Luminant

Cynthia Vodopivec
Zimmer Power Company LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

August 13, 2021

Sent via email

Mr. Michael S. Regan, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code 5304-P
Washington, DC 20460

Re: Zimmer Power Plant Alternative Closure Demonstration—Request to Transfer to 40 C.F.R. § 257.103(f)(2)

Dear Administrator Regan:

Zimmer Power Company LLC (Zimmer)[1] has announced that the William H. Zimmer Power Plant (Zimmer Plant) in Ohio will cease coal-fired operations by May 31, 2022. As a result, Zimmer hereby submits this request under 40 C.F.R. § 257.103(f)(4)(i) to transfer the current authorization for a site-specific alternative deadline for the three surface impoundments at the Zimmer Plant from § 257.103(f)(1) (development of alternative capacity is technically infeasible) to § 257.103(f)(2) (permanent cessation of a coal-fired boiler(s) by a date certain).

By way of background, on November 25, 2020, Zimmer timely submitted to the U.S. Environmental Protection Agency (EPA) an alternative closure demonstration pursuant to § 257.103(f)(1) to extend the rule's April 11, 2021 deadline in order to develop alternative capacity for its CCR and non-CCR wastestreams. Specifically, the demonstration sought additional time to allow the Zimmer Plant to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose it as a non-CCR basin, and initiate closure of D Basin. Although more than four months has passed since that submission was made, EPA has not taken action on it or published a proposed decision for comment. Thus, the April 21, 2021 cease receipt deadline is currently tolled pursuant to § 257.103(f)(3)(ii), and Zimmer is currently authorized to continue operating the three impoundments.

On July 19, 2021, however, Zimmer announced that the Zimmer Plant will be retiring by May 31, 2022 and, as a result, Zimmer plans to close all three impoundments by October 17, 2023, instead of retrofitting them for continued operations. Accordingly, as authorized by § 257.103(f)(4)(i), Zimmer requests to transfer the alternate closure demonstration that was previously submitted to EPA on November 25, 2020, pursuant to § 257.103(f)(1) and replace it with the enclosed demonstration prepared by Burns & McDonnell pursuant to § 257.103(f)(2). Because Zimmer is "authorized to continue operating [the] impoundment[s] under [§ 257.103]" by virtue of its prior timely submittal, it "may at any time request authorization to continue operating the impoundment pursuant to another paragraph of subsection (f), by submitting the information in paragraph (f)(4)(i) or (ii) of [§ 257.103]." 40 C.F.R. § 257.103(f)(4).

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[1] Formerly Dynegy Zimmer, LLC.

In accordance with § 257.103(f)(4)(i), the enclosed demonstration addresses all of the criteria in § 257.103(f)(2)(i)-(iv) and contains the documentation required by § 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 Zimmer's publicly available website: https://www.luminant.com/ccr/

Sincerely,

Cynthia Vodopivec
SVP - 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

Zimmer Power Company LLC

William H. Zimmer Power Plant
Project No. 122702

Revision 0
8/13/2021

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

prepared for

Zimmer Power Company LLC
William H. Zimmer Power Plant
Moscow, Ohio

Project No. 122702

Revision 0
8/13/2021

prepared by

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

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Zimmer Power Company LLC
CCR Surface Impoundment
Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline
Project No. 122702

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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 Zimmer Power Company LLC or others without specific verification or adaptation by the Engineer.

Matt D Bleything

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

Date: 8/13/21

MATTHEW
DAVID
BLEYTHING
82440

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
Zimmer	Zimmer Power Company LLC
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	Environmental Protection Agency
Zimmer Plant	William H. Zimmer Power Plant
RCRA	Resource Conservation and Recovery Act
SWPPP	Stormwater Pollution Prevention Plan

1.0 EXECUTIVE SUMMARY

Zimmer Power Company LLC (Zimmer) has announced that the William H. Zimmer Power Plant (Zimmer Plant) in Ohio will cease coal-fired operations by May 31, 2022. As a result, Zimmer hereby submits this request under 40 C.F.R. § 257.103(f)(4)(i) to the U.S. Environmental Protection Agency (EPA) to transfer the current authorization for a site-specific alternative deadline for the three CCR surface impoundments (the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin) located at the Zimmer Plant under 40 C.F.R. § 257.103(f)(1) to 40 C.F.R. § 257.103(f)(2) —"Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain." On November 25, 2020, Zimmer timely submitted to EPA an alternative closure demonstration pursuant to § 257.103(f)(1) to extend the rule's April 11, 2021, deadline in order to develop alternative capacity for its CCR and non-CCR wastestreams. Specifically, the demonstration sought additional time to allow the Zimmer Plant to retrofit the Coal Pile Runoff Pond, reroute CCR wastestreams away from the Gypsum Recycle Pond to the Mercury Effluent Treatment System, close the Gypsum Recycle Pond and repurpose it as a non-CCR basin, and initiate closure of D Basin. Thus, the Zimmer Plant's cease receipt deadline is currently tolled pursuant to § 257.103(f)(3)(ii), and Zimmer is currently authorized to continue operating the three impoundments. Because Zimmer is "authorized to continue operating [the] impoundment[s] under this section [§ 257.103]" by virtue of its prior timely submittal, it "may at any time request authorization to continue operating the impoundment pursuant to another paragraph of subsection (f), by submitting the information in paragraph (f)(4)(i) or (ii) of this section." 40 C.F.R. § 257.103(f)(4).

In accordance with § 257.103(f)(4)(i), this demonstration addresses all of the criteria in § 257.103(f)(2)(i)-(iv) and contains the documentation required by § 257.103(f)(2)(v). The impoundments are each less than 40 acres in size and are used to manage CCR and non-CCR wastestreams at the Zimmer Plant. As discussed below, the boilers at the plant will cease coal-fired operations no later than May 31, 2022, and the impoundments will complete closure no later than October 17, 2023. Therefore, Zimmer is requesting to transfer the current authorization for a site-specific deadline from 40 C.F.R. § 257.103(f)(1) to 40 C.F.R. § 257.103(f)(2) so that these impoundments may continue to receive CCR and non-CCR wastestreams and complete closure no later than October 17, 2023.

2.0 INTRODUCTION

The Zimmer Plant is a 1,450-megawatt coal-fueled electric generating plant in Moscow, Ohio. Fly ash, economizer ash, and gas recirculation ash are captured dry. Bottom ash and pyrites are handled using a dewatering bin with settling and surge tanks and a recirculation system. Any overflow or leaks from this system, with any associated de minimis amounts of solids, are routed to the Wastewater Pond via the collection trenches and the East Precipitator Sump. The Zimmer facility includes three CCR surface impoundments (listed in Table 2-1) that are the subject of this demonstration. A site plan (Figure 1) and water balance diagram (Figure 2) are provided in Appendix A.

Table 2-1: Zimmer CCR Surface Impoundment Summary

CCR Surface Impoundment Name	Alternate Designation (see Figure 2)	Year Placed in Service	Impoundment Size (acres) / Storage Volume (acre-feet)	Lined?	Meets Location Restrictions?	Groundwater Status
Gypsum Recycle Pond	SPD-4 Pond-4 Truck Wash Pond	1995	0.6 / 4.5	Yes[1]	Yes	Assessment Monitoring was initiated in May 2018 and is ongoing. No exceedances of Appendix IV parameters have been identified; therefore, an assessment of corrective measures is not required.
Coal Pile Runoff Pond	SPD-3 Pond-3 Coal Pile Runoff Pond	1987	2.8 / 36.3	Yes[1]	Yes	
D Basin	SPD-5 Pond-5 D Basin Dredge Dewatering Basin	2003	6.1 / 46.6	No	No[2]	

[1] Originally classified as lined per 40 C.F.R. § 257.71(a)(1)(i), which was subsequently vacated by the U.S. Court of Appeals for the D.C. Circuit. This impoundment now qualifies as an eligible unlined CCR surface impoundment per § 257.53.
[2] Meets criteria for wetlands, fault areas, seismic impact zones, and unstable areas but not aquifer separation.

The three CCR surface impoundments onsite at the Zimmer Plant are utilized as follows:

- Gypsum Recycle Pond (referred to as SPD-4 Pond-4 Truck Wash Pond on Figure 2):
    - Receives centrate centrifuge effluent (FGD wastewater) that is not recycled back to the scrubber
    - Receives mag thickener overflow (FGD wastewater)
    - Receives stormwater runoff from the FGD pad mix stackout pile and wash water from the associated truck wash system

    - Receives wash water from the FGD Waste Handling Building, Coal Conveyor 56E/W, and Fly Ash Silo (via the Truck Scale Area Sump)
    - FGD solids settle out in the concrete-lined pond and are removed and placed on the gypsum stackout pile
    - The pond overflows to the FGD Waste Handling Building Sump (referred to as the FGD Stabilization Area Sump on Figure 2), which is typically forwarded to the Mercury Effluent Treatment System
- Coal Pile Runoff Pond (referred to as SPD-3 Pond-3 Coal Pile Runoff Pond on Figure 2):
    - Receives Coal Pile Runoff from A and B Basins
    - Receives stormwater from C Basin
    - Receives decant water and stormwater from D Basin
    - Receives treated flow (including solids) from the Mercury Effluent Treatment System (which treats water from the Gypsum Recycle Pond/FGD Waste Handling Building Sump as well as landfill leachate)
    - The treated pond effluent overflows to the Wastewater Pond, where it comingles with a majority of the plant process water flows prior to discharge
- D Basin (referred to as SPD-5 Pond-5 D Basin Dredge Dewatering Basin on Figure 2):
    - Used to dewater dredged CCR and non-CCR material from other ponds onsite, including the Wastewater Pond, the Coal Pile Runoff Pond, and the Gypsum Recycle Pond. This dredging is typically required annually to maintain adequate residence time to meet the discharge permit requirements at the outfall from the site pond system.

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 a complete alternative closure demonstration was submitted to the agency by November 30, 2020. 40 C.F.R. § 257.101(a)(1) (85 Fed. Reg. 53,516 (Aug. 28, 2020)). A submittal of a complete demonstration tolled the April 11, 2021, deadline until EPA acts on the submission and sets a site-specific deadline. 40 C.F.R. § 257.103(f)(3)(ii). Further, under 40 C.F.R. § 257.103(f)(4) owners and operators of a CCR surface impoundment that are "authorized to continue operating an impoundment under this section [§ 257.103]" may "request authorization to continue operating the impoundment pursuant to another paragraph of subsection (f), by submitting the information in paragraph (f)(4)(i) or (ii) of this section."

Specifically, an owner or operator of a surface impoundment that submitted a demonstration under § 257.103(f)(1) may request authorization to instead operate the surface impoundment in accordance with the requirements of § 257.103(f)(2). 40 C.F.R. § 257.103(f)(4)(i). To qualify for the 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).

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 Zimmer seeks to continue placing into the CCR surface impoundments. Consistent with the regulations, neither an increase in costs nor the inconvenience of existing capacity was used to support qualification under these 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 CCR surface impoundments receive both CCR flows and a portion of the non-CCR wastewater flows onsite for settling prior to overflowing to the Clear Water Pond for discharge to the Ohio River via Outfall 005. These wastestreams are discussed in more detail in the following sections. The remaining plant process flows are routed through the Wastewater Pond as shown on the water balance in Appendix A (see Figure 2). The Wastewater Pond is not authorized to receive the CCR flows and is not large enough to independently treat the total volume of the plant process water flows.

Zimmer also owns and operates a CCR landfill at a separate facility, located approximately 3 miles from the plant. This landfill is neither authorized nor capable of accepting wet-generated CCR and non-CCR wastestreams.

3.2 CCR Wastestreams

Zimmer evaluated each CCR wastestream placed in the CCR surface impoundments. The existing site water balance is included in Appendix A of this demonstration. The Zimmer Plant's fly ash, economizer ash, and gas recirculation ash systems are dry handled and disposed in the CCR landfill. The bottom ash (and non-CCR pyrites) is sluiced to dewatering bins equipped with surge tanks and a recirculation system. After dewatering, the bottom ash is disposed in the CCR landfill. For the reasons discussed below in Table 3-1, each of the following CCR wastestreams must continue to be placed in the CCR surface impoundments due to lack of alternative capacity both on and off-site.

Table 3-1: Zimmer CCR Wastestreams

CCR Wastestream	Average Flow (MGD)	Alternative Capacity Currently Available? YES/NO	Description	Details
FGD Wastewater	0.337	NO	The FGD system utilizes a series of thickeners with rakes and centrifuges to remove suspended solids and a magnesium recovery process to remove dissolved solids from the effluent. The Gypsum Recycle Pond receives centrate centrifuge effluent, FGD blowdown that is not recycled back to the scrubber, and mag thickener overflow (FGD wastewater). This pond effluent is forwarded to the Mercury Effluent Treatment System via the FGD area sump. Coal Pile Runoff Pond receives treated flow (including CCR solids) from the Mercury Effluent Treatment System. D Basin is used to dewater dredged CCR and non-CCR material from other ponds onsite (including Gypsum Recycle Pond and Coal Pile Runoff Pond).	The Gypsum Recycle Pond is integral to operation of the FGD and captures large portions of the wet-generated CCR solids from the centrate/mag thickener system overflows and various wash activities before having the water forwarded to the Mercury Effluent Treatment System. The Coal Pile Runoff Pond receives both coal fines from non-CCR wastestreams (specifically coal pile runoff) and the effluent from the Mercury Effluent Treatment System (including landfill leachate, FGD wastewater, and the CCR solids that settle out of the FGD wastewater). Based on the size of this impoundment, dredging (to D Basin) is required to remove CCR and non-CCR materials on a periodic basis to maintain the residence time and treatment capacity provided within the Coal Pile Runoff Pond.

Zimmer evaluated on-site, wet temporary storage options for the CCR wastestreams, in lieu of using the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin while permanent capacity is being developed. Based on our evaluation, we concluded the following:

- FGD wastewater:
    - On-site alternative capacity is currently not available and would need to be developed. The other onsite impoundments (A Basin, C Basin, Wastewater Pond, and Clear Water Pond) are non-CCR impoundments and are, therefore, not authorized to receive the CCR sluice flows.

- Development of 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, threatened and endangered species and historic preservation assessments, a construction & operating permit and a SWPPP at a minimum.
- Off-site alternative capacity is currently not available and would need to be developed. The FGD wastewater is currently comingled with non-CCR wastestreams in the Gypsum Recycle Pond and would require significant reconfiguration of piping and valves to segregate these flows and collect the FGD wastewater separately from the floor drains and trenches that collect wash water and other flows around the FGD areas. Once isolated, this flow would need to be pumped to the Mercury Effluent Treatment System and then captured in another set of tanks for treatment to remove the solids. Developed off-site alternative capacity would consist of both temporary on-site wet storage (frac tanks) and off-site transportation, via tanker trucks. Zimmer estimates that approximately 65 frac tanks would be required to provide the necessary settling time, accounting for reduced settling capacity and reduced residence time due to solid accumulation. Zimmer would also require 45 daily tanker trucks (~7,500 gallons per truck to maintain DOT weight restrictions) to haul the wastewater offsite, 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 increase 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.

Because Zimmer has now elected to permanently cease coal-fired operations of the boiler by no later than May 31, 2022, continuing to develop alternative disposal capacity for continued plant operations is counterproductive to the work to cease coal-fired operations of the boilers and close the impoundments. As long as Zimmer continues to wet handle the FGD waste, 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 Zimmer satisfy the demonstration requirement in § 257.103(f)(2)(i).

3.3 Non-CCR Wastestreams

Zimmer discharges non-contact cooling water, reclaim water, and cooling tower blowdown via Outfall 099, cooling tower overboard, sewage treatment plant, and south plant stormwater via Outfall 003, and sewage treatment flows and north plant stormwater via Outfall 004. The CCR surface impoundments, two other coal pile runoff ponds (A and B basins), a stormwater and river dredge pond (C Basin), and one low volume wastewater pond are used to manage all the remaining water process flows and stormwater on the plant site. These ponds are interconnected in series to allow for settling prior to overflowing to the Clear Water Pond for discharge to the Ohio River via Outfall 005. The existing site water balance is included in Appendix A of this demonstration (see Figure 2).

Zimmer evaluated each non-CCR wastestream placed in the Zimmer CCR surface impoundments. For the reasons discussed below in Table 3-2 and Table 3-3, each of the following non-CCR wastestreams must continue to be placed in the Gypsum Recycle Pond and Coal Pile Runoff Pond, respectively, due to lack of alternative capacity both on and off-site. The D Basin receives wastestreams during dredging of other impoundments onsite and will receive non-CCR wastestreams during closure/re-purposing of the Coal Pile Runoff Pond.

Table 3-2: Zimmer Gypsum Recycle Pond Non-CCR Wastestreams

Non-CCR Wastestream	Average Flow (MGD)	Alternative Capacity Currently Available? YES/NO	Description	Zimmer Notes
Stormwater runoff	Intermittent (0.76 estimated for 10-year 24-hour storm)	NO	Stormwater runoff from the FGD pad mix stackout pile	These flows are intermittent and collected in the impoundment via gravity drainage, where they comingle with CCR wastestreams listed in Table 3-1. Zimmer will need to employ temporary diversion measures to pump this water to the FGD stabilization area sump while the Gypsum Recycle Pond is being closed by removal. Once the Gypsum Recycle Pond has been closed by removal of CCR solids, it will be repurposed as a non-CCR basin and will continue to receive these flows until the site closure is completed.
Miscellaneous Process Wastewater	0.229	NO	Includes wash water from the truck wash system and drainage from the FGD Waste Handling Building, Coal Conveyor 56E/W, and Fly Ash Silo (via the trench system)	

Table 3-3: Zimmer Coal Pile Runoff Pond Non-CCR Wastestreams

Non-CCR Wastestream	Average Flow (MGD)	Alternative Capacity Currently Available? YES/NO	Description	Zimmer Notes
Coal Pile Runoff from A and B Basins	Intermittent (2.117 estimated for 10-year 24-hour storm)	NO	Flow is pumped from the Basins to the Coal Pile Runoff Pond which overflows to the Wastewater Pond	These flows will be temporarily rerouted to D Basin until while the Coal Pile Runoff Pond closure and re-purposing is completed. The D Basin effluent will need to be pumped to the Wastewater Pond. Rerouting flows will require installation of temporary piping. If the Coal Pile Runoff Pond were bypassed (without the temporary use of D Basin), the Wastewater Pond residence time would likely not provide adequate treatment to remove the coal fines and Zimmer would risk violating the discharge limits at Outfall 005.
Decant water and stormwater from C Basin	Intermittent (0.835 estimated for 10-year 24-hour storm)	NO		
Decant water and stormwater from D Basin	0.09 (1.95 estimated for 10-year 24-hour storm)	NO	Decant water flow is pumped from D Basin to the Coal Pile Runoff Pond during dredging operations and as needed due to stormwater	

Non-CCR Wastestream	Average Flow (MGD)	Alternative Capacity Currently Available? YES/NO	Description	Zimmer Notes
Landfill Leachate and Contact Stormwater	0.271 (0.967 estimated for 10-year 24-hour storm)	NO	Routed through the Mercury Effluent Treatment System	The Mercury Effluent Treatment System discharge (including CCR and non-CCR wastestreams) will be redirected to the D-Basin through temporary piping during closure of the Coal Pile Runoff Pond. This flow will be returned to the Coal Pile Runoff Pond after the CCR material is removed and the plant ceases operation on coal (FGD removed from service).

Zimmer did evaluate on-site, wet temporary storage options for each of the non-CCR wastestreams, in lieu of using the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin for the remainder of the plant operations. Based on our evaluation, we concluded the following:

- On-site alternative capacity is currently not available and would need to be developed for each of these six non-CCR wastestreams.
- Development of 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 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 (see Table 3-4) 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 increase 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. 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, Zimmer concludes that offsite disposal is not feasible for these flows at Zimmer at this time.

Table 3-4: Non-CCR Wastestream Offsite Disposal

Impoundment	Non-CCR Wastestreams	Estimated Flow (MGD)	No. of Frac Tanks required (21,000 gallons each)	No. of Trucks required per day (7,500 gallons each)
Gypsum Recycle Pond	Stormwater runoff	0 - 0.76 (for 10-year 24-hour storm)	0 - 37	0 - 102
	Miscellaneous Process Flows	0.229	0 - 11	0 - 31
Coal Pile Runoff Pond	Coal Pile Runoff from A and B Basins	0 - 2.117 (for 10-year 24-hour storm)	0 - 101	0 - 283
	Decant water and stormwater from C Basin	0 - 0.835 (for 10-year 24-hour storm)	0 - 40	0 - 112
	Decant water and stormwater from D Basin	0.09 - 1.95 (for 10-year 24-hour storm)	5 - 93	12 - 260
	Landfill Leachate and Contact Stormwater	0.271 - 0.967 (for 10-year 24-hour storm)	13 - 47	37 - 129
		Total	**18 - 329**	**49 - 917**

As stated previously, because Zimmer has elected to permanently cease coal-fired operations of the boilers by no later than May 31, 2022, continuing to develop alternative disposal capacity for continued plant operation is 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 Zimmer CCR surface impoundments due to lack of alternative capacity both on and off-site. Consequently, to continue to operate and generate electricity during the limited period prior to cessation of coal-fired operations, Zimmer must continue to use the CCR surface impoundments 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, Zimmer has prepared and attached a Risk Mitigation Plan for the Zimmer CCR surface impoundments (see Appendix B). 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 Zimmer facility includes four CCR units: the Gypsum Recycle Pond, the Coal Pile Runoff Pond, D Basin, and the CCR Landfill. The three impoundments are the only units seeking an extension pursuant to this demonstration; however, Zimmer has included compliance documents for the Landfill as part of this submittal for the Zimmer facility.

To demonstrate that the criteria in § 257.103(f)(2)(iii) has been met, Zimmer 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 Zimmer, 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. Zimmer’s CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

ZIMMER POWER COMPANY LLC

Cynthia E Vodg

Cynthia Vodopivec
SVP - Environmental Health & Safety
August 13, 2021

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), Zimmer has attached the following items to this demonstration (see Appendix C):

- Map(s) of groundwater monitoring well locations in relation to the CCR units (see Attachment C1 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Figure 2 for the CCR Landfill)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (see Attachment C2 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Attachment A for the CCR Landfill)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (see Attachment C3 for the surface impoundments and Attachment C5 Hydrogeological Characterization Report Figures 3 and 4 for the CCR Landfill)

5.3 Groundwater Monitoring Results - § 257.103(f)(2)(v)(C)(3)

Tables summarizing constituent concentrations at each groundwater monitoring well through the first 2021 semi-annual monitoring period are included as Attachment C4.

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 C5. In addition, see the Hydrogeological Characterization Report (Section 4.2) for relevant information pertaining to the CCR Landfill.

5.5 Corrective Measures Assessment - § 257.103(f)(2)(v)(C)(5)

Background sampling began at Zimmer in late 2015 and continued for eight consecutive quarters. The first semi-annual detection monitoring samples were collected in November 2017. The first assessment monitoring samples were collected in May 2018. The results, through the first 2021 semi-annual monitoring period, indicate all three CCR surface impoundments at Zimmer are currently in assessment monitoring, with no exceedances of the Appendix IV parameters.

The CCR Landfill has previously detected Lithium at Statistically Significant Levels (SSL), but the CCR Landfill remains in assessment monitoring due to successful Alternate Source Demonstrations (ASDs) from April and October 2019 that set forth the following lines of evidence.

1. Strontium isotopic ratios in groundwater near the CCR Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters.
2. Boron isotopic ratios in groundwater near the CCR Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters.

The groundwater sampling event in April 2020 also identified an SSL for Lithium at well MW-F. In accordance with the Statistical Analyses Plan, this well was resampled and after an evaluation of the analytical data, no SSL remained as set forth in an ASD completed in October 2020. The ASDs for the Zimmer Landfill are included as part of Attachment C4. The subsequent sampling events (September 2020 and March 2021) did not indicate any SSLs or the need for further ASDs.

Accordingly, an assessment of corrective measures and the associated remedy selection efforts are not currently required at the site.

5.6 Remedy Selection Progress Report - § 257.103(f)(2)(v)(C)(6)

As noted above, an assessment of corrective measures and the resulting remedy selection efforts are not currently required for the CCR units at Zimmer.

5.7 Structural Stability Assessment - § 257.103(f)(2)(v)(C)(7)

Pursuant to § 257.73(d), the initial structural stability assessment reports for the Coal Pile Runoff Pond, Gypsum Recycle Pond, and D Basin were prepared in October 2016, and are included as Attachment C6. As required for compliance, additional stability assessments will be completed in October 2021. Periodic structural stability assessments are not required for landfills.

5.8 Safety Factor Assessment - § 257.103(f)(2)(v)(C)(8)

Pursuant to § 257.73(e), the initial safety factor assessment reports for the Coal Pile Runoff Pond, Gypsum Recycle Pond, and D Basin were prepared in October 2016, and are included as Attachment C7. As required for compliance, additional safety factor assessments will be completed in October 2021. Periodic safety factor assessments are not required for landfills.

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 are included as in Appendix C as Attachment C8.

In order for a CCR surface impoundment less than 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, 2023. As discussed below, the boilers will cease coal-fired operations no later than May 31, 2022, and the CCR surface impoundments will be closed by removal and repurposed as non-CCR impoundments (to receive stormwater flows, landfill leachate, and/or other non-CCR wastestreams) prior to this October 17, 2023, deadline.

Table 6-1 summarizes the major tasks and durations associated with closing the CCR surface impoundments by removal. The CCR impoundments will be dewatered using a closely coordinated passive or gravity method. This method consists of the use of trenches excavated to lower the phreatic surface in the impoundment to obtain a stable ash surface to permit the safe excavation of ponded materials. 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 in potential for higher contaminants and TSS). After TSS settling, the water is discharged through the NPDES outfall in compliance with permitted limits.

While the water surface is being lowered, the CCR material can be further worked using mechanical methods, such as stacking the material, to promote additional dewatering prior to loading the material onto trucks and hauling it to the site CCR landfill for disposal. Once the CCR material is removed, the underlying pond liner and/or subgrade materials can be excavated and disposed of.

Table 6-1: Zimmer Impoundments Closure Schedule

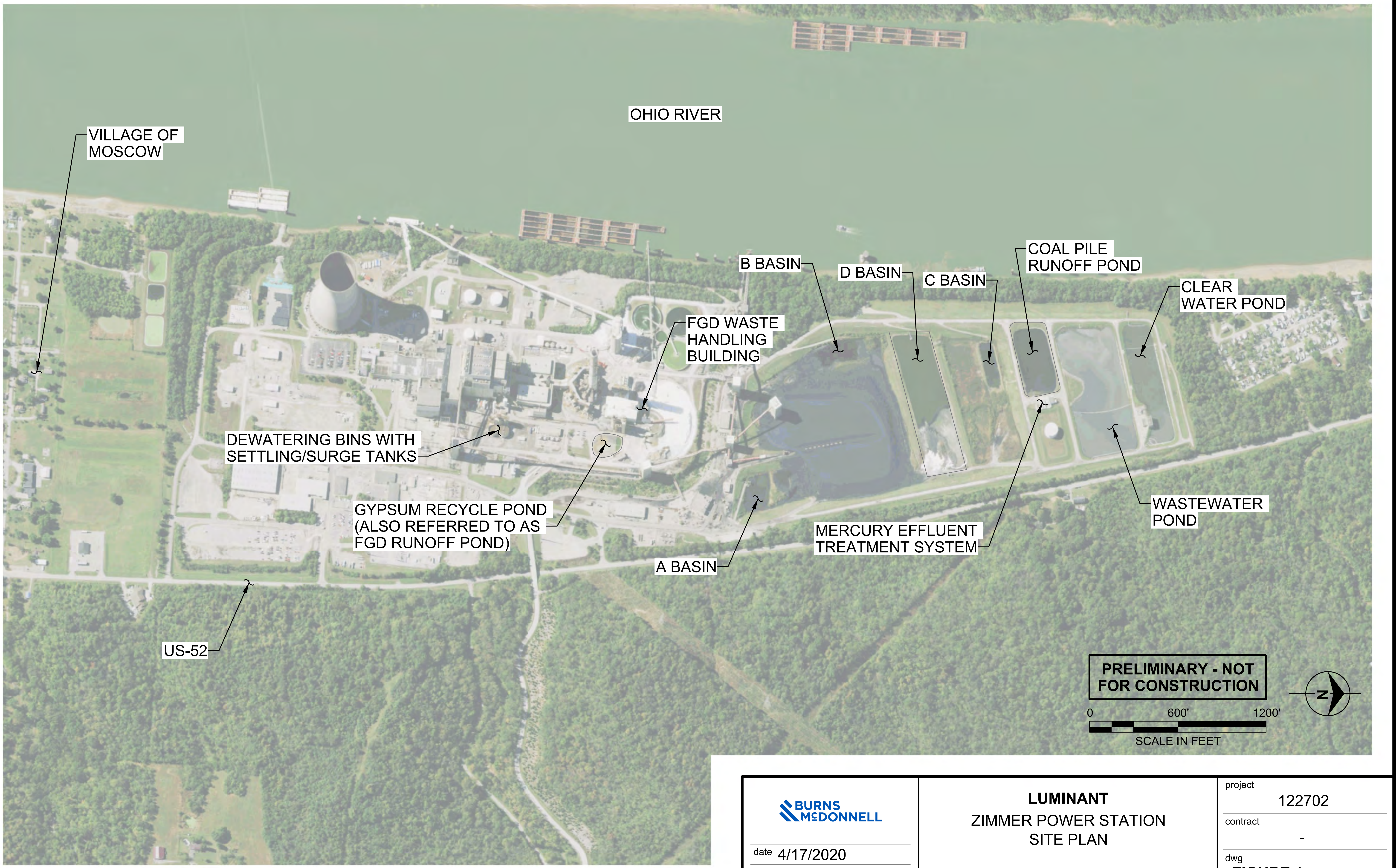
Action	Estimated Timeline (Months)
Finalize CCR unit closure plan	2
Obtain environmental permits: • State Waste Pollution Control Construction/Operating Permit • NPDES Industrial Wastewater Permit Modification (*modification would be required to allow the associated ponded and subsurface free liquids 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)	12 (concurrent with procurement activities)
Spec, Bid, and Award Construction Services for CCR Impoundment Closures	3
Cease Coal-Fired Operations of Boiler (No later than)	May 31, 2022
Cease Placement of Waste (No Later Than for initial impoundment in closure sequence. The impoundments will continue to receive stormwater, landfill leachate, and/or other non-CCR wastestreams following closure by removal and repurposing as non-CCR impoundments.)	October 17, 2022
Dewater Impoundments	1
Excavate CCR Material	6
Excavate Pond Liner/Underlying Subgrade Materials	2
Perform Site Restoration Activities and Complete Closure	3
Total Estimated Time to Complete Closure	26 months (including remaining design, permitting, procurement, and construction)
Date by Which Closure Must be Complete	October 17, 2023

7.0 CONCLUSION

Based upon the information included in and attached to this demonstration, Zimmer has demonstrated that the requirements of 40 C.F.R. § 257.103(f)(2) are satisfied for the Zimmer Plant's CCR surface impoundments (the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin). The CCR surface impoundments are needed to continue to manage the CCR and non-CCR wastestreams identified in Section 3.2 and 3.3 above, are less than 40 acres, the boilers at the plant will cease coal-fired operations no later than May 31, 2022, and the CCR surface impoundments will be closed by the October 17, 2023 deadline. Therefore, the CCR units qualify for the site-specific alternative deadline for the initiation of closure provided in 40 C.F.R. § 257.103(f)(2).

Therefore, it is requested that EPA approve Zimmer's request pursuant to 40 C.F.R. § 257.103(f)(4)(i) to transfer the current authorization for a site-specific alternative deadline for the three CCR surface impoundments at the Zimmer Plant from § 257.103(f)(1) to § 257.103(f)(2) so the impoundments may continue to receive CCR and non-CCR wastestreams and Zimmer may close the CCR surface impoundments by October 17, 2023, instead of retrofitting them for continued plant operations.

APPENDIX A – SITE PLAN AND WATER BALANCE DIAGRAM



BURNS McDONNELL

date 4/17/2020

designed A. MYERS

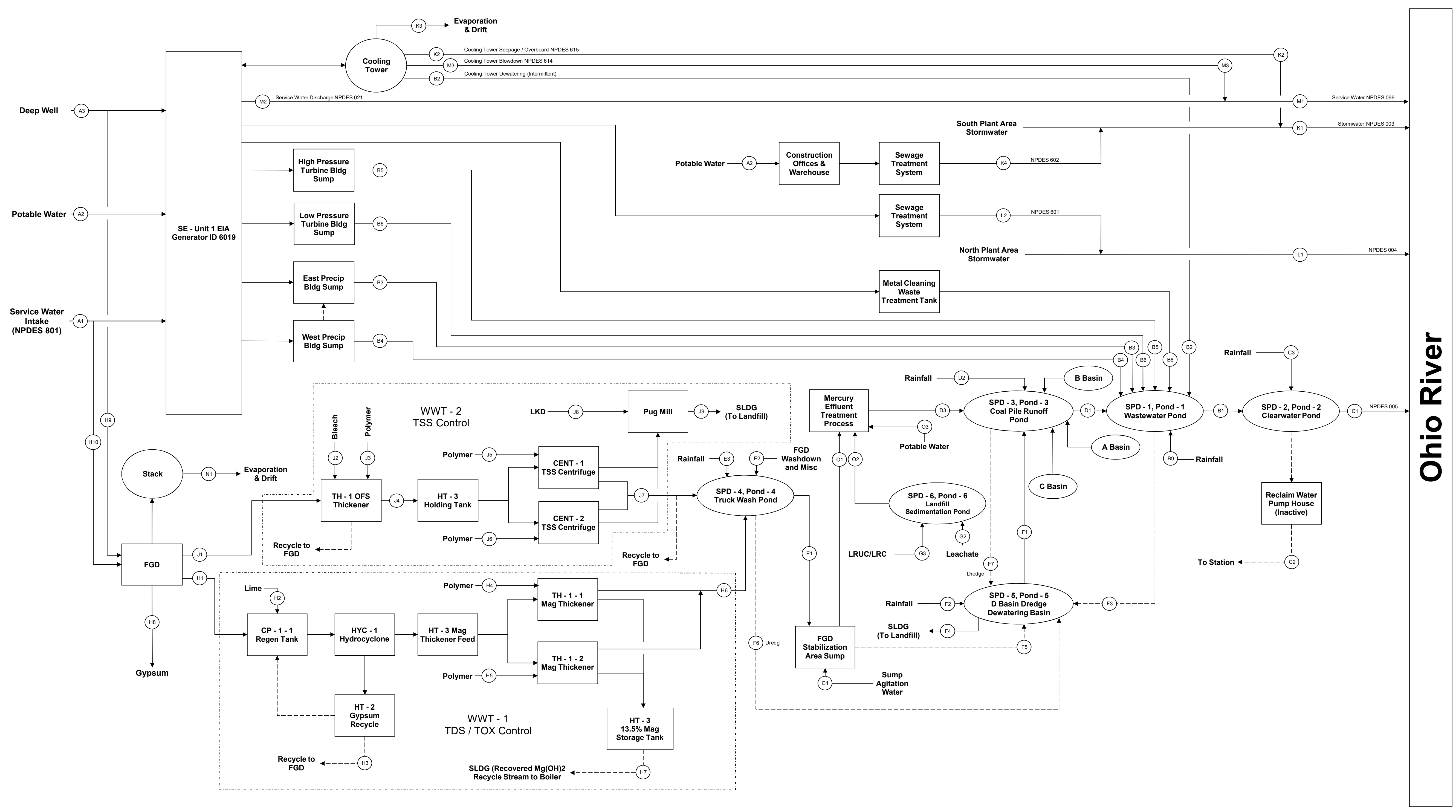
LUMINANT

ZIMMER POWER STATION
SITE PLAN

project 122702

contract -

dwg **FIGURE 1** -



Flow	Block Diagram Name	Station Name	MGD	Flow Data	Flow	Block Diagram Name	Station Name	MGD	Flow Data	Flow	Block Diagram Name	Station Name	MGD	Flow Data	EPA and Station Abbreviations
Label			Avg[1] / Max[2]	Avg	Label			Avg[1] / Max[2]	Avg	Label			Avg[1] / Max[2]	Avg	AHCW - Air Heater Cleaning Water
A1	NPDES801	Service Water Intake (Ohio River)	36.5	36,500,000 GPD 343 DPY		SPD - 4, Pond - 4	Truck Wash Pond			J1	WWT2 / SCRBP	Influent - OFS Thickener from Gypsum Clarifier[3]	0.457 / 0.471	457,000 GPD 340 DPY	CPR - Coal Pile Runoff
A2	Potable Water	Tate - Monroe Water Association	0.032 / 0.300	32,000 GPD 365 DPY	E1	Pond - 4 - EFF	Truck Wash Pond to Sump	0.566 / 0.782	566,000 GPD 340 DPY	J2		Bleach - Thickener	0.079	55 GPM 150 DPY	CTB - Cooling Tower Blowdown
A3	Deep Well	Station Well Water	1.85	1,850,000 GPD 365 DPY	E2	FDW	FGD Washdown and Misc.	0.229	160 GPM 340 DPY	J3		Polymer - Thickener		180 LB/DAY 323 DPY	EFF - Effluent
	SPD - 1, Pond - 1	Wastewater Pond			E3	GPR	Rainfall / Gypsum Pile Runoff	0 / 0.76	0 GPD	J4		Feed Tank - Centrifuge[3]	0.100 / 0.400	100,000 GPD 240 DPY	EVAP - Evaporation
B1	Pond - 1 - EFF	Wastewater Pond Discharge	4.29 / 13.85	4,293,000 GPD 365 DPY	E4		Sump Agitation Water			J5		Polymer - Centrifuge		298 LB/DAY 230 DPY	FDW - Floor Drain Wastewater
B2		Cooling Tower Dewatering (Intermittent)	0 / 2.88	0 GPD		SPD - 5, Pond - 5	D Basin			J6		Polymer - Centrifuge		298 LB/DAY 230 DPY	GPR - Gypsum Pile Runoff
B3	FDW	Sump - East Precipitator[3]	1.44 / 2.41	1,442,000 GPD 340 DPY	F1	Pond - 5 - EFF	D Basin Sump to Coal Pile Runoff	0.09 / 1.95	90,000 GPD 126 DPY	J7	WWT - 2 - EFF	Effluent - Centrifuge Centrate (Normally Recycled)[3]	0.075 / 0.243	75,000 GPD / 240 DPY	GR - General Runoff
B4	FDW	Sump - West Precipitator[3]		Not used during testing	F2	CPR	Coal Pile Rainfall	0 / 6.01	0 GPD	J8		LKD		60 TPD 240 DPY	HAUL - Hauled Off Site for Disposal
B5	AHCW/FDW	Sump - HP Turbine[3]	1.72 / 2.93	1,720,000 GPD 340 DPY	F3	SLDG	Dredge Sludge from WW Pond		128,000 WTPY	J9	LANDF	Sludge - Pug Mill		350 TPD 240 DPY	IXW - Ion Exchange Wastewater
B6	IXW/FDW	Sump - LP Turbine (Waste Collect Tank)[3]	0.169 / 1.058	169,000 GPD 340 DPY	F4	SLDG / LANDF	Dewatered Sludge		59,482 WTPY						LANDF - On Site Landfill
					F5		FGD Sump to Basin			K1	NPDES 003 / SW/YARDW	Stormwater Outfall - South Plant Area+615+602		34,400 GPD 10 DPY	LEACH - Leachate
B8	HAUL	Metal Cleaning Waste Tank (Not Used)		Inactive	F6		Dredge Sludge from Truck Wash Pond			K2	NPDES 615	Cooling Tower Seepage / Overboard		34,400 GPD 10 DPY	LKD - Lime Kiln Dust
B9	GR	Rainfall	0.03 / 1.02	30,000 GPD 126 DPY	F7		Dredge Sludge from Coal Pile Runoff Pond			K3	EVAP	Cooling Tower Evaporation and Drift	15.5	15,500,000 GPD 340 DPY	LRC - Landfill Runoff - Capped Landfill
	SPD - 2, Pond - 2	Clearwater Pond				SPD - 6, Pond - 6	Landfill Sedimentation Pond			K4	NPDES 602	Sanitary Construction Offices		400 GPD 365 DPY	LRUC - Landfill Runoff - Uncapped Landfill
C1	Pond-2-EFF / NPDES 005	Discharge to Ohio River	5.22 / 14.40	5,216,000 GPD	G2	LEACH	Leachate Collection[3]	0.193 / 0.239	193,000 GPD 365 DPY						MGD - Million Gallons per Day
C2		Reclaim Water Pump House		Inactive	G3	LRG / LRUC	Landfill Runoff	0.20016	200,160 GPD 126 DPY	L1	NPDES 004 / SW/YARDW	Stormwater Outfall - Main Plant Area+601	0.002	2,080 GPD 365 DPY	MGOH2 - Magnesium Hydroxide
C3		Rainfall	0 / 0.55	0 GPD			Wastewater Treatment Systems			L2	NPDES 601	Sanitary Main Plant	0.002	2,080 GPD 365 DPY	OFS - Inerts
	SPD - 3, Pond - 3	Coal Pile Runoff Pond			H1	WWT - 1 / SCRBP	Influent - Regen Tank from CRW Bleed[3]	0.296 / 0.353	296,000 GPD 340 DPY						RECYC - Recycle Flow
D1	Pond - 3 - EFF	Gravity Flow to Wastewater Pond	0.934	934,000 GPD 365 DPY	H2		Lime - Regen Tank[3]	0.076 / 0.096	76,000 GPD 340 DPY	M1	NPDES 099 / SW	Service Water Outfall Includes NPDES 021, 614	15.5	15,500,000 GPD 343 DPY	SCRBP - FGD Scrubber Purge
D2		Rainfall (Pond Area)	0.00 / 0.31	0 GPD	H3	RECYC - Gypsum	Recovered Gypsum	0.048	33 GPM 340 DPY	M2	NPDES 021	Service Water Discharge	12.1	12,100,000 GPD 343 DPY	SLDG - Sludge
D3		Mercury Treatment System to CPR Pond	0.844	844,000 GPD 365 DPY	H4		Polymer - Mag Thickener		0.432 GPD 340 DPY	M3	NPDES 614 / CTB	Cooling Tower Blowdown	3.37	3,300 GPM 17 HPD 270 DPY	SW - Discharge to Surface Water
					H5		Polymer - Mag Thickener		0.432 GPD 340 DPY	M4	NPDES 625	Reclaim Water		Inactive	WTPY - Wet Tons per Year
					H6	WWT - 1 - EFF	Effluent from Mag Thickener Overflow[3]	0.262 / 0.336	262,000 GPD 340 DPY						YARDW - Yard Drain Wastewater
					H7	RECYC - SLDG - MGOH2	Sludge from Mag Thickener Underflow	0.360	42 GPM 340 DPY	N1		Boiler and Stack Evaporation	4.55	4,553,000 GPD 340 DPY	
					H8	Gypsum	Gypsum (Total Produced)[4]	0.040	40,000 GPD 340 DPY5						
								-	566,600 WTPY	O1		FGD Sump to Mercury Treatment System[3]	0.566 / 0.782	566,000 GPD 340 DPY	
					H9		Gypsum Cake Wash and Pump Seal Water	0.360	250 GPM 340 DPY	O2		Landfill Sump to Mercury Treatment System[3]	0.271 / 0.967	271,000 GPD 126 DPY	
					H10		FGD Makeup	5.303	1,940 GPM 340 DPY	O3	Potable Water	Tate - Monroe Water Association	0.0072	5 GPM 365 DPY	

no.	date	by	ckd	description
A	5/24/17	DKE	KAB	Initial Issue
B	10/13/17	ZSF	AAE	Updated with Flow Data
C	9/24/18	DKE	BDH	Updated logo

NOTES:

1. Average flows are based on 30 day average.
2. Max flows are based on 10 year, 24 hour rain event.
3. Average and max flows of streams highlighted in grey were updated based on BMcD flow survey data.
4. Gypsum average daily water flow rate assumes previous value of 566,600 WTPY, at 10% moisture and 340 DPY.
5. Flow diagram is intended to depict plant typical daily flows and usage. Flow rates shown in diagram are not intended to balance. (Total flow in ≠ Total flow out)

PRELIMINARY

BURNS McDONNELL

date	detailed
5/23/2017	D. Elliott
designed	checked
D. Elliott	K. Bland

Luminant

Dynegy
Zimmer Station
Plant Water Flow Diagram

project 99477
contract
drawing **WMB-01** --- rev. **C**
sheet 1 of 1 sheets
file

APPENDIX B – 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, Zimmer Power Company LLC (Zimmer) has prepared this Risk Mitigation Plan for the Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin located at the William H. Zimmer Power Plant ("Zimmer Plant") in Ohio.

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. at 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, Zimmer plans to continue to mitigate the risks to human health and the environment from the Zimmer Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin 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 Gypsum Recycle Pond, Coal Pile Runoff Pond, and D Basin are CCR surface impoundments. Consistent with the requirements of the CCR rule, compliance documents on Zimmer's CCR public website reflect the characterization of these impoundments as individual units for purposes of groundwater monitoring and closure activities.

The Gypsum Recycle Pond receives centrifuge effluent, FGD blowdown that is not recycled back to the scrubber, and mag thickener overflow (FGD wastewater). This pond effluent is forwarded to the Mercury Effluent Treatment System via the FGD area sump. The Gypsum Recycle Pond surface impoundment is designed to handle runoff from the Flue Gas Desulfurization (FGD) waste/gypsum stackout area for the 10-year, 24-hour storm event. It also serves to collect solids washed off the FGD waste and gypsum hauling trucks at the truck wash station.

Coal Pile Runoff Pond receives treated flow (including CCR solids) from the Mercury Effluent Treatment System. The Coal Pile Runoff Pond surface impoundment handles storm water runoff from the coal pile basin; leachate discharged from Landfill, and treated FGD wastewater.

D Basin is used to dewater dredged CCR and non-CCR material from other impoundments onsite (including Gypsum Recycle Pond and Coal Pile Runoff Pond), and collects stormwater runoff.

At Zimmer, none of the Appendix IV parameter have reported SSLs, or SSLs above their respective Ground Water Protection Standards (GWPSs) as sampled and analyzed per the CCR surface impoundment's groundwater monitoring program. Therefore, Zimmer's current physical treatment operation adequately limits potential risks to human health and the environment during operation. Zimmer will continue this treatment process for the CCR surface impoundments until such time as closure is required per 40 CFR Part 257. The facility's current physical treatment process is discussed below.

1.1 CURRENT OPERATION OF PHYSICAL TREATMENT

The Zimmer Plant's fly ash, economizer ash, and gas recirculation ash systems are dry handled and disposed in the CCR landfill. The bottom ash (and non-CCR pyrites) is sluiced to dewatering bins equipped with surge tanks and a recirculation system. After dewatering, the bottom ash is disposed in the CCR landfill.

The FGD system utilizes a series of thickeners with rakes and centrifuges to remove suspended solids and a magnesium recovery process to remove dissolved solids from the effluent.

The Gypsum Recycle Pond receives centrate centrifuge effluent, FGD blowdown that is not recycled back to the scrubber, mag thickener overflow (FGD wastewater) and various wash activities. This pond effluent is forwarded to the Mercury Effluent Treatment System via the FGD area sump.

The Coal Pile Runoff Pond receives both coal fines from non-CCR wastestreams (specifically coal pile runoff) and the effluent from the Mercury Effluent Treatment System (including landfill leachate, FGD wastewater, and the CCR solids that settle out of the FGD wastewater).

D Basin is used to dewater dredged CCR and non-CCR material from other ponds onsite (including Gypsum Recycle Pond and Coal Pile Runoff Pond).

If Appendix IV releases are discovered per the facility's groundwater monitoring program, Zimmer will test, evaluate, and implement a chemical treatment method (i.e. pH adjustment, coagulation, precipitation, or other method as determined) for the effected CCR Impoundment to limit potential risks to human health and the environment during operation.

2 GROUNDWATER IMPACTS, RECEPTORS, AND POTENTIAL EXPOSURE MITIGATION - 40 C.F.R. § 257.101(F)(2)(V)(B)(2)

Descriptions of each unit are provided below.

Gypsum Recycle Pond

The Zimmer Gypsum Recycle Pond with a footprint of approximately 0.6 acres (Figure 1) is currently in assessment monitoring. There have been no statistically significant levels (SSLs) of Appendix IV parameter concentrations since assessment monitoring was established in May 2018. The most recent summary of groundwater monitoring activities is provided in the "2020 Annual Groundwater Monitoring and Corrective Action Report, Zimmer Gypsum Recycle Pond, Zimmer Power Station" (Ramboll, 2021) [see Attachment 1]. A summary of the assessment monitoring program is provided in Table 1. Since there have been no SSLs or GWPS exceedances to date, no plume delineation maps have been necessary.

Coal Pile Runoff Pond

The Zimmer Coal Pile Runoff Pond with a footprint of approximately 2.8 acres (Figure 2) is currently in assessment monitoring. There have been no SSLs of Appendix IV parameter concentrations since assessment monitoring was established in May 2018. The most recent summary of groundwater monitoring activities is provided in the "2020 Annual Groundwater Monitoring and Corrective Action Report, Zimmer Coal Pile Runoff Pond, Zimmer Power Station" (Ramboll, 2021) [see Attachment 1]. A summary of the assessment monitoring program is provided in Table 2. Since there have been no SSLs or GWPS exceedances to date, no plume delineation maps have been necessary.

D Basin

The Zimmer D Basin with a footprint of approximately 6.1 acres (Figure 3) is currently in assessment monitoring. There have been no SSLs of Appendix IV parameter concentrations since assessment monitoring was established in May 2018. The most recent summary of groundwater monitoring activities is provided in the "2020 Annual Groundwater Monitoring and Corrective Action Report, Zimmer D Basin, Zimmer Power Station" (Ramboll, 2021) [see Attachment 1]. A summary of the assessment monitoring program is provided in Table 3. Since there have been no SSLs or GWPS exceedances to date, no plume delineation maps have been necessary.

Receptors

Should a release to groundwater for one or more Appendix IV parameters occur in the future, the two primary risks to human health and the environment are via groundwater exposure and surface water exposure. Groundwater exposure would be via ingestion or dermal contact, neither of which are a complete exposure pathway for CCR-related constituents originating from the Gypsum Recycle Pond, Coal Pile Runoff Pond and D Basin. Surface water exposure would be from groundwater impacts to nearby surface water bodies – specifically the Ohio River located approximately 300 feet west of the Coal Pile Runoff Pond, 400 feet west of D Basin, and 2,450 feet (0.47 miles) west of the Gypsum Recycle Pond – but does not pose a risk for the reasons discussed below.

There are no surface-water intakes for community water supply (CWS) on the Ohio River identified within a one-mile radius of the Zimmer property line. An Ohio River Valley Water Sanitation Commission report from October 1998 indicates the nearest water supply intakes are located at river mile 407.8 upstream of the Zimmer Ponds in Maysville, KY; and, at river mile 462.8 downstream of the Pond System in the Cincinnati, OH metro area. The Zimmer ponds are located near river mile 444, meaning the nearest downstream intake is over 18 river miles away.

There are no potable industrial, commercial, CWS or non-CWS water wells in a downgradient or cross-gradient groundwater flow direction within 2,500 feet of the Zimmer Ponds that are at risk of impacts from a release. Groundwater near the Gypsum Recycle Pond may occasionally be within the radius of influence of Zimmer's industrial pumping wells located within the southern portion of the property. All groundwater pumped by the production wells are non-contact water and non-potable for industrial use only. Also, since there are currently no exceedances of GWPS(s) for Appendix IV parameters, no wells are at risk.

Ambient groundwater flow beneath Zimmer is generally westward towards the Ohio River. There is a secondary component of flow southward toward the Zimmer production wells, which is most evident during the dry season. This southerly component, resulting from the radius of influence of on-site production wells, is more evident at the Gypsum Recycle Pond, which is located further south and further from the Ohio River than the Coal Pile Runoff Pond and D Basin. The third component of flow is from the river eastward back into the aquifer when the river stage is high. The hydraulic gradient under normal ambient conditions is westward across the site at approximately 0.003 ft/ft in summer and 0.004 ft/ft in fall, suggesting a flow rate of approximately 1.5 ft/day.

Exposure Mitigation

Mitigation of future potential exposures to groundwater contamination from continued operation of the Gypsum Recycle Pond, the Coal Pile Runoff Pond and D Basin is discussed in detail in the following section.

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 future potential impacted groundwater associated with the Zimmer Gypsum Recycle Pond, Coal Pile Runoff Pond and D Basin are based on impacts to the Uppermost Aquifer. The Uppermost Aquifer consists primarily of coarse alluvial deposits (sand and gravel) of the Ohio River valley overlain by fine-grained fluvial and lacustrine deposits (clay and silt), which occur to a maximum depth of 45 feet below the present ground surface. The Uppermost Aquifer is underlain by bedrock, which ranges in depth from 60 to 90 feet below the ground surface.

Since there has been no release of Appendix IV parameters to groundwater above GWPS(s), which would trigger a Corrective Measures Assessment (CMA) under 40 C.F.R. § 257.96 based on specific parameter concentrations and contaminant plume dimensions, several options are evaluated to address potential future plume containment. The evaluation criteria for assessing remedial options 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.

Although future potential source control measures (e.g. closure in place, closure by removal to on-site or off-site landfill, in-situ solidification/stabilization) to mitigate groundwater impacts are typically considered as part of a CMA process, the shorter-term options considered for mitigating groundwater impacts relative to a potential future release of one or more Appendix IV parameters at Zimmer are as follows:

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

These same groundwater remedial corrective measures will be evaluated for all Appendix IV parameters that present a future risk to human health or the environment.

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

Upon notification of a release of one or more Appendix IV parameter(s) to groundwater, MNA will be 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.

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.

Groundwater Extraction

This corrective measure includes installation of a series of 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 model, and aquifer test if a well system is the best option for intercepting the groundwater contaminant plume. Upon notification of an SSL exceedance of a GWPS for one or more Appendix IV parameters an aquifer test will be conducted, and groundwater model developed for designing a groundwater extraction system for optimization of contaminant plume capture.

A schematic of a typical groundwater extraction well is shown on Figure 4. Based on site specific hydrogeology and future potential plume width and depth, a groundwater extraction system will typically 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.

Groundwater Cutoff Wall

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 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 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. For a cutoff wall to be technically feasible, there must be a low-permeability lower confining layer into which the barrier can be keyed, and it must be at a technically feasible depth.

Permeable Reactive Barrier

Chemical 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).

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.

In-Situ Chemical Treatment

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 and molybdenum. Implementation of in-situ chemical treatment requires detailed technical analysis of field hydrogeological and geochemical conditions along with laboratory studies.

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.

3.1 CONTAINMENT PLAN

Based on the options evaluated for containment of a future potential groundwater contaminant plume originating from one of the three CCR impoundments at the Zimmer Plant for one or more Appendix IV parameters exceeding their GWPS(s), the most viable short-term option of those evaluated is a groundwater extraction or recovery trench system, which would allow for capture of impacted groundwater and prevention of further plume migration towards the principal receptor, which has been identified as surface water of the Ohio River to the west.

In circumstances where there is not an immediate concern of endangerment to human health or the environment, other longer-term corrective measures may be more viable. The principal method under consideration for controlling potential future Appendix IV parameter releases is MNA. MNA is a potentially viable corrective measure that will be further evaluated for use at the Zimmer impoundments.

Depending on the location and plume geometry of any future potential Appendix IV exceedances of GWPSs, the specific parameter(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 in-situ chemical treatment – are all secondary remedial alternatives available for consideration following the current primary options of groundwater extraction for short-term application and MNA for long-term application.

4 REFERENCES

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USEPA, 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. Directive No. 9200.U-17P. Washington, D.C.: EPA, Office of Solid Waste and Emergency Response.

USEPA, 2007. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume 1 – Technical Basis for Assessment. EPA/600/R-07/139. National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. October 2007.

USEPA, 2015. Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites. Directive No. 9283.1-36. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. August 2015.

TABLES

Table 1 - Assessment Monitoring Program Summary, Gypsum Recycle Pond

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
May 8-9, 2018	July 10, 2018	Appendix III Appendix IV	NA	NA	NA	NA
September 27, 2018	October 8, 2018	Appendix III Appendix IV Detected[1]	None	January 7, 2019	NA	NA
March 13-14, 2019	May 2, 2019	Appendix III Appendix IV	None	July 31, 2019	NA	NA
September 11-12, 2019	October 16, 2019	Appendix III Appendix IV Detected[1]	None	January 14, 2020	NA	NA
April 9-10, 2020	April 27, 2020	Appendix III Appendix IV	None	July 27, 2020	NA	NA
September 16-17, 2020	October 31, 2020	Appendix III Appendix IV Detected[1]	None	January 29, 2021	NA	NA
March 22, 2021	April 14, 2021	Appendix III Appendix IV	None	July 13, 2021	NA	NA

[O: RAB 8/1/21; C: EJT 8/2/21]

Notes:

CMA = Corrective Measures Assessment

NA = Not Applicable

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).

Table 2 - Assessment Monitoring Program Summary, Coal Pile Runoff Pond

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
May 8-9, 2018	July 10, 2018	Appendix III Appendix IV	NA	NA	NA	NA
September 19, 27, 2018	October 8, 2018	Appendix III Appendix IV Detected[1]	None	January 7, 2019	NA	NA
March 14-15, 2019	April 29, 2019	Appendix III Appendix IV	None	July 29, 2019	NA	NA
September 11-12, 2019	October 16, 2019	Appendix III Appendix IV Detected[1]	None	January 14, 2020	NA	NA
April 9-10, 2020	April 30, 2020	Appendix III Appendix IV	None	July 29, 2020	NA	NA
September 16, 2020	October 19, 2020	Appendix III Appendix IV Detected[1]	None	January 17, 2021	NA	NA
March 22-23, 2021	April 14, 2021	Appendix III Appendix IV	None	July 13, 2021	NA	NA

[O: RAB 8/1/21; C: EJT 8/2/21]

Notes:

CMA = Corrective Measures Assessment

NA = Not Applicable

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).

Table 3 - Assessment Monitoring Program Summary, D Basin

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
May 8-9, 2018	July 10, 2018	Appendix III Appendix IV	NA	NA	NA	NA
September 19, 27, 2018	October 8, 2018	Appendix III Appendix IV Detected[1]	None	January 7, 2019	NA	NA
March 14, 2019	May 2, 2019	Appendix III Appendix IV	None	July 31, 2019	NA	NA
September 11, 2019	October 16, 2019	Appendix III Appendix IV Detected[1]	None	January 14, 2020	NA	NA
April 9, 2020	May 6, 2020	Appendix III Appendix IV	None	August 4, 2020	NA	NA
September 16-17, 2020	October 19, 2020	Appendix III Appendix IV Detected[1]	None	January 17, 2021	NA	NA
March 22-23, 2021	April 14, 2021	Appendix III Appendix IV	None	July 13, 2021	NA	NA

[O: RAB 8/1/21; C: EJT 8/2/21]

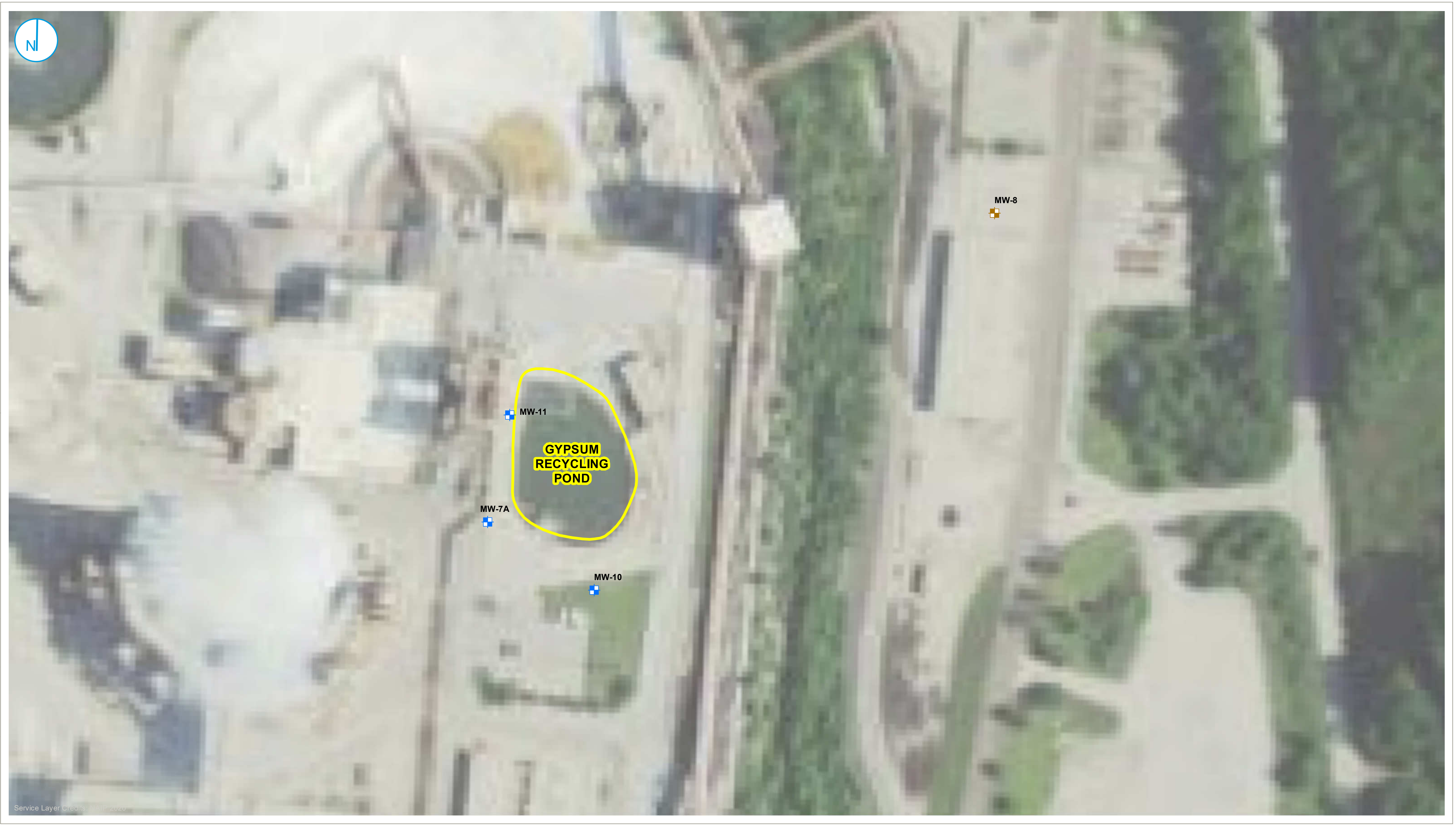
Notes:

CMA = Corrective Measures Assessment

NA = Not Applicable

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).

FIGURES



Y:\Mapping\Projects\22\2285\MXD\2020_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_GRP.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarnmc

✚	BACKGROUND MONITORING WELL LOCATION
✚	DOWNGRADIENT MONITORING WELL LOCATION
▭	CCR MONITORED UNIT

0 50 100 Feet

MONITORING WELL LOCATION MAP
ZIMMER GYPSUM RECYCLING POND
UNIT ID:124

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER PLANT
MOSCOW, OHIO

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\2020_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_CPRP.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarnmc

Service Layer Credits: NAIP 2020

- BACKGROUND MONITORING WELL LOCATION
- DOWNGRADIENT MONITORING WELL LOCATION
- CCR MONITORED UNIT

0 100 200 Feet

MONITORING WELL LOCATION MAP
ZIMMER COAL PILE RUNOFF POND
UNIT ID:125

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER PLANT
MOSCOW, OHIO

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\2020_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_DBasin.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarnmc

🟧 BACKGROUND MONITORING WELL LOCATION

🟦 DOWNGRADIENT MONITORING WELL LOCATION

🟨 CCR MONITORED UNIT

0 175 350
Feet

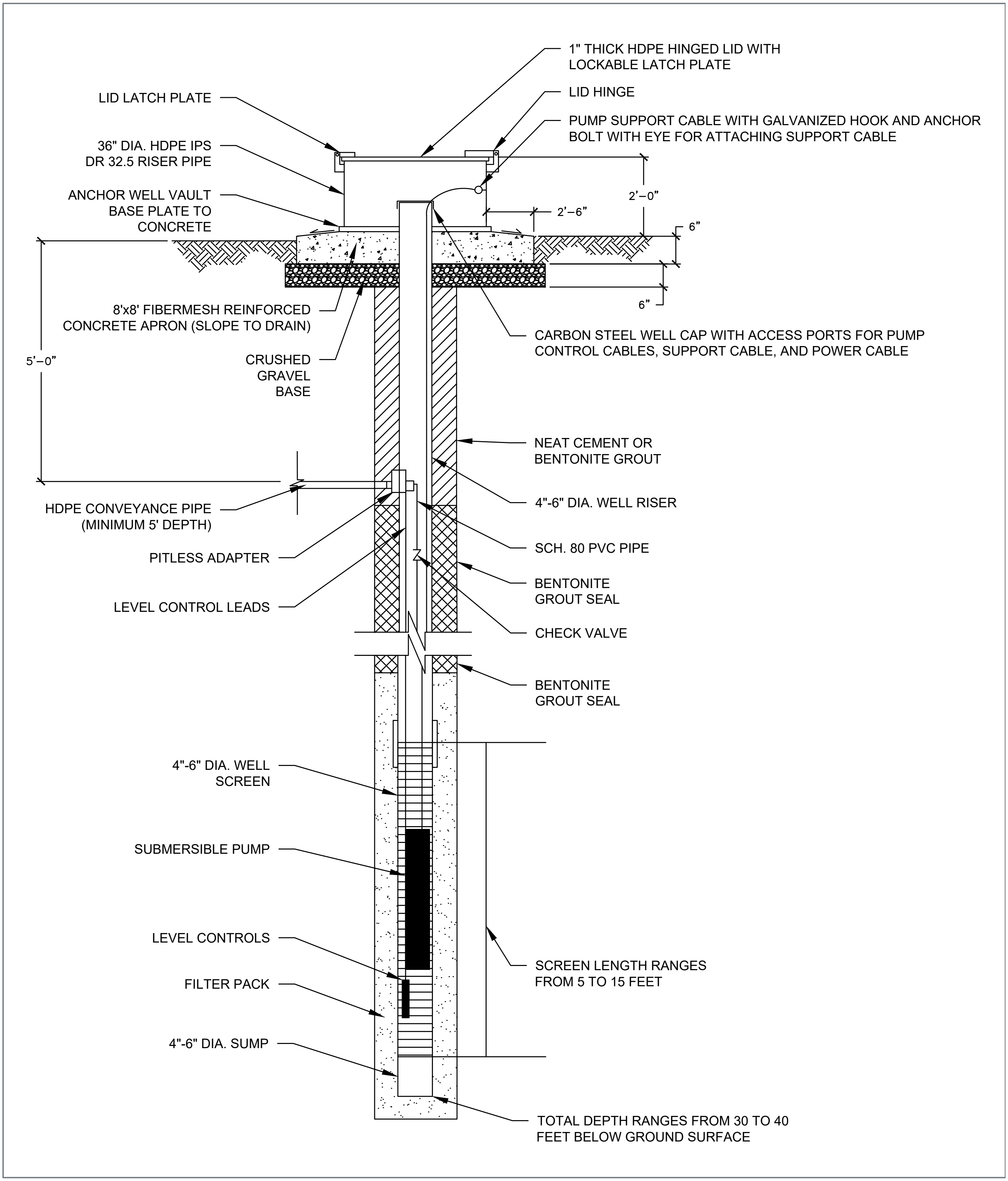
MONITORING WELL LOCATION MAP
ZIMMER D BASIN
UNIT ID:121

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER PLANT
MOSCOW, OHIO

FIGURE 3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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



NOTES

1. NOT TO SCALE

TYPICAL HYDRAULIC GRADIENT CONTROL WELL DETAIL

FIGURE 4

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Zimmer Power Company LLC

ZIMMER GRP, CPRP & D BASIN
MOSCOW, OHIO

ATTACHMENT 1

Prepared for
Dynegy Zimmer, LLC

Date
January 31, 2021

Project No.
1940074924

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER GYPSUM RECYCLE POND, ZIMMER POWER STATION

Bright ideas. Sustainable change.

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER GYPSUM RECYCLE POND, ZIMMER POWER STATION

Project name	**Zimmer Power Station**
Project no.	**1940074924**
Recipient	**Dynegy Zimmer, LLC**
Document type	**Annual Groundwater Monitoring and Corrective Action Report**
Version	**FINAL**
Date	**January 31, 2021**
Prepared by	**Kristen L. Theesfeld**
Checked by	**Nikki M. Pagano, PE**
Approved by	**Lauren D. Cook**
Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Kristen L. Theesfeld
Hydrogeologist

Nikki M. Pagano, PG
Senior Managing Engineer

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2. Monitoring and Corrective Action Program Status **6**
3. Key Actions Completed in 2020 **7**
4. Problems Encountered and Actions to Resolve the Problems **9**
5. Key Activities Planned for 2021 **10**
6. References **11**

TABLES (IN TEXT)

Table A 2019-2020 Assessment Monitoring Program Summary

TABLES (ATTACHED)

Table 1 Analytical Results – Groundwater Elevation and Appendix III Parameters
Table 2 Analytical Results – Appendix IV Parameters
Table 3 Statistical Background Values
Table 4 Groundwater Protection Standards

FIGURES

Figure 1 Monitoring Well Location Map

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
CMA	Corrective Measures Assessment
GRP	Gypsum Recycle Pond
GWPS	Groundwater Protection Standard
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.90(e) for Zimmer Gypsum Recycle Pond (GRP) located at Zimmer Power Station near Moscow, Ohio.

Groundwater is being monitored at Zimmer GRP in accordance with the Assessment Monitoring Program requirements specified in 40 C.F.R. § 257.95. Assessment Monitoring was initiated at Zimmer GRP on April 9, 2018.

No changes were made to the monitoring system in 2020 (no wells were installed or decommissioned).

No Statistically Significant Levels (SSLs) of 40 C.F.R. Part 257 Appendix IV parameters were determined. Consequently, a Corrective Measures Assessment (CMA) is not required and Zimmer GRP remains in the Assessment Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions Inc. (Ramboll) on behalf of Dynegy Zimmer, LLC, to provide the information required by 40 C.F.R.§ 257.90(e) for Zimmer GRP located at Zimmer Power Station near Moscow, Ohio.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection Monitoring or Assessment Monitoring Programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring in addition to identifying the constituent(s) detected at a Statistically Significant Increase [SSI] relative to background levels).
5. Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.
6. A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:
    i. At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    ii. At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    iii. If it was determined that there was a SSI over background for one or more constituents listed in Appendix III of §257 pursuant to §257.94(e):
        A. Identify those constituents listed in Appendix III of §257 and the names of the monitoring wells associated with the SSI(s).

B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

iv. If it was determined that there was a SSL above the Groundwater Protection Standard (GWPS) for one or more constituents listed in Appendix IV of §257 pursuant to §257.95(g) include all of the following:

A. Identify those constituents listed in Appendix IV of §257 and the names of the monitoring wells associated with the SSL(s).

B. Provide the date when the CMA was initiated for the CCR unit.

C. Provide the date when the public meeting was held for CMA for the CCR unit.

D. Provide the date when the CMA was completed for the CCR unit.

v. Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection.

vi. Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.

This report provides the required information for Zimmer GRP for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the Monitoring Program status in calendar year 2020, and Zimmer GRP remains in the Assessment Monitoring Program in accordance with 40 C.F.R. § 257.95.

3. KEY ACTIONS COMPLETED IN 2020

The Assessment Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in Figure 1. No changes were made to the monitoring system in 2020. In general, one groundwater sample was collected from each background and downgradient well during each monitoring event. All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (AECOM, 2017). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2020, and analytical results for the September 2019 sampling event, are presented in Tables 1 and 2. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017) to determine any SSLs of Appendix IV parameters over GWPSs.

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

Table A – 2019-2020 Assessment Monitoring Program Summary

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s)	SSL(s) Determination Date
September 11 - 12, 2019	October 16, 2019	Appendix III Appendix IV Detected [1]	none	January 14, 2020
April 9 - 10, 2020	April 27, 2020	Appendix III Appendix IV	none	July 27, 2020
September 16-17, 2020	October 31, 2020	Appendix III Appendix IV Detected [1]	TBD	TBD

Notes:

NA: Not Applicable

TBD: To Be Determined

1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. § 257.95(d)(1).

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2020. Groundwater samples were collected and analyzed in accordance with the Sampling and Analysis Plan (AECOM, 2017), and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continuation of the Assessment Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2021.
- Complete evaluation of analytical data from the downgradient wells, using GWPSs to determine whether an SSL of Appendix IV parameters has occurred.
- If an SSL is identified, potential alternate sources (*i.e.*, a source other than the CCR unit caused the SSL or that that SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is demonstrated to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL determination and included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.
  - If an alternate source(s) is not identified to be the cause of the SSL, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 (*e.g.*, assessment of corrective measures) as may apply in 2021 will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

AECOM, 2017, Sampling and Analysis Plan, CCR Rule Groundwater Monitoring, Gypsum Recycle Pond, Unit 124, Zimmer Power Station, Moscow, Ohio, Job Number: 60442412, Revision 0, October 17, 2017.

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

TABLES

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
124 - GYPSUM RECYCLE POND
MOSCOW, OH

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft)	Groundwater Elevation (ft NAVD88)	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
				6020A	6020A	6020A	6020A	9251	9214	SM4500 H+B	9036	SM 2540C
MW-7A Downgradient	38.869036	-84.227563	9/11/2019	53.72	458.07	3.38	159	62.8	<1	7.3	376	912
			4/10/2020			2.43	156	62.8	<0.15	7.2	366	876
			9/17/2020	54.82	456.97	3.26	148	66.4	<0.15	6.9	397	974
MW-8 Background	38.86994583	-84.22557183	9/10/2019	52.51	459.09							
			9/11/2019			<0.08	129	34	<1	6.8	59.5	508
			4/9/2020	41.15	470.45	<0.03	122	16	<0.15	6.8	65.2	421
			9/16/2020	53.62	457.98	0.0434	122	13.8	<0.15	7.0	67.2	473
MW-10 Downgradient	38.86885	-84.22711983	9/10/2019	52.97	459.21							
			9/12/2019			2.79	140	73.3	1.41	6.8	513	1100
			4/9/2020	42.44	469.74							
			4/10/2020			4.38	108	60.5	1.92	7.3	372	845
			9/16/2020	54.85	457.33							
			9/17/2020			2.03	94.6	55	1.63	7.1	289	735
MW-11 Downgradient	38.868625	-84.227203	9/10/2019	50.06	458.81							
			9/12/2019			0.45	119	45.1	<1	6.9	145	590
			4/9/2020	39.66	469.21							
			4/10/2020			0.719	110	48.9	0.17	7.4	135	510
			9/16/2020	51.61	457.26							
			9/17/2020			0.395	85.4	31.7	0.184	7.2	107	427

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
4-digit numbers below parameter represent SW-846 analytical methods and alpha-numeric values that begin with SM represent Standard Methods for the Examination of Water and Wastewater.

