures – § 257.96(c)

The following performance standards, per 40 C.F.R. § 257.97, must be met by the selected corrective measures:

- Be protective of human health and the environment.
- Attain the groundwater protection standards per 40 C.F.R. § 257.95(h).
- Provide source control to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents.
- Remove from the environment as much of the contaminated material as feasible.
- Comply with waste management standards, per 40 C.F.R. § 257.98(d).

Site-specific considerations regarding the Pond System, provided in Section 2, were used to evaluate potential corrective measures. Each of the corrective measures evaluated may be capable of satisfying the performance standards listed above to varying degrees of effectiveness. The corrective measure review process yields a set of applicable corrective measures that can be used in developing a long-term corrective action plan. The corrective measures may be used independently or may be combined into specific remedial alternatives to leverage the advantages of multiple corrective measures to meet the performance standards.

The following potential corrective measures are commonly used to mitigate groundwater impacts and were considered as a part of the CMA process:

- Potential Source Control Corrective measures
  - Closure in Place (CIP)
  - Closure by Removal (CBR) (Off-Site Landfill)
  - In-Situ Solidification/Stabilization (ISS)
- Potential Groundwater Remedial Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - Permeable Reactive Barrier (PRB)
  - Groundwater Extraction

3.2 Potential Source Control Corrective Measures

3.2.1 Closure in Place

CIP includes constructing a cover system in direct contact with the graded CCR. Cover systems are designed to significantly minimize water infiltration into the CCR unit and allow surface water to drain off the cover system, thus reducing generation of potentially impacted water and reducing the extent of cobalt impact in the Uppermost Aquifer.

Construction of a cover system typically includes, but is not limited to, the following primary project components:

- Removal of free water and grading the CCR to allow cover system construction.
- Relocating and/or reshaping the existing CCR and cover material within the impoundment to achieve acceptable grades for closure. Borrow soil may be used to supplement fill volume, if necessary, to reach final design grades.
- Constructing a cover system that complies with the CCR Rule, including establishment of a vegetative cover to minimize long-term erosion.
- Constructing a stormwater management system to convey runoff from the cover system to a system of perimeter drainage channels for ultimate routing and discharge to nearby surface water.
- Ongoing inspection and maintenance of the cover system; and, stormwater and property management.

3.2.2 Closure by Removal

CBR includes the following components: removal of all CCR from the CCR unit; moisture conditioning the CCR as needed to facilitate excavating, loading and transporting CCR to either an on-site or off-site landfill; and backfilling the excavation. This corrective measure would address the source of groundwater impacts by removing the CCR, but the groundwater impacts would not begin to diminish until the source is completely removed.

3.2.3 In Situ Solidification/Stabilization

ISS is a corrective measure which consists of encapsulating waste within a cured monolith having increased compressive strength and reduced hydraulic conductivity. Hazards can be reduced by both converting waste constituents into a less soluble and mobile forms and by isolating waste from groundwater, thus facilitating groundwater remediation and reducing leaching to groundwater. ISS includes solidifying all CCR from the CCR unit and encapsulating the CCR through in-place mechanical mixing with reagents in an engineered grout mixture. The grout is typically emplaced using augers, backhoes or injection grouting. ISS also improves the geotechnical stability and material strength of the CCR materials.

ISS construction technologies include vertical rotary mixed ISS, hydraulic auger mixed ISS, hydraulic mixing tool ISS, and excavator mixed ISS. ISS construction may use a combination of these technologies depending on site-specific design requirements. ISS design typically requires data on, but not limited to, the following CCR material properties: geotechnical parameters, inorganic chemical constituents, class of ash, and ash management information (*e.g.,* coal source, co-management). Due to the variability in material properties of CCR, ISS would require an extensive mix design process for assessing ISS performance. Typical design and performance parameters include but are not limited to: volume expansion (swell), leachability, permeability, and unconfined compressive strength. ISS performance may be evaluated based on both civil design and remedial performance objectives.

3.3 Potential Groundwater Corrective Measures

3.3.1 Monitored Natural Attenuation

Both federal and state regulators have long recognized that MNA can be an acceptable component of a remedial action when it can achieve remedial action objectives in a reasonable timeframe. In 1999, the USEPA published a final policy directive (USEPA, 1999) for use of MNA for groundwater remediation and described the process as follows:

- The reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. The 'natural attenuation processes' that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants.

The USEPA has stated that source control is the most effective means of ensuring the timely attainment of remediation objectives (USEPA, 1999). Natural attenuation processes may be appropriate as a "finishing step" after effective source control implementation, if there are no risks to receptors and/or the contaminant plume is not expanding. Thus, MNA would be used in conjunction with source control measures described in Section 3.2.

The 1999 USEPA MNA document was focused on organic compounds in groundwater. However, in a 2015 companion document, the USEPA addressed the use of MNA for inorganic compounds in groundwater. The USEPA noted that the use of MNA to address inorganic contaminants: (1) is not intended to constitute a treatment process for inorganic contaminants; (2) when appropriately implemented, can help to restore an aquifer to beneficial uses by immobilizing contaminants onto aquifer solids and providing the primary means for attenuation of contaminants in groundwater; and (3) is not intended to be a "do nothing" response (USEPA, 2015). Rather, documenting the applicability of MNA for groundwater remediation should be thoroughly and adequately supported with site-specific characterization data and analysis in accordance with the USEPA's tiered approach to MNA (USEPA 1999, 2007, and 2015):

1. Demonstrate that the area of groundwater impacts is not expanding.
2. Determine the mechanisms and rates of attenuation.
3. Determine that the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform adequately.

Both physical and chemical attenuation processes can contribute to the reduction in mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Physical attenuation processes applicable to CCR include dilution, dispersion, and flushing. Chemical attenuation processes applicable to CCR include precipitation and coprecipitation (*i.e.*, incorporation into sulfide minerals), sorption (*i.e.*, to iron, manganese, aluminum, or other metal oxides or oxyhydroxides, or to sulfide minerals or organic matter), and ion exchange. Timeframes to achieve GWPS are dependent on site-specific conditions, actual timeframes would require detailed technical analysis.

Cobalt has the potential to be sorbed onto iron hydroxides or organic matter in the aquifer materials, depending on the geochemical conditions, but is typically mobile (EPRI, 2012). Physical and chemical mechanisms are available natural attenuation processes acting upon CCR constituents such as cobalt. The performance of MNA as a groundwater corrective measure varies based on site-specific conditions. Additional data collection and analysis may be required to support the USEPA's tiered approach to MNA (USEPA, 2015) and obtain regulatory approval.

3.3.2 Groundwater Extraction

Groundwater extraction is a widely used groundwater corrective measure. This corrective measure includes installation of one or more groundwater pumping wells or trenches to control and extract impacted groundwater. Groundwater extraction captures and contains impacted groundwater and can limit plume expansion and/or off-site migration. Construction of a groundwater extraction system typically includes, but is not limited to, the following primary components:

- Designing and constructing a groundwater extraction system consisting of one or more extraction wells or trenches and operating at a rate to allow capture of CCR impacted groundwater within the Uppermost Aquifer.
- Management of extracted groundwater, which may include modification to the existing NPDES permit, including treatment prior to discharge, if necessary.
- Ongoing inspection and maintenance of the groundwater extraction system.

Remediation of inorganics by groundwater extraction can be effective, but systems do not always perform as expected. A combination of factors, including geologic heterogeneities, difficulty in flushing low permeability zones, and rates of contaminant desorption from aquifer solids can limit effectiveness. Groundwater extraction systems require ongoing operation and maintenance to ensure optimal performance and the extracted groundwater must be managed, either by ex-situ treatment or disposal.

3.3.3 Groundwater Cutoff Wall

Since the late 1970s and early 1980s, vertical cutoff walls have been used to control and/or isolate impacted groundwater. Low-permeability cutoff walls can be used to prevent horizontal off-site migration of potentially impacted groundwater. Cutoff walls act as barriers to transport of impacted groundwater and can isolate soils that have been impacted by CCR to prevent contact with unimpacted groundwater. Cutoff walls are often used in conjunction with an interior pumping system to establish a reverse gradient within the cutoff wall. The reverse gradient imparted by the pumping system maintains an inward flow through the wall, keeping it from acting as a groundwater dam and controlling potential end-around or breakout flow of contaminated groundwater.

A commonly used cutoff wall construction technology is the slurry trench method, which consists of excavating a trench and backfilling it with a soil-bentonite mixture, often created with the soils excavated from the trench. The trench is temporarily supported with bentonite slurry that is pumped into the trench as it is excavated (D'Appolonia & Ryan, 1979). Excavation for cutoff walls is conducted with conventional hydraulic excavators, hydraulic excavators equipped with specialized booms to extend their reach (*i.e.*, long-stick excavators), or chisels and clamshells, depending upon the depth of the trench and the material to be excavated. Constructing the cutoff wall such that it intersects a low-permeability material at its base, referred to as "keying", can greatly increase its effectiveness, depending on the objectives of the barrier.

3.3.4 Permeable Reactive Barrier

Chemical treatment via a PRB is defined as an emplacement of reactive materials in the subsurface designed to intercept a contaminant plume, provide a flow path through the reactive media, and transform or otherwise render the contaminant(s) into environmentally acceptable forms to attain remediation concentration goals downgradient of the barrier (EPRI, 2006).

As groundwater passes through the PRB under natural gradients, dissolved constituents in the groundwater react with the media and are transformed or immobilized. A variety of media have been used or proposed for use in PRBs. Zero-valent iron has been shown to effectively immobilize CCR constituents, including arsenic, chromium, cobalt, molybdenum, selenium, and sulfate. Zero-valent iron has not been proven effective for boron, antimony, or lithium (EPRI, 2006).

System configurations include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where low-permeability barriers are installed to control groundwater flow through a permeable gate containing the reactive media. Continuous PRBs intersect the entire contaminant plume and do not materially impact the groundwater flow system. Design may or may not include keying the PRB into a low-permeability unit at depth. Funnel-and-gate systems utilize a system of barriers to groundwater flow (funnels) to direct the contaminant plume through the reactive gate. The barriers, typically some form of cutoff wall, are keyed into a low-permeability unit at depth to prevent short circuiting of the plume. Funnel-and-gate design must consider the residence time to allow chemical reactions to occur. Directing the contaminant plume through the reactive gate can significantly increase the flow velocity, thus reducing residence time.

Design of PRB systems requires rigorous site investigation to characterize the site hydrogeology and to delineate the contaminant plume. A thorough understanding of the geochemical and redox characteristics of the plume is critical to assess the feasibility of the process and select appropriate reactive media. Laboratory studies, including batch studies and column studies using samples of site groundwater, are needed to determine the effectiveness of the selected reactive media at the site (EPRI, 2006). The main considerations in selecting reactive media are as follows (EPRI, 2006):

- Reactivity - The media should be of adequate reactivity to immobilize a contaminant within the residence time of the design.
- Hydraulic performance - The media should provide adequate flow through the barrier, meaning a greater particle size than the surrounding aquifer materials. Alternatively, gravel beds have been emplaced in front of barriers to direct flow through the barrier.

- Stability - The media should remain reactive for an amount of time that makes its use economically advantageous over other technologies.
- Environmentally compatible by-products - Any by-products of media reaction should be environmentally acceptable. For example, iron released by zero-valent iron corrosion should not occur at levels exceeding regulatory acceptance levels.
- Availability and price: The media should be easy to obtain in large quantities at a price that does not negate the economic feasibility of using a PRB.

3.3.5 In-Situ Chemical Treatment

In-situ chemical treatment technologies for inorganics are being tested and applied with increasing frequency (Evanko and Dzombak, 1997). In-situ chemical treatment includes the targeted injection of reactive media into the subsurface to mitigate groundwater impacts. Inorganic contaminants are typically remediated through immobilization by reduction or oxidation followed by precipitation or adsorption (EPRI, 2006). Chemical reactants that have been applied or are in development for application in treating inorganic contaminants include ferrous sulfate, nanoscale zero-valent iron, organo-phosphorus nutrient mixture (PrecipiPHOS™) and sodium dithionite (EPRI, 2006). Zero-valent iron has been shown to effectively immobilize cobalt.

In-situ chemical treatment design considerations include the following (EPRI, 2006):

- Source location and dimensions
- Source contaminant mass
- The ability to comingle the contaminants and reactants in the subsurface
- Competing subsurface reactions (that consume added reactants)
- Hydrologic characteristics of the source and subsurface vicinity
- Delivery options for the cleanup procedure(s)
- Capture of any contaminants mobilized by the procedures
- Long-term stability of any immobilized contaminants

4. ASSESSMENT OF CORRECTIVE MEASURES

4.1 Evaluation Criteria – § 257.96(c)

The corrective measures described in the previous section were evaluated relative to the criteria presented in Section 1.2 and reiterated below:

- Performance
- Reliability
- Ease of implementation
- Potential impacts of appropriate potential remedies (safety impacts, cross-media impacts, and control of exposure to any residual contamination)
- Time required to begin and complete the remedy
- Institutional requirements that may substantially affect implementation of the remedy(s) (permitting, environmental or public health requirements)

These factors are presented in Table 3 for the corrective measures described in Section 3 to allow a qualitative evaluation of the ability of each corrective measure to address SSLs for cobalt in the Uppermost Aquifer. The goal is to understand which potential corrective measures could be used, either independently or in combination, to attain the GWPS, as discussed in the following sections.

Discussion of potential groundwater corrective measures is provided below with content pertaining to each evaluation criteria provided above highlighted in **bold** text.

4.2 Potential Source Control Corrective Measure Evaluation

As presented in Section 3, the following source control corrective measures may be viable to address SSLs in the Uppermost Aquifer:

- Potential Source Control Corrective measures
  - Closure in Place (CIP)
  - Closure by Removal (CBR) (On-Site or Off-Site Landfill)
  - In-Situ Solidification/Stabilization (ISS)

These remedial corrective measures are discussed below relative to their ability to effectively address the cobalt SSL in the Uppermost Aquifer. To attain GWPS these source control corrective measures may be combined with groundwater corrective measures, such as MNA

4.2.1 Closure in Place

CIP is an accepted corrective measure. The **performance** of CIP as a source control corrective measure can vary based on site-specific conditions and may require additional data collection or groundwater fate and transport modeling to support the design and regulatory approval. Site conditions at the Miami Fort Pond System are favorable for effective source control by CIP because the basins are underlain by low-permeability clays. CIP is a **reliable** source control measure that does not require active systems to operate and requires limited maintenance.

Implementation of CIP only requires commonly performed construction and earthwork activities as described in Section 3.2 and can typically be completed in a **timeframe** of 5 to 8 years, including design, permitting, and construction.

Cover systems control exposure to CCR by limiting potential contact with CCR material, controlling stormwater runoff and significantly reducing infiltration of water into the CCR material. During construction of the cover system there is the potential **impact** of short term exposure to CCR. During the approximately 1 to 2 year construction period there could be some increase in off-site traffic due to the increased need for on-site workers.

Controlling the primary source quickly results in lowering the total mass released, subsequently reducing the time to attain GWPS. Based on groundwater modeling of geosynthetic and soil cover systems at affiliate Dynegy Midwest Generation, LLC CCR units with similar hydrogeologic conditions (*e.g.,* Hennepin West and Hennepin East), concentrations of CCR constituents are expected to begin to decline and the extent of groundwater impacts are expected to reduce within months after cover placement. **Timeframes to achieve GWPS** are dependent on site-specific conditions which require detailed technical analysis. CIP requires **approval by OEPA** to be implemented.

4.2.2 Closure by Removal

CBR is an accepted corrective measure. CBR is a **reliable** source control measure that does not require active systems to operate and requires limited maintenance. CBR only requires commonly performed construction and earthwork activities as described in Section 3.2. However, dewatering and moisture conditioning of the CCR for transport can often be problematic to **implementation**; and site access is limited.

The **regulatory approval process** for constructing a new on-site landfill, if feasible, would take multiple levels of approval, including environmental permits and local authorization. Opposition to such projects and regulatory approvals would take years before construction could commence. However, most importantly, there is no available space (see Figure 1) at the MFS on which to site or construct an on-site landfill, requiring that only off-site landfill alternatives be considered.

Assuming 60 trucks per day (8 trucks per hour), it will take over 18 years to transport the CCR to an off-site landfill. This will result in an **impact** of 289,000 roundtrips (3.6 MCY of CCR; assuming 12.5 CY per truck load) between the MFS and the landfill.

CBR of the Pond System could be completed in the **timeframe** of approximately 20 to 24 years, including design, permitting, and construction. Delays in controlling the primary source will increase the potential for additional mass release, subsequently increasing the **time to attain GWPS**.

During that timeframe the transport of the CCR could lead to the following **impacts**: increased risk to the public, increased greenhouse gas emissions and carbon footprint, and increased potential for fugitive dust exposure.

Commercially available landfill capacity is extremely limited. Decatur Hills Landfill in Greensburg, Indiana has the most available airspace within 50 miles of the MFS but it is insufficient to accommodate the 3.6 MCY of CCR to be removed, unless they cease accepting municipal solid waste.

Due to insufficient available commercial landfill capacity, and lack of space onsite to construct a landfill, CBR is not retained as a viable corrective measure.

4.2.3 In-Situ Solidification/Stabilization (ISS)

Performance of ISS for application as a CCR source control measure is not proven, therefore the **performance and reliability are unknown**. The design of ISS as a source control corrective measure would require additional data collection. During ISS construction there would be the potential **impacts** of short-term exposure to CCR.

Implementation of ISS would require extensive pre-implementation testing, specialized equipment, and specialized contractors. ISS construction **timeframes** would be dependent on application volume. Treatment of all CCR materials may not be feasible dependent upon depth and obstructions. Targeted ISS may reduce the timeframe required; however, another source control corrective measure would be required to address remaining CCR. ISS requires **approval by the OEPA** to be implemented. The **timeframe to implement** ISS, including bench-scale and pilot-scale testing to support the detailed design and regulatory approval, would delay source control. In addition, the effects on groundwater chemistry associated with the addition of large volumes of Portland cement and other amendments to the subsurface would require detailed evaluation.

Site conditions at the Miami Fort Pond System would support implementation of ISS because the CCR material is present less than 50 feet below ground surface and underlain by low-permeability clays which are likely to provide a viable "key layer" for the stabilization of CCR material.

4.3 Potential Groundwater Corrective Measure Evaluation

Based on the corrective measure review presented in Section 3.3, the following remedial corrective measures are considered potentially viable to address the cobalt SSL in the Uppermost Aquifer:

- Potential Groundwater Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - Permeable Reactive Barrier (PRB)
  - Groundwater Extraction

These corrective measures are discussed below relative to their ability to effectively address the cobalt SSL in the Uppermost Aquifer. Additional site-specific data collection and analyses will be required to verify the feasibility of selected corrective measures and to design the corrective measure(s), consistent with 40 C.F.R. § 257.97 requirements.

4.3.1 Monitored Natural Attenuation

MNA is an in-situ remedial technology which relies on source control and natural processes occurring in aquifers to attenuated dissolved constituents and thereby reduce their concentrations in groundwater. MNA is most effective at sites where the source is controlled, the contaminant plume is stable or shrinking, contaminant concentrations are low, and potential receptors are not exposed to concentrations greater than health-based values. The **performance** of MNA as a groundwater remedy can vary based on site-specific conditions; these conditions should be evaluated in accordance with USEPA's tiered approach to MNA (USEPA 1999, 2007, and 2015).

The results of an in-progress independent evaluation regarding the potential feasibility of MNA as a groundwater remedy are provided as Attachment E. This evaluation considered whether site-specific conditions appear favorable for **implementation** of MNA. As part of this evaluation, the likely ability of MNA, in combination with source control, to meet the criteria provided in 40 C.F.R. § 257.96(c) was completed; these results are also summarized in Table 3. As discussed in the independent evaluation in Attachment E, MNA performance is likely to achieve the 40 C.F.R. § 257.97 performance criteria based on the conclusions of the evaluation and the geochemical behavior of cobalt. Additional efforts will be completed to gather information to complete the tiered evaluation in accordance with USEPA guidance which will support the selection of MNA, in combination with source control, as a groundwater remedy. The MNA evaluation is currently underway at the Miami Fort Pond System and will be completed in 2021.

4.3.2 Groundwater Extraction

Groundwater extraction is a widely accepted corrective measure for groundwater with a long track record of performance and reliability. It is routinely approved by state and federal regulators. The **performance** of a groundwater extraction system is dependent on site-specific hydrogeologic conditions and would require additional data collection (aquifer testing) and possibly groundwater fate and transport modeling to support the design and regulatory approval. Groundwater extraction systems are proven **reliable** when properly designed and maintained.

Implementation of a groundwater extraction system presents design challenges due to the significant features controlling hydraulic head and groundwater flow in the Uppermost Aquifer (*i.e.,* Ohio River and Great Miami River). Relatively high horizontal hydraulic conductivities are anticipated to require a high pumping rate to successfully control groundwater in the vicinity of the Pond System. For a corrective measure using groundwater containment to effectively control off-site flow or to remove potentially contaminated groundwater, horizontal and vertical capture zone(s) must be created using pumping wells. Depending on the volumetric rate of extraction required, groundwater pumping wells may require high capacity well registration. Extracted groundwater would need to be managed, which may include modification to the existing NPDES permit and treatment prior to discharge, if necessary.

There could be some **impacts** associated with constructing and operating a groundwater extraction system, including limited exposure to extracted groundwater. Additional data collection and analyses would be required to design an extraction system. Construction could be completed within 1 year. **Time of implementation** is approximately 3 to 4 years, including characterization, design, permitting and construction. **Timeframes to achieve GWPS** are dependent on site-specific conditions and selected source control measures, which require detailed technical analysis. Groundwater extraction requires **approval by the OEPA** to be implemented.

The high transmissivity of the Uppermost Aquifer (see Section 2.2) and the nature, extent, and detected concentrations of cobalt in groundwater may limit the effectiveness of a pump and treat system to hydraulically contain and capture the cobalt plume in close proximity to the Ohio River, and in an Uppermost Aquifer with relatively high permeability. The proximity of the plume to the

Ohio River and existing industrial production wells presents challenges for plume capture and containment, which would require removal and treatment of high volumes of groundwater.

4.3.3 Groundwater Cutoff Wall

Groundwater cutoff walls are a widely accepted corrective measure used to control and/or isolate impacted groundwater and are routinely approved by the state and federal regulators. Cutoff walls have a long history of **reliable performance** as hydraulic barriers provided they are properly designed and constructed. **Implementation** of a cutoff wall extending to, and keyed into, the bedrock underlying the Uppermost Aquifer would present challenges due to the required depth (estimated thickness of the permeable valley fill at the MFS is approximately 120 feet). Additional site investigation would be required to verify the feasibility of a cutoff wall keyed into the bedrock below the Uppermost Aquifer, and to evaluate alternate configurations, including a shallower wall used in conjunction with groundwater extraction.

Cutoff walls are designed to act as hydraulic barriers; as a result, cutoff walls inherently alter the existing groundwater flow system. These changes to the existing groundwater flow system may need to be controlled to maximize the effectiveness of the remedy; for example, groundwater extraction may be required to control build-up of hydraulic head upgradient and around the groundwater cutoff walls. The effectiveness and **performance** of a cutoff wall as a hydraulic barrier also relies on the contrast between the hydraulic conductivity of the aquifer and the cutoff wall. The most effective barriers have hydraulic conductivity values that are several orders of magnitude lower than the aquifer that it is in contact with. Based on literature, and the high yield of the production wells, the hydraulic conductivity is expected to be high. The high horizontal conductivities in the upper aquifer suggest that a barrier wall would have the desired contrast in hydraulic conductivities which improves the **reliability** as groundwater will be unlikely to migrate through the barrier.

There could be some **impacts** associated with constructing and operating a groundwater cutoff wall, including changes to the groundwater flow system that have to be considered for effective groundwater corrective action. Additional data collection and analyses would be required to design a cutoff wall. Construction could be completed within 3 to 4 years. **Time of implementation** is approximately 6 to 9 years, including characterization, design, permitting and construction. To attain GWPS, groundwater cutoff walls require a separate groundwater corrective measure to operate in concert with the hydraulic barriers. Groundwater cutoff walls are commonly coupled with MNA and/or groundwater extraction as groundwater corrective measures. **Timeframes to achieve GWPS** are dependent on site-specific conditions, which require detailed technical analysis. Groundwater cutoff walls require **approval by the OEPA** to be implemented.

4.3.4 Permeable Reactive Barrier

PRB application as a groundwater corrective measure for cobalt is not well established and more research is needed (EPRI, 2006), therefore, **performance** is unknown. PRB treatment of cobalt is expected to have variable **reliability** based on site-specific hydrogeologic and geochemical conditions. The capacity of the reactive media may be exceeded and require replacement or rejuvenation. Conservative estimates indicate iron-based reactive media are expected to require maintenance every 10 years (ITRC, 2005). **Implementation** of PRBs may have design challenges associated with both groundwater hydraulics and plume configuration given the location of the groundwater impacts between the Ohio River and two high capacity pumping centers.

Funnel-and-gate PRBs inherently alters the existing groundwater flow system. As mentioned above, the high horizontal conductivities in the upper aquifer suggest that the barrier portions of a funnel-and-gate system would have the desired contrast in hydraulic conductivities which improves the reliability as groundwater will be unlikely to migrate through the barrier. These changes to the existing groundwater flow system may need to be controlled to reduce **potential impacts** of the remedy. Construction of PRBs could be completed within 2 to 3 years. **Time of implementation** is approximately 6 to 9 years, including characterization, design, permitting and construction. **Timeframes to achieve GWPS** are dependent on site-specific conditions, including reactivity and maintenance (replacement or rejuvenation requirements) which require detailed technical analysis. PRBs and potentially associated groundwater cutoff walls (funnel-and-gate system) **require approval by OEPA** to be implemented.

4.3.5 In-Situ Chemical Treatment

In-situ chemical treatment of cobalt is not well established, and more research is needed (EPRI, 2006); therefore, **performance and reliability** are unknown. Chemical treatment of cobalt is expected to have variable reliability based on site-specific geochemical conditions. The capacity of the reactive media may be exceeded and require replacement or rejuvenation. Conservative estimates indicate iron-based reactive media is expected to require maintenance every 10 years (ITRC, 2005).

Implementation of in-situ chemical treatment may have design challenges associated with groundwater hydraulics given the location of the groundwater impacts between the Ohio River and two high capacity pumping centers.

Injections of reactive media could be completed within 2 to 3 years. **Time of implementation** is approximately 8 to 13 years, including characterization, design, permitting and injections. Chemical treatment alters groundwater geochemical conditions, which may result in potential **impacts** associated with **implementation** of the remedy. **Timeframes to achieve GWPS** are dependent on site-specific conditions, including reactivity and maintenance (replacement or rejuvenation requirements) which require detailed technical analysis. Since in-situ chemical treatment alters groundwater geochemistry implementation of the remedy **may require Underground Injection Control approval (UIC)**.

In-situ chemical treatment is not retained as a viable corrective measure to address SSLs of cobalt in the Uppermost Aquifer since its performance and reliability are unknown and the groundwater hydraulics are likely to require increased control provided by a PRB.