TABLE 2.
ANALYTICAL RESULTS - APPENDIX IV PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER POWER STATION
124 - GYPSUM RECYCLE POND
MOSCOW, OH

Well ID	**Date**	**Antimony, total** 6020A	**Arsenic, total** 6020A	**Barium, total** 6020A	**Beryllium, total** 6020A	**Cadmium, total** 6020A	**Chromium, total** 6020A	**Cobalt, total** 6020A	**Fluoride, total** 6020A	**Lead, total** 6020A	**Lithium, total** 6020A	**Mercury, total** 7470A	**Molybdenum, total** 6020A	**Radium-226 + Radium 228,** 6020A	**Selenium, total** 6020A	**Thallium, total** 6020A
MW-7A Downgradient	9/11/2019		<0.001	0.0458		<0.001	<0.002	0.00101	<1	<0.001	0.0124		<0.005	0.436	<0.005	
	4/10/2020	<0.004	<0.002	0.0371	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	<0.002	<0.0002	<0.005	0.785	0.00204	<0.002
	9/17/2020		<0.002	0.04		<0.001	<0.002	<0.002	<0.15	<0.005	0.0031		<0.005	0.43	0.0027	
MW-8 Background	9/11/2019		<0.001	0.0552	<0.001		0.00206	<0.0005	<1	<0.001	0.00754		<0.005	0.261	<0.005	
	4/9/2020	<0.004	<0.002	0.046	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
	9/16/2020		<0.002	0.0452	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00612		<0.005	0.0611	<0.002	
MW-10 Downgradient	9/12/2019		0.00501	0.0127		<0.001	<0.002	0.00464	1.41	<0.001	0.0144		0.0105	0.336	<0.005	
	4/10/2020	<0.004	0.00201	<0.02	<0.002	<0.001	<0.002	<0.002	1.92	<0.005	0.00934	<0.0002	0.00628	1.29	<0.002	<0.002
	9/17/2020		0.00241	<0.02		<0.001	<0.002	<0.002	1.63	<0.005	0.00856		<0.005	0.107	<0.002	
MW-11 Downgradient	9/12/2019		0.00109	0.0493		<0.001	<0.002	0.00136	<1	<0.001	0.00609		<0.005	0.105	<0.005	
	4/10/2020	<0.004	<0.002	0.0443	<0.002	<0.001	<0.002	<0.002	0.17	<0.005	<0.002	<0.0002	<0.005	0.955	<0.002	<0.002
	9/17/2020		<0.002	0.0329		<0.001	<0.002	<0.002	0.184	<0.005	<0.002		<0.005	1.26	<0.002	

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
NA = Not Analyzed
pCi/L = picoCuries per liter
< = concentration is less than concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Levels (SSLs) over Groundwater Protection Standards.
4-digit numbers below parameter represent SW-846 analytical methods and 3-digit numbers represent Clean Water Act analytical methods.

TABLE 3.
STATISTICAL BACKGROUND VALUES
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
124 - GYPSUM RECYCLE POND
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	Statistical Background Value (UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.09
Calcium (mg/L)	169
Chloride (mg/L)	42.17
Fluoride (mg/L)	0.106
pH (S.U.)	6.5 / 7.8
Sulfate (mg/L)	72.7
Total Dissolved Solids (mg/L)	578

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

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

TABLE 4.

GROUNDWATER PROTECTION STANDARDS

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER POWER STATION
124 - GYPSUM RECYCLE POND
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	Groundwater Protection Standard[1]
40 C.F.R. Part 257 Appendix IV	
Antimony (mg/L)	0.006
Arsenic (mg/L)	0.010
Barium (mg/L)	2
Beryllium (mg/L)	0.004
Cadmium (mg/L)	0.005
Chromium (mg/L)	0.10
Cobalt (mg/L)	0.006
Fluoride (mg/L)	4
Lead (mg/L)	0.015
Lithium (mg/L)	0.040
Mercury (mg/L)	0.002
Molybdenum (mg/L)	0.10
Radium 226+228 (pCi/L)	5
Selenium (mg/L)	0.05
Thallium (mg/L)	0.002

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

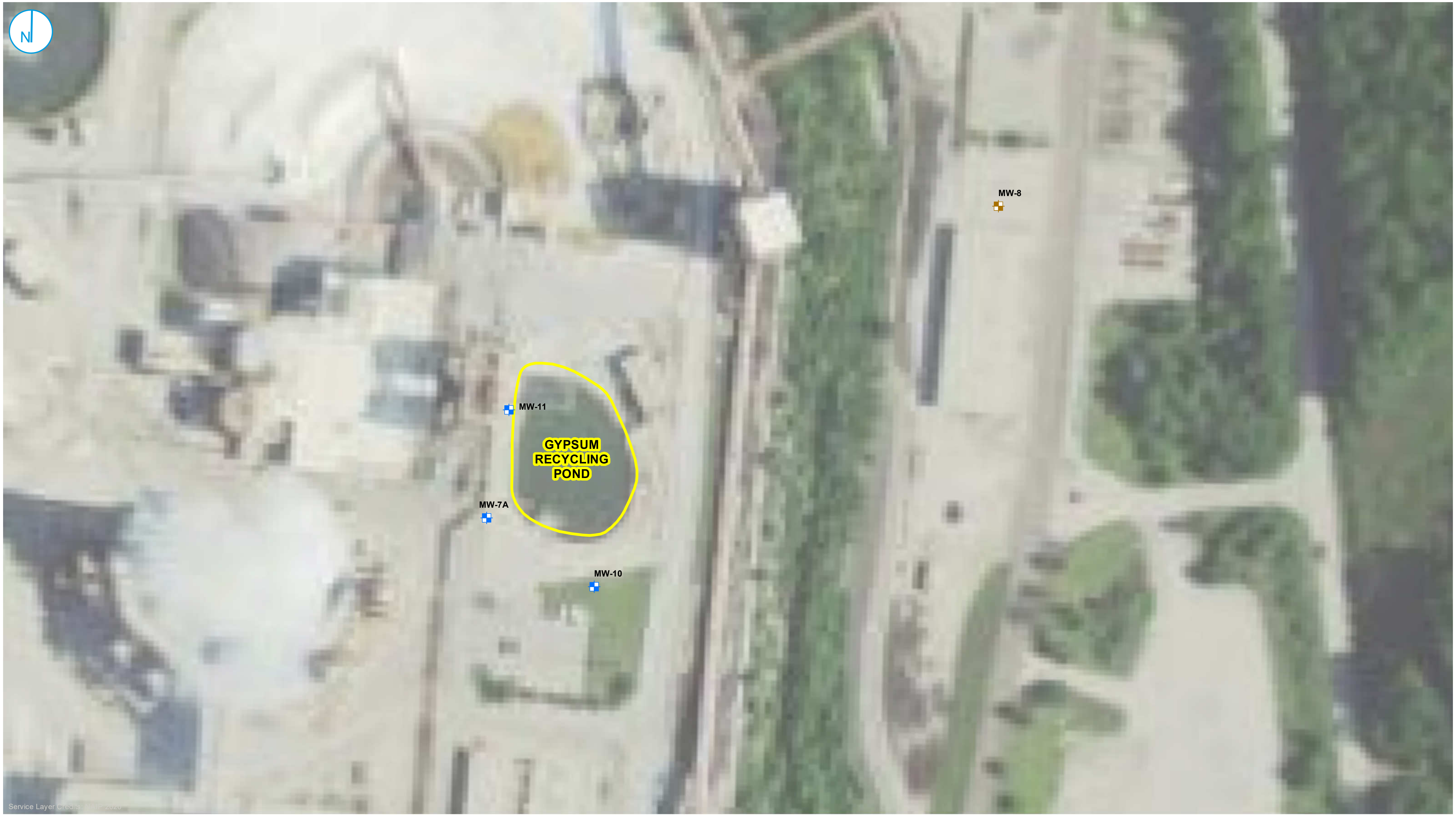
Notes:

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

FIGURES

Y:\Mapping\Projects\22\2285\MXD\2020_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_GRP.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarnmc



⊞ BACKGROUND MONITORING WELL LOCATION

⊞ DOWNGRADIENT MONITORING WELL LOCATION

□ CCR MONITORED UNIT

0 50 100 Feet

MONITORING WELL LOCATION MAP
ZIMMER GYPSUM RECYCLING POND
UNIT ID:124

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

Prepared for
Dynegy Zimmer, LLC

Date
January 31, 2021

Project No.
1940074924

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER COAL PILE RUNOFF POND, ZIMMER POWER STATION

RAMBOLL Bright ideas. Sustainable change.

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER COAL PILE RUNOFF POND, ZIMMER POWER STATION

Project name	**Zimmer Power Station**
Project no.	**1940074924**
Recipient	**Dynegy Zimmer, LLC**
Document type	**Annual Groundwater Monitoring and Corrective Action Report**
Version	**FINAL**
Date	**January 31, 2021**
Prepared by	**Kristen L. Theesfeld**
Checked by	**Nikki M. Pagano, PE**
Approved by	**Lauren D. Cook**
Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Kristen L. Theesfeld
Hydrogeologist

Nikki M. Pagano, PG
Senior Managing Engineer

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2. Monitoring and Corrective Action Program Status **6**
3. Key Actions Completed in 2020 **7**
4. Problems Encountered and Actions to Resolve the Problems **9**
5. Key Activities Planned for 2021 **10**
6. References **11**

TABLES (IN TEXT)

Table A 2019-2020 Assessment Monitoring Program Summary

TABLES (ATTACHED)

Table 1 Analytical Results – Groundwater Elevation and Appendix III Parameters
Table 2 Analytical Results – Appendix IV Parameters
Table 3 Statistical Background Values
Table 4 Groundwater Protection Standards

FIGURES

Figure 1 Monitoring Well Location Map

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
CCR	Coal Combustion Residuals
CMA	Corrective Measures Assessment
CPRP	Coal Pile Runoff Pond
GWPS	Groundwater Protection Standard
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.90(e) for Zimmer Coal Pile Runoff Pond (CPRP) located at Zimmer Power Station near Moscow, Ohio.

Groundwater is being monitored at Zimmer CPRP in accordance with the Assessment Monitoring Program requirements specified in 40 C.F.R. § 257.95. Assessment Monitoring was initiated at Zimmer CPRP on April 9, 2018.

No changes were made to the monitoring system in 2020 (no wells were installed or decommissioned).

No Statistically Significant Levels (SSLs) of 40 C.F.R. Part 257 Appendix IV parameters were determined. Consequently, a Corrective Measures Assessment (CMA) is not required and Zimmer CPRP remains in the Assessment Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions Inc. (Ramboll) on behalf of Dynegy Zimmer, LLC, to provide the information required by 40 C.F.R.§ 257.90(e) for Zimmer CPRP located at Zimmer Power Station near Moscow, Ohio.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection Monitoring or Assessment Monitoring Programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring in addition to identifying the constituent(s) detected at a Statistically Significant Increase [SSI] relative to background levels).
5. Other information required to be included in the Annual Report as specified in §§ 257.90 through 257.98.
6. A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:
    i. At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    ii. At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    iii. If it was determined that there was a SSI over background for one or more constituents listed in Appendix III of §257 pursuant to §257.94(e):
        A. Identify those constituents listed in Appendix III of §257 and the names of the monitoring wells associated with the SSI(s).
        B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

iv. If it was determined that there was a SSL above the Groundwater Protection Standard (GWPS) for one or more constituents listed in Appendix IV of §257 pursuant to §257.95(g) include all of the following:

   A. Identify those constituents listed in Appendix IV of §257 and the names of the monitoring wells associated with the SSL(s).

   B. Provide the date when the CMA was initiated for the CCR unit.

   C. Provide the date when the public meeting was held for CMA for the CCR unit.

   D. Provide the date when the CMA was completed for the CCR unit.

v. Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection.

vi. Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.

This report provides the required information for Zimmer CPRP for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the Monitoring Program status in calendar year 2020, and Zimmer CPRP remains in the Assessment Monitoring Program in accordance with 40 C.F.R. § 257.95.

3. KEY ACTIONS COMPLETED IN 2020

The Assessment Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in Figure 1. No changes were made to the monitoring system in 2020. In general, one groundwater sample was collected from each background and downgradient well during each monitoring event. All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (AECOM, 2017). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2020, and analytical results for the September 2019 sampling event, are presented in Tables 1 and 2. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017) to determine any SSLs of Appendix IV parameters over GWPSs.

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

Table A – 2019-2020 Assessment Monitoring Program Summary

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s)	SSL(s) Determination Date
September 11 - 12, 2019	October 16, 2019	Appendix III		
		Appendix IV Detected [1]	none	January 14, 2020
April 9 - 10, 2020	April 30, 2020	Appendix III		
		Appendix IV	none	July 29, 2020
September 16, 2020	October 19, 2020	Appendix III		
		Appendix IV Detected [1]	TBD	TBD

Notes:

NA: Not Applicable

TBD: To Be Determined

1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. § 257.95(d)(1).

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

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

5. KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continuation of the Assessment Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2021.
- Complete evaluation of analytical data from the downgradient wells, using GWPSs to determine whether an SSL of Appendix IV parameters has occurred.
- If an SSL is identified, potential alternate sources (*i.e.*, a source other than the CCR unit caused the SSL or that that SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is demonstrated to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL determination and included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.
    - If an alternate source(s) is not identified to be the cause of the SSL, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 (*e.g.*, assessment of corrective measures) as may apply in 2021 will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

AECOM, 2017, Sampling and Analysis Plan, CCR Rule Groundwater Monitoring, Coal Pile Runoff Pond, Unit 125, Zimmer Power Station, Moscow, Ohio, Job Number: 60442412, Revision 0, October 17, 2017.

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

TABLES

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
125 - COAL PILE RUNOFF POND
MOSCOW, OH

Well ID	**Latitude (Decimal Degrees)**	**Longitude (Decimal Degrees)**	**Date**	**Depth to Groundwater (ft)** 6020A	**Groundwater Elevation (ft NAVD88)** 6020A	**Boron, total (mg/L)** 6020A	**Calcium, total (mg/L)** 6020A	**Chloride, total (mg/L)** 9251	**Fluoride, total (mg/L)** 9214	**pH (field) (STD)** SM4500 H+B	**Sulfate, total (mg/L)** 9036	**Total Dissolved Solids (mg/L)** SM 2540C
MW-1 Background	38.877476	-84.227174	9/10/2019	52.01	458.91							
			9/11/2019			<0.08	167	63.1	<1	7.0	90.6	637
			4/9/2020	39.67	471.25	0.123	170	80.5	<0.15	6.7	92.3	592
			9/16/2020	51.76	459.16	0.0365	169	84.3	<0.15	7.1	99.1	644
MW-3S Downgradient	38.87705583	-84.23023028	9/10/2019	54.15	456.06							
			9/11/2019			1.91	228	39.2	<1	7.6	532	1090
			4/9/2020	43.82	466.39							
			4/10/2020			1.03	221	43	<0.15	7.0	447	949
			9/16/2020	53.52	456.69	2.44	210	26.5	<0.15	7.2	550	1030
MW-16 Downgradient	38.87746694	-84.23021972	9/10/2019	55.64	456.02							
			9/12/2019			0.13	156	45.5	<1	6.8	187	686
			4/9/2020	45.32	466.34							
			4/10/2020			0.0621	162	47.6	0.151	6.9	197	687
			9/16/2020	54.97	456.69	0.087	169	48.6	<0.15	7.1	253	741
MW-17 Downgradient	38.8772725	-84.23025583	9/10/2019	55.22	456.03							
			9/12/2019			0.0889	177	47.8	<1	7.0	280	776
			4/9/2020	44.88	466.37							
			4/10/2020			0.0608	178	51.1	0.162	7.0	283	767
			9/16/2020	54.62	456.63	0.301	184	46.7	<0.15	7.1	337	840
MW-18 Downgradient	38.87681917	-84.23023278	9/10/2019	55.61	456.02							
			9/12/2019			3	226	30.8	<1	7.1	612	1210
			4/9/2020	45.23	466.4							
			4/10/2020			3.56	272	43.2	0.161	7.0	771	1300
			9/16/2020	54.93	456.7	2.76	179	19.1	<0.15	7.3	548	976

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
4-digit numbers below parameter represent SW-846 analytical methods and alpha-numeric values that begin with SM represent Standard Methods for the Examination of Water and Wastewater.

TABLE 2.
ANALYTICAL RESULTS - APPENDIX IV PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
125 - COAL PILE RUNOFF POND
MOSCOW, OH

Well ID	Date	Antimony, total (mg/L) 6020A	Arsenic, total (mg/L) 6020A	Barium, total (mg/L) 6020A	Beryllium, total (mg/L) 6020A	Cadmium, total (mg/L) 6020A	Chromium, total (mg/L) 6020A	Cobalt, total (mg/L) 6020A	Fluoride, total (mg/L) 6020A	Lead, total (mg/L) 6020A	Lithium, total (mg/L) 6020A	Mercury, total (mg/L) 7470A	Molybdenum, total (mg/L) 6020A	Radium-226 + Radium 228, total (pCi/L) 6020A	Selenium, total (mg/L) 6020A	Thallium, total (mg/L) 6020A
MW-1 Background	9/11/2019		<0.001	0.077	<0.001		<0.002	<0.0005	<1	<0.001	0.0109		<0.005	0.11	<0.005	
	4/9/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
	9/16/2020		<0.002	0.073	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00966		<0.005	0.215	<0.002	
MW-3S Downgradient	9/11/2019		<0.001	0.0715		<0.001	0.00275	<0.0005	<1	<0.001	0.0118		<0.005	0.338	0.0111	
	4/10/2020	<0.004	<0.002	0.0576	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00548	<0.0002	<0.005	0.888	0.0039	<0.002
	9/16/2020		<0.002	0.0589		<0.001	<0.002	<0.002	<0.15	<0.005	0.00495		<0.005	0.373	0.00601	
MW-16 Downgradient	9/12/2019		<0.001	0.0538		<0.001	0.00218	0.00201	<1	<0.001	0.0111		<0.005	0.969	<0.005	
	4/10/2020	<0.004	<0.002	0.0474	<0.002	<0.001	<0.002	0.00208	0.151	<0.005	0.00522	<0.0002	<0.005	1.85	<0.002	<0.002
	9/16/2020		<0.002	0.051		<0.001	<0.002	<0.002	<0.15	<0.005	0.00467		<0.005	0.869	0.0043	
MW-17 Downgradient	9/12/2019		<0.001	0.0815		<0.001	0.00243	0.00139	<1	<0.001	0.0175		<0.005	0.658	<0.005	
	4/10/2020	<0.004	<0.002	0.0602	<0.002	<0.001	<0.002	<0.002	0.162	<0.005	0.00536	<0.0002	<0.005	0.806	0.00204	<0.002
	9/16/2020		<0.002	0.0641		<0.001	<0.002	<0.002	<0.15	<0.005	0.0057		<0.005	0.456	0.00467	
MW-18 Downgradient	9/12/2019		<0.001	0.0411		<0.001	0.00252	0.00176	<1	<0.001	0.0134		<0.005	0.328	0.0157	
	4/10/2020	<0.004	<0.002	0.0317	<0.002	<0.001	<0.002	<0.002	0.161	<0.005	0.00537	<0.0002	<0.005	0.568	0.012	<0.002
	9/16/2020		<0.002	0.02		<0.001	<0.002	<0.002	<0.15	<0.005	0.00407		<0.005	0.325	0.00615	

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
NA = Not Analyzed
pCi/L = picoCuries per liter
< = concentration is less than concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Levels (SSLs) over Groundwater Protection Standards.
4-digit numbers below parameter represent SW-846 analytical methods and 3-digit numbers represent Clean Water Act analytical methods.

TABLE 3.
STATISTICAL BACKGROUND VALUES
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
125 - COAL PILE RUNOFF POND
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	Statistical Background Value (UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.08
Calcium (mg/L)	213
Chloride (mg/L)	73.75
Fluoride (mg/L)	0.2
pH (S.U.)	6.8 / 7.3
Sulfate (mg/L)	102.6
Total Dissolved Solids (mg/L)	678

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

Notes:

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

TABLE 4.

GROUNDWATER PROTECTION STANDARDS

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER POWER STATION
125 - COAL PILE RUNOFF POND
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	**Groundwater Protection Standard**[1]
40 C.F.R. Part 257 Appendix IV	
Antimony (mg/L)	0.006
Arsenic (mg/L)	0.010
Barium (mg/L)	2
Beryllium (mg/L)	0.004
Cadmium (mg/L)	0.005
Chromium (mg/L)	0.10
Cobalt (mg/L)	0.006
Fluoride (mg/L)	4
Lead (mg/L)	0.015
Lithium (mg/L)	0.040
Mercury (mg/L)	0.002
Molybdenum (mg/L)	0.10
Radium 226+228 (pCi/L)	5
Selenium (mg/L)	0.05
Thallium (mg/L)	0.002

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

Notes:

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

FIGURES

Y:\Mapping\Projects\22\2285\MXD\2020_AnnualGWM_CAR\Figure 1_GWS_WellLoc_Zimmer_CPRP.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarnmc

🟧 BACKGROUND MONITORING WELL LOCATION

🟦 DOWNGRADIENT MONITORING WELL LOCATION

🟨 CCR MONITORED UNIT

0 100 200 Feet

MONITORING WELL LOCATION MAP
ZIMMER COAL PILE RUNOFF POND
UNIT ID:125

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

Prepared for
Dynegy Zimmer, LLC

Date
January 31, 2021

Project No.
1940074924

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER D BASIN, ZIMMER POWER STATION

RAMBOLL Bright ideas. Sustainable change.

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER D BASIN, ZIMMER POWER STATION

Project name	**Zimmer Power Station**
Project no.	**1940074924**
Recipient	**Dynegy Zimmer, LLC**
Document type	**Annual Groundwater Monitoring and Corrective Action Report**
Version	**FINAL**
Date	**January 31, 2021**
Prepared by	**Kristen L. Theesfeld**
Checked by	**Nikki M. Pagano, PE**
Approved by	**Lauren Cook**
Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Kristen L. Theesfeld
Hydrogeologist

Nikki M. Pagano, PE
Senior Managing Engineer

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2. Monitoring and Corrective Action Program Status **6**
3. Key Actions Completed in 2020 **7**
4. Problems Encountered and Actions to Resolve the Problems **9**
5. Key Activities Planned for 2021 **10**
6. References **11**

TABLES (IN TEXT)

Table A 2019-2020 Assessment Monitoring Program Summary

TABLES (ATTACHED)

Table 1 Analytical Results – Groundwater Elevation and Appendix III Parameters
Table 2 Analytical Results – Appendix IV Parameters
Table 3 Statistical Background Values
Table 4 Groundwater Protection Standards

FIGURES

Figure 1 Monitoring Well Location Map

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
CMA	Corrective Measures Assessment
GWPS	Groundwater Protection Standard
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

EXECUTIVE SUMMARY

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

Groundwater is being monitored at Zimmer D Basin in accordance with the Assessment Monitoring Program requirements specified in 40 C.F.R. § 257.95. Assessment Monitoring was initiated at Zimmer D Basin on April 9, 2018.

No changes were made to the monitoring system in 2020.

No Statistically Significant Levels (SSLs) of 40 C.F.R. Part 257 Appendix IV parameters were determined. Consequently, a Corrective Measures Assessment (CMA) is not required and Zimmer D Basin remains in the Assessment Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions Inc. (Ramboll) on behalf of Dynegy Zimmer, LLC, to provide the information required by 40 C.F.R.§ 257.90(e) for Zimmer D Basin located at Zimmer Power Station near Moscow, Ohio.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection Monitoring or Assessment Monitoring Programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring in addition to identifying the constituent(s) detected at a Statistically Significant Increase [SSI] relative to background levels).
5. Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.
6. A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:
    i. At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    ii. At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    iii. If it was determined that there was a SSI over background for one or more constituents listed in Appendix III of §257 pursuant to §257.94(e):
        A. Identify those constituents listed in Appendix III of §257 and the names of the monitoring wells associated with the SSI(s).

   B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

iv. If it was determined that there was a SSL above the Groundwater Protection Standard (GWPS) for one or more constituents listed in Appendix IV of §257 pursuant to §257.95(g) include all of the following:

   A. Identify those constituents listed in Appendix IV of §257 and the names of the monitoring wells associated with the SSL(s).

   B. Provide the date when the CMA was initiated for the CCR unit.

   C. Provide the date when the public meeting was held for CMA for the CCR unit.

   D. Provide the date when the CMA was completed for the CCR unit.

v. Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection.

vi. Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.

This report provides the required information for Zimmer D Basin for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the Monitoring Program status in calendar year 2020, and Zimmer D Basin remains in the Assessment Monitoring Program in accordance with 40 C.F.R. § 257.95.

3. KEY ACTIONS COMPLETED IN 2020

The Assessment Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in Figure 1. No changes were made to the monitoring system in 2020. In general, one groundwater sample was collected from each background and downgradient well during each monitoring event. All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (AECOM, 2017). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2020, and analytical results for the September 2019 sampling event, are presented in Tables 1 and 2. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017) to determine any Statistically Significant Levels (SSLs) of Appendix IV parameters over GWPSs.

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

Table A – 2019-2020 Assessment Monitoring Program Summary

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s)	SSL(s) Determination Date
September 11, 2019	October 31, 2019	Appendix III Appendix IV Detected [1]	none	January 14, 2020
April 9, 2020	May 6, 2020	Appendix III Appendix IV	none	August 4, 2020
September 16 - 17, 2020	October 19, 2020	Appendix III Appendix IV Detected [1]	TBD	TBD

Notes:

NA: Not Applicable

TBD: To Be Determined

1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. § 257.95(d)(1).

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2020. Groundwater samples were collected and analyzed in accordance with the Sampling and Analysis Plan (AECOM, 2017), and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continuation of the Assessment Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2021.
- Complete evaluation of analytical data from the downgradient wells, using GWPSs to determine whether an SSL of Appendix IV parameters has occurred.
- If an SSL is identified, potential alternate sources (*i.e.*, a source other than the CCR unit caused the SSL or that that SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is demonstrated to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL determination and included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.
  - If an alternate source(s) is not identified to be the cause of the SSL, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 (*e.g.*, assessment of corrective measures) as may apply in 2021 will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

AECOM, 2017, Sampling and Analysis Plan, CCR Rule Groundwater Monitoring, Basin D, Unit 121, Zimmer Power Station, Moscow, Ohio, Job Number: 60442412, Revision 0, October 17, 2017.

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

TABLES

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
121 - D BASIN
MOSCOW, OH

Well ID	**Latitude (Decimal Degrees)**	**Longitude (Decimal Degrees)**	**Date**	**Depth to Groundwater (ft)** 6020A	**Groundwater Elevation (ft NAVD88)** 6020A	**Boron, total (mg/L)** 6020A	**Calcium, total (mg/L)** 6020A	**Chloride, total (mg/L)** 9251	**Fluoride, total (mg/L)** 9214	**pH (field) (STD)** SM4500 H+B	**Sulfate, total (mg/L)** 9036	**Total Dissolved Solids (mg/L)** SM 2540C
MW-1 Background	38.877476	-84.227174	9/10/2019	52.01	458.91							
			9/11/2019			<0.08	167	63.1	<1	7.0	90.6	637
			4/9/2020	39.67	471.25	0.123	170	80.5	<0.15	6.7	92.3	592
			9/16/2020	51.76	459.16	0.0365	169	84.3	<0.15	7.1	99.1	644
MW-8 Background	38.86994583	-84.22557183	9/10/2019	52.51	459.09							
			9/11/2019			<0.08	129	34	<1	6.8	59.5	508
			4/9/2020	41.15	470.45	<0.03	122	16	<0.15	6.8	65.2	421
			9/16/2020	53.62	457.98	0.0434	122	13.8	<0.15	7.0	67.2	473
MW-9 Downgradient	38.875469	-84.23018383	9/10/2019	53.31	456.6							
			9/11/2019			0.737	236	30.7	<1	8.3	495	1190
			4/9/2020	42.9	467.01	0.511	270	32.3	<0.15	6.9	589	1160
			9/16/2020	52.66	457.25	0.127	220	21.4	<0.15	7.2	485	999
MW-12 Background	38.87556583	-84.22642183	9/10/2019	52.38	459.54							
			9/11/2019			0.204	148	26.6	<1	7.7	90	557
			4/9/2020	39.26	472.66	0.21	162	32.5	<0.15	6.9	98.3	598
			9/16/2020	51.94	459.98	0.207	149	31.7	<0.15	7.0	98.3	579
MW-13 Downgradient	38.87510983	-84.230056	9/10/2019	42.98	456.42							
			9/11/2019			<0.08	144	14.4	<1	7.6	146	616
			4/9/2020	32.74	466.66	0.0597	166	20.4	0.165	7.0	281	715
			9/17/2020	42.4	457	0.0557	132	17.7	0.176	7.2	135	577
MW-14 Downgradient	38.874746	-84.230119	9/10/2019	47.5	456.31							
			9/11/2019			0.139	181	28.8	<1	7.4	287	836
			4/9/2020	37.31	466.5	0.116	213	40	0.179	7.4	427	939
			9/17/2020	46.97	456.84	0.119	156	29.4	0.2	7.1	237	745
MW-15 Downgradient	38.87445	-84.230181	9/10/2019	53.93	456.65							
			9/11/2019			0.12	241	36.2	<1	7.4	535	1170
			4/9/2020	43.89	466.69	0.079	258	41.1	0.175	7.4	567	1090
			9/17/2020	53.46	457.12	0.126	245	46.8	0.168	6.9	560	1250

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
121 - D BASIN
MOSCOW, OH

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
4-digit numbers below parameter represent SW-846 analytical methods and alpha-numeric values that begin with SM represent Standard Methods for the Examination of Water and Wastewater.

TABLE 2.
ANALYTICAL RESULTS - APPENDIX IV PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ZIMMER POWER STATION
121 - D BASIN
MOSCOW, OH

Well ID	**Date**	**Antimony, total (mg/L)** 6020A	**Arsenic, total (mg/L)** 6020A	**Barium, total (mg/L)** 6020A	**Beryllium, total (mg/L)** 6020A	**Cadmium, total (mg/L)** 6020A	**Chromium, total (mg/L)** 6020A	**Cobalt, total (mg/L)** 6020A	**Fluoride, total (mg/L)** 6020A	**Lead, total (mg/L)** 6020A	**Lithium, total (mg/L)** 6020A	**Mercury, total (mg/L)** 7470A	**Molybdenum, total (mg/L)** 6020A	**Radium-226 + Radium 228, total (pCi/L)** 6020A	**Selenium, total (mg/L)** 6020A	**Thallium, total (mg/L)** 6020A
MW-1 Background	9/11/2019		<0.001	0.077	<0.001		<0.002	<0.0005	<1	<0.001	0.0109		<0.005	0.11	<0.005	
	4/9/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
	9/16/2020		<0.002	0.073	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00966		<0.005	0.215	<0.002	
MW-8 Background	9/11/2019		<0.001	0.0552	<0.001		0.00206	<0.0005	<1	<0.001	0.00754		<0.005	0.261	<0.005	
	4/9/2020	<0.004	<0.002	0.046	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
	9/16/2020		<0.002	0.0452	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00612		<0.005	0.0611	<0.002	
MW-9 Downgradient	9/11/2019		0.00188	0.0261	<0.001		0.00237	0.00267	<1	<0.001	0.0135		<0.005	0.372	<0.005	
	4/9/2020	<0.004	<0.002	0.026	<0.002	<0.001	<0.002	0.00286	<0.15	<0.005	0.00709	<0.0002	<0.005	6.29	<0.002	<0.002
	9/16/2020		<0.002	0.0215	<0.002		<0.002	0.00242	<0.15	<0.005	0.0068		<0.005	0.727	<0.002	
MW-12 Background	9/11/2019		<0.001	0.0692	<0.001		0.00249	<0.0005	<1	<0.001	0.0114		<0.005	0.118	<0.005	
	4/9/2020	<0.004	<0.002	0.0657	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00591	<0.0002	<0.005	3.9	<0.002	<0.002
	9/16/2020		<0.002	0.0629	<0.002		<0.002	<0.002	<0.15	<0.005	0.00612		<0.005	0.409	<0.002	
MW-13 Downgradient	9/11/2019		0.00525	0.0461	<0.001		0.00231	0.00368	<1	<0.001	0.00811		<0.005	0.449	<0.005	
	4/9/2020	<0.004	0.00261	0.0477	<0.002	<0.001	<0.002	0.00297	0.165	<0.005	0.00266	<0.0002	<0.005	3.43	<0.002	<0.002
	9/17/2020		<0.002	0.039	<0.002		<0.002	0.0028	0.176	<0.005	0.00274		<0.005	1.73	<0.002	
MW-14 Downgradient	9/11/2019		0.00155	0.0554	<0.001		0.00254	0.00239	<1	<0.001	0.00843		<0.005	1.94	<0.005	
	4/9/2020	<0.004	<0.002	0.0501	<0.002	<0.001	<0.002	0.00223	0.179	<0.005	0.00236	<0.0002	<0.005	1.6	<0.002	<0.002
	9/17/2020		<0.002	0.0417	<0.002		<0.002	<0.002	0.2	<0.005	0.0024		<0.005	0.919	<0.002	
MW-15 Downgradient	9/11/2019		<0.001	0.0836	<0.001		0.00257	0.00381	<1	<0.001	0.00845		<0.005	0.756	<0.005	
	4/9/2020	<0.004	<0.002	0.0663	<0.002	<0.001	<0.002	0.00374	0.175	<0.005	0.00213	<0.0002	<0.005	3.26	<0.002	<0.002
	9/17/2020		<0.002	0.069	<0.002		<0.002	0.00289	0.168	<0.005	0.00244		<0.005	1.13	<0.002	

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
NA = Not Analyzed
pCi/L = picoCuries per liter
< = concentration is less than concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Levels (SSLs) over Groundwater Protection Standards.
4-digit numbers below parameter represent SW-846 analytical methods and 3-digit numbers represent Clean Water Act analytical methods.

TABLE 3.

STATISTICAL BACKGROUND VALUES

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER POWER STATION
121 - D BASIN
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	Statistical Background Value (UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.38
Calcium (mg/L)	200
Chloride (mg/L)	72.87
Fluoride (mg/L)	0.2
pH (S.U.)	6.7 / 7.4
Sulfate (mg/L)	129.2
Total Dissolved Solids (mg/L)	695

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

Notes:

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

TABLE 4.
GROUNDWATER PROTECTION STANDARDS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

ZIMMER POWER STATION
121 - D BASIN
MOSCOW, OHIO
ASSESSMENT MONITORING PROGRAM

Parameter	**Groundwater Protection Standard[1]**
40 C.F.R. Part 257 Appendix IV	
Antimony (mg/L)	0.006
Arsenic (mg/L)	0.010
Barium (mg/L)	2
Beryllium (mg/L)	0.004
Cadmium (mg/L)	0.005
Chromium (mg/L)	0.10
Cobalt (mg/L)	0.006
Fluoride (mg/L)	4
Lead (mg/L)	0.015
Lithium (mg/L)	0.040
Mercury (mg/L)	0.002
Molybdenum (mg/L)	0.10
Radium 226+228 (pCi/L)	5
Selenium (mg/L)	0.05
Thallium (mg/L)	0.002

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

Notes:

40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
pCi/L = picoCuries per liter

[1] Groundwater Protection Standard is the higher of the Maximum Contaminant Level / Health-Based Level or background.

FIGURES

Y:\Mapping\Projects\22\2285\MXD\2020_Annual\GWM_CAR\Figure 1_GWS_WellLoc_Zimmer_DBasin.mxd

PROJECT: 169000XXXX | DATED: 1/25/2021 | DESIGNER: galarmc

▨ BACKGROUND MONITORING WELL LOCATION

▨ DOWNGRADIENT MONITORING WELL LOCATION

☐ CCR MONITORED UNIT

0 175 350
Feet

MONITORING WELL LOCATION MAP
ZIMMER D BASIN
UNIT ID:121

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

APPENDIX C – COMPLIANCE DOCUMENTS

APPENDIX C1 – MAP OF GROUNDWATER MONITORING WELL LOCATIONS

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

PROJECT: 169000XXXX | DATED: 1/14/2020 | DESIGNER: GALARNMC

🟫 UPGRADIENT MONITORING WELL LOCATION

🟦 DOWNGRADIENT MONITORING WELL LOCATION

☐ CCR MONITORED UNIT

0 100 200 Feet

MONITORING WELL LOCATION MAP
ZIMMER COAL PILE RUNOFF POND
UNIT ID:125

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

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

RAMBOLL

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

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT: 169000XXXX | DATED: 1/14/2020 | DESIGNER: GALARNMC

- ▨ UPGRADIENT MONITORING WELL LOCATION
- ▨ DOWNGRADIENT MONITORING WELL LOCATION
- ☐ CCR MONITORED UNIT

0 50 100
Feet

MONITORING WELL LOCATION MAP
ZIMMER GYPSUM RECYCLING POND
UNIT ID:124

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

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

RAMBOLL

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

PROJECT: 169000XXXX | DATED: 1/28/2020 | DESIGNER: BARTELAB

- 🟧 UPGRADIENT MONITORING WELL LOCATION
- 🟦 DOWNGRADIENT MONITORING WELL LOCATION
- 🟨 CCR MONITORED UNIT

0 175 350 Feet

MONITORING WELL LOCATION MAP
ZIMMER D BASIN
UNIT ID:121

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
VISTRA CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 1

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

RAMBOLL

APPENDIX C2 – WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N. 5940 W- 520

BORING NO. Z-117 DATE 4-26-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE CORE
CASING USED ✓ SIZE HW DRILLING MUD USED —
BORING BEGUN 4-26-89 BORING COMPLETED 4-27-89
GROUND ELEVATION 511.1 REFERRED TO
DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING:	Flood plain monitoring well
WATER LEVEL	38.0
TIME	11:00
DATE	4-27-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	2	5	8	15"					Clay- Br- moist- med to low plasticity	
										CL		
2	7.5	9.0	3	5	8	18"					Same as 1	
								10				
3	12.5	14.0	3	4	5	18"					Silt/Clay- multi-colored Br. med to low plasticity	
										CL		
4	17.5	19.0	3	4	5	18"					Same as 2	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________

COMPANY ____________

PROJECT ____________

COORDINATES ____________

BORING NO. Z117 DATE ____________ SHEET 2 OF ____

TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______

CASING USED ______ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ______ BORING COMPLETED ______

GROUND ELEVATION ______ REFERRED TO ______ DATUM

FIELD PARTY ____________ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
											Top 9"	
5	22.5	24.0	2	3	4	19"					Clay- yellowish Br- moist to wet- med to low plasticity	
										CL		
											Bottom 9" Clay- Gray- wet- med to low plasticity	
										CL		
6	27.5	29.0	2	3	3	18"					Clay- Gray- wet- med to low plasticity	
										CL		
								30				
7	32.5	34.0	1	2	3	18"					Same as 6	
8	37.5	39.0	20	26	12	16"					Sand + Gravel- Gray- Br- saturated - quartz- rounded ½" max size- w/ fines	
										GM		
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY ____________
PROJECT ____________
COORDINATES ____________

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. Z 117 DATE ____________ SHEET 3 OF ____
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	10	15	15	12"					Sand- BR- QUARTZ- moist	
										SW		
10	47.5	49.0	8	12	17	12"					SAND- BR- QUART -SATURATed	
										SP		
								50				
11	52.5	54.0	15	17	10	14"					Sand + GRAVel- BR- SATURATEd QUARTZ- Rounded- 1" MAX SIZE w/ FINES - STRONG REACTION TO HCL	
										GM		
12	57.5	59.0	12	14	16	15"					Sand- BR- SATURATed- QUARTZ- TRACE OF PEA GRAVEL STRONG REACTION TO HCL	
										SP		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY ____________
PROJECT ____________
COORDINATES ____________

BORING NO. Z-117 DATE ____________ SHEET 4 OF ___
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	62.5	64.0	16	17	11	13"					Gravelly Silty Sand- Br- Saturated- Quartz- 3/4" max size - Strong Reaction to HCL	
14	67.5	69.0	29	39	31	16"					Sand + Gravel- Br. Saturated Quartz- 1" max size - w/ Fines - Strong Reaction to HCL	
								70				
15	72.5	74.0	12	28	40	8"					Clayey Sand + Gravel Br. Saturated - 1" max size Rounded- Quartz - Strong Reaction to HCL	
										GC		
16	77.5	79.0	14	30	38	9"					Same as 15	
								80				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________

COMPANY ____________

PROJECT ____________

COORDINATES ____________

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. Z-117 DATE ____________ SHEET 5 OF 5

TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______

CASING USED ______ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ______ BORING COMPLETED ______

GROUND ELEVATION ______ REFERRED TO ______

______ DATUM

FIELD PARTY ____________ RIG ______

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	82.5	84.0	8	11	13	11"					Gravelly Sand- Br. Saturated Quartz 3/4" max size - Rounded w/ Fines + Black Lignite Strong Reaction to HCL	
18	87.5	89.0	12	11	14	13"					Gravelly Sand - Br. Saturated Quartz - Rounded - 3/4" max size w/ Fines - Strong Reaction to HCL	
											Stopped Hole - 89.9 and Installed 2" O.B. well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N-5700 W-1400

BORING NO. 2119 DATE 5-2-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN 5-2-89 BORING COMPLETED 5-2-89
GROUND ELEVATION 509.9 REFERRED TO ______ DATUM
FIELD PARTY Howell - Darst RIG 75

LOCATION OF BORING: Flood plain monitoring well

WATER LEVEL	42.0	30.0
TIME	6:00 PM	7:51 AM
DATE	5-2-89	5-3-89

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	6	7	9	14"					Clay - Br - moist - med to low plasticity	
										CL		
2	7.5	9.0	3	4	4	12"					Same as 1 w/ trace of V-Fine Sand	
								10				
3	12.5	14.0	3	4	6	10"					Same as 1 w/ trace of V-Fine Sand	
4	17.5	19.0	3	5	8	16"					Same as 1 w/ trace of V-Fine Sand	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ________
COMPANY ________
PROJECT ________
COORDINATES ________

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. Z-119 DATE ________ SHEET 2 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
________ DATUM
FIELD PARTY ________ RIG ____

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	22.5	24.0	3	5	7	16"					Clay- multi-color Brs- moist med. to low plasticity	
										CL		
6	27.5	29.0	4	5	7	16"					Same as 5	
								30				
7	32.5	34.0	2	4	5	6"					Sandy Clay- multi-color Brs moist w/ Dr. Br. Sand Lens	
										CL		
8	37.5	39.0	1	2	3	16"					Sandy Clay- Gray- moist to wet w/ V-Fine Grain Sand Lens	
										CL		
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. 2114 DATE ____ SHEET 3 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	2	2	3	16"					ClAyey Sand- Gray Saturated w/ organic material (wood) mixture	
										SC		
10	47.5	49.0	1	1	13	16"					Sand + Gravel- Br- Saturated Quartz- ½" max size- w/ Fines	
								50				
11	52.5	54.0	6	5	10	0						
											Started washing out augers	
12	57.5	59.0	6	7	9	8"					Sand- Br- Quartz- Saturated Trace of Pea Gravel-	
										SP		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY ____________
PROJECT ____________
COORDINATES ____________

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING NO. Z-119 DATE ____________ SHEET 4 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ____________ RIG ______

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	62.5	64.0	9	13	19	16"					Sand- Br. Saturated med to Fine Grain - moderate Reaction to HCL	
										SP		
											1 Gravel	
14	67.5	69.0	14	22	17	6"					Sand- Br. Saturated 100% Fine Grain Strong Reaction to HCL	
								70		SP		
15	72.5	74.0	13	14	14	12"					Same as 14	
16	77.5	79.0	17	24	32	14"					Same as 14 Gray	
								80				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK

NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

Job No. ____________
Company ____________
Project ____________
Coordinates ____________

Location of Boring:

Water Level	
Time	
Date	

Boring No. Z-119 Date ____________ Sheet 5 of 5
Type of Samples: SPT ______ 3" Tube ______ Core ______
Casing used ______ Size ______ Drilling mud used ______
Boring begun ______ Boring Completed ______
Ground Elevation ______ referred to ______ Datum
Field Party ______ Rig ______

Sample Number	Sample Depth in Feet From	Sample Depth in Feet To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	U S C S	Soil / Rock Identification	Driller's Notes
								80				
17	82.5	84.0	9	13	14	14"					Sand- Gray. Saturated Quartz - Strong Reaction to HCL. Med to Fine Grain	
										SP		
18	87.5	89.0	13	13	13	12"					Same as 17	
								90				
19	92.5	94.0	10	12	12	16"					Same as 17	
											Stopped augers 94.9 + installed well	

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

Recorder ____________

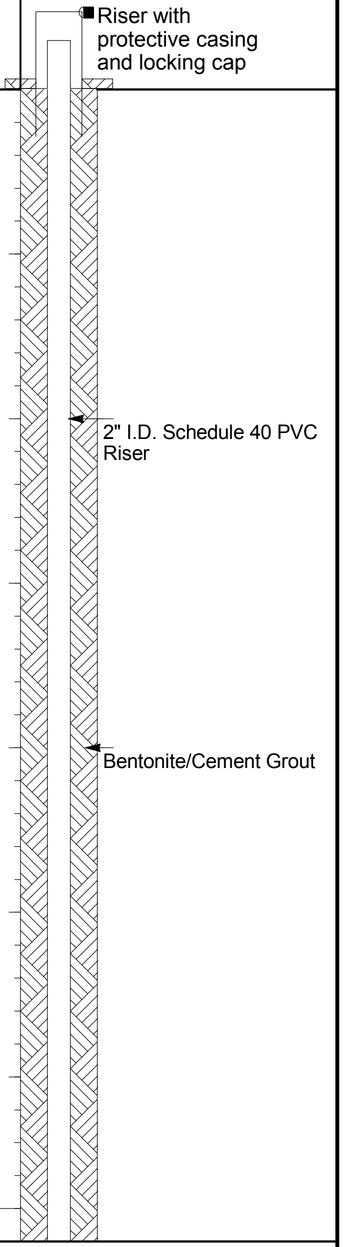
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-16
Sheet 1 of 2

Date(s) Drilled	**8/2/16 - 8/3/16**	Logged By	**J. Alten**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**70.0 feet bgs**
Date of Groundwater Measurement	**8/9/16**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**509.19 feet, msl**
Depth to Groundwater	**55.65 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**511.66 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	Graphic Log	MATERIAL DESCRIPTION
	0		78		Light brown SILT with abundant fine angular gravel and coarse sand, medium stiff, dry
					grades red with tan mottling, less gravel and sand
505	5				
					grades dark brown with few subrounded medium gravel and coarse sand, very stiff, slightly moist.
500					grades with rare subrounded gravel and few coarse sand
	10		78		
					grades medium brown, medium stiff to stiff
495	15				grades with gray mottling, some clay
					grades with less clay and some fine sand
490	20		88		grades with more fine sand
					grades brown with red and gray mottling
485					grades with few coarse sand, few black inclusions
	25				
					grades with more clay and some very fine sand
480	30		88		
					grades with increasing fine sand, soft, moist
475					Brown, red, gray fine SAND with silt, moist, soft
	35				

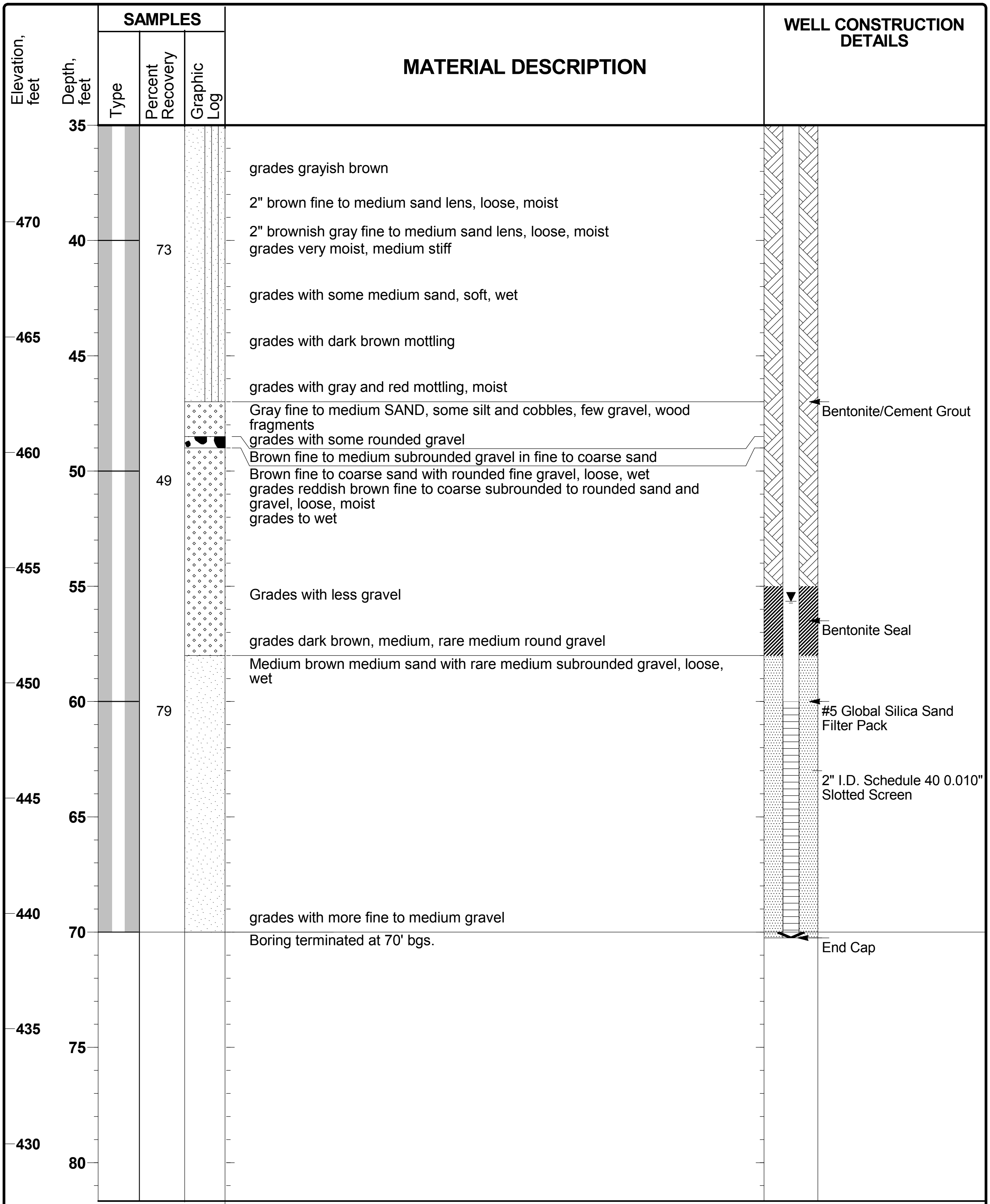
WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-16

Sheet 2 of 2



MATERIAL DESCRIPTION

grades grayish brown

2" brown fine to medium sand lens, loose, moist

2" brownish gray fine to medium sand lens, loose, moist
grades very moist, medium stiff

grades with some medium sand, soft, wet

grades with dark brown mottling

grades with gray and red mottling, moist

Gray fine to medium SAND, some silt and cobbles, few gravel, wood fragments
grades with some rounded gravel

Brown fine to medium subrounded gravel in fine to coarse sand

Brown fine to coarse sand with rounded fine gravel, loose, wet
grades reddish brown fine to coarse subrounded to rounded sand and gravel, loose, moist
grades to wet

Grades with less gravel

grades dark brown, medium, rare medium round gravel

Medium brown medium sand with rare medium subrounded gravel, loose, wet

grades with more fine to medium gravel

Boring terminated at 70' bgs.

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

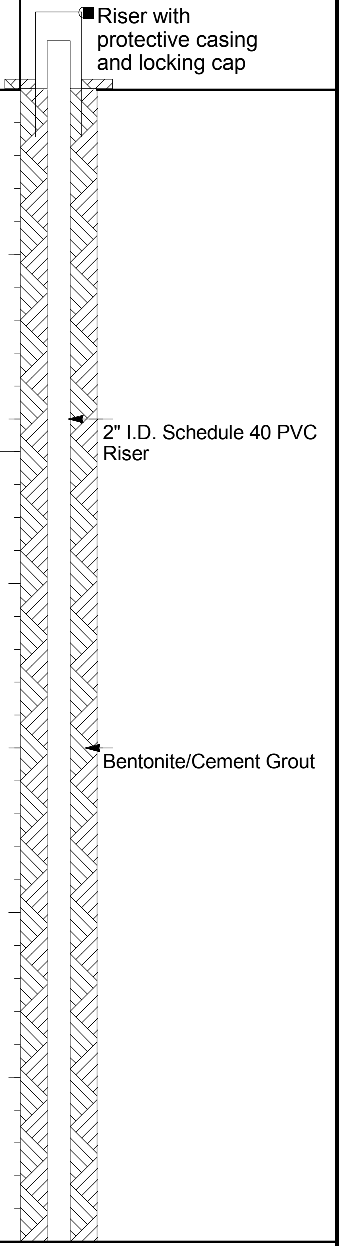
Monitoring Well MW-17

Sheet 1 of 2

Date(s) Drilled	**8/3/16**	Logged By	**J. Alten**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**70.0 feet bgs**
Date of Groundwater Measurement	**8/9/16**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**508.83 feet, msl**
Depth to Groundwater	**55.22 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**511.25 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					

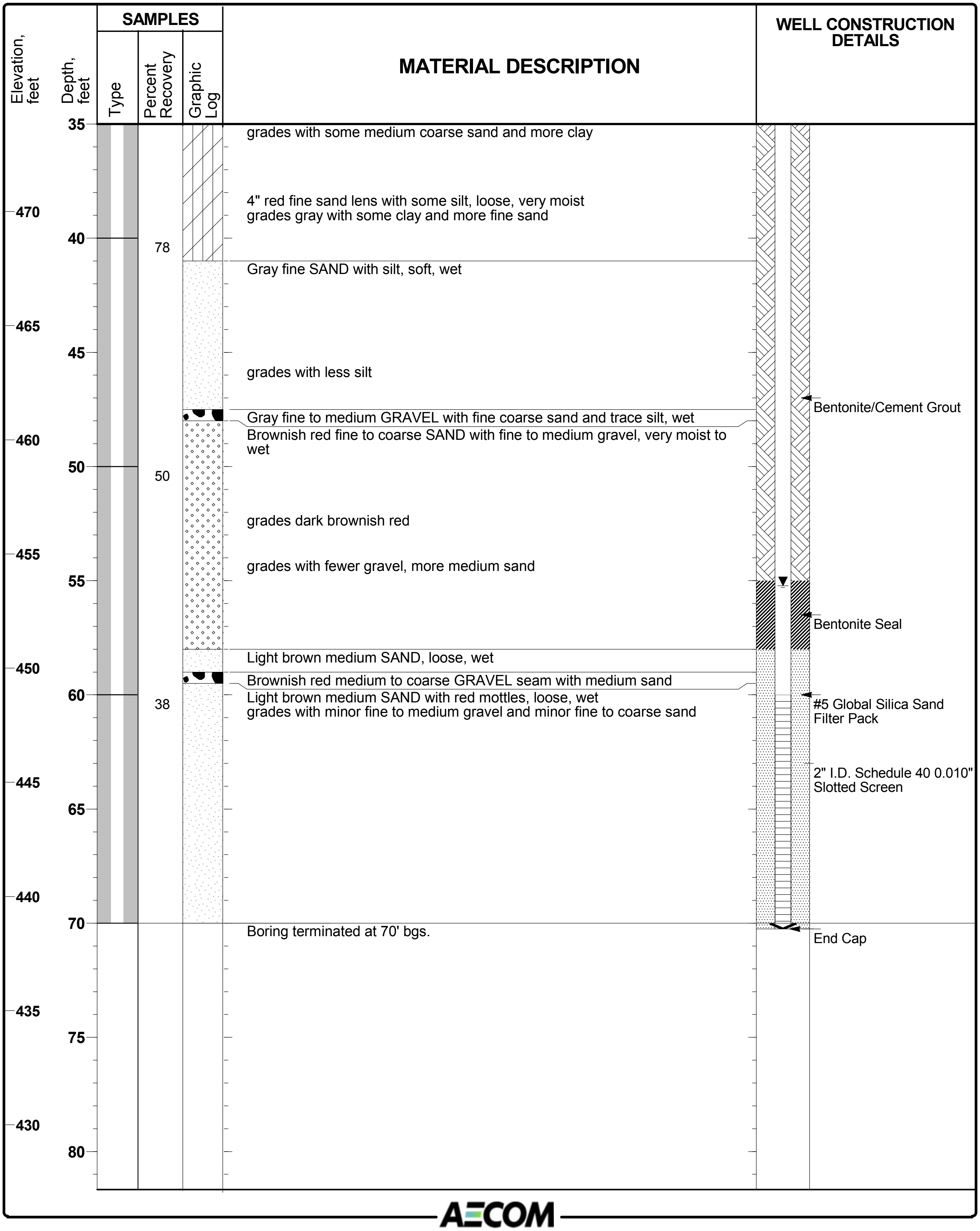
Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		83		Medium brown to reddish brown friable SILT with some angular gravel, dry
					grades with minor fine sand and more subrounded gravel, less angular gravel
505					grades stiff with gray mottles and some clay, less sand
	5				
					grades with more rounded fine gravel
500					grades very stiff, no gray mottles
	10		90		
					Medium brown to gray clayey SILT, with few fine gravel, stiff to very stiff, moist
495					grades with abundant clay
	15				
					grades with minor coarse sand
490					grades with black inclusions, and some rounded fine gravel, some coarse sand
	20		96		grades with no gravel, medium stiff
485					grades with fewer gray mottles, less clay, more black inclusions, stiff
	25				
					grades medium stiff to soft, trace clay, minor coarse sand
480					grades very soft, very moist
	30		93		grades very light brown to gray silt, some reddish mottles, soft to medium stiff
					grades with some fine sand, less clay
					grades with more fine sand
475					2" reddish-brown silty sand seam, loose, moist
	35				

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-17
Sheet 2 of 2



grades with some medium coarse sand and more clay

4" red fine sand lens with some silt, loose, very moist
grades gray with some clay and more fine sand

Gray fine SAND with silt, soft, wet

grades with less silt

Gray fine to medium GRAVEL with fine coarse sand and trace silt, wet

Brownish red fine to coarse SAND with fine to medium gravel, very moist to wet

grades dark brownish red

grades with fewer gravel, more medium sand

Light brown medium SAND, loose, wet

Brownish red medium to coarse GRAVEL seam with medium sand

Light brown medium SAND with red mottles, loose, wet
grades with minor fine to medium gravel and minor fine to coarse sand

Boring terminated at 70' bgs.

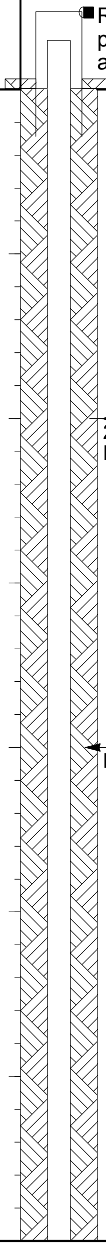
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-18
Sheet 1 of 2

Date(s) Drilled	**8/4/16**	Logged By	**J. Alten**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**70.0 feet bgs**
Date of Groundwater Measurement	**8/9/16**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**509.22 feet, msl**
Depth to Groundwater	**55.59 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**511.63 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	Graphic Log	MATERIAL DESCRIPTION
	0		80		Brownish red SILT with some fine to medium angular to subrounded gravel and trace medium to coarse sand, friable, very dense, dry
					grades with tan mottles grades with few gray mottles and some black mottles
505					
	5				grades with fewer gravels
					grades with brown and tan mottles, rare coarse sand
500					grades with more clay, dry to slightly moist
	10		97.5		grades medium stiff
495					grades with gray clayey mottles
	15				
					grades with abundant gray clayey mottles
490					
	20		97.5		grades with tan to brown mottles grades stiff, moist
					grades with less sand and gravel
485					grades medium stiff with few gray clayey mottles
	25				
480					grades soft with more clay
	30		100		
					grades with few gray mottles and wood fragments
475					
	35				

WELL CONSTRUCTION DETAILS



Riser with protective casing and locking cap

2" I.D. Schedule 40 PVC Riser

Bentonite/Cement Grout

AECOM

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-18
Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	35				grades very soft, very moist grades gray with some fine sand	
470					grades with more fine sand	
	40		86		Gray fine SAND with silt, loose, very moist grades very silty, soft, wet	
					grades with few coarse sand and fine gravel	
465					grades with less silt	
	45				grades with abundant wood fragments and medium sand	
					Subrounded gray medium to coarse GRAVEL in gray medium sand, few fine gravel and coarse sand	Bentonite/Cement Grout
460					Fine to coarse brownish red SAND with fine to medium rounded gravel, loose, very moist	
	50		39			
455						
	55					
					grades coarse with fine to coarse rounded gravel, loose, wet	Bentonite Seal
					grades with medium sand and less coarse sand, few gravel	
					Brown medium SAND with few coarse sand and medium to coarse gravel, trace cobble, loose, wet	
450						
	60		83			#5 Global Silica Sand Filter Pack
						2" I.D. Schedule 40 0.010" Slotted Screen
445						
	65					
440					grades with dark brown inclusions	
	70				Terminate boring at 70' bgs.	End Cap
435						
	75					
430						
	80					

JOB NO.

COMPANY Zimmer Plant

PROJECT

COORDINATES N-5940 W-520

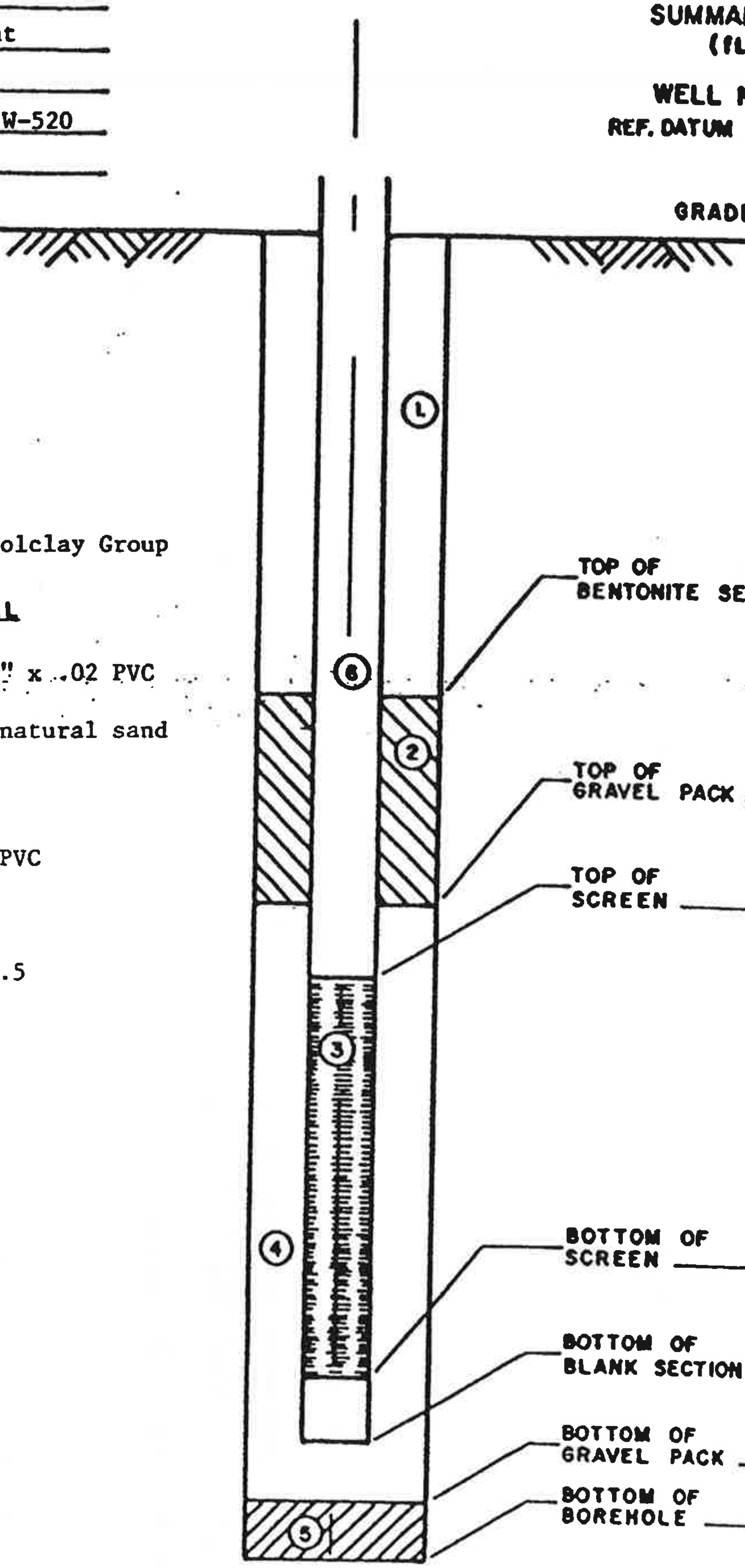
DATE 5/2/89 TIME

WELL CONSTRUCTION
SUMMARY ELEVATIONS
(FL NGVD)

WELL No. 1

REF. DATUM PT. 511.8

GRADE 509.9



1. GROUT SEAL Volclay Group
   509.9 to 470.9
2. BENTONITE SEAL
3. SCREEN 20' x 2" x .02 PVC
4. GRAVEL PACK natural sand
5. N. A.
6. RISER PIPE 2" PVC

Water level 470.5
5/2/89

TOP OF BENTONITE SEAL NA

TOP OF GRAVEL PACK 470.9

TOP OF SCREEN 442.5

BOTTOM OF SCREEN 423.4

BOTTOM OF BLANK SECTION 422.4

BOTTOM OF GRAVEL PACK 422.4

BOTTOM OF BOREHOLE 422.4

GEOTECHNICAL ENGINEERING SECTION
CIVIL DESIGN STANDARD

REVISION

APPROVED

DR.

CH.

AMERICAN ELECTRIC POWER SVC. CORP.

OBSERVATION WELL

CDS-04

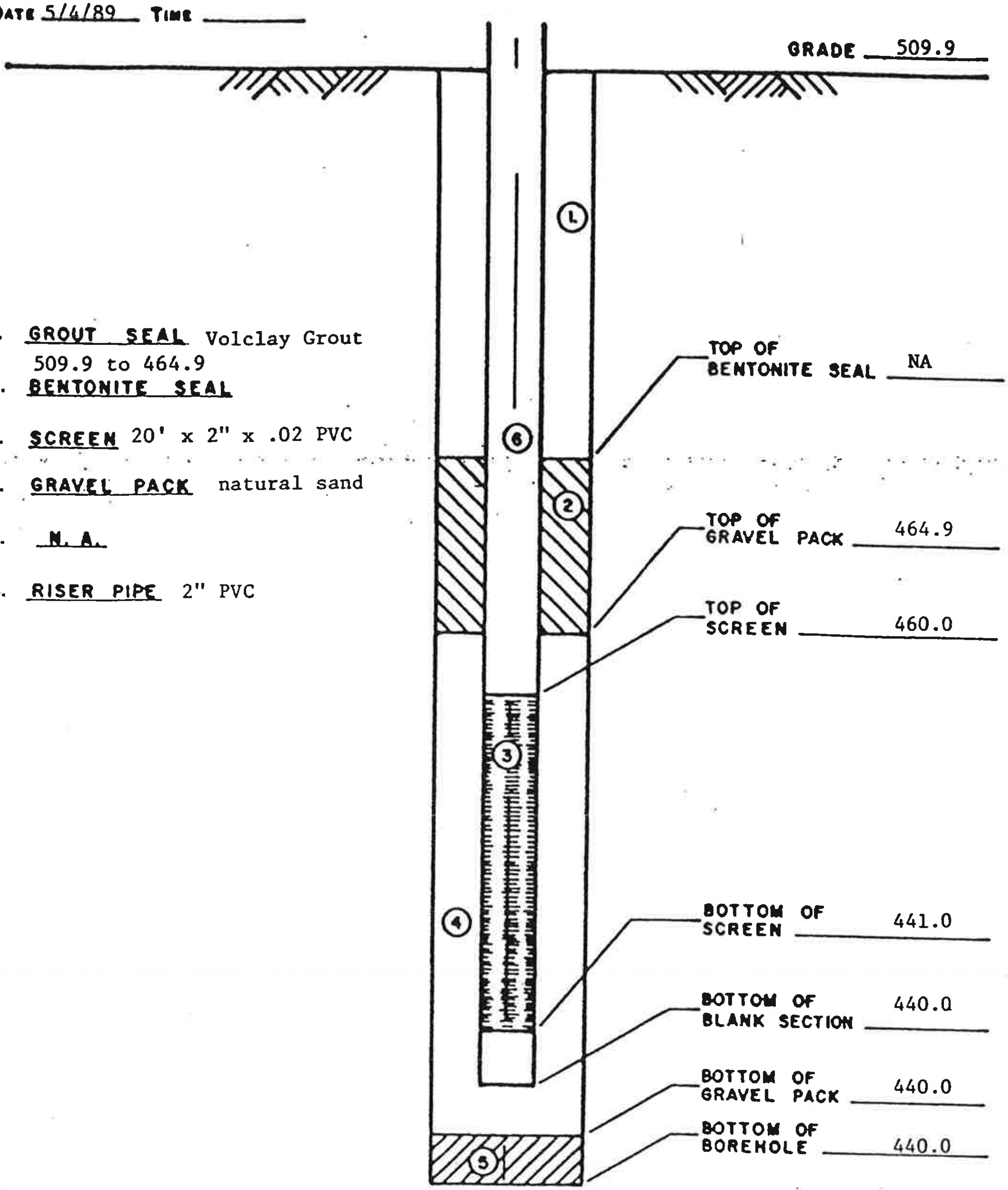
SH.

COMPANY Zimmer Plant
PROJECT
COORDINATES N-5710 W-1400
DATE 5/4/89 **TIME**

SUMMARY ELEVATIONS (ILNGVD)

WELL No. 3S
REF. DATUM PT. 511.9

GRADE 509.9



1. **GROUT SEAL** Volclay Grout 509.9 to 464.9
2. **BENTONITE SEAL**
3. **SCREEN** 20' x 2" x .02 PVC
4. **GRAVEL PACK** natural sand
5. **N. A.**
6. **RISER PIPE** 2" PVC

TOP OF BENTONITE SEAL NA
TOP OF GRAVEL PACK 464.9
TOP OF SCREEN 460.0
BOTTOM OF SCREEN 441.0
BOTTOM OF BLANK SECTION 440.0
BOTTOM OF GRAVEL PACK 440.0
BOTTOM OF BOREHOLE 440.0

GEOTECHNICAL ENGINEERING SECTION
CIVIL DESIGN STANDARD
REVISION
OBSERVATION WELL
APPROVED
DR.
CH.
AMERICAN ELECTRIC POWER SVC. CORP.
CDS-04
SH.