5. REMEDY SELECTION PROCESS

Per 40 C.F.R. § 257.97, a remedy must be selected to address the SSLs in the Uppermost Aquifer, based on the results of the CMA. The remedy should be selected as soon as possible and must meet the following standards:

- Be protective of human health and the environment
- Attain the groundwater protection standard as specified pursuant to § 257.95(h)
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment
- Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems
- Comply with standards for management of wastes as specified in § 257.98(d)

5.1 Retained Corrective Measures

This CMA was prepared to address the requirements of 40 C.F.R. § 257.96. The following potentially viable corrective measures were identified based upon site-specific conditions:

- Potential Source Control Corrective measures
  - Closure in Place (CIP)
  - In-Situ Solidification/Stabilization (ISS)
- Potential Groundwater Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Extraction
  - Groundwater Cutoff Wall
  - Permeable Reactive Barrier (PRB)

Per 40 C.F.R. § 257.97, a remedy must be selected to address the SSLs in the Uppermost Aquifer, based on the results of the CMA. The remedy should be selected as soon as feasible and must meet the following standards:

- Be protective of human health and the environment
- Attain the groundwater protection standard as specified pursuant to § 257.95(h)
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment
- Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems
- Comply with standards for management of wastes as specified in § 257.98(d)

Using the currently available site-specific data discussed in this CMA, Closure in Place is the source control corrective measure that best fits the standards mentioned above. It is a proven, reliable technology with relatively short implementation (and therefore GWPS attainment) timelines compared to ISS.

Based on the analysis completed to-date (Appendix E), MNA combined with source control appears to be a promising groundwater remedy at the Miami Fort Pond System when reviewed against the requirements in 40 C.F.R. § 257.96(c). Further investigation will be completed in 2021 to collect sufficient evidence to support the tiered MNA evaluation, which will include an analysis of the attenuation mechanism, rate, and aquifer capacity to establish multiple lines of evidence in accordance with USEPA guidance.

Additional investigation is also required to increase the density and resolution of Uppermost Aquifer data to facilitate design of a groundwater extraction system, cutoff wall, and/or PRB, if necessary, to evaluate other corrective measures. As presented in the September 5, 2020 Semiannual Remedy Selection Progress Report, groundwater flow and transport modeling is in development to support selection and design of the groundwater remedy. Bench-scale evaluation of reactive media would also be required for design of a PRB.

5.2 Future Actions

Additional investigation will be completed to support analysis of the attenuation mechanism, rate, and aquifer capacity to complete the tiered MNA evaluation recommended by USEPA guidance. Additional Uppermost Aquifer data needed for design of groundwater extraction, cutoff wall, and/or PRB will also be collected during the MNA investigation to the extent allowed by the scope of the MNA investigation.

Semiannual reports per § 257.97 will be prepared to describe the progress in selecting and designing the remedy that addresses the cobalt SSL in the Uppermost Aquifer. A final report describing the selected remedy and how it meets the standards listed above will also be prepared per § 257.97. The corrective action plan will address impacts from CCR constituents in the Uppermost Aquifer.

6. REFERENCES

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TABLES

TABLE 1. ASSESSMENT MONITORING PROGRAM SUMMARY
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
September 18-20, 2018	January 2, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 7, 2019	NA	Sept 5, 2019 (completed CMA)
			Arsenic (MW-2, MW-10)		April 8, 2019	NA
March 12-14, 2019	April 29, 2019	Appendix III	--	--	--	--
		Appendix IV	Cobalt (MW-4) Molybdenum (MW-6)	July 29, 2019	NA	ongoing
			Arsenic (MW-2, MW-10)		October 28, 2019	NA
June 12-14, 2019 (delineation event)[2]	July 1, 2019	Cobalt and Molybdenum	NA	NA	NA	NA
September 9-10, 2019	October 8, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 6, 2020	NA	Feasibility study phase of CMA; Public meeting held December 16, 2019
			Arsenic (MW-2, MW-10)		April 6, 2020	NA
April 6-7, 2020	May 4, 2020	Appendix III	--	--	--	--
		Appendix IV	Cobalt (4A, MW-4)	August 3, 2020	NA	March 5, 2020 (Semiannual remedy selection progress report)
			Molybdenum (MW-6) Arsenic (MW-2, MW-10, MW-13)		November 12, 2020	September 5, 2020 (Semiannual remedy selection progress report)
September 14-15, 2020	October 20, 2020	Appendix III	--	--	--	--
		Appendix IV Detected[1]	TBD	TBD	TBD	November 30, 2020 (revised CMA)

[O: RAB 9/11/20; C: EJT 9/16/20][U: BGH 11/18/20][U:KLT 11/24/20, C: RAB 11/24/2020]

Notes:
-- = SSL evaluation not apply to Appendix III parameters
ASD = Alternate Source Demonstration
CMA = Corrective Measures Assessment
NA = Not Applicable
SSL = Statistically Significant Level
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. Part 257.95(d)(1).
2. June 12-14, 2019 samples were collected as part of a delineation event and analytical results were not statistically evaluated for SSLs. Individual monitoring well exceedances of the GWPS are presented.

TABLE 2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Monitoring Well ID	GWPS	9/18-20/2018		3/12-14/2019		6/12-14/2019		8/9/2019	
		Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.006	--	--	--	--	--	--	0.00200	0.00200
MW-1	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NS	NS
MW-2	0.006	NS	0.00050	0.00098	0.00050	NS	NS	NS	NS
MW-3A	0.006	NS	0.00022	0.00223	0.00050	NS	NS	NS	NS
MW-4	0.006	0.01870	**0.00762**	0.00588	**0.00727**	0.0083	**0.0083**	NS	NS
MW-5	0.006	<0.0005	0.00050	<0.0005	0.00050	0.00066	0.00066	NS	NS
MW-6	0.006	0.00473	0.00255	0.00258	0.00253	0.0033	0.0033	NS	NS
MW-7	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NS	NS
MW-8	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS
MW-9	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS
MW-10	0.006	NS	0.00116	<0.0005	0.00095	NS	NS	NS	NS
MW-11	0.006	NS	0.00211	0.00061	-0.00457	NS	NS	NS	NS
MW-12	0.006	0.00193	0.00183	0.00194	0.00183	0.0023	0.0023	NS	NS
MW-13	0.006	<0.0005	-0.01049	<0.0005	-0.01040	<0.0005	<0.0005	NS	NS
MW-14	0.006	NI	NI	NI	NI	0.00099	0.00099	NS	NS
MW-15	0.006	NI	NI	NI	NI	0.0065	**0.0065**	NS	NS
MW-16	0.006	NI	NI	NI	NI	0.00960	**0.00960**	NS	NS
MW-17	0.006	NI	NI	NI	NI	NI	NI	NI	NI
MW-18	0.006	NI	NI	NI	NI	NI	NI	NI	NI
MW-19	0.006	NI	NI	NI	NI	NI	NI	NI	NI

[O: KLT 9/1/20, C: RAB 9/2/2020][U:KLT 9/14/20, C:MGP 9/16/20, U: BGH 11/18/20][U: KLT 11/23/20, C: RAB 11/23/2020]

Notes:
Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated
< = Not Detected at Reporting Limit
-- = No sample; monitoring well not part of CCR program during sampling event
GWPS = Groundwater Protection Standard
mg/L = milligrams per liter
NI = Not Installed
NS = Not Sampled
1. Negative comparison values are the result of the Lower Confidence Band around a negative slope.
2. Comparison Values are presented on plume maps.

TABLE 2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Monitoring Well ID	GWPS	9/9-10/2019		4/6-7/2020		6/12/2020		9/14-15/2020	
		Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.006	--	--	0.00908	**0.00908**	0.012	**0.012**	0.0109	TBD
MW-1	0.006	<0.0005	<0.0005	<0.002	<0.002	NS	NS	<0.002	TBD
MW-2	0.006	0.00063	0.00051	<0.002	0.00052	NS	NS	<0.002	TBD
MW-3A	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-4	0.006	0.01710	**0.00795**	0.02240	**0.00844**	NS	NS	0.0149	TBD
MW-5	0.006	0.00052	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-6	0.006	0.00296	0.00263	0.00263	0.00262	NS	NS	0.00266	TBD
MW-7	0.006	<0.0005	<0.0005	<0.002	<0.002	NS	NS	<0.002	<0.002
MW-8	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-9	0.006	<0.0005	0.00050	<0.002	0.00050	NS	NS	<0.002	TBD
MW-10	0.006	<0.0005	-0.00599	<0.002	0.00073	NS	NS	<0.002	TBD
MW-11	0.006	0.00062	-0.00420	<0.002	-0.00382	NS	NS	<0.002	TBD
MW-12	0.006	0.00256	0.00193	0.00259	0.00193	NS	NS	0.00245	TBD
MW-13	0.006	<0.0005	-0.00836	<0.002	-0.00887	NS	NS	<0.002	TBD
MW-14	0.006	0.00069	0.00069	<0.002	<0.002	NS	NS	<0.002	TBD
MW-15	0.006	0.00360	0.00360	0.00386	0.00386	NS	NS	0.00379	TBD
MW-16	0.006	0.00267	0.00267	0.00217	0.00217	NS	NS	0.00347	TBD
MW-17	0.006	NI	NI	NI	NI	NI	NI	<0.002	<0.002
MW-18	0.006	NI	NI	NI	NI	NI	NI	NS	NS
MW-19	0.006	NI	NI	NI	NI	NI	NI	0.0145	**0.0145**

[O: KLT 9/1/20, C: RAB 9/2/2020][U:KLT 9/14/20, C:MGP 9/16/20, U: BGH 11/18/20][U: KLT 11/23/20, C: RAB 11/23/2020]

Notes:

Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated
< = Not Detected at Reporting Limit
-- = No sample; monitoring well not part of CCR program during sampling event
GWPS = Groundwater Protection Standard
mg/L = milligrams per liter
NI = Not Installed
NS = Not Sampled
1. Negative comparison values are the result of the Lower Confidence Band around a negative slope.
2. Comparison Values are presented on plume maps.

TABLE 3. CORRECTIVE MEASURES ASSESSMENT MATRIX
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POWER STATION
MIAMI FORT POND SYSTEM
NORTH BEND, OH

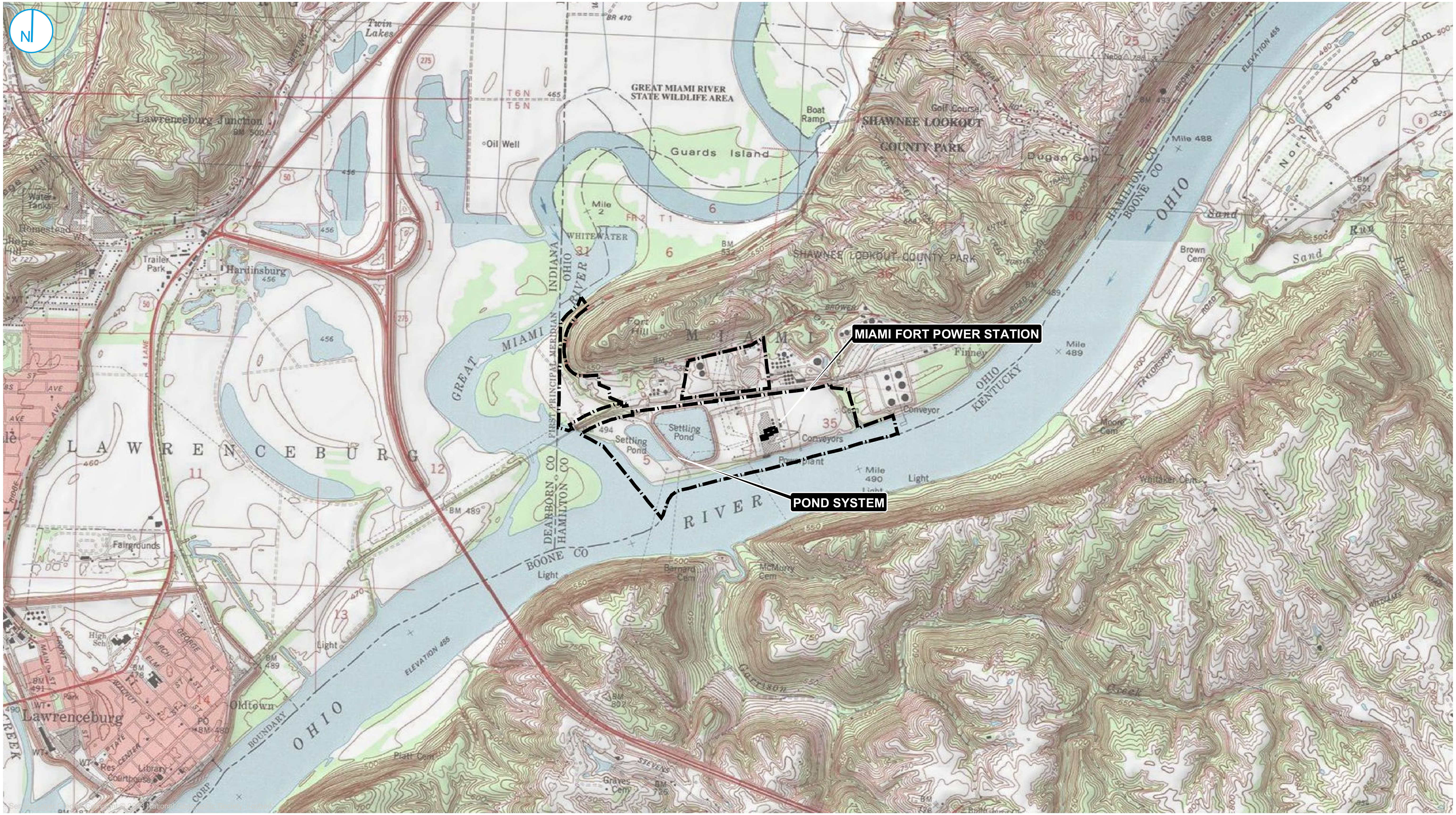
	Evaluation Factors	Performance	Reliability	Ease of Implementation	Potential Impacts of Remedy (safety impacts, cross-media impacts, control of exposure to any residual contamination)	Time Required to Begin and Implement Remedy[1]	Time to Attain Groundwater Protection Standards	Institutional Requirements (state/local permit requirements, environmental/public health requirements that affect implementation of remedy)
Source Control Corrective Measures	**Closure In Place**	Widely accepted source control method, routinely approved; variable performance based on site-specific conditions which are favorable for Miami Fort.	Reliable technology.	Commonly performed construction and earthwork.	Controls exposure to CCR. Some potential short term exposure during construction.	5 to 8 years.	CIP achieves source control in 5 to 8 years. Additional time to attain GWPS is dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
	Closure By Removal	Widely accepted, good performance with regard to source control.	Reliable technology.	Commonly performed earthwork. Dewatering can be problematic. Insufficient landfill capacity available with 50 miles.	Significant impact to the community due to CCR transport; reduction in landfill airspace; increases potential for additional mass relase.	20 to 24 years.	CBR achieves source control in 20 to 24 years. Additional time to attain GWPS is dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
	In-Situ Solidification /Stabilization	Not proven in CCR applications.	Unknown.	Requires extensive preimplementation testing and specialized equipment and contractors. Site specific conditions are favorable.	Some potential short term exposure during construction.	Dependent on application volume.	Dependent on selected groundwater remediation technology.	Requires regulatory approval processes.

TABLE 3. CORRECTIVE MEASURES ASSESSMENT MATRIX
CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POWER STATION
MIAMI FORT POND SYSTEM
NORTH BEND, OH

	Evaluation Factors	Performance	Reliability	Ease of Implementation	Potential Impacts of Remedy (safety impacts, cross-media impacts, control of exposure to any residual contamination)	Time Required to Begin and Implement Remedy[1]	Time to Attain Groundwater Protection Standards	Institutional Requirements (state/local permit requirements, environmental/public health requirements that affect implementation of remedy)
Groundwater Remediation Corrective Measures	**MNA**	Performance appears likely to be good given existing information on the constituents of concern and site conditions.	Planned additional testing will evaluate if the attenuation mechanism has low reversability and the aquifer has sufficient capacity.	Easy - completion of tiered evaluation and long-term monitoring required, neither of which require extensive specialized equipment or contractors.	None identified.	1 year, not including source control measures.	Dependent on site-specific condtions including schedule for source controls. Planned additional testing will evaluate attenuation rate.	Requires state regulatory approval processes; additional investigation is designed to address criteria of regulatory process
	Groundwater Extraction	Widely accepted, routinely approved; variable performance based on site-specific conditions. Challenges presented by high permeability aquifer, proximity to Ohio River, and other production wells.	Reliable if properly designed, constructed and maintained.	Design challenges due to groundwater hydraulics and plume configuration. Extracted groundwater may require management of high volumes of water.	Alters groundwater flow system. Potential for some limited exposure to extracted groundwater.	3 to 4 years.	Dependent on site-specific condtions including schedule for source controls.	Extracted groundwater will require management and approval from OEPA. May require high capacity well registration.
	Groundwater Cutoff Wall	Widely accepted, routinely approved, good performance if properly designed and constructed. May not be feasible for full penetration of the Uppermost Aquifer.	Reliable if properly designed and constructed (if feasible). Hydraulic conductivity of aquifer is favorable.	Widely used, established technology. May not be feasible for full penetration of the Uppermost Aquifer.	Alters groundwater flow system.	6 to 9 years.	Needs to be combined with other remediation technology(ies). Time required to attain GWPS dependent on combined technologies and schedule for source control.	Requires regulatory approval processes.
	Permeable Reactive Barrier	Permeable Reactive Barrier treatment not well established for cobalt, therefore performance is unknown.	Variable reliability based on site-specific groundwater hydraulics and geochemical conditions. Hydraulic conductivity of aquifer is favorable.	Design challenges associated with groundwater hydraulics and plume configuration.	Alters groundwater flow system.	6 to 9 years.	Dependent on site-specific conditions including detailed analaysis of reactivity and maintenance.	Requires regulatory approval processes.
	In-Situ Chemical Treatment	In-Situ treatment not well established for cobalt, therefore performance is unknown.	Variable reliability based on site-specific geochemical conditions.	Design challenges associated with groundwater hydraulics.	Alters groundwater geochemistry.	8 to 13 years.	Dependent on site-specific conditions including detailed analaysis of reactivity.	May require Underground Injection Control approval.

Notes:
[1]Time required to begin and implement remedy includes design, permitting and construction.

FIGURES



Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\CMA_Figures\Rev_201022\Figure 1_Site Location Map.mxd

PROJECT: 169000XXXX | DATED: 10/22/2020 | DESIGNER: STOLZSD

APPROXIMATE PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

FIGURE 1

CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT POND SYSTEM
MIAMI FORT POWER STATION
NORTH BEND, OHIO

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

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Part A\Figure 1_Well Locations BasinAandB.mxd

PROJECT: 72799 | DATED: 11/25/2020 | DESIGNER: MARRAMJ

DOWNGRADIENT CCR MONITORING WELL
BACKGROUND CCR MONITORING WELL
MONITORING WELL
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 250 500 Feet

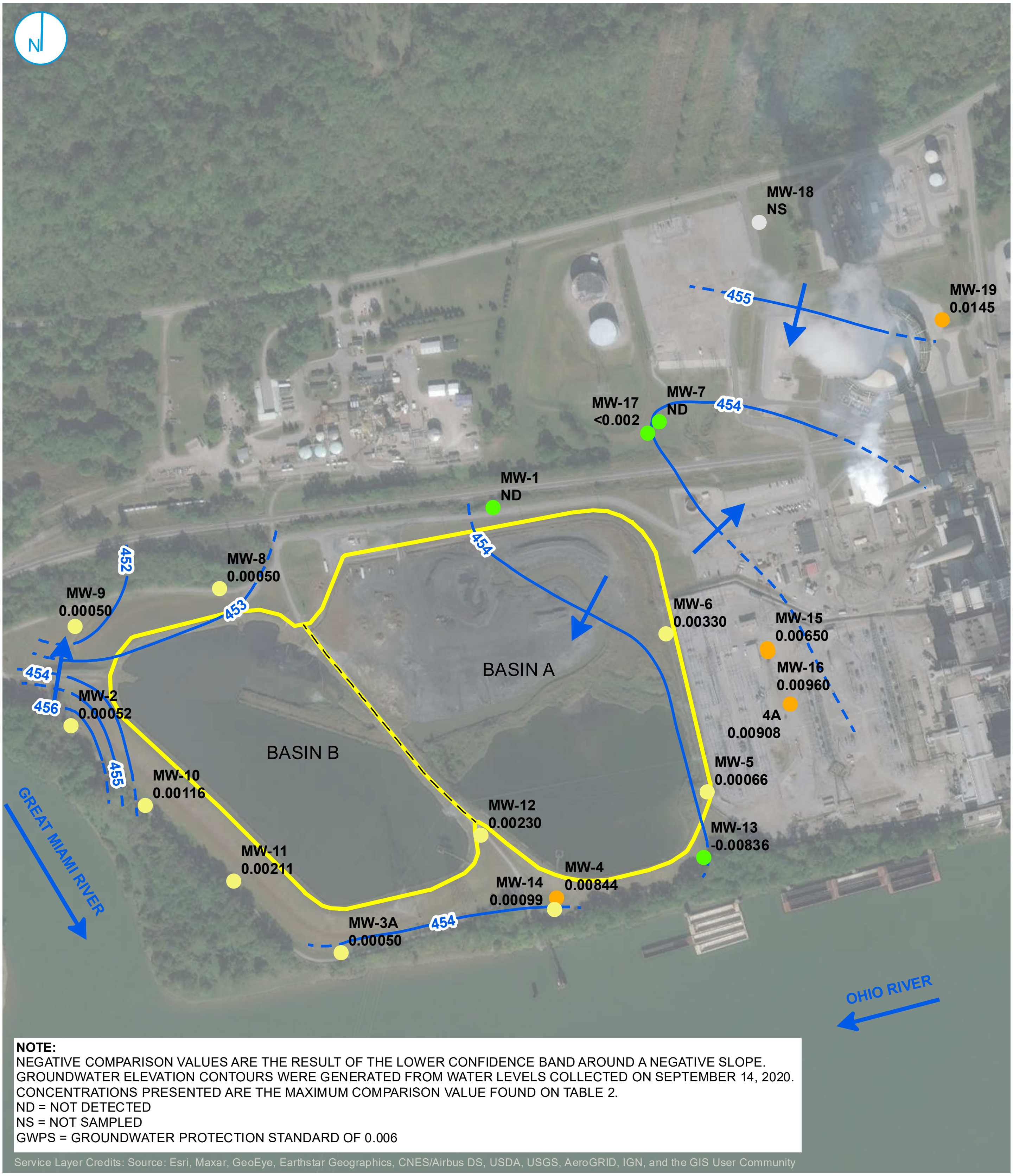
SITE AND WELL LOCATION MAP
POND SYSTEM
(MULTI-UNIT ID: 115)

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



NOTE:
NEGATIVE COMPARISON VALUES ARE THE RESULT OF THE LOWER CONFIDENCE BAND AROUND A NEGATIVE SLOPE.
GROUNDWATER ELEVATION CONTOURS WERE GENERATED FROM WATER LEVELS COLLECTED ON SEPTEMBER 14, 2020.
CONCENTRATIONS PRESENTED ARE THE MAXIMUM COMPARISON VALUE FOUND ON TABLE 2.
ND = NOT DETECTED
NS = NOT SAMPLED
GWPS = GROUNDWATER PROTECTION STANDARD OF 0.006

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Part A\Figure 2_MF_BasinAB_GW_Cobalt Plume Map_2004.mxd

PROJECT: 72799 | DATED: 11/30/2020 | DESIGNER: MARRAMJ

COBALT, TOTAL (mg/L)

- NON-DETECT
- DETECTED
- DETECTED, >GWPS
- WATER LEVEL ONLY WELL
- CCR MONITORED MULTI-UNIT
- BERM
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- RIVER FLOW DIRECTION

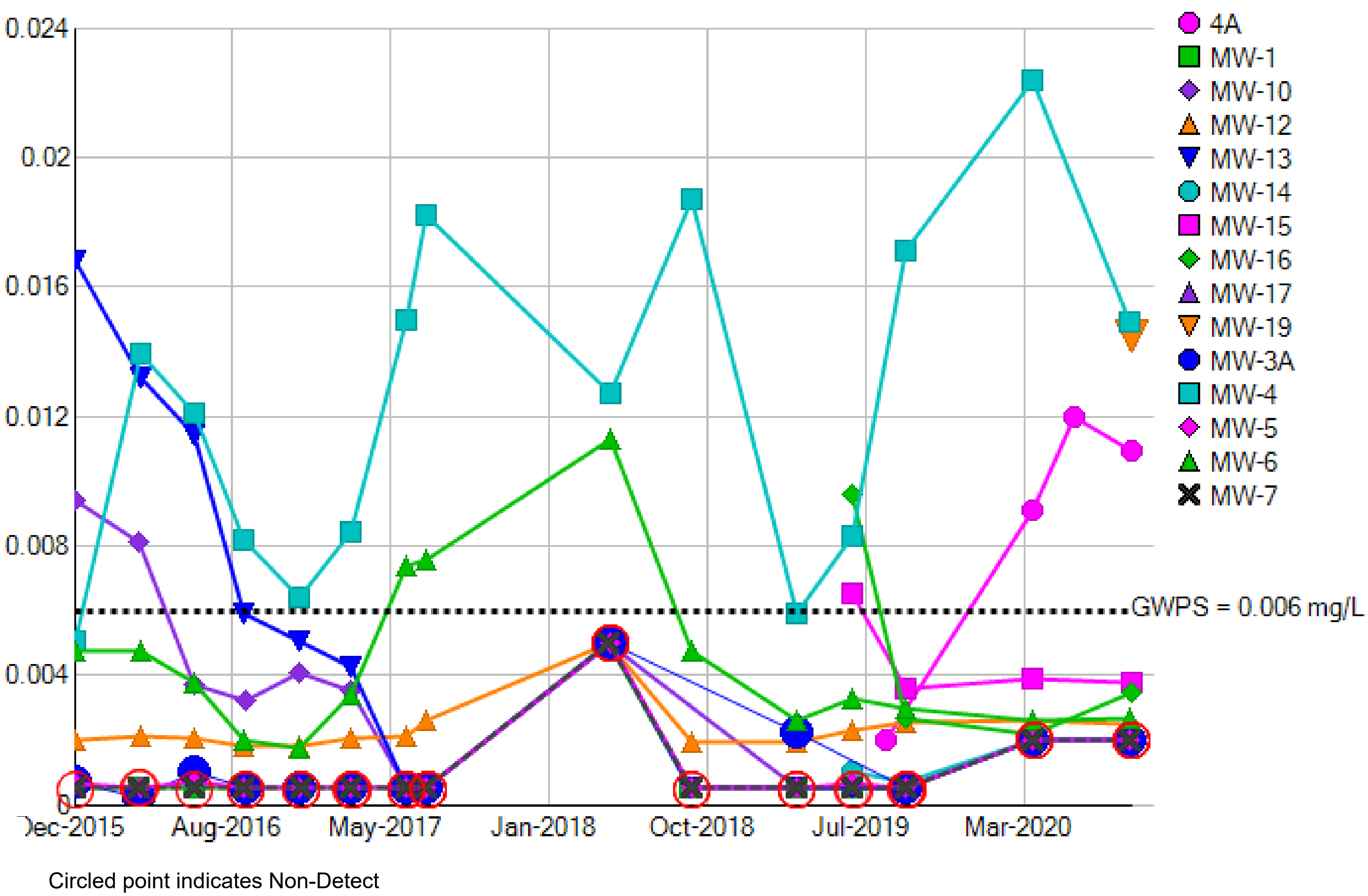
0 250 500 Feet

TOTAL COBALT PLUME MAP

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



COBALT - TIMESERIES

FIGURE 4

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

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

APPENDIX A
ALTERNATE SOURCE DEMONSTRATION FOR ARSENIC & MOLYBDENUM SSLS

Intended for
Dynegy Miami Fort, LLC

Date
November 12, 2020

Project No.
1940074922

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION
MIAMI FORT POND SYSTEM

CERTIFICATIONS

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
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

I, Nicole M. Pagano, 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.

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

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FIGURES (IN TEXT)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
CMP	corrugated metal pipe
FGD	Flue Gas Desulfurization
f/k/a	formerly known as
ft	feet
GWPS	Groundwater Protection Standards
HDPE	high density polyethylene
LOEs	lines of evidence
MCD	Miami Conservancy District
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OEPA	Ohio Environmental Protection Agency
ORP	oxidation-reduction potential
Ramboll	Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
RCRA	Resource Conservation and Recovery Act
Site	Miami Fort Power Station
SSIs	Statistically Significant Increases
SSLs	Statistically Significant Levels
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 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 (GWPS) 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 [ASD]).