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

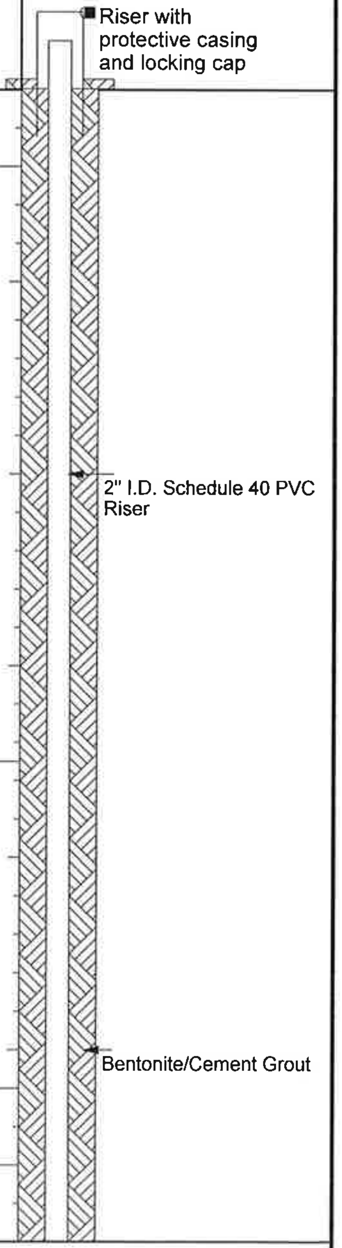
Monitoring Well
MW-7A

Sheet 1 of 2

Date(s) Drilled	**12/1/15**	Logged By	**Becky Smolenski**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**64.0 feet**
Date of Groundwater Measurement	**12/18/15**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**509.53 feet, msl**
Depth to Groundwater	**54.32 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**511.79 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	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown sandy SILT, with fine to coarse angular to subrounded gravel, hard, dry
					Brown SAND with silt and fineto coarse angular to subrounded gravel, dense, dry
505	5		100		
					grades without fines, subrounded to round gravel, medium dense to loose, moist
500	10		99		
					grades clayey
495	15				grades gray
					grades with trace black wood fragments
					Gray clayey SILT with trace fine to coarse subrounded gravel with trace black mottling and trace wood fragments, medium stiff to stiff, slightly moist
			100		grades very stiff to hard
490	20				grades with fine to medium sand
485	25				
					Brown fine to coarse SAND with fines and trace fine subrounded gravel, loose, moist
					Brown SILT with sand and trace fine subrounded gravel, very hard, dry
480	30		100		large wood fragment

WELL CONSTRUCTION DETAILS

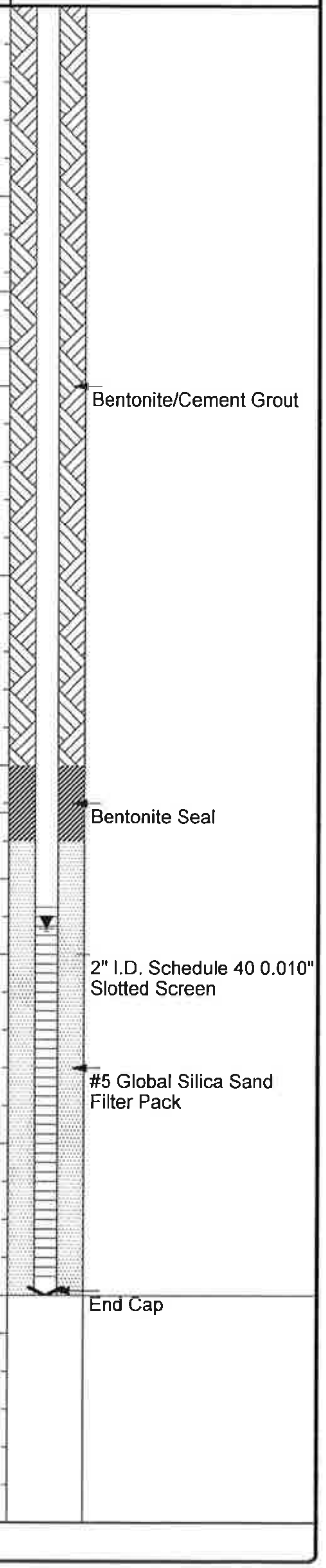


Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-7A
Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	30				grades clayey and without sand with trace gray and black mottling, very hard, dry to slightly moist
475	35		70		grades stiff to very stiff, slightly moist to moist grades medium stiff to stiff, moist Brown silty CLAY with trace fine subrounded gravel, medium stiff, wet grades gray with wood fragments Brown clayey fine SAND, soft, moist
470	40				
465	45		100		Brown sandy fine to coarse subrounded GRAVEL with clay, medium dense, wet
460	50				Brown clayey fine SAND with trace fine to coarse subrounded gravel, medium dense, wet grades fine to medium Brown clayey fine to coarse SAND with trace fine to coarse subrounded gravel, medium dense, wet
455	55		50		grades without clay and with black lamina grades more coarse, with more fine to coarse angular to subrounded gravel
450	60				grades with trace gravel End of boring at 64' bgs
445	65				
440	70				

WELL CONSTRUCTION DETAILS



FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

Job No.
Company AEP
Project Zimmer Plant
Coordinates N-3270 E-130

Boring No. Z124 Date 4-20-89 Sheet 1 of 5
Type of Samples: SPT ✓ 3" Tube ____ Core ____
Casing used ____ Size ____ Drilling mud used ____
Boring begun 4-20-89 Boring Completed 4-25-89
Ground Elevation 541.1 referred to ____ Datum
Field Party Howell - Darst Rig 75

Location of Boring:	Flood plain monitoring wells
Water Level	28.5
Time	10:00
Date	4-20-89

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
1	30	4.5	4	5	5	0					Limestone Road base	
2	8.0	9.5	20	29	42	12"				SP	Sand - Br - moist - Quartz Strong Reaction to HCL	
								10				
3	13.0	14.5	16	29	50/.4	14"				SC	Clayey Sand Br - moist Quartz - Trace of Gravel Strong Reaction to HCL	
4	18.0	19.5	17	29	45	16"				SP	Sand - Br - moist - Strong Reaction to HCL - 90% Fine Grain - Quartz	
								20				

6" x 3.25 HSA	✓
HW Casing Advancer 4"	
NQ Core Rock	
NW Casing 3"	
SW Casing 6"	

Recorder ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-124 DATE ______ SHEET 2 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	23.0	24.5	12	19	35	15"					Sand- BR- moist. Strong Reaction to HCL Quartz 80% Fine Grain	
										SP		
6	28.0	29.5	50/.4			6"					Sand- BR. Saturated- Quartz w/3 Broken Lime Stone Frag- Strong Reaction to HCL-	
								30		SP		
7	33.0	34.5	18	15	21	14"					Clay- BR- moist. med to Low plasticity	
										CL		
8	38.0	39.5	7	9	12	16"					Same as - 7 Trace of V-Fine Sand	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY ____________
PROJECT ____________
COORDINATES ____________

BORING NO. Z-124 DATE ____________ SHEET 3 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
											TOP-6"	
9	43.0	44.5	5	6	8	16"					CLAY- BR- WET- med to Low plasticity	
										CL		
											BOTTOM 10" CLAYEY SAND- BR- SATURATED 100% FINE GRAIN - QUARTZ	
										SC		
10	48.0	49.5	5	10	16	18"					CLAYEY SAND- BR- SATURATED QUARTZ	
										SC		
								50				
11	53.0	54.5	12	15	15	16"					SAND- BR- SATURATED QUARTZ- med TO FINE GRAIN	
										SP		
12	58.0	59.5	12	15	23	15"					SAND- BR- QUARTZ- SATURATED w/ TRACE OF PEA GRAVEL	
										SW		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

Job No. ______
Company ______
Project ______
Coordinates ______

Location of Boring:

Water Level	
Time	
Date	

Boring No. Z-124 Date ______ Sheet 4 of 5
Type of Samples: SPT ______ 3" Tube ______ Core ______
Casing used ______ Size ______ Drilling mud used ______
Boring begun ______ Boring Completed ______
Ground Elevation ______ referred to ______ Datum
Field Party ______ Rig ______

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
								60				
13	63.0	64.5	8	10	12	10"					Sand- Br- Saturated med to Fine Grain - Quartz	
										SP		
14	68.0	69.5	8	10	15	14"					Same as 13 - Strong Reaction to HCL	
								70				
15	73.0	74.5	6	10	16	12"					Sand- Br- Quartz - Saturated 100% Fine Grain	
16	78.0	74.5	6	16	24	15"					Same as 15	

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

Recorder ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-124 DATE ______ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	83.0	84.5	16	27	43	13"					SILT/ SAND + GRAVEL - BR SATURATED - QUARTZ - 1" MAX SIZE - ANGULAR -	
										GM		
18	88.0	89.5	11	14	15	12"					SAND - BR - SATURATED - TRACE OF FINES - STRONG REACTION TO HOL - TRACE OF FINES	
								90		SW		
19	93.0	94.5	10	14	16	14"					SAME AS 18"	
											STOPPED HOLE 96.1 INSTALLED WELL	

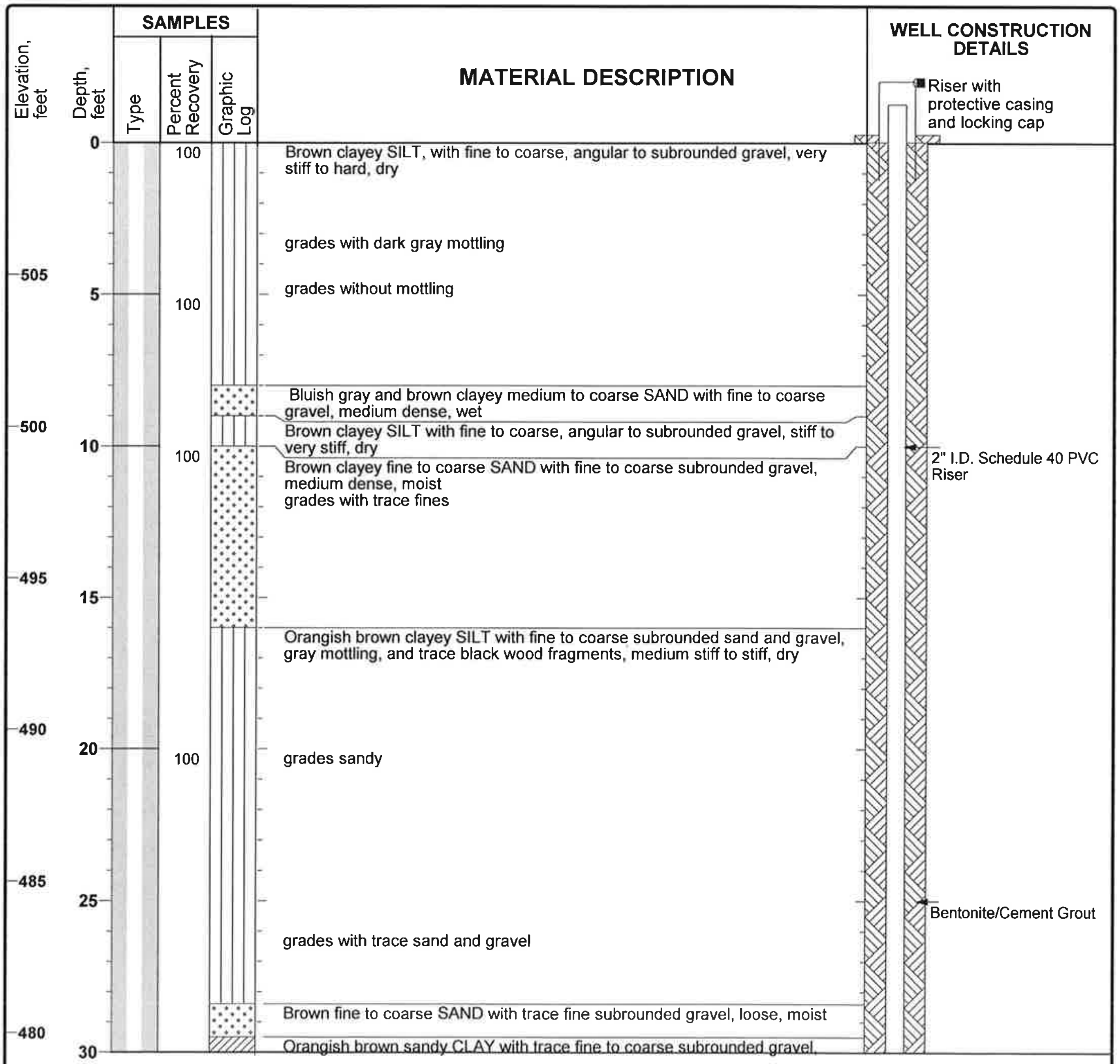
6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-10
Sheet 1 of 2

Date(s) Drilled	12/10/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	65.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.36 feet, msl
Depth to Groundwater	52.5 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	512.18 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					



MATERIAL DESCRIPTION

Brown clayey SILT, with fine to coarse, angular to subrounded gravel, very stiff to hard, dry

grades with dark gray mottling

grades without mottling

Bluish gray and brown clayey medium to coarse SAND with fine to coarse gravel, medium dense, wet

Brown clayey SILT with fine to coarse, angular to subrounded gravel, stiff to very stiff, dry

Brown clayey fine to coarse SAND with fine to coarse subrounded gravel, medium dense, moist
grades with trace fines

Orangish brown clayey SILT with fine to coarse subrounded sand and gravel, gray mottling, and trace black wood fragments, medium stiff to stiff, dry

grades sandy

grades with trace sand and gravel

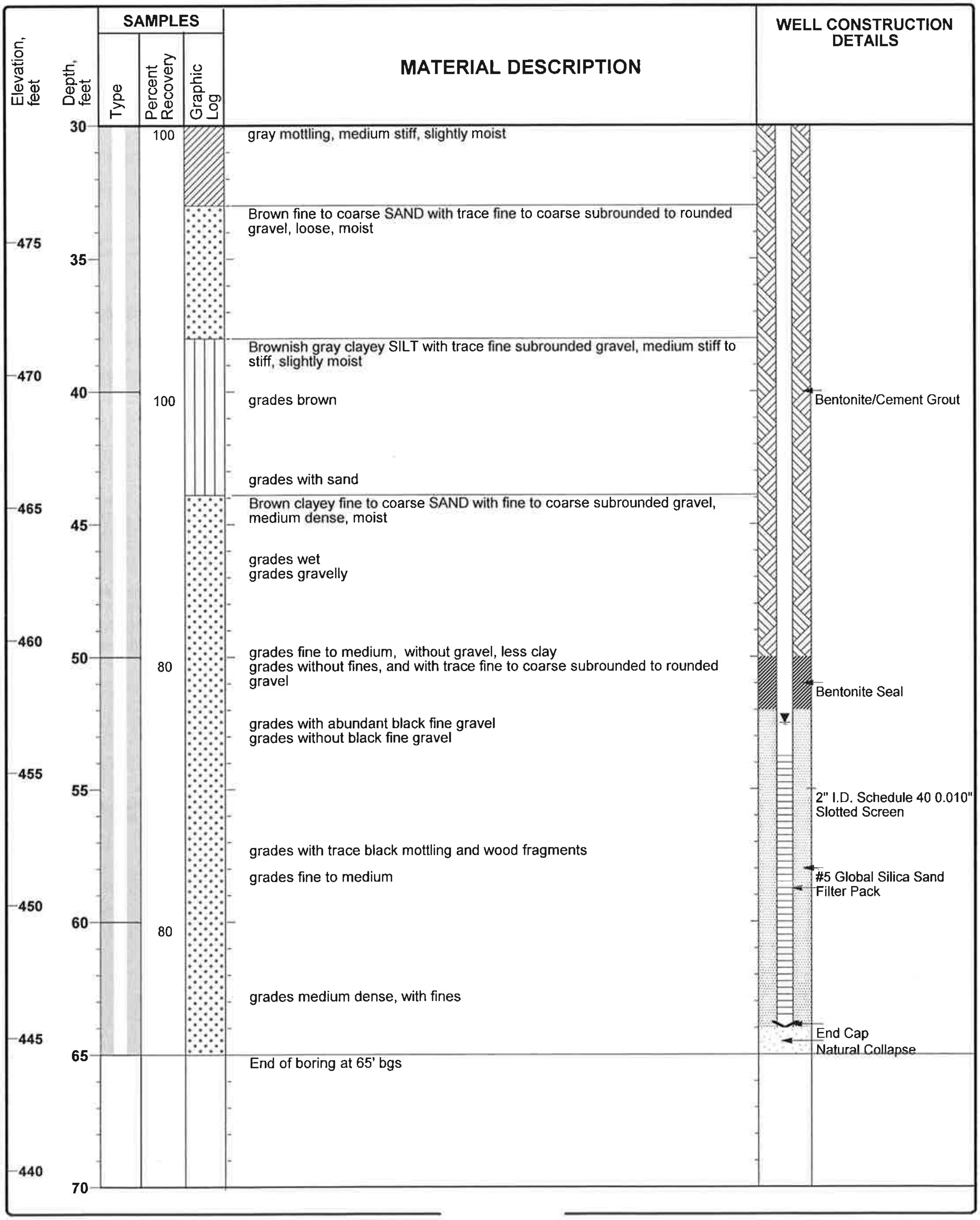
Brown fine to coarse SAND with trace fine subrounded gravel, loose, moist

Orangish brown sandy CLAY with trace fine to coarse subrounded gravel,

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-10

Sheet 2 of 2



gray mottling, medium stiff, slightly moist

Brown fine to coarse SAND with trace fine to coarse subrounded to rounded gravel, loose, moist

Brownish gray clayey SILT with trace fine subrounded gravel, medium stiff to stiff, slightly moist

grades brown

grades with sand

Brown clayey fine to coarse SAND with fine to coarse subrounded gravel, medium dense, moist

grades wet
grades gravelly

grades fine to medium, without gravel, less clay
grades without fines, and with trace fine to coarse subrounded to rounded gravel

grades with abundant black fine gravel
grades without black fine gravel

grades with trace black mottling and wood fragments

grades fine to medium

grades medium dense, with fines

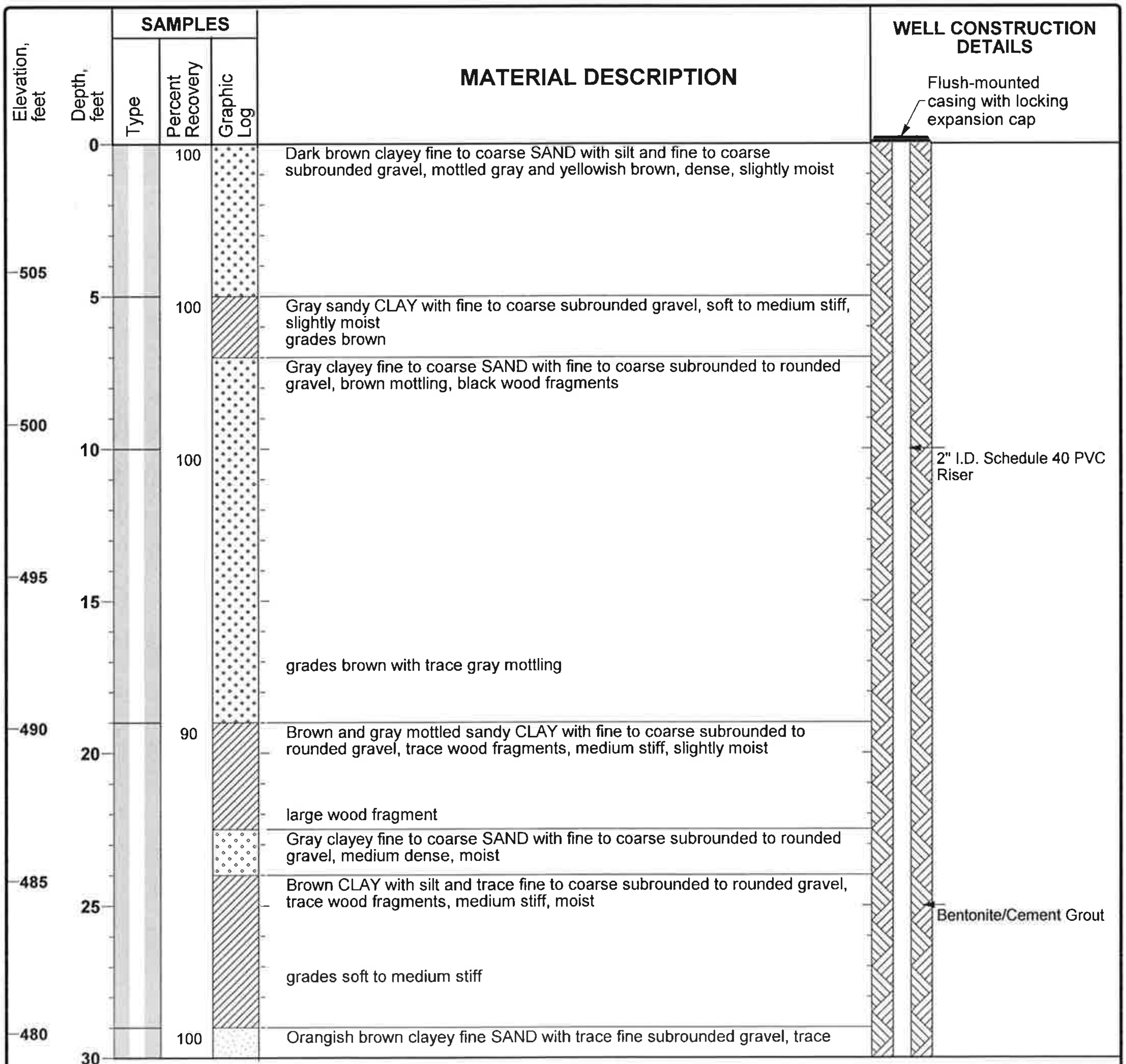
End of boring at 65' bgs

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-11

Sheet 1 of 2

Date(s) Drilled	12/2/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	64.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.18 feet, msl
Depth to Groundwater	51.5 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	508.87 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					



Dark brown clayey fine to coarse SAND with silt and fine to coarse subrounded gravel, mottled gray and yellowish brown, dense, slightly moist

Gray sandy CLAY with fine to coarse subrounded gravel, soft to medium stiff, slightly moist
grades brown

Gray clayey fine to coarse SAND with fine to coarse subrounded to rounded gravel, brown mottling, black wood fragments

grades brown with trace gray mottling

Brown and gray mottled sandy CLAY with fine to coarse subrounded to rounded gravel, trace wood fragments, medium stiff, slightly moist

large wood fragment

Gray clayey fine to coarse SAND with fine to coarse subrounded to rounded gravel, medium dense, moist

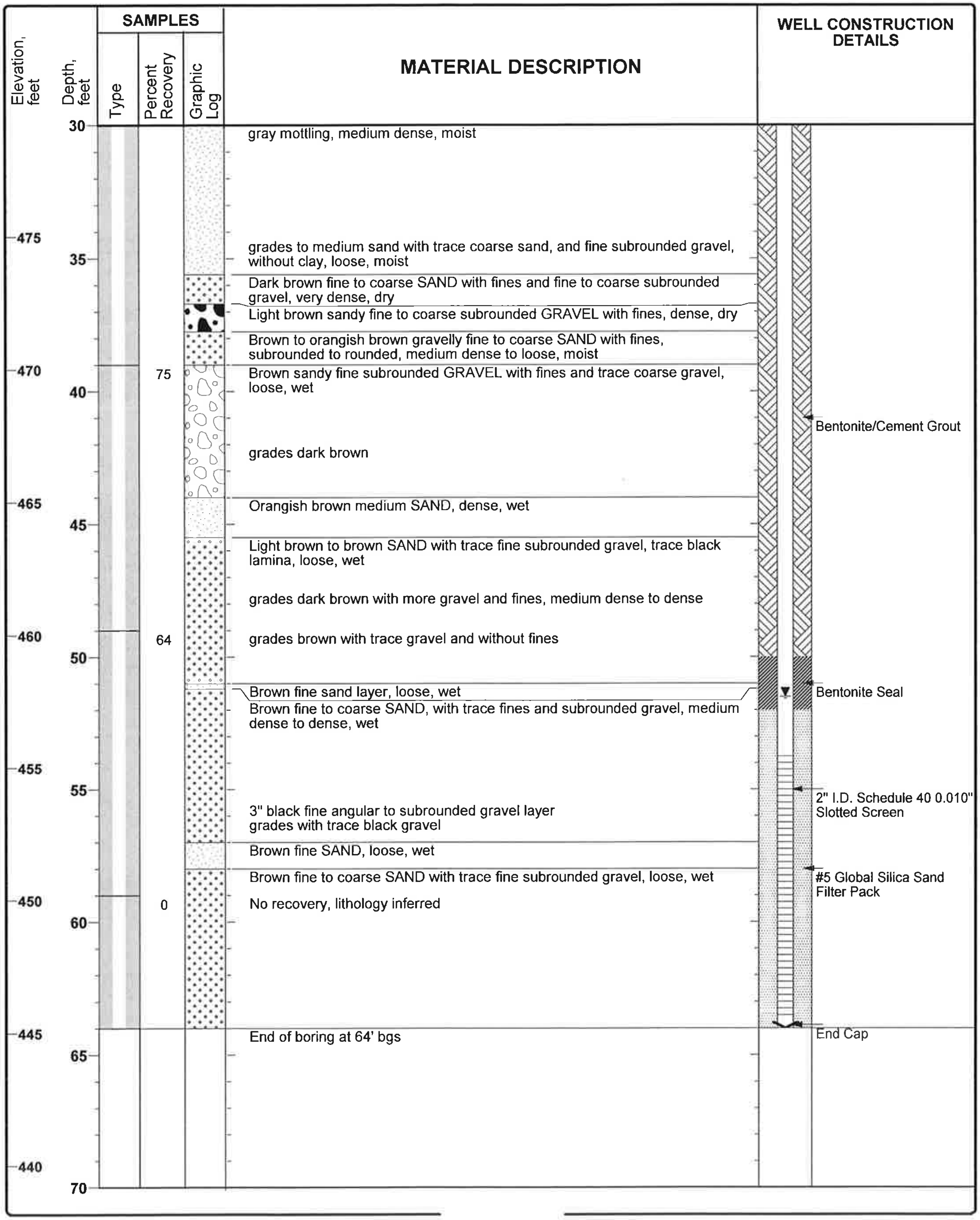
Brown CLAY with silt and trace fine to coarse subrounded to rounded gravel, trace wood fragments, medium stiff, moist

grades soft to medium stiff

Orangish brown clayey fine SAND with trace fine subrounded gravel, trace

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-11
Sheet 2 of 2



gray mottling, medium dense, moist

grades to medium sand with trace coarse sand, and fine subrounded gravel, without clay, loose, moist

Dark brown fine to coarse SAND with fines and fine to coarse subrounded gravel, very dense, dry

Light brown sandy fine to coarse subrounded GRAVEL with fines, dense, dry

Brown to orangish brown gravelly fine to coarse SAND with fines, subrounded to rounded, medium dense to loose, moist

Brown sandy fine subrounded GRAVEL with fines and trace coarse gravel, loose, wet

grades dark brown

Orangish brown medium SAND, dense, wet

Light brown to brown SAND with trace fine subrounded gravel, trace black lamina, loose, wet

grades dark brown with more gravel and fines, medium dense to dense

grades brown with trace gravel and without fines

Brown fine sand layer, loose, wet

Brown fine to coarse SAND, with trace fines and subrounded gravel, medium dense to dense, wet

3" black fine angular to subrounded gravel layer
grades with trace black gravel

Brown fine SAND, loose, wet

Brown fine to coarse SAND with trace fine subrounded gravel, loose, wet

No recovery, lithology inferred

End of boring at 64' bgs

JOB NO.

COMPANY Zimmer Plant

PROJECT Flood plain monitoring well

COORDINATES N-3270 E-130

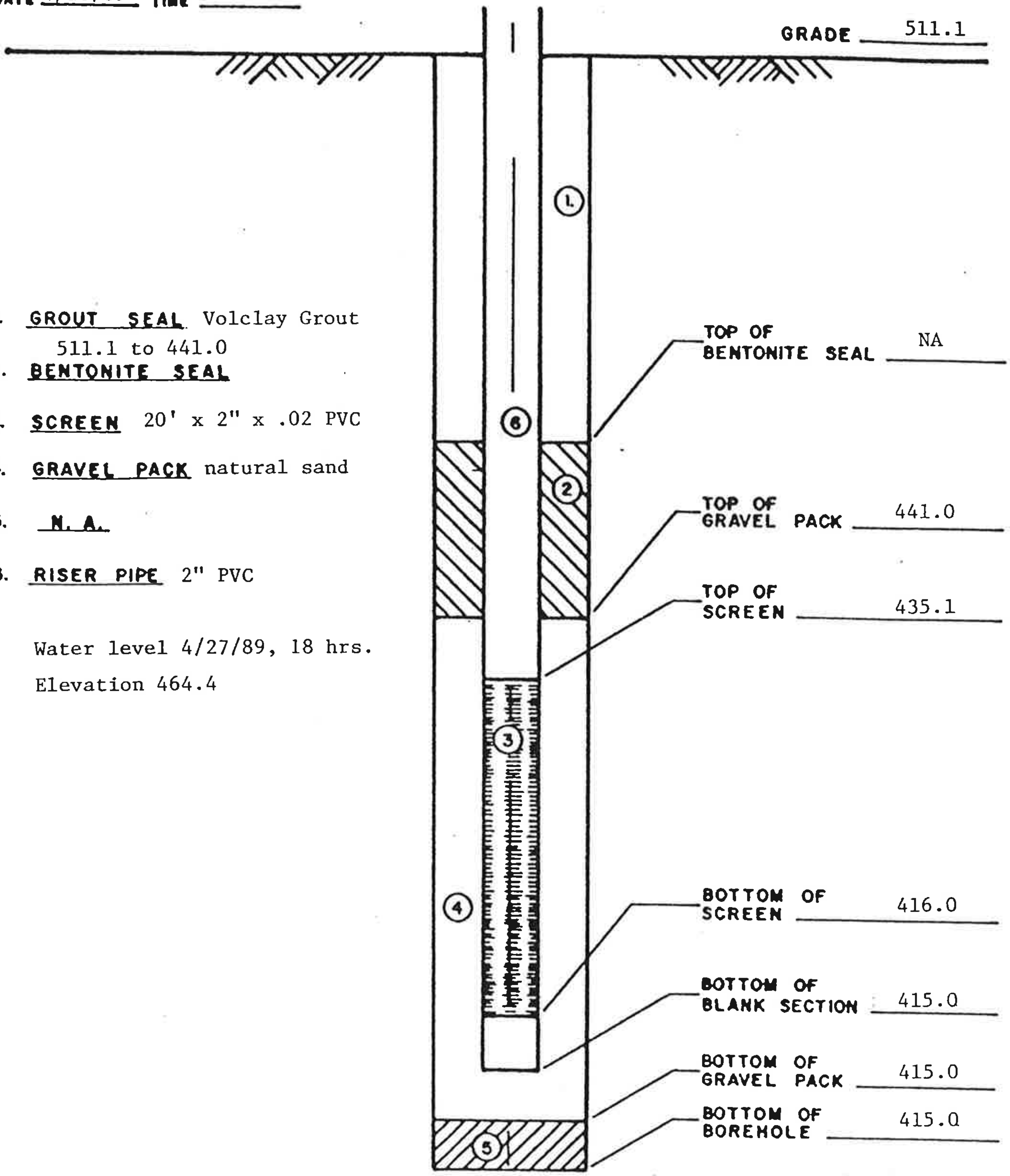
DATE 4/26/89 **TIME**

WELL CONSTRUCTION SUMMARY ELEVATIONS (ft NGVD)

WELL No. 8

REF. DATUM PT. 513.1

GRADE 511.1



1. **GROUT SEAL** Volclay Grout
   511.1 to 441.0
2. **BENTONITE SEAL**
3. **SCREEN** 20' x 2" x .02 PVC
4. **GRAVEL PACK** natural sand
5. **N. A.**
6. **RISER PIPE** 2" PVC

Water level 4/27/89, 18 hrs.

Elevation 464.4

TOP OF BENTONITE SEAL	NA
TOP OF GRAVEL PACK	441.0
TOP OF SCREEN	435.1
BOTTOM OF SCREEN	416.0
BOTTOM OF BLANK SECTION	415.0
BOTTOM OF GRAVEL PACK	415.0
BOTTOM OF BOREHOLE	415.0

GEOTECHNICAL ENGINEERING SECTION
CIVIL DESIGN STANDARD

REVISION

APPROVED

DR.

CH.

AMERICAN ELECTRIC POWER SVC. CORP.

OBSERVATION WELL

CDS-04

SH.

FORM. CE-5
REV. 1/87

AMERIC N ELECTRIC POWER SERVICE CO RATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N. 5940 W- 520

LOCATION OF BORING:	Flood plain monitoring well
WATER LEVEL	38.0
TIME	11:00
DATE	4-27-89

BORING NO. Z-117 DATE 4-26-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE CORE
CASING USED ✓ SIZE HW DRILLING MUD USED —
BORING BEGUN 4-26-89 BORING COMPLETED 4-27-89
GROUND ELEVATION 511.1 REFERRED TO
DATUM
FIELD PARTY Howell - Darst RIG 75

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.5	4.0	2	5	8	15"					Clay- Br- moist- med to low plasticity	
										CL		
2	7.5	9.0	3	5	8	18"					Same as 1	
								10				
3	12.5	14.0	3	4	5	18"					Silt/Clay- multi-colored Br. med to low plasticity	
										CL		
4	17.5	19.0	3	4	5	18"					Same as 2	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ________
COMPANY ________
PROJECT ________
COORDINATES ________

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING NO. Z117 DATE ______ SHEET 2 OF ____
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
											Top 9"	
5	22.5	24.0	2	3	4	19"					Clay- yellowish Br- moist to wet- med to low plasticity	
										CL		
											Bottom 9" Clay- Gray- wet- med to low plasticity	
										CL		
6	27.5	29.0	2	3	3	18"					Clay- Gray- wet- med to low plasticity	
										CL		
								30				
7	32.5	34.0	1	2	3	18"					Same as 6	
8	37.5	39.0	20	26	12	16"					Sand + Gravel- Gray- Br- Saturated - Quartz- Rounded ½" max size - w/ Fines	
										GM		
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. Z117 DATE ______ SHEET 3 OF ____
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
9	42.5	44.0	10	15	15	12"					Sand- Br- Quartz- moist	
										SW		
											Sand- Br- Quart -Saturated	
10	47.5	49.0	8	12	17	12"						
										SP		
								50				
11	52.5	54.0	15	17	10	14"					Sand + Gravel- Br- Saturated Quartz- Rounded- 1" max size w/ Fines - Strong Reaction to Hcl	
										GM		
12	57.5	59.0	12	14	16	15"					Sand- Br- Saturated- Quartz- Trace of Pea Gravel Strong Reaction to Hcl	
										SP		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING NO. 2117 DATE ______ SHEET 4 OF ______
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	62.5	64.0	16	17	11	13"					Gravelly Silty Sand- Br- Saturated- Quartz- 3/4" max size - Strong Reaction to HCL	
14	67.5	69.0	29	39	31	16"					Sand + Gravel- Br. Saturated Quartz- 1" max size - w/ Fines - Strong Reaction to HCL	
								70				
15	72.5	74.0	12	28	40	8"					Clayey Sand + Gravel Br. Saturated - 1" max size Rounded- Quartz - Strong Reaction to HCL	
										GC		
16	77.5	79.0	14	30	38	9"					Same as 15	
								80				

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. Z-117 DATE ____ SHEET 5 OF 5
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	82.5	84.0	8	11	13	11"					Gravelly Sand - Br. Saturated Quartz 3/4" max size - Rounded w/ Fines + Black Lignite Strong Reaction to HCL	
18	87.5	89.0	12	11	14	13"					Gravelly Sand - Br. Saturated Quartz - Rounded - 3/4" max size w/ Fines - Strong Reaction to HCL	
											Stopped Hole - 89.9 and Installed 2" O.B. well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY AEP
PROJECT Zimmer Plant
COORDINATES N-3270 E-130

LOCATION OF BORING:	Flood plain monitoring wells
WATER LEVEL	28.5
TIME	10:00
DATE	4-20-89

BORING NO. Z-124 DATE 4-20-89 SHEET 1 OF 5
TYPE OF SAMPLES: SPT ✓ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 4-20-89 BORING COMPLETED 4-25-89
GROUND ELEVATION 511.1 REFERRED TO ____
____ DATUM
FIELD PARTY Howell - Darst RIG 75

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	30	4.5	4	5	5	0					Limestone Road base	
2	8.0	9.5	20	29	42	12"				SP	Sand - Br - moist - QUARTZ STRONG REACTION TO HCL	
								10				
3	13.0	14.5	16	29	50/.4	14"				SC	Clayey Sand Br. moist QUARTZ - TRACE OF GRAVEL STRONG REACTION TO HCL	
4	18.0	19.5	17	29	45	16"				SP	Sand - Br - moist - STRONG REACTION TO HCL - 90% FINE GRAIN - QUARTZ	
								20				

6" x 3.25 HSA	✓
HW CASING ADVANCER 4"	
NQ CORE ROCK	
NW CASING 3"	
SW CASING 6"	

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____

COMPANY ____

PROJECT ____

COORDINATES ____

BORING NO. 2-124 DATE ____ SHEET 2 OF 5

TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____

CASING USED ____ SIZE ____ DRILLING MUD USED ____

BORING BEGUN ____ BORING COMPLETED ____

GROUND ELEVATION ____ REFERRED TO ____ DATUM

FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
5	23.0	24.5	12	19	35	15"					Sand- BR- moist. Strong Reaction to HCL- Quartz 80% Fine Grain	
										SP		
6	28.0	29.5	50/.4			6"					Sand- BR. Saturated- Quartz w/3 Broken Lime Stone Frag- Strong Reaction to HCL-	
								30		SP		
7	33.0	34.5	18	15	21	14"					Clay- BR- moist. med to Low plasticity	
										CL		
8	38.0	39.5	7	9	12	16"					Same as - 7 Trace of V-Fine Sand	
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______
COMPANY ______
PROJECT ______
COORDINATES ______

BORING NO. Z-124 DATE ______ SHEET 3 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
											TOP-6"	
9	43.0	44.5	5	6	8	16"					CLAY- BR- WET- MED TO LOW PLASTICITY	
										CL		
											BOTTOM 10" CLAYEY SAND- BR- SATURATED 100% FINE GRAIN - QUARTZ	
										SC		
10	48.0	49.5	5	10	16	18"					CLAYEY SAND- BR- SATURATED QUARTZ	
										SC		
								50				
11	53.0	54.5	12	15	15	16"					SAND- BR- SATURATED QUARTZ- MED TO FINE GRAIN	
										SP		
12	58.0	59.5	12	15	23	15"					SAND- BR- QUARTZ- SATURATED W/ TRACE OF PEAGRAVEL	
										SW		
								60				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ______

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________
COMPANY ____________
PROJECT ____________
COORDINATES ____________

BORING NO. Z-124 DATE ____________ SHEET 4 OF 5
TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______
CASING USED ______ SIZE ______ DRILLING MUD USED ______
BORING BEGUN ______ BORING COMPLETED ______
GROUND ELEVATION ______ REFERRED TO ______ DATUM
FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								60				
13	63.0	64.5	8	10	12	10"					Sand- Br- Saturated med to Fine Grain - Quartz	
										SP		
14	68.0	69.5	8	10	15	14"					Same as 13 - Strong Reaction to HCL	
								70				
15	73.0	74.5	6	10	16	12"					Sand- Br- Quartz - Saturated 100% Fine Grain	
16	78.0	74.5	6	16	29	15"					Same as 15	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY
PROJECT
COORDINATES

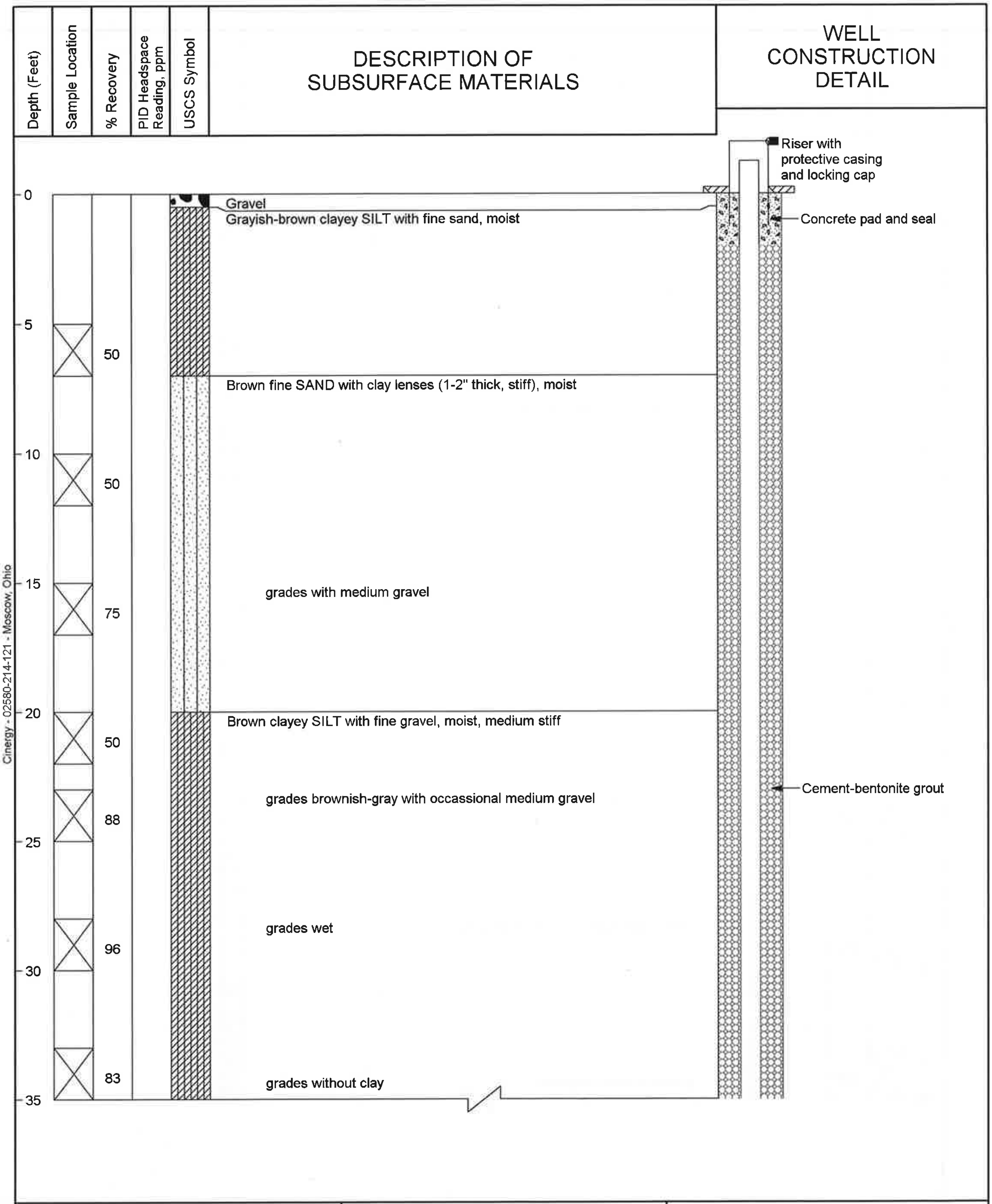
LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

BORING NO. 2-124 DATE SHEET 5 OF 5
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO
 DATUM
FIELD PARTY RIG

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								80				
17	83.0	84.5	16	27	43	13"				GM	Silty Sand + Gravel - Br Saturated - Quartz - 1" Max Size - Angular -	
18	88.0	89.5	11	14	15	12"				SW	Sand - Br - Saturated - Trace of Fines - Strong Reaction to HCL - Trace of Fines	
								90				
19	93.0	94.5	10	14	16	14"					Same as 18"	
											Stopped Hole 96.1 Installed well	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER



Cinergy - 02580-214-121 - Moscow, Ohio

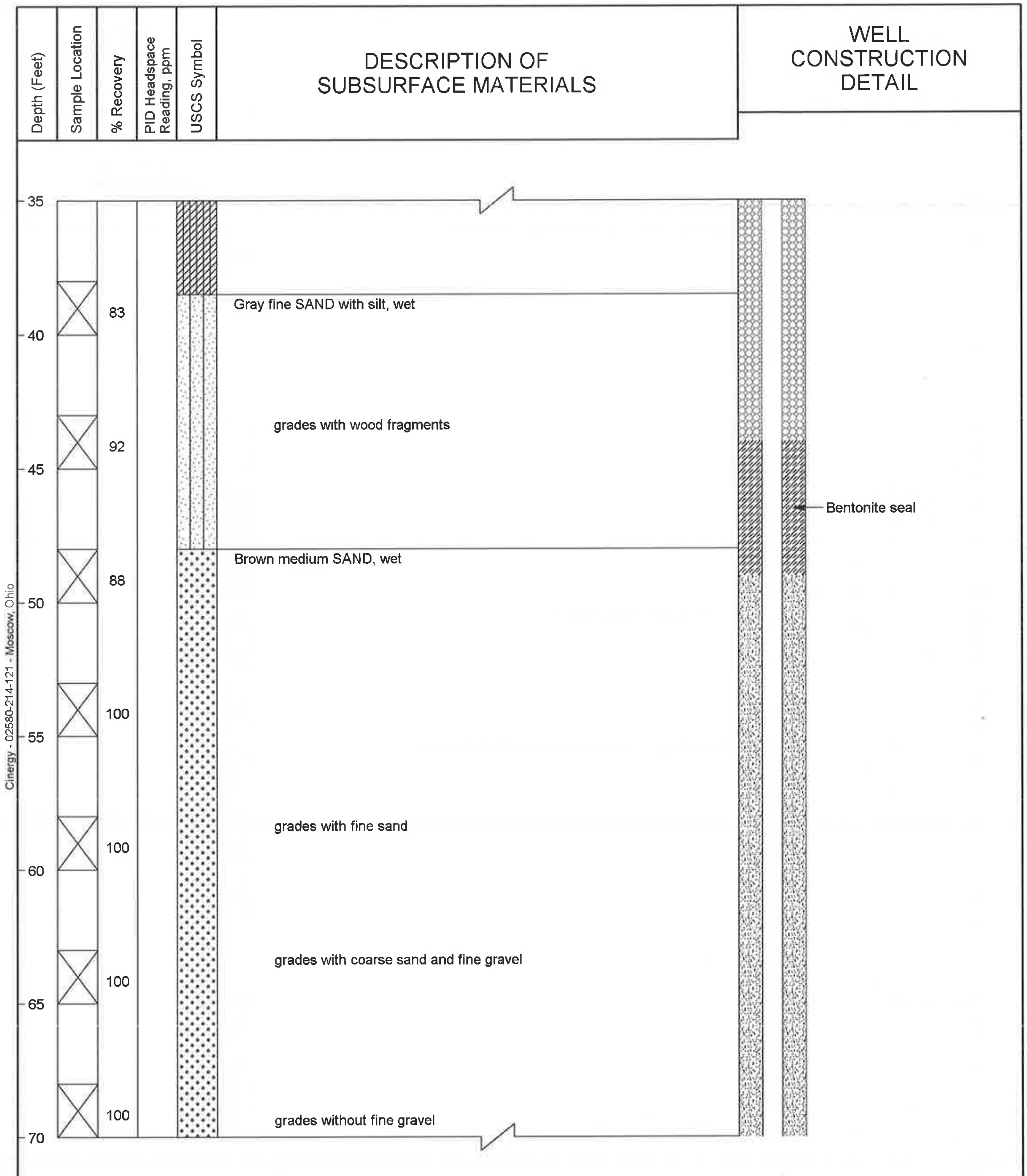
URS

JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station

Moscow, Ohio

SOIL BORING
MW-9



Gray fine SAND with silt, wet

grades with wood fragments

Brown medium SAND, wet

grades with fine sand

grades with coarse sand and fine gravel

grades without fine gravel

URS

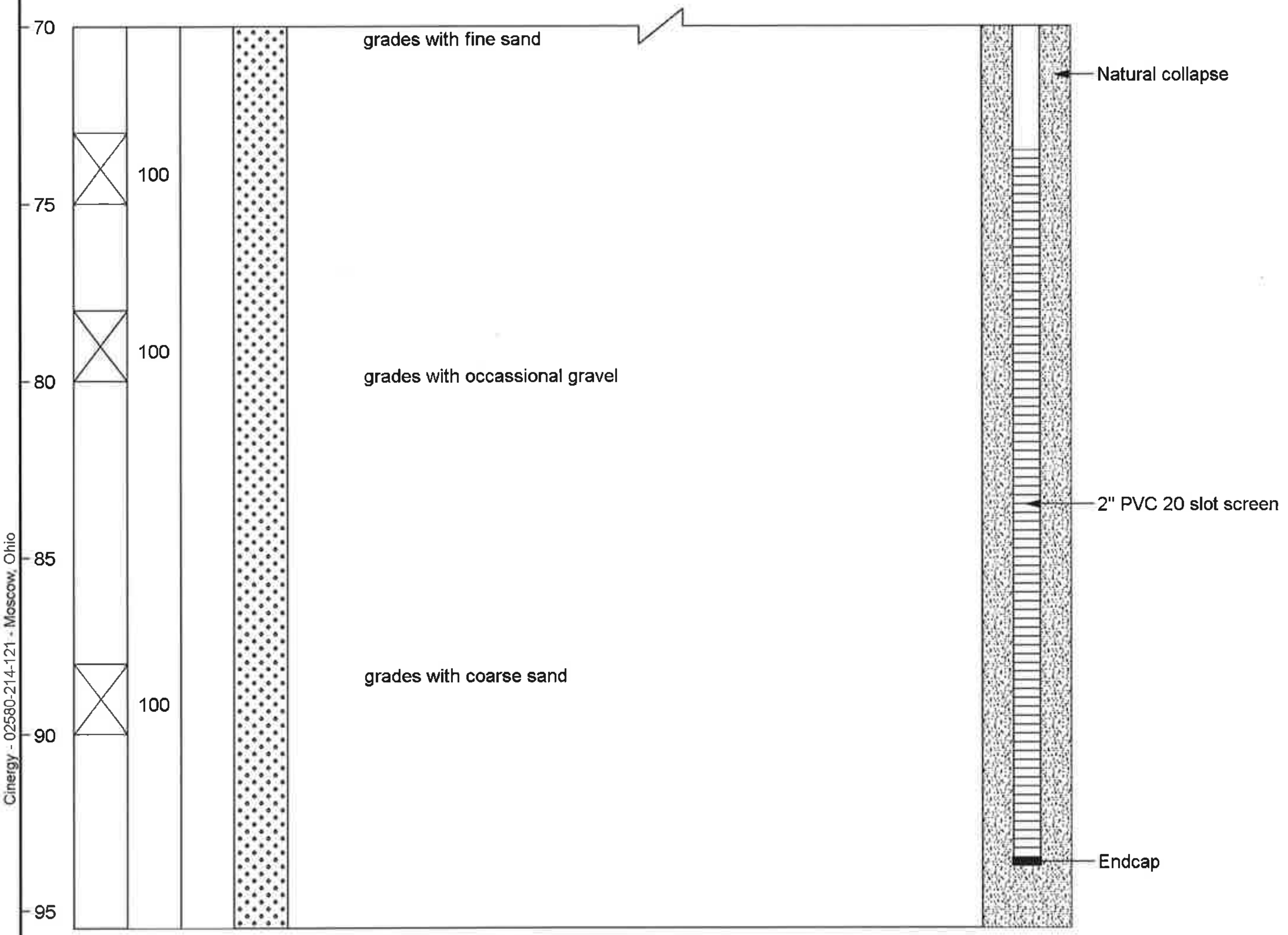
JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station

Moscow, Ohio

SOIL BORING
MW-9

Depth (Feet)	Sample Location	% Recovery	PID Headspace Reading, ppm	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS	WELL CONSTRUCTION DETAIL



grades with fine sand

grades with occassional gravel

grades with coarse sand

End of boring at 95.2 ft. bgs.
Monitoring well installed to 93.5 ft. bgs. on 10/15/2003.

LEGEND:

☐ Auger Cuttings
☒ Split Spoon
PID Photoionization Detector
bgs Below ground surface

URS
JOB NO. 02580-214-121

Cinergy
Zimmer Generating Station
Moscow, Ohio

SOIL BORING
MW-9

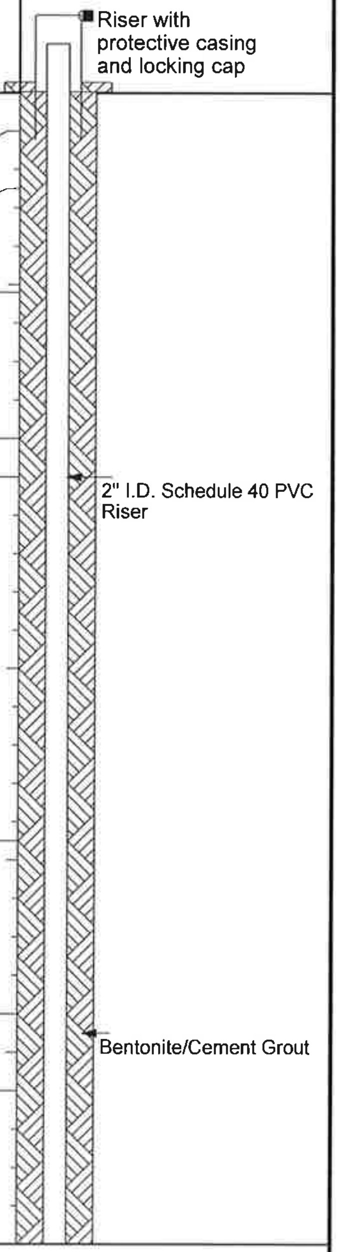
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-12
Sheet 1 of 2

Date(s) Drilled	11/20/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	64.0 feet
Date of Groundwater Measurement	12/08/15	Sampler Type	Sonic Sleeve	Surface Elevation	509.34 feet, msl
Depth to Groundwater	53.19 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	511.92 feet, msl
Diameter of Hole (inches)	6.0	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Diameter of Well (inches)	2				
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	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown silty SAND with trace fine angular gravel, trace roots, loose, moist grades with angular fine to coarse gravel
					Light brown fine to coarse angular sandy GRAVEL with fines, loose, moist grades silty and sandy
505					Brown SILT with clay and trace fine angular to subrounded gravel, medium dense, slightly moist grades sandy with trace fine to coarse subrounded gravel 1" fine to coarse sand layer
	5		100		Brown fine to coarse SAND with fines and trace fine to coarse subrounded to rounded GRAVEL, loose, slightly moist
500					Brown to tan CLAY with silt and sand, very stiff, slightly moist
	10		100		Brown to tan CLAY and SILT with sand, very stiff, moist grades with less sand, slightly less stiff
495	15				grades reddish brown with gray mottling, more silt and less clay, less stiff grades with trace medium gravel
490	20		90		Gray SILT with clay and very fine to fine sand, very soft, moist grades with abundant fine sand
485	25				Gray very fine to fine SAND and SILT, soft, moist
					Gray fine to coarse SAND with fine to coarse subrounded gravel, loose, slightly moist grades brown to red mottled with fine to medium gravel and black mottles
480	30		80		grades dark brown, subrounded to rounded

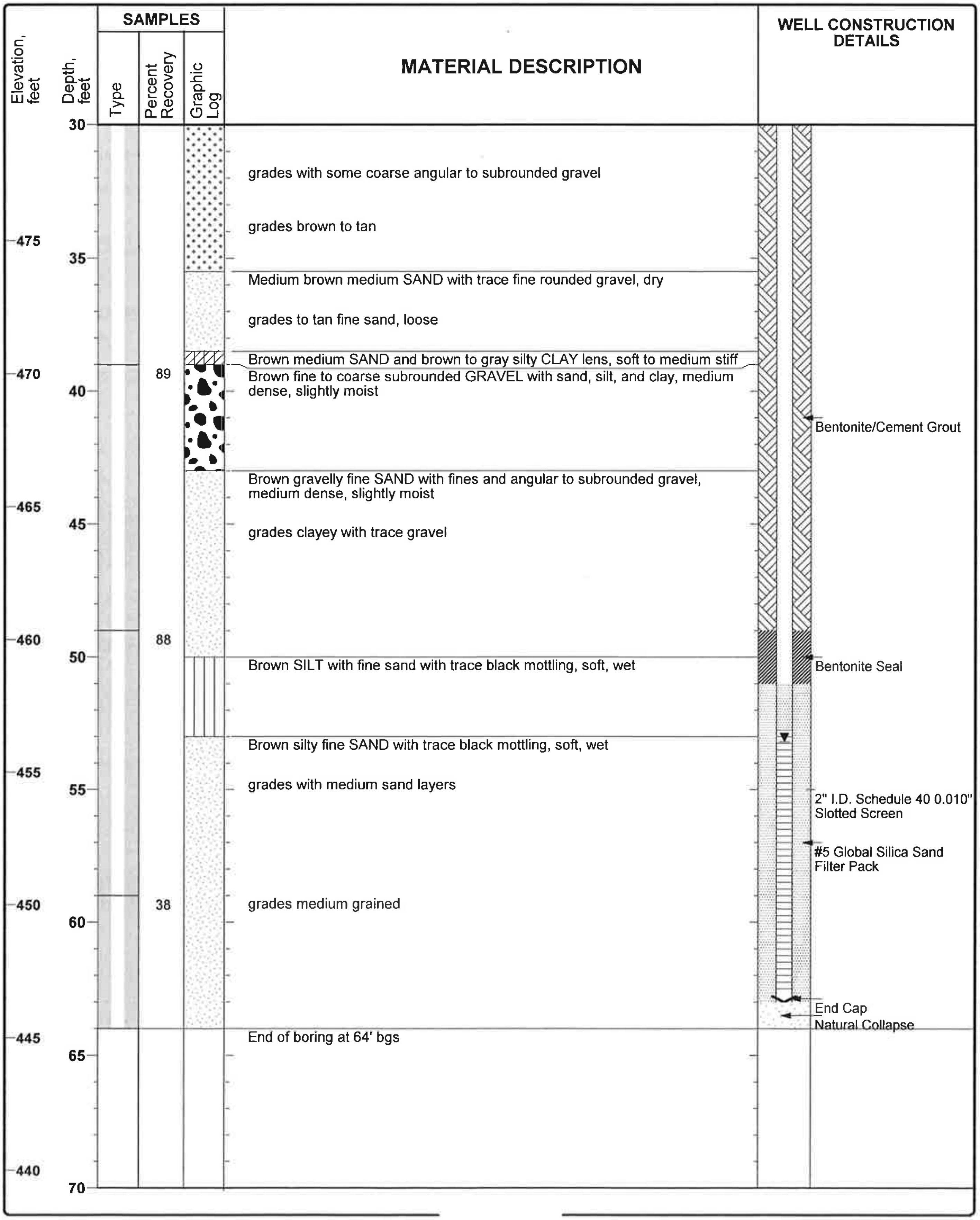
WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-12

Sheet 2 of 2



grades with some coarse angular to subrounded gravel

grades brown to tan

Medium brown medium SAND with trace fine rounded gravel, dry

grades to tan fine sand, loose

Brown medium SAND and brown to gray silty CLAY lens, soft to medium stiff

Brown fine to coarse subrounded GRAVEL with sand, silt, and clay, medium dense, slightly moist

Brown gravelly fine SAND with fines and angular to subrounded gravel, medium dense, slightly moist

grades clayey with trace gravel

Brown SILT with fine sand with trace black mottling, soft, wet

Brown silty fine SAND with trace black mottling, soft, wet

grades with medium sand layers

grades medium grained

End of boring at 64' bgs

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

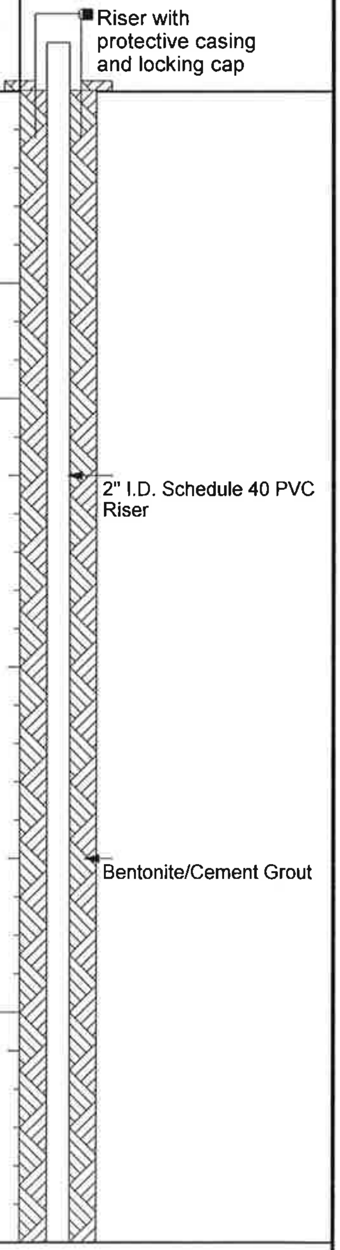
Monitoring Well MW-13

Sheet 1 of 2

Date(s) Drilled	11/24/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	54.0 feet
Date of Groundwater Measurement	12/08/15	Sampler Type	Sonic Sleeve	Surface Elevation	497.21 feet, msl
Depth to Groundwater	39.51 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	499.4 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					

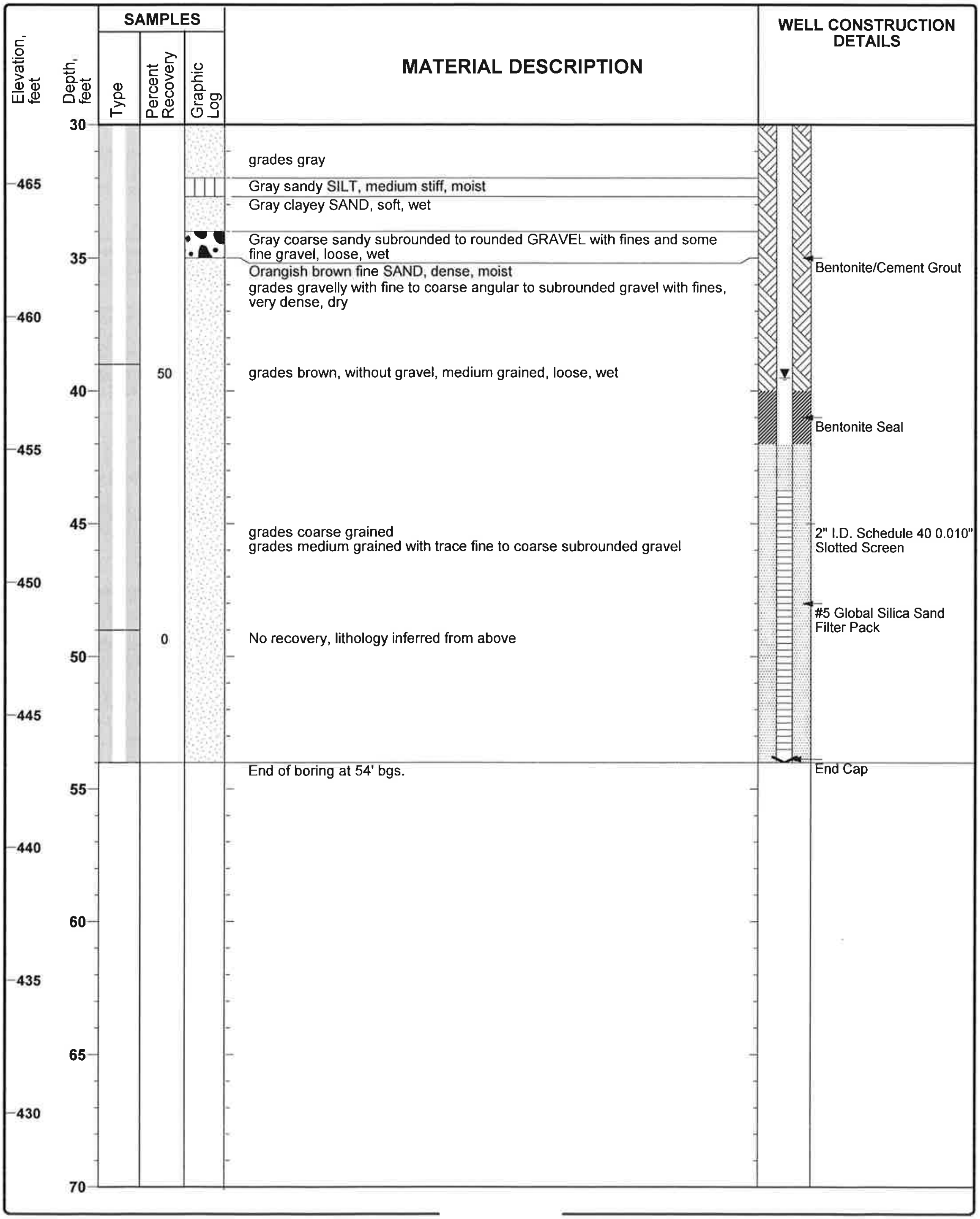
Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown to reddish brown clayey SILT with trace fine to coarse sand, and trace fine subrounded gravel, medium stiff to stiff, dry
495					
					grades very hard
	5		100		Brown medium to coarse SAND with trace fine subrounded gravel, loose, wet
490					
					Brown clayey SILT with trace fine angular to subrounded gravel, trace gray and black mottling, hard, dry
	10		92		grades without gravel, slightly moist to moist
485					grades with more sand, medium stiff
					grades sandy, fine
	15				
480					grades soft, very moist
			92		grades with black mottling
	20				
475					
					Brown clayey fine SAND, soft, wet
	25				
470					
			98		grades grayish brown
	30				

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-13
Sheet 2 of 2



grades gray

Gray sandy SILT, medium stiff, moist

Gray clayey SAND, soft, wet

Gray coarse sandy subrounded to rounded GRAVEL with fines and some fine gravel, loose, wet

Orangish brown fine SAND, dense, moist

grades gravelly with fine to coarse angular to subrounded gravel with fines, very dense, dry

grades brown, without gravel, medium grained, loose, wet

grades coarse grained

grades medium grained with trace fine to coarse subrounded gravel

No recovery, lithology inferred from above

End of boring at 54' bgs.

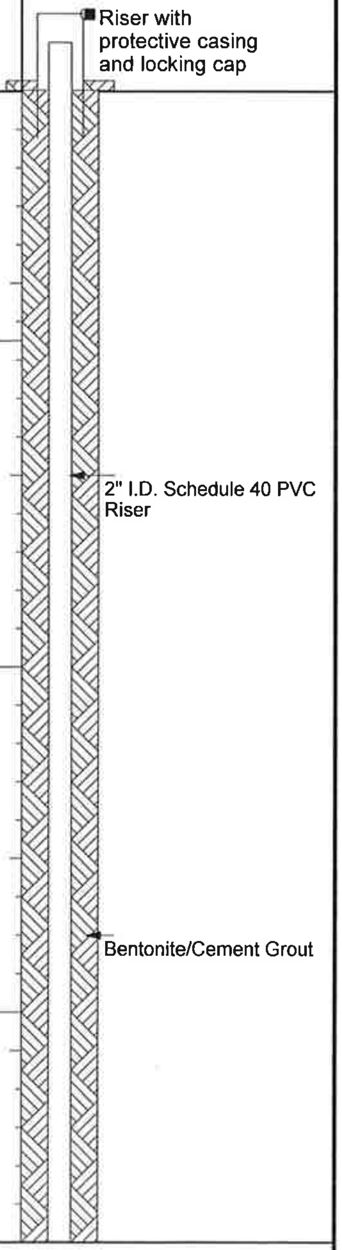
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-14
Sheet 1 of 2

Date(s) Drilled	12/9/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	60.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	502.06 feet, msl
Depth to Groundwater	46.27 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	503.81 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	Graphic Log	MATERIAL DESCRIPTION
	0		76		Brown fine sandy SILT with fine subrounded gravel, hard, dry
500					
	5		100		
495					Brown fine to coarse SAND with fines and trace fine subrounded gravel, dense, slightly moist
					grades without fines and with trace fine to coarse subrounded gravel, loose, moist
	10		100		grades grayish with fines
490					
	15				Grayish brown clayey SILT with trace fine subrounded gravel and trace plant stems/roots, medium stiff, slightly moist
485					grades gray with black mottling, soft grades brown to reddish brown, medium stiff to stiff
	20		100		grades sandy
480					
					Reddish brown clayey fine SAND, soft, moist to very moist
	25				
475					
					grades with trace black mottling
	30				

WELL CONSTRUCTION DETAILS

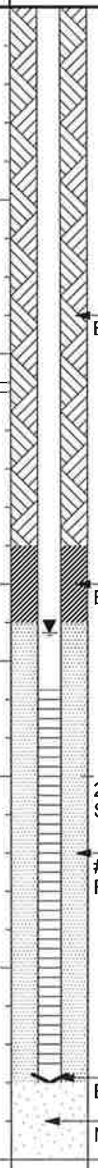


Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-14

Sheet 2 of 2

Elevation, feet	Depth, feet	Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30	100	grades medium brown, wet	
470			grades with gray mottling, trace oxidation staining	
			grades very soft to soft	
	35			
			grades grayish brown	
465			grades bluish gray with trace fine subrounded gravel and trace black wood fragments	Bentonite/Cement Grout
			Bluish gray sandy fine to coarse, subrounded to rounded GRAVEL with fines, loose, wet	
	40	43	Brown fine to coarse SAND, loose, wet	
460				
			grades with trace fine to coarse subrounded gravel	
	45			Bentonite Seal
455			Brown medium SAND with trace fines, medium dense, wet	
	50	70	Brown fine to coarse SAND with trace subrounded gravel, loose, wet	2" I.D. Schedule 40 0.010" Slotted Screen
450				#5 Global Silica Sand Filter Pack
	55		grades fine to medium	
			grades fine to coarse	
445				
			grades coarse, with fine to coarse subrounded gravel	End Cap
				Natural Collapse
	60		End of boring at 60' bgs	
440				
	65			
435				
	70			

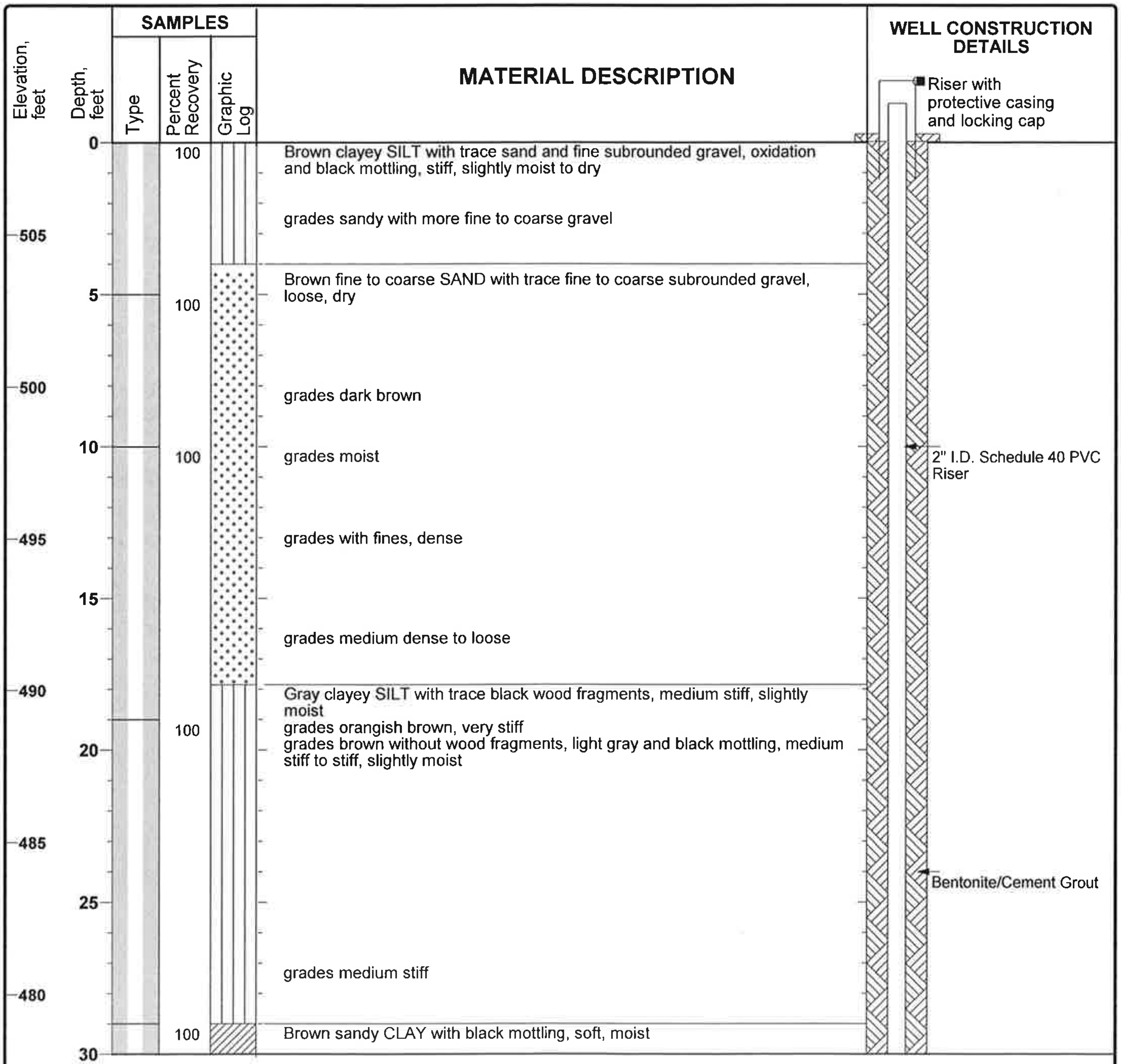


Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-15

Sheet 1 of 2

Date(s) Drilled	11/25/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	62.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	508.04 feet, msl
Depth to Groundwater	52.77 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	510.58 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					



Brown clayey SILT with trace sand and fine subrounded gravel, oxidation and black mottling, stiff, slightly moist to dry

grades sandy with more fine to coarse gravel

Brown fine to coarse SAND with trace fine to coarse subrounded gravel, loose, dry

grades dark brown

grades moist

grades with fines, dense

grades medium dense to loose

Gray clayey SILT with trace black wood fragments, medium stiff, slightly moist
grades orangish brown, very stiff
grades brown without wood fragments, light gray and black mottling, medium stiff to stiff, slightly moist

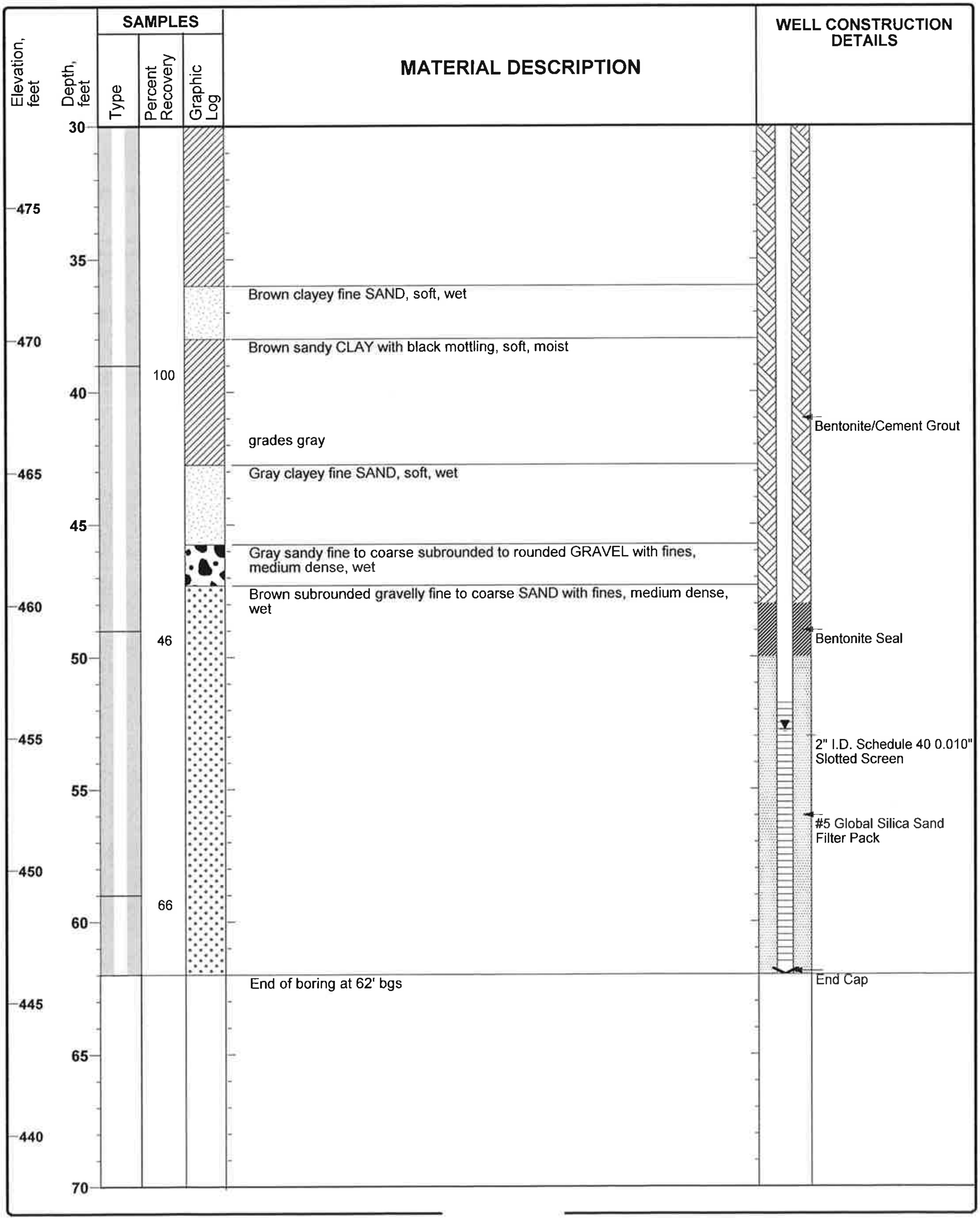
grades medium stiff

Brown sandy CLAY with black mottling, soft, moist

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-15

Sheet 2 of 2



Brown clayey fine SAND, soft, wet

Brown sandy CLAY with black mottling, soft, moist

grades gray

Gray clayey fine SAND, soft, wet

Gray sandy fine to coarse subrounded to rounded GRAVEL with fines, medium dense, wet

Brown subrounded gravelly fine to coarse SAND with fines, medium dense, wet

End of boring at 62' bgs

JOB NO.