This ASD has been prepared on behalf of Dynegy Miami Fort, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc.(Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Pond System located near North Bend, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 6 through April 7, 2020 and analytical data were received on May 4, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPS. That evaluation identified the following SSLs at downgradient monitoring wells:

- Arsenic at wells MW-2, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

In accordance with the Statistical Analysis Plan, wells MW-13 and 4A were resampled on June 12, 2020 and analyzed only for arsenic and cobalt, respectively, to confirm the SSLs. Following evaluation of analytical data from the resample event, the SSLs listed above for MW-13 and 4A were confirmed.

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence (LOEs) demonstrate that sources other than the Miami Fort Pond System were the cause of the arsenic and molybdenum SSLs listed above. This ASD was completed by November 2, 2020, within 90 days of determination of the SSLs (August 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii). This ASD does not address cobalt SSLs at downgradient monitoring wells MW-4 and 4A which is addressed by the Corrective Measures Assessment for the Pond System.

2. BACKGROUND

2.1 Site Location and Description

Miami Fort Power Station (Site) is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River (Figure 1). The Miami Fort Pond System (Pond System) is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Miami Fort electric switch yard to the east. The Miami Fort production wells are located east of Basin A and Veolia's production wells are located northwest of Basin B. Pond System CCR monitoring well locations, production well locations, and source water sampling locations are shown in Figure 1.

2.2 Description of the CCR Multi-Unit

The Pond System is a CCR Multi-Unit consisting of Basins A and B (CCR Multi-Unit ID 115). The Multi-Unit covers a total area of approximately 51 acres and is located in the southwest corner of the Site property as shown in Figure 1.

Basin A (formerly Unit 111) receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization (FGD) effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The Basin A normal pool level is typically between elevations of 495 and 498 ft. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert sliplined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM, 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the permitted outfall structure in Basin B. Miscellaneous yard drainage is also currently discharged directly to Basin B (AECOM, 2017).

2.3 Geology and Hydrogeology

The native geologic materials present beneath the Pond System at the Site include alluvial deposits, glacial outwash (Uppermost Aquifer), and bedrock, as described below:

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits are present at a depth ranging from approximately 20 to 60 ft below ground surface (bgs). A silty, sandy clay layer is the primary component of the alluvial deposits. The top of clay elevation ranges from 428 ft referenced to the North American Vertical Datum of 1988 (NAVD88) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Pond System and thickens towards the Ohio River. The clay is thickest beneath the southern half of the

Pond System, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.

- Glacial Outwash (Uppermost Aquifer) - The Uppermost Aquifer consists of glacial outwash sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits beneath the Site is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally overlying the outwash deposits and ranges in thickness from 4 to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel, and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 ft and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence.

Groundwater elevations across the Site ranged from approximately 456 to 460 ft during A3, coincident with an approximate Ohio River pool elevation of 461 ft. The groundwater elevation contours shown on Figure 2 are based on groundwater measurements collected on April 6, 2020, the day prior to A3 analytical sampling. Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following LOEs:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

These LOEs are described and supported in greater detail below. Monitoring wells and Pond System source water sample locations are shown on Figure 1.

3.1 LOE #1: Median Arsenic and Molybdenum Concentrations in the Pond System Source Water Are Lower Than the Median Arsenic and Molybdenum Concentrations Observed in Downgradient Wells with Arsenic and Molybdenum SSLs.

Box-and-whisker plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of (*i.e.*, below and above the box). The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers. The number in parentheses below each plot is the number of observations (i.e. samples) represented in that dataset.

Figure A below provides a box-and-whisker plot of the total arsenic concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2, and B-3 (monitoring well and source water [pond] sampling locations are shown on Figure 1). Total arsenic concentrations obtained in source water samples and presented in Figure A were pooled to provide a median concentration for comparison to arsenic concentrations in monitoring wells.

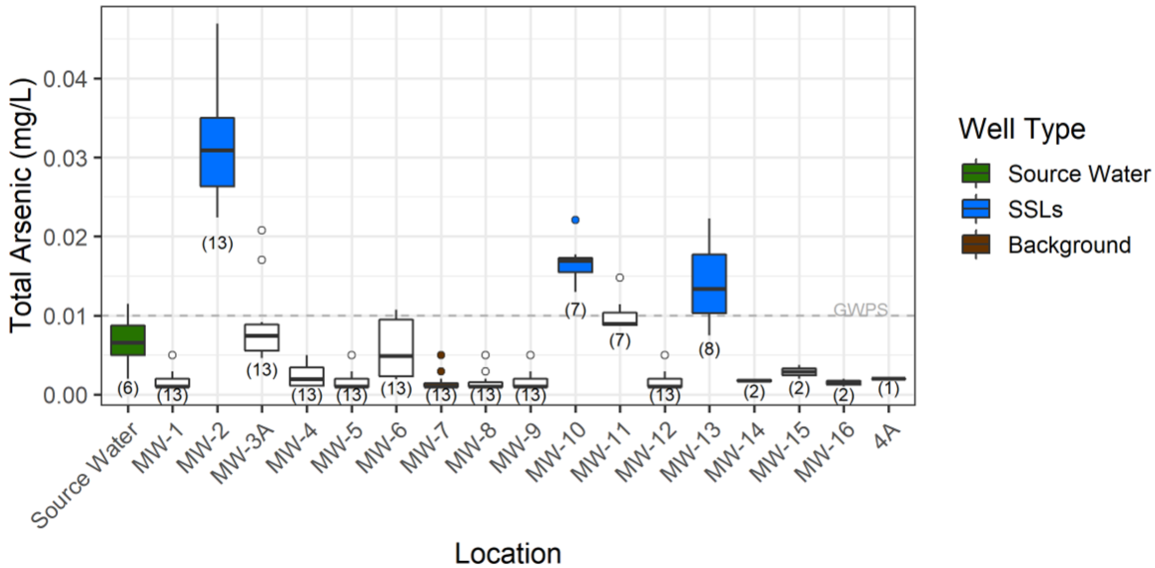

Figure A. Distribution of Arsenic Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure A) shows the arsenic concentrations in wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13) have median arsenic concentrations greater than the median arsenic concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of arsenic in downgradient groundwater at wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13), Pond System source water concentrations would be higher than the groundwater concentrations at those wells. Therefore, the Pond System is not the source of the arsenic in the downgradient groundwater.

Figure B below provides a box-and-whisker plot of the molybdenum concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2 and B-3 (monitoring well and source water sampling locations are shown on Figure 1).

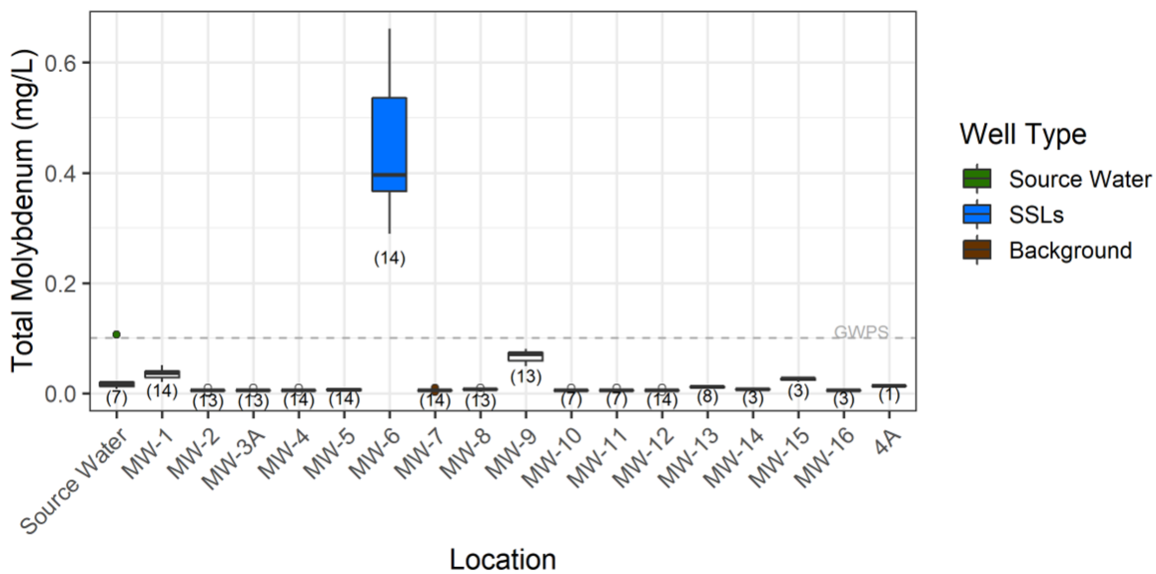

Figure B. Distribution of Molybdenum Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure B) shows the median molybdenum concentration in the well with a molybdenum SSL (*i.e.*, MW-6) is greater than the median molybdenum concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of molybdenum in downgradient groundwater at the well with a molybdenum SSL (*i.e.*, MW-6), Pond System source water concentrations would be higher than the groundwater concentrations at that well. Therefore, the Pond System is not the source of the molybdenum in the downgradient groundwater.

3.2 LOE #2: Arsenic and Molybdenum Concentrations Associated with Monitoring Wells MW-2, MW-10 and MW-13, and MW-6, respectively, are Not Correlated with Boron Concentrations, a Common Indicator for CCR Impacts to Groundwater.

Boron is a common indicator of CCR impacts to groundwater due to its leachability from CCR and mobility in groundwater. If a CCR constituent is identified as an SSL but boron is not correlated with that constituent, it is unlikely that the CCR unit is the source of the SSL.

Figure C below provides a scatter plot of arsenic versus boron concentrations (collected between 2015 and 2020) in downgradient groundwater at wells with arsenic SSLs, along with the results of a Kendall correlation test for non-parametric data. The results of the test at each well are described by the p-value and tau (Kendall's correlation coefficient) included in each plot. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship. The range of tau falls between -1 and 1, with a perfect correlation equal to -1 or 1. The closer tau is to 0, the less of a correlation exists in the data.

The results of the correlation analyses indicated that groundwater concentrations of arsenic observed at monitoring wells MW 2, MW-10, and MW-13 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure C below illustrates the lack of a relationship between arsenic concentrations and boron concentrations in groundwater at MW-2, MW-10, and MW-13, where the p-values are greater than 0.05 and tau is close to 0.

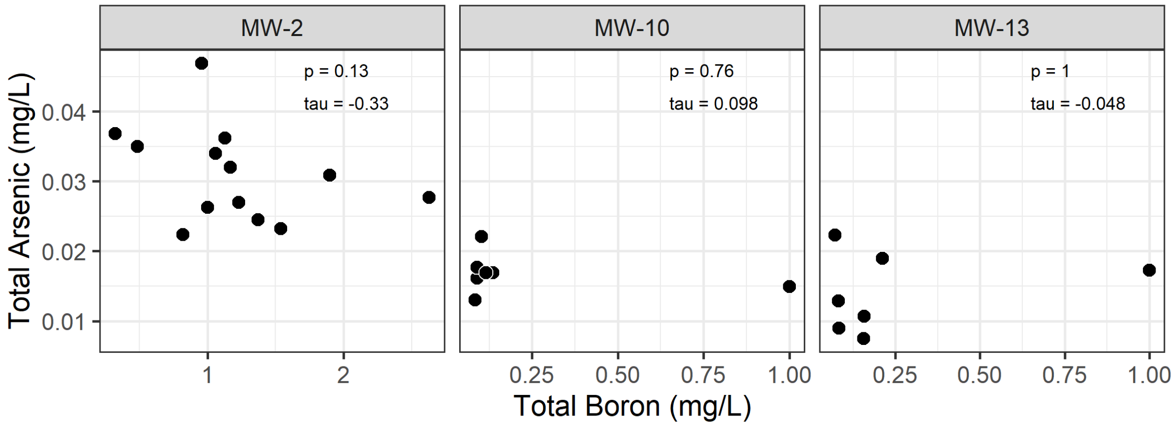

Figure C. Arsenic Concentrations Versus Boron Concentrations at Wells MW-2, MW-10, and MW-13 (2015-2020).

Figure D below provides a scatter plot of molybdenum versus boron concentrations (collected between 2015-2020) in downgradient groundwater at the only well with a molybdenum SSL, MW-6, along with the results of Kendall correlation analysis at MW-6 as described by the p-values and tau correlation coefficients included in the plot. The results of the Kendall correlation analysis indicated that groundwater molybdenum concentrations observed at monitoring well MW-6 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure D below illustrates the lack of a relationship between molybdenum concentrations and boron concentrations in groundwater at MW-6, where the p-value is greater than 0.05 and tau is close to 0.

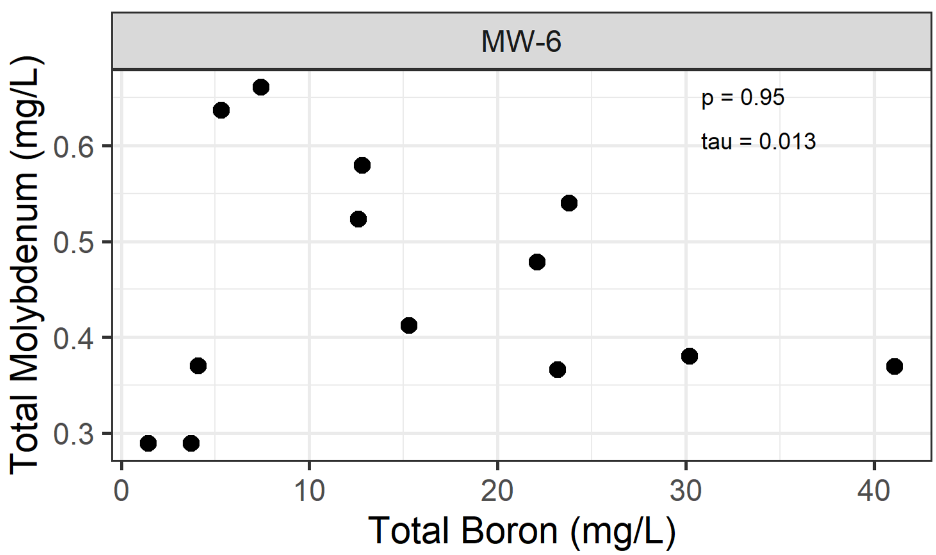

Figure D. Molybdenum Concentrations Versus Boron Concentrations at Well MW-6 (2015-2020).

Arsenic and molybdenum concentrations do not correlate with boron concentrations in downgradient monitoring wells with arsenic and molybdenum SSLs, indicating the Pond System is not the source of CCR constituents detected in the downgradient monitoring wells.

3.3 LOE #3: Naturally-Occurring Concentrations of Arsenic are Commonly Found in Soils and Groundwater in Southwestern Ohio. MW-2, MW-10, and MW-13 are Located in Southwestern Ohio, Along the Banks of the Great Miami River and Ohio River, Where They are Susceptible to Geochemical Conditions that can Mobilize Naturally-Occurring Arsenic from the Soils into Groundwater.

Naturally-occurring concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 ft bgs) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 ft northeast of the Pond System (Figure 1), 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). Results of the analysis indicated surficial terrace soils (clay) adjacent to the Pond System have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg).

Arsenic occurs naturally in southwestern Ohio glacial buried-valley deposit aquifers like the Uppermost Aquifer. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to increase understanding of arsenic occurrence in southwest Ohio (Thomas et al., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposits 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 (greater than or equal to 10 micrograms per liter [μg/L]) 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), indicating the potential for the reduction of arsenic-bearing iron oxides present in soil.

Based on previous studies discussed above, naturally-occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer) as the Pond System. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 ft northeast) to the Pond System. 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 indicating the potential for arsenic mobilization are likely to occur at the Pond System monitoring wells MW-2, MW-10, and MW-13, where arsenic SSLs were determined, as indicated by the following factors discussed below:

- Most riverbank boring logs indicate organic materials are present in the soils.
- MW-2, MW-10, and MW-13 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potential (ORP) at the Site were observed.

- Dissolved iron concentrations present in groundwater at monitoring well MW-2 correlate with dissolved arsenic concentrations.

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, and 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; McArthur et al., 2001). Arsenic-bearing soils are known to be present in the areas near the Pond System (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the most riverbank boring logs for monitoring wells located along the banks of the Great Miami River and Ohio River (see boring logs for wells MW-2, MW-3A, MW-4, MW-10, and MW-11 in Appendix 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 riverbanks of the Great Miami River and Ohio River as evidenced by the low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, MW-11, MW-13 and MW-14 (presented in Figure E below; monitoring wells adjacent to the riverbank are illustrated with solid lines, upland wells are illustrated with dashed lines).

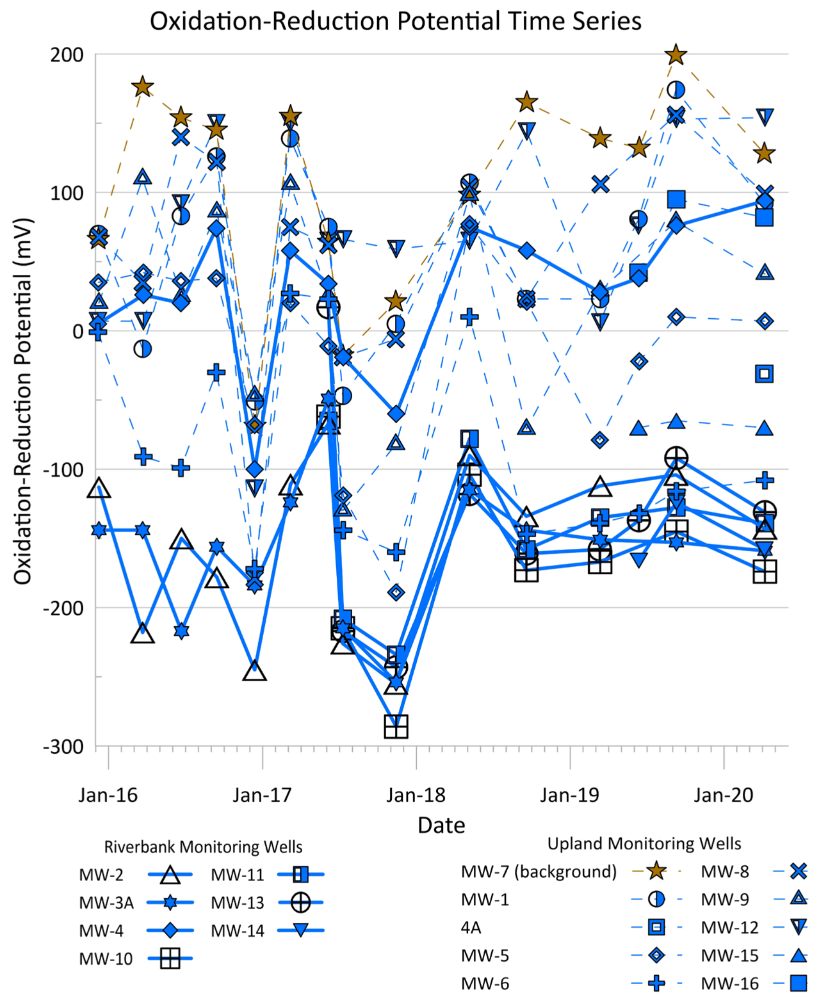

Figure E. Oxidation Reduction Potential Time-Series for Groundwater Samples (Monitoring Wells Adjacent to the Riverbank are Illustrated with Solid Lines, Upland Wells are Illustrated with Dashed Lines).

Available data indicated that concentrations of dissolved iron observed in groundwater at monitoring well MW-2 from 2008 to 2014 correlate with dissolved arsenic concentrations. Dissolved iron concentrations ranged from 11.8 to 52.1 mg/L at monitoring well MW-2 from 2008 to 2014, at least an order of magnitude greater than the 1 mg/L reported by the USGS as being indicative of iron-reducing geochemical conditions. Dissolved iron concentrations were also near or greater than 1 mg/L in A3 for MW-2, MW-10, and MW-13 at 45, 2.5 and 0.91 mg/L, respectively. Figure F below illustrates the relationship between dissolved iron concentrations and dissolved arsenic concentrations in groundwater at MW-2, where the R-squared value is 0.87, indicating a good correlation between dissolved iron and dissolved arsenic.

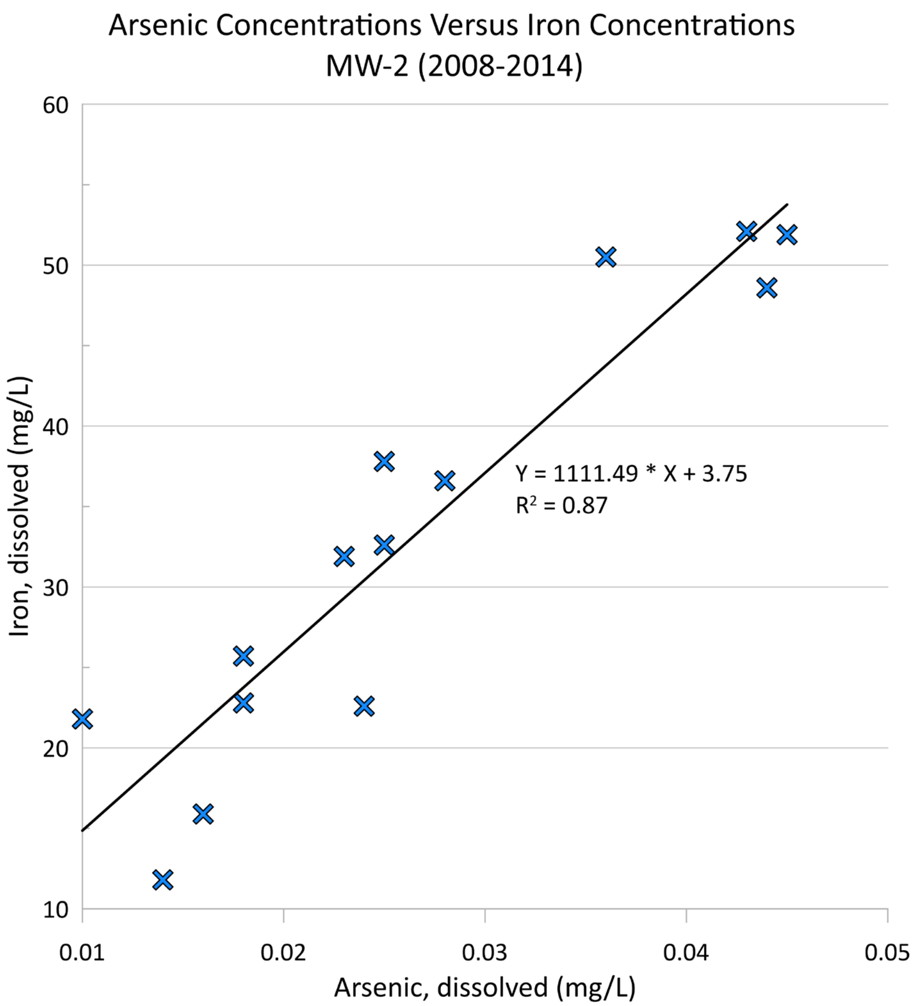

Figure F. Arsenic Concentrations Versus Iron Concentrations at Well MW-2 (2008-2014).

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 from soil to groundwater indicate that elevated concentrations of arsenic at monitoring wells MW-2, MW-10, and MW-13 are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

4. CONCLUSIONS

Based on the following three LOEs, it has been demonstrated that the arsenic SSLs at MW-2, MW-10, and MW-13, and the molybdenum SSL at MW-6 are not due to Miami Fort Pond System but are from a source other than the CCR unit being monitored:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSLs for arsenic and molybdenum observed during the A3 sampling event were not due to the Pond System. Therefore, a corrective measures assessment is not required for arsenic and molybdenum at the Miami Fort Pond System.

5. REFERENCES

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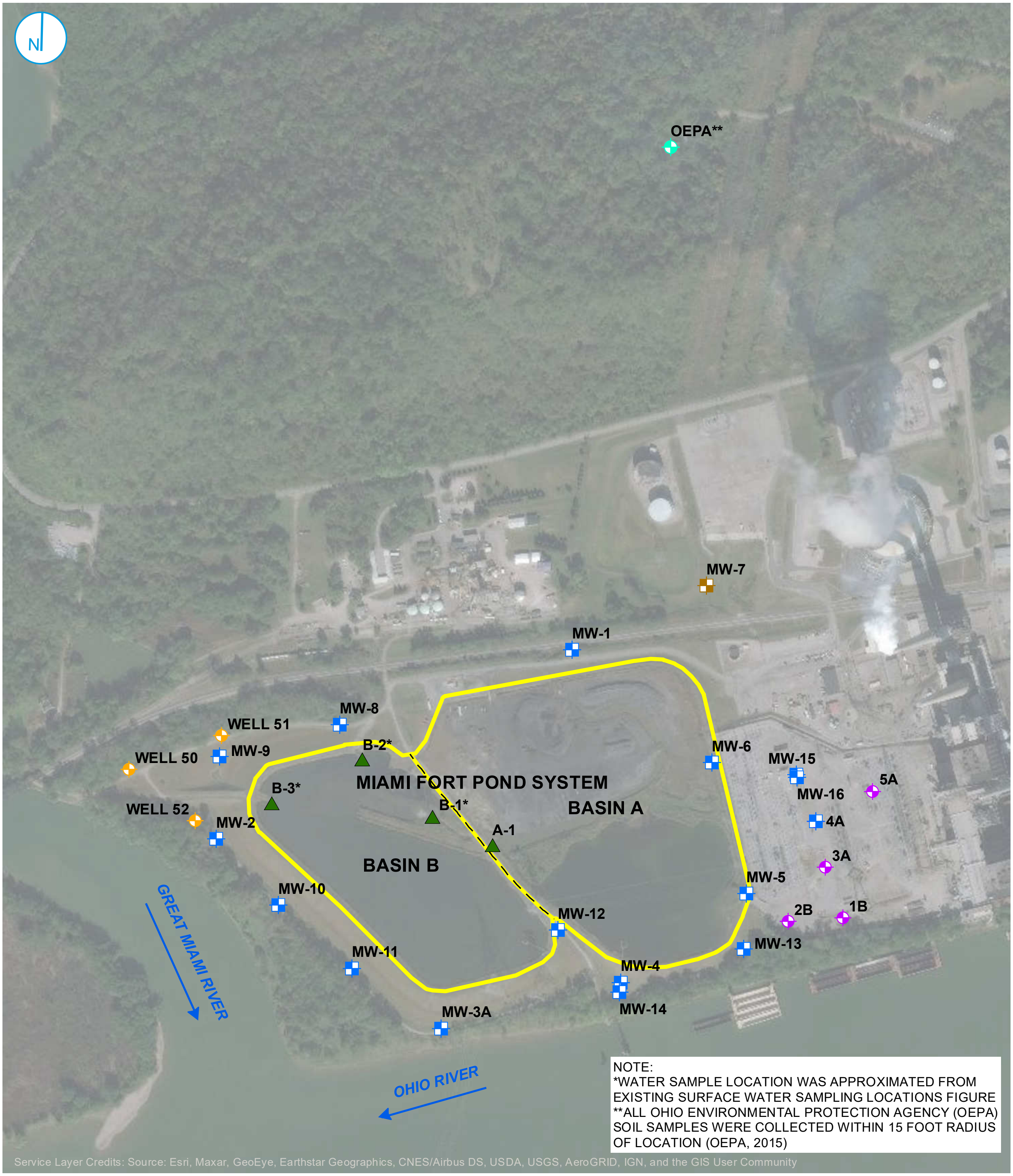
Thomas, M.A., Schumann, T.L., and Pletsch, B.A., 2005, Arsenic in ground water in selected parts of southwestern Ohio, 2002–03: U.S. Geological Survey Scientific Investigations Report 2005–5138, 30 p.