COMPANY Zimmer Plant

PROJECT

COORDINATES N-5940 W-520

DATE 5/2/89 TIME

WELL CONSTRUCTION
SUMMARY ELEVATIONS
(FLNGVD)

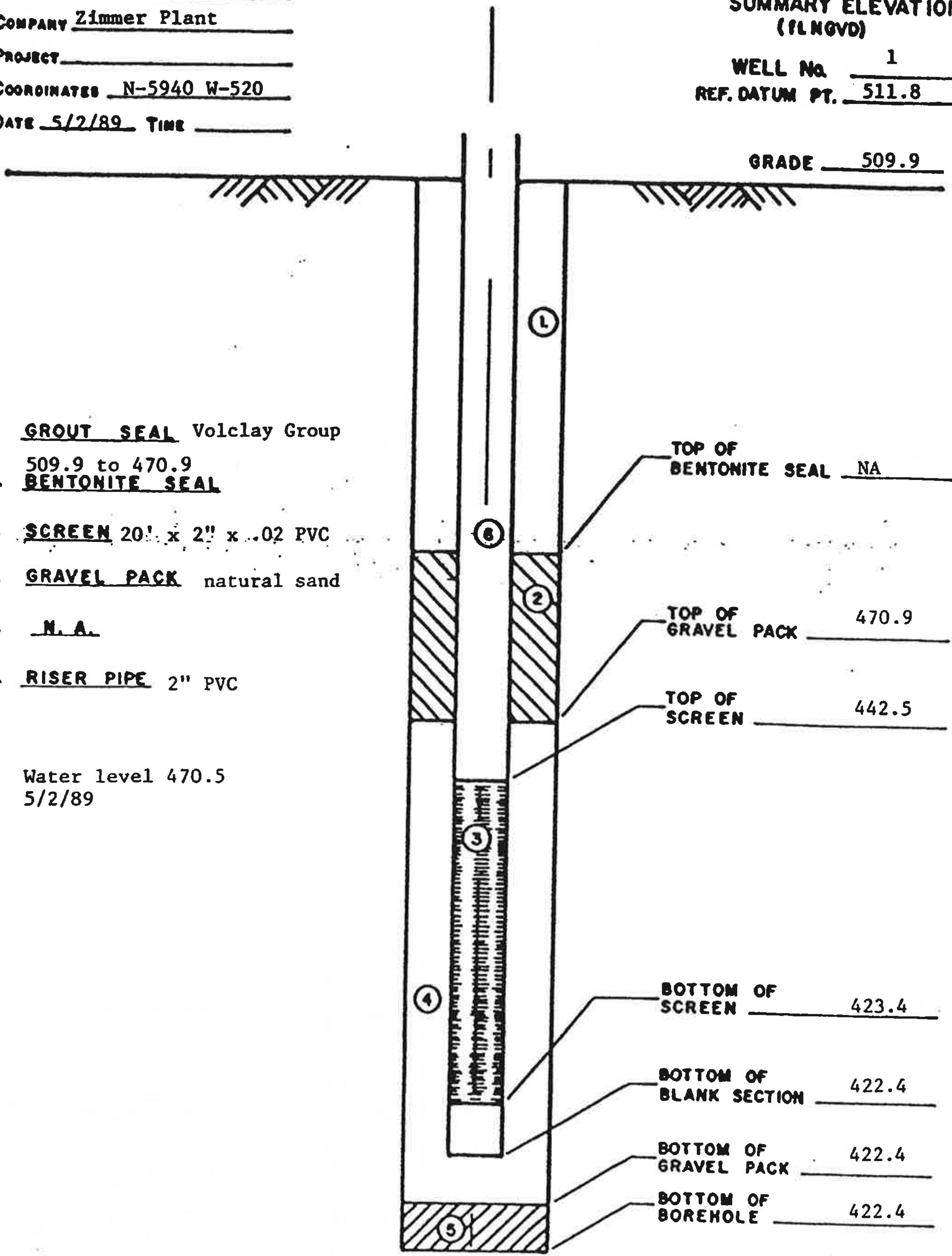
WELL No. 1

REF. DATUM PT. 511.8

GRADE 509.9

1. **GROUT SEAL** Volclay Group
509.9 to 470.9
2. **BENTONITE SEAL**
3. **SCREEN** 20' x 2" x .02 PVC
4. **GRAVEL PACK** natural sand
5. **N. A.**
6. **RISER PIPE** 2" PVC

Water level 470.5
5/2/89



TOP OF BENTONITE SEAL NA

TOP OF GRAVEL PACK 470.9

TOP OF SCREEN 442.5

BOTTOM OF SCREEN 423.4

BOTTOM OF BLANK SECTION 422.4

BOTTOM OF GRAVEL PACK 422.4

BOTTOM OF BOREHOLE 422.4

GEOTECHNICAL ENGINEERING SECTION
CIVIL DESIGN STANDARD

REVISION

OBSERVATION WELL

APPROVED

DR.

CH.

AMERICAN ELECTRIC POWER SVC. CORP.

CDS-04

SH.

JOB No.

COMPANY Zimmer Plant

PROJECT Flood plain monitoring well

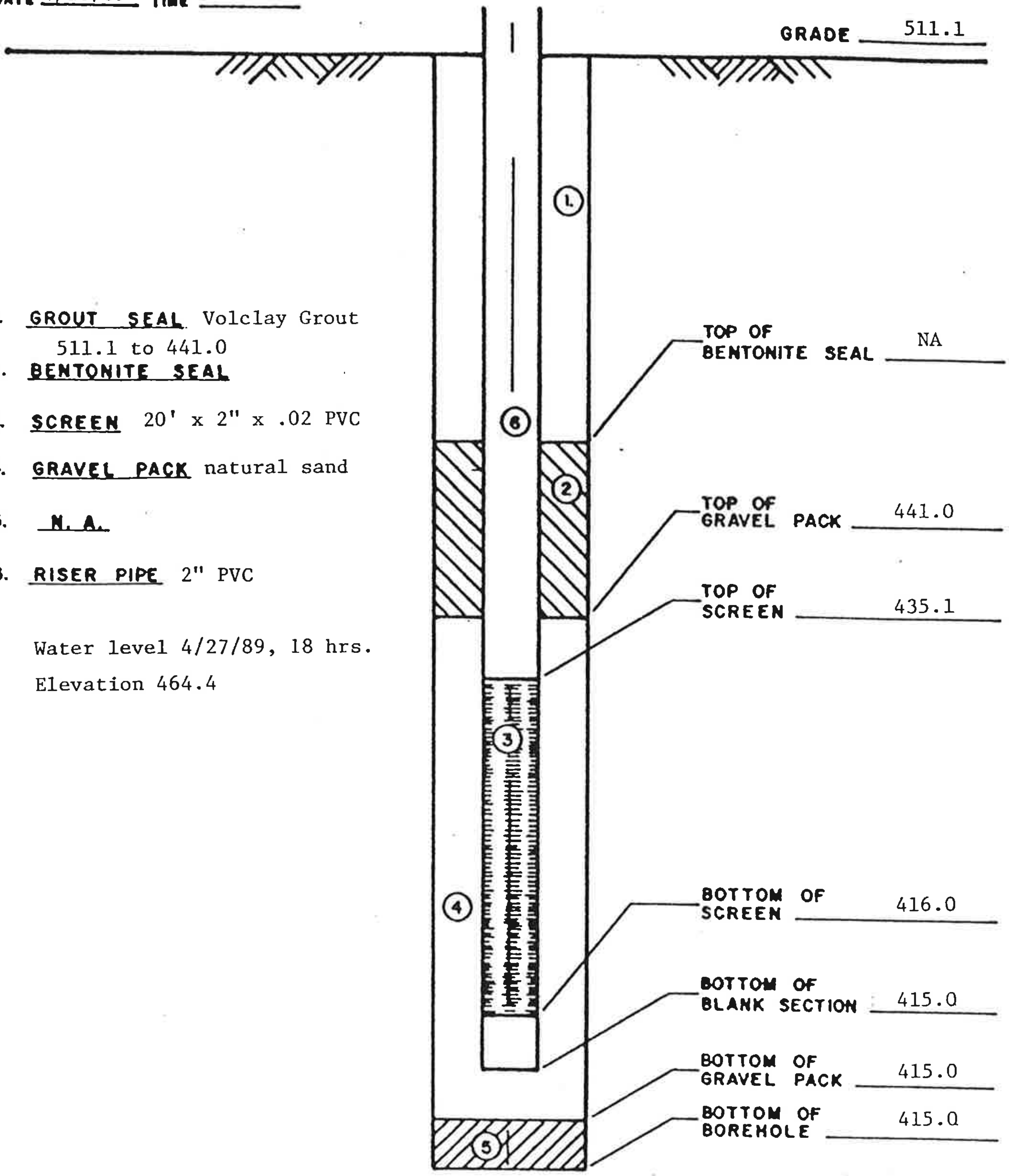
COORDINATES N-3270 E-130

DATE 4/26/89 **TIME**

WELL CONSTRUCTION
SUMMARY ELEVATIONS
(ft NGVD)

WELL No. 8

REF. DATUM PT. 513.1



GRADE 511.1

1. **GROUT SEAL** Volclay Grout
   511.1 to 441.0
2. **BENTONITE SEAL**
3. **SCREEN** 20' x 2" x .02 PVC
4. **GRAVEL PACK** natural sand
5. **N. A.**
6. **RISER PIPE** 2" PVC

Water level 4/27/89, 18 hrs.
Elevation 464.4

TOP OF BENTONITE SEAL NA

TOP OF GRAVEL PACK 441.0

TOP OF SCREEN 435.1

BOTTOM OF SCREEN 416.0

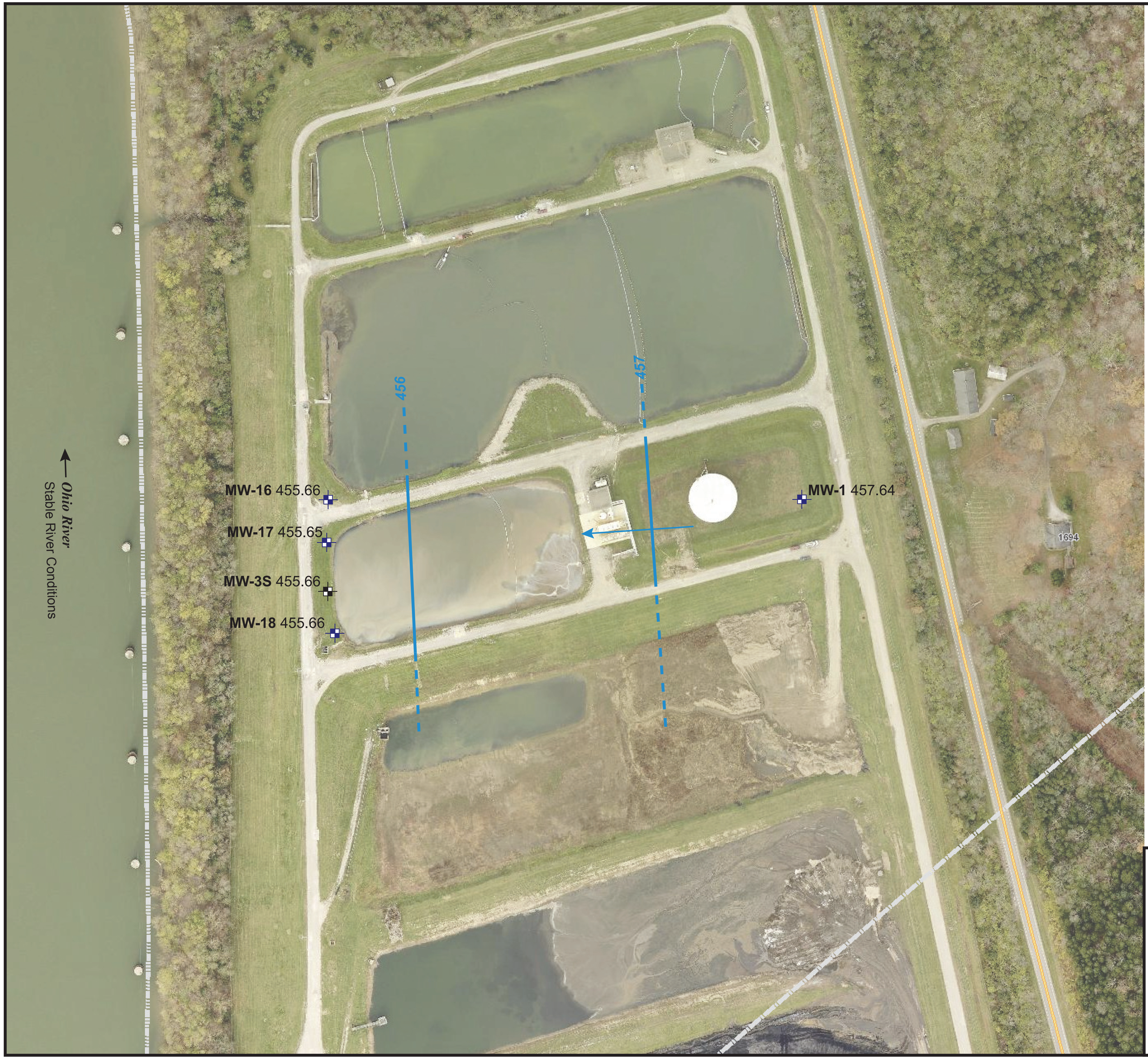
BOTTOM OF BLANK SECTION 415.0

BOTTOM OF GRAVEL PACK 415.0

BOTTOM OF BOREHOLE 415.0

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION		OBSERVATION WELL
APPROVED	DR.	CH.		
AMERICAN ELECTRIC POWER SVC. CORP.				CDS-04 SH.

APPENDIX C3 – MAPS OF THE DIRECTION OF GROUNDWATER FLOW



UNIT BOUNDARY

✚ EXISTING MONITORING WELL LOCATION

✚ DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

→ GROUNDWATER FLOW DIRECTION

457.64 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED AUGUST 31, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
AUGUST 31, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

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

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM PIEZ\coal pile fig1_08-16.ai

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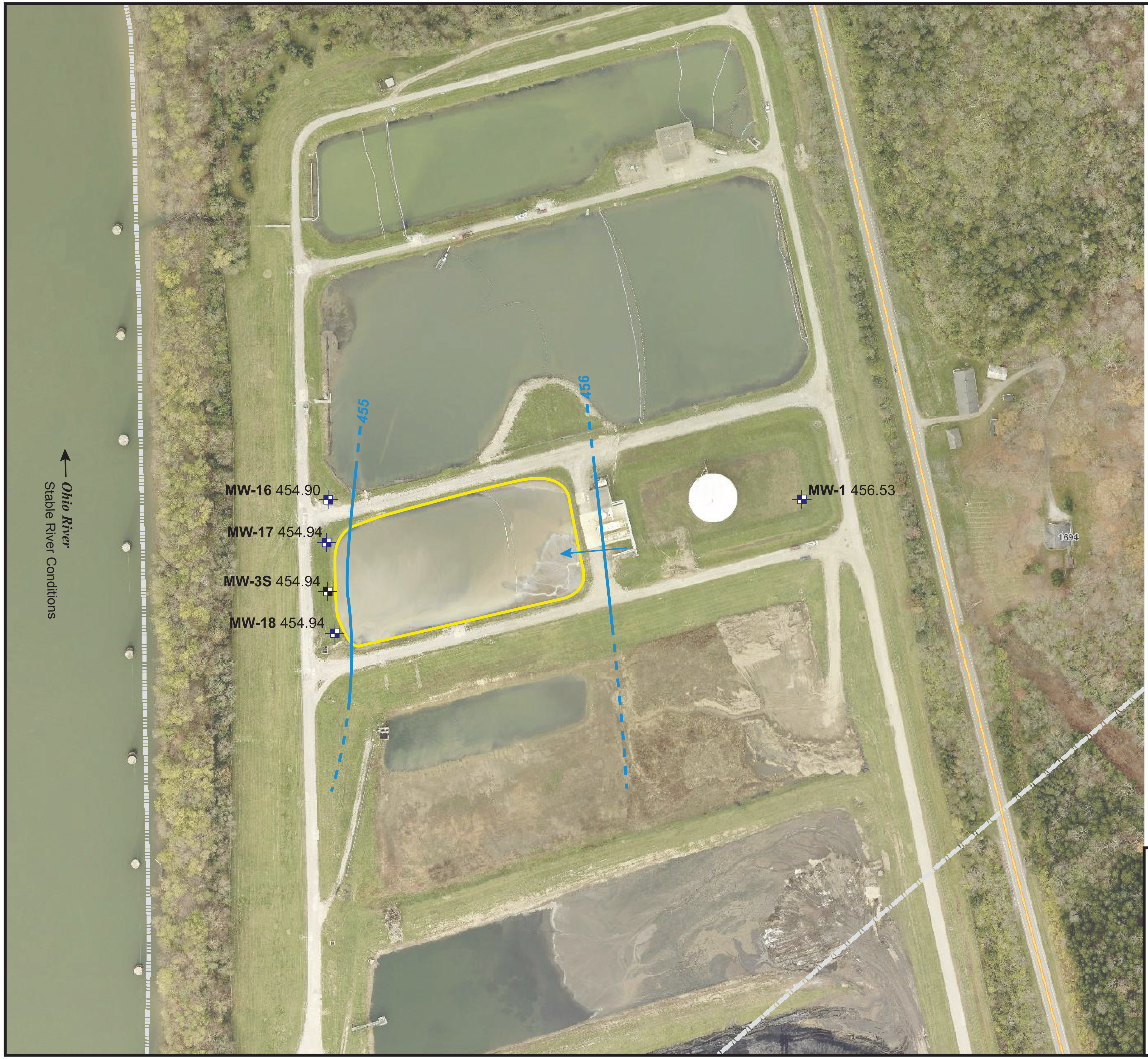

🟨	UNIT BOUNDARY
✚	EXISTING MONITORING WELL LOCATION
✚	DOWNGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
456.53	GROUNDWATER ELEVATION (FEET, MSL), MEASURED SEPTEMBER 26, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/15/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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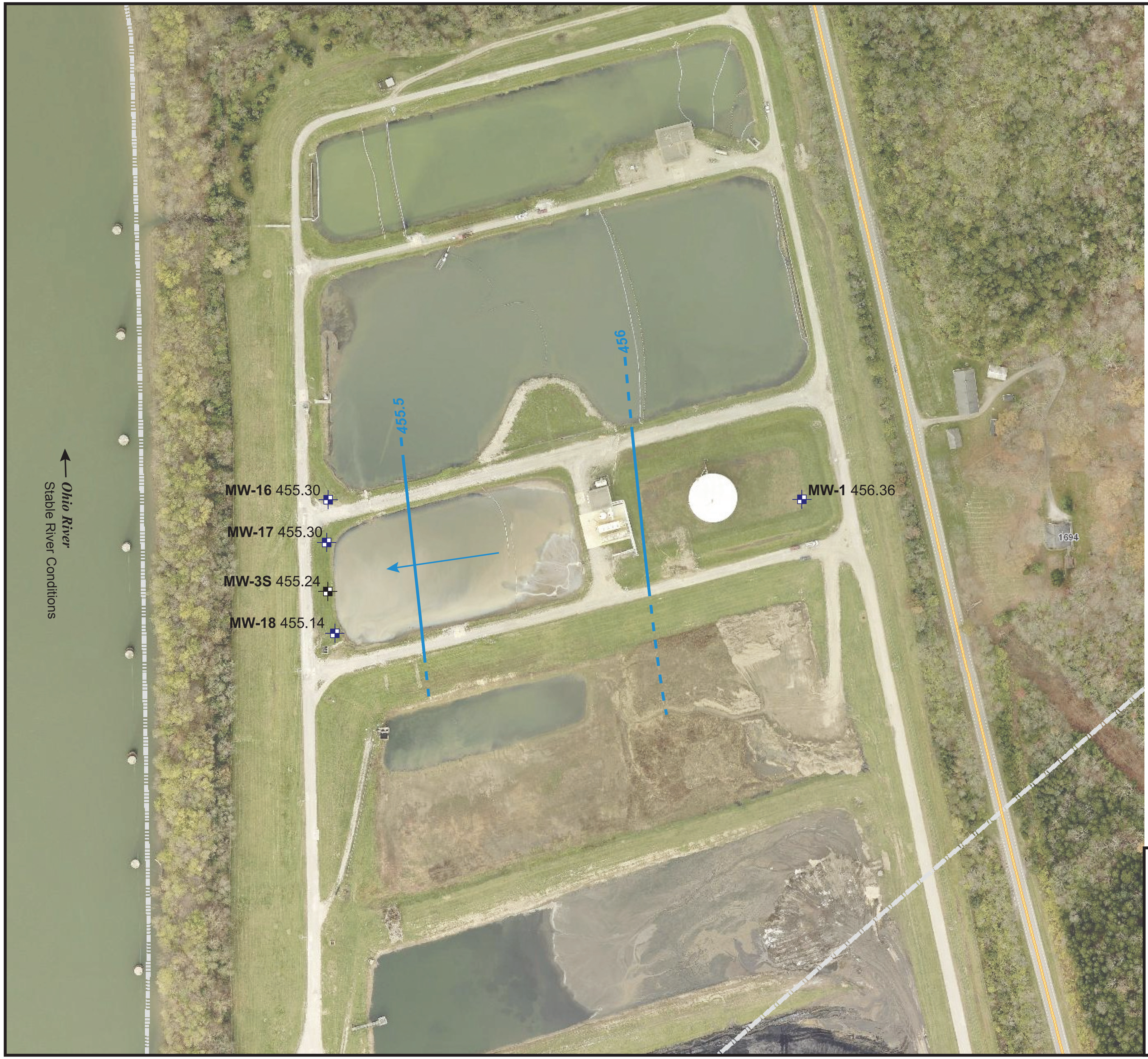

🟨	UNIT BOUNDARY
✚	EXISTING MONITORING WELL LOCATION
✚	DOWNGRADIENT MONITORING WELL LOCATION
🟦	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
456.36	GROUNDWATER ELEVATION (FEET, MSL), MEASURED OCTOBER 12, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
OCTOBER 12, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

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

JOB NO. 60442412

AECOM

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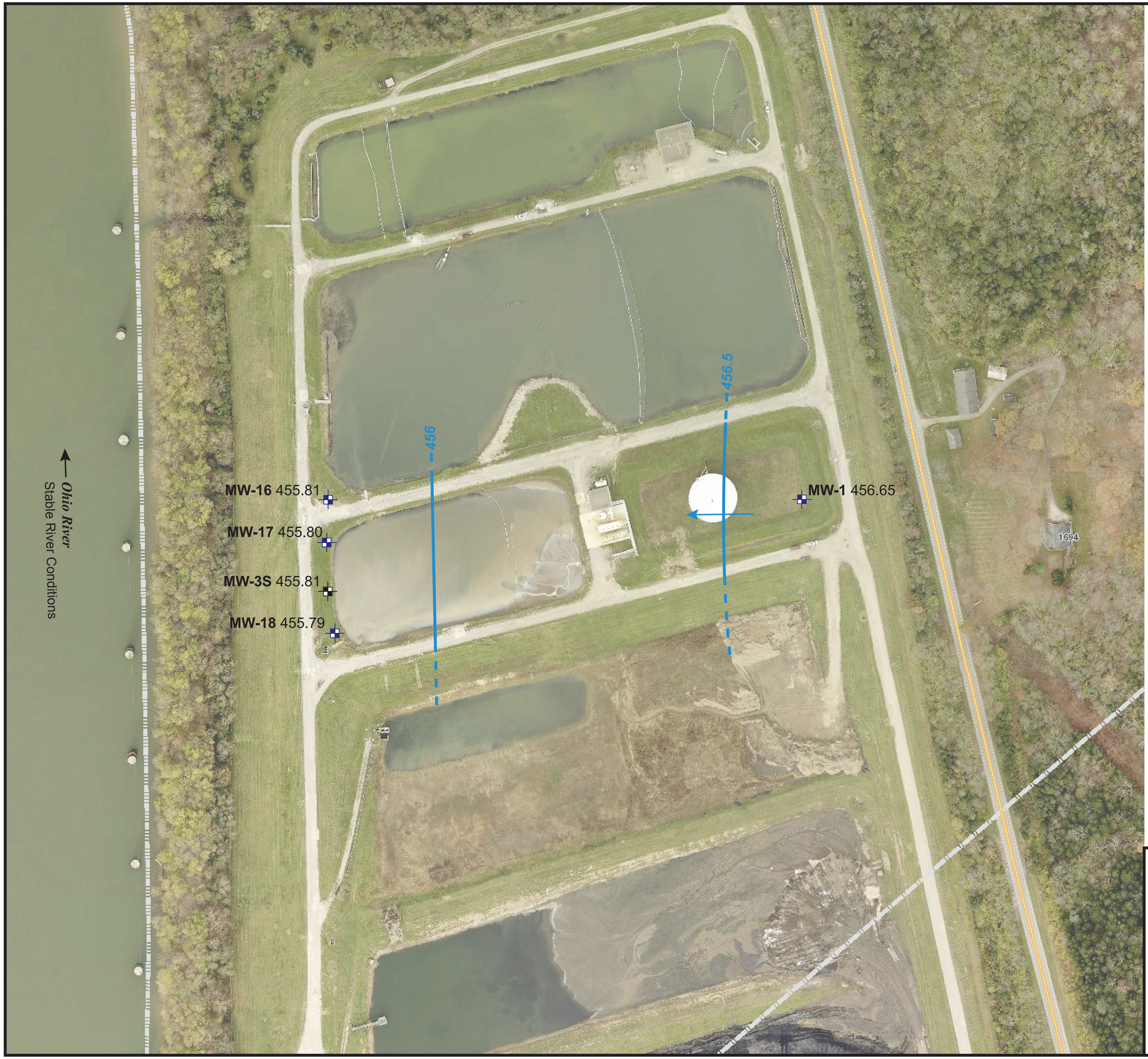


—	UNIT BOUNDARY
✛	EXISTING MONITORING WELL LOCATION
✛	DOWNGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
456.65	GROUNDWATER ELEVATION (FEET, MSL), MEASURED NOVEMBER 16, 2016

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

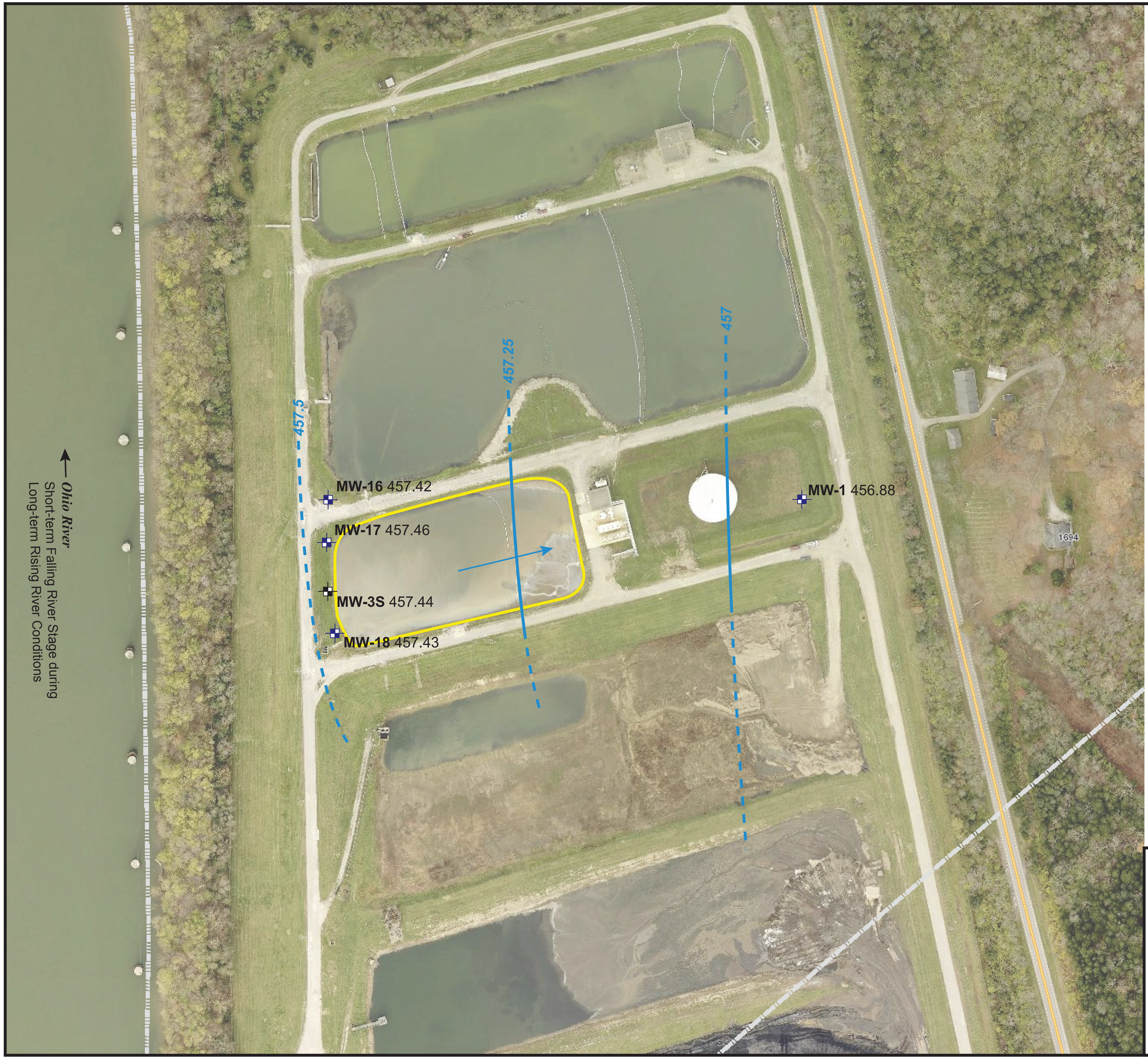
Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
NOVEMBER 16, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

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

JOB NO. 60442412

AECOM



AERIAL SOURCE: CLERMONT COUNTY, OH GIS

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
COAL PILE RUNOFF POND (UNIT ID: 125)
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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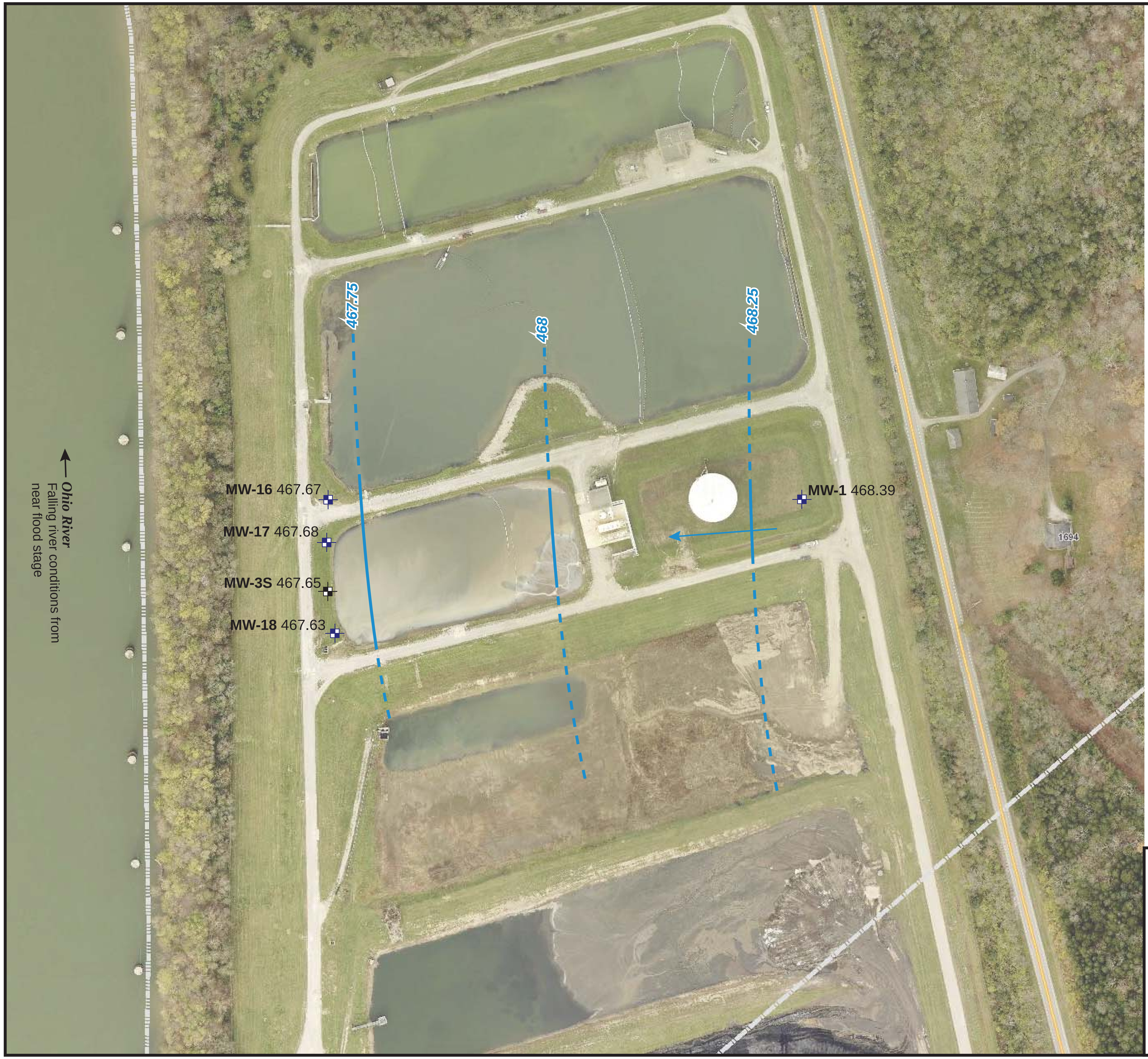


━ UNIT BOUNDARY

✚ EXISTING MONITORING WELL LOCATION

✚ DOWNGRADIENT MONITORING WELL LOCATION

━ WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

→ GROUNDWATER FLOW DIRECTION

468.39 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED MARCH 8, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE ____________________

DATE ____________________

DYNEGY

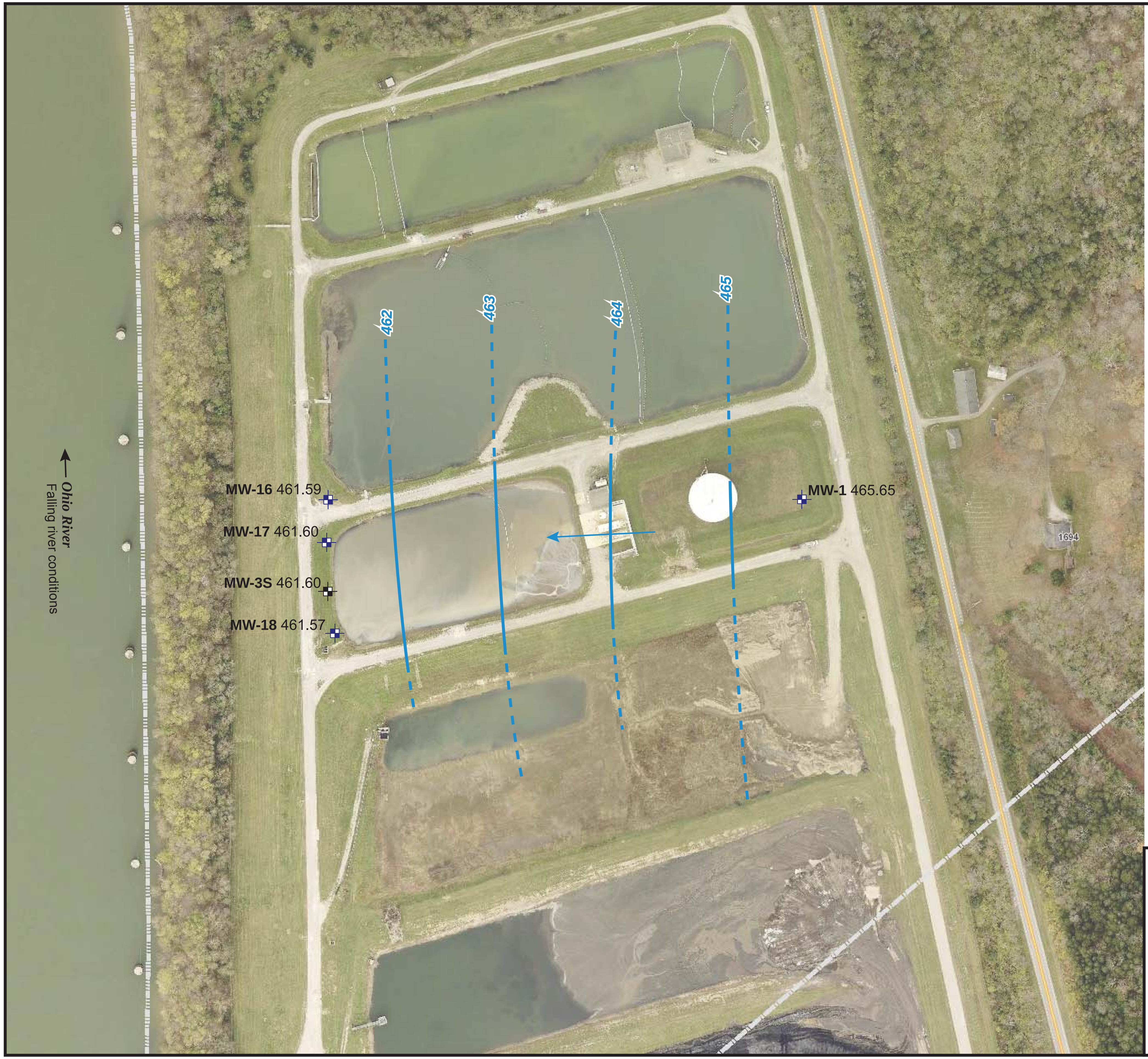
Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

AECOM



UNIT BOUNDARY

EXISTING MONITORING WELL LOCATION

DOWNGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

465.65 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JUNE 8, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS

N

0 100 200
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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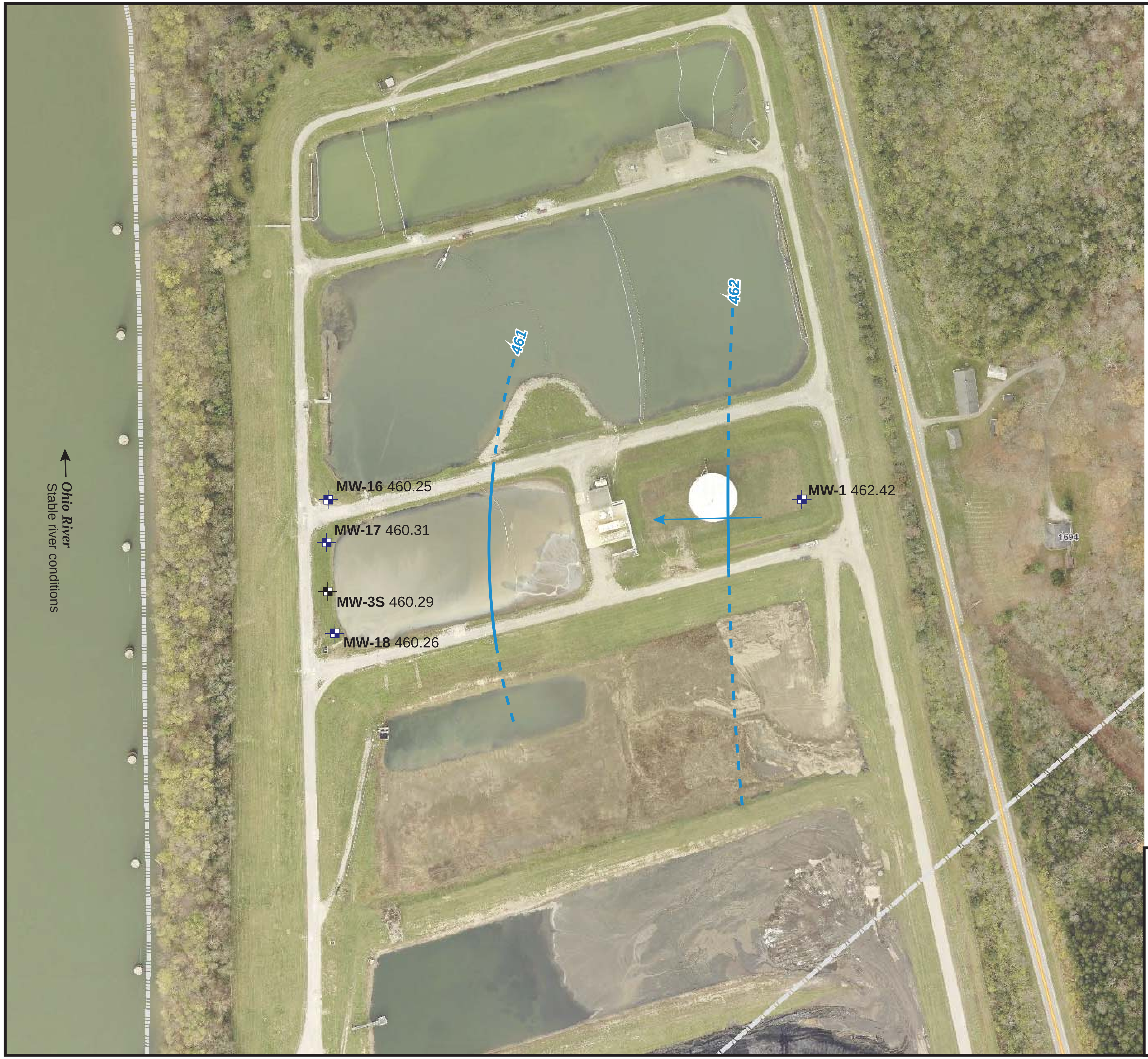
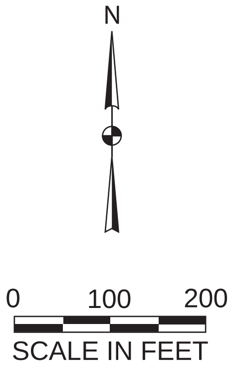


🟨	UNIT BOUNDARY
✚	EXISTING MONITORING WELL LOCATION
✚	DOWNGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
462.42	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

AERIAL SOURCE: CLERMONT COUNTY, OH GIS



Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
COAL PILE RUNOFF POND (UNIT ID: 125)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/07/17	0	ALW	MAW

JOB NO. 60442412

AECOM

1/29/2020 8:48:24 AM


Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

✚	CCR MONITORING WELL LOCATION
—	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- -	INFERRED GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

✚	CCR MONITORING WELL LOCATION
—	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7-9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2018_2Q\R2018_2Q_ZimmerDB_CPR_GW_Contours.mxd

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

⊞	CCR MONITORING WELL LOCATION
──	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
➡	GROUNDWATER FLOW DIRECTION
🟨	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

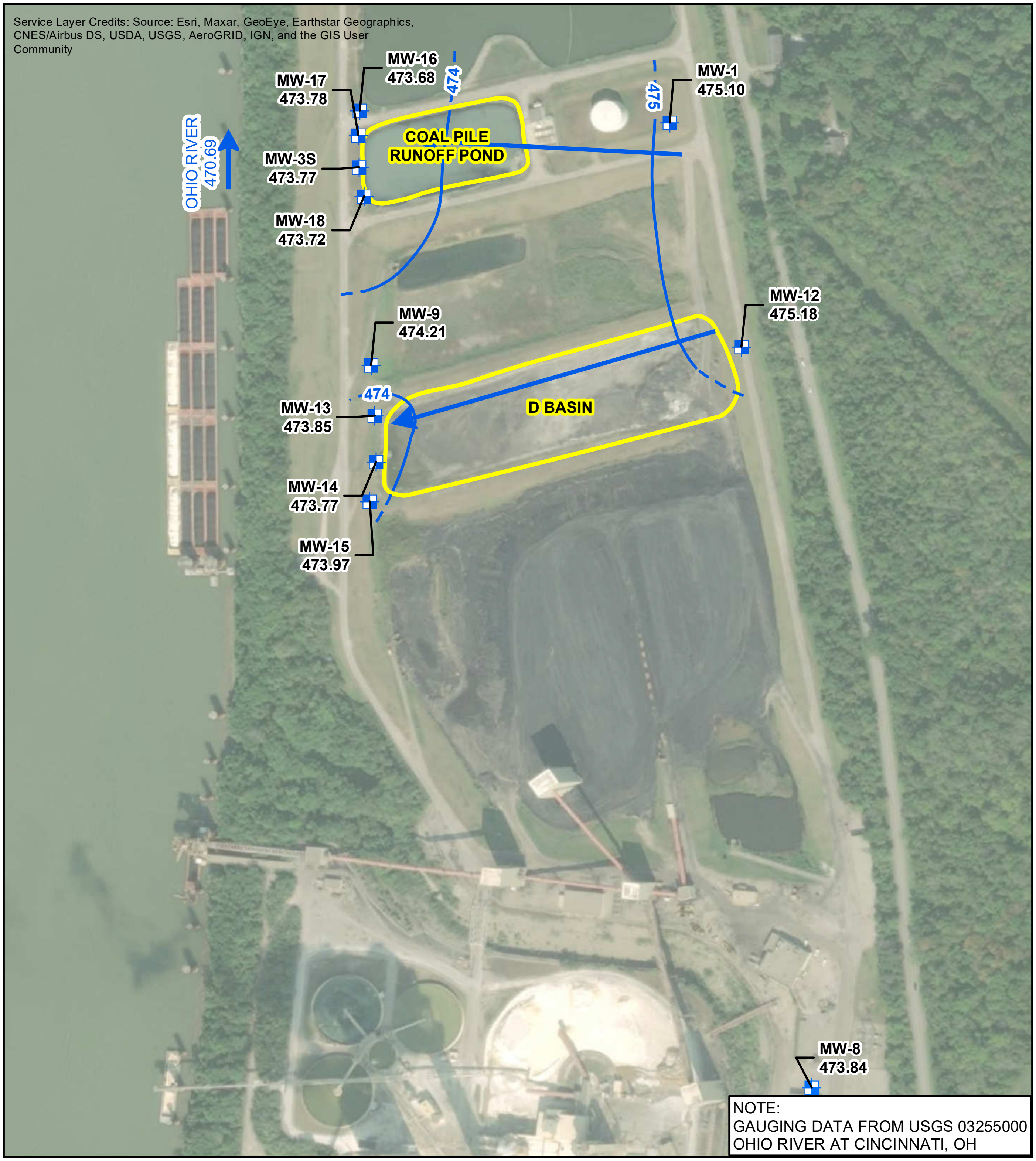
CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

1/29/2020 7:30:46 AM



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

- ✚ CCR MONITORING WELL LOCATION
- ― GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 13, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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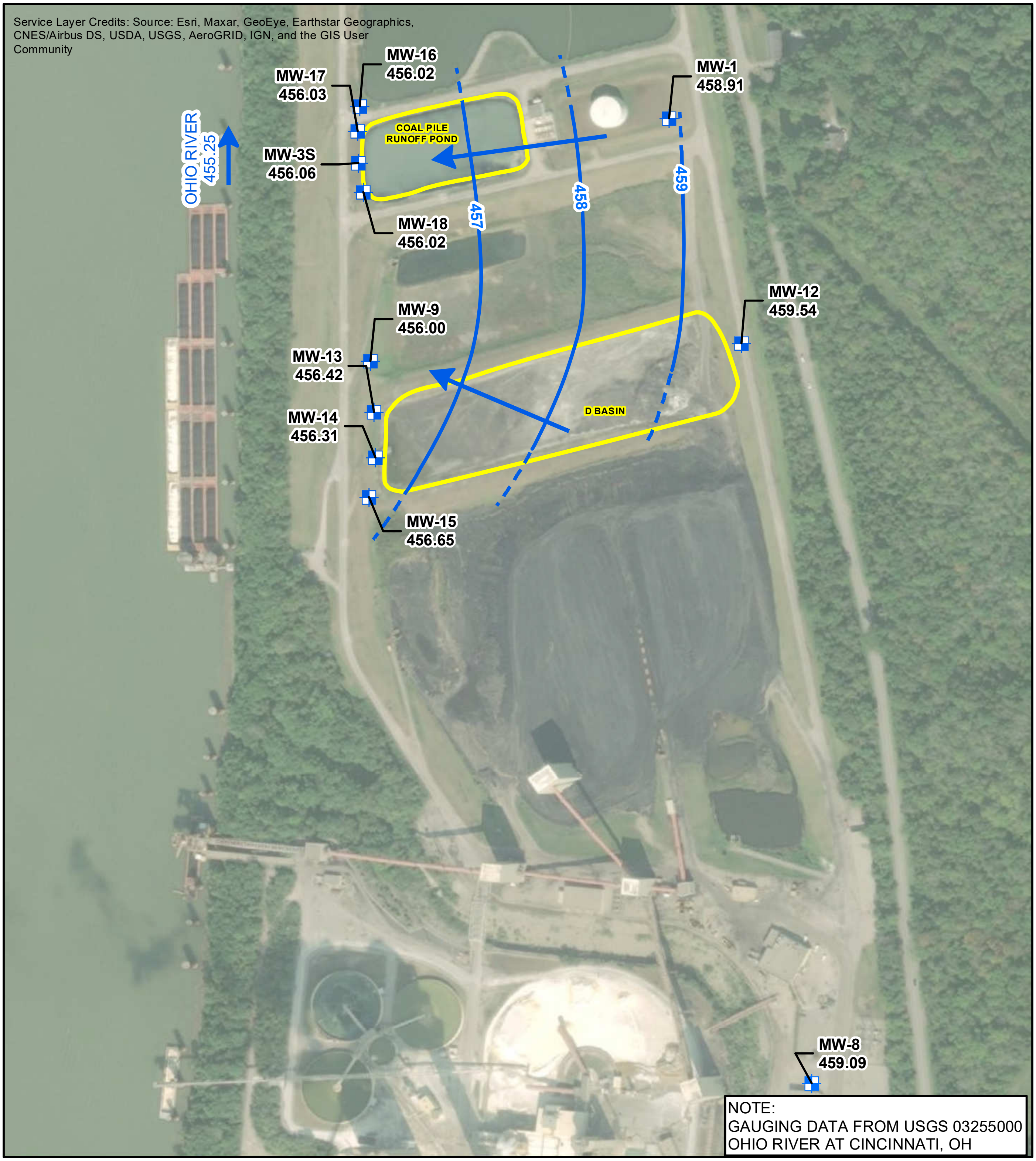

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

✚	CCR MONITORING WELL LOCATION
──	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
➜	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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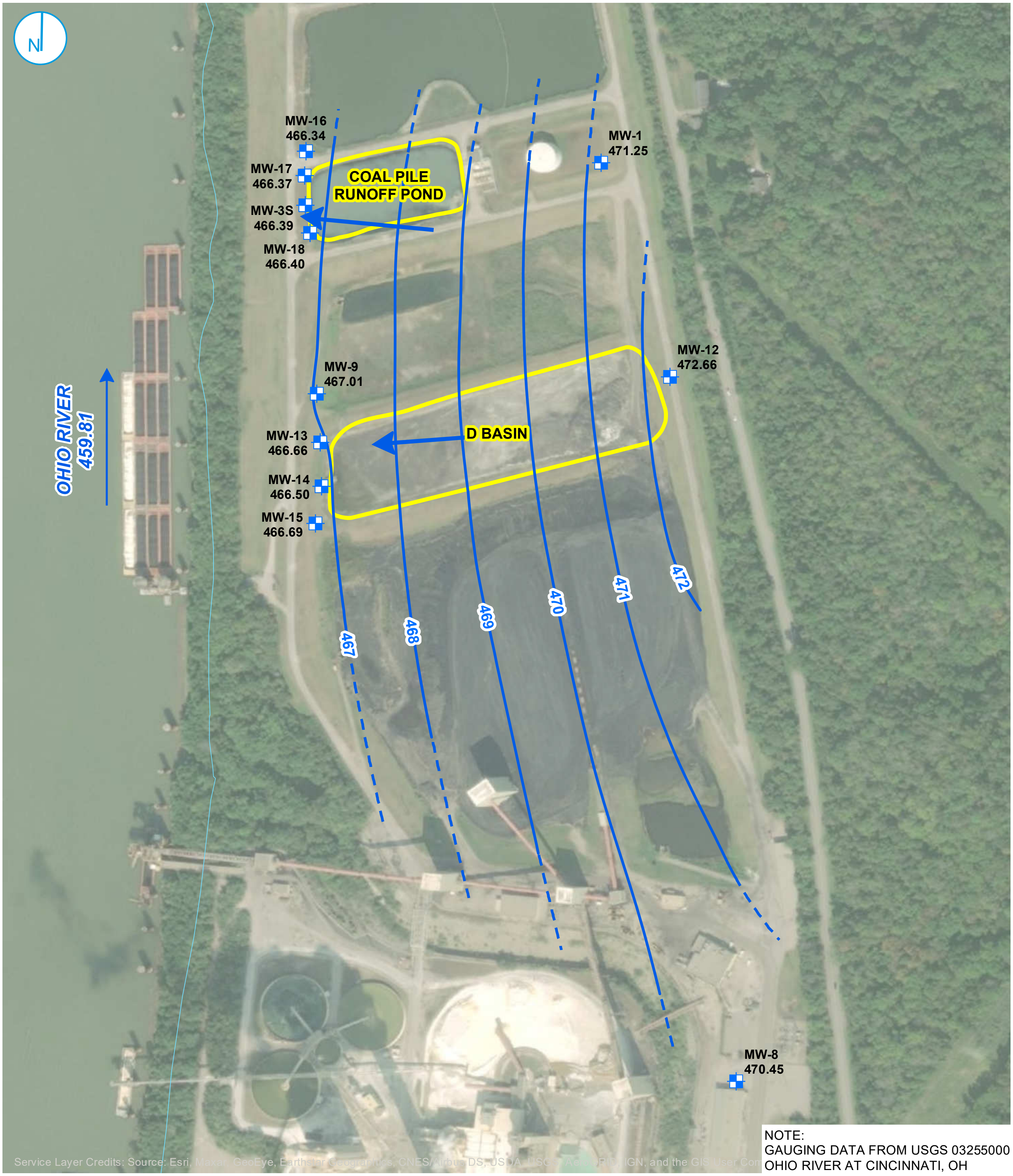

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

- ✚ CCR MONITORING WELL LOCATION
- ━ GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- ‒ ‒ INFERRED GROUNDWATER ELEVATION CONTOUR
- ➜ GROUNDWATER FLOW DIRECTION
- ◯ SURFACE WATER FEATURE
- ▭ CCR MONITORED UNIT

0 200 400
Feet

GROUNDWATER ELEVATION CONTOUR MAP

APRIL 9, 2020

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

PROJECT: 72799 | DATED: 8/13/2020 | DESIGNER: galarmmc

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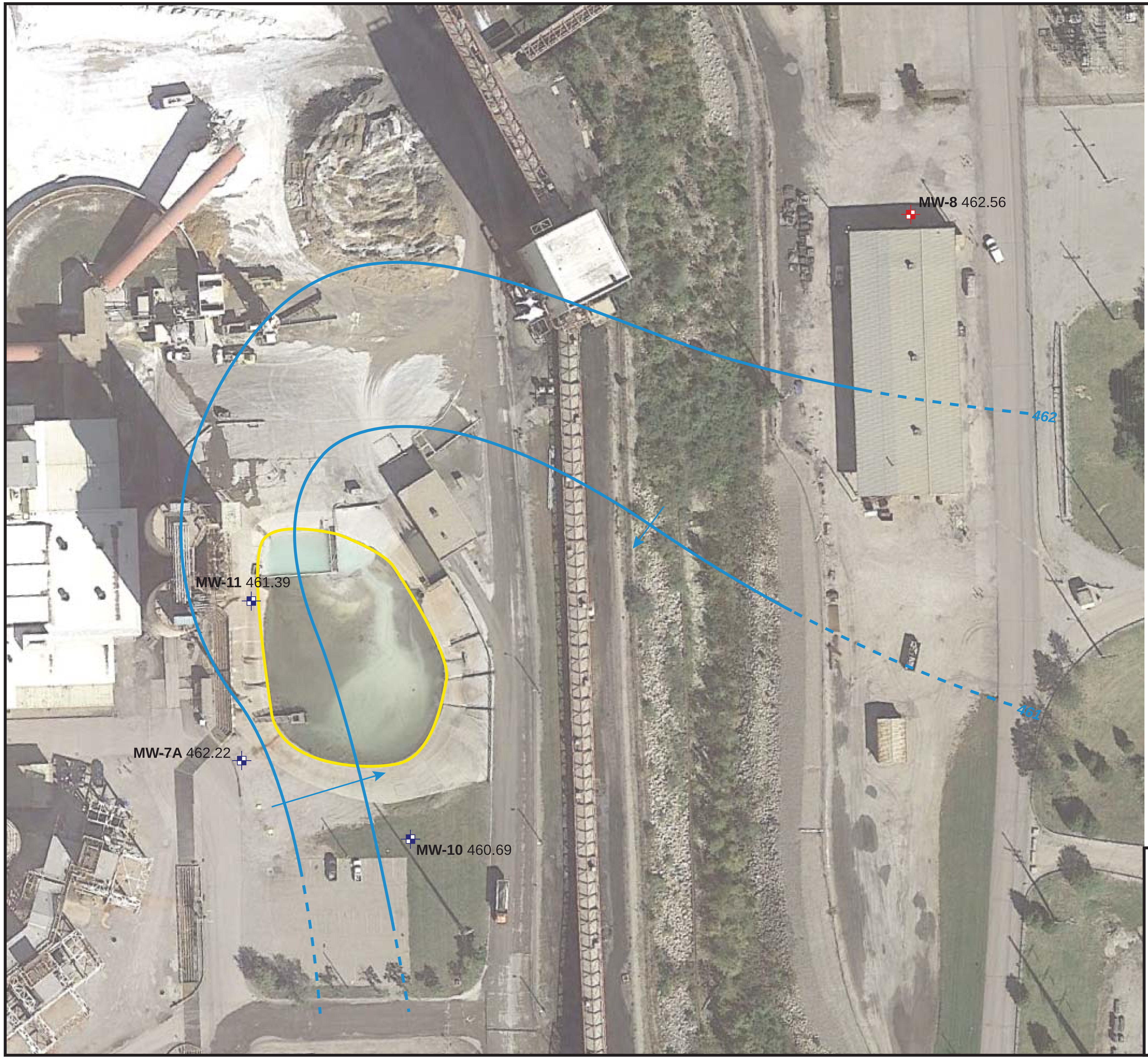

🟨	UNIT BOUNDARY
⌖	DOWNGRADIENT MONITORING WELL LOCATION
⌖	UPGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
462.56	GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 29, 2015

NOTE- RISING OHIO RIVER CONDITIONS TO
NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 29, 2015
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	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

468.40 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED MARCH 16, 2016

NOTE- RAPID RISING OHIO RIVER CONDITIONS FOLLOWING
RAPID DECENDING CONDITIONS FROM NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

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DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 16, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	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
461.68	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 15, 2016

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

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DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 15, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	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
455.20	GROUNDWATER ELEVATION (FEET, MSL), MEASURED SEPTEMBER 26, 2016

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

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SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/44/16	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
455.44	GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

NOTE- SHORT-TERM FALLING RIVER STAGE DURING RISING LONG-TERM OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80

SCALE IN FEET

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
GYPSUM RECYCLING POND (UNIT ID: 124)
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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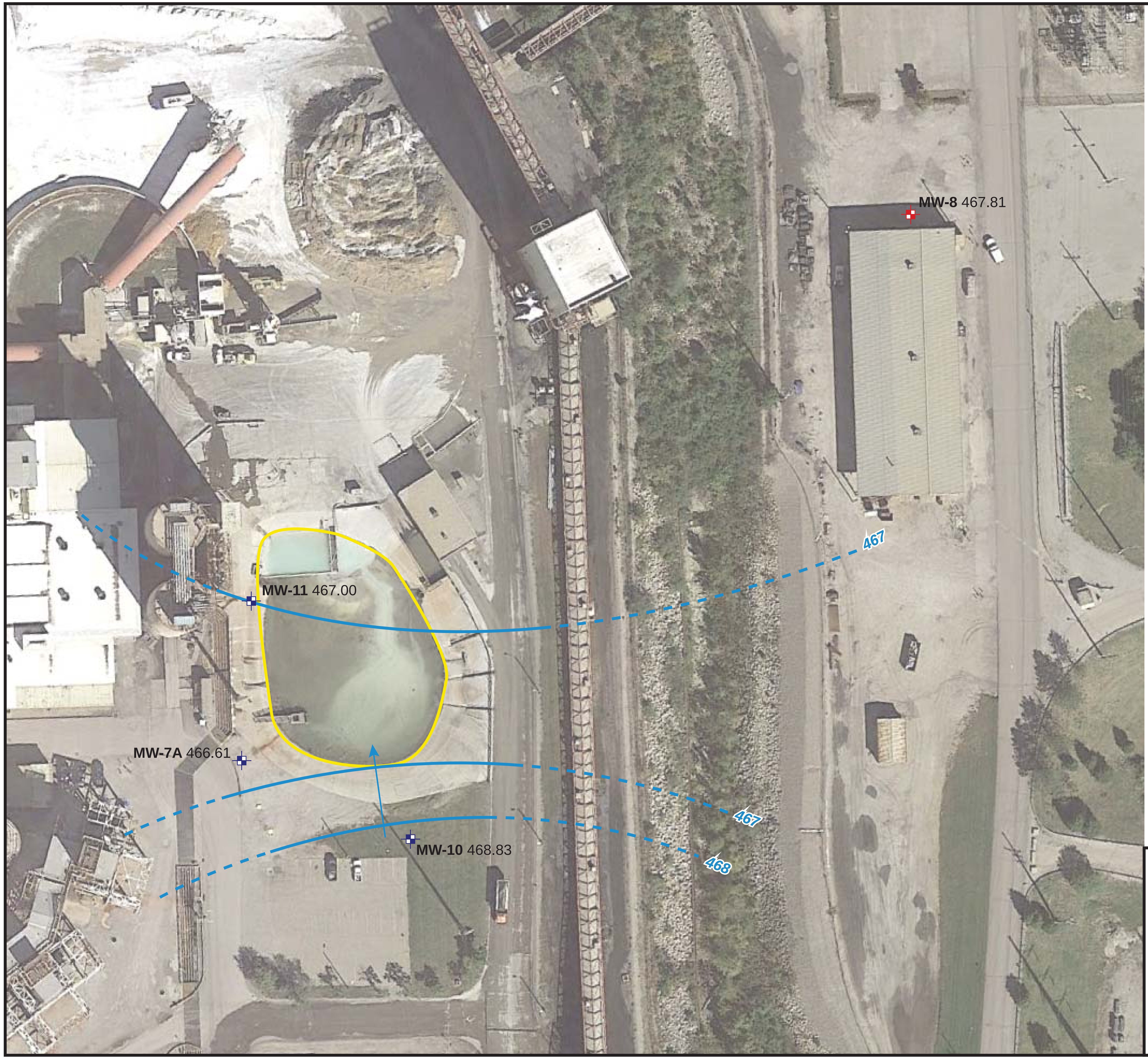

━	UNIT BOUNDARY
⊕	DOWNGRADIENT MONITORING WELL LOCATION
⊕	UPGRADIENT MONITORING WELL LOCATION
━	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
467.81	GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 8, 2017

NOTE- FALLING OHIO RIVER CONDITIONS FROM NEAR FLOOD STAGE

AERIAL SOURCE: CAGIS

N

0 40 80

SCALE IN FEET

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DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	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
465.09	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 8, 2017

NOTE- FALLING OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80

SCALE IN FEET

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SIGNATURE

DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	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
462.21	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

NOTE- STABLE OHIO RIVER CONDITIONS

AERIAL SOURCE: CAGIS

N

0 40 80
SCALE IN FEET

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DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
GYPSUM RECYCLING POND (UNIT ID: 124)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/19/17	0	ALW	MAW

JOB NO. 60442412

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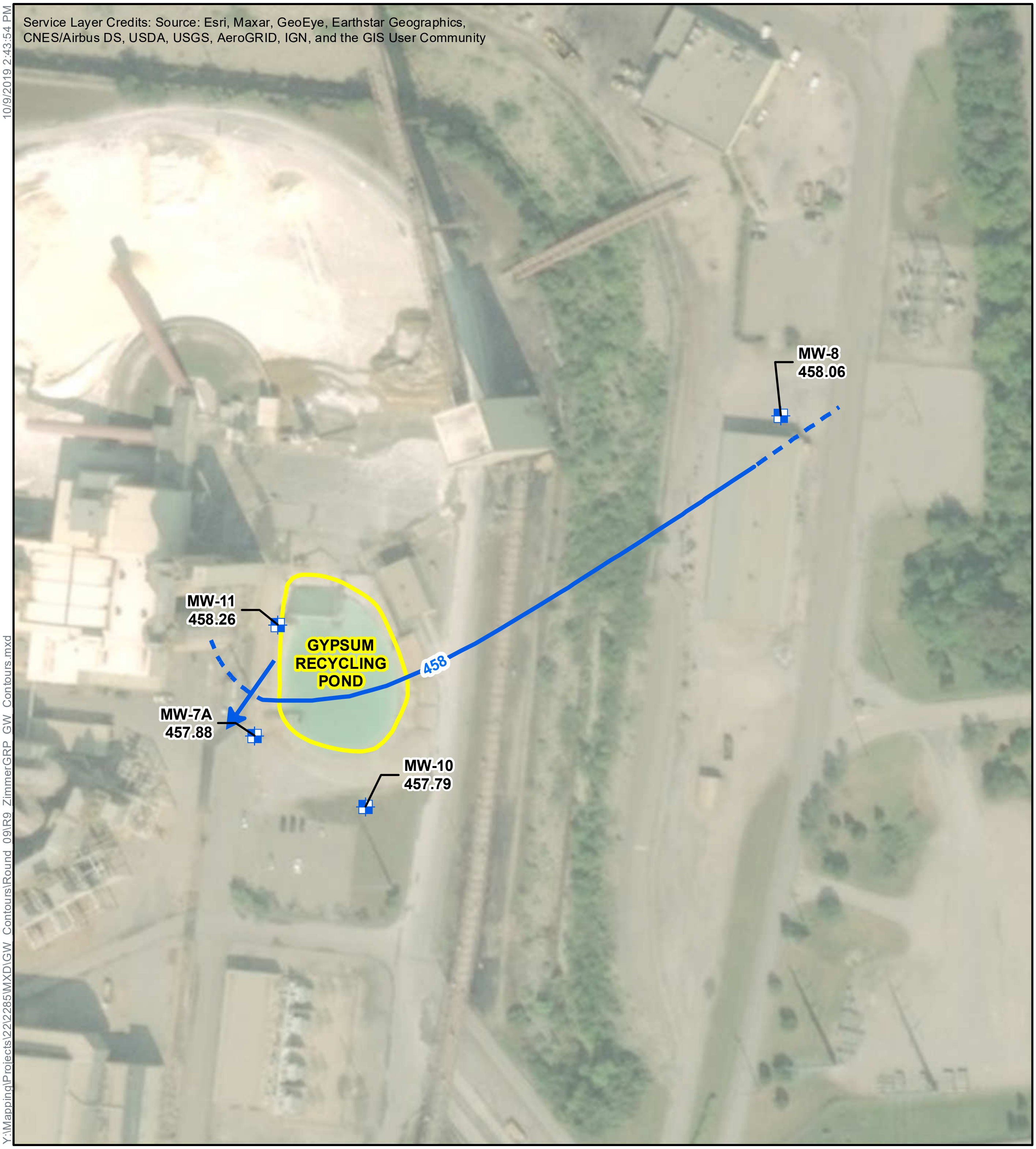

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- ✚ CCR MONITORING WELL LOCATION
- — GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - - INFERRED GROUNDWATER CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

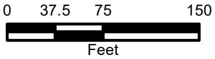
N

O'BRIEN & GERE ENGINEERS, INC.

✚	CCR MONITORING WELL LOCATION
—	GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO



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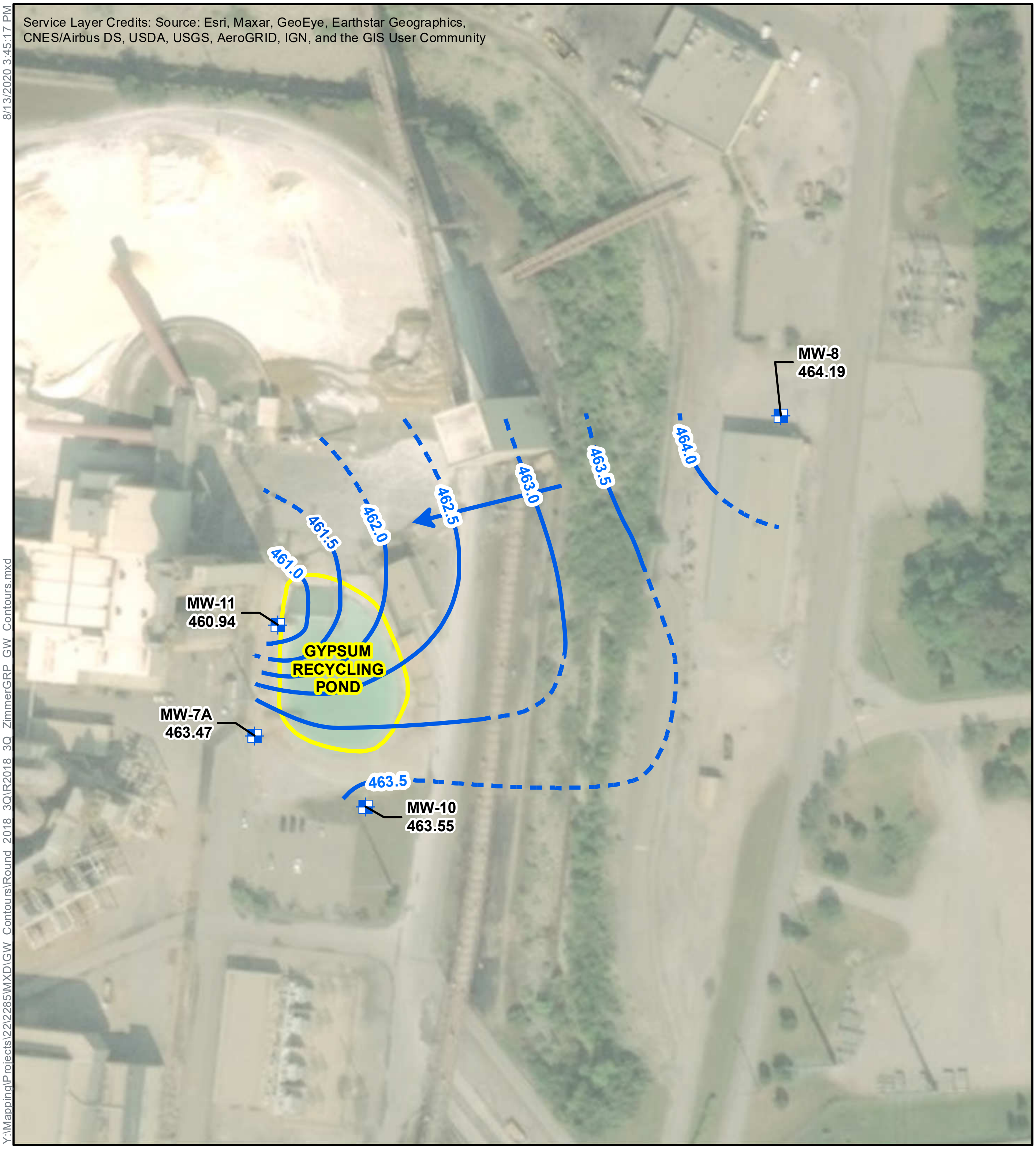
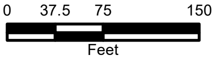


✚	CCR MONITORING WELL LOCATION
━	GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO



O'BRIEN & GERE ENGINEERS, INC.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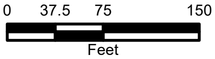
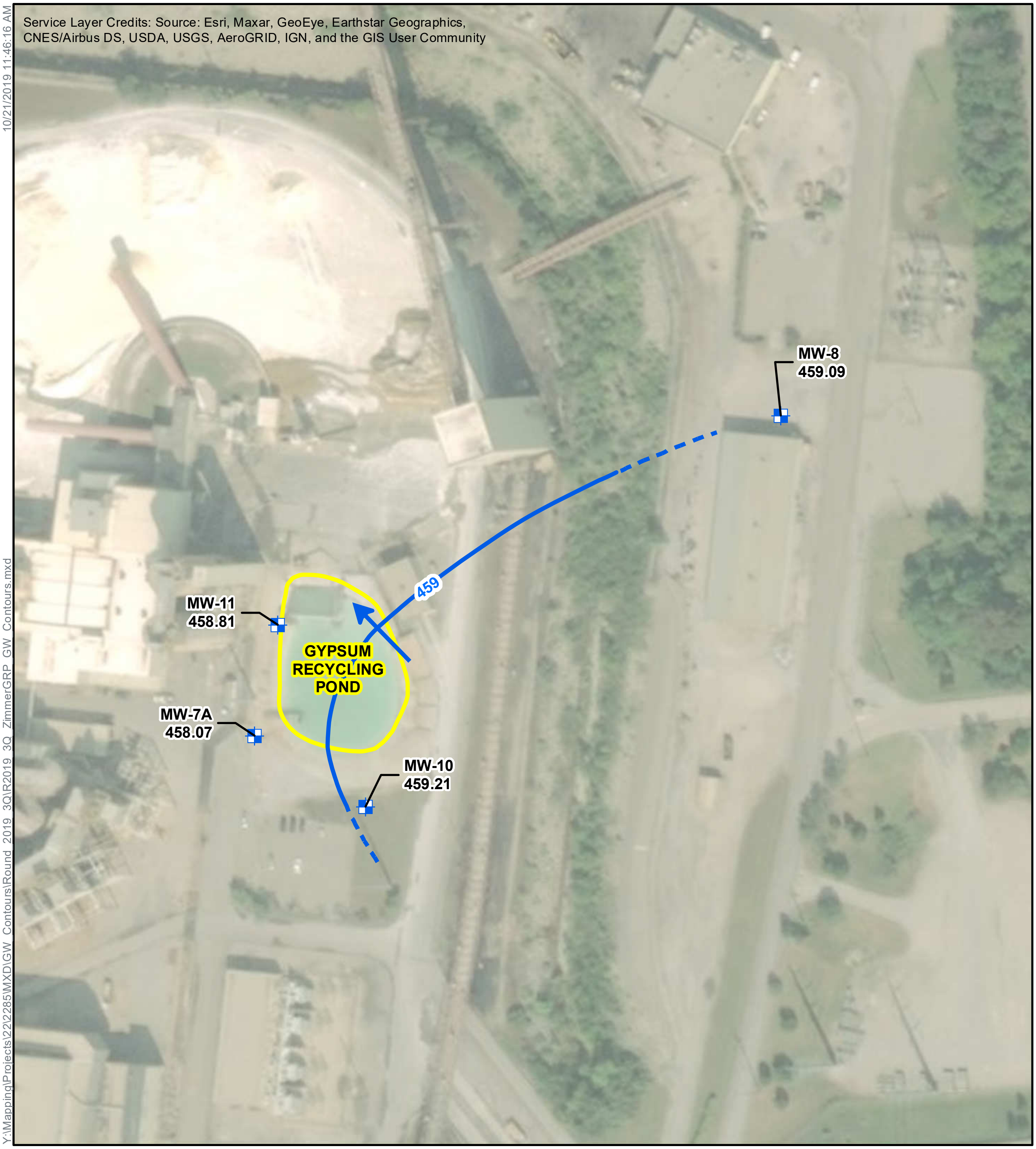
- ✦ CCR MONITORING WELL LOCATION
- ━ GROUNDWATER ELEVATION CONTOUR (0.25-FT CONTOUR INTERVAL, FT MSL)
- ╍ INFERRED GROUNDWATER CONTOUR
- ➔ GROUNDWATER FLOW DIRECTION
- 🟨 CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 12, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO



O'BRIEN & GERE ENGINEERS, INC.