FIGURES

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 1_Monitoring Well and Sampling Locations.mxd

PROJECT: 169000XXXX | DATED: 10/20/2020 | DESIGNER: galarmmc



DOWNGRADIENT CCR MONITORING WELL LOCATION
BACKGROUND CCR MONITORING WELL LOCATION
SOURCE WATER SAMPLING LOCATION
OEPA SOIL SAMPLE LOCATION
MIAMI FORT PRODUCTION WELL
VEOLIA PRODUCTION WELL

CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 300 600
Feet

MONITORING WELL AND SAMPLING LOCATION MAP

FIGURE 1

MIAMI FORT POND SYSTEM (UNIT ID:115)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
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PROJECT: 72799 | DATED: 10/22/2020 | DESIGNER: STOLZSD

CCR MONITORING WELL LOCATION

MIAMI FORT PRODUCTION WELLS

VEOLIA PRODUCTION WELLS

CCR MONITORED MULTI-UNIT

BERM

RIVER FLOW DIRECTION

SURFACE WATER FEATURE

GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

MIAMI FORT POND SYSTEM (UNIT ID: 115)
ALTERNATE SOURCE DEMONSTRATION
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 2

RAMBOLL US CORPORATION
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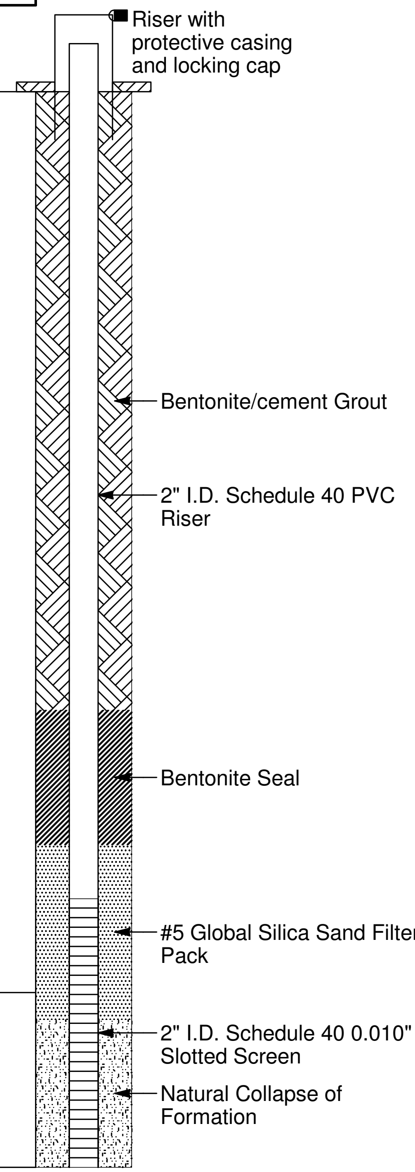
RAMBOLL

APPENDIX A
BORING LOGS FOR MONITORING WELLS
MW-2, MW-3A, MW-4, MW-10, AND MW-11

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

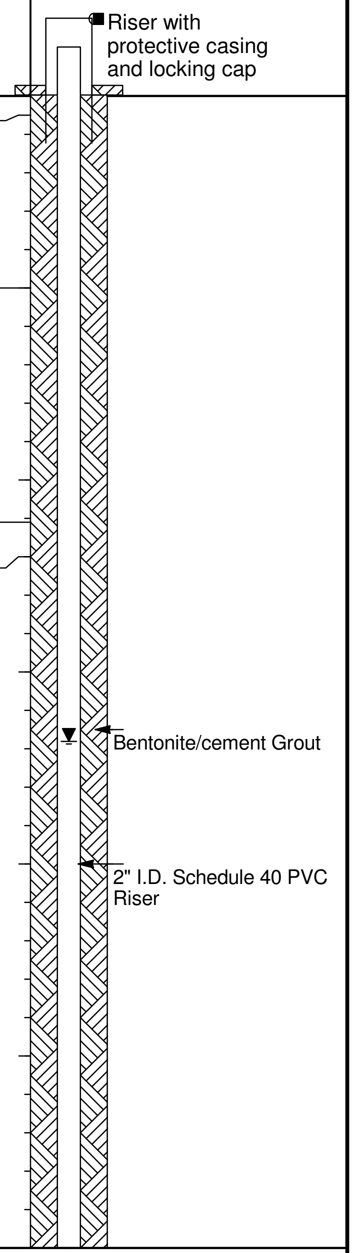
Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

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	SAMPLES: Blows per 1-foot Interval	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION
	0	X	12	83	Yellowish red CLAY TOPSOIL, moist 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
	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 grades high plasticity, very moist to wet
	10	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	grades with fine grained sand lenses
		X	2	100	grades brown with increasing fine sand
	20	X	2	100	
450		X	2	100	grades with gray to reddish gray lenses, decreasing sand, without sand lenses
		X	**	100	grades gray, without gray to reddish gray lenses, medium plasticity 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				

WELL CONSTRUCTION DETAILS



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

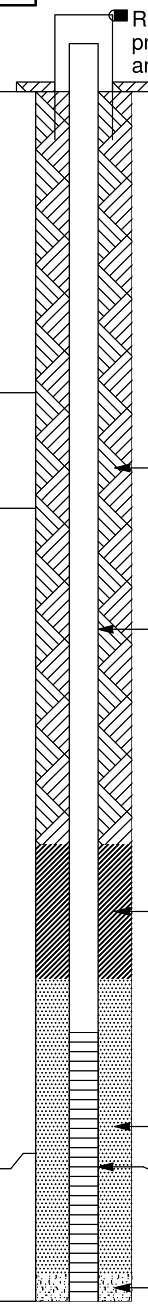
Elevation, feet	Depth, feet	Type	Blows per 1-foot Interval	Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30		1	100		
440					grades without sand, with trace organics	
			4	100	grades with sand, without organics	
			4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity	
	35				grades with increasing sand, without organics	
435			3	100		Bentonite Seal
					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	
	40		4	100		
430					grades with trace organcis, less sand, increasing silt	
			8	100		
					Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet	
			14	42		
	45					
425			7	100		Natural Collapse of Formation
						2" I.D. Schedule 40 0.010" Slotted Screen
			22	63	grades with increasing diameter gravel	
	50		13	50		
420						
					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.	
	55					
415						
	60					
410						
	65					
405						
	70					

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

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0		100		Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist
5		50		grades very hard to brittle (FILL) with glass piece grades dry, very loose with angular clasts (FILL)
10		62		Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist grades soft
15		80		Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained) grades loose, with increasing sand grades soft
20		80		grades sandy clay/clayey sand (increasing sand), very moist to wet
25		80		grades very moist grades with less sand, with red staining and organics, medium stiff
30		40		grades with increasing sand grades with less sand
35		100		grades gray grades with increasing sand (clayey sand), very moist large wood piece through core sample
40		0		Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet NO RECOVERY 40-45 feet bgs
45				

Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

(Rotosonic symbol)	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

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

MONITORING WELL MW-4

Duke Energy - 14947868 - North Bend, OH

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

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
470	0		74		Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist
					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
					Grades with less silt and clay
445	25				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

WELL CONSTRUCTION DETAILS

Riser with protective casing and locking cap

2" I.D. Schedule 40 PVC Riser

Bentonite/cement Grout

DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

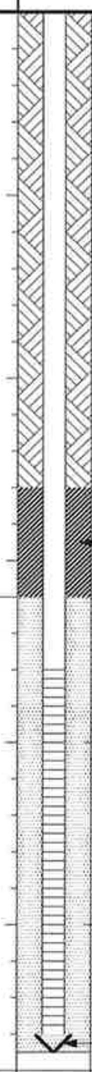
AECOM

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

Monitoring Well MW-10

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
440						
	35				Grades with some medium sand	
435						
					Grades to medium sand	
			58		Grades wet	
	40					
430						
					Grades with silt, more dense	
	45				Grades with fine and coarse sand	Bentonite Seal
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					



DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

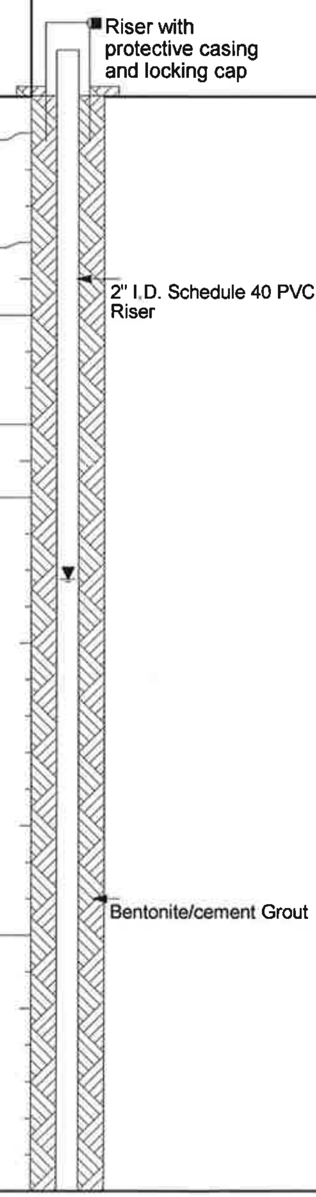
AECOM

Project: Dynegy	Monitoring Well MW-11
Project Location: Miami Fort Station	Sheet 1 of 2
Project Number: 60442412	

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				Grades with less clay
455					
	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

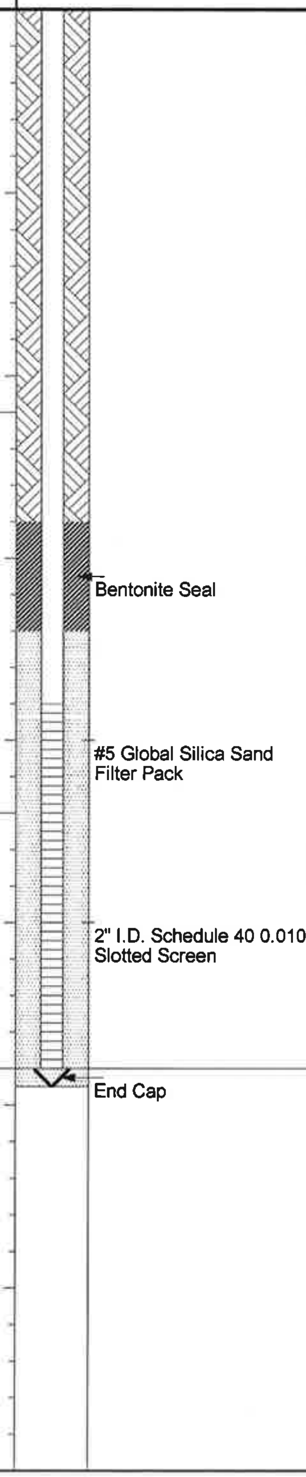


AECOM

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

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	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				
425					Grades brown and gray
					Grades fine to coarse sand with rounded fine to medium gravel
			80		
	50				Grades wet
420					Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet
	55				
415					
					Boring terminated at 59'
	60				
410					
	65				
405					
	70				

WELL CONSTRUCTION DETAILS



DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

AECOM

APPENDIX B
GEOLOGIC CROSS-SECTIONS

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TIMFS\MFS HCR\Unit 111 and 112

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

CROSS-SECTION LOCATION

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

DYNEGY

Miami Fort
Hamilton County, Ohio

FIGURE 4
SITE AND GEOLOGIC
CROSS-SECTION LOCATION MAP

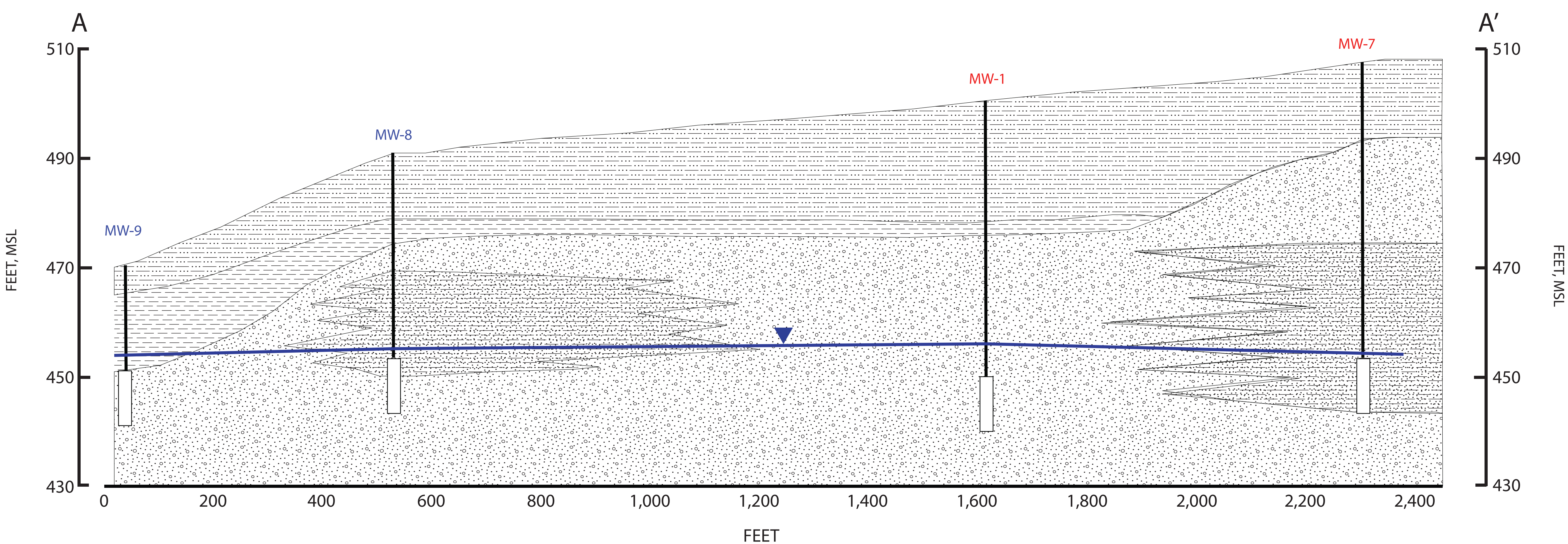
DATE	REV NO.	DWG. BY	CHKD. BY
09/28/17	0	ALW	MAW

JOB NO. 60442412

AECOM

Appendix B - Geologic Cross Sections

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS\MFS HCR\Unit 111 and 112



LEGEND

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-7 UPGRADIENT MONITORING WELL LOCATION

MW-8 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 07-10-17

MONITORING WELL RISER

MONITORING WELL SCREEN

20

200

(Vertical Exaggeration in Feet = 10x)

DYNEGY

Miami Fort
Hamilton County, Ohio

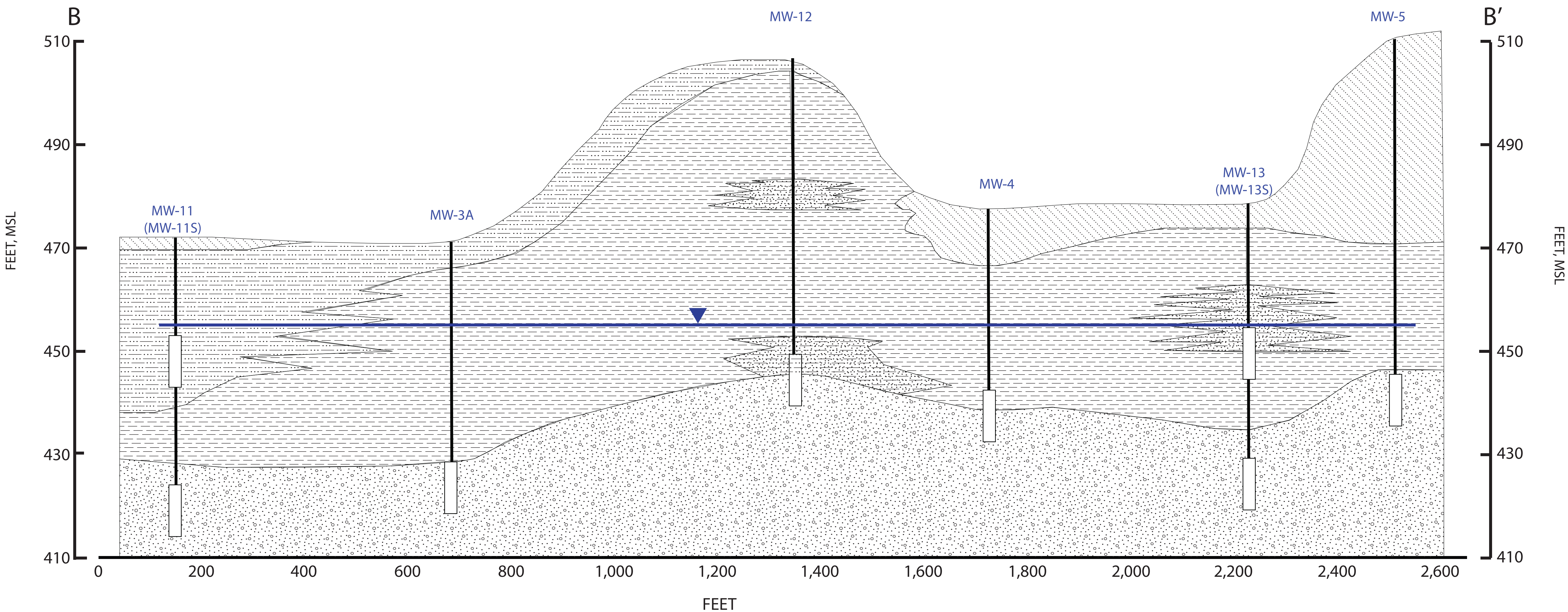
FIGURE 5
GEOLOGIC CROSS-SECTION A-A′

DATE	REV NO.	DWG. BY	CHKD. BY
08/28/17	0	JMA	MAW

JOB NO. 60442412

AECOM

Appendix B - Geologic Cross Sections



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LEGEND

GRAVEL / SAND / CLAY FILL

SAND

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-11 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 07-10-17

MONITORING WELL RISER

MONITORING WELL SCREEN

20

200

(Vertical Exaggeration in Feet = 10x)

DYNEGY

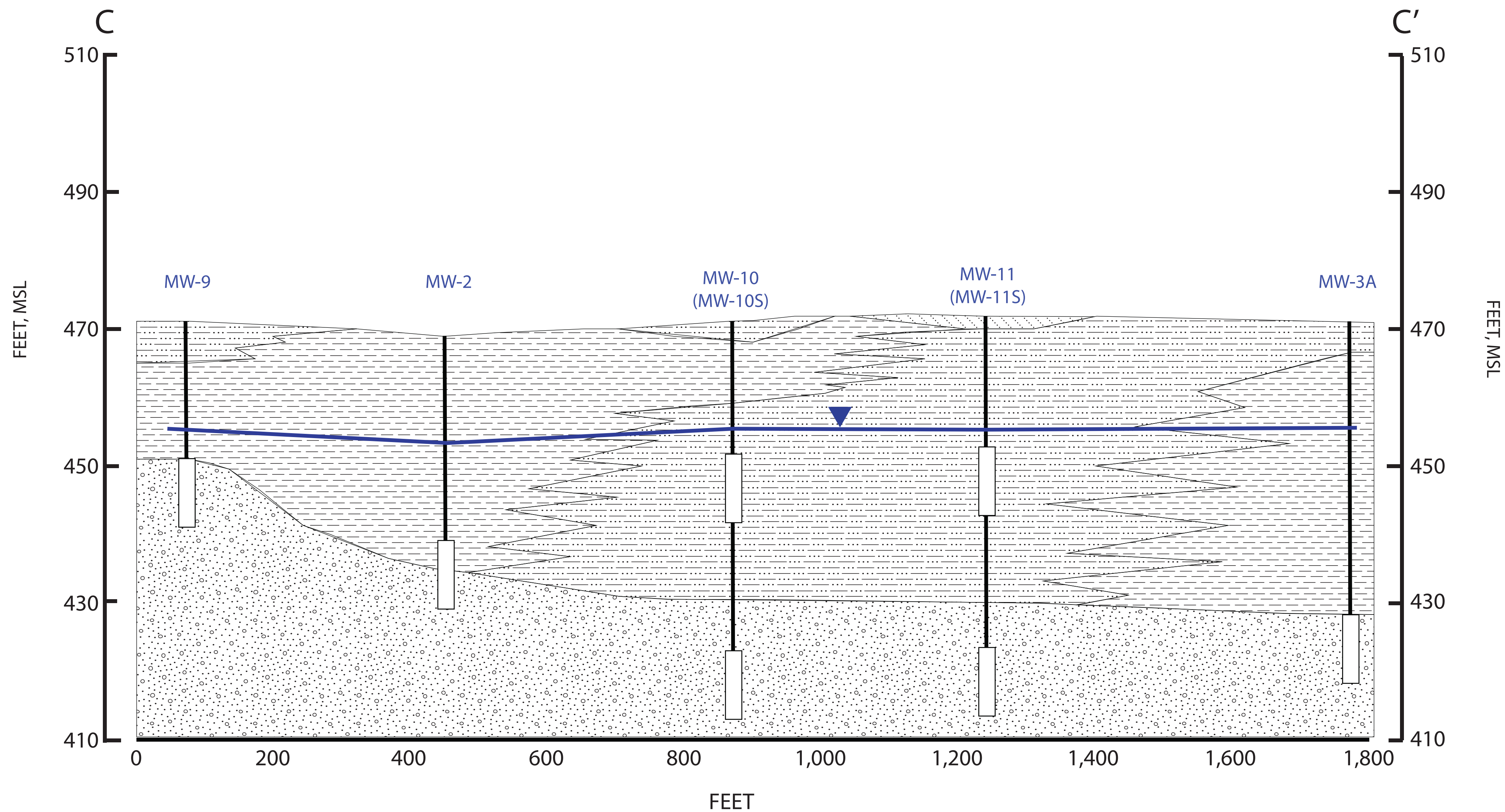
Miami Fort
Hamilton County, Ohio

FIGURE 6
GEOLOGIC CROSS-SECTION B-B′

DATE	REV NO.	DWG. BY	CHKD. BY
08/28/17	0	JMA	MAW

JOB NO. 60442412 AECOM

Appendix B - Geologic Cross Sections



LEGEND

GRAVEL FILL

SILT

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-9 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 07-14-17

MONITORING WELL RISER

MONITORING WELL SCREEN

20

200

(Vertical Exaggeration in Feet = 10x)

DYNEGY

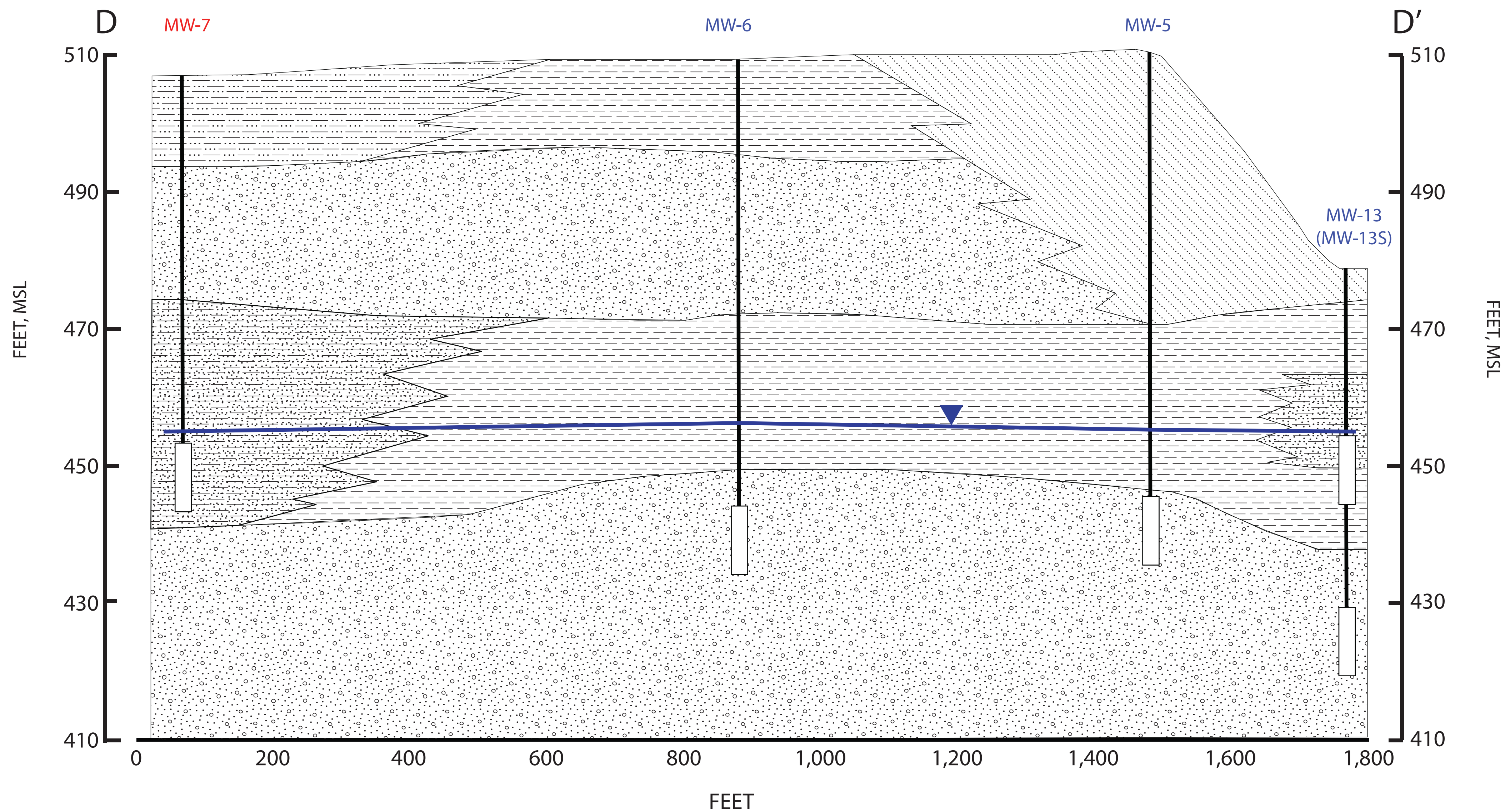
Miami Fort
Hamilton County, Ohio

FIGURE 7
GEOLOGIC CROSS-SECTION C-C′

DATE	REV NO.	DWG. BY	CHKD. BY
08/28/17	0	JMA	MAW

JOB NO. 60442412

AECOM



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LEGEND

GRAVEL FILL

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-7 UPGRADIENT MONITORING WELL LOCATION

MW-6 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 07-10-17

MONITORING WELL RISER

MONITORING WELL SCREEN

20

200

(Vertical Exaggeration in Feet = 10x)

DYNEGY

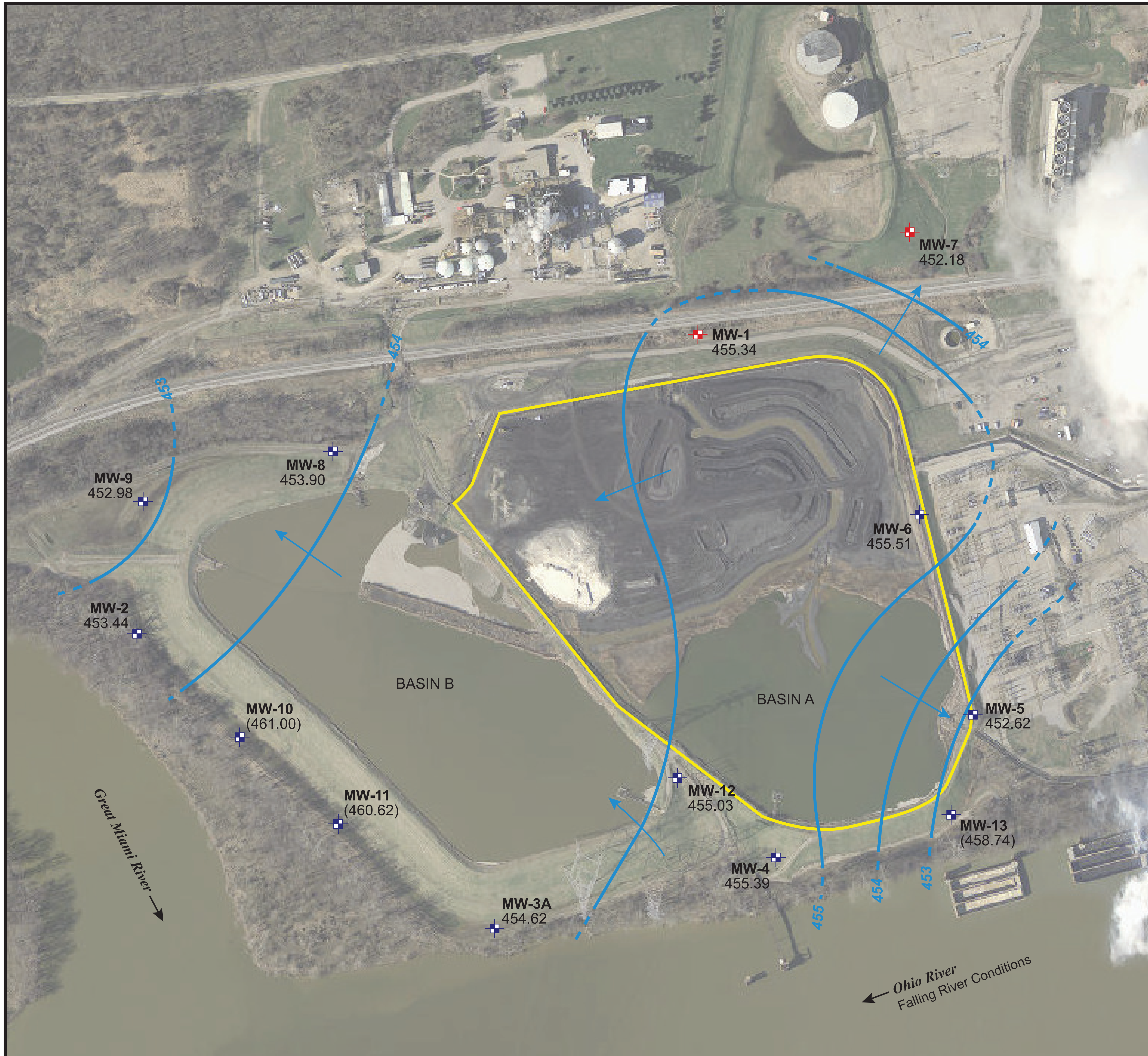
Miami Fort
Hamilton County, Ohio

FIGURE 8
GEOLOGIC CROSS-SECTION D-D′

DATE	REV NO.	DWG. BY	CHKD. BY
08/28/17	0	JMA	MAW

JOB NO. 60442412 AECOM

APPENDIX C
GROUNDWATER ELEVATION CONTOUR MAPS, 2015-2020



UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.51 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 8, 2015

(458.74) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED DECEMBER 8, 2015

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS PIEZ\basin a fig1_12-15.ai

Certified By:

SIGNATURE

DATE

DYNEGY

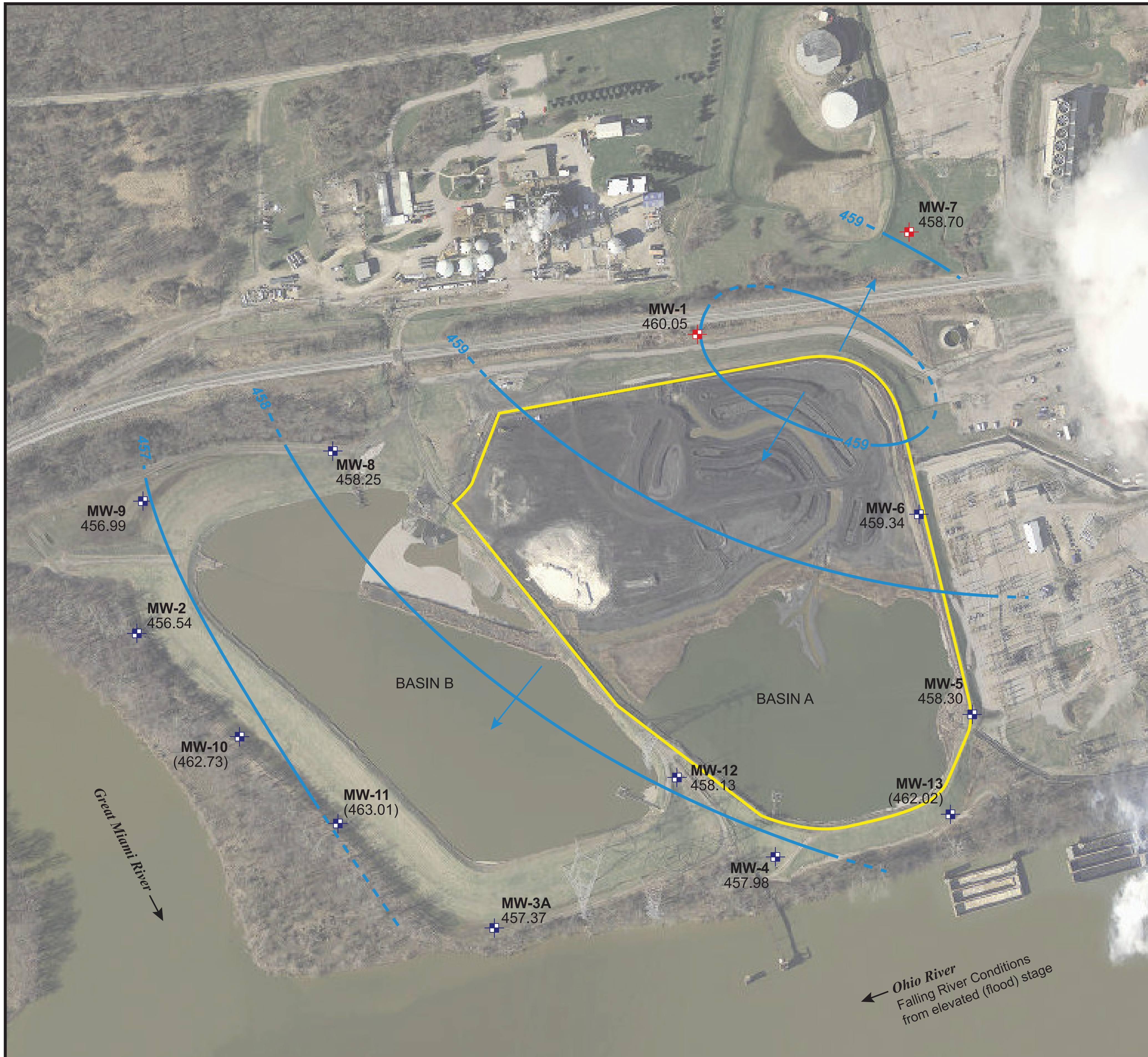
Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 8, 2015
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM



UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

458.70 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 21, 2016

(462.02) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED MARCH 21, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 21, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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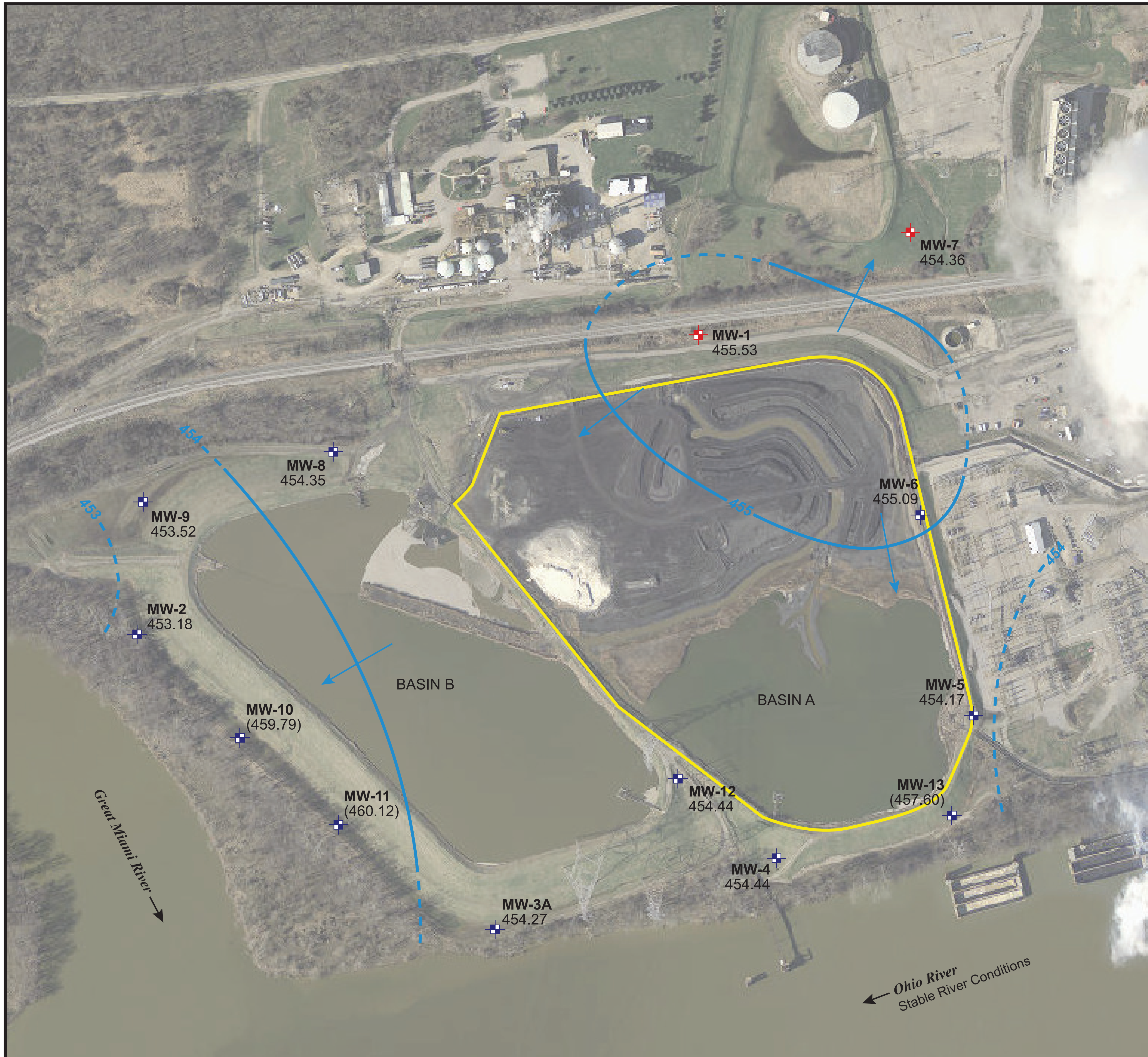

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

454.36 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 20, 2016

(457.60) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED JUNE 20, 2016

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 20, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\MFS\MFS PIEZ\basin a fig1_6-16.ai

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

453.46 GROUNDWATER ELEVATION (FEET, MSL), MEASURED SEPTEMBER 12, 2016

(459.64) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED SEPTEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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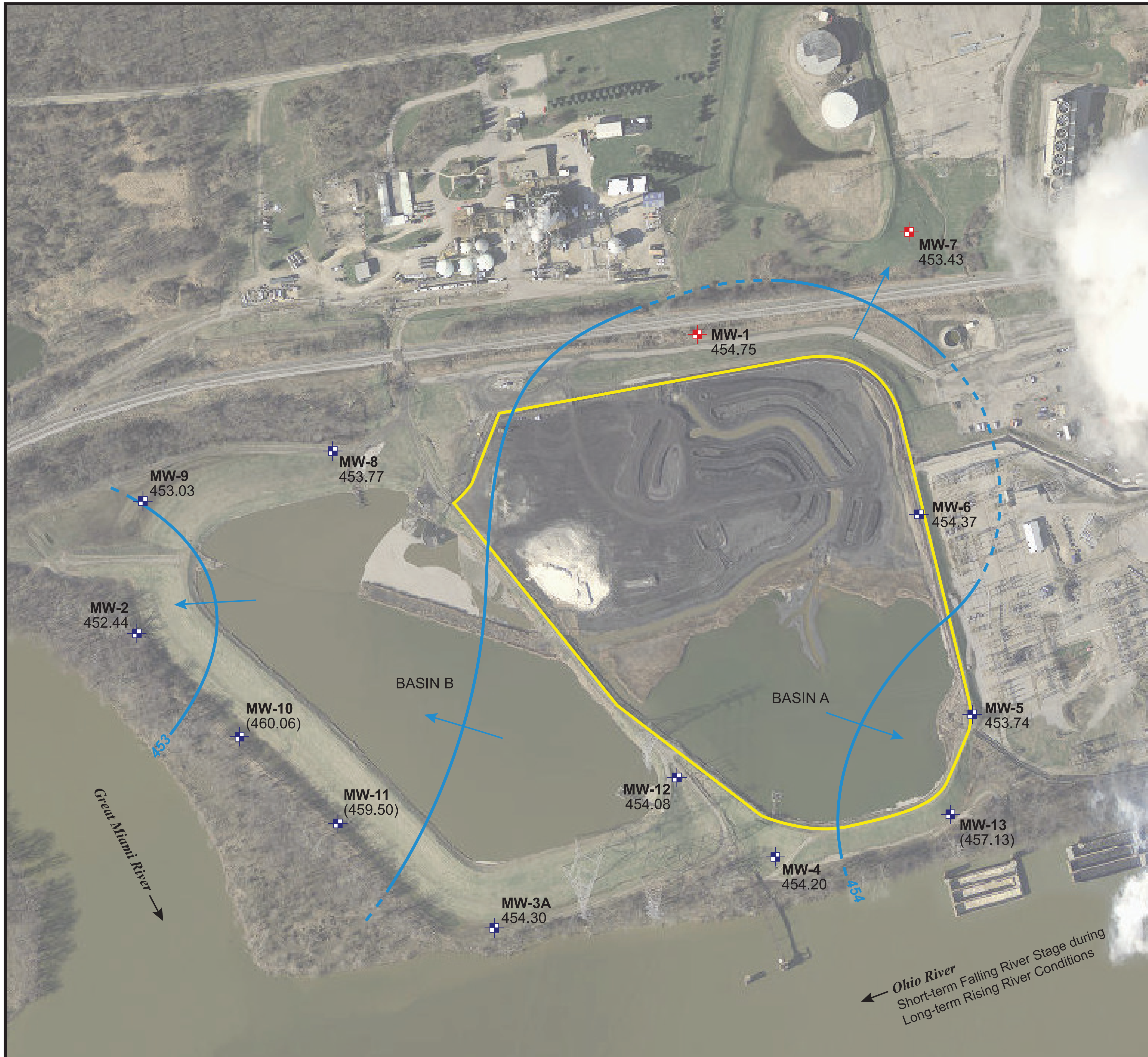

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

453.43 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

(459.50) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED DECEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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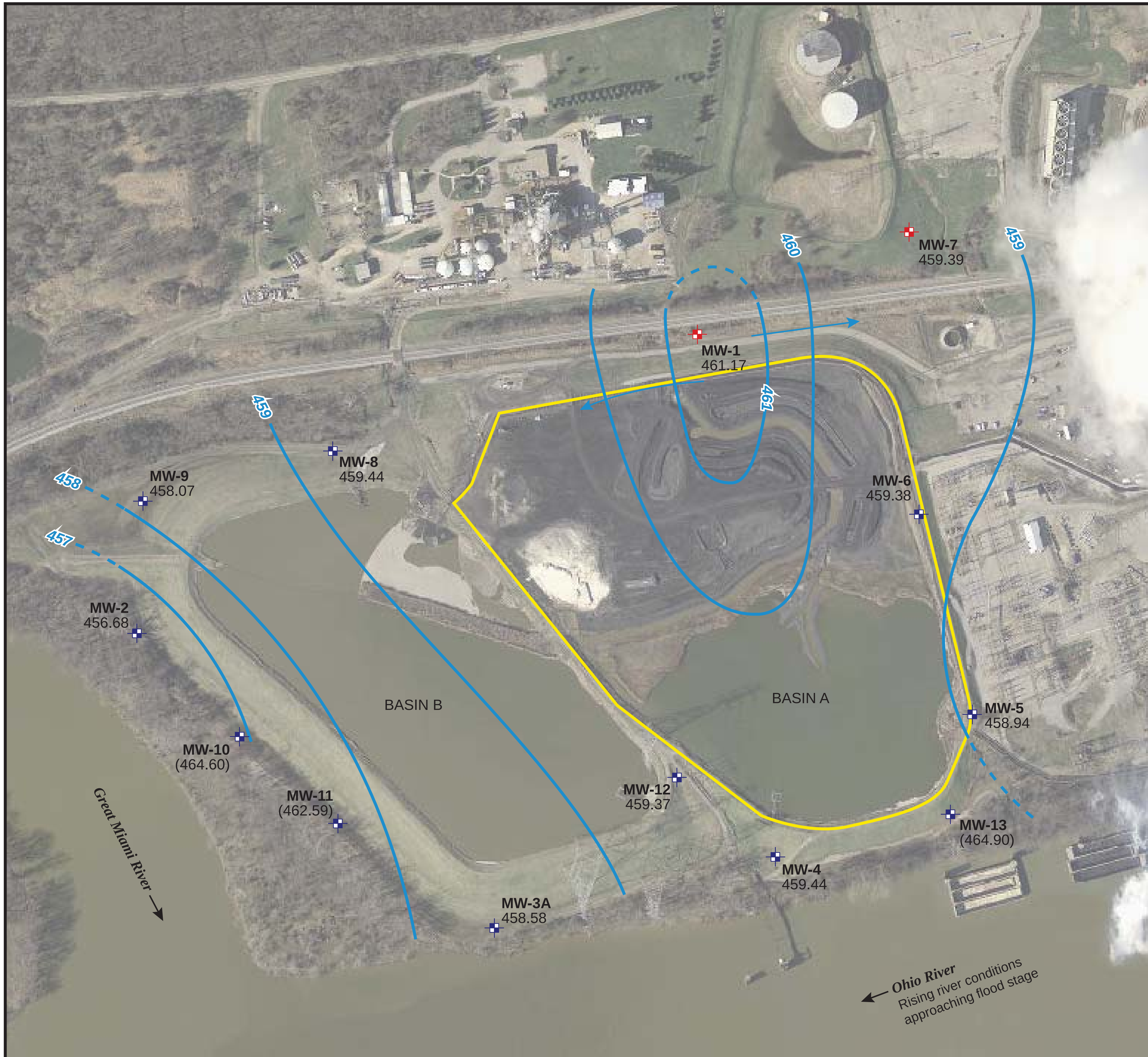

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

459.38 GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 7, 2017

(464.90) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED MARCH 7, 2017

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 7, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/09/17	0	ALW	MAW

JOB NO. 60442412 AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS\MFS PIEZ\basin a fig1_3-17.ai

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.94 GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 5, 2017

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 5, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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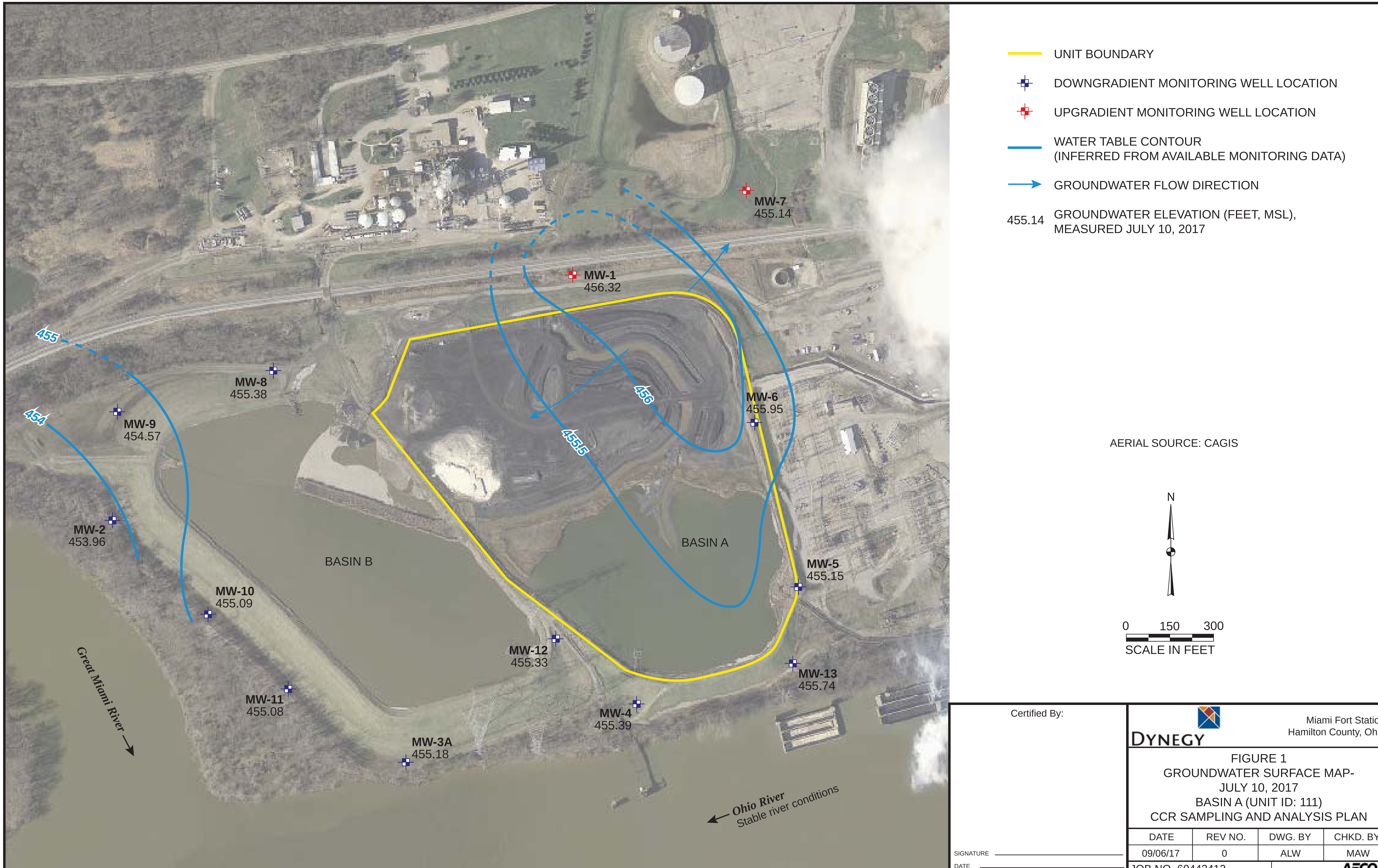


J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS\MFS PIEZ\basin a fig1_7-17.ai

Certified By:

SIGNATURE

DATE

DYNEGY

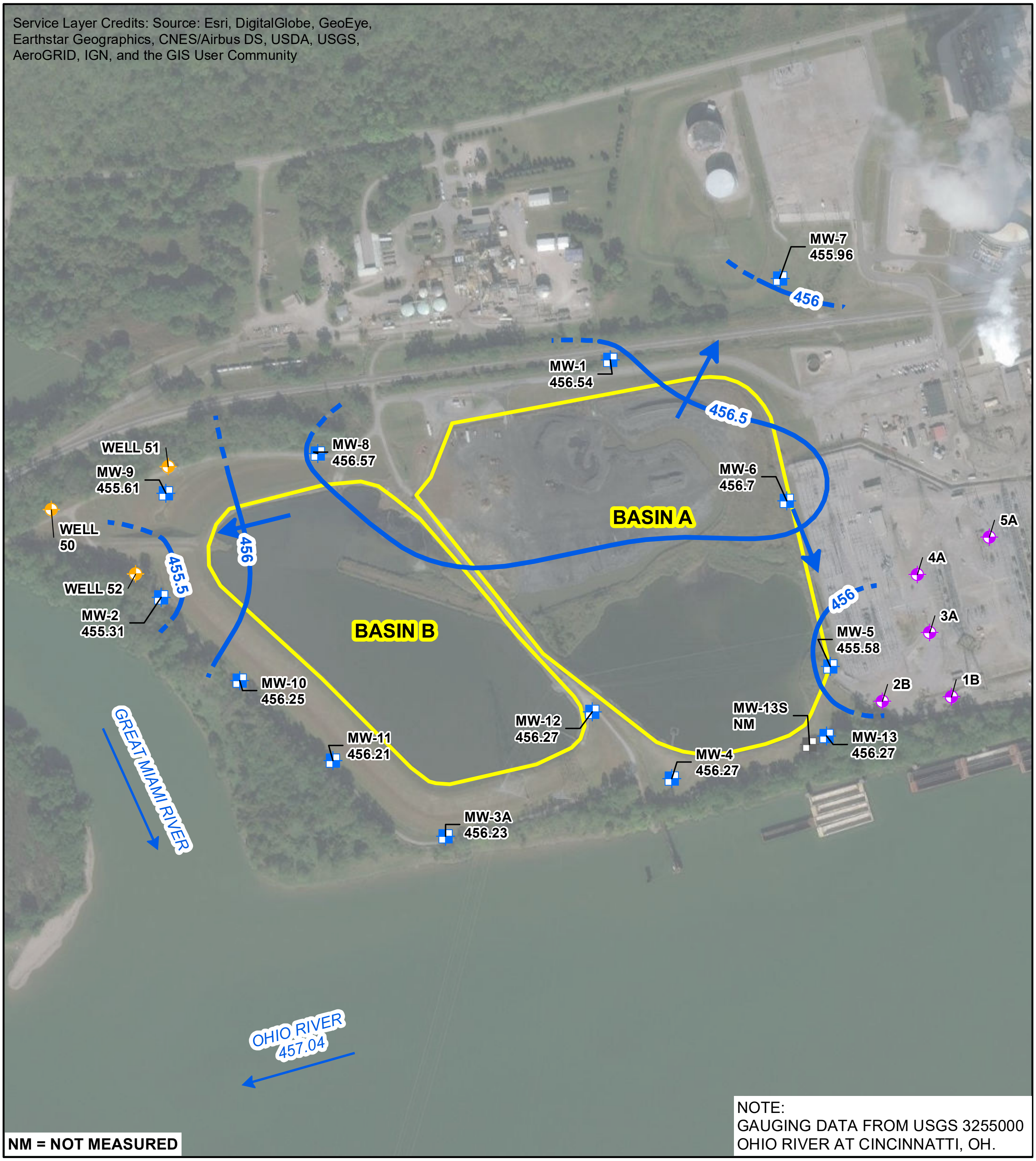
Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 10, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

AECOM



CCR MONITORING WELL LOCATION

NON-CCR UNIT MONITORING WELL LOCATION

MIAMI FORT PRODUCTION WELLS

VEOLIA PRODUCTION WELLS

GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL, NAVD 88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14-15, 2017

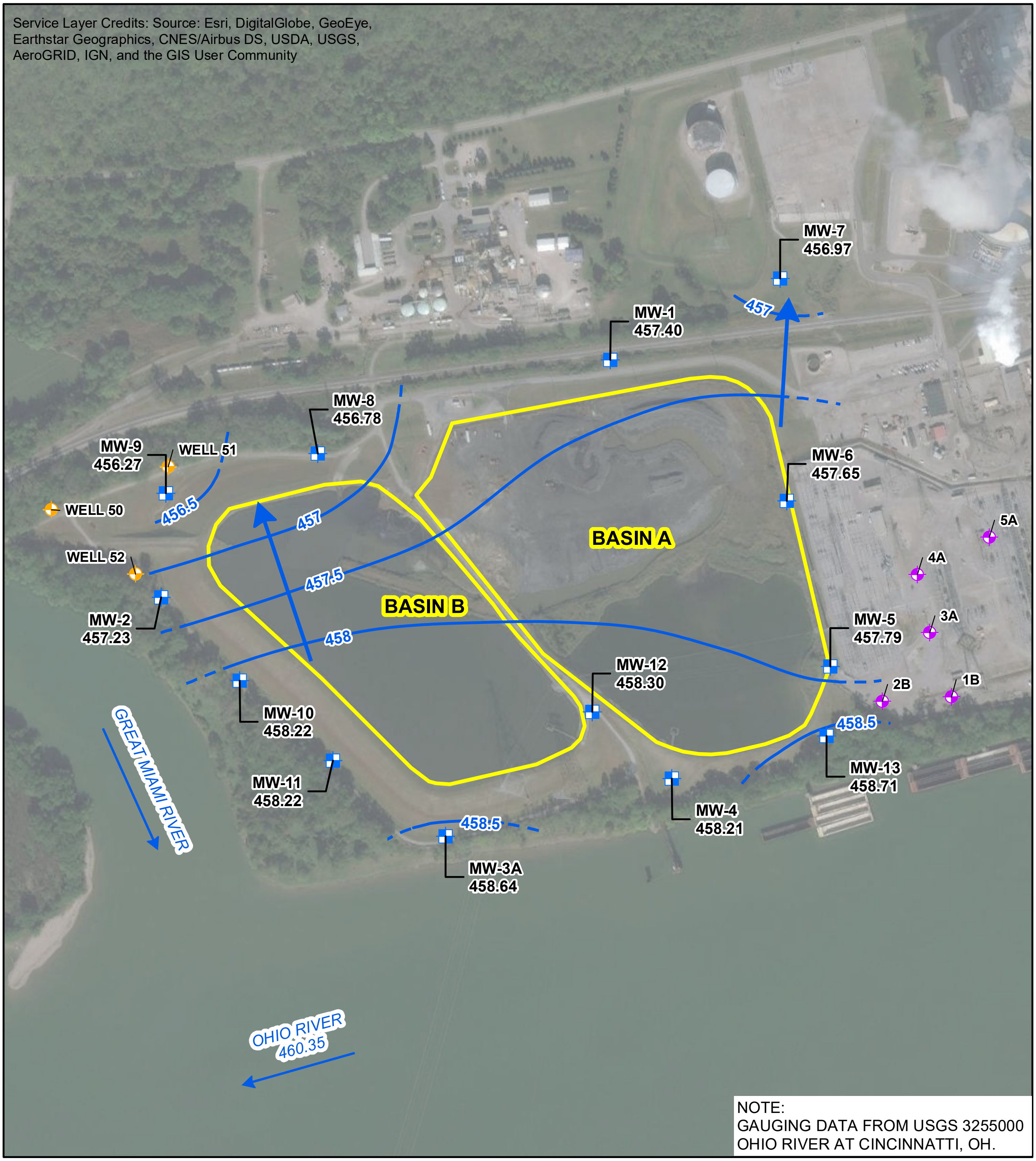
CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_09\R9_MiamiFt_BasinAB_GW_Contours.mxd

O'BRIEN & GERE ENGINEERS, INC.