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- ✚ CCR MONITORING WELL LOCATION
- ─ GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - - INFERRED GROUNDWATER CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ☐ CCR MONITORED UNIT

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124) GROUNDWATER ELEVATION CONTOUR MAP

SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 37.5 75 150
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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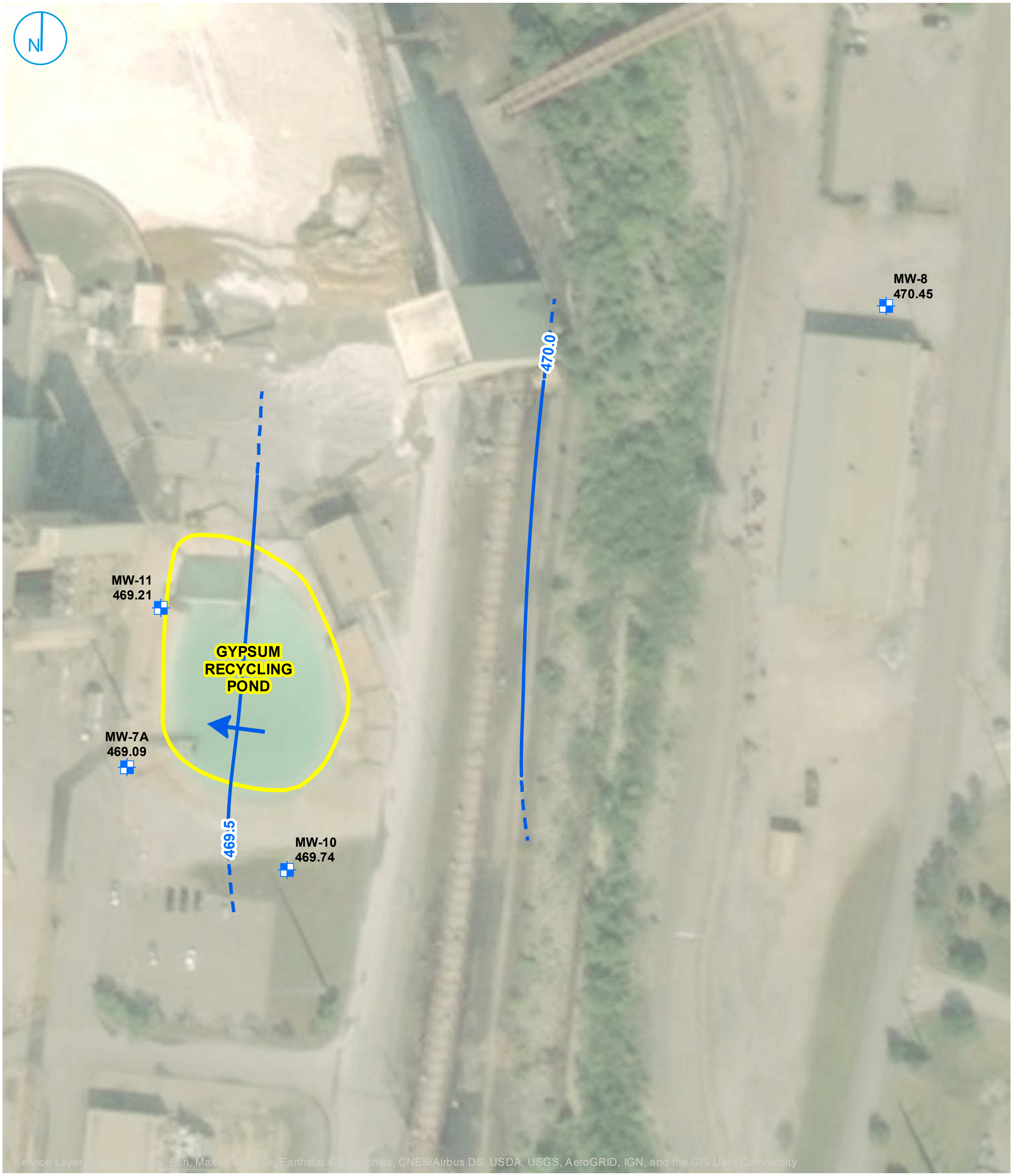
PROJECT: 72799 | DATED: 8/14/2020 | DESIGNER: galarmmc



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- CCR MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (0.5-FT CONTOUR INTERVAL, FT MSL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

0 50 100
Feet

GROUNDWATER ELEVATION CONTOUR MAP

APRIL 9, 2020

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

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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
463.65	GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 29, 2015

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 29, 2015
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	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

469.30 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED MARCH 16, 2016

AERIAL SOURCE: CAGIS

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0 200 400
SCALE IN FEET

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Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 16, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	0	ALW	MAW

JOB NO. 60442412

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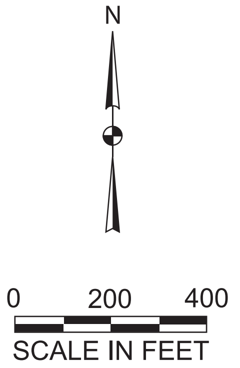
—	UNIT BOUNDARY
⊕	DOWNGRADIENT MONITORING WELL LOCATION
⊕	UPGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
461.87	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 15, 2016

AERIAL SOURCE: CAGIS



Certified By:

SIGNATURE

DATE

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Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 15, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
08/04/16	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
456.53	GROUNDWATER ELEVATION (FEET, MSL), MEASURED SEPTEMBER 26, 2016

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 26, 2016
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/14/16	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
- 456.77 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
D BASIN (UNIT ID: 121)
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
468.36	GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 8, 2017

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE ____________________

DATE ____________________

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 8, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/08/17	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
466.54	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 8, 2017

AERIAL SOURCE: CAGIS

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SCALE IN FEET

Certified By:

SIGNATURE ______

DATE ______

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 8, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/08/17	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
463.14	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 13, 2017

AERIAL SOURCE: CAGIS

N

0 200 400
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 13, 2017
D BASIN (UNIT ID: 121)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
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JOB NO. 60442412

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NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

- ⊞ CCR MONITORING WELL LOCATION
- — GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 13, 2017

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

⯐	CCR MONITORING WELL LOCATION
──	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
➞	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7-9, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

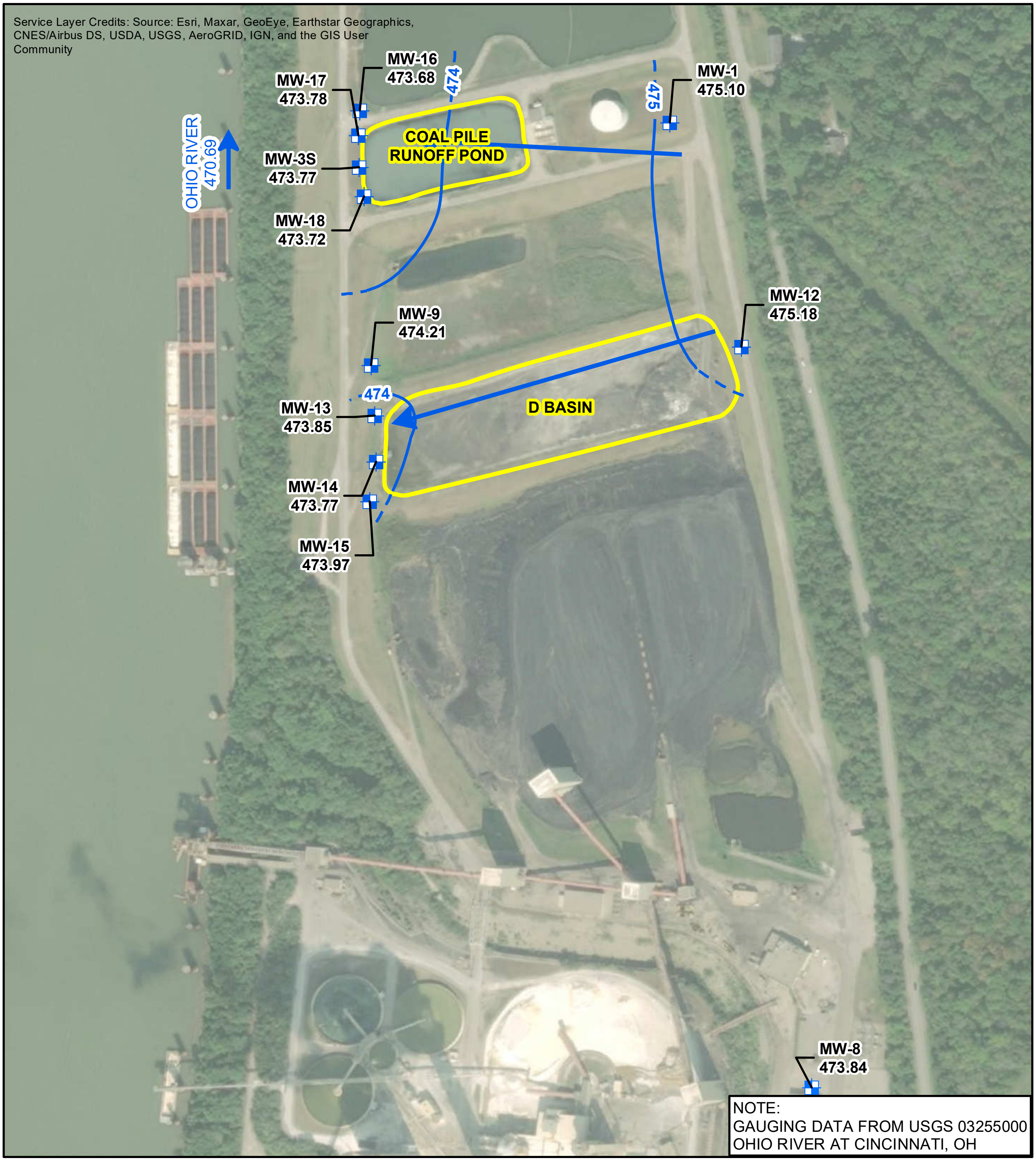
- CCR MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

O'BRIEN & GERE ENGINEERS, INC.

1/29/2020 7:30:46 AM



NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

⊞	CCR MONITORING WELL LOCATION
—	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 13, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

0 100 200 400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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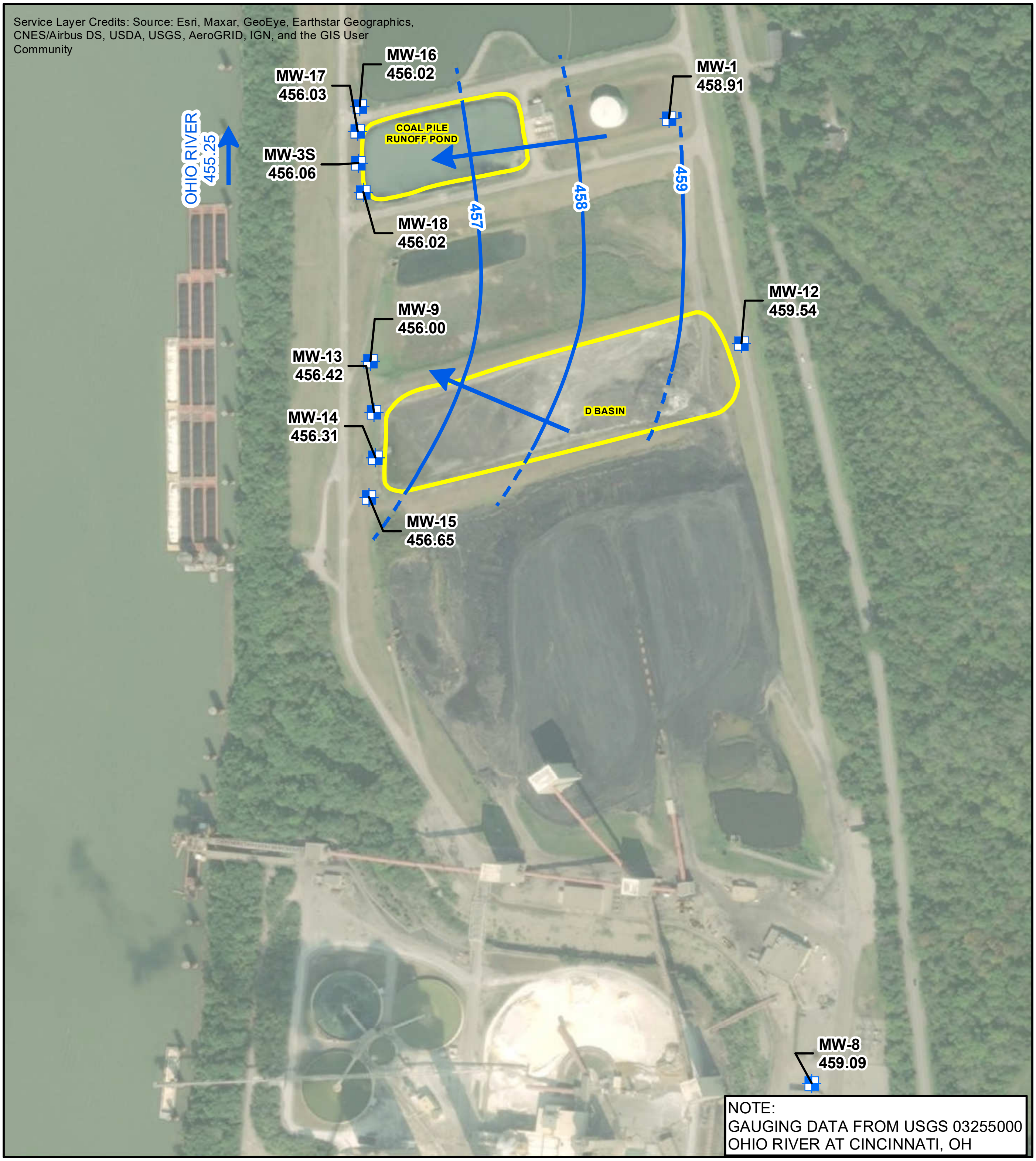

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

✚	CCR MONITORING WELL LOCATION
───	GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
➜	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

CCR RULE GROUNDWATER MONITORING
ZIMMER POWER STATION
MOSCOW, OHIO

O'BRIEN & GERE ENGINEERS, INC.

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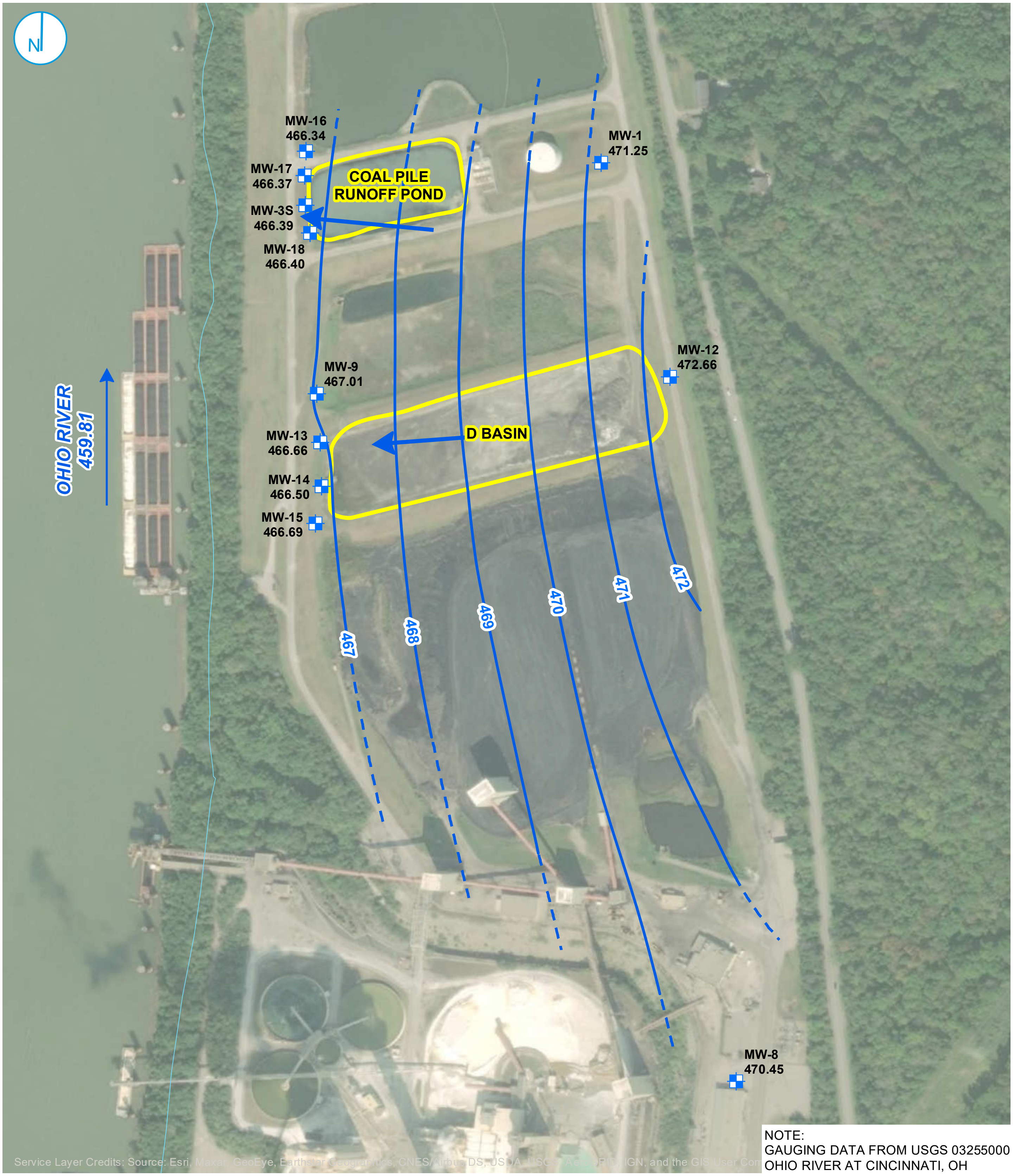

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Com

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATI, OH

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PROJECT: 72799 | DATED: 8/13/2020 | DESIGNER: galarmmc

✚ CCR MONITORING WELL LOCATION

— GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, FT MSL)

- - INFERRED GROUNDWATER ELEVATION CONTOUR

➜ GROUNDWATER FLOW DIRECTION

○ SURFACE WATER FEATURE

▭ CCR MONITORED UNIT

0 200 400
Feet

GROUNDWATER ELEVATION CONTOUR MAP

APRIL 9, 2020

ZIMMER D BASIN (UNIT ID: 121) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

APPENDIX C4 – TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

Analytical Results - Appendix III

Zimmer Coal Pile Runoff Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background								
MW-1	12/30/2015	0.072	155	48.5	0.2	7.2	90.1	544
MW-1	03/16/2016	0.0233	206	59.1	0.146	7.1	85.2	583
MW-1	06/16/2016	0.0389	154	59.6	<1	7	95.3	648
MW-1	09/26/2016	0.0349	160	64.9	<1	7.1	93.1	621
MW-1	12/13/2016	0.0322	165	52.4	<1	7	93.3	561
MW-1	03/09/2017	<0.08	150	58.2	<1	8.3	85.9	589
MW-1	06/08/2017	<0.08	171	65.5	<1	7.1	87	582
MW-1	07/13/2017	<0.08	144	61.3	<1	7	79	608
MW-1	11/13/2017	<0.08	150	53.1	<1	6.9	89.1	571
MW-1	05/09/2018	<1	157	71	<1	7	88.9	631
MW-1	09/27/2018	<0.08	163	62.7	<1	6.9	113	578
MW-1	03/14/2019	<0.08	152	78.7	<1	7	90.2	617
MW-1	09/11/2019	<0.08	167	63.1	<1	7	90.6	637
MW-1	04/09/2020	0.123	170	80.5	<0.15	6.7	92.3	592
MW-1	09/16/2020	0.0365	169	84.3	<0.15	7.1	99.1	644
MW-1	03/22/2021	0.082	173	79.2	0.166	7	99.2	613
Compliance								
MW-3S	08/31/2016	0.109	194	<60	<1	6.9	371	860
MW-3S	09/26/2016	0.209	188	54.7	<1	6.9	338	830
MW-3S	10/12/2016	0.0983	168	66.3	<1	6.9	328	779
MW-3S	11/16/2016	0.071	169	44	<1	7.5	268	706

Analytical Results - Appendix III

Zimmer Coal Pile Runoff Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-3S	12/12/2016	0.0567	131	36.4	<1	6.7	179	559
MW-3S	03/09/2017	<0.08	139	37.2	<1	8.3	242	665
MW-3S	06/08/2017	<0.08	208	69.5	<1	7	384	892
MW-3S	07/13/2017	0.0984	201	<60	<1	7.2	399	934
MW-3S	11/13/2017	<0.08	127	33.8	<1	6.5	176	560
MW-3S	05/09/2018	<1	115	32.1	<1	6.7	151	568
MW-3S	09/19/2018	0.188	162	41.3	<1	6.7	251	720
MW-3S	03/15/2019	0.143	160	37.3	<1	6.9	199	683
MW-3S	09/11/2019	1.91	228	39.2	<1	7.6	532	1090
MW-3S	04/10/2020	1.03	221	43	<0.15	7	447	949
MW-3S	09/16/2020	2.44	210	26.5	<0.15	7.2	550	1030
MW-3S	03/23/2021	1.14	190	25.4	<0.15	6.7	382	833
MW-16	08/31/2016	0.0506	143	41.8	<1	6.4	198	642
MW-16	09/26/2016	0.102	163	42.2	<1	6.8	173	639
MW-16	10/12/2016	0.0689	149	51.6	<1	7.2	172	609
MW-16	11/16/2016	0.0446	151	38.8	<1	6.4	168	628
MW-16	12/12/2016	0.0527	151	37.8	<1	7	175	612
MW-16	03/09/2017	<0.08	106	28	<1	8.5	121	484
MW-16	06/08/2017	<0.08	132	31.8	<1	7.1	155	541
MW-16	07/13/2017	<0.08	135	36.1	<1	7.2	161	605
MW-16	11/13/2017	<0.08	139	38.8	<1	7	169	592
MW-16	05/09/2018	<1	128	32.3	<1	7	145	571

Analytical Results - Appendix III

Zimmer Coal Pile Runoff Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-16	09/19/2018	<0.08	153	38.5	<1	6.9	175	640
MW-16	03/15/2019	<0.08	153	39.4	<1	7	160	621
MW-16	09/12/2019	0.13	156	45.5	<1	6.8	187	686
MW-16	04/10/2020	0.0621	162	47.6	0.151	6.9	197	687
MW-16	09/16/2020	0.087	169	48.6	<0.15	7.1	253	741
MW-16	03/23/2021	0.133	170	47.1	<0.15	6.9	232	709
MW-17	08/31/2016	0.0584	128	36.3	<1	7.1	190	646
MW-17	09/26/2016	0.0757	147	32	<1	7.1	181	622
MW-17	10/12/2016	0.0478	126	39.5	<1	7.4	174	596
MW-17	11/16/2016	0.0447	142	38.7	<1	6.4	167	615
MW-17	12/12/2016	0.0569	145	37.6	<1	7.2	184	608
MW-17	03/09/2017	<0.08	112	<30	<1	8.4	159	528
MW-17	06/08/2017	<0.08	135	31.7	<1	7.1	182	602
MW-17	07/13/2017	<0.08	137	70.2	<1	7.1	390	626
MW-17	11/13/2017	<0.08	145	39.4	<1	7.1	180	627
MW-17	05/09/2018	<1	125	34.9	<1	7.1	167	603
MW-17	09/19/2018	<0.08	152	35.8	<1	6.9	187	659
MW-17	03/15/2019	<0.08	144	38.3	<1	7.1	174	620
MW-17	09/12/2019	0.0889	177	47.8	<1	7	280	776
MW-17	04/10/2020	0.0608	178	51.1	0.162	7	283	767
MW-17	09/16/2020	0.301	184	46.7	<0.15	7.1	337	840
MW-17	03/23/2021	0.209	192	46.9	0.169	7	346	783

Analytical Results - Appendix III

Zimmer Coal Pile Runoff Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-18	08/31/2016	4.54	312	67.4	<1	7	973	1640
MW-18	09/26/2016	4.11	321	70.6	<1	7.2	874	1660
MW-18	10/12/2016	3.78	287	66.2	<1	7.3	924	1570
MW-18	11/16/2016	4.46	307	<60	<1	7.7	1130	1570
MW-18	12/12/2016	5.14	336	63.3	<1	7.1	918	1570
MW-18	03/09/2017	4.43	287	77.9	<1	8.3	844	1510
MW-18	06/08/2017	3.27	311	59.1	<1	7	883	1440
MW-18	07/13/2017	4.85	318	70.8	<1	7.2	1170	1760
MW-18	11/13/2017	3.72	322	54	<1	6.9	931	1520
MW-18	05/09/2018	2.62	249	56.5	<1	7	748	1450
MW-18	09/19/2018	4.32	306	52.1	<1	6.9	795	1600
MW-18	03/15/2019	2.77	262	49	<1	7	711	1370
MW-18	09/12/2019	3	226	30.8	<1	7.1	612	1210
MW-18	04/10/2020	3.56	272	43.2	0.161	7	771	1300
MW-18	09/16/2020	2.76	179	19.1	<0.15	7.3	548	976
MW-18	03/23/2021	3.57	215	27.5	0.178	7.2	669	1160

Notes:
1. Abbreviations: mg/L - milligrams per liter; STD - standard units

Analytical Results - Appendix IV

Zimmer Coal Pile Runoff Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background																
MW-1	12/30/2015	<0.002	0.00142	0.0655	<0.002	<0.001	0.00191	<0.005	0.2	<0.005	<0.5	<0.0002	<0.01	<0.426	<0.01	<0.001
MW-1	03/16/2016	<0.01	<0.025	0.0863	<0.01	<0.005	<0.015	<0.025	0.146	<0.025	0.0101	<0.0002	<0.05	<0.937	<0.05	<0.005
MW-1	06/16/2016	<0.002	<0.001	0.0601	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.603	<0.005	<0.001
MW-1	09/26/2016	<0.002	<0.001	0.0627	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.168	<0.005	<0.001
MW-1	12/13/2016	<0.002	<0.001	0.0629	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	0.0002	<0.005	<5	<0.005	<0.001
MW-1	03/09/2017	<0.002	<0.001	0.0587	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	06/08/2017	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	07/13/2017	<0.002	<0.001	0.0566	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<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	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-1	09/27/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-1	03/14/2019	<0.002	<0.001	0.0665	<0.001	<0.001	0.0023	<0.0005	<1	<0.001	0.00665	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	09/11/2019	NA	<0.001	0.077	<0.001	NA	<0.002	<0.0005	<1	<0.001	0.0109	NA	<0.005	<5	<0.005	NA
MW-1	04/09/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
MW-1	09/16/2020	NA	<0.002	0.073	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00966	NA	<0.005	0.215	<0.002	NA
MW-1	03/22/2021	<0.004	<0.002	0.0713	<0.002	<0.001	<0.002	<0.002	0.166	<0.002	0.00782	<0.0002	<0.005	0.0171	<0.002	<0.002
Compliance																
MW-3S	08/31/2016	<0.002	<0.001	0.0519	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.138	<0.005	<0.001
MW-3S	09/26/2016	<0.002	<0.001	0.0515	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.364	0.00588	<0.001
MW-3S	10/12/2016	<0.002	<0.001	0.0508	<0.001	<0.001	<0.002	<0.0005	<1	0.00182	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-3S	11/16/2016	<0.002	0.0019	0.0491	<0.001	<0.001	<0.002	0.00254	<1	0.00134	<0.00959	<0.0002	<0.005	<5	0.00557	<0.001
MW-3S	12/12/2016	<0.002	<0.001	0.0393	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	0.00529	<0.001
MW-3S	03/09/2017	<0.002	<0.001	0.0383	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Coal Pile Runoff Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-3S	06/08/2017	<0.002	<0.001	0.0507	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-3S	07/13/2017	<0.002	<0.001	0.0513	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-3S	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-3S	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-3S	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-3S	03/15/2019	<0.002	<0.001	0.0517	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-3S	09/11/2019	NA	<0.001	0.0715	NA	<0.001	0.00275	<0.0005	<1	<0.001	0.0118	NA	<0.005	<5	0.0111	NA
MW-3S	04/10/2020	<0.004	<0.002	0.0576	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00548	<0.0002	<0.005	0.888	0.0039	<0.002
MW-3S	09/16/2020	NA	<0.002	0.0589	NA	<0.001	<0.002	<0.002	<0.15	<0.005	0.00495	NA	<0.005	0.373	0.00601	NA
MW-3S	03/23/2021	<0.004	<0.002	0.0512	<0.002	<0.001	<0.002	<0.002	<0.15	<0.002	0.00512	<0.0002	<0.005	0.149	0.00681	<0.002
MW-16	08/31/2016	<0.002	<0.001	0.0371	<0.001	<0.001	<0.002	0.00402	<1	<0.001	<0.00959	<0.0002	0.00679	0.371	<0.005	<0.001
MW-16	09/26/2016	<0.002	<0.001	0.0414	<0.001	<0.001	<0.002	0.00416	<1	<0.001	<0.00959	<0.0002	0.00517	0.402	<0.005	<0.001
MW-16	10/12/2016	<0.002	0.00124	0.0432	<0.001	<0.001	<0.002	0.00417	<1	0.00383	<0.00959	<0.0002	0.00508	<5	<0.005	<0.001
MW-16	11/16/2016	<0.002	<0.001	0.0466	<0.001	<0.001	<0.002	0.00322	<1	<0.001	<0.00959	<0.0002	0.00572	<5	<0.005	<0.001
MW-16	12/12/2016	<0.002	<0.001	0.0453	<0.001	<0.001	<0.002	0.00461	<1	<0.001	<0.00959	<0.0002	0.00674	<5	<0.005	<0.001
MW-16	03/09/2017	<0.002	<0.001	0.0314	<0.001	<0.001	<0.002	0.00204	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-16	06/08/2017	<0.002	<0.001	0.0348	<0.001	<0.001	<0.002	0.00246	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-16	07/13/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	0.00252	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-16	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-16	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-16	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-16	03/15/2019	<0.002	<0.001	0.114	<0.001	<0.001	<0.002	0.00203	<1	<0.001	0.00677	<0.0002	<0.005	<5	<0.005	<0.001
MW-16	09/12/2019	NA	<0.001	0.0538	NA	<0.001	0.00218	0.00201	<1	<0.001	0.0111	NA	<0.005	<5	<0.005	NA
MW-16	04/10/2020	<0.004	<0.002	0.0474	<0.002	<0.001	<0.002	0.00208	0.151	<0.005	0.00522	<0.0002	<0.005	1.85	<0.002	<0.002

Analytical Results - Appendix IV

Zimmer Coal Pile Runoff Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-16	09/16/2020	NA	<0.002	0.051	NA	<0.001	<0.002	<0.002	<0.15	<0.005	0.00467	NA	<0.005	0.869	0.0043	NA
MW-16	03/23/2021	<0.004	<0.002	0.0539	<0.002	<0.001	<0.002	0.00222	<0.15	<0.002	0.00552	<0.0002	<0.005	0.353	0.00312	<0.002
MW-17	08/31/2016	<0.002	<0.001	0.0489	<0.001	<0.001	<0.002	0.00177	<1	<0.001	<0.00959	<0.0002	0.00715	0.533	<0.005	<0.001
MW-17	09/26/2016	<0.002	<0.001	0.0537	<0.001	<0.001	<0.002	0.00189	<1	<0.001	<0.00959	<0.0002	0.00825	0.802	<0.005	<0.001
MW-17	10/12/2016	<0.002	<0.001	0.0532	<0.001	<0.001	<0.002	0.00203	<1	0.0015	<0.00959	<0.0002	0.009	<5	<0.005	<0.001
MW-17	11/16/2016	<0.002	<0.001	0.0642	<0.001	<0.001	<0.002	0.00159	<1	<0.001	<0.00959	<0.0002	0.0096	<5	<0.005	<0.001
MW-17	12/12/2016	<0.002	<0.001	0.0599	<0.001	<0.001	<0.002	0.00188	<1	<0.001	<0.00959	<0.0002	0.0095	<5	<0.005	<0.001
MW-17	03/09/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	0.00102	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-17	06/08/2017	0.00232	<0.001	0.0498	<0.001	<0.001	<0.002	0.00109	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-17	07/13/2017	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	0.00117	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-17	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-17	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-17	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-17	03/15/2019	<0.002	<0.001	0.0619	<0.001	<0.001	<0.002	0.000964	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-17	09/12/2019	NA	<0.001	0.0815	NA	<0.001	0.00243	0.00139	<1	<0.001	0.0175	NA	<0.005	<5	<0.005	NA
MW-17	04/10/2020	<0.004	<0.002	0.0602	<0.002	<0.001	<0.002	<0.002	0.162	<0.005	0.00536	<0.0002	<0.005	0.806	0.00204	<0.002
MW-17	09/16/2020	NA	<0.002	0.0641	NA	<0.001	<0.002	<0.002	<0.15	<0.005	0.0057	NA	<0.005	0.456	0.00467	NA
MW-17	03/23/2021	<0.004	<0.002	0.0664	<0.002	<0.001	<0.002	<0.002	0.169	<0.002	0.0053	<0.0002	<0.005	0.905	0.00377	<0.002
MW-18	08/31/2016	<0.002	<0.001	0.0494	<0.001	<0.001	<0.002	0.00369	<1	<0.001	0.00973	<0.0002	<0.005	0.975	0.0112	<0.001
MW-18	09/26/2016	<0.002	<0.001	0.0471	<0.001	<0.001	<0.002	0.00279	<1	<0.001	<0.00959	<0.0002	<0.005	1.55	0.0142	<0.001
MW-18	10/12/2016	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	0.0024	<1	0.00106	<0.00959	<0.0002	<0.005	<5	0.0052	<0.001
MW-18	11/16/2016	<0.002	<0.001	0.0524	<0.001	<0.001	<0.002	0.00231	<1	<0.001	<0.00959	<0.0002	<0.005	<5	0.0128	<0.001
MW-18	12/12/2016	<0.002	<0.001	0.055	<0.001	<0.001	<0.002	0.00358	<1	<0.001	<0.00959	<0.0002	<0.005	<5	0.0134	<0.001
MW-18	03/09/2017	<0.002	<0.001	0.0416	<0.001	<0.001	<0.002	0.00168	<1	<0.001	0.0111	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Coal Pile Runoff Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-18	06/08/2017	<0.002	<0.001	0.0475	<0.001	<0.001	<0.002	0.00203	<1	<0.001	0.0121	<0.0002	<0.005	<5	<0.005	<0.001
MW-18	07/13/2017	<0.002	<0.001	0.0407	<0.001	<0.001	<0.002	0.00172	<1	<0.001	<0.00959	<0.0002	<0.005	<5	0.00697	<0.001
MW-18	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-18	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-18	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-18	03/15/2019	<0.002	<0.001	0.0398	<0.001	<0.001	<0.002	0.00131	<1	<0.001	0.00562	<0.0002	<0.005	<5	0.0143	<0.001
MW-18	09/12/2019	NA	<0.001	0.0411	NA	<0.001	0.00252	0.00176	<1	<0.001	0.0134	NA	<0.005	<5	0.0157	NA
MW-18	04/10/2020	<0.004	<0.002	0.0317	<0.002	<0.001	<0.002	<0.002	0.161	<0.005	0.00537	<0.0002	<0.005	0.568	0.012	<0.002
MW-18	09/16/2020	NA	<0.002	0.02	NA	<0.001	<0.002	<0.002	<0.15	<0.005	0.00407	NA	<0.005	0.325	0.00615	NA
MW-18	03/23/2021	<0.004	<0.002	0.0274	<0.002	<0.001	<0.002	<0.002	0.178	<0.002	0.00477	<0.0002	<0.005	0.175	0.00502	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter

Analytical Results - Appendix III

Zimmer Gypsum Recycle Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background								
MW-8	12/30/2015	0.0783	108	10.3	0.0766	7.3	52	370
MW-8	03/16/2016	0.0359	165	32.4	0.106	7.1	59.1	468
MW-8	06/15/2016	0.0455	114	13.8	<1	7.1	64.4	474
MW-8	09/27/2016	0.0413	119	13.1	<1	7	66	446
MW-8	12/13/2016	0.0405	128	19.2	<1	7	65.2	455
MW-8	03/09/2017	<0.08	114	21.1	<1	8.6	57.3	474
MW-8	06/08/2017	<0.08	118	31.6	<1	7.5	63.4	534
MW-8	07/13/2017	<0.08	109	27.5	<1	6.9	61.1	491
MW-8	11/13/2017	<0.08	113	15	<1	6.8	<50	434
MW-8	05/08/2018	<1	127	33.8	<1	7	62.8	491
MW-8	09/27/2018	<0.08	121	14.5	<1	7	66.5	439
MW-8	03/14/2019	<0.08	117	23.8	<1	6.9	62.5	462
MW-8	09/11/2019	<0.08	129	34	<1	6.8	59.5	508
MW-8	04/09/2020	<0.03	122	16	<0.15	6.8	65.2	421
MW-8	09/16/2020	0.0434	122	13.8	<0.15	7	67.2	473
MW-8	03/22/2021	0.0734	134	38.6	<0.15	6.9	67.7	517
Compliance								
MW-7A	12/30/2015	1.63	135	81.4	0.206	7	259	737
MW-7A	03/16/2016	2.82	180	134	0.0655	6.6	444	1090
MW-7A	06/16/2016	0.84	122	90.7	<1	6.8	261	765
MW-7A	09/27/2016	4.51	198	108	<1	6.7	512	1180

Analytical Results - Appendix III

Zimmer Gypsum Recycle Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-7A	12/13/2016	1.41	121	160	<1	6.7	553	721
MW-7A	03/10/2017	6.14	260	156	<1	7.7	682	1870
MW-7A	06/08/2017	1.58	146	78.6	<1	6.7	311	854
MW-7A	07/13/2017	1.22	116	69.1	<1	6.8	247	725
MW-7A	11/14/2017	1.4	118	64.7	<1	6.7	277	718
MW-7A	05/08/2018	1.54	135	63.7	<1	6.8	318	923
MW-7A	09/27/2018	1.57	119	55.7	<1	6.7	205	667
MW-7A	03/13/2019	3.03	175	111	<1	6.5	517	1170
MW-7A	09/11/2019	3.38	159	62.8	<1	7.3	376	912
MW-7A	04/10/2020	2.43	156	62.8	<0.15	7.2	366	876
MW-7A	09/17/2020	3.26	148	66.4	<0.15	6.9	397	974
MW-7A	03/22/2021	1.58	115	41.2	0.167	6.8	270	680
MW-10	12/29/2015	5.42	135	57.3	0.218	7.7	234	1050
MW-10	03/16/2016	9.05	189	122	0.181	7.1	550	1230
MW-10	06/16/2016	4.91	81.5	146	<1	7.2	409	960
MW-10	09/27/2016	0.27	137	149	<1	7.1	606	1400
MW-10	12/13/2016	6.63	127	221	<1	6.8	527	1190
MW-10	03/10/2017	6	103	77.9	<1	7.9	426	1160
MW-10	06/08/2017	5.87	99.7	99.5	<1	6.9	452	1050
MW-10	07/13/2017	4.87	79.1	75.7	<1	7.1	367	883
MW-10	11/14/2017	4.07	126	<150	1.44	6.9	582	1210
MW-10	05/08/2018	5.72	249	146	2.49	6.9	1070	2180

Analytical Results - Appendix III

Zimmer Gypsum Recycle Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-10	09/27/2018	4.89	150	113	1.77	6.9	534	1230
MW-10	03/13/2019	5.9	308	176	2.38	6.7	1420	2390
MW-10	09/12/2019	2.79	140	73.3	1.41	6.8	513	1100
MW-10	04/10/2020	4.38	108	60.5	1.92	7.3	372	845
MW-10	09/17/2020	2.03	94.6	55	1.63	7.1	289	735
MW-10	03/22/2021	2.01	86.8	40.2	2.25	7.2	239	622
MW-11	12/29/2015	0.581	176	70.4	0.175	7	252	768
MW-11	03/16/2016	0.489	270	126	0.0952	6.8	447	1140
MW-11	06/16/2016	0.572	130	81.1	<1	6.9	170	640
MW-11	09/27/2016	0.444	137	74.8	<1	6.9	196	703
MW-11	12/13/2016	1.45	225	131	<1	6.8	545	1110
MW-11	03/10/2017	0.434	147	66.9	<1	8.1	209	736
MW-11	06/08/2017	0.508	167	69.9	<1	6.8	248	767
MW-11	07/13/2017	0.825	149	66.7	<1	6.8	195	728
MW-11	11/14/2017	0.498	133	68.1	<1	6.8	188	634
MW-11	05/08/2018	<1	139	75.1	<1	7	197	793
MW-11	09/27/2018	0.921	164	78.1	<1	6.8	<250	771
MW-11	03/13/2019	0.458	181	58.2	<1	6.7	352	959
MW-11	09/12/2019	0.45	119	45.1	<1	6.9	145	590
MW-11	04/10/2020	0.719	110	48.9	0.17	7.4	135	510
MW-11	09/17/2020	0.395	85.4	31.7	0.184	7.2	107	427
MW-11	03/22/2021	0.525	146	46.6	0.174	6.9	278	714

Analytical Results - Appendix III

Zimmer Gypsum Recycle Pond

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)

Notes:
1. Abbreviations: mg/L - milligrams per liter; STD - standard units

Analytical Results - Appendix IV

Zimmer Gypsum Recycle Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background																
MW-8	12/30/2015	<0.002	0.00115	0.0378	<0.002	<0.001	<0.003	<0.005	0.0766	<0.005	<0.5	<0.0002	<0.01	<0.265	<0.01	<0.001
MW-8	03/16/2016	<0.01	<0.025	0.0681	<0.01	<0.005	<0.015	<0.025	0.106	<0.025	0.00635	<0.0002	<0.05	<0.849	<0.05	<0.005
MW-8	06/15/2016	<0.002	<0.001	0.0418	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0694	<0.005	<0.001
MW-8	09/27/2016	<0.002	<0.001	0.043	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.214	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0458	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	0.0002	<0.005	<5	<0.005	<0.001
MW-8	03/09/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-8	06/08/2017	<0.002	<0.001	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-8	07/13/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<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	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-8	09/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-8	03/14/2019	<0.002	<0.001	0.0454	<0.001	<0.001	0.00201	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-8	09/11/2019	NA	<0.001	0.0552	<0.001	NA	0.00206	<0.0005	<1	<0.001	0.00754	NA	<0.005	<5	<0.005	NA
MW-8	04/09/2020	<0.004	<0.002	0.046	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
MW-8	09/16/2020	NA	<0.002	0.0452	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00612	NA	<0.005	0.0611	<0.002	NA
MW-8	03/22/2021	<0.004	<0.002	0.0545	<0.002	<0.001	<0.002	<0.002	<0.15	<0.002	0.00553	<0.0002	<0.005	0	<0.002	<0.002
Compliance																
MW-7A	12/30/2015	<0.002	0.00217	0.0597	<0.002	<0.001	<0.003	0.0126	0.206	<0.005	<0.5	<0.0002	0.00369	<0.393	<0.01	<0.001
MW-7A	03/16/2016	0.000634	0.0978	0.0543	<0.002	0.0004	0.0123	0.00783	0.0655	<0.005	0.00136	<0.0002	0.0014	<0.698	0.00267	<0.001
MW-7A	06/16/2016	<0.002	<0.001	0.0377	<0.001	<0.001	<0.002	0.00291	<1	<0.001	<0.00959	<0.0002	<0.005	0.256	<0.005	<0.001
MW-7A	09/27/2016	<0.002	<0.001	0.0544	<0.001	<0.001	<0.002	0.00411	<1	<0.001	<0.00959	<0.0002	<0.005	0.471	<0.005	<0.001
MW-7A	12/13/2016	<0.002	<0.001	0.0319	<0.001	<0.001	<0.002	0.00298	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-7A	03/10/2017	<0.002	<0.001	0.0437	<0.001	<0.001	<0.002	0.00528	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Gypsum Recycle Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-7A	06/08/2017	<0.002	<0.001	0.0287	<0.001	<0.001	<0.002	0.00149	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-7A	07/13/2017	<0.002	<0.001	0.0263	<0.001	<0.001	<0.002	0.00113	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-7A	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-7A	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	0.00755	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-7A	09/27/2018	NA	<0.001	NA	NA	NA	0.00207	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-7A	03/13/2019	<0.002	<0.001	0.0483	<0.001	<0.001	<0.002	0.00245	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-7A	09/11/2019	NA	<0.001	0.0458	NA	<0.001	<0.002	0.00101	<1	<0.001	0.0124	NA	<0.005	<5	<0.005	NA
MW-7A	04/10/2020	<0.004	<0.002	0.0371	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	<0.002	<0.0002	<0.005	0.785	0.00204	<0.002
MW-7A	09/17/2020	NA	<0.002	0.0395	NA	<0.001	<0.002	<0.002	<0.15	<0.005	0.00314	NA	<0.005	0.427	0.00266	NA
MW-7A	03/22/2021	<0.004	<0.002	0.0277	<0.002	<0.001	<0.002	<0.002	0.167	<0.002	<0.002	<0.0002	<0.005	0.863	<0.002	<0.002
MW-10	12/29/2015	<0.002	0.00228	0.13	<0.002	<0.001	0.00293	0.01	0.218	<0.005	<0.5	<0.0002	0.0146	0.434	<0.01	<0.001
MW-10	03/16/2016	<0.002	0.00263	0.114	<0.002	0.0004	<0.003	0.00835	0.181	<0.005	0.00132	<0.0002	0.0075	0.382	0.0006	<0.001
MW-10	06/16/2016	<0.002	0.00139	0.0729	<0.001	<0.001	<0.002	0.0041	<1	<0.001	<0.00959	<0.0002	0.00793	0.787	<0.005	<0.001
MW-10	09/27/2016	<0.002	0.00203	0.0577	<0.001	<0.001	<0.002	0.00756	<1	<0.001	0.0103	<0.0002	0.0109	0.521	<0.005	<0.001
MW-10	12/13/2016	<0.002	0.00127	0.0436	<0.001	<0.001	<0.002	0.00883	<1	<0.001	<0.00959	<0.0002	0.0059	<5	<0.005	<0.001
MW-10	03/10/2017	<0.002	0.00164	0.0564	<0.001	<0.001	<0.002	0.00593	<1	<0.001	<0.00959	<0.0002	0.00513	<5	<0.005	<0.001
MW-10	06/08/2017	<0.002	0.00286	0.0618	<0.001	<0.001	<0.002	0.00417	<1	<0.001	<0.00959	<0.0002	0.00752	<5	<0.005	<0.001
MW-10	07/13/2017	<0.002	<0.001	0.0453	<0.001	<0.001	<0.002	0.00371	<1	<0.001	<0.00959	<0.0002	0.00731	<5	<0.005	<0.001
MW-10	11/14/2017	NA	NA	NA	NA	NA	NA	NA	1.44	NA	NA	NA	NA	NA	NA	NA
MW-10	05/08/2018	<0.003	0.00535	<0.2	<0.004	<0.005	<0.005	<0.005	2.49	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-10	09/27/2018	NA	0.00153	NA	NA	NA	<0.002	NA	1.77	NA	NA	NA	NA	<5	NA	NA
MW-10	03/13/2019	<0.002	0.00407	0.021	<0.001	<0.001	<0.002	0.00112	2.38	<0.001	0.0187	<0.0002	<0.005	<5	<0.005	<0.001
MW-10	09/12/2019	NA	0.00501	0.0127	NA	<0.001	<0.002	0.00464	1.41	<0.001	0.0144	NA	0.0105	<5	<0.005	NA
MW-10	04/10/2020	<0.004	0.00201	<0.02	<0.002	<0.001	<0.002	<0.002	1.92	<0.005	0.00934	<0.0002	0.00628	1.29	<0.002	<0.002

Analytical Results - Appendix IV

Zimmer Gypsum Recycle Pond

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-10	09/17/2020	NA	0.00241	<0.02	NA	<0.001	<0.002	<0.002	1.63	<0.005	0.00856	NA	<0.005	0.107	<0.002	NA
MW-10	03/22/2021	<0.004	0.00719	<0.02	<0.002	<0.001	<0.002	0.00417	2.25	<0.002	0.00772	<0.0002	0.00889	0.59	<0.002	<0.002
MW-11	12/29/2015	<0.002	0.00194	0.00977	<0.002	<0.001	0.000794	0.0092	0.175	<0.005	<0.5	<0.0002	0.00471	0.471	<0.01	<0.001
MW-11	03/16/2016	<0.002	0.0035	0.116	<0.002	0.0004	<0.003	0.00422	0.0952	<0.005	0.0014	<0.0002	0.00219	0.523	0.0006	<0.001
MW-11	06/16/2016	<0.002	<0.001	0.0539	<0.001	<0.001	<0.002	0.00192	<1	<0.001	<0.00959	<0.0002	<0.005	0.525	<0.005	<0.001
MW-11	09/27/2016	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	0.00147	<1	<0.001	<0.00959	<0.0002	<0.005	0.891	<0.005	<0.001
MW-11	12/13/2016	<0.002	<0.001	0.0921	<0.001	<0.001	<0.002	0.0019	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-11	03/10/2017	<0.002	<0.001	0.0585	<0.001	<0.001	<0.002	0.00176	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-11	06/08/2017	<0.002	0.00166	0.0643	<0.001	<0.001	<0.002	0.002	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-11	07/13/2017	<0.002	<0.001	0.0589	<0.001	<0.001	<0.002	0.00172	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<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	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-11	09/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-11	03/13/2019	<0.002	0.00123	0.0764	<0.001	<0.001	<0.002	0.00175	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-11	09/12/2019	NA	0.00109	0.0493	NA	<0.001	<0.002	0.00136	<1	<0.001	0.00609	NA	<0.005	<5	<0.005	NA
MW-11	04/10/2020	<0.004	<0.002	0.0443	<0.002	<0.001	<0.002	<0.002	0.17	<0.005	<0.002	<0.0002	<0.005	0.955	<0.002	<0.002
MW-11	09/17/2020	NA	<0.002	0.0329	NA	<0.001	<0.002	<0.002	0.184	<0.005	<0.002	NA	<0.005	1.26	<0.002	NA
MW-11	03/22/2021	<0.004	0.0033	0.0575	<0.002	<0.001	0.00344	0.00619	0.174	<0.002	<0.002	<0.0002	0.00548	0.43	<0.002	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background								
MW-1	12/30/2015	0.072	155	48.5	0.2	7.2	90.1	544
MW-1	03/16/2016	0.0233	206	59.1	0.146	7.1	85.2	583
MW-1	06/16/2016	0.0389	154	59.6	<1	7	95.3	648
MW-1	09/26/2016	0.0349	160	64.9	<1	7.1	93.1	621
MW-1	12/13/2016	0.0322	165	52.4	<1	7	93.3	561
MW-1	03/09/2017	<0.08	150	58.2	<1	8.3	85.9	589
MW-1	06/08/2017	<0.08	171	65.5	<1	7.1	87	582
MW-1	07/13/2017	<0.08	144	61.3	<1	7	79	608
MW-1	11/13/2017	<0.08	150	53.1	<1	6.9	89.1	571
MW-1	05/09/2018	<1	157	71	<1	7	88.9	631
MW-1	09/27/2018	<0.08	163	62.7	<1	6.9	113	578
MW-1	03/14/2019	<0.08	152	78.7	<1	7	90.2	617
MW-1	09/11/2019	<0.08	167	63.1	<1	7	90.6	637
MW-1	04/09/2020	0.123	170	80.5	<0.15	6.7	92.3	592
MW-1	09/16/2020	0.0365	169	84.3	<0.15	7.1	99.1	644
MW-1	03/22/2021	0.082	173	79.2	0.166	7	99.2	613
MW-8	12/30/2015	0.0783	108	10.3	0.0766	7.3	52	370
MW-8	03/16/2016	0.0359	165	32.4	0.106	7.1	59.1	468
MW-8	06/15/2016	0.0455	114	13.8	<1	7.1	64.4	474
MW-8	09/27/2016	0.0413	119	13.1	<1	7	66	446
MW-8	12/13/2016	0.0405	128	19.2	<1	7	65.2	455

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-8	03/09/2017	<0.08	114	21.1	<1	8.6	57.3	474
MW-8	06/08/2017	<0.08	118	31.6	<1	7.5	63.4	534
MW-8	07/13/2017	<0.08	109	27.5	<1	6.9	61.1	491
MW-8	11/13/2017	<0.08	113	15	<1	6.8	<50	434
MW-8	05/08/2018	<1	127	33.8	<1	7	62.8	491
MW-8	09/27/2018	<0.08	121	14.5	<1	7	66.5	439
MW-8	03/14/2019	<0.08	117	23.8	<1	6.9	62.5	462
MW-8	09/11/2019	<0.08	129	34	<1	6.8	59.5	508
MW-8	04/09/2020	<0.03	122	16	<0.15	6.8	65.2	421
MW-8	09/16/2020	0.0434	122	13.8	<0.15	7	67.2	473
MW-8	03/22/2021	0.0734	134	38.6	<0.15	6.9	67.7	517
MW-12	12/30/2015	0.3	179	27.3	0.145	7.1	127	608
MW-12	03/18/2016	0.22	200	66	0.172	6.8	99.8	666
MW-12	06/15/2016	0.273	159	42.4	<1	7	137	649
MW-12	09/27/2016	0.276	160	29.5	<1	7.1	110	600
MW-12	12/13/2016	0.241	151	31	<1	6.9	88.8	555
MW-12	03/09/2017	0.246	160	42.9	<1	8.4	113	610
MW-12	06/08/2017	0.215	168	39.6	<1	7	110	606
MW-12	07/13/2017	0.199	154	35.6	<1	6.9	105	579
MW-12	11/13/2017	0.199	146	30	<1	6.8	95.5	550
MW-12	05/09/2018	<1	143	30.7	<1	6.9	104	584
MW-12	09/19/2018	0.272	163	31.9	<1	6.8	104	577

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-12	03/14/2019	0.256	147	33.2	<1	6.9	106	596
MW-12	09/11/2019	0.204	148	26.6	<1	7.7	90	557
MW-12	04/09/2020	0.21	162	32.5	<0.15	6.9	98.3	598
MW-12	09/16/2020	0.207	149	31.7	<0.15	7	98.3	579
MW-12	03/23/2021	0.892	152	40	<0.15	6.9	98.1	565
Compliance								
MW-9	12/30/2015	3.31	331	106	0.152	7.2	944	1770
MW-9	03/17/2016	1.98	363	111	0.139	7	789	1680
MW-9	06/15/2016	1.12	235	55.6	<1	7.2	630	1170
MW-9	09/27/2016	0.628	213	38.3	<1	7.2	512	989
MW-9	12/12/2016	1.96	280	71.8	<1	7	740	1430
MW-9	03/09/2017	2.65	300	104	<1	8.3	837	1680
MW-9	06/08/2017	0.521	262	72.6	<1	7	658	1240
MW-9	07/13/2017	1.3	291	<150	<1	7.1	729	1380
MW-9	11/13/2017	0.869	264	50.7	<1	7	650	1190
MW-9	05/09/2018	2.47	360	110	<1	6.9	905	1870
MW-9	09/19/2018	1.62	277	53.5	<1	6.8	658	1320
MW-9	03/14/2019	2.29	299	111	<1	7	995	1840
MW-9	09/11/2019	0.737	236	30.7	<1	8.3	495	1190
MW-9	04/09/2020	0.511	270	32.3	<0.15	6.9	589	1160
MW-9	09/16/2020	0.127	220	21.4	<0.15	7.2	485	999
MW-9	03/23/2021	0.709	237	32.3	<0.15	7.2	570	920

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-13	12/29/2015	0.0968	220	13.9	0.28	7.2	328	710
MW-13	03/17/2016	0.0482	165	20.7	0.294	7.2	276	667
MW-13	06/15/2016	0.0739	134	39.9	<1	7.1	256	685
MW-13	09/27/2016	0.0594	163	21.9	<1	7.2	215	672
MW-13	12/13/2016	0.0612	162	19.6	<1	7.1	239	678
MW-13	03/09/2017	<0.08	140	17.3	<1	8.5	267	705
MW-13	06/08/2017	<0.08	154	17.2	<1	7.1	256	683
MW-13	07/13/2017	<0.08	149	15.9	<1	7.2	302	722
MW-13	11/13/2017	<0.08	151	19	<1	6.9	<250	667
MW-13	05/09/2018	<1	147	17.2	<1	7.1	236	674
MW-13	09/19/2018	<0.08	167	19.2	<1	6.9	260	732
MW-13	03/14/2019	0.083	141	18.5	<1	7.1	260	717
MW-13	09/11/2019	<0.08	144	14.4	<1	7.6	146	616
MW-13	04/09/2020	0.0597	166	20.4	0.165	7	281	715
MW-13	09/17/2020	0.0557	132	17.7	0.176	7.2	135	577
MW-13	03/23/2021	0.354	142	19.9	0.196	7.1	198	622
MW-14	12/29/2015	0.11	262	<3	<1	7.3	467	1010
MW-14	03/17/2016	0.0453	245	33.7	0.225	7.2	470	992
MW-14	06/15/2016	0.0595	172	<30	<1	7.1	348	837
MW-14	09/27/2016	0.0661	183	29.6	<1	7.1	303	814
MW-14	12/13/2016	0.0702	196	33.4	<1	7	365	905
MW-14	03/09/2017	<0.08	192	29.9	<1	8.4	408	916

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-14	06/08/2017	<0.08	181	<30	<1	7	354	843
MW-14	07/13/2017	<0.08	198	30.8	<1	7.2	477	1020
MW-14	11/13/2017	<0.08	194	30.6	<1	7	340	893
MW-14	05/09/2018	<1	199	27.9	<1	7.1	398	947
MW-14	09/19/2018	<0.08	207	31.6	<1	6.9	416	1000
MW-14	03/14/2019	<0.08	186	29.5	<1	7.1	420	946
MW-14	09/11/2019	0.139	181	28.8	<1	7.4	287	836
MW-14	04/09/2020	0.116	213	40	0.179	7.4	427	939
MW-14	09/17/2020	0.119	156	29.4	0.2	7.1	237	745
MW-14	03/23/2021	<0.3	184	37	0.205	7	360	845
MW-15	12/30/2015	0.11	296	31.1	0.298	7.1	505	1100
MW-15	03/18/2016	0.0557	233	34	0.29	6.9	447	1110
MW-15	06/15/2016	0.0737	213	34.9	<1	6.9	606	1120
MW-15	09/27/2016	0.0833	237	38	<1	7.1	493	1160
MW-15	12/13/2016	0.0816	247	38.2	<1	7	522	1140
MW-15	03/09/2017	<0.08	212	32.8	<1	8.4	505	1100
MW-15	06/08/2017	<0.08	226	32.4	<1	7	524	1090
MW-15	07/13/2017	<0.08	217	36.6	<1	7.1	549	1120
MW-15	11/13/2017	<0.08	224	36.5	<1	6.8	498	1110
MW-15	05/09/2018	<1	203	31.1	<1	7	414	1000
MW-15	09/19/2018	0.0939	240	38.7	<1	6.9	529	1170
MW-15	03/14/2019	0.0807	198	38.6	<1	6.9	486	1090

Analytical Results - Appendix III

Zimmer D Basin

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-15	09/11/2019	0.12	241	36.2	<1	7.4	535	1170
MW-15	04/09/2020	0.079	258	41.1	0.175	7.4	567	1090
MW-15	09/17/2020	0.126	245	46.8	0.168	6.9	560	1250
MW-15	03/23/2021	<0.3	235	43.4	0.201	7	556	1170

Notes:
1. Abbreviations: mg/L - milligrams per liter; STD - standard units

Analytical Results - Appendix IV

Zimmer D Basin

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background																
MW-1	12/30/2015	<0.002	0.00142	0.0655	<0.002	<0.001	0.00191	<0.005	0.2	<0.005	<0.5	<0.0002	<0.01	<0.426	<0.01	<0.001
MW-1	03/16/2016	<0.01	<0.025	0.0863	<0.01	<0.005	<0.015	<0.025	0.146	<0.025	0.0101	<0.0002	<0.05	<0.937	<0.05	<0.005
MW-1	06/16/2016	<0.002	<0.001	0.0601	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.603	<0.005	<0.001
MW-1	09/26/2016	<0.002	<0.001	0.0627	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.168	<0.005	<0.001
MW-1	12/13/2016	<0.002	<0.001	0.0629	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	0.0002	<0.005	<5	<0.005	<0.001
MW-1	03/09/2017	<0.002	<0.001	0.0587	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	06/08/2017	<0.002	<0.001	0.0643	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	07/13/2017	<0.002	<0.001	0.0566	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<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	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-1	09/27/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-1	03/14/2019	<0.002	<0.001	0.0665	<0.001	<0.001	0.0023	<0.0005	<1	<0.001	0.00665	<0.0002	<0.005	<5	<0.005	<0.001
MW-1	09/11/2019	NA	<0.001	0.077	<0.001	NA	<0.002	<0.0005	<1	<0.001	0.0109	NA	<0.005	<5	<0.005	NA
MW-1	04/09/2020	<0.004	<0.002	0.0725	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00964	<0.0002	<0.005	0.0302	<0.002	<0.002
MW-1	09/16/2020	NA	<0.002	0.073	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00966	NA	<0.005	0.215	<0.002	NA
MW-1	03/22/2021	<0.004	<0.002	0.0713	<0.002	<0.001	<0.002	<0.002	0.166	<0.002	0.00782	<0.0002	<0.005	0.0171	<0.002	<0.002
MW-8	12/30/2015	<0.002	0.00115	0.0378	<0.002	<0.001	<0.003	<0.005	0.0766	<0.005	<0.5	<0.0002	<0.01	<0.265	<0.01	<0.001
MW-8	03/16/2016	<0.01	<0.025	0.0681	<0.01	<0.005	<0.015	<0.025	0.106	<0.025	0.00635	<0.0002	<0.05	<0.849	<0.05	<0.005
MW-8	06/15/2016	<0.002	<0.001	0.0418	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.0694	<0.005	<0.001
MW-8	09/27/2016	<0.002	<0.001	0.043	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.214	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0458	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	0.0002	<0.005	<5	<0.005	<0.001
MW-8	03/09/2017	<0.002	<0.001	0.0423	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-8	06/08/2017	<0.002	<0.001	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer D Basin

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-8	07/13/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<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	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-8	09/27/2018	NA	<0.001	NA	NA	NA	<0.002	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-8	03/14/2019	<0.002	<0.001	0.0454	<0.001	<0.001	0.00201	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-8	09/11/2019	NA	<0.001	0.0552	<0.001	NA	0.00206	<0.0005	<1	<0.001	0.00754	NA	<0.005	<5	<0.005	NA
MW-8	04/09/2020	<0.004	<0.002	0.046	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00464	<0.0002	<0.005	0.292	<0.002	<0.002
MW-8	09/16/2020	NA	<0.002	0.0452	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00612	NA	<0.005	0.0611	<0.002	NA
MW-8	03/22/2021	<0.004	<0.002	0.0545	<0.002	<0.001	<0.002	<0.002	<0.15	<0.002	0.00553	<0.0002	<0.005	0	<0.002	<0.002
MW-12	12/30/2015	<0.002	0.00169	0.0697	<0.002	<0.001	0.000518	<0.005	0.145	<0.005	<0.5	<0.0002	<0.01	<0.387	0.00131	<0.001
MW-12	03/18/2016	<0.01	<0.025	0.0813	<0.01	<0.005	<0.015	<0.025	0.172	<0.025	0.00875	<0.0002	<0.05	<0.789	<0.05	<0.005
MW-12	06/15/2016	<0.002	<0.001	0.0605	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	0.13	<0.005	<0.001
MW-12	09/27/2016	<0.002	<0.001	0.0614	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	1.11	<0.005	<0.001
MW-12	12/13/2016	<0.002	<0.001	0.0588	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-12	03/09/2017	<0.002	<0.001	0.0563	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-12	06/08/2017	<0.002	<0.001	0.0618	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-12	07/13/2017	<0.002	<0.001	0.0579	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-12	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-12	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-12	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-12	03/14/2019	<0.002	<0.001	0.0631	<0.001	<0.001	0.00218	<0.0005	<1	<0.001	0.00543	<0.0002	<0.005	<5	<0.005	<0.001
MW-12	09/11/2019	NA	<0.001	0.0692	<0.001	NA	0.00249	<0.0005	<1	<0.001	0.0114	NA	<0.005	<5	<0.005	NA
MW-12	04/09/2020	<0.004	<0.002	0.0657	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00591	<0.0002	<0.005	3.9	<0.002	<0.002
MW-12	09/16/2020	NA	<0.002	0.0629	<0.002	NA	<0.002	<0.002	<0.15	<0.005	0.00612	NA	<0.005	0.409	<0.002	NA

Analytical Results - Appendix IV

Zimmer D Basin

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-12	03/23/2021	<0.004	<0.002	0.0605	<0.002	<0.001	<0.002	<0.002	<0.15	<0.002	0.00627	<0.0002	<0.005	0.297	<0.002	<0.002
Compliance																
MW-9	12/30/2015	<0.002	0.00454	0.045	<0.002	0.000721	0.00159	0.00327	0.152	0.00021	0.00836	<0.0002	0.00145	0.649	<0.01	<0.001
MW-9	03/17/2016	<0.01	<0.025	0.0567	<0.01	<0.005	<0.015	0.00406	0.139	<0.025	0.011	<0.0002	<0.05	<0.854	<0.05	<0.005
MW-9	06/15/2016	<0.002	0.00127	0.0253	<0.001	<0.001	<0.002	0.00253	<1	<0.001	<0.00959	<0.0002	<0.005	0.573	<0.005	<0.001
MW-9	09/27/2016	<0.002	0.0014	0.0239	<0.001	<0.001	<0.002	0.00202	<1	<0.001	<0.00959	<0.0002	<0.005	0.841	<0.005	<0.001
MW-9	12/12/2016	<0.002	0.00151	0.0269	<0.001	<0.001	<0.002	0.00299	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-9	03/09/2017	<0.002	0.00161	0.033	<0.001	<0.001	<0.002	0.00403	<1	<0.001	0.0126	<0.0002	<0.005	<5	<0.005	<0.001
MW-9	06/08/2017	<0.002	0.00257	0.0337	<0.001	<0.001	<0.002	0.00219	<1	<0.001	0.0124	<0.0002	<0.005	<5	<0.005	<0.001
MW-9	07/13/2017	<0.002	0.00178	0.0308	<0.001	<0.001	<0.002	0.00292	<1	<0.001	0.0116	<0.0002	<0.005	<5	<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	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-9	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-9	03/14/2019	<0.002	0.00171	0.0333	<0.001	<0.001	<0.002	0.00351	<1	<0.001	0.00779	<0.0002	<0.005	<5	<0.005	<0.001
MW-9	09/11/2019	NA	0.00188	0.0261	<0.001	NA	0.00237	0.00267	<1	<0.001	0.0135	NA	<0.005	<5	<0.005	NA
MW-9	04/09/2020	<0.004	<0.002	0.026	<0.002	<0.001	<0.002	0.00286	<0.15	<0.005	0.00709	<0.0002	<0.005	6.29	<0.002	<0.002
MW-9	09/16/2020	NA	<0.002	0.0215	<0.002	NA	<0.002	0.00242	<0.15	<0.005	0.0068	NA	<0.005	0.727	<0.002	NA
MW-9	03/23/2021	<0.004	<0.002	<0.02	<0.002	<0.001	<0.002	0.00236	<0.15	<0.002	0.00656	<0.0002	<0.005	0.184	<0.002	<0.002
MW-13	12/29/2015	0.000841	0.0026	0.0564	<0.002	<0.001	<0.003	0.00653	0.28	<0.005	<0.5	<0.0002	0.00495	0.574	0.000664	<0.001
MW-13	03/17/2016	<0.01	0.0048	0.0691	<0.01	<0.005	<0.015	0.00516	0.294	<0.025	0.00426	<0.0002	0.00674	<1.01	<0.05	<0.005
MW-13	06/15/2016	<0.002	0.00264	0.0521	<0.001	<0.001	<0.002	0.00641	<1	<0.001	<0.00959	<0.0002	<0.005	0.459	<0.005	<0.001
MW-13	09/27/2016	<0.002	0.0046	0.0524	<0.001	<0.001	<0.002	0.00514	<1	<0.001	<0.00959	<0.0002	<0.005	0.612	<0.005	<0.001
MW-13	12/13/2016	<0.002	0.00324	0.0536	<0.001	<0.001	<0.002	0.00477	<1	<0.001	<0.00959	<0.0002	0.005	<5	<0.005	<0.001
MW-13	03/09/2017	<0.002	0.00348	0.0516	<0.001	<0.001	<0.002	0.00348	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer D Basin

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-13	06/08/2017	<0.002	0.00319	0.0503	<0.001	<0.001	<0.002	0.00237	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-13	07/13/2017	<0.002	0.00222	0.0446	<0.001	<0.001	<0.002	0.00244	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-13	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-13	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-13	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-13	03/14/2019	<0.002	0.0183	0.054	<0.001	<0.001	<0.002	0.00295	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-13	09/11/2019	NA	0.00525	0.0461	<0.001	NA	0.00231	0.00368	<1	<0.001	0.00811	NA	<0.005	<5	<0.005	NA
MW-13	04/09/2020	<0.004	0.00261	0.0477	<0.002	<0.001	<0.002	0.00297	0.165	<0.005	0.00266	<0.0002	<0.005	3.43	<0.002	<0.002
MW-13	09/17/2020	NA	<0.002	0.039	<0.002	NA	<0.002	0.0028	0.176	<0.005	0.00274	NA	<0.005	1.73	<0.002	NA
MW-13	03/23/2021	<0.004	<0.002	0.0394	<0.002	<0.001	<0.002	0.00254	0.196	<0.002	0.00216	<0.0002	<0.005	0.12	<0.002	<0.002
MW-14	12/29/2015	0.00067	0.00263	0.0509	<0.002	<0.001	<0.003	0.00857	<1	0.000291	<0.5	<0.0002	0.00142	0.594	<0.01	<0.001
MW-14	03/17/2016	<0.01	<0.025	0.0641	<0.01	<0.005	<0.015	0.00514	0.225	<0.025	0.00379	<0.0002	0.00276	0.957	<0.05	<0.005
MW-14	06/15/2016	<0.002	0.00171	0.048	<0.001	<0.001	<0.002	0.00547	<1	<0.001	<0.00959	<0.0002	<0.005	0.534	<0.005	<0.001
MW-14	09/27/2016	<0.002	0.00163	0.0464	<0.001	<0.001	<0.002	0.00435	<1	<0.001	<0.00959	<0.0002	<0.005	0.496	<0.005	<0.001
MW-14	12/13/2016	<0.002	0.00173	0.0535	<0.001	<0.001	<0.002	0.00563	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-14	03/09/2017	<0.002	0.00168	0.0465	<0.001	<0.001	<0.002	0.00367	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-14	06/08/2017	<0.002	0.00158	0.0465	<0.001	<0.001	<0.002	0.00278	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-14	07/13/2017	<0.002	0.00124	0.044	<0.001	<0.001	<0.002	0.00231	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-14	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-14	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-14	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-14	03/14/2019	<0.002	<0.001	0.0507	<0.001	<0.001	0.00213	0.00229	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-14	09/11/2019	NA	0.00155	0.0554	<0.001	NA	0.00254	0.00239	<1	<0.001	0.00843	NA	<0.005	<5	<0.005	NA
MW-14	04/09/2020	<0.004	<0.002	0.0501	<0.002	<0.001	<0.002	0.00223	0.179	<0.005	0.00236	<0.0002	<0.005	1.6	<0.002	<0.002