CCR MONITORING WELL LOCATION

MIAMI FORT PRODUCTION WELLS

VEOLIA PRODUCTION WELLS

GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL. NAVD 88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

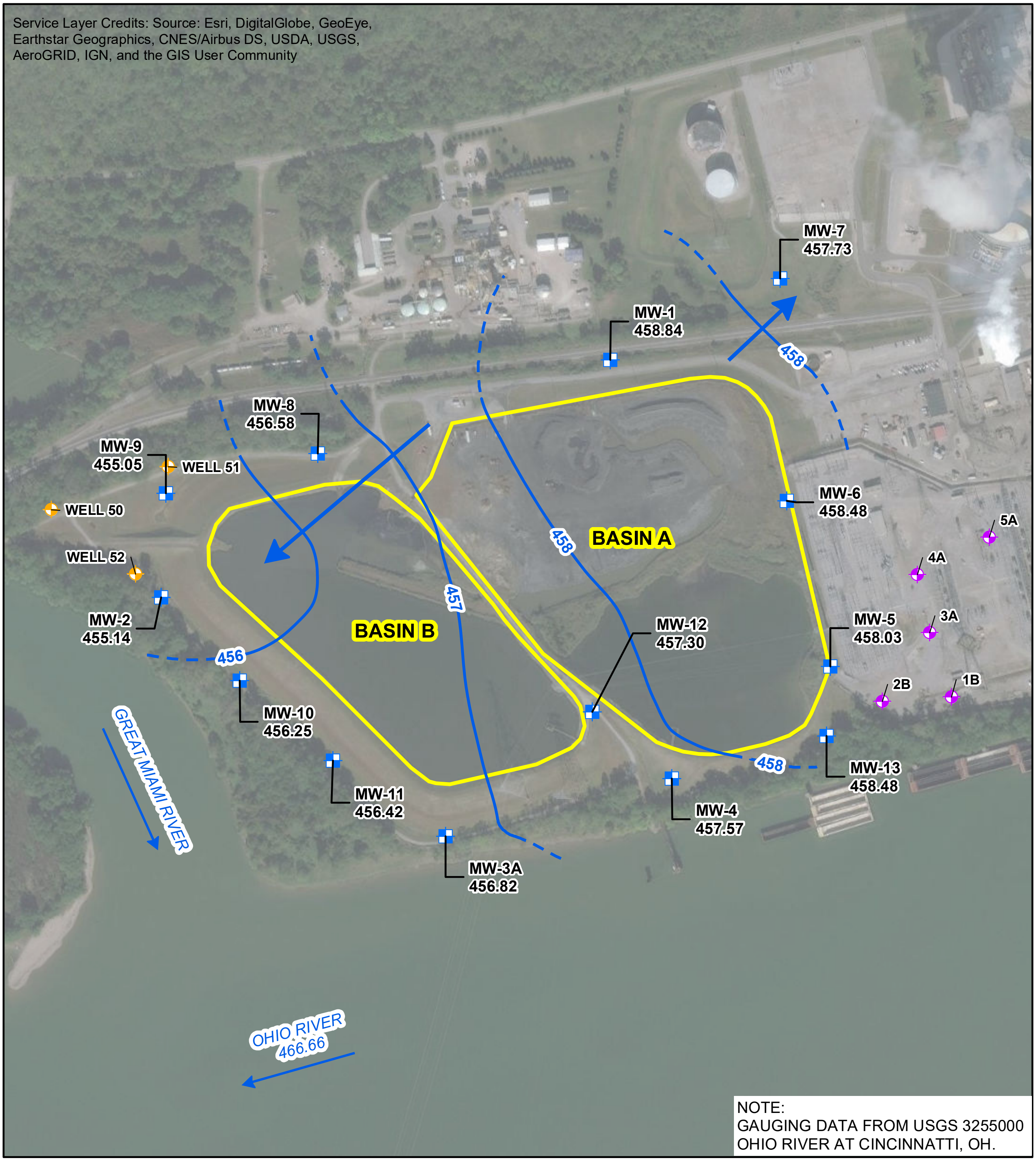
CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

N

0 125 250 500
Feet



CCR MONITORING WELL LOCATION

MIAMI FORT PRODUCTION WELLS

VEOLIA PRODUCTION

GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

N

0 125 250 500
Feet

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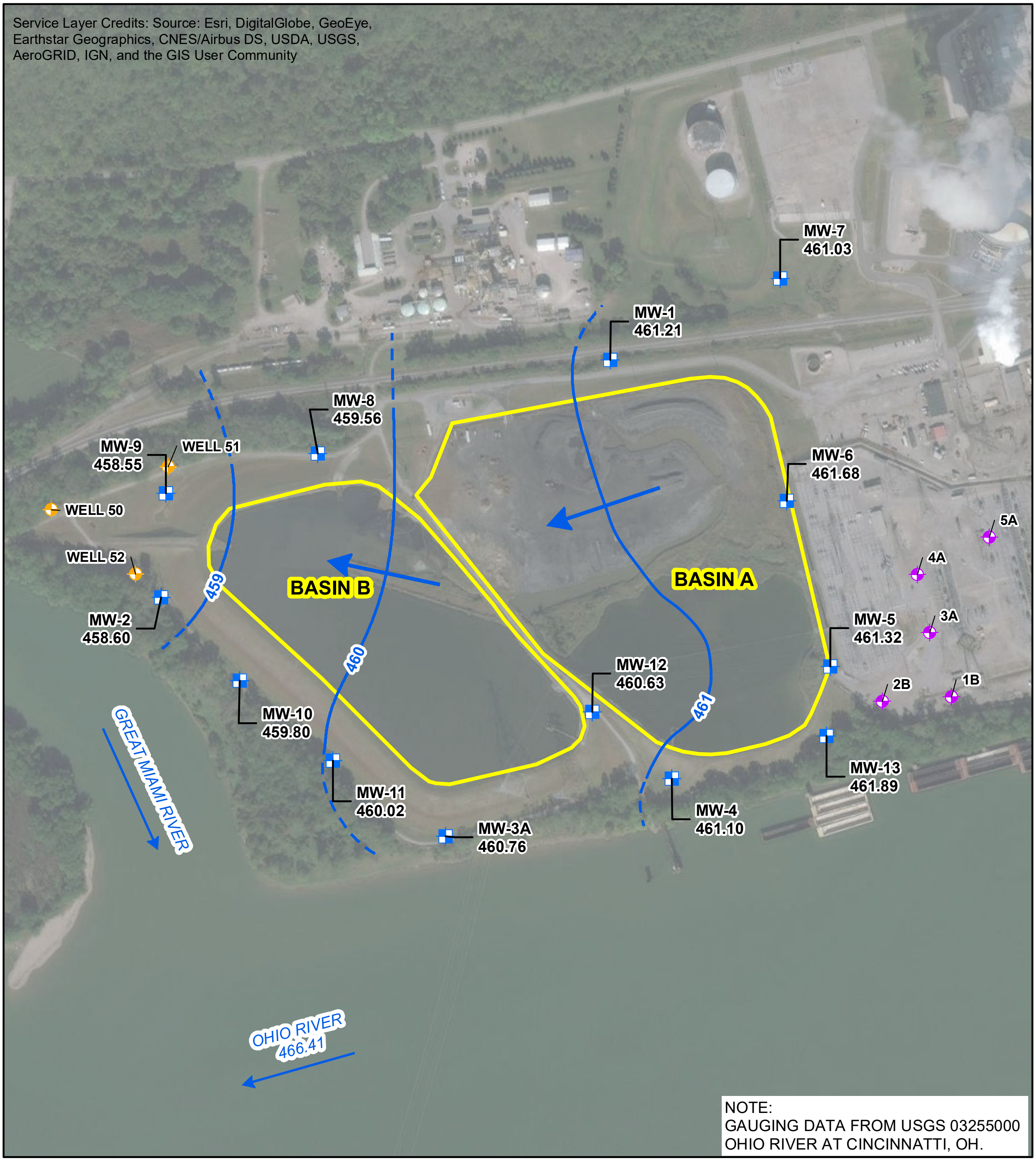

LEGEND

- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 11, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

N

0 125 250 500
Feet

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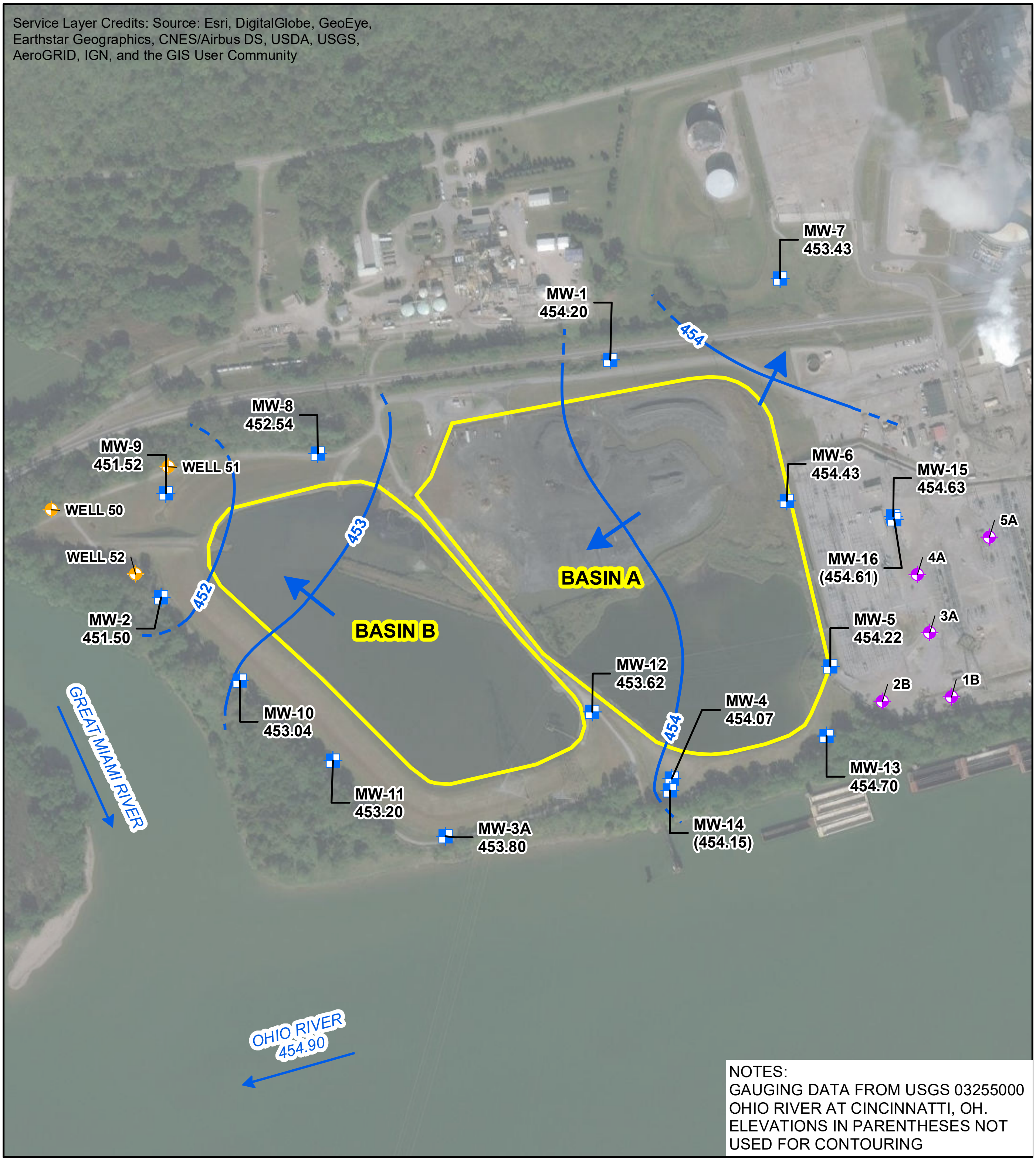

LEGEND

- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 9, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2019_3Q\R2019_3Q_MiamiFort_BasinAB_GW_Contours.mxd

O'BRIEN & GERE ENGINEERS, INC.

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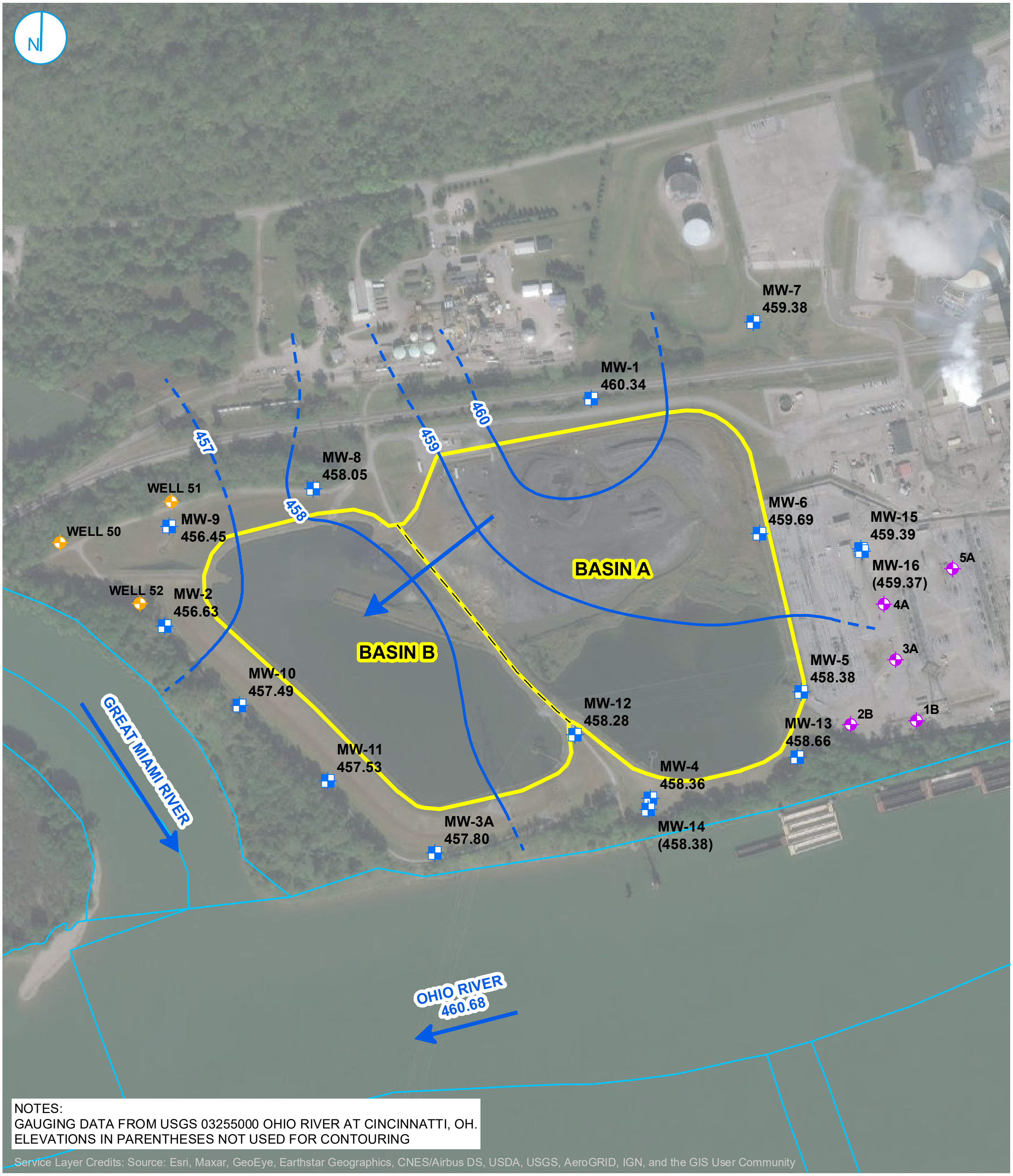


NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATI, OH.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING

PROJECT: 72799 | DATED: 8/31/2020 | DESIGNER: STOLZSD

- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- CCR MONITORED MULTI-UNIT
- CCR UNIT
- RIVER FLOW DIRECTION
- SURFACE WATER FEATURE
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

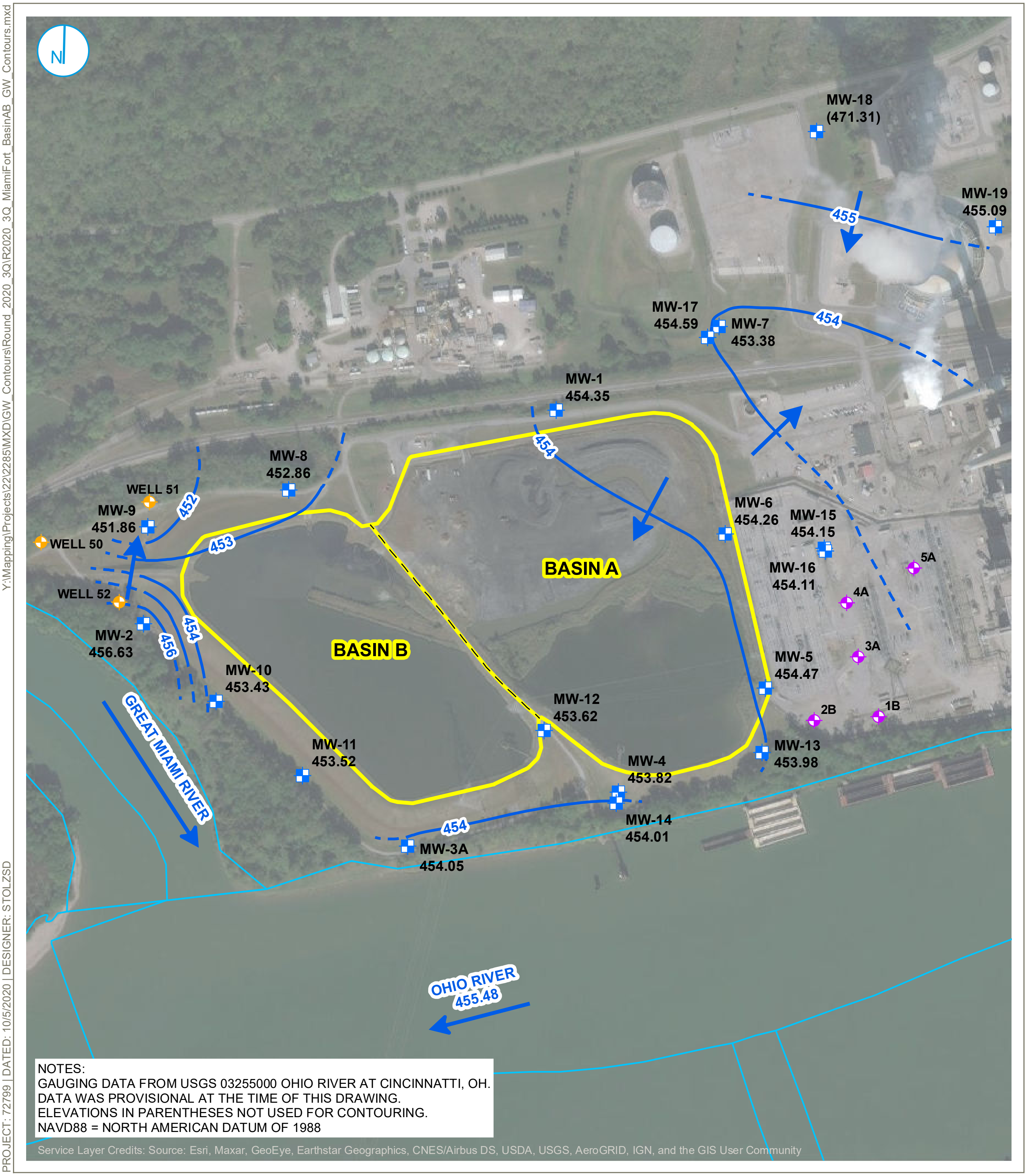
0 250 500
Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL



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PROJECT: 72799 | DATED: 10/5/2020 | DESIGNER: STOLZSD

CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
CCR UNIT
RIVER FLOW DIRECTION
SURFACE WATER FEATURE

GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 14, 2020

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

APPENDIX D
VERTICAL AND HORIZONTAL HYDRAULIC GRADIENTS

TABLE 1.

GROUNDWATER HORIZONTAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC MONITORING PLAN

VISTRA CCR RULE GROUNDWATER MONITORING

MIAMI FORT POND SYSTEM (MULTI-UNIT ID: 115)

NORTH BEND, OHIO

September 18, 2018		
Area	**Approximate Flow Direction**	**Horizontal Hydraulic Gradient (ft/ft)**
Miami Fort - Basin A	West	0.0026
Miami Fort - Basin B	West/Southwest	0.0024
March 11, 2019		
Area	**Approximate Flow Direction**	**Horizontal Hydraulic Gradient (ft/ft)**
Miami Fort - Basin A	West	0.0011
Miami Fort - Basin B	West/Northwest	0.0018
September 9, 2019		
Area	**Approximate Flow Direction**	**Horizontal Hydraulic Gradient (ft/ft)**
Miami Fort - Basin A	West/Southwest	0.0010
Miami Fort - Basin B	Northwest	0.0028

[O: KLT 5/6/20, C:JJW 5/7/20]

Notes:

ft/ft = feet per foot

1. Horizontal hydraulic gradient calculated using groundwater elevation contour maps generated for each sampling event.

TABLE 2.

GROUNDWATER VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC MONITORING PLAN

VISTRA CCR RULE GROUNDWATER MONITORING

MIAMI FORT POND SYSTEM (MULTI-UNIT ID: 115)

NORTH BEND, OHIO

Relative Position	Well ID	Screened Interval Lithology	Hydrogeologic Unit	Screen Midpoint (ft NAVD88)	Groundwater Elevation (ft NAVD88)		
					9/18/2018	3/11/2019	9/9/2019
Shallow	MW-4	Sand and Gravel, Sandy Clay	Uppermost Aquifer	436.49	457.57	461.10	454.07
Deep	MW-14	Sand with Gravel	Uppermost Aquifer	396.80	Not Installed [1]	Not Installed [1]	454.15
				Vertical Groundwater Gradient (ft/ft)	--	--	-0.0020
				Groundwater Flow Direction	--	--	Upward
Shallow	MW-15	Sand with Gravel	Uppermost Aquifer	424.30	Not Installed [1]	Not Installed [1]	454.63
Deep	MW-16	Sand with Gravel	Uppermost Aquifer	389.10	Not Installed [1]	Not Installed [1]	454.61
				Vertical Groundwater Gradient (ft/ft)	--	--	0.0006
				Groundwater Flow Direction	--	--	Downward

[O: KLT 5/6/20, C: 5/7/20]

Notes:

-- = No vertical gradient calculated

ft = feet

ft/ft = feet per foot

NAVD88 = North American Vertical Datum of 1988

1. Wells MW-14, MW-15, and MW-16 were installed in August 2019.

APPENDIX E
TECHNICAL MEMORANDUM – MIAMI FORT POND SYSTEM MONITORED NATURAL ATTENUATION (MNA) EVALUATION

Geosyntec consultants

941 Chatham Lane, Suite 103
Columbus, Ohio 43221
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

TECHNICAL MEMORANDUM

Date: November 30, 2020

To: Brian Voelker - Vistra

Copies to: Stu Cravens and Phil Morris - Vistra

From: Allison Kreinberg, Bob Glazier, Nathan Higgerson - Geosyntec Consultants

Subject: Miami Fort Pond System Monitored Natural Attenuation (MNA) Evaluation Update

Geosyntec is evaluating the feasibility of monitored natural attenuation (MNA), in combination with coal combustion residual (CCR) unit source control measures, as a groundwater remedy for statistically significant levels (SSLs) of cobalt above the groundwater protection standard (GWPS) at the Miami Fort Pond System. As discussed in Section 2.3 of the Corrective Measures Assessment (CMA), an SSL of cobalt was identified at downgradient monitoring well MW-4. The tiered evaluation is being completed in accordance with USEPA guidance[1,2] to assess whether MNA, in combination with source control, is likely to be the viable remedy based on current and potential post-closure site conditions. The findings of the study completed to-date and the additional data collection required to develop multiple lines of evidence to support the evaluation of MNA in accordance with USEPA guidance are summarized below.

MNA EVALUATION

The selection of MNA, with source control, as a remedy for groundwater constituents will be based on a multiple lines of evidence approach, as outlined in the USEPA guidance. The multiple lines of evidence approach for the Miami Fort Pond System will be based upon (i) source control to mitigate further loading of cobalt mass to groundwater; (ii) delineation of the nature and extent of cobalt impacts in groundwater; and (iii); a successful evaluation of favorable site conditions that result in the attenuation of cobalt in groundwater leading to stable or declining trends of cobalt in groundwater following source control implementation.