Analytical Results - Appendix IV

Zimmer D Basin

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-14	09/17/2020	NA	<0.002	0.0417	<0.002	NA	<0.002	<0.002	0.2	<0.005	0.0024	NA	<0.005	0.919	<0.002	NA
MW-14	03/23/2021	<0.004	<0.002	0.0462	<0.002	<0.001	<0.002	0.00212	0.205	<0.002	0.0021	<0.0002	<0.005	1.42	<0.002	<0.002
MW-15	12/30/2015	0.000823	0.00265	0.0896	<0.002	<0.001	<0.003	0.0109	0.298	<0.005	<0.5	<0.0002	0.00554	0.59	<0.01	<0.001
MW-15	03/18/2016	<0.01	<0.025	0.0835	<0.01	<0.005	<0.015	0.00798	0.29	<0.025	0.00298	<0.0002	0.00495	<0.946	<0.05	<0.005
MW-15	06/15/2016	<0.002	<0.001	0.0687	<0.001	<0.001	<0.002	0.00751	<1	<0.001	<0.00959	<0.0002	<0.005	0.735	<0.005	<0.001
MW-15	09/27/2016	<0.002	<0.001	0.0773	<0.001	<0.001	<0.002	0.00778	<1	<0.001	<0.00959	<0.0002	<0.005	1.26	<0.005	<0.001
MW-15	12/13/2016	<0.002	<0.001	0.0767	<0.001	<0.001	<0.002	0.00701	<1	<0.001	<0.00959	<0.0002	0.00524	<5	<0.005	<0.001
MW-15	03/09/2017	<0.002	<0.001	0.0677	<0.001	<0.001	<0.002	0.00593	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-15	06/08/2017	<0.002	<0.001	0.0663	<0.001	<0.001	<0.002	0.00353	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-15	07/13/2017	<0.002	<0.001	0.0676	<0.001	<0.001	<0.002	0.00427	<1	<0.001	<0.00959	<0.0002	<0.005	<5	<0.005	<0.001
MW-15	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-15	05/09/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-15	09/19/2018	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	<5	NA	NA
MW-15	03/14/2019	<0.002	<0.001	0.06	<0.001	<0.001	<0.002	0.00318	<1	<0.001	<0.005	<0.0002	<0.005	<5	<0.005	<0.001
MW-15	09/11/2019	NA	<0.001	0.0836	<0.001	NA	0.00257	0.00381	<1	<0.001	0.00845	NA	<0.005	<5	<0.005	NA
MW-15	04/09/2020	<0.004	<0.002	0.0663	<0.002	<0.001	<0.002	0.00374	0.175	<0.005	0.00213	<0.0002	<0.005	3.26	<0.002	<0.002
MW-15	09/17/2020	NA	<0.002	0.069	<0.002	NA	<0.002	0.00289	0.168	<0.005	0.00244	NA	<0.005	1.13	<0.002	NA
MW-15	03/23/2021	<0.004	<0.002	0.0533	<0.002	<0.001	<0.002	0.00296	0.201	<0.002	<0.002	<0.0002	<0.005	0.476	<0.002	<0.002

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background								
MW-3	01/27/2016	0.0275	244	181	0.127	7.1	47.2	777
MW-3	03/14/2016	0.0397	274	185	0.115	6.9	51.6	689
MW-3	06/14/2016	0.0191	168	159	<1	6.9	54.2	771
MW-3	09/29/2016	0.0276	174	161	<1	6.9	56.4	698
MW-3	12/20/2016	0.0453	170	201	<1	6.9	69.4	739
MW-3	04/18/2017	<0.08	178	195	<1	NA	53.1	792
MW-3	06/07/2017	<0.08	185	175	<1	7.3	<100	912
MW-3	07/12/2017	0.115	167	167	<1	6.9	<100	798
MW-3	03/12/2019	<0.08	195	206	<1	6.8	50	827
MW-3	09/11/2019	<0.08	176	154	<1	6.6	56.3	827
MW-3	04/07/2020	0.0416	191	193	<0.15	6.9	52.7	875
MW-3	09/16/2020	0.0487	181	190	<0.15	6.9	57.5	916
MW-3	03/23/2021	0.0888	190	224	<0.15	6.9	50.7	858
MW-13S	01/28/2016	0.03	148	142	0.278	7.2	34.3	479
MW-13S	03/16/2016	0.0122	124	128	0.761	7	35.1	482
MW-13S	04/20/2017	<0.08	94.2	154	<1	NA	37.4	526
MW-13S	06/07/2017	<0.08	105	136	<1	6.9	36.5	561
MW-13S	07/12/2017	<0.08	105	125	<1	6.9	<50	526
MW-13S	11/14/2017	<0.08	101	141	NA	7	<50	505
MW-13S	05/07/2018	<1	87.4	92.2	<1	7.1	31.3	448
MW-13S	09/17/2018	<0.08	108	99.4	<1	6.7	30.9	517

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-13S	03/12/2019	<0.08	109	140	<1	7.1	36.9	499
MW-13S	04/07/2020	<0.03	72	81.9	0.209	7.1	27	308
MW-13S	03/23/2021	<0.03	76.8	78.6	0.161	7	27.9	352
MW-18	01/26/2016	0.101	138	19.8	0.259	7.2	187	670
MW-18	03/17/2016	0.0837	128	111	0.269	6.8	NA	679
MW-18	04/20/2017	0.0844	104	19.7	<1	NA	176	675
MW-18	06/07/2017	0.106	95.3	<30	<1	7.2	167	653
MW-18	07/12/2017	0.111	86.5	<30	<1	7.1	160	649
MW-18	11/15/2017	<0.08	78.9	18.1	NA	7.3	132	574
MW-18	05/07/2018	<1	83.6	17.4	<1	7.2	142	594
MW-18	09/27/2018	0.125	111	19.4	<1	7.1	219	676
MW-18	03/12/2019	<0.08	90.3	19.9	<1	7.2	153	595
MW-18	04/07/2020	0.0818	88.8	18.8	0.238	7.1	147	597
MW-18	03/23/2021	<0.3	90.7	18	0.179	7.2	143	588
MW-21	01/28/2016	1.36	151	170	0.57	7	58.9	760
MW-21	03/14/2016	1.41	115	114	0.454	6.9	64.1	652
MW-21	06/13/2016	1.45	92.3	122	<1	7	93.7	687
MW-21	09/29/2016	1.23	93.6	134	<1	7.1	64.8	703
MW-21	12/20/2016	1.65	89.9	125	<1	7	64.3	704
MW-21	04/19/2017	1.34	81.4	148	<1	NA	69.8	698
MW-21	06/07/2017	1.88	74.2	153	<1	6.6	68.8	751
MW-21	07/12/2017	1.23	83	152	<1	7.2	65.9	748

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-21	03/12/2019	1.22	85.2	168	<1	7.1	68.4	759
MW-21	09/11/2019	1.4	93	129	<1	7.2	66.4	687
MW-21	04/07/2020	1.36	90.2	174	0.635	7.3	73	1460
MW-21	09/16/2020	1.73	92.6	225	0.491	7.2	74	881
MW-21	03/23/2021	1.3	88.6	184	0.516	7.3	73.3	780
Compliance								
MW-9D	01/26/2016	0.576	130	197	0.212	7.2	0.6	773
MW-9D	03/16/2016	0.584	91.2	237	0.244	7.2	0.413	809
MW-9D	06/13/2016	0.6	92.5	207	<1	7.1	<5	781
MW-9D	09/29/2016	0.523	93.8	260	<1	7.2	<5	794
MW-9D	12/20/2016	0.81	101	270	<1	7.1	<5	827
MW-9D	04/19/2017	0.493	85.9	238	<1	NA	<5	793
MW-9D	06/07/2017	1.29	64.2	384	<1	6.4	<5	1080
MW-9D	07/12/2017	0.728	75.3	351	<1	7.2	<5	1080
MW-9D	11/14/2017	1.05	73.1	638	<1	7	<5	1020
MW-9D	05/08/2018	<1	75.1	301	<1	7.2	<5	852
MW-9D	09/18/2018	1.64	71.7	337	<1	7.1	<5	909
MW-9D	03/13/2019	0.499	90.4	206	<1	7.1	<5	790
MW-9D	09/11/2019	0.73	84.4	193	<1	7.1	<5	849
MW-9D	04/07/2020	0.618	93.4	233	0.308	7.1	<5	812
MW-9D	09/16/2020	0.981	85.4	309	0.29	7.3	<5	953
MW-9D	03/22/2021	0.91	83.9	312	0.266	7.5	<5	966

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-11D	01/27/2016	0.197	100	7.02	0.264	7.3	10.7	369
MW-11D	03/16/2016	0.174	76	5.84	0.285	7.2	10.1	364
MW-11D	06/13/2016	0.172	74	6.11	<1	7.3	13.3	364
MW-11D	09/29/2016	0.147	80.3	6.5	<1	7.1	11.4	363
MW-11D	12/20/2016	0.221	78.3	11.9	<1	7.2	9.29	402
MW-11D	04/18/2017	0.156	74.1	5.2	<1	NA	11.9	360
MW-11D	06/07/2017	0.205	72.4	5.14	<1	7.4	12.1	361
MW-11D	07/12/2017	0.163	70.5	5.01	<1	7.1	11.3	355
MW-11D	11/14/2017	0.179	76.6	6.17	<1	6.8	8	381
MW-11D	05/08/2018	<1	71.5	5.15	<1	7.2	11.8	389
MW-11D	09/18/2018	0.207	78.2	5.56	<1	7	12.8	367
MW-11D	03/13/2019	0.156	76.3	5.06	<1	7.2	11.3	385
MW-11D	09/11/2019	0.169	75.2	3.67	<1	7.3	11.9	352
MW-11D	04/07/2020	0.172	76.6	5.4	0.286	7.3	11.4	367
MW-11D	09/16/2020	0.18	75	4.96	0.223	7.4	11.7	383
MW-11D	03/22/2021	0.173	76.6	5.17	0.224	7.6	10.7	384
MW-16D	01/28/2016	1.01	70.2	62.5	0.546	7.4	0.6	516
MW-16D	03/15/2016	1.06	59.9	57	0.456	7.2	0.18	505
MW-16D	06/14/2016	1.11	51.1	56.7	<1	7.3	<5	522
MW-16D	09/29/2016	0.934	50.9	64	<1	7.2	<5	530
MW-16D	12/20/2016	1.28	50.6	57	<1	7.3	<5	528
MW-16D	04/18/2017	0.91	45.9	57	<1	NA	<5	504

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-16D	06/07/2017	1.11	48.7	53.3	<1	6.7	<5	521
MW-16D	07/12/2017	0.839	48	53.5	<1	7.3	<5	520
MW-16D	11/15/2017	1.02	48.7	61.2	<1	7.2	<5	533
MW-16D	05/07/2018	<1	50.2	57.9	<1	7.3	<5	537
MW-16D	09/18/2018	1.2	54.4	60.2	<1	7.1	<5	520
MW-16D	03/12/2019	0.895	51.5	59.5	<1	7.3	<5	541
MW-16D	09/11/2019	0.979	51	56.6	<1	7	<5	514
MW-16D	04/07/2020	0.922	51.7	58.2	0.502	7.3	<5	536
MW-16D	09/17/2020	1.06	51.3	61.4	0.447	7.4	<5	535
MW-16D	03/23/2021	0.889	52.3	56.8	0.462	7.3	<5	503
MW-20D	01/28/2016	0.256	136	39.9	0.273	7.2	17.6	368
MW-20D	03/15/2016	0.446	95.1	34.6	0.224	7.1	19.4	375
MW-20D	06/14/2016	0.241	71.2	13.7	<1	7.3	<25	326
MW-20D	09/29/2016	0.225	83	24.5	<1	7.1	19.6	344
MW-20D	12/20/2016	0.323	84.7	44	<1	7.1	17.8	399
MW-20D	04/18/2017	0.207	71.7	12.3	<1	NA	20.1	328
MW-20D	06/07/2017	0.261	77.2	13.3	<1	7.1	19.6	332
MW-20D	07/13/2017	0.221	73.1	17.9	<1	7	<25	347
MW-20D	11/15/2017	0.266	76.5	16.1	<1	7.1	20.9	330
MW-20D	05/07/2018	<1	72.8	14.6	<1	7.2	20.7	337
MW-20D	09/17/2018	0.29	80.2	24.1	<1	6.9	19.3	371
MW-20D	03/12/2019	0.224	81.5	23.4	<1	7.2	18.9	353

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-20D	09/12/2019	0.274	85.3	23	<1	6.7	19	362
MW-20D	04/07/2020	0.245	80.2	22.8	0.272	7.3	18.9	347
MW-20D	09/16/2020	0.254	75.7	13.2	0.222	7.3	19.3	336
MW-20D	03/22/2021	0.216	77.6	9.66	0.235	7.6	19.4	313
MW-22	01/26/2016	0.532	180	45.5	0.06	7	106	621
MW-22	03/16/2016	0.4	107	31.9	0.333	7	81.9	550
MW-22	06/13/2016	0.372	108	25.9	<1	7	79.5	531
MW-22	09/29/2016	0.364	114	35.4	<1	7	94	557
MW-22	12/20/2016	0.575	112	38.7	<1	6.9	91.9	601
MW-22	04/19/2017	0.457	112	38.9	<1	NA	94.2	584
MW-22	06/07/2017	0.443	113	<30	<1	7.2	83.1	547
MW-22	07/25/2017	0.448	99.7	34.6	<1	6.9	92.9	569
MW-22	11/14/2017	0.522	121	39	<1	6.7	101	604
MW-22	05/08/2018	<1	114	32.1	<1	7	99.7	585
MW-22	09/18/2018	0.521	122	37.3	<1	6.9	91	595
MW-22	03/13/2019	0.392	118	36.9	<1	7	96.1	590
MW-22	09/11/2019	0.466	117	36.4	<1	6.9	93.7	589
MW-22	04/08/2020	0.431	118	35	0.289	6.9	93.4	558
MW-22	09/16/2020	0.514	121	40.1	0.255	7.1	281	619
MW-22	03/22/2021	0.469	121	37.5	0.269	7.4	104	595
MW-24	01/27/2016	0.175	75.6	4.46	0.418	7.8	17.2	248
MW-24	03/15/2016	0.178	57.2	5.84	0.348	7.4	19	233

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-24	06/14/2016	0.144	45.4	5.89	<1	7.5	<25	242
MW-24	09/29/2016	0.15	50.4	6.3	<1	7.4	22.3	245
MW-24	12/20/2016	0.213	49.4	6.61	<1	7.5	23	252
MW-24	04/18/2017	0.146	43.3	5.66	<1	NA	21.8	236
MW-24	06/07/2017	0.164	46.2	5.65	<1	7.6	22.8	232
MW-24	07/12/2017	0.139	47.1	6.22	<1	7.6	<25	246
MW-24	11/14/2017	0.183	51.4	6.84	<1	7.1	26.5	260
MW-24	05/07/2018	<1	46.3	6.74	<1	7.5	25.1	245
MW-24	09/27/2018	0.217	53.4	6.46	<1	7.4	25.2	251
MW-24	03/12/2019	0.13	54.9	9.41	<1	7.4	36.3	269
MW-24	09/11/2019	0.184	53.4	5.8	<1	7.4	27.1	246
MW-24	04/08/2020	0.172	54.5	6.33	0.35	7.2	24.4	238
MW-24	09/16/2020	0.193	52.6	6.22	0.284	7.5	24.9	273
MW-24	03/22/2021	0.165	55.3	5.14	0.272	7.8	22	253
MW-D	01/28/2016	4.26	5.1	23.5	2.11	8.7	12.8	532
MW-D	03/15/2016	5	5.18	23.9	1.86	8.5	13.8	528
MW-D	06/14/2016	5.99	4.01	25.6	1.82	8.7	13	518
MW-D	09/30/2016	4.31	3.51	29.4	1.99	7.2	12.7	524
MW-D	12/21/2016	5.92	8.19	32.1	1.91	8.5	12.9	562
MW-D	04/18/2017	4.72	3.09	39	2.11	NA	13.9	565
MW-D	06/07/2017	5.22	2.75	35.4	2.19	6.9	13.3	559
MW-D	07/12/2017	4.03	2.81	29.9	2.1	8.2	13.2	545

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-D	11/14/2017	5.69	3.55	26.2	2.63	8.2	14.1	527
MW-D	05/08/2018	4.62	3.17	32.5	2.01	8.2	12.2	544
MW-D	09/18/2018	5.3	3.43	30.7	1.9	7.7	12.6	532
MW-D	03/13/2019	4.18	2.93	29.6	2.2	8.4	14.4	533
MW-D	09/11/2019	4.41	3.42	22.3	1.95	8.2	12.3	508
MW-D	04/08/2020	4.29	3.84	28.7	2.04	8.2	12.5	517
MW-D	09/16/2020	4.86	3.72	25.1	1.67	8.5	12	499
MW-D	03/22/2021	3.9	3.42	25.6	1.81	8.8	12.5	515
MW-E	01/27/2016	3.8	141	338	1.25	8.4	78.1	978
MW-E	03/17/2016	3.03	74.9	152	0.28	8.1	96.8	819
MW-E	06/14/2016	2.03	58.8	131	<1	7.4	<50	572
MW-E	09/30/2016	1.9	59.7	96.9	1.03	7.6	34.1	475
MW-E	12/21/2016	3.74	56.6	114	<1	7.4	36.7	596
MW-E	04/18/2017	0.999	46.5	21.4	<1	NA	30	376
MW-E	06/07/2017	1.08	46.9	<30	<1	6.9	24.8	372
MW-E	07/25/2017	0.934	48.2	21.5	<1	7.5	25.9	385
MW-E	11/14/2017	2.08	51	43.1	<1	7.1	27.4	448
MW-E	05/08/2018	<1	45.2	14.8	<1	7.3	20	345
MW-E	09/18/2018	0.968	55.8	19.9	<1	7.2	19.5	361
MW-E	03/13/2019	0.805	50.7	17.6	<1	7.3	20.5	361
MW-E	09/11/2019	1.01	51.2	25.6	<1	7.3	40	450
MW-E	04/08/2020	0.758	55.3	14.2	0.782	7.3	18.4	330

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-E	09/16/2020	1.16	55.3	24.6	0.652	7.5	17.2	365
MW-E	03/22/2021	0.751	53.8	15.2	0.699	7.7	18.5	347
MW-F	01/28/2016	4.11	265	515	1.02	7.4	164	1440
MW-F	03/18/2016	4.78	134	483	0.674	6.9	165	1440
MW-F	06/14/2016	8.38	139	561	<1	7.1	159	1490
MW-F	09/30/2016	4.37	114	572	1.05	7.2	167	1440
MW-F	12/21/2016	6.64	133	685	<1	7.1	177	1760
MW-F	04/18/2017	5.05	106	522	<1	NA	206	1580
MW-F	06/07/2017	5.36	103	582	<1	6.6	<250	1610
MW-F	07/25/2017	4.88	100	766	<1	7.2	<250	1500
MW-F	11/15/2017	5.83	113	531	<1	7	185	1420
MW-F	05/08/2018	6.14	93.1	628	<1	7.3	181	1620
MW-F	09/18/2018	4.79	105	568	<1	6.9	158	1510
MW-F	03/13/2019	4.04	92.3	548	<1	7.3	169	1490
MW-F	09/11/2019	4.42	98.4	506	<2.5	7.3	151	1390
MW-F	04/08/2020	1.16	72.7	120	0.607	7.2	105	564
MW-F	07/01/2020	2.06	90	264	0.491	7.2	124	404
MW-F	09/16/2020	2.71	92.6	315	0.539	7.3	132	1040
MW-F	03/23/2021	2.57	89.6	323	0.589	7.3	138	1020
MW-G	01/27/2016	0.79	97.1	131	0.597	7.3	6.66	671
MW-G	03/15/2016	1.22	88.1	156	0.359	7.2	2.98	659
MW-G	06/14/2016	1.04	65.2	158	<1	7.3	<5	674

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-G	09/30/2016	0.738	67.6	155	<1	7.2	<5	672
MW-G	12/14/2016	0.979	66.9	158	<1	7.2	<5	685
MW-G	04/18/2017	0.94	65.5	155	<1	NA	<5	699
MW-G	06/07/2017	1.08	64.7	162	<1	7.2	<5	707
MW-G	07/13/2017	0.892	63.1	166	<1	7.1	<5	719
MW-G	11/15/2017	1.22	70.6	189	<1	7.2	<5	712
MW-G	05/07/2018	<1	60.1	167	<1	7.2	<5	711
MW-G	09/17/2018	1.24	69.1	173	<1	6.9	<5	744
MW-G	03/12/2019	0.875	68.3	180	<1	7.2	<5	704
MW-G	09/11/2019	1.03	70.2	151	<1	7.2	<5	693
MW-G	04/08/2020	0.869	68.4	172	0.502	7.1	<5	665
MW-G	09/17/2020	1.12	69.2	174	0.372	7.3	<5	743
MW-G	03/23/2021	0.926	68.3	175	0.383	7.3	<5	700
MW-H	01/27/2016	0.481	148	95.8	0.679	7.3	25.1	622
MW-H	03/15/2016	0.563	134	124	0.384	7	40.1	640
MW-H	06/14/2016	0.617	129	127	<1	7	<50	705
MW-H	09/30/2016	0.469	111	119	<1	7	26	621
MW-H	12/20/2016	0.65	107	116	<1	7	21.9	624
MW-H	04/18/2017	0.494	105	110	<1	NA	25.9	671
MW-H	06/07/2017	0.576	103	129	<1	6.8	38.5	726
MW-H	07/25/2017	0.56	120	159	<1	6.8	37.1	724
MW-H	11/15/2017	0.678	121	138	<1	7	32.8	677

Analytical Results - Appendix III

Zimmer Landfill

Location	Sample Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (STD)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-H	05/07/2018	<1	105	123	<1	7.1	36.2	729
MW-H	09/18/2018	0.674	122	120	<1	6.9	39	722
MW-H	03/12/2019	0.548	114	132	<1	7	39.6	671
MW-H	09/12/2019	0.627	118	105	<1	6.7	29	629
MW-H	04/08/2020	0.58	114	126	0.443	6.9	34.4	637
MW-H	09/17/2020	0.651	113	121	0.394	7	33.7	690
MW-H	03/23/2021	0.577	114	130	0.405	7.1	34.2	656

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; STD - standard units

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background																
MW-3	01/27/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.127	<0.005	0.0093	<0.0002	<0.01	<0.384	<0.01	<0.001
MW-3	03/14/2016	0.000743	0.00594	0.0464	<0.002	<0.001	<0.003	<0.005	0.115	<0.005	0.00807	<0.0002	<0.01	0.632	<0.01	0.00159
MW-3	06/14/2016	<0.002	<0.001	0.042	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.499	<0.005	<0.001
MW-3	09/29/2016	<0.002	<0.001	0.0455	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.514	<0.005	<0.001
MW-3	12/20/2016	<0.002	<0.001	0.0482	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-3	04/18/2017	<0.002	<0.001	0.0413	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-3	06/07/2017	<0.002	<0.001	0.0495	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-3	07/12/2017	<0.002	<0.001	0.0455	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-3	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	NA	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-3	09/17/2018	NA	<0.001	0.0637	NA	NA	<0.002	NA	NA	NA	0.014	NA	NA	<5	NA	NA
MW-3	03/12/2019	<0.002	<0.001	0.0468	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0134	<0.0002	<0.005	<5	<0.005	<0.001
MW-3	09/11/2019	NA	<0.001	0.0595	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0161	NA	<0.005	<5	<0.005	NA
MW-3	04/07/2020	<0.004	<0.002	0.0515	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00844	<0.0002	<0.005	1.16	<0.002	<0.002
MW-3	09/16/2020	NA	<0.002	0.0541	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.0136	NA	<0.005	1.13	<0.002	NA
MW-3	03/23/2021	<0.004	<0.002	0.057	<0.002	<0.001	0.00261	<0.002	<0.15	<0.002	0.0126	<0.0002	<0.005	0.454	<0.002	<0.002
MW-13S	01/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.278	<0.005	0.0123	<0.0002	<0.01	0.421	<0.01	<0.001
MW-13S	03/16/2016	<0.01	<0.025	0.0519	<0.01	<0.005	<0.015	<0.025	0.761	<0.025	0.0138	<0.0002	<0.05	0.853	<0.05	<0.005
MW-13S	04/20/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-13S	06/07/2017	<0.002	<0.001	0.0325	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-13S	07/12/2017	<0.002	<0.001	0.0447	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-13S	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-13S	09/17/2018	NA	<0.001	0.0579	NA	NA	0.00216	NA	<1	NA	0.0121	NA	NA	<5	NA	NA
MW-13S	03/12/2019	<0.002	<0.001	0.0349	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0138	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-13S	04/07/2020	<0.004	<0.002	0.0331	<0.002	<0.001	<0.002	<0.002	0.209	<0.005	0.00424	<0.0002	<0.005	0.273	<0.002	<0.002
MW-13S	03/23/2021	<0.004	<0.002	0.0397	<0.002	<0.001	<0.002	<0.002	0.161	<0.002	0.00631	NA	<0.005	1	<0.002	NA
MW-18	01/26/2016	<0.02	<0.005	<0.2	<0.02	<0.01	0.00782	0.0005	0.259	<0.005	0.101	<0.0002	<0.01	<0.747	<0.01	<0.001
MW-18	03/17/2016	<0.01	<0.025	0.02	<0.01	<0.005	<0.015	0.000605	0.269	<0.025	0.112	<0.0002	<0.05	1.1	<0.05	<0.005
MW-18	04/20/2017	<0.002	<0.001	0.016	<0.001	<0.001	<0.002	0.00101	<1	0.00147	0.0898	<0.0002	<0.005	<5	<0.005	<0.001
MW-18	06/07/2017	<0.002	<0.001	0.019	<0.001	<0.001	0.00263	0.00333	<1	0.00224	0.0877	<0.0002	<0.005	<5	<0.005	<0.001
MW-18	07/12/2017	0.00309	<0.001	0.0124	<0.001	<0.001	<0.002	0.00103	<1	<0.001	0.0886	<0.0002	<0.005	<5	<0.005	<0.001
MW-18	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.0747	<0.0002	<0.01	<5	<0.01	<0.002
MW-18	09/27/2018	NA	<0.001	0.0213	NA	NA	0.00203	NA	<1	NA	0.099	NA	NA	<5	NA	NA
MW-18	03/12/2019	<0.002	<0.001	<0.01	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0816	<0.0002	<0.005	<5	<0.005	<0.001
MW-18	04/07/2020	<0.004	<0.002	<0.02	<0.002	<0.001	<0.002	<0.002	0.238	<0.005	0.066	<0.0002	<0.005	0.309	<0.002	<0.002
MW-18	03/23/2021	<0.004	<0.002	<0.02	<0.002	<0.001	<0.002	<0.002	0.179	<0.002	0.0754	NA	<0.005	0.553	<0.002	NA
MW-21	01/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.57	<0.005	0.0773	<0.0002	<0.01	1.39	<0.01	<0.001
MW-21	03/14/2016	<0.002	0.00362	0.0717	<0.002	<0.001	0.00113	<0.005	0.454	<0.005	0.0626	<0.0002	<0.01	1.18	<0.01	0.00132
MW-21	06/13/2016	<0.002	<0.001	0.0663	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0639	<0.0002	<0.005	1.49	<0.005	<0.001
MW-21	09/29/2016	<0.002	<0.001	0.0694	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0669	<0.0002	<0.005	1.43	<0.005	<0.001
MW-21	12/20/2016	<0.002	<0.001	0.0612	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0684	<0.0002	<0.005	<5	<0.005	<0.001
MW-21	04/19/2017	<0.002	<0.001	0.0631	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0722	<0.0002	<0.005	<5	<0.005	<0.001
MW-21	06/07/2017	<0.002	<0.001	0.0909	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0895	<0.0002	<0.005	<5	<0.005	<0.001
MW-21	07/12/2017	0.00238	<0.001	0.0733	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0783	<0.0002	<0.005	<5	<0.005	<0.001
MW-21	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	NA	<0.005	0.0773	<0.0002	<0.01	<5	<0.01	<0.002
MW-21	09/27/2018	NA	<0.001	0.0768	NA	NA	<0.002	NA	NA	NA	0.07	NA	NA	<5	NA	NA
MW-21	03/12/2019	<0.002	<0.001	0.0777	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0752	<0.0002	<0.005	<5	<0.005	<0.001
MW-21	09/11/2019	NA	<0.001	0.0833	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0735	NA	<0.005	<5	<0.005	NA

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-21	04/07/2020	<0.004	<0.002	0.0944	<0.002	<0.001	<0.002	<0.002	0.635	<0.005	0.0707	<0.0002	<0.005	0.596	<0.002	<0.002
MW-21	09/16/2020	NA	<0.002	0.092	<0.02	<0.001	<0.002	<0.002	0.491	<0.005	0.103	NA	<0.005	1.49	<0.002	NA
MW-21	03/23/2021	<0.004	<0.002	0.0929	<0.002	<0.001	<0.002	<0.002	0.516	<0.002	0.0837	NA	<0.005	0.83	<0.002	NA
Compliance																
MW-9D	01/26/2016	<0.02	<0.005	0.622	<0.02	<0.01	<0.003	0.0005	0.212	<0.005	0.0414	<0.0002	<0.01	2.98	<0.01	<0.001
MW-9D	03/16/2016	<0.002	0.0635	0.581	<0.002	0.0004	0.0114	0.0024	0.244	0.000638	0.0427	<0.0002	<0.01	3.35	0.00262	<0.001
MW-9D	06/13/2016	<0.002	0.00434	0.551	<0.001	<0.001	<0.002	0.00209	<1	0.0012	<0.05	<0.0002	<0.005	2.47	<0.005	<0.001
MW-9D	09/29/2016	<0.002	0.00485	0.6	<0.001	<0.001	<0.002	0.002	<1	<0.001	<0.05	<0.0002	<0.005	2.64	<0.005	<0.001
MW-9D	12/20/2016	<0.002	0.00506	0.642	<0.001	<0.001	0.00936	0.00827	<1	0.00498	0.0585	<0.0002	<0.005	5.02	<0.005	<0.001
MW-9D	04/19/2017	<0.002	0.00447	0.503	<0.001	<0.001	0.00278	0.00256	<1	0.00187	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-9D	06/07/2017	<0.002	0.00164	0.773	<0.001	<0.001	0.0021	0.00365	<1	0.00155	0.075	<0.0002	<0.005	<5	<0.005	<0.001
MW-9D	07/12/2017	<0.002	0.00139	0.613	<0.001	<0.001	<0.002	0.00176	<1	<0.001	0.0567	<0.0002	<0.005	<5	<0.005	<0.001
MW-9D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-9D	05/08/2018	<0.003	<0.005	0.677	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.0526	<0.0002	<0.01	<5	<0.01	<0.002
MW-9D	09/18/2018	NA	0.00319	0.757	NA	NA	0.00953	NA	<1	NA	0.0995	NA	NA	<5	NA	NA
MW-9D	03/13/2019	<0.002	0.00408	0.501	<0.001	<0.001	<0.002	0.000887	<1	<0.001	0.0396	<0.0002	<0.005	<5	<0.005	<0.001
MW-9D	09/11/2019	NA	0.00265	0.608	<0.001	<0.001	<0.002	0.00193	<1	<0.001	0.0523	NA	<0.005	<5	<0.005	NA
MW-9D	04/07/2020	<0.004	0.00423	0.627	<0.002	<0.001	<0.002	<0.002	0.308	<0.005	0.0364	<0.0002	<0.005	2.9	<0.002	<0.002
MW-9D	09/16/2020	NA	0.00221	0.7	<0.01	<0.001	0.00204	0.0025	0.29	<0.005	0.0667	NA	<0.005	1.87	<0.002	NA
MW-9D	03/22/2021	<0.004	0.00218	0.693	<0.002	<0.001	0.00221	0.00234	0.266	<0.002	0.0639	NA	<0.005	2.6	<0.002	NA
MW-11D	01/27/2016	<0.02	<0.005	0.202	0.01	0.004	0.00351	0.0005	0.264	<0.005	0.00852	<0.0002	<0.01	0.519	<0.01	<0.001
MW-11D	03/16/2016	<0.002	0.0577	0.174	<0.002	0.0004	0.0106	0.000505	0.285	<0.005	0.00711	<0.0002	<0.01	0.403	0.00174	<0.001
MW-11D	06/13/2016	<0.002	0.0019	0.16	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.823	<0.005	<0.001
MW-11D	09/29/2016	<0.002	0.00155	0.181	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.265	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-11D	12/20/2016	<0.002	<0.001	0.171	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-11D	04/18/2017	<0.002	0.00201	0.149	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-11D	06/07/2017	<0.002	0.00186	0.164	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-11D	07/12/2017	<0.002	0.00227	0.154	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-11D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-11D	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-11D	09/18/2018	NA	0.00221	0.188	NA	NA	<0.002	NA	<1	NA	0.00938	NA	NA	<5	NA	NA
MW-11D	03/13/2019	<0.002	0.00191	0.161	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0103	<0.0002	<0.005	<5	<0.005	<0.001
MW-11D	09/11/2019	NA	0.00255	0.174	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0107	NA	<0.005	<5	<0.005	NA
MW-11D	04/07/2020	<0.004	0.00223	0.175	<0.002	<0.001	<0.002	<0.002	0.286	<0.005	0.00696	<0.0002	<0.005	1.12	<0.002	<0.002
MW-11D	09/16/2020	NA	0.00226	0.176	<0.002	<0.001	<0.002	<0.002	0.223	<0.005	0.00931	NA	<0.005	1.19	<0.002	NA
MW-11D	03/22/2021	<0.004	0.00216	0.177	<0.002	<0.001	<0.002	<0.002	0.224	<0.002	0.0074	NA	<0.005	0.33	<0.002	NA
MW-16D	01/28/2016	<0.02	0.0052	<0.2	<0.02	<0.01	<0.003	0.0005	0.546	<0.005	0.0394	<0.0002	<0.01	<0.368	<0.01	<0.001
MW-16D	03/15/2016	<0.002	0.00787	0.126	<0.002	<0.001	<0.003	<0.005	0.456	<0.005	0.0439	<0.0002	0.00146	0.35	<0.01	0.000731
MW-16D	06/14/2016	<0.002	0.00579	0.109	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.254	<0.005	<0.001
MW-16D	09/29/2016	<0.002	0.00539	0.108	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.563	<0.005	<0.001
MW-16D	12/20/2016	<0.002	0.00513	0.104	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-16D	04/18/2017	<0.002	0.00837	0.105	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-16D	06/07/2017	<0.002	0.00859	0.121	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-16D	07/12/2017	<0.002	0.00529	0.106	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.25	<0.0002	<0.005	<5	<0.005	<0.001
MW-16D	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-16D	05/07/2018	<0.003	0.0105	<0.2	<0.004	<0.005	0.00519	<0.005	<1	<0.005	0.0416	<0.0002	<0.01	<5	<0.01	<0.002
MW-16D	09/18/2018	NA	0.00724	0.13	NA	NA	<0.002	NA	<1	NA	0.0435	NA	NA	<5	NA	NA
MW-16D	03/12/2019	<0.002	0.00904	0.106	<0.001	0.00265	<0.002	<0.0005	<1	<0.001	0.0471	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-16D	09/11/2019	NA	0.00654	0.112	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0448	NA	<0.005	<5	<0.005	NA
MW-16D	04/07/2020	<0.004	0.00891	0.119	<0.002	<0.001	<0.002	<0.002	0.502	<0.005	0.0363	<0.0002	<0.005	0.413	<0.002	<0.002
MW-16D	09/17/2020	NA	0.00611	0.116	<0.01	<0.001	<0.002	<0.002	0.447	<0.005	0.0478	NA	<0.005	0.693	<0.002	NA
MW-16D	03/23/2021	<0.004	0.0116	0.121	<0.002	<0.001	<0.002	<0.002	0.462	<0.002	0.0414	NA	<0.005	1.34	<0.002	NA
MW-20D	01/28/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.273	<0.005	0.017	<0.0002	<0.01	0.395	<0.01	<0.001
MW-20D	03/15/2016	0.000643	0.00432	0.152	<0.002	<0.001	0.000585	<0.005	0.224	<0.005	0.0169	<0.0002	0.00662	0.819	<0.01	0.00133
MW-20D	06/14/2016	<0.002	0.00103	0.116	<0.001	<0.001	<0.002	<0.0005	<1	0.001	<0.05	<0.0002	<0.005	0.462	<0.005	<0.001
MW-20D	09/29/2016	<0.002	<0.001	0.142	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00573	0.714	<0.005	<0.001
MW-20D	12/20/2016	<0.002	0.00116	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0052	<5	<0.005	<0.001
MW-20D	04/18/2017	<0.002	0.00111	0.114	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-20D	06/07/2017	<0.002	0.00113	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00515	<5	<0.005	<0.001
MW-20D	07/13/2017	<0.002	0.00123	0.128	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-20D	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-20D	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-20D	09/17/2018	NA	0.00124	0.149	NA	NA	<0.002	NA	<1	NA	0.0147	NA	NA	<5	NA	NA
MW-20D	03/12/2019	<0.002	0.00125	0.14	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0163	<0.0002	0.00525	<5	<0.005	<0.001
MW-20D	09/12/2019	NA	0.00187	0.162	<0.001	<0.001	0.0026	0.000771	<1	<0.001	0.0201	NA	0.00565	<5	<0.005	NA
MW-20D	04/07/2020	<0.004	<0.002	0.147	<0.002	<0.001	<0.002	<0.002	0.272	<0.005	0.0129	<0.0002	0.00587	0.349	<0.002	<0.002
MW-20D	09/16/2020	NA	<0.002	0.137	<0.002	<0.001	<0.002	<0.002	0.222	<0.005	0.0153	NA	0.00551	0.914	<0.002	NA
MW-20D	03/22/2021	<0.004	<0.002	0.139	<0.002	<0.001	0.00256	<0.002	0.235	<0.002	0.0115	NA	0.00543	1.36	<0.002	NA
MW-22	01/26/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.06	<0.005	0.0275	<0.0002	<0.01	0.92	<0.01	<0.001
MW-22	03/16/2016	<0.002	0.0737	0.0535	<0.002	0.0004	0.0113	0.000745	0.333	<0.005	0.0207	<0.0002	0.00075	0.485	0.00231	<0.001
MW-22	06/13/2016	<0.002	0.00204	0.0491	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.849	<0.005	<0.001
MW-22	09/29/2016	<0.002	0.00348	0.0563	<0.001	<0.001	<0.002	<0.0005	<1	0.00349	<0.05	<0.0002	<0.005	0.92	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-22	12/20/2016	<0.002	0.00325	0.0549	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-22	04/19/2017	<0.002	0.00305	0.0489	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-22	06/07/2017	<0.002	0.00266	0.0478	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-22	07/25/2017	<0.002	0.00283	0.0567	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-22	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-22	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-22	09/18/2018	NA	0.00379	0.0544	NA	NA	<0.002	NA	<1	NA	0.0243	NA	NA	<5	NA	NA
MW-22	03/13/2019	<0.002	0.00182	0.0484	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0239	<0.0002	<0.005	<5	<0.005	<0.001
MW-22	09/11/2019	NA	0.00294	0.0526	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0246	NA	<0.005	<5	<0.005	NA
MW-22	04/08/2020	<0.004	0.00262	0.0491	<0.002	<0.001	<0.002	<0.002	0.289	<0.005	0.0202	<0.0002	<0.005	0.292	<0.002	<0.002
MW-22	09/16/2020	NA	0.00523	0.0513	<0.002	<0.001	<0.002	<0.002	0.255	<0.005	0.0207	NA	<0.005	0.429	<0.002	NA
MW-22	03/22/2021	<0.004	<0.002	0.0531	<0.002	<0.001	<0.002	<0.002	0.269	<0.002	0.0227	NA	<0.005	0.831	<0.002	NA
MW-24	01/27/2016	<0.02	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	0.418	<0.005	0.0166	<0.0002	<0.01	<0.326	<0.01	<0.001
MW-24	03/15/2016	<0.002	0.00261	0.0444	<0.002	<0.001	<0.003	<0.005	0.348	<0.005	0.0155	<0.0002	<0.01	<0.341	<0.01	<0.001
MW-24	06/14/2016	<0.002	<0.001	0.0359	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.348	<0.005	<0.001
MW-24	09/29/2016	<0.002	<0.001	0.0407	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.905	<0.005	<0.001
MW-24	12/20/2016	<0.002	<0.001	0.0392	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-24	04/18/2017	<0.002	<0.001	0.0344	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-24	06/07/2017	<0.002	<0.001	0.0411	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-24	07/12/2017	<0.002	<0.001	0.0374	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-24	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-24	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-24	09/27/2018	NA	<0.001	0.0467	NA	NA	<0.002	NA	<1	NA	0.0177	NA	NA	<5	NA	NA
MW-24	03/12/2019	<0.002	<0.001	0.0394	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0186	<0.0002	<0.005	<5	<0.005	<0.001

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-24	09/11/2019	NA	<0.001	0.0452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0194	NA	<0.005	<5	<0.005	NA
MW-24	04/08/2020	<0.004	<0.002	0.0449	<0.002	<0.001	<0.002	<0.002	0.35	<0.005	0.0151	<0.0002	<0.005	0.788	<0.002	<0.002
MW-24	09/16/2020	NA	<0.002	0.0438	<0.002	<0.001	<0.002	<0.002	0.284	<0.005	0.0145	NA	<0.005	0.178	<0.002	NA
MW-24	03/22/2021	<0.004	<0.002	0.0472	<0.002	<0.001	<0.002	<0.002	0.272	<0.002	0.0161	NA	<0.005	0.486	<0.002	NA
MW-D	01/28/2016	<0.1	<0.005	<0.2	<0.02	<0.01	<0.003	0.0005	2.11	<0.005	0.12	<0.0002	<0.01	<0.621	<0.01	<0.001
MW-D	03/15/2016	<0.002	0.00224	0.0247	<0.002	<0.001	0.000694	<0.005	1.86	<0.005	0.12	<0.0002	0.000631	0.296	<0.01	<0.001
MW-D	06/14/2016	<0.002	<0.001	0.0225	<0.001	<0.001	<0.002	<0.0005	1.82	<0.001	0.116	<0.0002	<0.005	0.0247	<0.005	<0.001
MW-D	09/30/2016	<0.002	<0.001	0.0235	<0.001	<0.001	<0.002	<0.0005	1.99	<0.001	0.118	<0.0002	<0.005	0.682	<0.005	<0.001
MW-D	12/21/2016	<0.002	<0.001	0.0273	<0.001	<0.001	0.00292	0.000997	1.91	<0.001	0.125	<0.0002	<0.005	<5	<0.005	<0.001
MW-D	04/18/2017	<0.002	<0.001	0.0257	<0.001	<0.001	<0.002	<0.0005	2.11	<0.001	0.119	<0.0002	<0.005	<5	<0.005	<0.001
MW-D	06/07/2017	<0.002	<0.001	0.0273	<0.001	<0.001	<0.002	<0.0005	2.19	<0.001	0.113	<0.0002	<0.005	<5	<0.005	<0.001
MW-D	07/12/2017	<0.002	<0.001	0.0239	<0.001	<0.001	<0.002	<0.0005	2.1	<0.001	0.123	<0.0002	<0.005	<5	<0.005	<0.001
MW-D	11/14/2017	NA	NA	NA	NA	NA	NA	NA	2.63	NA	NA	NA	NA	NA	NA	NA
MW-D	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	2.01	<0.005	0.125	<0.0002	<0.01	<5	<0.01	<0.002
MW-D	09/18/2018	NA	<0.001	0.0282	NA	NA	<0.002	NA	1.9	NA	0.125	NA	NA	<5	NA	NA
MW-D	03/13/2019	<0.002	<0.001	0.0281	<0.001	<0.001	<0.002	<0.0005	2.2	<0.001	0.125	<0.0002	<0.005	<5	<0.005	<0.001
MW-D	09/11/2019	NA	<0.001	0.027	<0.001	<0.001	0.00646	<0.0005	1.95	<0.001	0.119	NA	<0.005	<5	<0.005	NA
MW-D	04/08/2020	<0.004	<0.002	0.0299	<0.002	<0.001	<0.002	<0.002	2.04	<0.005	0.107	<0.0002	<0.005	0.611	<0.002	<0.002
MW-D	09/16/2020	NA	<0.002	0.0268	<0.002	<0.001	<0.002	<0.002	1.67	<0.005	0.104	NA	<0.005	0.112	<0.002	NA
MW-D	03/22/2021	<0.004	<0.002	0.0295	<0.002	<0.001	<0.002	<0.002	1.81	<0.002	0.114	NA	<0.005	0.191	<0.002	NA
MW-E	01/27/2016	<0.1	0.00507	0.462	<0.02	<0.01	0.0229	0.0141	1.25	0.00625	0.163	<0.0002	<0.01	2.49	<0.01	<0.05
MW-E	03/17/2016	<0.01	<0.025	0.441	<0.01	<0.005	0.00386	0.00331	0.28	0.00147	0.132	<0.0002	0.00367	1.79	<0.05	<0.005
MW-E	06/14/2016	<0.002	0.00224	0.251	<0.001	<0.001	0.00728	0.00447	<1	0.00255	0.0651	<0.0002	0.0117	0.637	<0.005	<0.001
MW-E	09/30/2016	<0.002	0.00162	0.353	<0.001	<0.001	0.00314	0.00451	1.03	0.00263	0.0623	<0.0002	0.00515	1.39	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-E	12/21/2016	<0.002	0.00412	0.421	<0.001	<0.001	0.0144	0.00958	<1	0.00457	0.101	<0.0002	0.0101	<5	<0.005	<0.001
MW-E	04/18/2017	<0.002	<0.001	0.214	<0.001	<0.001	<0.002	0.00123	<1	<0.001	<0.05	<0.0002	0.0103	<5	<0.005	<0.001
MW-E	06/07/2017	<0.002	<0.001	0.271	<0.001	<0.001	0.00293	0.00272	<1	0.00115	<0.05	<0.0002	0.00652	<5	<0.005	<0.001
MW-E	07/25/2017	<0.002	<0.001	0.193	<0.001	<0.001	<0.002	0.000653	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-E	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-E	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-E	09/18/2018	NA	<0.001	0.166	NA	NA	<0.002	NA	<1	NA	0.0324	NA	NA	<5	NA	NA
MW-E	03/13/2019	<0.002	<0.001	0.186	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0344	<0.0002	<0.005	<5	<0.005	<0.001
MW-E	09/11/2019	NA	0.00106	0.246	<0.001	<0.001	0.00351	0.00232	<1	0.00131	0.0416	NA	<0.005	<5	<0.005	NA
MW-E	04/08/2020	<0.004	<0.002	0.175	<0.002	<0.001	<0.002	<0.002	0.782	<0.005	0.0292	<0.0002	<0.005	0.861	<0.002	<0.002
MW-E	09/16/2020	NA	<0.002	0.218	<0.002	<0.001	<0.002	<0.002	0.652	<0.005	0.0317	NA	<0.005	1.55	<0.002	NA
MW-E	03/22/2021	<0.004	<0.002	0.218	<0.002	<0.001	<0.002	<0.002	0.699	<0.002	0.0312	NA	<0.005	0.993	<0.002	NA
MW-F	01/28/2016	<0.1	0.0106	0.264	<0.02	<0.01	0.0337	0.0222	1.02	0.0233	0.26	<0.0002	<0.01	<1.37	<0.01	<0.05
MW-F	03/18/2016	<0.01	<0.025	0.146	<0.01	<0.005	0.00665	0.00423	0.674	0.00393	0.328	<0.0002	<0.05	1.06	<0.05	<0.005
MW-F	06/14/2016	<0.002	0.00602	0.0938	<0.001	<0.001	0.0187	0.00944	<1	0.0103	0.249	<0.0002	<0.005	2.72	<0.005	<0.001
MW-F	09/30/2016	<0.002	0.00118	0.071	<0.001	<0.001	0.00307	0.00243	1.05	0.00253	0.261	<0.0002	<0.005	6.36	<0.005	<0.001
MW-F	12/21/2016	<0.002	0.00801	0.0901	0.00113	<0.001	0.0301	0.0142	<1	0.0124	0.289	<0.0002	<0.005	<5	<0.005	<0.001
MW-F	04/18/2017	<0.002	<0.001	0.039	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.232	<0.0002	<0.005	<5	<0.005	<0.001
MW-F	06/07/2017	<0.002	<0.001	0.0426	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.224	<0.0002	<0.005	<5	<0.005	<0.001
MW-F	07/25/2017	<0.002	<0.001	0.0404	<0.001	<0.001	<0.002	0.000653	<1	<0.001	0.235	<0.0002	<0.005	<5	<0.005	<0.001
MW-F	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-F	05/08/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	0.265	<0.0002	<0.01	<5	<0.01	<0.002
MW-F	09/18/2018	NA	<0.001	0.039	NA	NA	<0.002	NA	<1	NA	0.249	NA	NA	<5	NA	NA
MW-F	03/13/2019	<0.002	<0.001	0.0326	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.231	<0.0002	<0.005	<5	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-F	09/11/2019	NA	0.00103	0.0423	<0.001	<0.001	<0.002	<0.0005	<2.5	<0.001	0.232	NA	<0.005	<5	<0.005	NA
MW-F	04/08/2020	<0.004	<0.002	0.0284	<0.002	<0.001	<0.002	<0.002	0.607	<0.005	0.0613	<0.0002	<0.005	2.24	<0.002	<0.002
MW-F	07/01/2020	<0.004	<0.002	0.0396	<0.002	<0.001	<0.002	<0.002	0.491	<0.005	0.115	<0.0002	<0.005	NA	<0.002	<0.002
MW-F	09/16/2020	NA	<0.002	0.0409	<0.002	<0.001	<0.002	<0.002	0.539	<0.005	0.117	NA	<0.005	2.15	<0.002	NA
MW-F	03/23/2021	<0.004	<0.002	0.0335	<0.002	<0.001	<0.002	<0.002	0.589	<0.002	0.137	NA	<0.005	1.01	<0.002	NA
MW-G	01/27/2016	<0.02	0.00747	0.496	<0.02	<0.01	<0.003	0.0005	0.597	<0.005	0.0341	<0.0002	<0.01	1.31	<0.01	<0.001
MW-G	03/15/2016	<0.002	0.00788	0.466	<0.002	<0.001	<0.003	<0.005	0.359	<0.005	0.0362	<0.0002	0.00252	1.07	<0.01	0.000537
MW-G	06/14/2016	<0.002	0.00352	0.406	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.42	<0.005	<0.001
MW-G	09/30/2016	<0.002	0.00295	0.425	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.05	<0.005	<0.001
MW-G	12/14/2016	<0.002	0.00315	0.438	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-G	04/18/2017	<0.002	0.00293	0.387	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-G	06/07/2017	<0.002	0.00257	0.432	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-G	07/13/2017	<0.002	0.00276	0.392	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-G	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-G	05/07/2018	<0.003	<0.005	0.417	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-G	09/17/2018	NA	0.00202	0.441	NA	NA	<0.002	NA	<1	NA	0.0425	NA	NA	<5	NA	NA
MW-G	03/12/2019	<0.002	0.00171	0.53	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0391	<0.0002	<0.005	<5	<0.005	<0.001
MW-G	09/11/2019	NA	0.00196	0.452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0416	NA	<0.005	<5	<0.005	NA
MW-G	04/08/2020	<0.004	<0.002	0.445	<0.002	<0.001	<0.002	<0.002	0.502	<0.005	0.0324	<0.0002	<0.005	1.89	<0.002	<0.002
MW-G	09/17/2020	NA	<0.002	0.425	<0.002	<0.001	<0.002	<0.002	0.372	<0.005	0.0342	NA	<0.005	1.87	<0.002	NA
MW-G	03/23/2021	<0.004	<0.002	0.45	<0.002	<0.001	<0.002	<0.002	0.383	<0.002	0.0362	NA	<0.005	1.11	<0.002	NA
MW-H	01/27/2016	<0.02	<0.005	0.0005	<0.02	<0.01	<0.003	<0.05	0.679	<0.005	0.03	<0.0002	<0.01	0.454	<0.01	<0.001
MW-H	03/15/2016	<0.002	0.00548	0.127	<0.002	<0.001	0.000966	<0.005	0.384	<0.005	0.0303	<0.0002	<0.01	0.622	<0.01	<0.001
MW-H	06/14/2016	<0.002	0.00129	0.126	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.599	<0.005	<0.001

Analytical Results - Appendix IV

Zimmer Landfill

Location	Sample Date	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, total (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-H	09/30/2016	<0.002	0.00132	0.103	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.601	<0.005	<0.001
MW-H	12/20/2016	<0.002	0.00131	0.0974	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-H	04/18/2017	<0.002	0.00126	0.0837	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-H	06/07/2017	<0.002	<0.001	0.11	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-H	07/25/2017	<0.002	0.00101	0.121	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	<5	<0.005	<0.001
MW-H	11/15/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-H	05/07/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	<5	<0.01	<0.002
MW-H	09/18/2018	NA	<0.001	0.135	NA	NA	<0.002	NA	<1	NA	0.0376	NA	NA	<5	NA	NA
MW-H	03/12/2019	<0.002	0.00107	0.111	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0376	<0.0002	<0.005	<5	<0.005	<0.001
MW-H	09/12/2019	NA	0.00105	0.124	<0.001	<0.001	0.00216	<0.0005	<1	<0.001	0.04	NA	<0.005	<5	<0.005	NA
MW-H	04/08/2020	<0.004	<0.002	0.119	<0.002	<0.001	<0.002	<0.002	0.443	<0.005	0.0337	<0.0002	<0.005	0.673	<0.002	<0.002
MW-H	09/17/2020	NA	<0.002	0.116	<0.002	<0.001	<0.002	<0.002	0.394	<0.005	0.0321	NA	<0.005	0.12	<0.002	NA
MW-H	03/23/2021	<0.004	<0.002	0.125	<0.002	<0.001	<0.002	<0.002	0.405	<0.002	0.0352	NA	<0.005	0.46	<0.002	NA

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter

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 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 Zimmer, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll, to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Zimmer Landfill located near the Zimmer Power Station and Moscow, OH.

The first Assessment Monitoring sampling event was completed on May 7, 2018, and May 8, 2018. As stipulated in 40 C.F.R. § 257.95(d)(1), all wells were resampled on September 17, 2018, and September 18, 2018, for all Appendix III parameters and Appendix IV parameters detected during the first Assessment Monitoring sampling event. Due to shipping delays, samples from monitoring wells MW-18, MW-21, and MW-24 arrived at the analytical laboratory above the temperature allowable by the analysis method. These three wells were resampled on September 27, 2018 and submitted for analysis. Analytical data from all sampling events from December 2015 through the resampling event on September 27, 2018, were evaluated in accordance with the statistical analysis plan[1] to determine any statistically significant levels (SSLs) of Appendix IV parameters over the Groundwater Protection Standards (GWPSs) established in accordance with 40 C.F.R. § 257.95(h). That evaluation identified SSLs at downgradient monitoring wells as follows:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the SSL listed above. This alternate source demonstration (ASD) was completed within 90 days of determination of the SSLs (January 9, 2019), as required by 40 C.F.R. § 257.95(g)(3)(ii).

ISOTOPIC EVALUATION

Isotopes are commonly used in age dating, provenance studies, and to differentiate between sources of groundwater. Multiple studies have shown that boron and strontium isotope ratios can be successfully used in identifying CCR impacts to groundwater[2-3]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as boron and strontium isotopes, make good groundwater tracers. This ASD compares boron and strontium isotope ratios to published ranges for CCR impacted groundwater and CCR leachate.

Boron

Boron isotopes do not fractionate during combustion, meaning the isotopic ratio in the coal and in the subsequent CCR are similar, regardless of the total boron in the coal and the combusted coal[2]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[2].

Because variations in boron isotope ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\delta^{11}\mathrm{B} = \left[\frac{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{sample}} - (^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}\right] \times 1000$$

Strontium

One of the four stable isotopes (^{87}Sr) is subject to long-term radiogenic ingrowth by radioactive decay of rubidium (^{87}Rb). The isotopic ratio, ^{87}Sr/^{86}Sr, is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[6].

ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

Lines of evidence supporting this ASD include the following:

1. Boron isotope ratios in downgradient groundwater are not consistent with boron isotope ratios in CCR and CCR-impacted waters.
2. Strontium isotope ratios in groundwater are lower than the typical range for CCRs.

These lines of evidence are described and supported in greater detail below.

LOE #1: BORON ISOTOPE RATIOS DOWNGRADIENT ARE WITHIN THE TYPICAL RANGE FOR GROUNDWATER.

Strontium isotope ratios (^{87}Sr/^{86}Sr) for groundwater and leachate are plotted against boron isotope ratios (δ^{11}B) in Figure 2. The δ^{11}B range for typical groundwater, shaded green, is 10‰ to 40‰ [7]. The area shaded orange represents δ^{11}B range for CCR-impacted water, which has a distinctive negative δ^{11}B signature ranging from -70 ‰ to -1‰[2, 8].

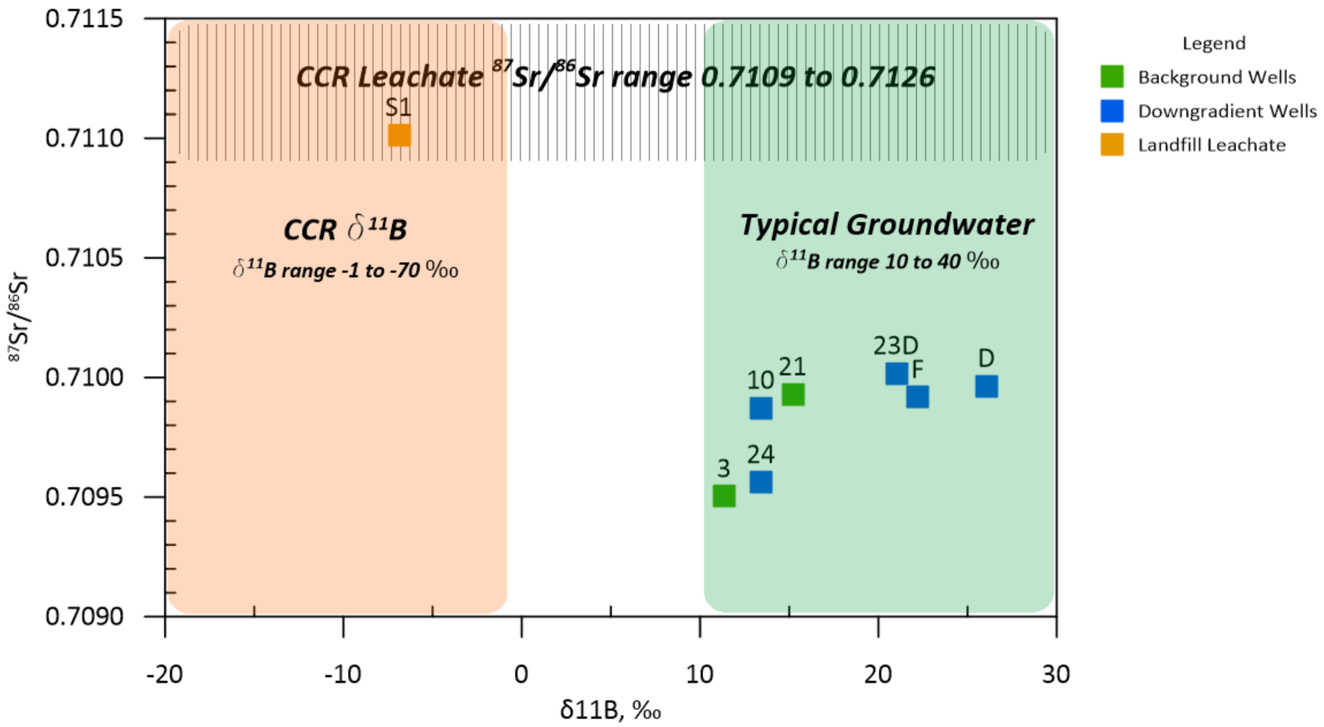

Figure 2. Strontium isotope ratio vs boron isotope ratio[2]

All groundwater results are within the typical $\delta^{11}B$ range for groundwater[2]. The leachate results, S1, are within the typical negative $\delta^{11}B$ range for CCR leachates[2]. Figure 2 shows that $\delta^{11}B$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

LOE #2: STRONTIUM ISOTOPE RATIOS DOWNGRADIENT ARE LOWER THAN THE TYPICAL RANGE FOR CCR IMPACTED WATERS.

Strontium isotope ratios in coal, fly ash, and bottom ash range from 0.7109 to 0.7126, indicated by the vertical hatching in Figure 2.

The groundwater results are within the typical groundwater range[2]. The leachate sample is within the typical $^{87}Sr/^{86}Sr$ range for CCR leachates[2]. Figure 2 shows that $^{87}Sr/^{86}Sr$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

Based on these two lines of evidence, it has been demonstrated that the Zimmer Landfill has not caused the Lithium SSL in MW-F.

This information serves as the written ASD, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the lithium SSL observed during the assessment monitoring program was not due to Zimmer Landfill, but naturally-occurring conditions. Therefore, a corrective measures assessment is not required, and the Zimmer Landfill will remain in assessment monitoring.

REFERENCES

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8. Williams, L. B.; Hervig, R. L., Boron isotope composition of coals: a potential tracer of organic contaminated fluids. *Applied Geochemistry* **2004,** *19* (10), 1625-1636.

I, Nicole M. Pagano, 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.

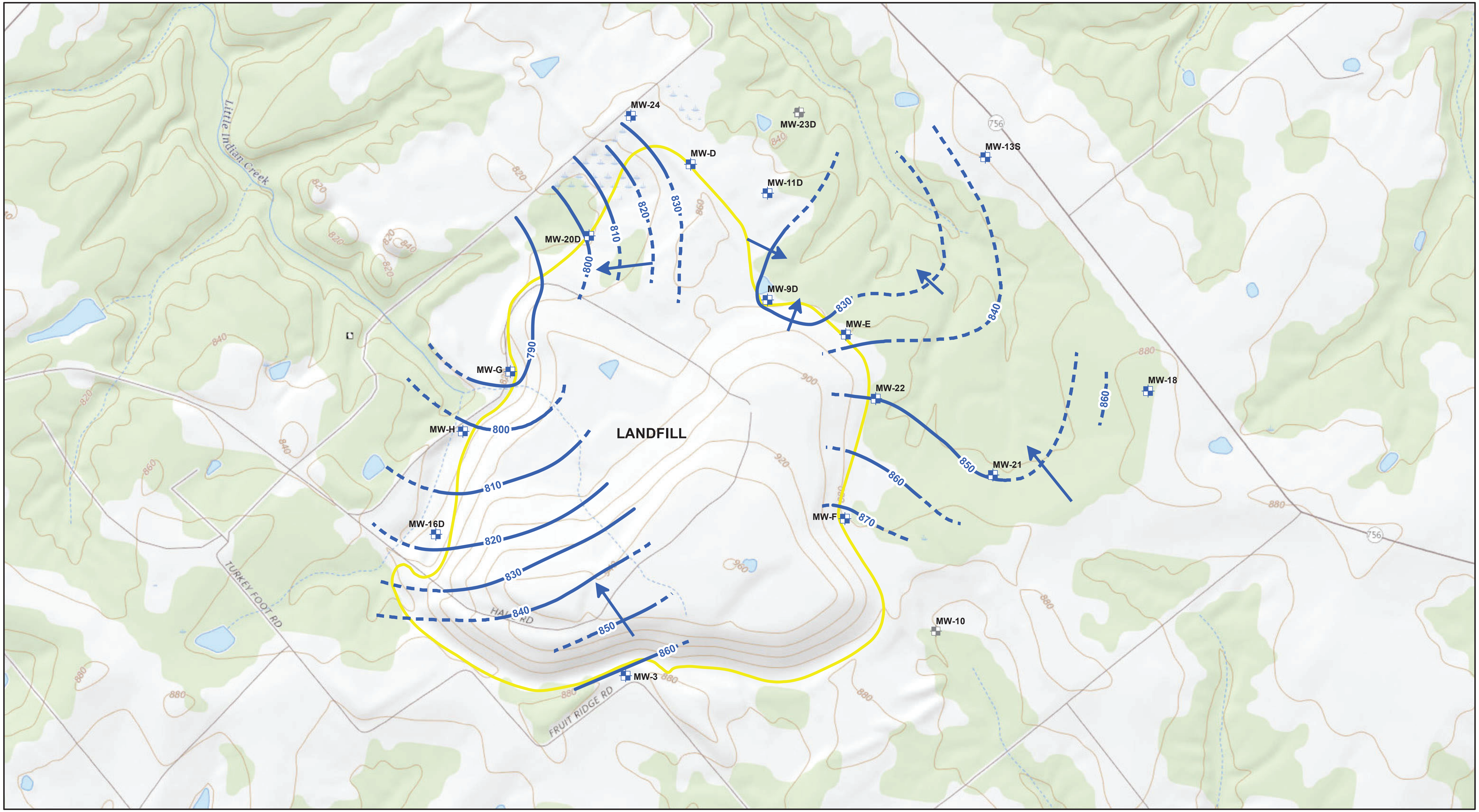
Nicole M. Pagano
Senior Managing Engineer
OBG, part of Ramboll
Date: April 8, 2019

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

RICHARD
H. WEBER
71678

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

FIGURE NO. 1



LEGEND

▣ NON-CCR MONITORING WELL LOCATION

▣ CCR MONITORING WELL LOCATION

☐ CCR MONITORED UNIT

VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

0 175 350 700 1,050 1,400
Feet

N

ZIMMER LANDFILL (UNIT ID: 122)
MONITORING WELL MAP WITH GROUNDWATER DIVIDE
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14, 2017

O'BRIEN & GERE ENGINEERS, INC.

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 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 Zimmer, LLC, by O'Brien & Gere Engineers, Inc., part of Ramboll, to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Zimmer Landfill located near the Zimmer Power Station and Moscow, OH.

The second Assessment Monitoring sampling event (A2) was completed on March 13, 2019 and analytical data were received on April 29, 2019. Analytical data from all sampling events, from December 2015 through A2, were evaluated in accordance with the Statistical Analysis Plan[1] to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over Groundwater Protection Standards (GWPSs). That evaluation identified SSLs at downgradient monitoring wells as follows:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the SSL 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).

ISOTOPIC EVALUATION

Isotopes are commonly used in age dating, provenance studies, and to differentiate between sources of groundwater. Multiple studies have shown that boron and strontium isotope ratios can be successfully used in identifying CCR impacts to groundwater[2-3]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as boron and strontium isotopes, make good groundwater tracers. This ASD compares boron and strontium isotope ratios to published ranges for CCR impacted groundwater and CCR leachate.

Boron

Boron isotopes do not fractionate during coal combustion, meaning the isotopic ratio in the coal is preserved, regardless of the total boron in the coal and the combusted coal[2]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[2].

Because variations in boron isotope ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\delta^{11}\mathrm{B} = \left[\frac{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{sample}} - (^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}\right] \times 1000$$

Strontium

One of the four stable isotopes (^{87}Sr) is subject to long-term radiogenic ingrowth by radioactive decay of rubidium (^{87}Rb). The isotopic ratio, ^{87}Sr/^{86}Sr, is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[4].

ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

Lines of evidence (LOE) supporting this ASD include the following:

1. Strontium isotope ratios in groundwater are lower than the typical range for CCR impacted waters.
2. Boron isotope ratios in downgradient groundwater are not consistent with boron isotope ratios in CCR and CCR impacted waters.

These lines of evidence are described and supported in greater detail below.

LOE #1: STRONTIUM ISOTOPE RATIOS DOWNGRADIENT ARE LOWER THAN THE TYPICAL RANGE FOR CCR IMPACTED WATERS.

Strontium isotope ratios (^{87}Sr/^{86}Sr) for groundwater and leachate are plotted against total lithium in Figure 1. Strontium isotope ratios in coal, fly ash, and bottom ash impacted waters range from 0.7109 to 0.7126[2], indicated by the area shaded orange in Figure 1.

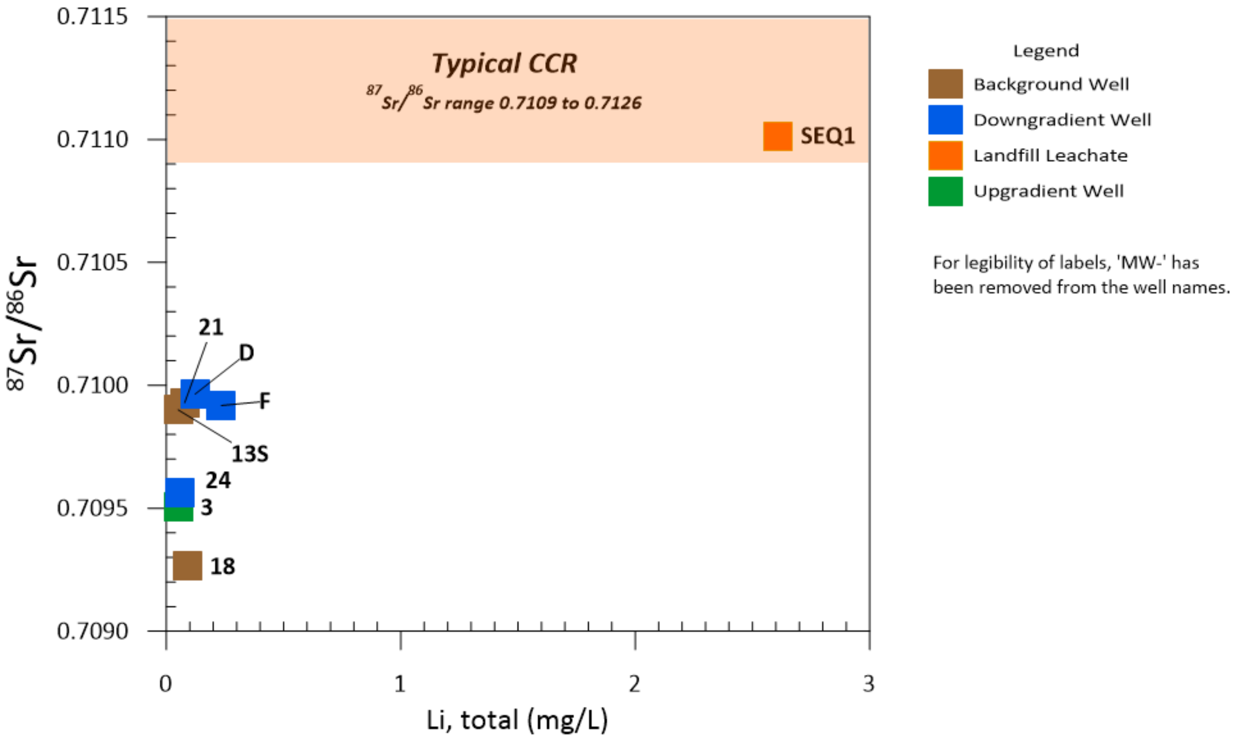


Figure 1. Strontium isotope ratio vs total lithium[2]

The groundwater results are within the typical groundwater range[2]. The leachate sample is within the typical $^{87}Sr/^{86}Sr$ range for CCR impacted waters[2]. Figure 2 shows that $^{87}Sr/^{86}Sr$ groundwater results are well grouped, and that the leachate is not mixing with the groundwater.

LOE #2: BORON ISOTOPE RATIOS DOWNGRADIENT ARE WITHIN THE TYPICAL RANGE FOR GROUNDWATER.

Total boron (B) for groundwater and leachate are plotted against boron isotope ratios ($\delta^{11}B$) in Figure 2. The $\delta^{11}B$ range for typical groundwater, shaded green, is 10‰ to 40‰ [5]. The area shaded orange represents $\delta^{11}B$ range for CCR impacted water, which has a distinctive negative $\delta^{11}B$ signature ranging from -70 ‰ to -1‰[2, 6].

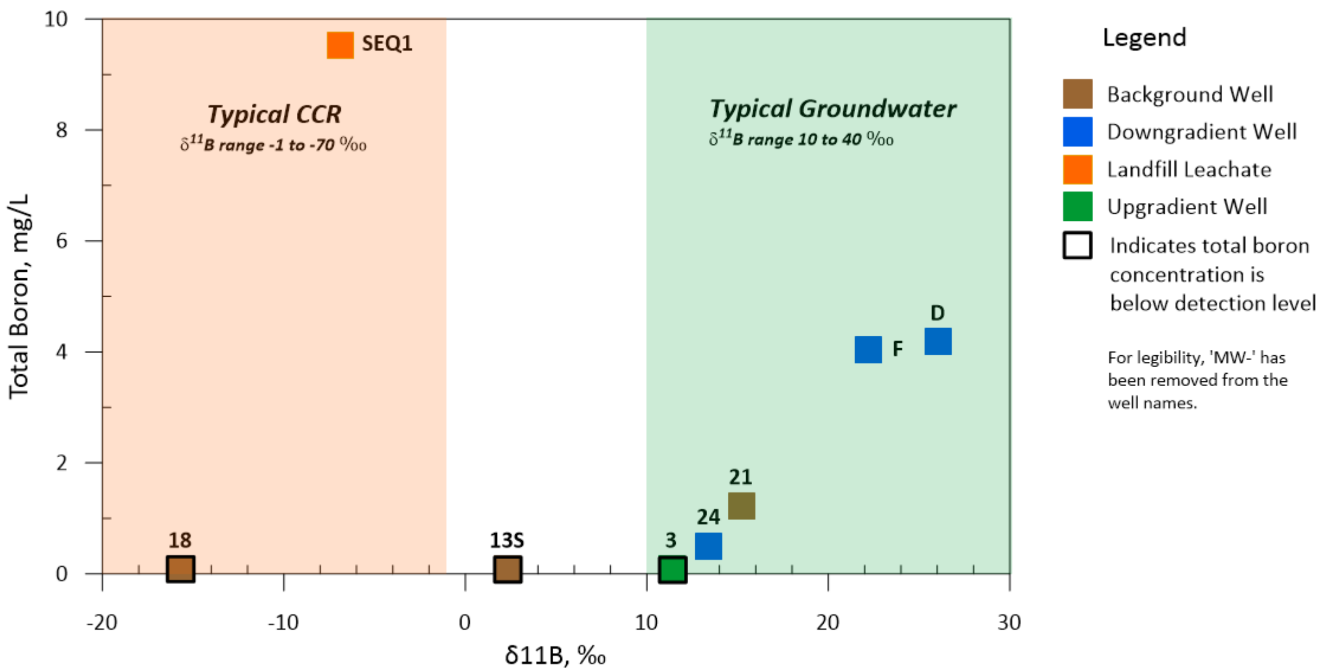


Figure 2. Total boron vs boron isotope ratio[2]

All groundwater results are within the typical $\delta^{11}B$ range for groundwater[2] at wells with total boron concentration above the detection limit. The leachate results, SEQ1, are within the typical negative $\delta^{11}B$ range for CCR leachates[2]. Figure 2 shows that $\delta^{11}B$ groundwater results are well grouped, except for background wells MW-13S and MW-18, which did not have detectable concentrations of total boron, and that the leachate is not mixing with the groundwater. The landfill is not influencing MW-13S and MW-18 as evidenced by groundwater flow shown on Figure 3.

Based on these two lines of evidence, it has been demonstrated that the Zimmer Landfill has not caused the Lithium SSL in MW-F.