---

[1] USEPA. 2007. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume I – Technical Basis for Assessment. EPA/600/R-07/139. October.
[2] USEPA. 2015. Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites. Directive No. 9283.1-36. August.

KEY CONDITIONS

The status of key conditions which will support the selection of MNA, in combination with source control, as a groundwater remedy is summarized below. These conditions were assessed as Tier 1 of the evaluation.

Site Geology and Hydrogeology

As noted in Section 2.2 of the CMA, the uppermost aquifer at the site is a glacial outwash consisting of sands and gravels overlain by alluvial silts and clays. These alluvial sediments are likely to provide sufficient attenuation capacity. Thus, the geologic and hydrogeologic conditions at the site are favorable for reliable performance monitoring.

Cobalt Delineation

As discussed in Section 2.3 of the CMA, the cobalt impacts at MW-4 are vertically delineated via groundwater monitoring well MW-14. There is insufficient space downgradient of MW-4 to install another delineation well before reaching the Ohio River. In lieu of using downgradient groundwater monitoring wells for delineation, the anticipated contribution of cobalt from groundwater to the Ohio River was calculated.

The current average concentration of cobalt at MW-4 is 12.3 micrograms per liter (µg/L), with a maximum reported value of 22.4 µg/L. Even without surface water dilution, the concentrations observed at MW-4 are below the Ohio Environmental Protection Agency (OEPA) aquatic life risk screening level established in OAC 3745-1[3]. OEPA does not currently have a human exposure surface water screening level for cobalt. Calculations completed by Ramboll (provided as Appendix A and included as an attachment to the Risk Mitigation Plan submitted with the Part A extension application) show that, with mixing during low flow conditions of the Ohio River, contributions of cobalt to the Ohio River will result in a negligible increase of 0.00076 µg/L in surface water concentrations in the Ohio River. USEPA guidance states that MNA should not be used at sites where concentrations result in "impacts to environmental resources that would be unacceptable to the overseeing regulatory authority". However, the initial evaluation suggests that the contribution of cobalt to the Ohio River do not represent a potential risk for human or ecological receptors. Thus, delineation is sufficient to proceed with an MNA evaluation. An additional evaluation of the surface water-groundwater interface will be completed in 2021 after protocols and methodologies specific to the site have been established.

Source Control

Source control measures will be implemented in the future. Per Section 5.1 of the CMA, closure in place, closure by removal (off-site landfill), and in-situ solidification/stabilization were

[3] Ohio Administrative Code (OAC). 2018. 3745-1. State of Ohio Water Quality Standards. Rev. May 2018.

retained as potential source control measures. It is assumed that MNA will be paired with one of the retained potential source control measures, which will result in a decrease in the input of cobalt to the groundwater system and a subsequent reduction in concentration at MW-4.

Cobalt Attenuation

According to USEPA guidance, the groundwater plume should be stable or decreasing. While there is variability in cobalt concentrations at MW-4 (Figure 1), Mann-Kendall analysis shows that there is not a significant increasing trend (Appendix B).

Cobalt readily undergoes attenuation in soils due to favorable adsorption onto clay minerals, iron and manganese oxides, and organic matter[4]. Amorphous iron oxides were found to readily remove cobalt from the aqueous phase, with minimal subsequent desorption observed[5]. Cobalt adsorption onto soils increases with increasing pH with a marked increase above pH 7. Oxidation-reduction (redox) conditions in groundwater do not appear to directly affect cobalt sorption behavior below pH 9.5; however, changes in redox conditions can affect the stability of iron oxides to which cobalt is attenuated.

A review of geochemical conditions at the Pond System suggests that cobalt is likely attenuated via interactions with iron-containing solid phases. Groundwater samples collected during the April 2020 event were analyzed for total and dissolved iron. For locations where cobalt was detected, there appears to be a correlation between cobalt and total iron, with higher iron associated with higher cobalt concentrations (Figure 2). A reduction potential (Eh)-pH diagram was developed to model iron speciation in groundwater at MW-4 (Figure 3). The ORP values measured during groundwater sampling at MW-4 were converted to Eh[6] (shown in volts [V]) and plotted against the measured pH values to show the predominant iron species in groundwater during each event. Groundwater samples with higher cobalt concentrations (shown with orange symbology on Figure 3) are typically associated with lower pH values and somewhat with lower Eh values. Under these conditions, a greater percentage of iron is present in its more mobile Fe^{2+} form and could result in the dissolution of iron oxides. These results suggest that cobalt attenuation at the site is influenced by the stability of iron-containing solid phases.

These findings adequately meet the requirements of Tier 1 of the MNA evaluation in accordance with USEPA guidance. However, additional data are required to sufficiently develop all lines of evidence and complete a full tiered evaluation.

---

[4] Borggaard, O. K. 1987. Influence of iron oxides on cobalt adsorption by soils. *J. Soil Sci.*, **38**, 229-238.
[5] McLaren, R. G., Lawson, D.M., Swift, R. S. 1986. Sorption and Desorption of Cobalt by Soils and Soil Components. *J. Soil Sci.*, **37**, 413-426.
[6] Field ORP measurements are typically recorded using an Ag/AgCl electrode (or similar), whereas Eh is defined as the voltage reading compared to the Standard Hydrogen Electrode (SHE). A conversion between the Ag/AgCl electrode and the SHE can be made by adding an offset voltage to the measured ORP value. Thus, Eh = ORP + 0.2V.

ADDITIONAL EVALUATION

As part of the tiered evaluation, additional efforts are planned for completion in 2021 to support the existing findings that MNA, in combination with source control, may be an appropriate groundwater remedy at the Miami Fort Pond System. For each tier of the remaining evaluation, the following scope of work is planned to collect sufficient additional information:

- Tier 2 (Demonstrate the attenuation mechanism and rate): Solid phase material will be collected adjacent to MW-4 to better characterize the reactive phases which are present and can attenuate cobalt. Potential analytical techniques to characterize the reactive phase include X-ray diffraction (XRD), sequential phase extraction (SEP), analysis of total metals, and analysis of total organic carbon (TOC). Rates are described in Tier 3 below.
- Tier 3 (Demonstrate that the aquifer capacity is sufficient for attenuation and the mechanism is sufficiently irreversible): Bench-scale adsorption isotherm and/or column tests will be run to evaluate the attenuation capacity and rate of the aquifer system. Groundwater with elevated cobalt concentrations should be exposed to unimpacted aquifer solids collected from an upgradient location in these tests. Desorption isotherm tests and/or column flushing tests should be run to evaluate the stability of the attenuation mechanism. For these tests, unimpacted site groundwater should be mixed with aquifer solids that have attenuated cobalt. Additional design considerations will be determined based on the results of the Tier 2 analyses.
- Tier 4 (Long-Term Monitoring): Based on the results of the Tier 2 and Tier 3 tests, a performance monitoring plan will be developed to evaluate the efficacy of MNA at the site. The performance monitoring plan will also include potential supplemental remedies, if needed. These other potential remedies will be evaluated in parallel with the tiered evaluation in accordance with 40 C.F.R. § 257.97 in the performance monitoring plan.

EVALUATION CRITERIA

MNA was evaluated to assess whether it will likely meet the criteria outlined in 40 C.F.R. § 257.96(c) as a potential corrective action. This evaluation is summarized below and in Table 3 of the CMA.

MNA Performance

Based on the initial evaluation described herein and cobalt's geochemical behavior, MNA performance at the Pond System is likely to achieve the performance criteria outlined in 40 C.F.R. § 257.97. Completion of the tiered evaluation and assessment of cobalt concentrations under closure conditions, and stability of the attenuated cobalt, are required to fully assess MNA performance relative to the performance criteria.

Reliability of MNA

The reliability of MNA is dependent on site-specific conditions. As discussed above, it appears that cobalt attenuation at the site is controlled by iron-containing solid phases. This iron-cobalt relationship is well documented in academic literature cited above. Additional evaluation is required to understand the site-specific attenuation mechanism, capacity, and rate, all of which will provide more information on the reliability of MNA.

Ease of implementation of MNA

MNA is relatively easy to implement compared to other potential remedies which require construction, earthwork, or engineering design. Additional efforts required to implement MNA include completion of the tiered investigation and implementation of the performance monitoring plan. These efforts do not require specialized equipment or contractors.

Potential impacts (including safety impacts, cross-media impacts, and control of exposure to any residual contamination)

Potential impacts are not anticipated with MNA. MNA relies on processes that are naturally occurring in the aquifer; therefore, cross-media impacts are unlikely. Large scale handling of impacted materials (such as during groundwater extraction) is not required, reducing the potential for exposure to residuals during implementation. Conservative calculations indicate that there are currently no exceedances of the relevant regulatory criteria in the Ohio River; this will be further assessed in the groundwater-surface water interface evaluation.

Time required to begin and complete MNA

USEPA guidance states that "natural attenuation should achieve site-specific objections within a time frame that is reasonable compared to that offered by more active methods"[7]. When considering a reasonable time frame, USEPA recommends consideration of factors such as contaminant properties, exposure risk, classification of the protected resource, and potential for plume stability. As discussed above, delineation of impacts is complete and there is no current calculated exceedance of human or aquatic risk-based criteria for potential receptors in the Ohio River. Cobalt, which is known to attenuate via interactions with aquifer solids, appears to be present in stable concentrations at MW-4.

Additional efforts are planned to complete the tiered MNA evaluation and assess the attenuation capacity of the aquifer to predict future stability. The collection of this additional information does not require specialized contractors and can be completed within one year. The time required to attain the groundwater protection standard at MW-4 can be estimated once additional information is developed regarding the attenuation rate and likely decline in concentrations after

[7] USEPA. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive 9200.4-17P. April.

implementation of source control. Because the time to completion will depend on the source decay rate, it is anticipated that MNA would have a similar cleanup time as other potential corrective actions, such as groundwater extraction. It is anticipated that the timeframe is reasonable and within the guidance provided by USEPA.

Institutional requirements, such as state or local permit requirements, that may substantially affect implementation of MNA

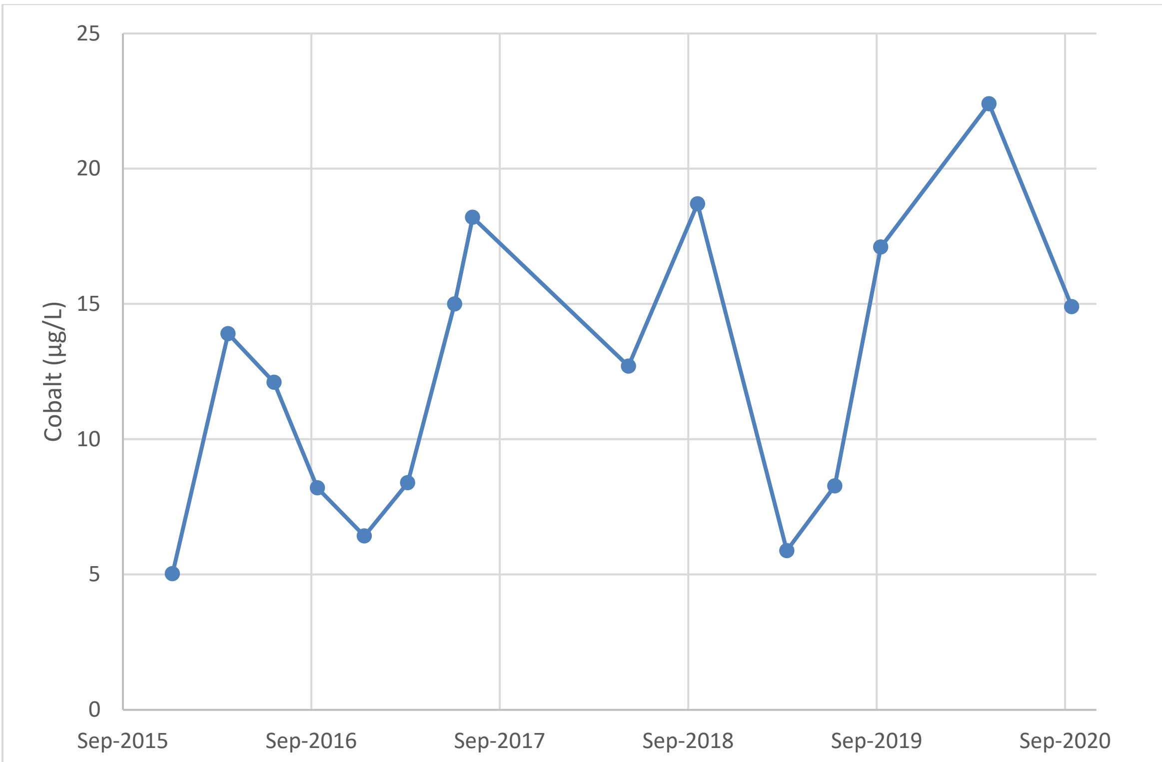
MNA requires approval by OEPA to be implemented. Existing OEPA guidance relies on the same principals as the USEPA guidance, which are being followed in this evaluation[8]. OEPA notes that "A monitored natural attenuation plan requires a study of the processes (based on extensive monitoring) to establish that natural attenuation is already occurring and the rate of attenuation of contaminants of concern"[9]. The tiered investigation described herein is designed to address these criteria; thus, state permitting is not expected to substantially affect MNA implementation.

CONCLUSIONS

Based on the analysis completed to-date, MNA combined with source control appears to be a promising groundwater remedy at the Miami Fort Pond System when reviewed against the requirements in 40 C.F.R. § 257.96(c). Further investigation will be completed in 2021 to collect sufficient evidence to support the tiered MNA evaluation, which will include an analysis of the attenuation mechanism, rate, and aquifer capacity to establish multiple lines of evidence in accordance with USEPA guidance.

[8] OEPA. 2001. Remediation Using Monitored Natural Attenuation – Division of Environmental Response and Revitalization Remedial Response Program Fact Sheet. January.
[9] OEPA. 2002. Distinction Between Monitored Natural Attenuation and Enhanced Monitoring at DERR Remedial Sites – Technical Decision Compendium. October.

FIGURES



Notes: Cobalt concentrations are shown as micrograms per liter (µg/L).

MW-4 Cobalt Time Series Graph

Miami Fort Pond System
North Bend, Ohio

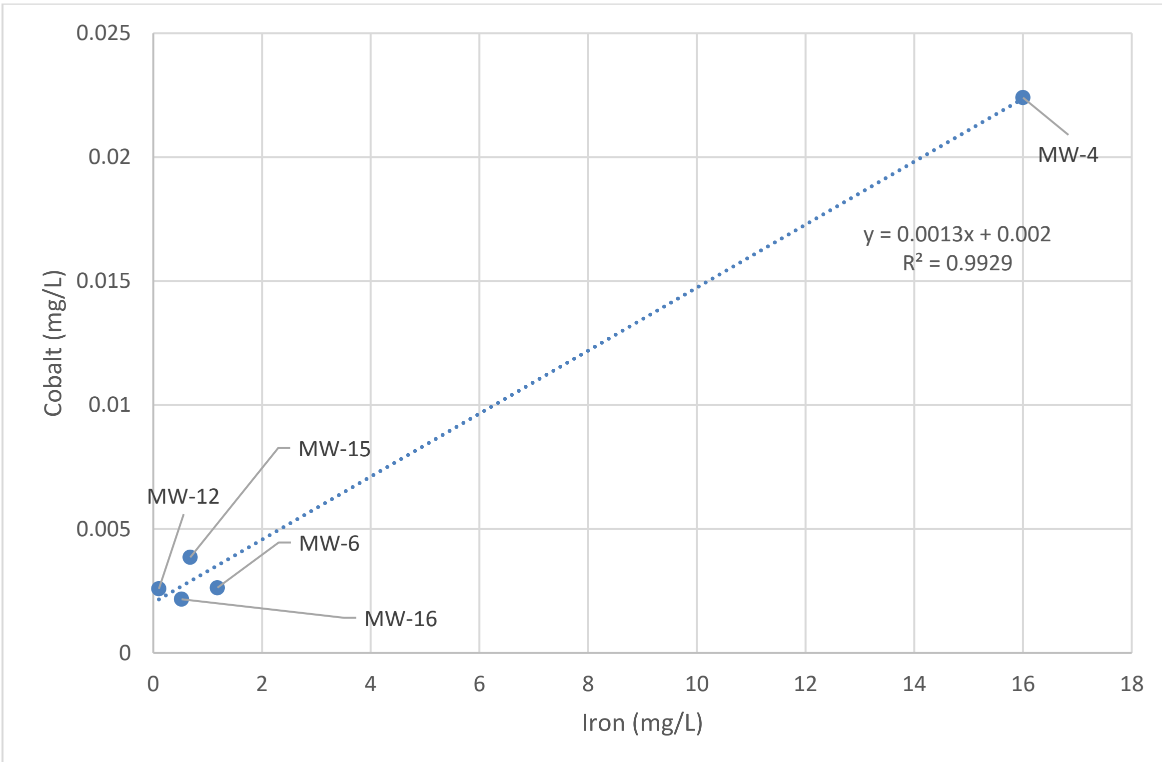
Geosyntec consultants

Figure
1

Columbus, OH

2020/11/23

internal info: path, date revised, author



Notes: April 2020 data are shown. Only locations where cobalt was detected are shown. Cobalt and iron concentrations are shown as milligrams per liter (mg/L).

Iron v. Cobalt Scatter Plot

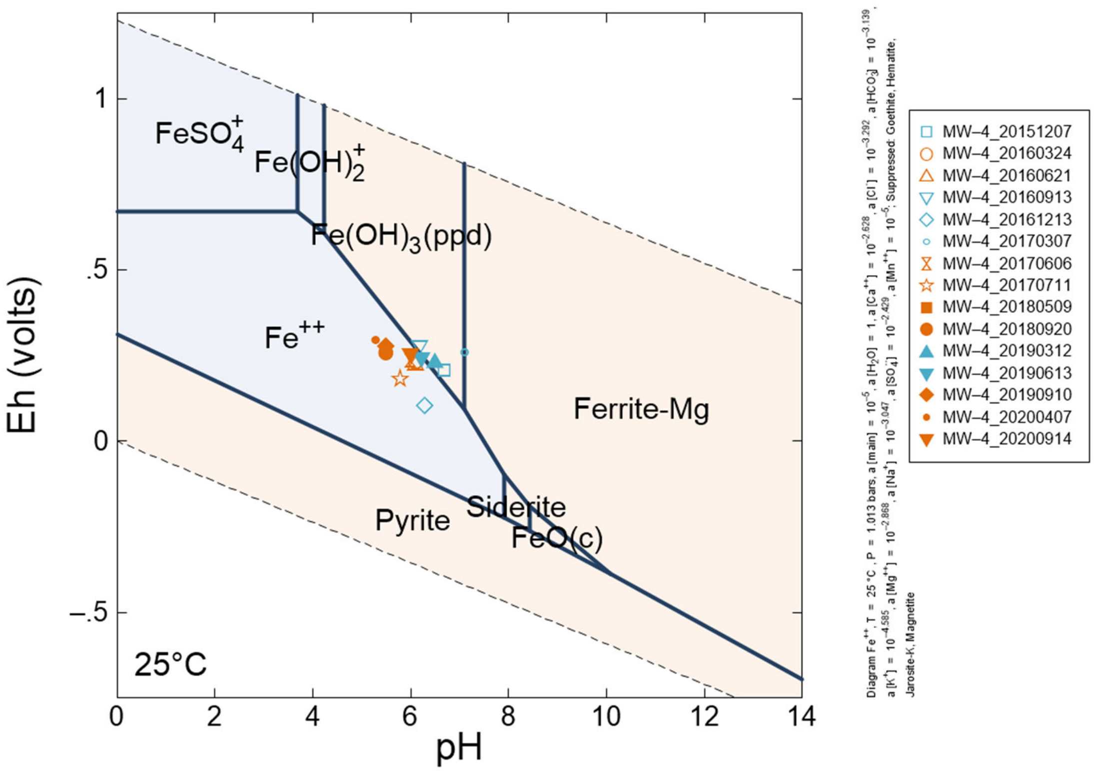
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure **2**

Columbus, OH | 2020/11/30

internal info: path, date revised, author



Notes: Average groundwater concentrations for major solutes at MW-4 and an assumed iron activity of 10^{-5} molal were used as input parameters. Groundwater field measurements at MW-4 are shown in the scatter plot. Events which had a reported cobalt concentration greater than 0.01 mg/L are shown in orange.

MW-4 Iron Eh-pH Diagram

Miami Fort Pond System

North Bend, Ohio

Geosyntec consultants

Figure **3**

Columbus, OH | 2020/11/24

internal info; path, date revised, author

APPENDIX A

Ohio River Mixing Calculation

Mixing Calculation Showing Effect of Cobalt Loading on Ohio River Quality at Low Flow

Baseflow (90th percentile daily mean low flow)		22,697	cfs	Source[1]: ORSANCO, calculated as the 90th percentile low
	=	5.6E+10	L/day	of estimated daily mean discharge rates (11/1986-2/2016) at
				river mile 483.5 provided by U.S. Army Corps' CASCADE model
Cobalt loading rate				
Maximum Cobalt Concentration in Groundwater		0.0187	mg/L	Maximum Concentration Well MW-4 - 9/2018
Maximum Hydraulic Conductivity (Uppermost Aquifer)		0.123	cm/s	Source[2]: USGS, maximum hydraulic conductivity (350 ft/d)
				based on area aquifer tests conducted in alluvial deposits
Hydraulic Gradient		0.0008		Calculated based on June 2019 groundwater elevations
Basin A Discharge Zone Thickness		64	ft	Estimated maximum depth of impacts in Uppermost Aquifer[3]
Basin A Discharge Zone Length		890	ft	Estimated maximum length of impacts in Uppermost Aquifer[4]
Q = KIA				
K = Max Hydraulic Conductivity		0.0041	ft/s	
I = Hydraulic Gradient		0.0008		
A = Cross-Sectional Area		56,960	ft^2	
Q (per second)		0.17	cfs	
Q (per day)		423,400	L/day	
Loading Rate (L)		7,900	mg/day	$= C_{max} * Q$
	L =	0.02	lb/day	
Cobalt concentration increase in Ohio River at low flow due to loading from Basin A				
	d_B =	0.00000014	mg/L	$= L/Q_{90th\ low}$
Cobalt concentration increase near-shore in Ohio River at low flow due to loading from the Basin A				
Assumes loading distributed within 328 feet (100 meters) of shoreline		0.00000076	mg/L	River is approximately 1750 ft wide
Typical Cobalt laboratory detection limit		0.000075	mg/L	Source: Test America Report for 9/2018 Sampling Event

Conclusion:
The calculated cobalt concentration increase in the Ohio River at ***low flow*** due to groundwater loading from the Basin A is less than the typical cobalt detection limit, indicating that increases due to impacted discharge would not be detectable. These calculations indicate that the effects of cobalt loading in groundwater discharge to the Ohio River are negligible.

Notes
[1]Ohio River Valley Water Sanitation Commission (ORSANCO), 2019. Historical Flow Data. Prepared by U.S. Army Corps of Engineers. Accessed August 28, 2019. http://www.orsanco.org/data/flow/
[2]United States Geological Survey (USGS), 1999. Hydrogeology and Simulation of Ground-Water Flows in the Ohio River Alluvial Aquifer Near Carrollton, Kentucky, Report 98-4215. Prepared by M.D. Unkthank, in cooperation with the Carrol County Water-Supply Board.1999.
[3]Upper limit estimated as average June 2019 groundwater elevations from MW-12, MW-4 and MW-13 . Lower limit estimated as base of MW-14 well screen elevation.
[4]Estimated as linear distance from MW-12 to MW-4 to MW-13.

APPENDIX B

Mann-Kendall Analysis - Cobalt Concentrations at MW-4

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.111/25/2020 12:32:20
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.99
Level of Significance	0.01

MF-MW-4_Co

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	15
Number Values Reported (n)	15
Minimum	0.00503
Maximum	0.0224
Mean	0.0125
Geometric Mean	0.0114
Median	0.0127
Standard Deviation	0.00531
Coefficient of Variation	0.425

Mann-Kendall Test

M-K Test Value (S)	37
Tabulated p-value	0.037
Standard Deviation of S	20.21
Standardized Value of S	1.782
Approximate p-value	0.0374

Insufficient evidence to identify a significant trend at the specified level of significance.

ATTACHMENT 8 – SEMI-ANNUAL REMEDY SELECTION PROGRESS REPORTS (MARCH 5, 2020 AND SEPTEMBER 5, 2020)

RAMBOLL

ENVIRONMENT
& HEALTH

March 5, 2020

SEMIANNUAL REMEDY SELECTION PROGRESS REPORT
MIAMI FORT BASIN A

In accordance with Title 40 Code of Federal Regulations (C.F.R.) § 257.97(a), the owner or operator of a coal combustion residuals (CCR) unit must prepare a semiannual report describing the progress in selecting and designing a remedy for statistically significant levels (SSLs) of constituents listed in Appendix IV of 40 C.F.R. Part 257 over the groundwater protection standards established in accordance with 40 C.F.R. § 257.95(h).

This report is for Basin A at Miami Fort Power Station.

As stated in the notification dated February 6, 2019, SSLs for total cobalt and total molybdenum were identified at Basin A during assessment monitoring completed in accordance with 40 C.F.R. § 257.95.

A Corrective Measures Assessment (CMA) was completed for Basin A on September 5, 2019 as required by 40 C.F.R. § 257.96. The CMA identified three potential source control measures and five potential groundwater corrective measures for further evaluation.

A public meeting was held on December 16, 2019 at the Miami Township Community Center in North Bend, Ohio to discuss the results of the of the CMA in accordance with 40 C.F.R. § 257.96(e).

Selection of the source control measure is currently in the feasibility study phase and will incorporate groundwater flow and transport modeling. Selection of the groundwater corrective measure is currently in the monitored natural attenuation (MNA) feasibility study phase.

RAMBOLL

ENVIRONMENT
& HEALTH

September 5, 2020

SEMIANNUAL REMEDY SELECTION PROGRESS REPORT
MIAMI FORT POND SYSTEM

In accordance with Title 40 Code of Federal Regulations (C.F.R.) § 257.97(a), the owner or operator of a coal combustion residuals (CCR) unit must prepare a semiannual report describing the progress in selecting and designing a remedy for statistically significant levels (SSLs) of constituents listed in Appendix IV of 40 C.F.R. Part 257 over the groundwater protection standards established in accordance with 40 C.F.R. § 257.95(h).

This report is for activities occurring between March 5, 2020 and September 5, 2020 at the Miami Fort Pond System located at the Miami Fort Power Station.

As stated in the March 5, 2020 Semiannual Remedy Selection Progress Report, A Corrective Measures Assessment (CMA) was completed for Basin A of the Miami Fort Pond System on September 5, 2019 as required by 40 C.F.R. § 257.96. The CMA identified three potential source control measures and five potential groundwater corrective measures for further evaluation.

In May of 2020, the Pond System Groundwater Monitoring System Certification, Rev 0 was prepared, and the Miami Fort Statistical Method Certification, Rev 1 was updated to reflect the characterization of the Miami Fort Pond System as a single multi-unit system for purposes of groundwater monitoring and closure activities.

As stated in the notification letter dated August 13, 2020, SSLs for total arsenic, total cobalt, and total molybdenum were identified at the Pond System during assessment monitoring completed in accordance with 40 C.F.R. § 257.95.

Selection of the source control measure continues to be in the feasibility study phase and will incorporate groundwater flow and transport modeling that is in development. Selection of the groundwater remedy continues to be in the monitored natural attenuation (MNA) feasibility study phase. Activities completed since March 5, 2020 include review of existing groundwater and source water data, identification and collection of additional groundwater and source water samples, identification of additional data collection needs to support development of a geochemical conceptual site model, and completion of additional monitoring wells and aquifer testing. These activities are necessary to supplement hydrogeologic site characterization, understand the natural attenuation mechanisms occurring at the site, and to evaluate the natural attenuation of constituents to meet applicable groundwater protection standards. Ongoing corrective measures assessment activities address the entire multi-unit Miami Fort Pond System.