This information serves as the written ASD, prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii), that the lithium SSL observed during the assessment monitoring program was not due to Zimmer Landfill. Therefore, a corrective measures assessment is not required, and the Zimmer Landfill will remain in assessment monitoring.

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1. Natural Resource Technology, Statistical Analysis Plan. 2017.
2. Ruhl, L. S.; Dwyer, G. S.; Hsu-Kim, H.; Hower, J. C.; Vengosh, A., Boron and Strontium Isotopic Characterization of Coal Combustion Residuals; Validation of New Environmental Tracers. *Environmental Science & Technology* **2014**, 9.
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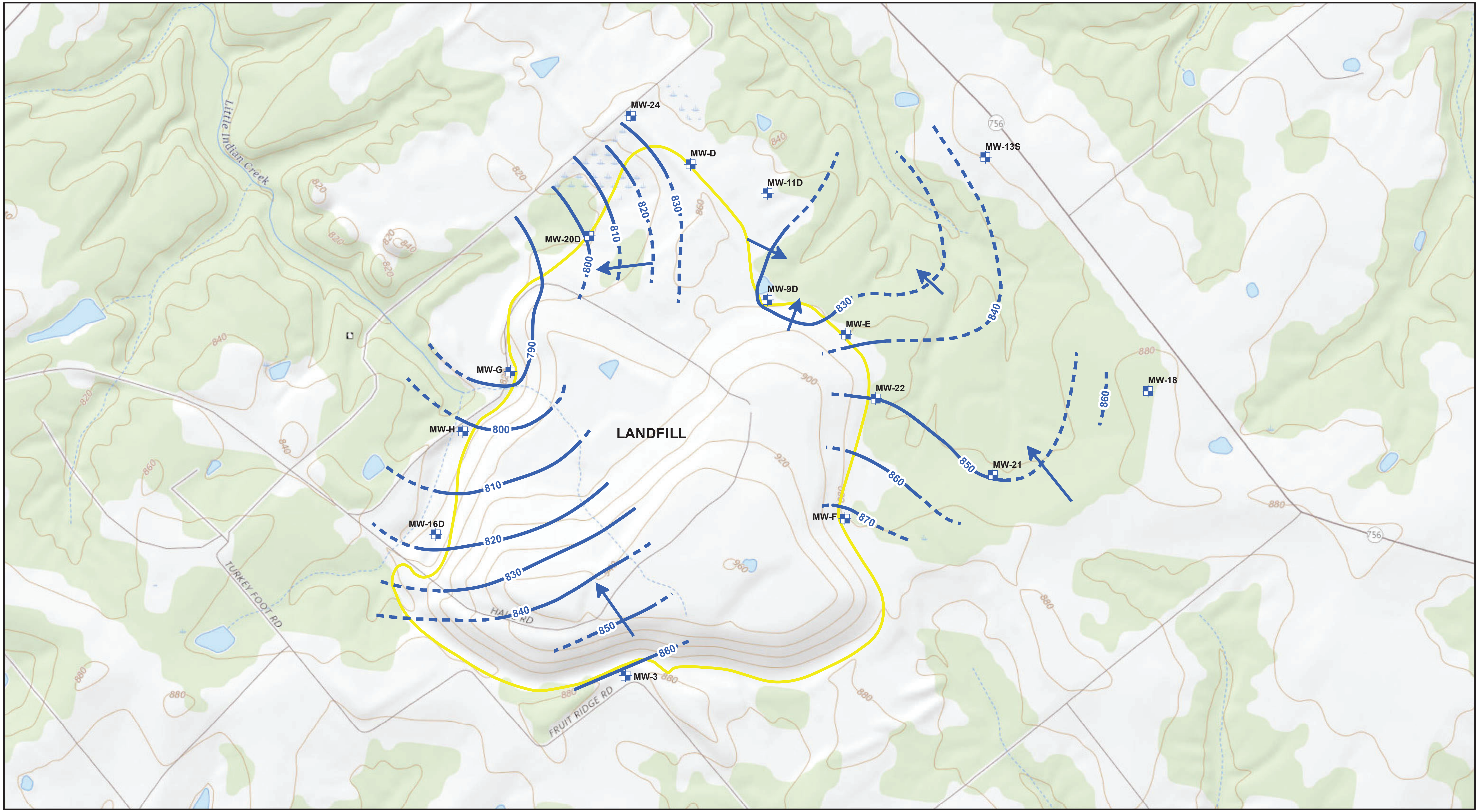
6. Williams, L. B.; Hervig, R. L., Boron isotope composition of coals: a potential tracer of organic contaminated fluids. *Applied Geochemistry* **2004,** *19* (10), 1625-1636.

ATTACHMENTS

Figure 3 Groundwater Elevation Contour Map



LEGEND

⌖ CCR MONITORING WELL LOCATION

▭ CCR MONITORED UNIT

VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

0 175 350 700 1,050 1,400
Feet

N

ZIMMER LANDFILL (UNIT ID: 122)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14, 2017

O'BRIEN & GERE ENGINEERS, INC.

I, Nicole M. Pagano, 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.

NPagano

Nicole M. Pagano
Senior Managing Engineer
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
71678

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

Intended for
Dynegy Zimmer, LLC

Date
May 4, 2020

Project No.
74924

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

ZIMMER LANDFILL

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: May 4, 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: May 4, 2020

LICENSED PROFESSIONAL GEOLOGIST
NICOLE M. PAGANO
196-000750
ILLINOIS

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T 414-837-3607
F 414-837-3608
https://ramboll.com

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FIGURES (IN TEXT)

Figure A	Strontium Isotopic Ratios for Monitoring Well and Sampling Locations
Figure B	Boron Isotopic Ratios for Monitoring Well and Sampling Locations

FIGURES

Figure 1	Monitoring Well and Sampling Location Map
Figure 2	Groundwater Elevation Contour Map, September 10, 2019

ACRONYMS AND ABBREVIATIONS

‰	parts per thousand or *per mil* variations
^{10}B	boron-10
^{11}B	boron-11
^{86}Sr	strontium-86
^{87}Sr	strontium-87
^{87}Sr/^{86}Sr	isotopic ratio of strontium-87 to strontium-86
40 C.F.R.	Title 40 of the Code of Federal Regulation
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
C.F.R.	Code of Federal Regulations
ft	feet
GWPS	Groundwater Protection Standard
LOE	line of evidence
mg/L	milligrams per liter
msl	above Mean Sea Level
NRT/OBG	Natural Resource Technology, an OBG Company
PTI	permit-to-install
Site	Zimmer Power Station Landfill
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
std	standard

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 Zimmer, 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 Zimmer Landfill located near Moscow, Ohio.

The most recent Assessment Monitoring sampling event (A2D) was completed on September 11 and September 12, 2019 and analytical data were received on November 4, 2019. Analytical data from all sampling events, from December 2015 through A2D, were evaluated in accordance with the Statistical Analysis Plan.[1] 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:

- Lithium at well MW-F

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than the Zimmer Landfill were the cause of the lithium SSL listed above. This ASD was completed by May 4, 2020, within 90 days of determination of the SSLs (February 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

The W. H. Zimmer Power Station is located in southwest Ohio, approximately 30 miles southeast of Cincinnati, Ohio. The Zimmer Power Station Landfill (Site) is located approximately 3 miles east of the power station and is bounded by State Route 756 on the northeast, Turkeyfoot Road on the northwest, and Fruit Ridge Road on the southwest (Figure 1).

2.2 Description of Landfill CCR Unit

The landfill footprint covers approximately 288 acres (Figure 1). CCR generated at the station is trucked to the landfill for disposal. Materials approved for disposal include fly ash, dewatered bottom ash, dewatered and stabilized flue gas desulfurization wastes, and gypsum. Disposal activities commenced in January 1991 and have progressed through a series of fill areas or phases.

2.3 Groundwater Flow

The Uppermost Aquifer is continuous beneath the Site and is comprised of the upper 20 feet (ft) or less of the fractured and weathered bedrock. Bedrock is typically encountered 15 to 25 ft below ground surface and overlain by clay, although it may be deeper in the two major surface drainage channels at the Site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The bedrock unit is the interbedded shale and limestone of the Fairview and Kope Formations.

In order to collect all groundwater elevations within the same day, as required by the Sampling and Analysis Plan[2], groundwater measurements during A2D were collected on September 10, 2019, the day prior to the first day of analytical sampling at the Site (September 11, 2019). Groundwater elevations across the Site ranged from approximately 787 to 873 ft above Mean Sea Level (msl) during A2D (Figure 2). Groundwater in the Uppermost Aquifer generally flows from bedrock highs towards the drainage channels, paralleling the direction of topographic slope, in a manner similar to the flow of surface runoff. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns, as groundwater movement may be controlled by preferential pathways created by open fractures and their degree of interconnection.

2.4 Isotopic Evaluation

Stable isotope analysis is commonly used in age dating, provenance studies and to differentiate between sources of groundwater. Multiple studies have shown that strontium and boron isotopic ratios can be successfully used in identifying CCR impacts to groundwater[3,4]. When a material is altered, the mass of a given element in the resulting material may be conserved or reduced. Alteration processes, such as combustion, may also affect the isotopic ratios of a given element, referred to as fractionation. Isotopes that have minimal fractionation during the alteration process, such as strontium and boron isotopes, make good groundwater tracers, therefore, strontium and boron isotopic ratios can be used to identify CCR impacted groundwater and CCR leachate[3]. This ASD compares strontium and boron isotopic ratios of groundwater in the vicinity of Zimmer Landfill and landfill leachate to typical published ranges for groundwater and CCR impacted waters.

2.4.1 Strontium

The ratio of stable strontium isotopes, strontium-87 to strontium-86[5] ($^{87}Sr/^{86}Sr$), is commonly used to trace the mixing of global reservoirs and to evaluate the environmental conditions in surface waters, oceans, and sediments. Strontium isotopes are very useful for provenance identification because the isotopic signature of rock is transferred to the soil, vegetation, and up the food web with minimal isotopic fractionation[6].

Strontium isotopic ratios are typically expressed and reported as an absolute ratio (i.e., $^{87}Sr/^{86}Sr$) due to strontium-86 (^{86}Sr) being a stable isotope with a constant abundance[7,8]. This is the exception for stable isotope analysis, since most results are reported relative to a standard, as described in further detail for boron below in Section 2.3.

2.4.2 Boron

Boron isotopes do not fractionate during coal combustion, meaning the isotopic ratio in the coal is preserved, between the coal and the combusted coal[3]. The isotopic ratio is also conserved when mobilized to water; thus, CCR-impacted groundwater will have similar isotopic ratios as the original coal and the CCR[3].

Because variations in boron isotopic ratios are usually small, they are reported in parts per thousand or *per mil* variations, denoted ‰, from a standard.

$$\boldsymbol{\delta}^{11}\mathrm{B} = \left[\frac{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{sample}} - (^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}{(^{11}\mathrm{B}/^{10}\mathrm{B})_{\mathrm{std}}}\right] \times \mathbf{1000}$$

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

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

1. Strontium isotopic ratios in groundwater near the Zimmer Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters.
2. Boron isotopic ratios in groundwater near the Zimmer Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters.

These LOEs are described and supported in greater detail below. Monitoring wells and landfill leachate sample locations are shown on Figure 1.

3.1 LOE #1: Strontium Isotopic Ratios in Groundwater Near the Zimmer Landfill are Lower Than the Published Typical Range of Strontium Isotopic Ratios for CCR Impacted Waters.

Strontium isotopic ratios ($^{87}Sr/^{86}Sr$) for samples collected from groundwater monitoring wells and landfill leachate (SEQ1) on September 17, 18 and 27, 2018 are plotted in Figure A below. Published $^{87}Sr/^{86}Sr$ in coal, fly ash, and bottom ash impacted waters range from 0.7109 to 0.7126[3], as indicated by the area shaded orange in Figure A.

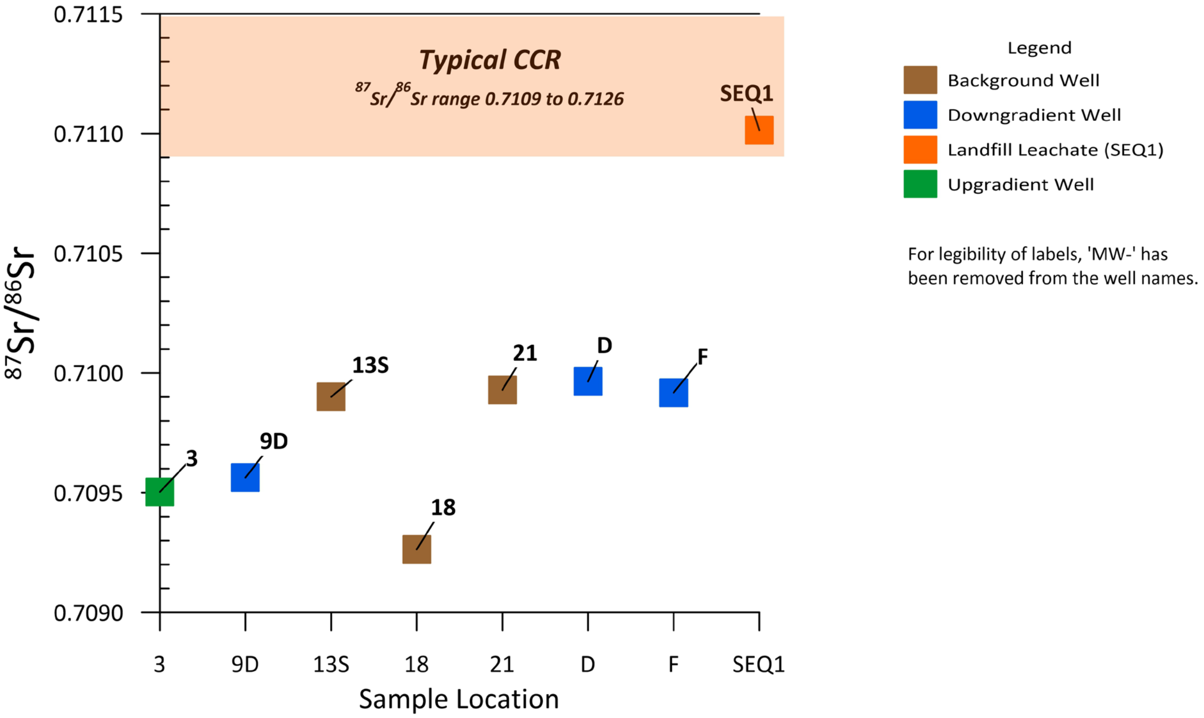
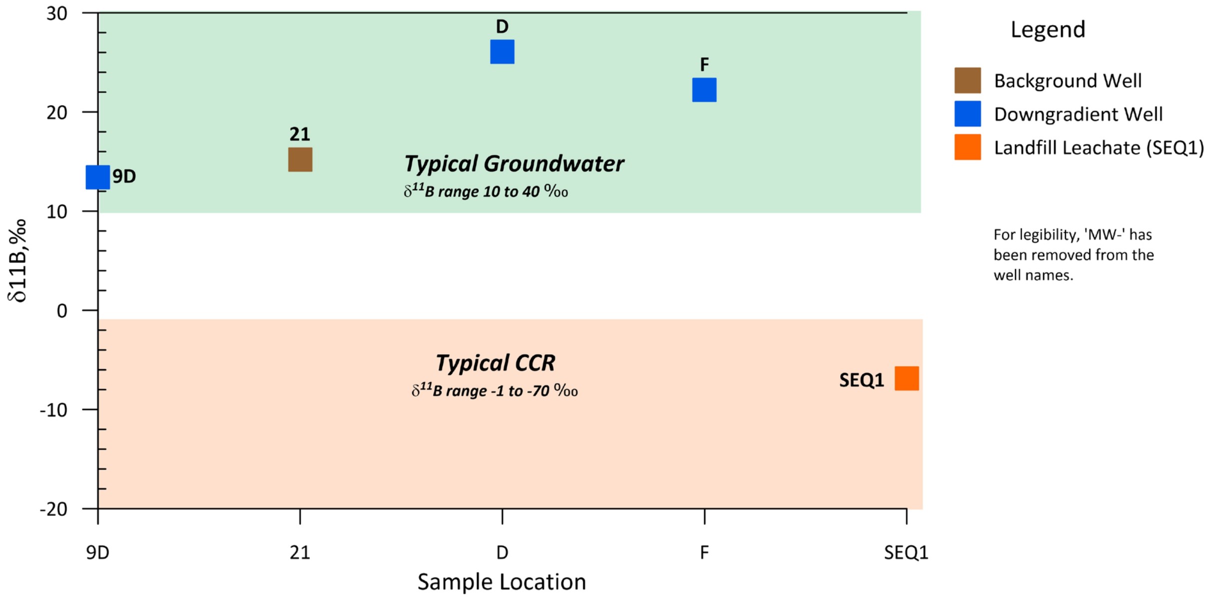


Figure A. Strontium Isotopic Ratios for Monitoring Well and Sampling Locations[3].

The range of ^{87}Sr/^{86}Sr found in groundwater, 0.70926 to 0.70996, near Zimmer Landfill are below the published typical range of ^{87}Sr/^{86}Sr for CCR impacted waters indicating groundwater near Zimmer Landfill is not impacted by CCR[3] The ^{87}Sr/^{86}Sr found in the landfill leachate sample (SEQ1), 0.71101, is within the published typical range of ^{87}Sr/^{86}Sr for CCR impacted waters (0.7109 to 0.7126) indicating leachate collected at location SEQ1 is impacted by CCR[3]. Figure A also shows that ^{87}Sr/^{86}Sr in groundwater near Zimmer Landfill are well grouped, and that the ^{87}Sr/^{86}Sr in landfill leachate (SEQ1) is distinctly different than groundwater near Zimmer Landfill. The ^{87}Sr/^{86}Sr in groundwater near Zimmer Landfill indicate that groundwater is not influenced by CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

3.2 LOE #2: Boron Isotopic Ratios in Groundwater Near the Zimmer Landfill are Within the Published Typical Range of Boron Isotopic Ratios for Groundwater and are Not Consistent With the Published Typical Boron Isotopic Ratios in CCR and CCR Impacted Waters.

Boron isotopic ratios (δ11B) for samples collected from groundwater monitoring wells and landfill leachate (SEQ1) on September 17, 18 and 27, 2018 are plotted in Figure B below. The published typical range of δ^{11}B for groundwater, shaded green in Figure B, is 10‰ to 40‰[3]. The area shaded orange in Figure B represents the published typical range of δ^{11}B for CCR and CCR impacted water, which has a distinctive negative δ^{11}B signature ranging from -70 ‰ to -1‰[3,9].



For legibility, 'MW-' has been removed from the well names.

Figure B. Boron Isotopic Ratios for Monitoring Well and Sampling Locations[3] (note: total boron concentrations at sample locations MW-3, MW-13S and MW-18 were below detection level and were not included).

The range of δ^{11}B found in groundwater, 13.43 to 26.07‰, near Zimmer Landfill are within the published typical range of δ^{11}B for groundwater (10‰ to 40‰), and are not consistent with the published typical range of δ^{11}B for CCR and CCR impacted water (-70 ‰ to -1‰) indicating groundwater near Zimmer Landfill is not impacted by CCR [3]. The δ^{11}B found in the landfill leachate sample (SEQ1), -6.86‰, is within the published typical range of $\delta^{11}B$ for CCR and CCR impacted waters (-70 ‰ to -1‰) indicating leachate collected at location SEQ1 is impacted by CCR[3]. Figure B also shows that $\delta^{11}B$ in groundwater near Zimmer Landfill are well grouped, and that the $\delta^{11}B$ in landfill leachate (SEQ1) is distinctly different than groundwater near Zimmer Landfill. The $\delta^{11}B$ in groundwater near Zimmer Landfill indicate that groundwater is not influenced by CCR or CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

4. CONCLUSIONS

Based on the following two lines of evidence, it has been demonstrated that the lithium SSL at MW-F is not due to Zimmer Landfill but is from a source other than the CCR unit being monitored:

1. Strontium isotopic ratios in groundwater near the Zimmer Landfill are lower than the published typical range of strontium isotopic ratios for CCR impacted waters. This indicates that groundwater is not influenced by CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.
2. Boron isotopic ratios in groundwater near the Zimmer Landfill are within the published typical range of boron isotopic ratios for groundwater and are not consistent with the published typical boron isotopic ratios in CCR and CCR impacted waters. This indicates that groundwater is not influenced by CCR or CCR impacted waters, including landfill leachate (SEQ1), therefore lithium in groundwater near Zimmer Landfill is from a source other than the Zimmer Landfill CCR unit and the associated landfill leachate.

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

5. REFERENCES

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

2 AECOM, 2017, Sampling and Analysis Plan, Zimmer Power Station Landfill, Dynegy Zimmer, LLC, October 17, 2017.

3 Ruhl, L. S.; Dwyer, G. S.; Hsu-Kim, H.; Hower, J. C.; Vengosh, A., Boron and Strontium Isotopic Characterization of Coal Combustion Residuals; Validation of New Environmental Tracers. *Environmental Science & Technology* **2014**, 9.

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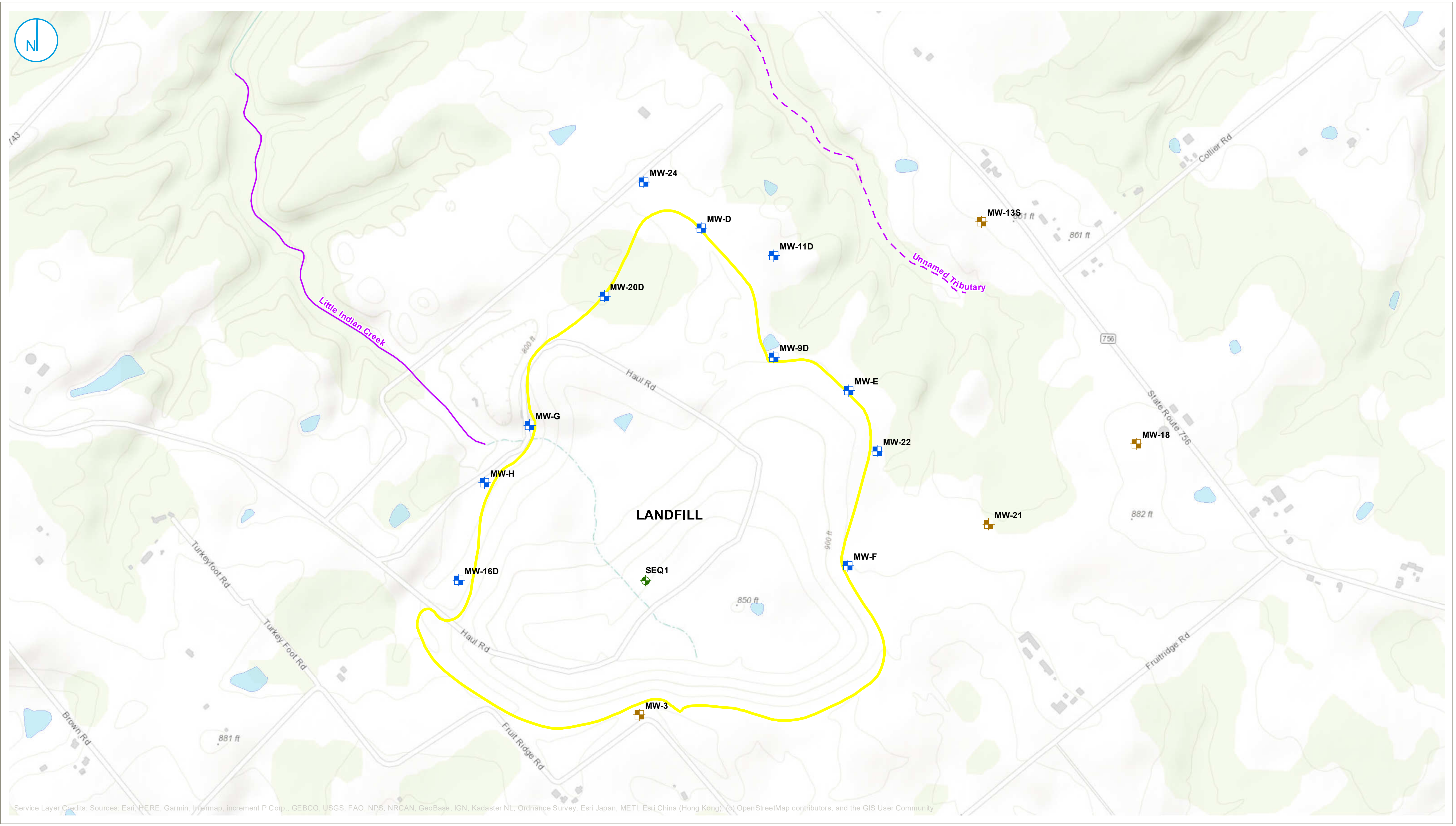
FIGURES

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Zimmer\Figure 1_Monitoring Well and Sampling Location Map.mxd

PROJECT: 169000XXXX | DATED: 5/4/2020 | DESIGNER: galarmmc



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✚	ZIMMER LANDFILL CCR MONITORING WELL LOCATION
✚	ZIMMER LANDFILL BACKGROUND CCR MONITORING WELL LOCATION
⊕	ZIMMER LANDFILL LEACHATE SAMPLE LOCATION
▭	CCR MONITORED UNIT

NATIONAL HYDROGRAPHY DATASET

∼	PERENNIAL STREAM
⋯	INTERMITTENT STREAM
▨	WATERBODY

0 350 700 Feet

MONITORING WELL AND SAMPLING LOCATION MAP

ZIMMER LANDFILL (UNIT ID: 122)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

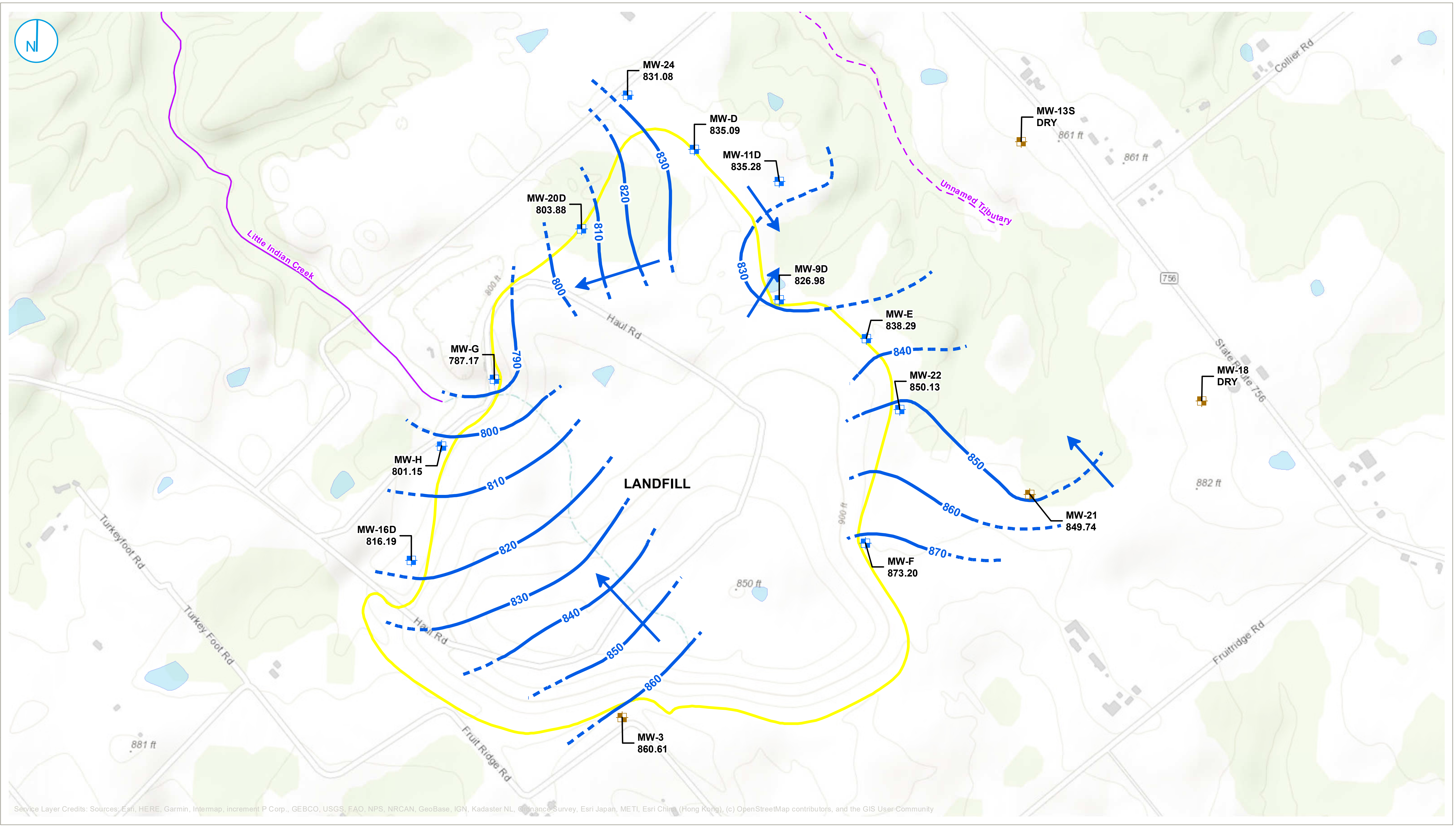
FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Zimmer\Figure 2_GW Elevation Contours.mxd

PROJECT: 169000XXXX | DATED: 5/4/2020 | DESIGNER: galarnmc



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

✚	ZIMMER LANDFILL CCR MONITORING WELL LOCATION
✚	ZIMMER LANDFILL BACKGROUND CCR MONITORING WELL LOCATION
━	GROUNDWATER ELEVATION CONTOUR (10-FT INTERVAL)
╍	INFERRED GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION
▭	CCR MONITORED UNIT

NATIONAL HYDROGRAPHY DATASET

∿	PERENNIAL STREAM
╍	INTERMITTENT STREAM
▨	WATERBODY

0 300 600
Feet

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 10, 2019

ZIMMER LANDFILL (UNIT ID: 122)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Intended for
Dynegy Zimmer, LLC

Date
October 26, 2020

Project No.
1940074924

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

ZIMMER LANDFILL

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
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 26, 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
E-85428

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
Date: October 26, 2020

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T 414-837-3607
F 414-837-3608
https://ramboll.com

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
f/k/a	formerly known as
GWPS	Groundwater Protection Standard
NRT/OBG	Natural Resource Technology, an OBG Company
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

ALTERNATE SOURCE DEMONSTRATION

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 Zimmer, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc. to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for Zimmer Landfill located near Moscow, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 8, 2020, and analytical data were received on April 27, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan[1] 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, as determined on July 27, 2020 and included in the Notification for Statistically Significant Levels of 40 C.F.R. Part 257 Appendix IV Constituents Above Groundwater Protection Standards for Zimmer Landfill dated August 13, 2020, at a downgradient monitoring well as follows:

- Lithium at well MW-F

In accordance with the Statistical Analysis Plan, MW-F was resampled on July 1, 2020 and analyzed for lithium to confirm the SSL. Following evaluation of analytical data from the resample event, no SSL remained. This ASD was completed by October 26, 2020, within 90 days of determination of the SSLs, as required by 40 C.F.R. § 257.95(g)(3)(ii).

---

[1] Natural Resource Technology, an OBG Company (NRT/OBG), 2017, Statistical Analysis Plan, Zimmer Power Station, Dynegy Zimmer, LLC, October 17, 2017.

APPENDIX C5 – SITE HYDROGEOLOGY AND STRATIGRAPHIC CROSS-SECTIONS OF THE SITE

CONCEPTUAL SITE MODEL AND DESCRIPTION OF SITE HYDROGEOLOGY (ASH POND AREAS)

The Zimmer Power Station (Zimmer Station) conceptual site model (CSM) and Description of Site Hydrogeology for the D Basin, the Gypsum Recycling Pond, and the Coal Pile Runoff Pond, hereinafter referred to as the 'Site', located near Moscow, Ohio are described in the following sections.

REGIONAL SETTING

The Ohio River Valley generally separates the Till Plains Section of the Central Lowlands Physiographic Province from the Lexington Plain Section of the Interior Low Plateaus Physiographic Province. The Central Lowlands Physiographic Province is characterized by plains of low relief with youthful to mature dissection developed on soil and rock deposits. The Till Plains Section is generally north of the Ohio River and is characterized by hills of low relief that are developed on nearly horizontal, Paleozoic sedimentary strata. Continental glaciation has affected most of the province so that bedrock is almost entirely concealed by glacial drift. Common valley fill material consists of coarse-grained outwash deposits, fine-grained lacustrine and overbank deposits, and glacial till. The bedrock consists of interbedded shales and limestones typical of the Cincinnatian Series.

SITE GEOLOGY

Zimmer Station is located on the relatively flat floor of the Ohio River Valley and is underlain by valley-fill glacial deposits. Glacial deposits directly beneath Zimmer Station consist of fine-grained fluvial and lacustrine deposits (clay and silt) to a maximum depth of 45 feet below the present ground surface. These deposits are underlain by coarser alluvial deposits that are composed of well-graded to poorly-graded sands having greater amounts of gravel with increasing depth. Bedrock beneath the unconsolidated sediments belongs to the Fairview and Kope formations. Depth to bedrock beneath the site varies between 60 and 90 feet below the ground surface.

Cross-sections showing the subsurface materials encountered at the Site are included in an attachment to this demonstration.

SITE HYDROGEOLOGY

The CCR groundwater monitoring system consists of the follow:

- Seven monitoring wells are installed in the uppermost aquifer and adjacent to the D Basin (MW-1, MW-8, MW-9, MW 12, MW-13, MW-14 and MW-15). The unit utilizes three background monitoring wells (MW-1, MW-8 and MW-12) as part of the CCR groundwater monitoring system.

- Four monitoring wells are installed in the uppermost aquifer and adjacent to the Gypsum Recycling Pond (MW-7A, MW-8, MW-10 and MW-11). The unit utilizes one background monitoring wells (MW-8) as part of the CCR groundwater monitoring system.

- Five monitoring wells are installed in the uppermost aquifer and adjacent to the Coal Pile Runoff Pond (MW-1, MW-3S, MW-16, MW-17 and MW-18). The unit utilizes one background monitoring wells (MW-1) as part of the CCR groundwater monitoring system.

See Monitoring Well Location Map, and Well Construction Diagrams and Drilling Logs attached to this demonstration.

Groundwater is encountered in the Ohio River valley aquifer. The aquifer consists primarily of the coarser alluvial deposits described above. The thickness of the deposits ranges from approximately 50 to 65 feet and covers much of the width of the flood plain between the river and Route 52 located to the east. Porosity of the aquifer material is likely to be on the order of 20 to 40 percent given the distribution of grain sizes. The groundwater potentiometric surface on site is encountered at depths of 25 to 50 feet below ground surface (bgs) (approximately 455 to 470 feet above mean sea level [msl]). The large variability is introduced by rising and falling river stage because of a relatively direct hydraulic connection between the riverbed and the aquifer.

The aquifer receives most of its recharge from infiltration of precipitation on the valley floor; however, secondary recharge sources include adjacent upgradient aquifers in the upland, and bank storage from the Ohio River during flood stages. Recharge to the aquifer from bank storage is periodic and short-lived, and the main movement of groundwater discharge is toward the river.

Zimmer Station withdraws water from the underlying sand and gravel aquifer through eight onsite production wells, all of which are located on the southern half of the facility. In general, each of the production wells is capable of yielding between 0.720 and 0.432 million gallons per day (mgd); however, the average daily yield is approximately 0.206 mgd.

When pumping, a localized cone of depression in the groundwater surface is created that encompasses the southern and, occasionally, the central portion of the site (AEP, November, 1986). This cone of depression induces flow from the Ohio River toward the pumping wells. The hydraulic gradient of the aquifer was calculated to be on the order of 0.0025 toward the Ohio River with a west-northwest to west southwest direction. The transmissivity of the aquifer is approximately 50,000 gallons per day per foot (gpd/ft), the hydraulic conductivity is approximately 1,000 gpd/ft^2 (134 ft/day), and the storage coefficient of the aquifer is 0.17 (Wm. H. Zimmer, 1983).

Material overlying the uppermost aquifer directly beneath Zimmer Station is comprised of glacial deposits consisting of fine-grained fluvial and lacustrine deposits (clay and silt) to a maximum depth of 45 feet bgs. Permeability tests conducted on in-situ cohesive material by American Electric Power Service Corporation, Civil Engineering Division in 1986 suggested values in the range of 9.7 x 10^{-9} to 1.4 x 10^{-8} cm/sec.

The lower confining unit underlying Zimmer Station is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. Depth to bedrock beneath the site varies between 60 and 90 feet bgs. These low-yielding shale and limestone formations are approximately 400- to 600-feet thick (Luft, et. al., 1973). 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 150 feet bgs (Wm. H. Zimmer, 1983).

REFERENCES

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Luft, Stanley J.1 Osborne, Robert H., and Malcolm P. Weiss. Geologic Map of the Moscow Quadrangle, Ohio - Kentucky (GQ-I069). Prepared in cooperation with The Commonwealth of Kentucky, University of Kentucky, Kentucky Geological Survey, 1973.

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Y:\Mapping\Projects\22\2285\MXD\MISC\Figure 1_Zimmer_CrossSections.mxd

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✚ CCR MONITORING WELL LOCATION
● TEST BORING LOCATION
— CROSS SECTION LOCATION
☐ CCR MONITORED UNIT

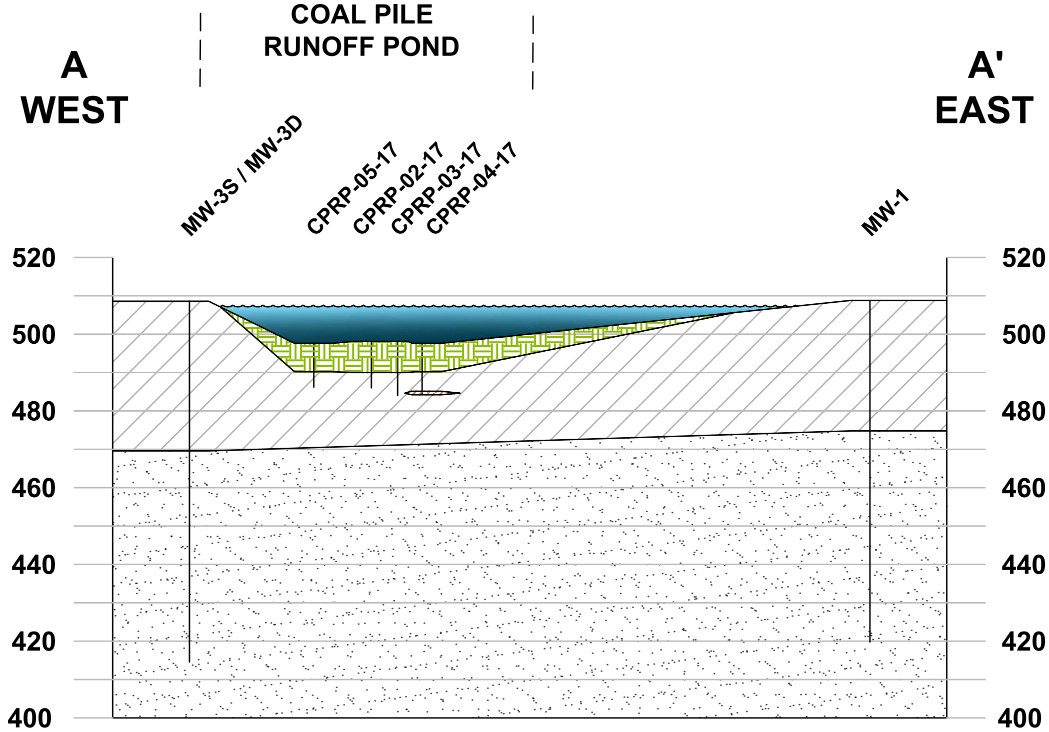
CROSS SECTION LOCATION MAP

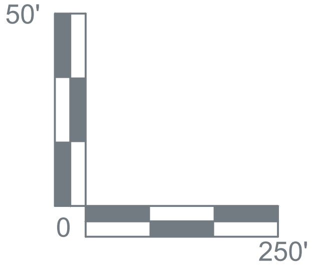
ZIMMER D BASIN (UNIT ID: 121),
ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124) AND
ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

0 200 400
Feet

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

PROJECT: RAMBOLL PROJECT NUMBER DATED: 9/16/2020 9:39 AM DESIGNER: ENGLEHSA \\ramboll.sharepoint.com@SSL\DavWWWRoot\sites\vistra\Shared Documents\-CCR GW\Deliverables\Part A\Zimmer\Cross Sections\CAD\Zimmer Cross Sections.dwg





NOTES
1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

LEGEND

🟦	WATER
▦	SEDIMENT
▨	CLAY
▨	SILT
░	SAND

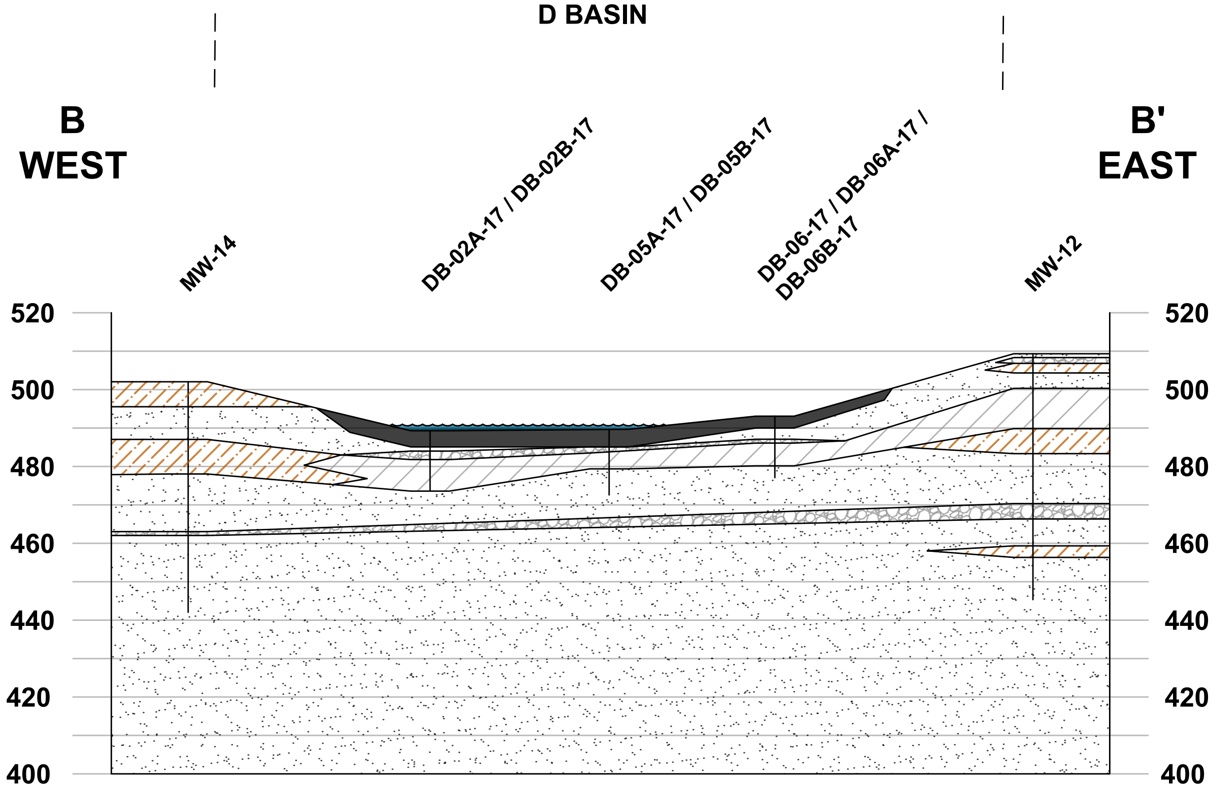
CROSS SECTION A-A'

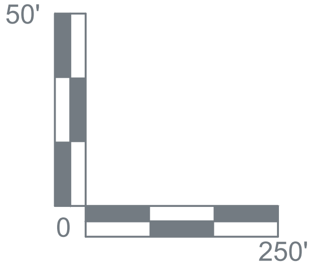
FIGURE 2

ZIMMER COAL PILE RUNOFF POND (UNIT ID: 125)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

PROJECT: RAMBOLL PROJECT NUMBER DATED: 9/16/2020 9:39 AM DESIGNER: ENGLEHSA \\ramboll.sharepoint.com@SSL\DavWWWRoot\sites\vistra\Shared Documents\-CCR GW\Deliverables\Part A\Zimmer\Cross Sections\CAD\Zimmer Cross Sections.dwg





NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

LEGEND

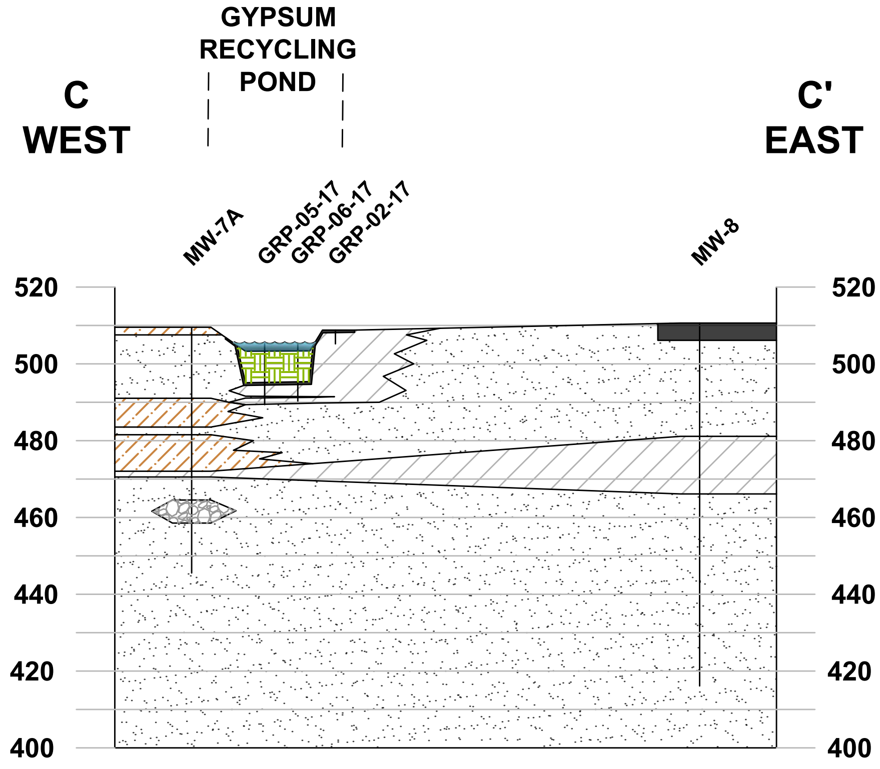
🟦	WATER
⬛	CCR
▨	CLAY
▨	SILT
░	SAND
▒	GRAVEL

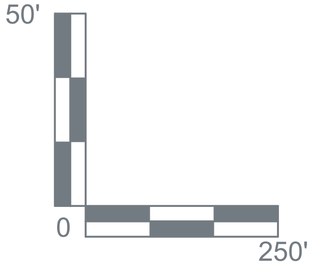
CROSS SECTION
B-B'

ZIMMER D BASIN (UNIT ID:121)
ZIMMER POWER STATION
MOSCOW, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY





NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 5X.

LEGEND

- 🟦 WATER
- ⬛ CONCRETE / ROAD BASE
- 🟩 SEDIMENT
- ▨ CLAY
- ▨ SILT
- ░ SAND
- ▒ GRAVEL

CROSS SECTION C-C'

FIGURE 2

ZIMMER GYPSUM RECYCLE POND (UNIT ID: 124)
ZIMMER POWER STATION
MOSCOW, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

HYDROGEOLOGICAL CHARACTERIZATION REPORT

CCR MANAGEMENT UNIT – 122 (Landfill)

ZIMMER POWER STATION
CLERMONT COUNTY, OHIO

Prepared for:

Dynegy Zimmer, LLC
Job Number: 60442412
October 11, 2017

Prepared by:

AECOM

525 Vine Street, Suite 1800
Cincinnati, Ohio
513.651.3440 tel
877.660.7727 fax

Approved by:
Dennis P. Connair, CPG

Signature

Date: 10-11-17

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Figure 2 Site and Well Location Map, Zimmer Station Landfill (Unit ID 122)

Figure 3 Groundwater Surface Map – March 14, 2016 Zimmer Station Landfill (Unit ID: 122)

Figure 4 Groundwater Surface Map – December 14, 2016 Zimmer Station Landfill (Unit ID: 122)

List of Attachments

Attachment A Boring Logs and Well Construction Logs
Attachment B Well Wizard Sampling Pumps, Equipment Specifications

HYDROGEOLOGICAL CHARACTERIZATION REPORT

ZIMMER POWER STATION
CLERMONT COUNTY, OHIO

[Unit 122 - Landfill]

1.0 INTRODUCTION

This Hydrogeological Characterization Report (HCR) was prepared on behalf of Dynegy Zimmer, LLC to document the character of site conditions that control the occurrence and flow of groundwater relative to the monitoring requirements for coal combustion residual (CCR) management units at the Zimmer Power Station (Zimmer) in accordance with Part 257.91 of the United States Environmental Protection Agency (USEPA) Final Rule to regulate the disposal of CCR under Subtitle D of the Resource Conservation and Recovery Act (RCRA) [40 Code of Federal Regulations (CFR) 257 Subpart D; published in 80 FR 21302-21501, April 17, 2015].

This HCR will apply specifically to the following CCR Unit; *Unit 122 (Zimmer Landfill)*, as defined further below.

The HCR describes the hydrogeologic context of the entire landfill site so as to inform the Qualified Professional Engineer (QPE) who is charged with certifying that the groundwater monitoring system proposed for the CCR unit meets the requirements stated in 40 CFR 257.91.

2.0 SITE DESCRIPTION

The Unit 122 is located at the intersection of State Route 756 and Turkeyfoot Road in Washington Township approximately 3 miles east of the W. H. Zimmer Station (**Figure 1**).

The Unit 122 footprint covers approximately 288 acres and is bounded by S.R. 756 on the northeast, Turkeyfoot Road on the northwest, and Fruit Ridge Road on the southwest. The area bounded by the roadway boundaries is 680 acres. Turkeyfoot Road, which is now vacated, provides limited access for local landfill construction traffic. Primary access to Unit 122 is provided by a dedicated, paved haul road from the Station to the Unit 122. The dedicated haul road is gated and not open to public traffic.

Residual wastes generated at the station are trucked to the facility for disposal in accordance with permit-to-install [PTI] (Permit No. 05-9746) conditions. The PTI was effective November 2, 1988. Wastes approved for disposal include fly ash, dewatered bottom ash, pyrites, pond sediments, dewatered and stabilized flue gas desulfurization (FGD) wastes, and gypsum. Disposal activities commenced in January 1991 and have progressed through a series of fill areas or phases.

3.0 SITE CHARACTERIZATION MEANS AND METHODS

The site conditions that control the occurrence and flow of groundwater relative to the monitoring of CCR units was evaluated through a series of investigation and well installation efforts on site. The available data were primarily derived from the following resources:

- Hydrogeologic Report - December 1985, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light

Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Civil Engineering Division, Columbus, Ohio.

- Addendum to the Hydrogeologic Report – June 1987, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Columbus, Ohio.
- Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)), William H. Zimmer Residual Solid Waste Landfill, Clermont County, Ohio, prepared by Duke Energy Ohio, Inc., Cincinnati, Ohio and S&ME, Inc., Dublin, Ohio, BBCM August 1998 (revised November 2012).
- Well logs for supplemental CCR monitoring wells installed around the Unit 122 (**Attachment A**).
- Annual evaluations (and Addendum 1-24-17) of the permit-required groundwater monitoring system conducted as required by Ohio Administrative Code (OAC) 3745-30-08(B)(5) and Section B(5) of the Facility permit-to-install (PTI) (Permit No. 05-9746) Groundwater Monitoring Plan (GWMP) dated August 1998 (revised November 2012). An evaluation of groundwater flow data is performed in order to evaluate whether the Groundwater Monitoring System is adequate for the facility.

The data from these reports were reviewed and used to evaluate geologic cross sections and potentiometric surface maps, that constitute the unified conceptual model of Unit 122 conditions as described in Section 4.0 below. Specific data cited in the sections below can be found within the documents listed above.

4.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) as described in the following sections addresses the requirements of 40 CFR 257.91(b), which specifies that the monitoring system design shall be based upon site-specific technical information that characterizes the following:

1. Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and
2. Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.

4.1 Regional Physiography

The Ohio River valley generally separates the Till Plains Section of the Central Lowlands Physiographic Province from the Lexington Plain Section of the Interior Low Plateaus Physiographic Province. The Central Lowlands Physiographic Province is characterized by plains of low relief with youthful to mature dissection developed on soil and rock deposits. The Till Plains Section is generally north of the Ohio River and is characterized by hills of low relief that are developed on nearly horizontal, Paleozoic sedimentary strata. Continental glaciation has affected most of the province so that bedrock is almost entirely concealed by glacial drift. Hills in the Till Plains are often composed of moraines or other glacial deposits (Hydrogeologic Report, December 1985). The bedrock consists of interbedded shales and limestones typical of the Cincinnatian Series.

Unit 122 is located in a transition zone between the Central Lowlands and Interior Low Plateaus Physiographic Provinces. Unit 122 lies east of the Ohio River on the uplands that rise to an elevation ranging between 700 and 850 feet National Geodetic Vertical Datum of 1929. These uplands are dissected by numerous small intermittent streams that result in an irregular set of ridges of similar elevation.

4.2 Site Geology and Hydrogeology

Unit 122 is underlain by a layer of unconsolidated sediments (glacial till) that ranges from 10 to 40 feet in thickness. The till is hard and consists of coarse, angular, gravel-sized material in a clay- and silt-rich matrix. Below the till is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations.

4.2.1 Uppermost Aquifer

The uppermost groundwater is typically encountered near the interface between the bedrock and overlying till deposits. This uppermost aquifer is continuous beneath Unit 122 and is comprised of the upper 20 feet or less of the fractured and weathered bedrock. Groundwater in this uppermost aquifer generally flows parallel to the direction of topographic slope in a manner similar to the flow of surface runoff. This is suggested by the relatively shallow depth-to-groundwater as compared to the topographic relief of the area. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns as groundwater movement may be controlled by the location of open fractures and their degree of interconnection.

A groundwater flow divide occupies the high ground between two major surface drainage channels at the site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The divide runs roughly northwest-southeast. Groundwater flows from the divide to the centerline of the drainage channels in the general downhill direction. These channels run roughly westward, exiting the site at the northern and western corners of the property.

As stated within the Addendum to the Hydrogeologic Report dated June 1987, field slug tests were performed on a total of nine observation wells in order to provide information on the site's hydrogeologic properties. These test data were used to evaluate the transmissivities of the Fairview and Kope formations, which underlie Unit 122. The aquifer test results had an average transmissivity value of 1.28 x 10^{-5} square meters per second (m^2/sec) and storage coefficient of 1.27 x 10^{-2}, which is indicative of the low permeability characterizing the site. The observation wells, with the exception of IJ_t and IK (noted in the Addendum to the Hydrogeologic Report dated June 1987), are designed to monitor the basal contact of the glacial till and the bedrock formations. Observation Wells IJ_t and IK are screened in the glacial till and exhibit lower transmissivity values (Addendum to the Hydrogeologic Report – June 1987).

The primary influences on groundwater flow beneath Unit 122 are infiltration of rainfall and other surface water and the lack of infiltration due to temporary or permanent capping of the landfill.

4.2.2 Material Overlying the Uppermost Aquifer

Material overlying the uppermost aquifer is comprised of unconsolidated sediments (glacial till) that range from 10 to 40 feet in thickness. The till is hard and consists of coarse, angular, gravel-sized material in a clay- and silt-rich matrix. Permeability tests conducted on test pit samples by American Electric Power Service Corporation, Civil Engineering Division in 1985 suggested a mean value of 6.18 x 10^{-6} centimeters per second (cm/sec) within the boundaries of Unit 122. Permeability tests conducted on the undisturbed Shelby tube samples gave a mean value of 5.78 x 10^{-8} cm/sec (Hydrogeologic Report - December 1985).

4.3.3 Materials Comprising the Lower Confining Unit

The lower confining unit underlying the site is bedrock consisting of interbedded shales and limestones belonging to the Fairview and Kope formations. These low-yielding shale and limestone formations are approximately 400- to 600-feet thick (Luft, et. al., 1973).

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 that 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. Saline to brackish waters have been encountered at 50 feet below the surface of Unit 122. Fresh water does not typically occur at depths greater than 150 feet below the surface.

5.0 GROUNDWATER MONITORING SYSTEM

Pursuant to 40 CFR § 257.90(b)(1), by October 17, 2017, an owner and operator of a CCR unit must install a groundwater monitoring system that meets the requirements of 40 CFR § 257.91. The groundwater monitoring system must meet the CCR Rule’s performance standard, which requires the system to consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of:

(1) background groundwater that has not been affected by leakage from a CCR unit; and

(2) groundwater passing the waste boundary of the CCR unit—the downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer and must monitor all potential contaminant pathways.

The collection of monitoring wells that comprise the CCR groundwater monitoring system for Unit 122 consists of the following:

- Ten (10) PTI-required monitoring wells (MW-3, MW-9D, MW-11D, MW-13S, MW-16D, MW-18, MW-20D, MW-21, MW-22, and MW-24), installed July 1985 through August 1989, February 1997, February 2009, and April 2010,

- Five (5) supplemental monitoring wells (MW-D, MW-E, MW-F, MW-H, and MW-G), installed November/December 2015.

The monitoring well locations are illustrated on **Figure 2**. As-built specifics of each well installation are summarized on **Table 1**. The boring and well construction logs for the wells are located in **Attachment A**.

The section below provides details of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices constituting the groundwater monitoring system for the subject site so as to support QPE certification of the system as required under 40 CFR 257.91(e)(1).

5.1 Monitoring Well System Installation

Preparation tasks prior to the installation of any part of the groundwater monitoring system involved preparation of a health and safety plan for all site activities; coordination of site activities with Station security requirements; and clearance and placement of drilling locations with Duke Energy/Dynegy Zimmer engineering staff to ensure safe work conditions by avoiding underground and overhead utilities, traffic hazards, and other operational hazards.

Field activities for all monitoring well installations involved a survey and utility clearance of the proposed monitoring well locations, drilling and installation of the monitoring wells, development of monitoring wells, and a final elevation and location survey of the monitoring wells. For all monitoring wells installed at Unit 122, the drill rig and all downhole equipment were decontaminated by pressure cleaning after mobilization to the first well site and between drilling locations in order to prevent the introduction of contaminants to the wells.

Permit-Required Monitoring Wells

Drilling and well installation activities for monitoring wells MW-3, MW-9D, MW-11D, MW-13S, MW-16D, MW-18, MW-20D, MW-21, MW-22, and MW-24) were conducted between July 1985 and August 1989, February 1997, February 2009, and April 2010. The PTI groundwater monitoring system wells were installed by S&ME (formerly BBCM). The monitoring wells installed at the site were set into boreholes drilled with auger and rotary drilling methods. It is reported that proper decontamination procedures were used during the drilling of the borings and installation of the wells.

The wells have similar construction: 2-inch diameter polyvinyl chloride (PVC) casing with machine-slotted PVC well screens ranging from 5 to 20 feet in length located at the bottom. Annular space adjacent to the screens is filled with sand, and a bentonite seal is located atop the sand. The remaining annular space is filled with cement/bentonite grout. The wells are finished in concrete well pads with steel protective casings and locking caps.

Monitoring well installation was conducted in accordance with the specifications of the approved Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)) as described in Part G of the Site Investigation Report included as Section 4 of the PTI application. As-built specifics of each well installation are summarized on **Table 1**.

Supplemental Monitoring Well

Monitoring wells MW-D, MW-E, MW-F, MW-H, and MW-G were installed November/December 2015 by roto-sonic drilling methods. Drilling was conducted by Frontz Drilling Inc. located in Wooster, Ohio (Ohio Certified Driller ODH Registration Number 0120) under the observation of AECOM (formerly URS) personnel. Soil samples were collected continuously in 5- or 10-foot intervals in order to classify the physical characteristics of the unsaturated and saturated zones. The wells were constructed following the same protocols as the existing wells on site with 10 feet of 0.010 slot, 2-inch diameter PVC screen. The targeted depths placed the well screens at roughly the same elevation as the existing uppermost aquifer monitoring wells to facilitate integration of new and old data.

Surface Completion – All Monitoring Wells

With the exception of monitoring well MW-G, all of the monitoring wells were completed 1 to 3 feet above ground surface with a locking steel casing, 4 by 4 foot concrete pad (sufficiently deep to protect against frost heave), and in areas of high traffic three (3) or four (4) surrounding bollard posts were installed to protect against vehicle strikes. Monitoring well MW-G was completed at the surface as a flush-mount casing to accommodate for vehicle access to key landfill operations. Each casing was painted with a high visibility, rust-preventative paint and the well number was painted on the casing in a contrasting color.

All of the wells were developed after installation to promote hydraulic connection to the aquifer. Development involved hand-bailing equipment and /or the use of a small submersible pump to over-pump and surge the well until water from the entire screened interval ran clear.

The location, ground surface elevation, and top of internal casing elevation for each monitoring well were surveyed by a licensed surveyor utilizing the local reference datum elevations. These survey data, along with well construction details, are presented in **Table 1**.

All of the monitoring wells were equipped with dedicated Well Wizard® bladder pumps. The bladder pump specifications, installation guide, and warranty information supplied by the vendor are provided as **Attachment B**.

5.2 Groundwater Flow – Unit 122

Groundwater flow conditions for Unit 122 were evaluated through eight baseline CCR monitoring events, supplemented by permit-required annual evaluation of the groundwater monitoring system since 2003.

Water level data collected during the eight baseline CCR monitoring events from January 2016 through July 2017 are summarized on **Table 1**. These data were used to construct piezometric surface maps to illustrate seasonal groundwater flow conditions for the uppermost aquifer [**Figure 3** (March 2016) and **Figure 4** (December 2016)]. These data and figures are representative of general conditions at the site and support the following analysis.

The uppermost groundwater is typically encountered near the interface between the bedrock and overlying till deposits. This uppermost aquifer is continuous beneath the site and is comprised of the upper 20 feet or less of the fractured and weathered bedrock. Groundwater in this uppermost aquifer generally flows parallel to the direction of topographic slope in a manner similar to the flow of surface runoff. This is suggested by the relatively shallow depth-to-groundwater as compared to the topographic relief of the area. However, because this groundwater occupies secondary porosity in the thin limestone units of the predominantly shale bedrock, the potential exists for locally unpredictable flow patterns as groundwater movement may be controlled by the location of open fractures and their degree of interconnection.

A groundwater flow divide occupies the high ground between two major surface drainage channels at the site (Little Indian Creek and an unnamed tributary to Little Indian Creek). The divide runs roughly northwest-southeast. Groundwater flows from the divide to the centerline of the drainage channels in the general downhill direction. These channels run roughly westward, exiting the site at the northern and western corners of the property.

6.0 REFERENCES

Addendum to the Hydrogeologic Report – June 1987, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Columbus, Ohio.

Groundwater Monitoring Program Plan (Lateral Expansion PTI, OAC 3745-30-05(C)), William H. Zimmer Residual Solid Waste Landfill, Clermont County, Ohio, prepared by Duke Energy Ohio, Inc., Cincinnati, Ohio and S&ME, Inc., Dublin, Ohio, BBCM August 1998 (revised May 2012).

Hydrogeologic Report - December 1985, The Zimmer Plant Flue Gas Desulfurization Waste Landfill Site, prepared for The Cincinnati Gas & Electric Company, The Dayton Power and Light Company, Columbus and Southern Ohio Electric Company, prepared by American Electric Power Service Corporation, Civil Engineering Division, Columbus, Ohio.

Luft, Stanley J.1 Osborne, Robert H., and Malcolm P. Weiss. Geologic Map of the Moscow Quadrangle, Ohio - Kentucky (GQ-I069). Prepared in cooperation with The Commonwealth of Kentucky, University of Kentucky, Kentucky Geological Survey, 1973.

Tables

Table 1. Sample Location Summary
CCR Groundwater Monitoring System
CCR Rule Groundwater Monitoring
CCR Unit Name: Zimmer Landfill
Unit ID: 122

Well ID	MW-3	MW-9 D	MW-11 D	MW-13 S	MW-16 D	MW-18	MW-20 D	MW-21
Well Location Latitude	38° 51' 2.0988"	38° 51' 29.4582"	38° 51' 37.3566"	38° 51' 39.5382"	38° 51' 11.8512"	38° 51' 23.3208"	38° 51' 32.9502"	38° 51' 17.9166"
Well Location Longitude	-84° 10' 0.6672"	-84° 9' 47.7252"	-84° 9' 47.649"	-84° 9' 27.4176"	-84° 10' 18.948"	-84° 9' 12.369"	-84° 10' 6.204"	-84° 9' 26.3052"
Well Construction Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter (inches)	2	2	2	2	2	2	2	2
Top of Casing Well Elevation (ft)	872.85	857.91	851.85	862.1	825.22	888.57	824.68	862.15
Well Depth Below Ground Surface (ft)	35.34	69.53	35.79	19.01	30.07	17.47	38.61	37.16
Screen Length (ft)	10	10	10	10	10	10	10	10
Top of Screen Elevation (ft)	845.65	796.44	824.3	851.6	803.6	877.17	794.38	832.25
Bottom of Screen Elevation (ft)	835.65	786.44	814.3	841.6	793.6	867.17	784.38	822.25
Well Stick-up Above Ground Surface (ft)	1.86	1.94	1.76	1.49	1.55	3.93	1.69	2.74
Hydraulic Position of Well (1)	U	D	D	D	D	U	D	D

Notes:
ft = feet
PVC = polyvinyl chloride
1. upgradient (U) or downgradient (D)

Table 1. Sample Location Summary
CCR Groundwater Monitoring System
CCR Rule Groundwater Monitoring
CCR Unit Name: Zimmer Landfill
Unit ID: 122

Well ID	MW-22	MW-24	MW-D	MW-E	MW-F	MW-G	MW-H
Well Location Latitude	38° 51' 22.482"	38° 51' 42.624"	38° 51' 40.0962"	38° 51' 27.09"	38° 51' 13.5936"	38° 51' 22.7298"	38° 51' 17.463"
Well Location Longitude	-84° 9' 37.08"	-84° 10' 1.0446"	-84° 9' 55.7856"	-84° 9' 40.4064"	-84° 9' 40.4526"	-84° 10' 11.6826"	-84° 10' 17.1804"
Well Construction Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter (inches)	2	2	2	2	2	2	2
Top of Casing Well Elevation (ft)	866.94	852.36	852.34	863.42	884.02	821.4	811.13
Well Depth Below Ground Surface (ft)	37.29	34.41	35.02	32.73	29.78	67.7	27.02
Screen Length (ft)	10	10	10	10	10	10	10
Top of Screen Elevation (ft)	836.97	826.65	824.82	838.03	861.7	764.39	792.03
Bottom of Screen Elevation (ft)	826.97	816.65	814.82	828.03	851.7	754.39	782.03
Well Stick-up Above Ground Surface (ft)	2.68	1.3	2.75	2.91	2.79	(0.44)	2.33
Hydraulic Position of Well (1)	D	D	D	D	D	D	D

Notes:
ft = feet
PVC = polyvinyl chloride
1. upgradient (U) or downgradient (D)

TABLE 2

MONITORING WELL GROUNDWATER ELEVATIONS - JANUARY 2016-JULY 2017

ZIMMER STATION - CLERMONT COUNTY, OHIO

ZIMMER LANDFILL (122)

Well ID	Reference Elevation Top of Casing* (feet, NAVD 88)	January 26, 2016		March 14, 2016		June 13, 2016		September 28, 2016		December 14, 2016		April 17, 2017		June 8, 2017		July 12, 2017	
		Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)	Depth to Water (feet)	Groundwater Elevation (feet, NAVD 88)
MW-3	872.85	10.68	862.17	7.91	864.94	11.20	861.65	13.13	859.72	12.87	859.98	9.81	863.04	10.78	862.07	11.11	861.74
MW-9D	857.91	30.80	827.11	29.63	828.28	30.83	827.08	31.11	826.80	30.96	826.95	30.89	827.02	30.91	827.00	30.93	826.98
MW-11D	851.85	16.85	835.00	15.78	836.07	17.20	834.65	17.54	834.31	17.54	834.31	17.31	834.54	17.27	834.58	17.16	834.69
MW-13S	862.1	8.54	853.56	7.15	854.95	NM**	NM	NM**	NM	NM**	NM	8.53	853.57	11.80	850.30	10.38	851.72
MW-16D	825.22	9.03	816.19	7.91	817.31	9.07	816.15	9.43	815.79	9.53	815.69	9.22	816.00	9.19	816.03	9.05	816.17
MW-18	888.57	13.28	875.29	10.16	878.41	NM	NM	NM	NM	NM	NM	12.54	876.03	15.77	872.80	14.67	873.90
MW-20D	824.68	23.83	800.85	21.35	803.33	22.70	801.98	21.75	802.93	23.12	801.56	23.79	800.89	24.01	800.67	23.82	800.86
MW-21	862.15	11.35	850.80	9.62	852.53	10.81	851.34	13.92	848.23	15.80	846.35	11.13	851.02	10.94	851.21	11.48	850.67
MW-22	866.94	17.38	849.56	16.11	850.83	17.18	849.76	17.36	849.58	17.59	849.35	17.94	849.00	17.77	849.17	17.75	849.19
MW-24	852.36	21.13	831.23	18.88	833.48	20.59	831.77	22.87	829.49	23.06	829.30	19.40	832.96	20.17	832.19	20.03	832.33
MW-D	852.34	17.28	835.06	16.19	836.15	17.45	834.89	18.83	833.51	19.44	832.90	18.49	833.85	17.66	834.68	17.51	834.83
MW-E	863.42	26.02	837.40	21.16	842.26	26.01	837.41	26.30	837.12	26.18	837.24	25.19	838.23	25.23	838.19	25.66	837.76
MW-F	884.02	9.74	874.28	9.21	874.81	9.82	874.20	12.97	871.05	14.54	869.48	9.56	874.46	10.11	873.91	11.07	872.95
MW-G	821.4	34.19	787.21	32.60	788.80	34.03	787.37	34.40	787.00	34.49	786.91	34.12	787.28	34.38	787.02	34.37	787.03
MW-H	811.13	8.60	802.53	7.04	804.09	8.70	802.43	10.25	800.88	10.68	800.45	8.24	802.89	9.24	801.89	9.37	801.76

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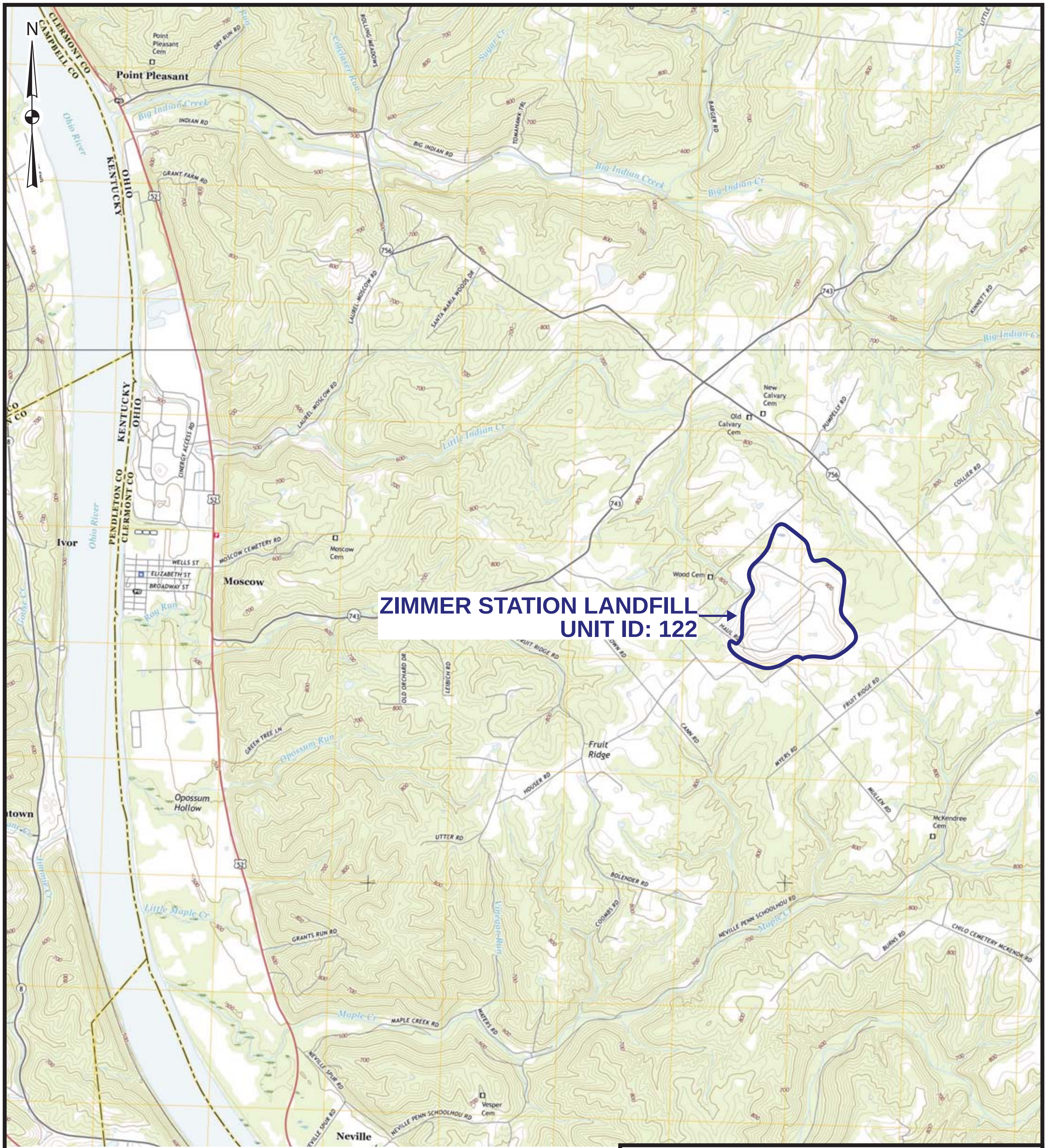
* = Reference elevations of monitoring wells surveyed by American Land Surveys 1-27-16
** = Well was dry to the top of pump

Figures



0 4,000 8,000

APPROXIMATE SCALE IN FEET

Quadrangle Location

BASE MAP SOURCE: USGS 7½ minute topographic quadrangle maps: Laurel, Ohio-Kentucky 2016; Moscow, Ohio-Kentucky 2016.