ATTACHMENT 9 – STRUCTURAL STABILITY ASSESSMENT

Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Basin A

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin A at the Miami Fort Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). Basin A is located near North Bend, Ohio in Hamilton County, approximately 0.2 miles west of the Miami Fort Power Station. Basin A serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin A is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of Basin A is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of Basin A were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. Basin A is a ring dike structure and does not have abutments.

The foundation consists of very soft to very stiff alluvial clays, overlying very soft to very stiff alluvial silts and clays, which in turn overlies medium dense to dense sand and gravel. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin A at Miami Fort Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of operational and maintenance procedures as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, Basin A was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations; therefore, Basin A meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at Basin A. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with vegetation and stacked CCRs, and the exterior slopes are protected with vegetation and concrete riprap. Operational and maintenance procedures are in place to repair the vegetation, stacked CCRs, and concrete riprap as needed to protect against surface erosion or wave action. Sudden drawdown of the pool in Basin A is not expected to occur due to the configuration of the outfall structures; therefore, slope protection to protect against the adverse effects of sudden drawdown is not required. Therefore, Basin A meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of medium stiff to very stiff material, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin A at Miami Fort Power Station* (October 2016); therefore, the original design and construction of Basin A included sufficient density and dike compaction. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction of the dikes to withstand the range of loading conditions. Therefore, Basin A meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Stacked CCRs on the interior slopes and concrete riprap on the exterior slopes is present in some areas, which is used as an alternate form of slope protection, and is adequate as significant areas of erosion or wave action not observed. Therefore, the original design and construction of Basin A included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, Basin A meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The primary spillway was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Basin A. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2). A secondary spillway is also present at Basin A, but it is not activated during the 1,000-year flood event and is therefore not considered in the evaluation of §257.73(d)(1)(v)(B).

The primary spillway is constructed of high-density polyethylene (HDPE) pipe sliplined into a corrugated metal pipe (CMP), which are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Basin A at Miami Fort Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, Basin A meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Two hydraulic structures are present at Basin A: the primary spillway and an inactive secondary spillway. Both structures are constructed of HDPE and CMP pipes. The stability and structural integrity of both spillways, which pass through the dikes of Basin A, were evaluated using design drawings, operational and maintenance procedures, closed-circuit television (CCTV) pipe inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of Basin A.

The CCTV pipe inspection of both spillways covered their complete length and found the pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structures. Therefore, Basin A meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of Basin A was evaluated by comparing the location of Basin A relative to adjacent water bodies using published Federal Emergency Management Agency Flood Insurance Rate Maps, aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, the Ohio River is adjacent to the southern downstream slopes of Basin A. No other downstream rivers, streams, or lakes are adjacent to the downstream slopes of Basin A. A sudden drawdown slope stability analysis was performed at a cross-section identified as critical for sudden drawdown slope stability. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition (El. 490 feet) to an empty pool condition, which thereby is an evaluation of both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from flood to normal pool, as factor of safety criteria for sudden drawdown slope stability is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, Basin A meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin A

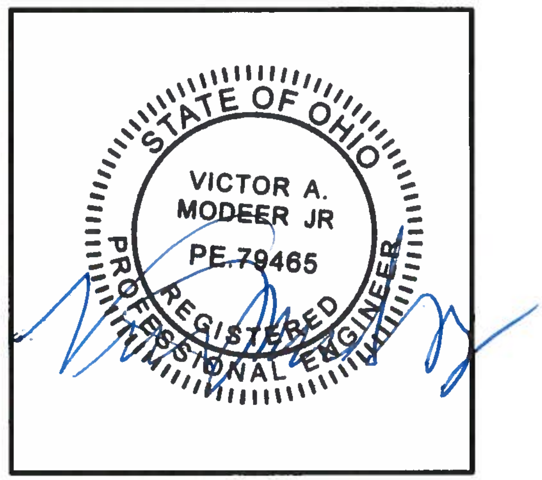
I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR

Printed Name

10/13/16

Date



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Miami Fort Power Station
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North Bend, OH 45052

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AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Basin B

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin B at the Miami Fort Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). Basin B is located near North Bend, Ohio in Hamilton County, approximately 0.4 miles west of the Miami Fort Power Station. Basin B serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin B is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of Basin B is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of Basin B were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. Basin B is a ring dike structure and does not have abutments.

The foundation consists of very soft to very stiff alluvial clays, overlying very soft to very stiff alluvial silts and clays, which in turn overlie medium dense to dense sand and gravel. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin B at Miami Fort Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of operational and maintenance procedures as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, Basin B was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations; therefore, Basin B meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at Basin B. No evidence of significant areas of erosion or wave action was observed. The interior and exterior slopes are protected vegetation. Operational and maintenance procedures are in place to repair the vegetation as needed to protect against surface erosion or wave action. Sudden drawdown of the pool in Basin B is not expected to occur due to the configuration of the spillway structure. Therefore, slope protection to protect against the adverse effects of sudden drawdown is not required as sudden drawdown conditions are not expected to occur. Therefore, Basin B meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of loose to very dense material that is dense on average, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin B at Miami Fort Power Station* (October 2016); therefore, the original design and construction of Basin B included sufficient dike compaction. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, Basin B meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Therefore, the original design and construction of Basin B included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, Basin B meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The spillway was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Basin B. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway is constructed of ductile iron and corrugated metal (CMP) pipes, which are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Basin B at Miami Fort Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, Basin B meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Two hydraulic structures are present at Basin B, the ductile iron and CMP primary spillway and a high-density polyethylene (HDPE) and CMP hydraulic structure located between Basin A (an adjacent CCR Unit) and Basin B. The stability and structural integrity of both spillways, which pass through the dikes of Basin B, were evaluated using design drawings, operational and maintenance procedures, closed-circuit television (CCTV) pipe inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of Basin B.

The CCTV pipe inspection of both spillways covered their complete length and found the pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structures. Therefore, Basin B meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of Basin B was evaluated by comparing the location of Basin B relative to adjacent water bodies using published Federal Emergency Management Agency Flood Insurance Rate Maps, aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, the Ohio River is adjacent to the southern downstream slopes of Basin B. No other downstream rivers, streams, or lakes are adjacent to the downstream slopes of Basin B. A sudden drawdown slope stability analysis was performed at three cross-sections identified as critical for sudden drawdown slope stability. The analysis considered drawdown of the pool in the Ohio River from the 100-year flood condition (El. 490 feet) to an empty pool condition, which thereby is an evaluation of both sudden drawdown and low pool conditions. The resulting factors of safety were found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from food to normal pool, as factor of safety criteria for sudden drawdown slope stability is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, Basin B meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin B

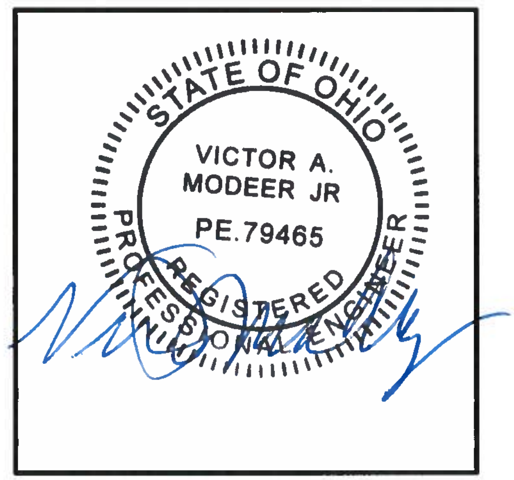
I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR

Printed Name

10/13/16

Date



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ATTACHMENT 10 – SAFETY FACTOR ASSESSMENT

Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Basin A

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin A at the Miami Fort Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). Basin A is located near North Bend, Ohio in Hamilton County, approximately 0.2 miles west of the Miami Fort Power Station. Basin A serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin A is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)
The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
(iii) The calculated seismic factor of safety must equal or exceed 1.00.
(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of Basin A. The exploration consisted of hollow-stem auger borings, cone penetration tests, and laboratory program including strength and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at Basin A consist of medium stiff to very stiff lean clay embankment fill, overlying very soft to very stiff alluvial clay, overlying very soft to very stiff alluvial silts and silty clays, which in turn overlies medium dense sand and gravel. The phreatic surface in the subsurface is typically at or slightly above the embankment/foundation interface.

Four (4) representative cross sections were analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross sections were located to represent critical surface geometry, subsurface stratigraphy, and phreatic conditions across the site. Each cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the Basin A dikes. As a result, this loading condition is not applicable to the Basin A dikes at the Miami Fort Power Station.

Results of the Initial Safety Factor Assessments for the critical cross-section for each loading condition (i.e., the lowest calculated factor of safety out of the cross sections analyzed for each loading condition), are listed in **Table 1**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	1.63
Maximum Surcharge Pool Loading	(ii)	1.40	1.63
Seismic	(iii)	1.00	1.18
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, Basin A meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin A

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR
Printed Name

10/13/16
Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79468
REGISTERED
PROFESSIONAL ENGINEER

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With nearly 100,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $19 billion.

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AECOM

Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Basin B

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin B at the Miami Fort Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). Basin B is located near North Bend, Ohio in Hamilton County, approximately 0.4 miles west of the Miami Fort Power Station. Basin B serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin B is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)
The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
(iii) The calculated seismic factor of safety must equal or exceed 1.00.
(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of Basin B. The exploration consisted of hollow-stem auger borings, cone penetration tests, and laboratory program including strength and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at the Basin B consist of compacted ash embankment fill with a lean clay cover, overlying very soft to very stiff alluvial clay, overlying very soft to very stiff alluvial silts and silty clays, which in turn overlies medium dense sand and gravel. The phreatic surface in the subsurface is typically above the embankment/foundation interface.

Four (4) representative cross sections were analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross sections were located to represent critical surface geometry, subsurface stratigraphy, and phreatic conditions across the site. Each cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the Basin B dikes. As a result, this loading condition is not applicable to the Basin B dikes at the Miami Fort Power Station.

Results of the Initial Safety Factor Assessments for the critical cross-section for each loading condition (i.e., the lowest calculated factor of safety out of the cross sections analyzed for each loading condition) are listed in **Table 1.**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	2.07
Maximum Surcharge Pool Loading	(ii)	1.40	2.07
Seismic	(iii)	1.00	1.54
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, Basin B meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin B

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date

STATE OF OHIO
VICTOR A. MODEER JR
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PROFESSIONAL ENGINEER

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ATTACHMENT 11 – CLOSURE PLAN

CLOSURE PLAN FOR EXISTING CCR SURFACE IMPOUNDMENT
40 CFR 257.102(b)
REV 0 – 10/17/2016

SITE INFORMATION

Site Name / Address	Miami Fort Power Station / 11021 Brower Road, North Bend, OH 45052		
Operator Name / Address	Dynegy Miami Fort, LLC / 1500 Eastport Plaza Drive, Collinsville, IL 62234		
CCR Unit	Basin A	Closure Method and Final Cover Type	Close In-Place Clayey Soil Cover with Vegetation

CLOSURE PLAN DESCRIPTION

(b)(1)(i) – Narrative description of how the CCR unit will be closed in accordance with this section.	Basin A will be dewatered, as necessary, to facilitate closure by leaving CCR in place. The CCR in Basin A will be shaped and graded. The existing transmission tower located on the west embankment of Basin A will remain and the foundation will be incorporated within the final cover system. The final cover will be sloped to promote drainage and stormwater runoff will be conveyed through a series of drainage channels on the cover system to an existing spillway near the southeast corner of Basin B. Existing inlet and outlet piping for Basin A will be removed from service. In accordance with 257.102(b)(3), this initial written closure plan will be amended to provide additional details after the final engineering design for the grading and cover system is completed, if the final design would substantially affect this written closure plan. This initial closure plan reflects the information available to date.
(b)(1)(iii) – If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system and methods and procedures used to install the final cover.	The soils for the final cover system will be placed directly on top of the graded CCR material to achieve final grades and will include (from bottom up): 1) 18" of compacted earthen material with a permeability of less than or equal to the permeability of the natural subsoils present at the site or no greater than $1x10^{-5}$ cm/sec, whichever is less; 2) 6" of soil capable of sustaining native plant growth; and 3) planted native grasses. Emplaced CCR material will be regraded as fill and supplemented with borrow soils as necessary to achieve design grades. Earthen material will be placed, graded, and compacted to meet the thickness and permeability as discussed above for the cover system. Organic earthen material will be placed on top of the 18" of compacted soils to create a 6" soil layer capable of sustaining native plant growth. The final cover surface will be seeded and vegetated. The final cover slope will have a minimum slope of 2% and will be graded to convey stormwater runoff to the perimeter drainage channel, which leads to Basin B and to the existing spillway.

(b)(1)(iii) – How the final cover system will achieve the performance standards in 257.102(d).

(d)(1)(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.	The permeability of the final cover will be equal to or less than the permeability of the natural subsoils present below the CCR material or permeability no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will not be greater than $1x10^{-5}$ cm/sec. The final cover system will be graded with a minimum 2% slope.
(d)(1)(ii) – Preclude the probability of future impoundment of water, sediment, or slurry.	The final cover will be installed with a minimum 2% slope. Drainage channels will be installed with a minimum 0.5% slope.
(d)(1)(iii) – Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period.	The final cover will have a minimum 2% slope and drainage channels will have minimum 0.5% slope. Drainage channels will be lined with turf reinforced mats where required to reduce the potential for erosion. The final slope of the berms and cover will meet the stability requirements to prevent sloughing or movement of the final cover system.
(d)(1)(iv) – Minimize the need for further maintenance of the CCR unit.	The final cover will be vegetated to minimize erosion and maintenance.
(d)(1)(v) – Be completed in the shortest amount of time consistent with	Closure is estimated to be completed no later than five

CLOSURE PLAN DESCRIPTION	
recognized and generally accepted good engineering practices.	years upon commencement of closure activities.
(d)(2)(i) – Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residue.	The unit will be dewatered sufficiently, as necessary, to remove the free liquids to provide a stable base for the construction of the final cover system.
(d)(2)(ii) – Remaining wastes must be stabilized sufficiently to support the final cover system.	Dewatering as necessary and regrading of existing in-place CCR will sufficiently stabilize the waste such that the final cover will be supported.
(d)(3) – A final cover system must be installed to minimize infiltration and erosion, and at minimum, meets the requirements of (d)(3)(i).	The final cover will consist of a minimum 18" earthen material layer with permeability equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec. Erosion will be minimized with a soil layer of no less than 6" of earthen material capable of sustaining native plant growth. The final cover surface will be seeded and vegetated.
(d)(3)(i) – The design of the final cover system must be included in the written closure plan.	When the design of the final cover system is completed, the written closure plan will be amended if the final design would substantially change this written closure plan. The design of the final cover system will meet the requirements of §(d)(3)(i)(A)–(D) as described below.
(d)(3)(i)(A) – The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than $1x10^{-5}$cm/sec, whichever is less.	The permeability of the final cover will be equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec.
(d)(3)(i)(B) – The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer than contains a minimum of 18 inches of earthen material.	The final cover will include a minimum 18" of compacted earthen material with a permeability equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec.
(d)(3)(i)(C) – The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.	The final cover will include a minimum 6" of an earthen erosion layer that is capable of sustaining native plant growth. The final cover will be seeded and vegetated.
(d)(3)(i)(D) – The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.	The final cover will be installed with a minimum 2% slope and will incorporate calculated settlement as well as differential settling and subsidence.

INVENTORY AND AREA ESTIMATES	
(b)(1)(iv) – Estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit	2,250,000 cubic yards
(b)(1)(v) – Estimate of the largest area of the CCR unit ever requiring a final cover	31 acres

CLOSURE SCHEDULE	
(b)(1)(vi) – Schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including major milestones and the estimated timeframes to complete each step or phase of CCR unit closure.	
The milestone and the associated timeframes are initial estimates. Some of the activities associated with the milestones will overlap. Amendments to the milestones and timeframes will be made as more information becomes available.	
Written Closure Plan	October 17, 2016
Notification of Intent to Close Placed in Operating Record	No later than the date closure of the CCR unit is initiated. Closure to commence in accordance with the applicable timeframes in 40 CFR 257.102(e).
Agency coordination and permit acquisition • Coordinating with state agencies for compliance • Acquiring state permits	 Year 1 – 5 (estimated) Year 1 (estimated)
Mobilization	Year 1 (estimated)
Dewater and stabilize CCR • Complete dewatering, as necessary • Complete stabilization of CCR	 Year 2 (estimated) Year 2 (estimated)
Grading • Grading of CCR material in pond to facilitate surface water drainage	Year 2 - 5 (estimated)
Installation of final cover	Year 2 - 5 (estimated)
Estimate of Year in which all closure activities will be completed	Year 5

AMENDMENT AND CERTIFICATION	
(b)(3)(i) – The owner or operator may amend the initial or any subsequent written closure plan developed pursuant to 257.102(b)(1) at any time. (b)(3)(ii) – The owner or operator must amend the written closure plan whenever: (A) There is a change in the operation of the CCR unit that would substantially affect the written closure plan in effect; or (B) Before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan. (b)(3)(iii) – The owner or operator must amend the closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written closure plan. If a written closure plan is revised after closure activities have commenced for a CCR unit, the owner or operator must amend the current closure plan no later than 30 days following the triggering event.	This initial closure plan will be amended as required by 257.102(b)(3) and, as allowed by 257.102(b)(3), may be amended at any time, including as more information becomes available.
(b)(4) – The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written closure plan meets the requirements of this 40 CFR 257.102.	Certification by a qualified professional engineer will be appended to this plan.

Certification Statement 40 CFR § 257.102 (d)(3)(iii) – Design of the Final Cover System for a CCR Surface Impoundment

CCR Unit: Dynegy Miami Fort, LLC; Miami Fort Power Station; Basin A

I, Victor Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the design of the final cover system as included in the initial written closure plan, dated October 17, 2016 meets the requirements of 40 CFR § 257.102.

Victor Modeer, PE, D.GE

Printed Name

10/13/16

Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

Certification Statement 40 CFR § 257.102 (b)(4) – Initial Written Closure Plan for a CCR Surface Impoundment

CCR Unit: Dynegy Miami Fort, LLC; Miami Fort Power Station; Basin A

I, Victor Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the information contained in the initial written closure plan, dated October 17, 2016, meets the requirements of 40 CFR § 257.102.

Victor Modeer, PE, D.GE

Printed Name

10/13/16

Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

CLOSURE PLAN FOR EXISTING CCR SURFACE IMPOUNDMENT
40 CFR 257.102(b)
REV 0 – 10/17/2016

SITE INFORMATION

Site Name / Address	Miami Fort Power Station / 11021 Brower Road, North Bend, OH 45052		
Operator Name / Address	Dynegy Miami Fort, LLC / 1500 Eastport Plaza Drive, Collinsville, IL 62234		
CCR Unit	Basin B	Closure Method and Final Cover Type	Close In-Place Clayey Soil Cover with Vegetation

CLOSURE PLAN DESCRIPTION

(b)(1)(i) – Narrative description of how the CCR unit will be closed in accordance with this section.	Basin B will be dewatered, as necessary, to facilitate closure by leaving CCR in place. The CCR in Basin B will be shaped and graded. The existing transmission towers located at the east and south embankments of Basin B will remain and the foundations will be incorporated within the final cover system. The final cover will be sloped to promote drainage and stormwater runoff will be conveyed through a series of drainage channels on the cover system to an existing spillway near the southeast corner of Basin B. Existing inlet piping for Basin B will be removed from service. In accordance with 257.102(b)(3), this initial written closure plan will be amended to provide additional details after the final engineering design for the grading and cover system is completed, if the final design would substantially affect this written closure plan. This initial closure plan reflects the information available to date.
(b)(1)(iii) – If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system and methods and procedures used to install the final cover.	The soils for the final cover system will be placed directly on top of the graded CCR material to achieve final grades and will include (from bottom up): 1) 18" of compacted earthen material with a permeability of less than or equal to the permeability of the natural subsoils present at the site or no greater than $1x10^{-5}$ cm/sec, whichever is less; 2) 6" of soil capable of sustaining native plant growth; and 3) planted native grasses. Emplaced CCR material will be regraded as fill and supplemented with borrow soils as necessary to achieve design grades. Earthen material will be placed, graded, and compacted to meet the thickness and permeability as discussed above for the cover system. Organic earthen material will be placed on top of the 18" of compacted soils to create a 6" soil layer capable of sustaining native plant growth. The final cover surface will be seeded and vegetated. The final cover slope will have a minimum slope of 2% and will be graded to convey stormwater runoff to the perimeter drainage channel, which leads to the existing spillway.

(b)(1)(iii) – How the final cover system will achieve the performance standards in 257.102(d).	
(d)(1)(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.	The permeability of the final cover will be equal to or less than the permeability of the natural subsoils present below the CCR material or permeability no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will not be greater than $1x10^{-5}$ cm/sec. The final cover system will be graded with a minimum 2% slope.
(d)(1)(ii) – Preclude the probability of future impoundment of water, sediment, or slurry.	The final cover will be installed with a minimum 2% slope. Drainage channels will be installed with a minimum 0.5% slope.
(d)(1)(iii) – Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period.	The final cover will have a minimum 2% slope and drainage channels will have minimum 0.5% slope. Drainage channels will be lined with turf reinforced mats where required to reduce the potential for erosion. The final slope of the berms and cover will meet the stability requirements to prevent sloughing or movement of the final cover system.
(d)(1)(iv) – Minimize the need for further maintenance of the CCR unit.	The final cover will be vegetated to minimize erosion and maintenance.
(d)(1)(v) – Be completed in the shortest amount of time consistent with	Closure is estimated to be completed no later than five

CLOSURE PLAN DESCRIPTION	
recognized and generally accepted good engineering practices.	years upon commencement of closure activities.
(d)(2)(i) – Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residue.	The unit will be dewatered sufficiently, as necessary, to remove the free liquids to provide a stable base for the construction of the final cover system.
(d)(2)(ii) – Remaining wastes must be stabilized sufficiently to support the final cover system.	Dewatering as necessary and regrading of existing in-place CCR will sufficiently stabilize the waste such that the final cover will be supported.
(d)(3) – A final cover system must be installed to minimize infiltration and erosion, and at minimum, meets the requirements of (d)(3)(i).	The final cover will consist of a minimum 18" earthen material layer with permeability equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec. Erosion will be minimized with a soil layer of no less than 6" of earthen material capable of sustaining native plant growth. The final cover surface will be seeded and vegetated.
(d)(3)(i) – The design of the final cover system must be included in the written closure plan.	When the design of the final cover system is completed, the written closure plan will be amended if the final design would substantially change this written closure plan. The design of the final cover system will meet the requirements of §(d)(3)(i)(A)–(D) as described below.
(d)(3)(i)(A) – The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than $1x10^{-5}$cm/sec, whichever is less.	The permeability of the final cover will be equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec.
(d)(3)(i)(B) – The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer than contains a minimum of 18 inches of earthen material.	The final cover will include a minimum 18" of compacted earthen material with a permeability equal to or less than the permeability of the natural subsoils or no greater than $1x10^{-5}$ cm/sec, whichever is less. Therefore, the permeability of the final cover system will be not greater than $1x10^{-5}$ cm/sec.
(d)(3)(i)(C) – The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.	The final cover will include a minimum 6" of an earthen erosion layer that is capable of sustaining native plant growth. The final cover will be seeded and vegetated.
(d)(3)(i)(D) – The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.	The final cover will be installed with a minimum 2% slope and will incorporate calculated settlement as well as differential settling and subsidence.

INVENTORY AND AREA ESTIMATES	
(b)(1)(iv) – Estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit	1,360,000 cubic yards
(b)(1)(v) – Estimate of the largest area of the CCR unit ever requiring a final cover	20 acres

CLOSURE SCHEDULE	
(b)(1)(vi) – Schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including major milestones and the estimated timeframes to complete each step or phase of CCR unit closure.	
The milestone and the associated timeframes are initial estimates. Some of the activities associated with the milestones will overlap. Amendments to the milestones and timeframes will be made as more information becomes available.	
Written Closure Plan	October 17, 2016
Notification of Intent to Close Placed in Operating Record	No later than the date closure of the CCR unit is initiated. Closure to commence in accordance with the applicable timeframes in 40 CFR 257.102(e).
Agency coordination and permit acquisition • Coordinating with state agencies for compliance • Acquiring state permits	 Year 1 – 5 (estimated) Year 1 (estimated)
Mobilization	Year 1 (estimated)
Dewater and stabilize CCR • Complete dewatering, as necessary • Complete stabilization of CCR	 Year 2 (estimated) Year 2 (estimated)
Grading • Grading of CCR material in pond to facilitate surface water drainage	Year 2 - 5 (estimated)
Installation of final cover	Year 2 - 5 (estimated)
Estimate of Year in which all closure activities will be completed	Year 5

AMENDMENT AND CERTIFICATION	
(b)(3)(i) – The owner or operator may amend the initial or any subsequent written closure plan developed pursuant to 257.102(b)(1) at any time. (b)(3)(ii) – The owner or operator must amend the written closure plan whenever: (A) There is a change in the operation of the CCR unit that would substantially affect the written closure plan in effect; or (B) Before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan. (b)(3)(iii) – The owner or operator must amend the closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written closure plan. If a written closure plan is revised after closure activities have commenced for a CCR unit, the owner or operator must amend the current closure plan no later than 30 days following the triggering event.	This initial closure plan will be amended as required by 257.102(b)(3) and, as allowed by 257.102(b)(3), may be amended at any time, including as more information becomes available.
(b)(4) – The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written closure plan meets the requirements of this 40 CFR 257.102.	Certification by a qualified professional engineer will be appended to this plan.

Certification Statement 40 CFR § 257.102 (b)(4) – Initial Written Closure Plan for a CCR Surface Impoundment

CCR Unit: Dynegy Miami Fort, LLC; Miami Fort Power Station; Basin B

I, Victor Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the information contained in the initial written closure plan, dated October 17, 2016, meets the requirements of 40 CFR § 257.102.

Victor Modeer, PE, D.GE

Printed Name

10/13/16

Date

STATE OF OHIO
VICTOR A.
MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

ADDENDUM NO. 1
MIAMI FORT POND SYSTEM CLOSURE PLAN

This Addendum No. 1 to the Closure Plans for Existing Coal Combustion Residuals (CCR) Impoundments for Basins A and B (Pond System) at the Miami Fort Power Station, Revision 0 – October 17, 2016 has been prepared to meet the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) Section 257.103(f)(2)(v)(D) as a component of the demonstration that the Miami Fort Pond System qualifies for a site-specific alternative deadline to initiate closure due to permanent cessation of a coal-fired boiler by a certain date.

In May of 2020, the Pond System Groundwater Monitoring System Certification, Rev 0 was prepared and the Miami Fort Statistical Method Certification, Revision 1 was updated to reflect the characterization of the Miami Fort Pond System (Basins A and B) as a single multi-unit system for purposes of groundwater monitoring and closure activities.

The Miami Fort Pond System will begin construction of closure and cease receipt and placement of CCR and non-CCR wastestreams no later than June 17, 2027 as indicated in the Miami Fort Power Station Alternative Closure Demonstration dated September 29, 2020. Closure will be completed by October 17, 2028 within the 5-year timeframe included in the Closure Schedule identified in the Miami Fort Pond System Closure Plans (Basin A and Basin B) in accordance with 40 C.F.R. § 257.102(f)(ii).

All other aspects of the Closure Plans remain unchanged.

CERTIFICATION

I, Nicole M. Pagano, a Qualified Professional Engineer in good standing in the State of Ohio, certify that the information in this addendum 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.

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: 9/29/2020

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