DYNEGY

Zimmer Station
Clermont County, Ohio

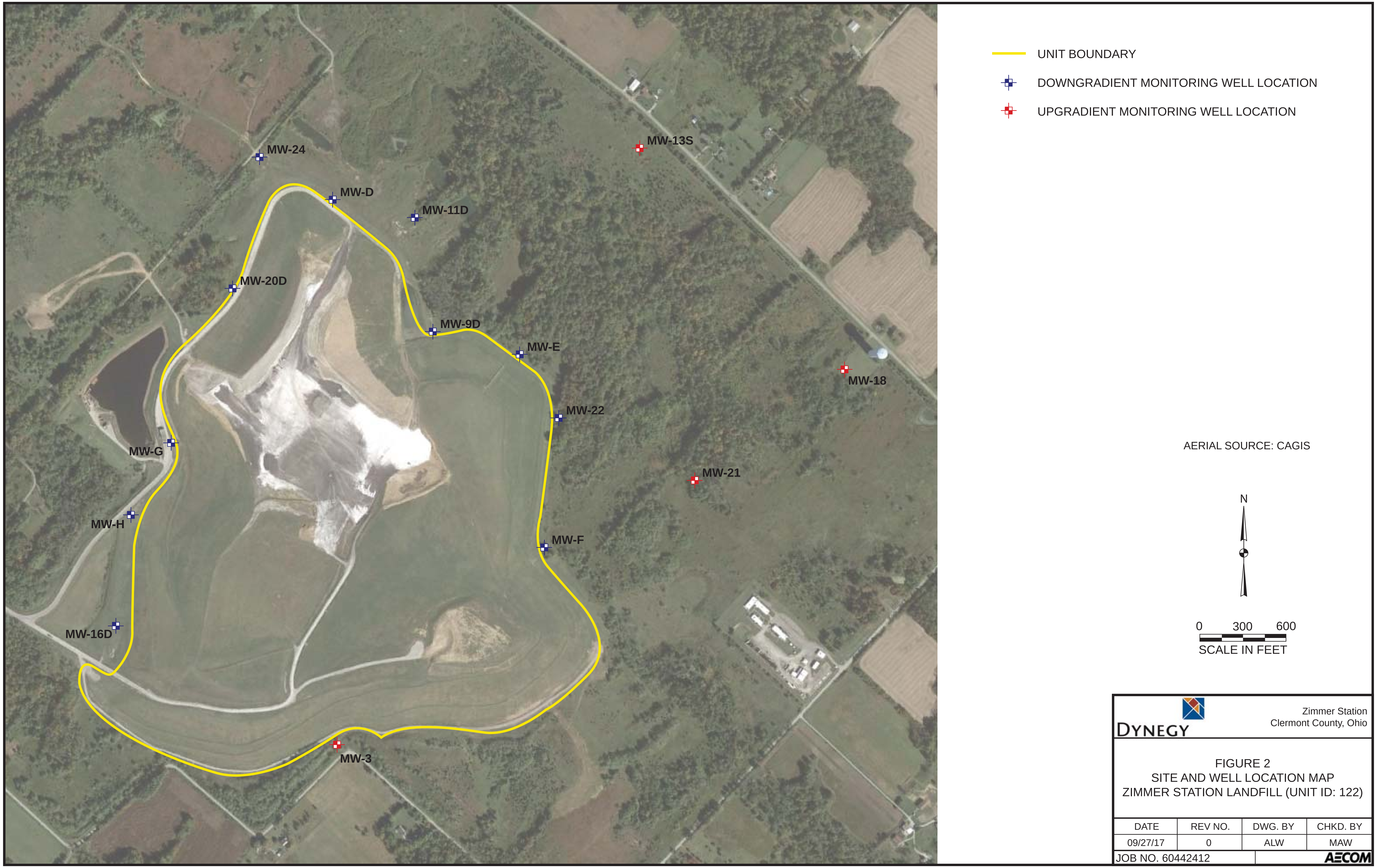
FIGURE 1
SITE AND WELL LOCATION MAP
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)



AERIAL SOURCE: CAGIS

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 2
SITE AND WELL LOCATION MAP
ZIMMER STATION LANDFILL (UNIT ID: 122)

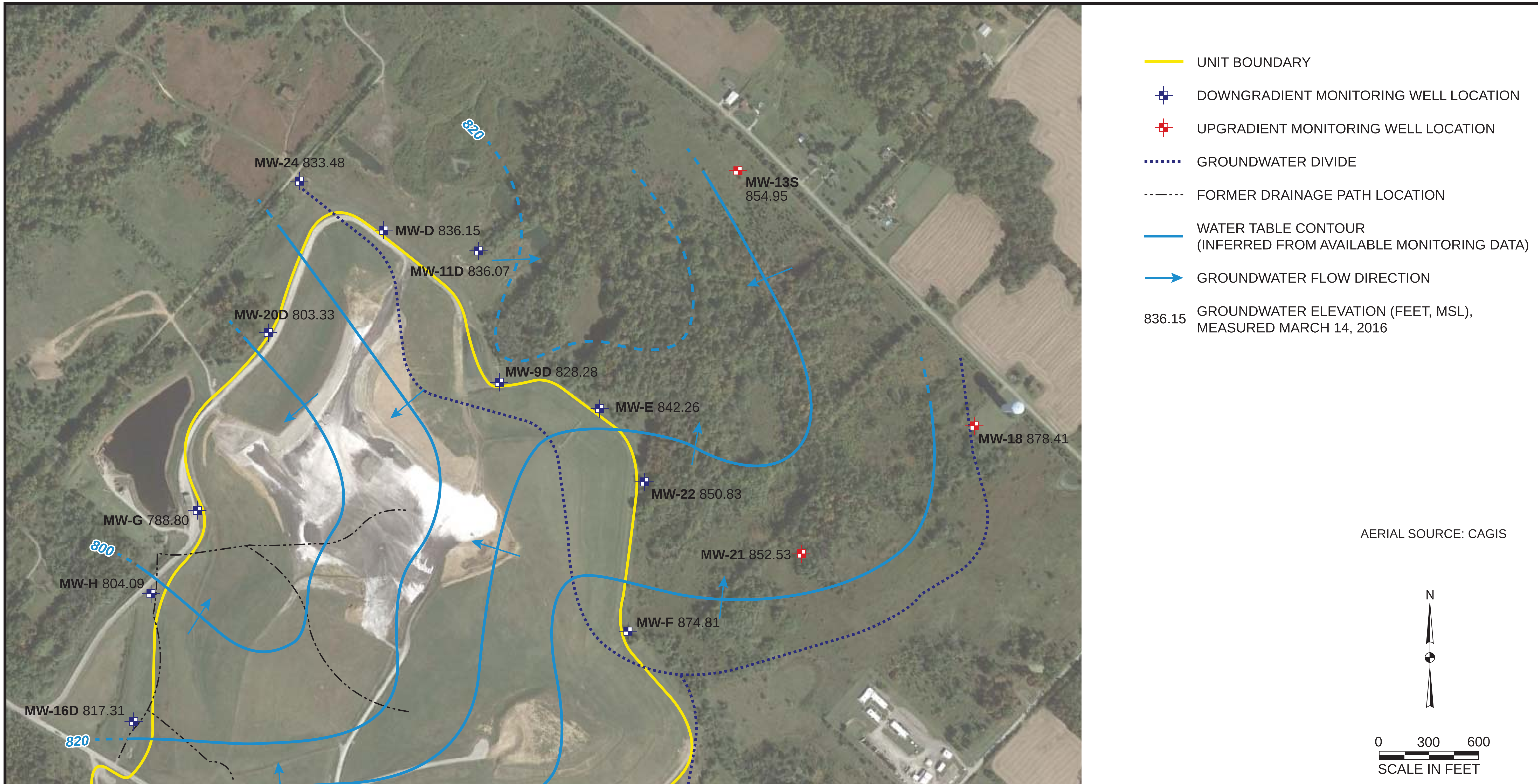
DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Projects\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)



AERIAL SOURCE: CAGIS

DYNEGY

Zimmer Station
Clermont County, Ohio

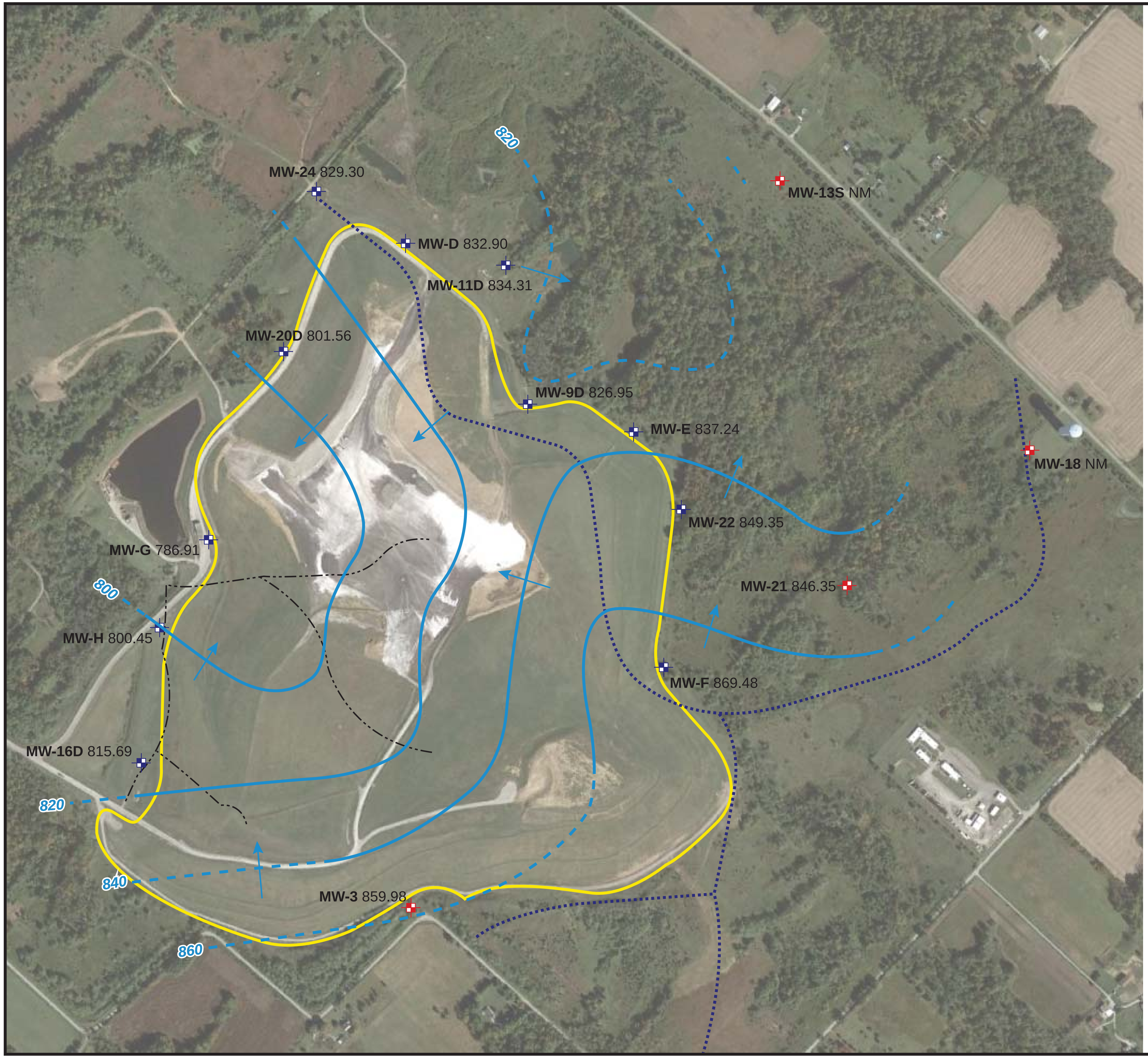
FIGURE 3
GROUNDWATER SURFACE MAP- MARCH 14, 2016 ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\ZIM\ZIM HCR\Unit 122 (LF)



🟨	UNIT BOUNDARY
✚	DOWNGRADIENT MONITORING WELL LOCATION
✚	UPGRADIENT MONITORING WELL LOCATION
······	GROUNDWATER DIVIDE
-·—·-	FORMER DRAINAGE PATH LOCATION
——	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
834.31	GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 14, 2016
NM	NOT MEASURED

AERIAL SOURCE: CAGIS

N

0 300 600
SCALE IN FEET

DYNEGY

Zimmer Station
Clermont County, Ohio

FIGURE 4
GROUNDWATER SURFACE MAP-
DECEMBER 14, 2016
ZIMMER STATION LANDFILL (UNIT ID: 122)

DATE	REV NO.	DWG. BY	CHKD. BY
09/27/17	0	ALW	MAW

JOB NO. 60442412

AECOM

Attachment A

Boring Logs and Well Construction Logs

JOB No.

COMPANY ZIMMER PLANT

PROJECT FGD LANDFILL

COORDINATES S:2325.72 E:17,443.40

DATE 08-23-89 TIME

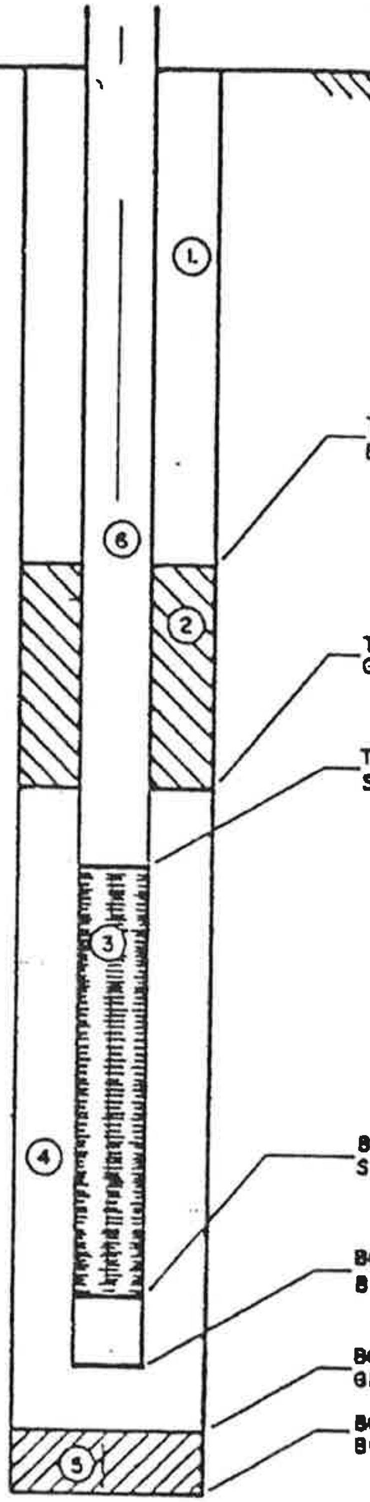
HOLE # 43

WELL CONSTRUCTION SUMMARY ELEVATIONS (IL NGVD)

WELL No. 3

REF. DATUM PT. 874.29

GRADE 872.09



1. GROUT SEAL Volclay
2. BENTONITE SEAL
3. SCREEN 20'x2"x.02 PVC
4. GRAVEL PACK
5. N. A.
6. RISER PIPE

TOP OF BENTONITE SEAL 864.59

TOP OF GRAVEL PACK 859.59

TOP OF SCREEN 857.59

BOTTOM OF SCREEN 837.89

BOTTOM OF BLANK SECTION 836.89

BOTTOM OF GRAVEL PACK 836.89

BOTTOM OF BOREHOLE 836.89

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD	REVISION	OBSERVATION WELL
APPROVED / DR.	CH.	
AMERICAN ELECTRIC POWER SVC. CORP.		CDS-04 SH.

FORM CE-9
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING Well 3

JOB NO.
COMPANY Zimmer Plant
PROJECT FGD Land Fill
COORDINATES S 2325.72 E: 17,443.40

BORING NO. 43 . DATE 8-22-89 SHEET 1 OF 2
TYPE OF SAMPLES: SPT x 3" TUBE CORE x
CASING USED SIZE HW DRILLING MUD USED
BORING BEGUN 8-22-89 BORING COMPLETED 8-22-89
GROUND ELEVATION 872.09 REFERRED TO
DATUM
FIELD PARTY Howell- Darst RIG 75

LOCATION OF BORING:	
WATER LEVEL	Hole was Drilled w/
TIME	Casing See well Log
DATE	/ /

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	4.0	5.5	13	16	16	17"					Sandy clay- multi-color Br moist	
										CL		
2	9.0	10.5	5	12	12	9"					Clay- multi-color Br moist med to low plasticity	
								10		CL		
3	14.0	15.5	8	50/.4		6"					Soft Gray clay + Clay Shale w/ lime stone Frag.	water change From Br to Gray at 14.5
4	19.0	19.1	50/1			0						

6" x 3.25 HSA
HW CASING ADVANCER 4" ✓
NQ CORE ROCK ✓
NW CASING 3"
SW CASING 6"

RECORDER

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ________
COMPANY ________
PROJECT ________
COORDINATES ________

BORING NO. 43 DATE ________ SHEET 2 OF 2
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
											19.1 - 35.2 Gray Hand Lime STONE w/ LAYERS OF GRAY Clay SHALE	
	19.1	22.7				3.5	0					
	22.7	30.0				6.9	0					
	30.0	35.2				5.1	37	30				
												InsTalled ws # 3
											Stopped Hole 35.2	

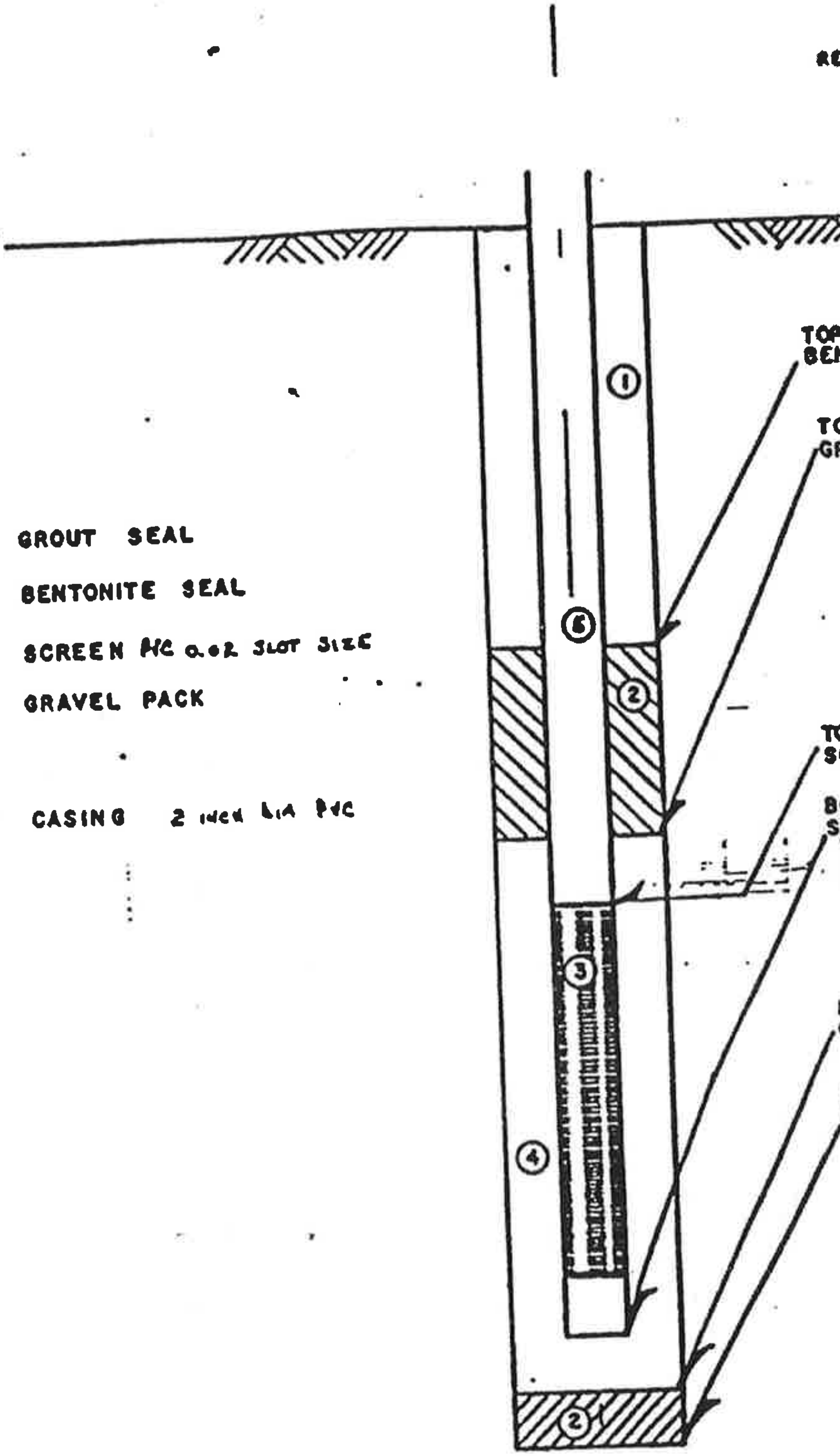
6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ________

WELL CONSTRUCTION SUMMARY ELEVATIONS
(ft. NGVD)

WELL NO. 9-D
REF. DATUM PT. 858.2
(TOP OF CASING)
Boring No. B-18

GRADE 856.2



TOP OF BENTONITE SEAL 813.2
TOP OF GRAVEL PACK 811.2
TOP OF SCREEN 809.2
BOTTOM OF SCREEN 792.89 ~~789.2~~
BOTTOM OF GRAVEL PACK 787.2
BOTTOM OF BOREHOLE 766.0

1 GROUT SEAL
2 BENTONITE SEAL
3 SCREEN PVC 0.02 SLOT SIZE
4 GRAVEL PACK
6 CASING 2 INCH DIA PVC

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD	REVISION 0		OBSERVATION WELL
APP'D.	DR. J. DEEMS	CH. JMN	DATE JUL 6, 1988
AMERICAN ELECTRIC POWER SERVICE CORP.			CDS — 04	SH.

PLATE 20

Well 9D

FORM CE-5
REV. 1/07

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB No.

COMPANY AEP

PROJECT Zimmer FGD Land Fill

LOCATION OF BORING: N. 500 E 18170

WATER LEVEL	
TIME	
DATE	

BORING No. B-18 DATE 2-3-87 SHEET 1 OF

TYPE OF BORING: SPT X 3" TUBE ____ CORE ✓

CASING USED ✓ SIZE HW DRILLING MUD USED

BORING BEGUN 2-3-87 BORING COMPLETED

GROUND ELEVATION 856.20 REFERRED TO ____ DATUM

FIELD PARTY Smith - Bumgarner Brill RIG 75

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								2				
1	4.0	5.5	7	9	12	15"		4			Clay- org. Br + Gray mottled moist - med to low plasticity	
								6		CL		
								8				
2	9.0	10.5	5	8	9	18"						
								10			Same as Sample No. 1	
								12				
3	14.0	15.5	22	50	–	11"		14			Sandy clay- Dk. Br. + Gray mottled - moist - w/ some Limestone Frag - strong Reaction to HCl	
								16		CL		
								18				
4	19.0	20.5	10	18	22	12"					Sandy Gravelly Clay- Blue moist - strong Reaction to HCL - limestone gravel	
								20				

6" x 3.25 HSA	
HW CASING ADVANCER 4"	X
NQ CORE ROCK	X
NW CASING 3"	
SW CASING 6"	

ENGINEER

FORM CE-9
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____

BORING NO. B-18 DATE ____ SHEET 2 OF ____
TYPE OF BORING: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING: ____

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
								22				
5	24.0	25.5	4	8	12	14"		24			Clay - Blue - moisT - STRONG ReadTion To HCL. w/ some Gravel	
								26				
								28				
6	29.0	30.5	5	8	10	16"					Same as Sample No. 5	
								30				
								32				
7	34.0	35.5	4	6	10	4"		34			Same as Sample No 5 more Sand	
								36				
								38			Same as Sample No. 5	
8	39.0	40.5	4	5	16	13"						
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY
PROJECT

BORING NO. B-18 DATE SHEET 3 OF
TYPE OF BORING: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO
DATUM
FIELD PARTY RIG

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
								42				
9	44.0	45.5	4	4	6	16"		44			Clay - Blue Gray moist to wet - med. to low plasticity - moderate Reaction to HCL	
								46		CL		
								48				
10	49.0	50.5	32	15	50/.4	3"					Limestone Rock Frag. + Clay mixture	
								50				
	52.0	50				–						
								52				
	52.2	55.1				.9 2.3	0					
											Gray Hard limestone	
								53				
											Broken shale	
								54				
											Broken limestone w/ shale lenses	
								55			Gray soft shale	
											→ Core lost ?	
	55.1	65.1				9.0	0				55.1 to 56.4 Gray soft shale - Broken large % fossil at 55.3 + 56.2	
								56				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER

FORM CE-9
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB No.
COMPANY
PROJECT
LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING No. B-18 DATE SHEET 4 OF
TYPE OF BORING: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO DATUM
FIELD PARTY RIG

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								56				
											56.4 to 57.0 Gray Hard Lime-stone w/ Shale Lows at 56.4-56.45	
								57			57.0-62.6 - Gray Soft Shale Except when noted	
								58				
								59			58.6-58.8 Gray Hard Limestone	
											59.2-59.4- Shale w/ Fossil Fragment -	
								60			Core Lost This Area-?	
											60.0-60.3 Gray Hard Limestone.	
								61			60.3- 60.7 Shale w/ Fossil Fragment-	
											61.4-62.6 Gray Hard Lime stone	
								62				
								63			62.6- 65.0 Gray Soft Clay Shale	
								64				
								65				
	65.1	75.1				10.0	60.0 TO 70.0				65.0-65.1 Gray Hard Lime stone	
								66				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

ENGINEER

FORM CE-8
REV. 1/97

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AL. CIVIL ENGINEERING LABORA.,RY
LOG OF BORING

Job No.
Company
Project
Location of Boring
Boring No. B-18 Date Sheet 5 of
Type of Boring SPT 3" Tube Core
Casing used Size Drilling mud used
Boring begun Boring Completed
Ground Elevation referred to
Datu
Field Party Rig

Water Level	
Time	
Date	

Sample Number	Sample Depth in Feet From	To	Standard Penetration Resistance Blow / 6"			Total Length Recovery	RQD %	Depth in Feet	Graph Log	USCS	Soil / Rock Identification	Driller's Notes
								66			65.1 - 75.1 - Gray soft clay Shale Except where noted	
								67				
								68			68.2 - 68.5 - Gray Hard Limestone Fossil Fragment in Shale	
								69			68.9 - 69.8 Gray Hard Lime-stone w/ .1 Shale Seam	
								70				
								71				
								72				
								73				
								74			73.9 to 74.3 Gray Hard Limestone	
	75.1	85.1				9.9	61.0	75				
											75.4 - 76.3 Gray Limestone w/ Layers of Clay Shale	
								76			75.1 to 83.1 Gray soft Shale Except where noted	

6" x 3.25 HSA
HW Casing Advancer 4"
NQ Core Rock
NW Casing 3"
SW Casing 6"

Engineer

FORM CE-8
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY
PROJECT
COORDINATES

BORING NO. 18 DATE SHEET 6 OF
TYPE OF SAMPLES: SPT 3" TUBE CORE
CASING USED SIZE DRILLING MUD USED
BORING BEGUN BORING COMPLETED
GROUND ELEVATION REFERRED TO
DATUM
FIELD PARTY RIG

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								76			76.3 - 77.1 Gray Hard Lime stone	
								77				
								78			78.1 - 78.3 Gray Hard Lime stone 78.3 - 78.5 Fossil Fragment in shale	
								79			79.2 - 79.4 Gray Hard Lime stone	
								80				
								81			Gray Hard Limestone 81.1-81.3	
								82				
								83			Fossil Fragment in shale 83.0-83.2	
								84				
								85				
	85.1	92.4				7.3	24.0				Gray Hard 85.5 - 85.8 Lime stone	
								86			85.8 - 85.9 Fossil Fragment in shale	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER

FORM CE-6
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ________
COMPANY ________
PROJECT ________
COORDINATES ________

BORING NO. B-18 DATE ________ SHEET 7 OF 7
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								86				
								87			87.1 Seam of Limestone	
											87.2 " " "	
											87.4 - 87.6 Fossil Fragment in shale	
								88			87.7 - 91.4	
											Gray Hard Limestone w/ Layers of Clay shale	
								89				
								90				
								91			91.4 - 92.4	
								92			Gray Soft Clay shale	
								93				
											Stopped Hole 92.4 + installed Piezometer	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ________

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

MW-11 D

No ______

AEP

Zimmer FGD Landfill

ocation of Boring:

Water Level	
Time	
ate	

Boring No. IJB Date 2-13-86 Sheet 1 of 1

Type of Boring ______ Rig CME-75

Casing used ______ Size ______ Drilling mud used ______

Boring Begun ______ Boring Completed ______

Ground Elevation 850.5 Referred to ______

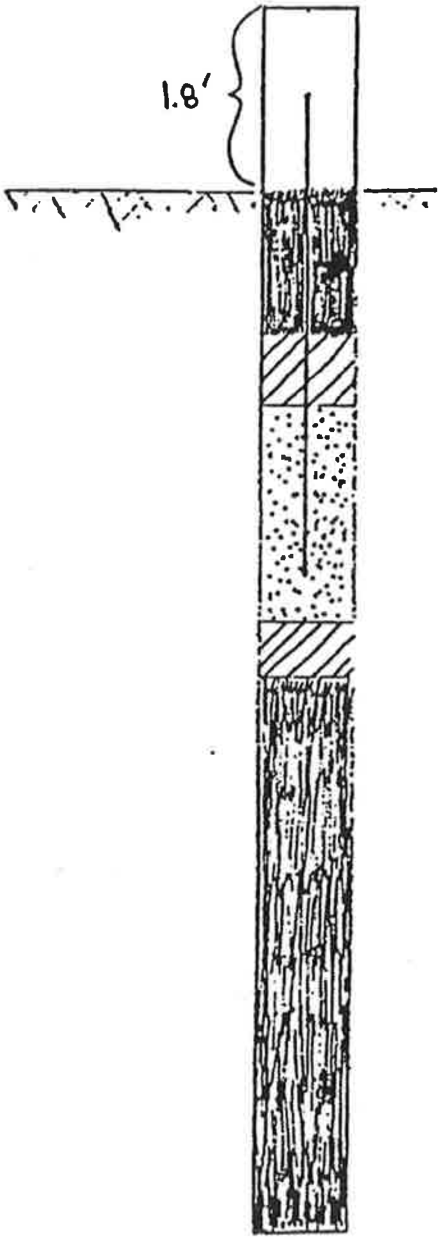
______ Datum

Field Party: Smith - Bumgarner

2" PVC rizer pipe

2" PVC .02 well screen

3" steel protector set in grout



Grout from 0 to 31.0 ft.

Bentonite seal from 31.0 to 33.5 ft.

Sand from 33.5 to 47.5 ft.

Screen from 35.5 to 45.5 ft.

Bentonite seal from 47.5 to 48.3 ft.

Cuttings from 48.3 to 85.0 ft.

ttom of boring 85.0 ft.

Figure 5

PLATE 25

FORM CE-5
REV. 8/81

AMERICAN ELECTRIC POWER SERVICE CORPORATION

N 1325.9

AEP CIVIL ENGINEERING LABORATORY

E 18,159.2

LOG OF BORING IJ

//s ||d

B-10

JOB NO. ____

COMPANY A.E.P.

PROJECT ZIMMER FGD

BORING NO. II DATE 7-23-85 SHEET 1 OF 2

TYPE OF BORING ____ RIG CME-75

CASING USED 20' SIZE NW DRILLING MUD USED ____

BORING BEGUN 7-23-85 BORING COMPLETED 7-23-85

GROUND ELEVATION 850.5 REFERRED TO ____

DAT

FIELD PARTY: SmiTH - Bumgarner

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION	DEPTH IN FEET	DESCRIPTION SOIL TYPE, COLOR, TEXTURE, CONSISTENCY, SAMPLER DRIVING NOTES BLOWS PER FOOT ON CASING, DEPTHS WASH WATER LOST, OBSERVED FLUCTUATIONS IN WATER LEVEL, NOTES ON DRILLING EASE, ETC.
								0	ROTARY wash + NQ core
								1	
								2	
								3	6 Sec. 1200 PSI 2.0 Push
1	3.0	5.0				1.6		4	TOP 7" MED. BRWN SDY CLAY CS SD SIZE IRON NODULES & SS FRAG
								5	BOTTOM 13" TAN-ORG BRWN SDY CLAY CS SD SIZE IRON NOD. & SS FRAG.
								6	Couldn't push Tube
2	6.0	8.0						7	
								8	Sandy Clay: Br. moisT - Quartz
3	8.0	9.5	16	21	33	12"		9	+ Limestone sand size material - STRONG Reaction -
								10	(Till)
								1	
								2	
								3	Sandy clay silT - Gray - moisT - LimeSTone + Quartz sand size
4	13.0	14.4	36	38	50/.4	6"		4	material - STRONG Reaction to HCL
								5	(Till)
								6	
								7	
								8	
								9	Sandy silTy Clay - Gray + Gray BR
5	19.5	21.0	10	15	18	8"		20	mottled - moisT - STRONG REACTION TO HCL - (Till)

ENGINEER

FORM CE-5
REV. 5/81

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________

COMPANY ____________

PROJECT ____________

LOCATION OF BORING: ____________

WATER LEVEL	
TIME	
DATE	

BORING NO. IJ DATE ____________ SHEET 2 OF 4

TYPE OF BORING ____________ RIG ____________

CASING USED ____________ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ____________ BORING COMPLETED ____________

GROUND ELEVATION ____________ REFERRED TO ____________ DATU

FIELD PARTY: ____________

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION	DEPTH IN FEET	DESCRIPTION SOIL TYPE, COLOR, TEXTURE, CONSISTENCY, SAMPLER DRIVING NOTES BLOWS PER FOOT ON CASING, DEPTHS WASH WATER LOST, OBSERVED FLUCTUATIONS IN WATER LEVEL, NOTES ON DRILLING EASE, ETC.
								20	
								1	
								2	
								3	
								4	
6	24.5	26.0	11	26	33	14"		5	Clay. Blue Gray- moist- Slight Reaction To HCl - Trace of Sand
								6	
								7	
								8	
								9	
7	29.5	31.0	14	16	16	16"		30	Clay- Blue Gray- moist- med To low plasticity- Trace of organic material- 8
								1	
								2	
								3	
								4	
8	34.5	36.0	12	16	20	16"		5	Clay. Blue Green- moist- med To low plasticity- moderate Reaction To HCl
								6	
								7	
								8	
								9	
9	39.5	39.6	50/.1					40	Drilled into Rock To 41.0

ENGINEER

FORM CE-5
REV 5/81

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NO. ____________

PANY ____________

ROJECT ____________

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. I J DATE ____________ SHEET 3 OF 4

TYPE OF BORING ____________ RIG ____________

CASING USED ____________ SIZE ______ DRILLING MUD USED ____________

BORING BEGUN ____________ BORING COMPLETED ____________

GROUND ELEVATION ____________ REFERRED TO ____________

____________ DATUM

FIELD PARTY: ____________

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION RQD	DEPTH IN FEET	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								40	Gray clay shale
	41.0	43.7				1.9	0	1	
								2	water Return stop AT 44.0
								3	* 43.7 - 55
	43.7	50.0				6.3	31%	4	Gray clay shale w/ laminated Layers of limestone
								5	
								6	
								8	
								9	
	50.0	55.0				4.8	28%	50	
								1	
								2	
								3	
								4	
								5	55.0 - 66.0
	55.0	63.7				8.7	21%	6	Gray clay shale
								7	
								8	
								9	
								60	

ENGINEER ____________

FORM CE-5
REV. 5/81

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ______

[COM]PANY ______

[P]ROJECT ______

LOCATION OF BORING:

WATER LEVEL	
TIME	
DATE	

BORING NO. I J DATE ______ SHEET 4 OF 4

TYPE OF BORING ______ RIG ______

CASING USED ______ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ______ BORING COMPLETED ______

GROUND ELEVATION ______ REFERRED TO ______ DATUM

FIELD PARTY: ______

SAMPLE No.	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"			TOTAL LENGTH RECOVERY	ELEVATION RQD	DEPTH IN FEET	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								40	
								1	
								2	
								3	
	63.7	66.0				2.3	0	4	
								5	
								6	66.0 - 70.0
	66.0	70.0				4.0	58%	7	Gray clay shale w/ laminated Layers of Limestone
								8	
								9	
								70	Gray clay shale
	70.0	75.0				5.0	67%	1	
								2	
								3	
								4	
								5	
	75.0	85.0				10.0	38%	6	Gray clay shale w/ laminated Layers of Limestone
								7	
								8	
								9	
								80	
									Stopped boring 85.0

7-23-85 Bailed water to

10.0 - 7-25-85 water 10'

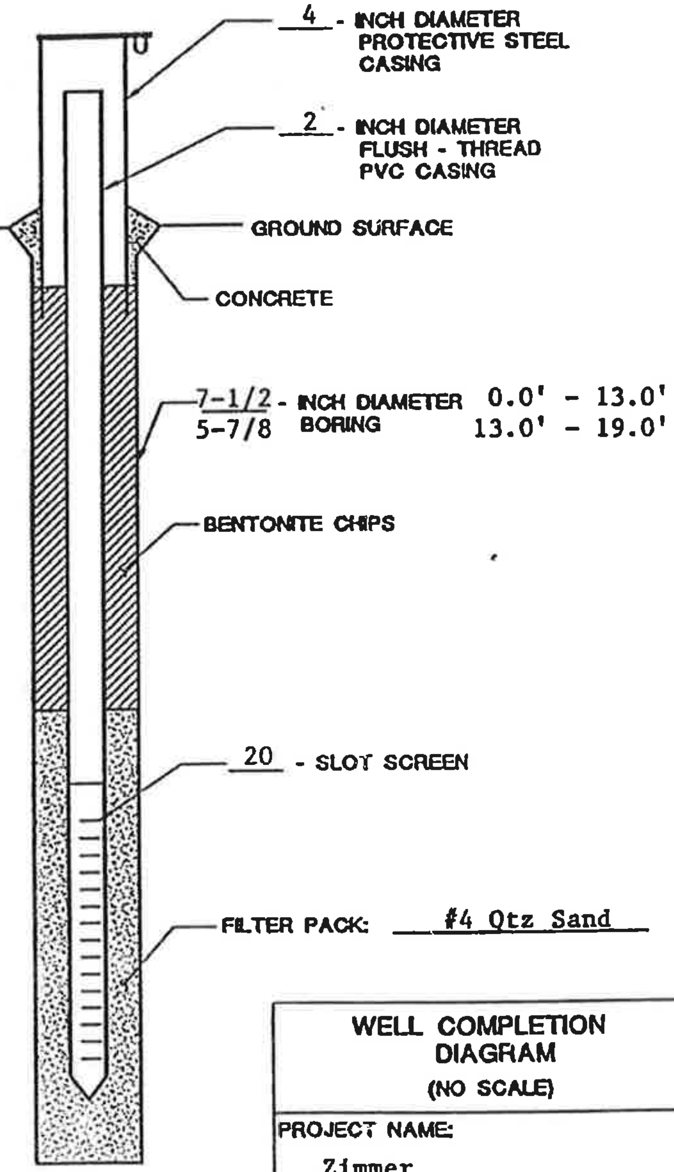
7-30-85 water 11.5 installed

2" PVC + Bailed water to

32.0 - 8-1-85 water Elev. 11.0

ENGINEER --

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
862.43	2.3	TOP OF COVER
862.22	2.1	TOP OF PVC
860.1	0.0	GROUND SURFACE
855.6	4.5	TOP OF BENTONITE
852.1	8.0	TOP OF FILTER PACK
853.8	6.3	TOP OF AQUIFER
851.9	9.1	TOP OF SCREEN OPENINGS
841.7	18.4	BOTTOM OF SCREEN OPENINGS
841.3	18.8	BOTTOM OF WELL
841.1	19.0	BOTTOM OF AQUIFER
840.8	19.3	BORING DEPTH



WELL COMPLETION DIAGRAM

(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-13S (B-117)

DATE WELL INSTALLED: 2/27/97

BBC & M PROJECT NO: 5718

STATIC WATER LEVEL #	857.85	841.38		
DATE:	3/5/97	4/9/97		

WELL DEVELOPMENT:

3/5 Hand bailed 20 gallons

3/7 Hand bailed 10 gallons, water slightly silty

FEET ABOVE MSL

FORM CE-5
REV. 1/87

Well 13

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO.
COMPANY A E P
PROJECT Zimmer Sludge Land Fill
COORDINATES N. 1680 - E. 19730

LOCATION OF BORING:	
WATER LEVEL	Dry
TIME	
DATE	

BORING NO. B-22 DATE 2-26-87 SHEET 1 OF 3
TYPE OF SAMPLES: SPT X 3" TUBE ____ CORE X
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN 2-26-87 BORING COMPLETED 2-26-87
GROUND ELEVATION 859.88 REFERRED TO ____ DATUM
FIELD PARTY T. Smith - Bumgarner RIG 75

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
1	2.0	3.5	4	7	10	7"		2			Clayey Silt- Br- Gr. moist	
								4				
								6				
2	7.0	7.5	50			2"					Weathered Lime stone	
								8				
								10			Auger Refusal 10.5	
	10.5	15.0				3.1	0					
								12			Gr. lime stone .1-.2 long w/ clay shale layers	
								14				
	15.0	25.0				6.8	0	16			lime stone Gr. max length .25" + .3 clay shale	
								18				
								20				

6" x 3.25 HSA	
HW ~~Casing Advancer~~ 4"	X
NQ Core Rock	X
NW Casing 3"	
SW Casing 6"	

RECORDER ____

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____________

COMPANY ____________

PROJECT ____________

COORDINATES ____________

BORING NO. B-22 DATE ____________ SHEET 2 OF 3

TYPE OF SAMPLES: SPT ______ 3" TUBE ______ CORE ______

CASING USED ______ SIZE ______ DRILLING MUD USED ______

BORING BEGUN ______ BORING COMPLETED ______

GROUND ELEVATION ______ REFERRED TO ______ DATUM

FIELD PARTY ______ RIG ______

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								20				
								22				
								24				
	25.0	35.0				9.5	0				Gray Lime stone w/ Layers of Clay shale - max length of lime stone .25 + clay shale .3	
								26				
								28				
								30				
								32				
								34				
	35.0	45.0				8.2	12	36			Clay shale. Gr w/ Layers of Lime stone - max Length of clay shale .75 + lime-stone .2	
								38				
								40				

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____________

FORM CE-5
REV. 1/87

AMERICAN ELECTRIC POWER SERVICE CORPORATION
AEP CIVIL ENGINEERING LABORATORY
LOG OF BORING

JOB NO. ____
COMPANY ____
PROJECT ____
COORDINATES ____

BORING NO. B-22 DATE ____ SHEET 3 OF 3
TYPE OF SAMPLES: SPT ____ 3" TUBE ____ CORE ____
CASING USED ____ SIZE ____ DRILLING MUD USED ____
BORING BEGUN ____ BORING COMPLETED ____
GROUND ELEVATION ____ REFERRED TO ____
____ DATUM
FIELD PARTY ____ RIG ____

LOCATION OF BORING:	
WATER LEVEL	
TIME	
DATE	

SAMPLE NUMBER	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOW / 6"			TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPH LOG	USCS	SOIL / ROCK IDENTIFICATION	DRILLER'S NOTES
								40				
								42				
								44				
	45.0	50.5				5.5	11					
								46			GRAY lime STone w/ LAYERS OF clay Shale - MAX LengTH OF lime STone .2 - clay Shale .7	
								48				
								50				
											STopped Hole 50.5 FT	
								52			+ INSTAlled piezometer	
											WATER Level 45.5 FT	
											16 HRS LATER 6.0	

6" x 3.25 HSA
HW CASING ADVANCER 4"
NQ CORE ROCK
NW CASING 3"
SW CASING 6"

RECORDER ____

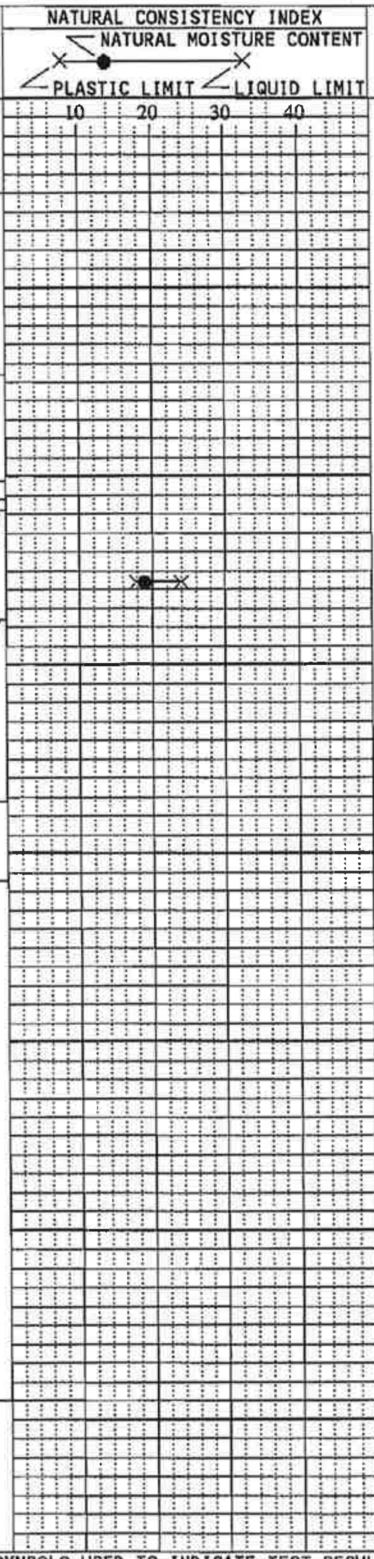
BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-309
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

Page 1 of 2

LOCATION: **S 1,461; E 15,918** ELEVATION: **823.5** DATE: **2/11/97 2/13/97**
DRILLING METHOD: **4-1/4" I.D. Hollow-stem Auger; Air Rotary** COMPLETION DEPTH: **68.5'**
SAMPLER(S): **2" O.D. Split-barrel Sampler; NQM Rock-core Barrel**

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION	TEST RESULTS
0	1	1/3/3/2	FILL: Medium-stiff to very-stiff brown with gray lean clay with sand (CL).	H=0.6-3.4
	2A	5/5/6/7		H=0.6-1.2
	2B		Very-stiff to hard brown sandy lean clay, few desiccation planes with oxidation, (CL).	H=3.7-4.5+
5	3	8/12/11/12		H=4.5+
	4A	8/12/12/16		H=4.5+
	4B		Very-stiff to hard gray lean clay with sand, few cobbles.	H=4.5+
	5	7/8/13/32		H=2.4-4.5+
10	6A	11/12/13/14	Medium-dense brown poorly graded sand with gravel, (SP-SC).	
	6B			
	6C		Medium-dense elastic silt, (MH).	H=3.2-4.5+
	▽ 7	7/10/9/12	Very-stiff to hard gray silty clay, few seams (<1/4") silt to fine sand, (CL-ML). - At 12.7', 1" seam of fine to coarse sand.	H=3.1-4.4
15	8	5/6/6/6	Very-stiff to hard gray lean clay with sand, occasional desiccation plane, (CL).	H=2.6-4.5+
	9	7/9/11/11		H=4.5+
	10A	10/33/38/48		H=2.1-4.5+
	10B		Very-soft gray with brown shale, nearly horizontally bedded, similar to soil.	H=4.5+
20				RQD 0%
	11	NQM REC 38%	Very-soft gray shale, nearly horizontally bedded, many seams 1/4" to 5" of medium-hard fossiliferous limestone, numerous horizontal fractures, partly similar to soil, 26% limestone.	
				RQD 10% K=9.4E-3
25	12	NQM REC 22%		
				RQD 0% K=3.2E-3
30	13	NQM REC 29%		
				RQD 21%
	14	NQM REC 58%		
				RQD 44% K=3.3E-3
35	15	NQM REC 84%	Soft gray with streaks of brown shale, nearly horizontally bedded, horizontal fractures, few seams 1/4" to 3" medium-hard fossiliferous limestone, 15% limestone.	



WATER LEVEL: ▽ 13.1
WATER NOTE:
DATE: 02/13/97

SYMBOLS USED TO INDICATE TEST RESULTS
G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES
H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718

-CONTINUED-

BBC&M

LOG OF BORING NO. B-309
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: **S 1,461; E 15,918** ELEVATION: **823.5** DATE: **2/11/97 2/13/97**

DRILLING METHOD: **4-1/4" I.D. Hollow-stem Auger; Air Rotary** COMPLETION DEPTH: **68.5'**

SAMPLER(S): **2" O.D. Split-barrel Sampler; NQM Rock-core Barrel**

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX (NATURAL MOISTURE CONTENT; PLASTIC LIMIT; LIQUID LIMIT) 10 20 30 40	TEST RESULTS
40	16	NQM REC 45%	Very-soft gray with yellow-brown shale, nearly horizontally bedded, few thin seams 1/4" to 2" medium-hard fossiliferous limestone, many horizontal fractures.		RQD 0% K=3.9E-3
	17	NQM REC 17%			RQD 0%
45	18	NQM REC 32%			RQD 0% K=3.3E-3
	19	NQM REC 80%	- From 46.6' to 47.1', vertical fracture.		RQD 0%
50	20	NQM REC 76%	Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/2" to 2", medium-hard gray fossiliferous limestone, 31% limestone. - From 50.3' to 50.8', vertical fracture. - From 50.3' to 51.3', limestone.		RQD 32% K=2.6E-3
55	21	NQM REC 100%	- From 55.9' to 57.2', limestone.		RQD 72% K=5.9E-4
60	22	NQM REC 99%			RQD 78% K=2.0E-5
65			Medium-hard gray limestone, nearly horizontally bedded, fossiliferous, many horizontal fractures, many seams 1/4" to 1.5' shale, 43% shale.		K=1.5E-3
70			- Slight seepage from 10.1' to 10.9'. - Seepage at 12.7'. - Encountered water from 20.7' to 34.5' (3-5 gpm). - Encountered water from 38.0' to 42.3'. - K values from packer tests, tests completed on 5' intervals. - Boring converted to groundwater monitoring well MW-16D.		
75					

WATER LEVEL: ⊻ 13.1 ⊻ ⊻

WATER NOTE:

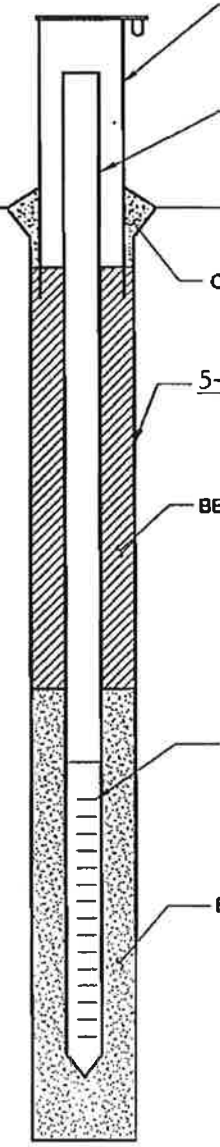
DATE: 02/13/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
} SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
825.59	2.1	TOP OF COVER
825.35	1.9	TOP OF PVC
823.5	0.0	GROUND SURFACE
819.0	4.5	TOP OF BENTONITE
801.3	22.2	TOP OF FILTER PACK
804.9	18.6	TOP OF AQUIFER
801.3	22.2	TOP OF SCREEN OPENINGS
794.1	29.4	BOTTOM OF SCREEN OPENINGS
793.5	30.0	BOTTOM OF WELL
776.2	47.3	BOTTOM OF AQUIFER
755.0	68.5	BORING DEPTH



4 - INCH DIAMETER PROTECTIVE STEEL CASING

2 - INCH DIAMETER FLUSH - THREAD PVC CASING

GROUND SURFACE

CONCRETE

5-7/8 INCH DIAMETER BORING

BENTONITE CHIPS

20 - SLOT SCREEN

FILTER PACK: #4 Qtz Sand

WELL COMPLETION DIAGRAM

(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-16D (B-109)

DATE WELL INSTALLED: 2/13/97

BBC & M PROJECT NO: 5718

Bottom Seal (Bentonite Chips) 31.7' - 35.0'

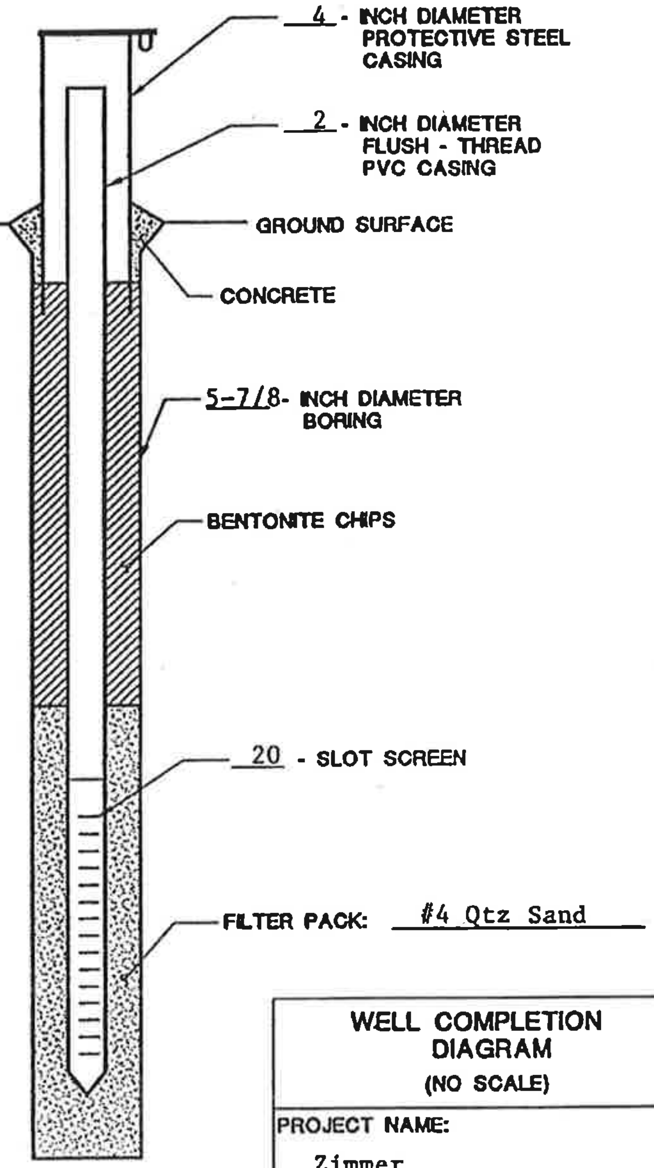
STATIC WATER LEVEL #	812.29	812.42	811.54	
DATE:	2/14/97	3/7/97	4/9/97	

WELL DEVELOPMENT:

2/19	Hand bailed 20 gallons
3/7	Hand bailed 15 gallons, water slightly silty

FEET ABOVE MSL

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
887.61	2.1	TOP OF COVER
887.37	1.9	TOP OF PVC
885.5	0.0	GROUND SURFACE
881.0	4.5	TOP OF BENTONITE
875.1	10.4	TOP OF FILTER PACK
877.1	8.4	TOP OF AQUIFER
875.1	10.4	TOP OF SCREEN OPENINGS
866.0	19.5	BOTTOM OF SCREEN OPENINGS
865.4	20.1	BOTTOM OF WELL
865.5	20.0	BOTTOM OF AQUIFER
766.7	118.8	BORING DEPTH



Bottom Seal (Bentonite Chips) 20.7' - 24.0'

WELL COMPLETION DIAGRAM

(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-18 (B112)

DATE WELL INSTALLED: 2/24/97

BBC & M PROJECT NO: 5718

STATIC WATER LEVEL #	877.61	876.20		
DATE:	2/26/97	4/9/97		

WELL DEVELOPMENT:

2/26	Hand bailed 7 gallons, nearly dry
3/6	Hand bailed 5 gallons, nearly dry, water silty

FEET ABOVE MSL

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

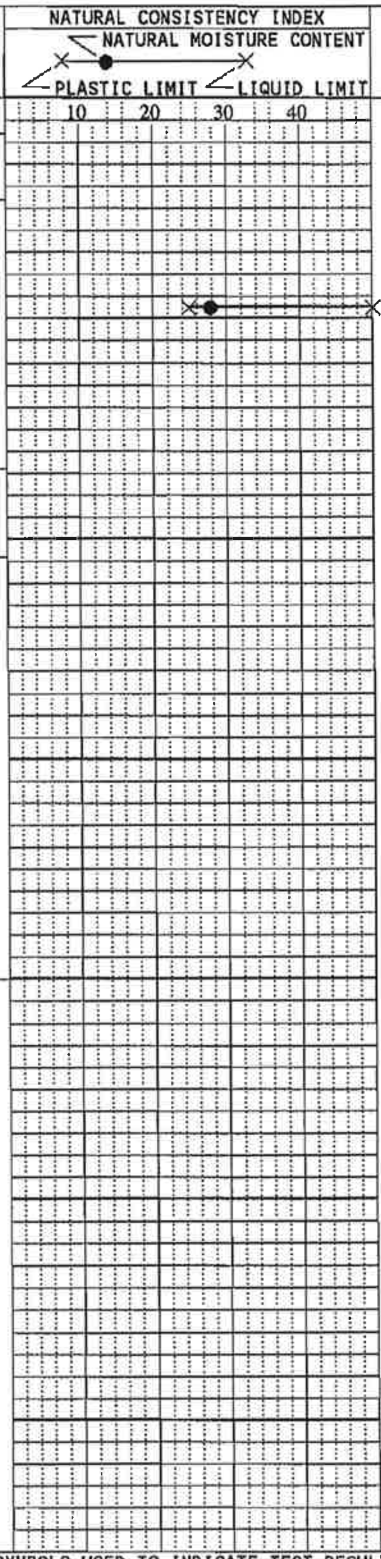
Page 1 of 4

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION	TEST RESULTS
0			TOPSOIL - 10 INCHES	
	1	1/2/2/3	Medium-stiff to stiff brown lean clay, (CL).	H=0.8-1.6
	2	3/3/6/8	Very-stiff to hard brown mottled gray fat clay, (CH).	H=2.3-4.5+
5	3	5/6/7/10		H=2.3-3.6
	4	4/13/11/7		H=2.4-3.4
	5A	15/29/33/50-4"R		H=3.2-3.6
	5B		Very-soft brown shale, nearly horizontally bedded, many seams 1/2" to 1" medium-hard gray limestone, partly similar to soil.	H=2.7-4.5+
10	6	50-5"R		H=4.5+
	7	NQM REC 76%	Soft to medium-hard gray with streaks of brown interbedded shale and limestone, nearly horizontally bedded, many horizontal fractures, limestone beds 1/2" to 6", shale beds 1/4" to 8", 44% limestone.	RQD 24%
				RQD 44%
		NQM REC 94%		
15	8			K=1.3E-4
				K=6.8E-5 RQD 54%
		NQM REC 96%		
20	9		Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.	
				K=2.2E-7 RQD 81%
		NQM REC 99%		
25				
				K=5.2E-7
	10			
30				



WATER LEVEL:	"Dry"		
WATER NOTE:			
DATE:	02/21/97		

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718

-CONTINUED-

BBC&M

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

Page 2 of 4

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
			NQM REC 94%	Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.		K=2.2E-7 RQD 49%
35						
	11					K=1.0E-7
40						RQD 63%
			NQM REC 96%			
	12					K=2.2E-7 RQD 54%
			NQM REC 98%			
45						
						K=1.0E-7
	13					
50						
			NQM REC 100%			K=1.1E-7 RQD 64%
55						
						K=1.0E-7
	14					
60						
			NQM REC 100%			K=1.1E-7 RQD 77%
65						

WATER LEVEL: ∇ "Dry"

WATER NOTE:

DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

-CONTINUED-

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

Page 3 of 4

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'

SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX NATURAL MOISTURE CONTENT PLASTIC LIMIT — LIQUID LIMIT 10 20 30 40	TEST RESULTS
	15			Medium-hard with zones of soft gray shale, nearly horizontally bedded, silty in parts, many seams 1/2" to 11" fossiliferous limestone, many horizontal fractures, 36% limestone.		K=1.0E-7
70				Medium-hard gray limestone, nearly horizontally bedded, fossiliferous, many horizontal fractures, numerous 1/8" to 1/2" shale partings, few seams 2" to 6" of soft shale.		
			NQM REC 99%			K=3.2E-7 RQD 49%
75						
	16					K=1.0E-7
80				Soft to medium-hard gray interbedded shale and fossiliferous, limestone, nearly horizontally bedded, many horizontal fractures, shale beds 1/4" to 8", limestone beds 1/2" to 3", 52% shale.		
			NQM REC 100%			K=1.1E-7 RQD 51%
85						
	17			Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/4" to 5" medium-hard fossiliferous, limestone, 19% limestone.		K=4.2E-7
90						
			NQM REC 88%			K=5.4E-7 RQD 46%
95				- From 95.3' to 95.6', vertical fracture.		
						K=1.0E-7
	18			- From 97.6' to 98.6', vertical fracture.		

WATER LEVEL: ⊻ "Dry" ⊻ ⊻

WATER NOTE:

DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION Q - UNCONFINED COMPR T - TRIAXIAL COMPR C - CONSOLIDATION	SEE SEPARATE CURVES	H - PENETROMETER (tsf) W - UNIT DRY WEIGHT (pcf) D - RELATIVE DENSITY (%)

-CONTINUED-

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-312
ZIMMER FGD LANDFILL EXPANSION
CLERMONT COUNTY, OHIO

LOCATION: N 156; E 21,063 ELEVATION: 885.5 DATE: 2/19/97 2/24/97
DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger; Air Rotary COMPLETION DEPTH: 118.1'
SAMPLER(S): 2" O.D. Split-barrel Sampler; NQM Rock-core Barrel

NATURAL CONSISTENCY INDEX: NATURAL MOISTURE CONTENT; PLASTIC LIMIT; LIQUID LIMIT (scale 10, 20, 30, 40)

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION - CONTINUED	TEST RESULTS
100				- From 99.3' to 103.1', vertical fracture.	
				Soft gray shale, nearly horizontally bedded, many horizontal fractures, few seams 1/4" to 5" medium-hard fossiliferous, limestone, 19% limestone.	K=1.0E-7 RQD 65%
			NQM REC 99%		
105					
					K=1.0E-7
	19				
110					
					K=1.1E-7 RQD 46%
			NQM REC 100%		
115	20				
				- Slight seepage from 10.4' to 20.0' (<1 gpm).	
120				- K values are from packer tests, tests completed on 5' intervals.	
				- Boring converted to groundwater monitoring well MW-18.	
125					
130					

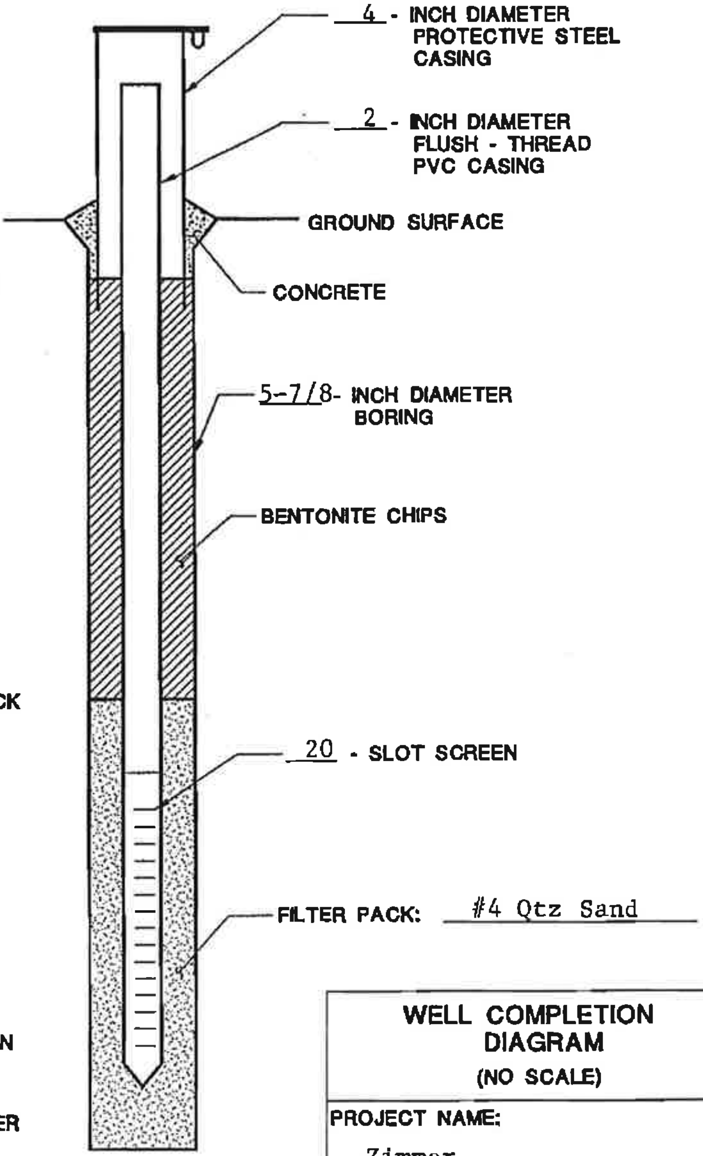
WATER LEVEL: ☒ "Dry"
WATER NOTE:
DATE: 02/21/97

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

ELEV. #	DEPTH BELOW GROUND SURFACE (FEET)	
887.61	2.1	TOP OF COVER
887.37	1.9	TOP OF PVC
885.5	0.0	GROUND SURFACE
881.0	4.5	TOP OF BENTONITE
875.1	10.4	TOP OF FILTER PACK
877.1	8.4	TOP OF AQUIFER
875.1	10.4	TOP OF SCREEN OPENINGS
866.0	19.5	BOTTOM OF SCREEN OPENINGS
865.4	20.1	BOTTOM OF WELL
865.5	20.0	BOTTOM OF AQUIFER
766.7	118.8	BORING DEPTH



4 - INCH DIAMETER PROTECTIVE STEEL CASING

2 - INCH DIAMETER FLUSH - THREAD PVC CASING

GROUND SURFACE

CONCRETE

5-7/8- INCH DIAMETER BORING

BENTONITE CHIPS

20 - SLOT SCREEN

FILTER PACK: #4 Qtz Sand

WELL COMPLETION DIAGRAM

(NO SCALE)

PROJECT NAME: Zimmer

BORING: MW-18 (B112)

DATE WELL INSTALLED: 2/24/97

BBC & M PROJECT NO: 5718

Bottom Seal (Bentonite Chips) 20.7' - 24.0'

STATIC WATER LEVEL #	877.61	876.20		
DATE:	2/26/97	4/9/97		

WELL DEVELOPMENT:

2/26 Hand bailed 7 gallons, nearly dry

3/6 Hand bailed 5 gallons, nearly dry, water silty

FEET ABOVE MSL

BBC&M

LOG OF BORING NO. B-502
ZIMMER FGD LANDFILL MODIFICATION
CLERMONT COUNTY, OHIO

LOCATION: N 754, E 16,726 ELEVATION: 823.2 DATE: 1/18/99 1/19/99

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger COMPLETION DEPTH: 40.5'

SAMPLER(S): 2" O.D. Split-barrel Sampler

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
0				TOPSOIL - 14 INCHES		
				Medium-stiff to stiff gray mottled with brown silty clay, trace fine to coarse sand.		
	1	■	2/3/5			H=.9-1.5
5				Very-stiff to hard brown mottled with gray silty clay, trace fine to coarse sand, trace fine to coarse gravel.		
	2	■	2/5/6			H=2.7-3.5
	3	■	2/4/5			H=2.0-4.1
10						
				Brown fine to coarse sand, some fine to coarse gravel, little clayey silt, few cobbles.		
				Hard brown clayey silt, some fine to coarse sand, trace fine to coarse gravel, few cobbles.		
	4	■	9/22/45			H=4.5+
15						
				Hard gray clayey silt, some fine to coarse sand, little fine to coarse gravel.		
	5	■	12/25/30			H=4.5+
20						
				Very-stiff gray clayey silt with seams of silt, trace fine to coarse sand.		
	6A	■	5/8/12			H=2.6-2.8
25	▽6B	■		Hard gray clayey silt, little fine to coarse sand,		H=4.5+

WATER LEVEL:	▽ 25.0	▼	▼
WATER NOTE:			
DATE:	01/19/99		

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718A

-CONTINUED-

BBC&M

LOG OF BORING NO. B-502
ZIMMER FGD LANDFILL MODIFICATION
CLERMONT COUNTY, OHIO

LOCATION: N 754, E 16,726 ELEVATION: 823.2 DATE: 1/18/99 1/19/99

DRILLING METHOD: 4-1/4" I.D. Hollow-stem Auger COMPLETION DEPTH: 40.5'

SAMPLER(S): 2" O.D. Split-barrel Sampler

DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	DESCRIPTION - CONTINUED	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
25			trace fine to coarse gravel.		
			Very-soft gray shale, nearly horizontally bedded, thinly bedded, many seams medium-hard limestone 1" - 6" thick.		
	7	37 50R-3"			
30					
		50R-1"			
35					
40					
			- Encountered water at 12.0' - 13.0'. - Encountered water below 27.0'. - Boring converted to groundwater monitoring well MW-20D. See well completion diagram.		
45					

WATER LEVEL: ∇ 25.0 ▼ ∇

WATER NOTE:

DATE: 01/19/99

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION
Q - UNCONFINED COMPR
T - TRIAXIAL COMPR
C - CONSOLIDATION
} SEE SEPARATE CURVES

H - PENETROMETER (tsf)
W - UNIT DRY WEIGHT (pcf)
D - RELATIVE DENSITY (%)

JOB: 5718A

PLATE

Page 1 of 2

DATE: 4/19/10 - 4/20/10

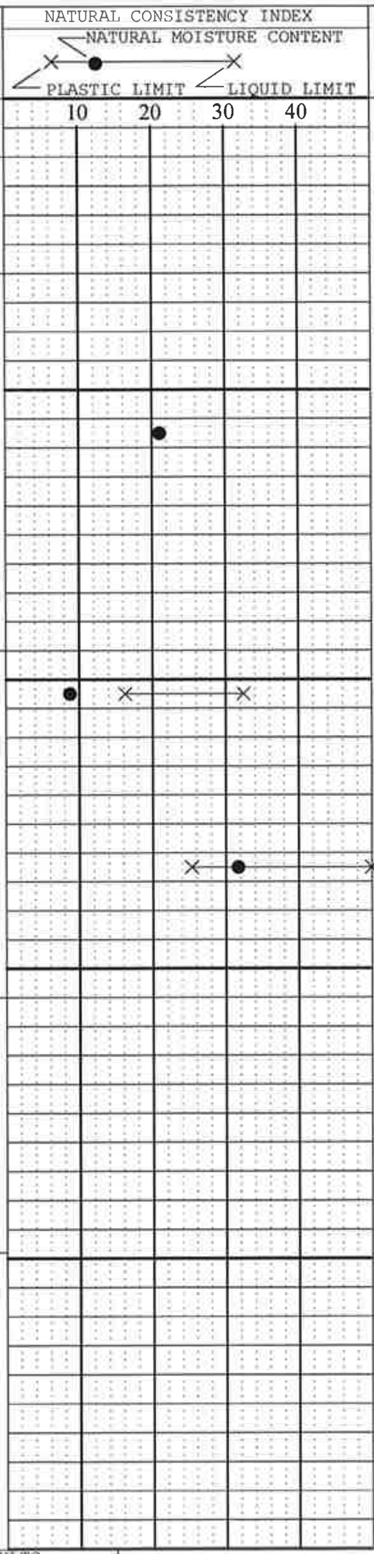
LOG OF BORING NO. MW-21
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked**
COORDINATES : **N -485.9; E 20013.1**
ELEVATION: **859.4**
DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger**
COMPLETION DEPTH: **41.2'**
SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N60	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0							TOPSOIL - 11 INCHES	
858.4									
		1		1/1/1	3	87	CH	Stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, few roots, moist.	H=1.5-1.75
856.4									
		2		P		67	CH	Stiff to very-stiff brown mottled with gray and orange-brown silty clay, some fine to coarse sand, trace fine gravel, cobbles near bottom of stratum, damp.	H=2.75
	5								
		3		3/5/4	13	60			H=2.75-3.5
		4		5/8/25	47	73			H=2.0-3.5
		5		12/11/50-3"R		67			H=1.25
849.9									
	10	6		46/17/25	60	73	CH	Very-stiff to hard brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, numerous cobbles, damp.	H=3.1 G
		7		22/17/11	40	73			H=4.5+
		8		4/5/50-5"R		100			LL=68 H=3.5-4.0
	15	9		12/32/40	102	53			H=4.5+
843.9									
		10		50-3"R		33		Gray fine to coarse gravel (limestone fragments), estimated medium to hard gray limestone interbedded with soft to medium-hard gray shale.	
		11		50-3"R		100			
		12		50-2"R		50			
839.5		13		50-6"R		100			
	20	14		RQD 17%		100		Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures. 52% LIMESTONE, 48% SHALE	
		15		RQD 8%		47			
	25								



WATER LEVEL:	▽ 10.1'	▼ 7.5'
WATER NOTE:	Prior to Coring	After Coring
DATE:	4/19/10	4/20/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

JOB: 011-05718-005

-CONTINUED-

Page 2 of 2

DATE: 4/19/10 - 4/20/10

LOG OF BORING NO. MW-21
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked**
COORDINATES : **N -485.9; E 20013.1**
ELEVATION: **859.4**
DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger**
COMPLETION DEPTH: **41.2'**
SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	NATURAL CONSISTENCY INDEX NATURAL MOISTURE CONTENT PLASTIC LIMIT / LIQUID LIMIT 10 20 30 40	TEST RESULTS
	25							Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures. 52% LIMESTONE, 48% SHALE		
		16		RQD 48%		100				
	30									
		17		RQD 48%		97				
	35									
		18		RQD 8%		99				
	40									
818.2								- Encountered seepage at 17.0'. - Encountered water at 26.0' during coring. - Encountered auger refusal at 19.9'. - Boring converted to groundwater monitoring well-see separate well log MW-21 for well completion diagram. - Boring location and elevation surveyed by ALS, Inc.		
	45									
	50									

WATER LEVEL:	▽ 10.1'	▼ 7.5'
WATER NOTE:	Prior to Coring	After Coring
DATE:	4/19/10	4/20/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

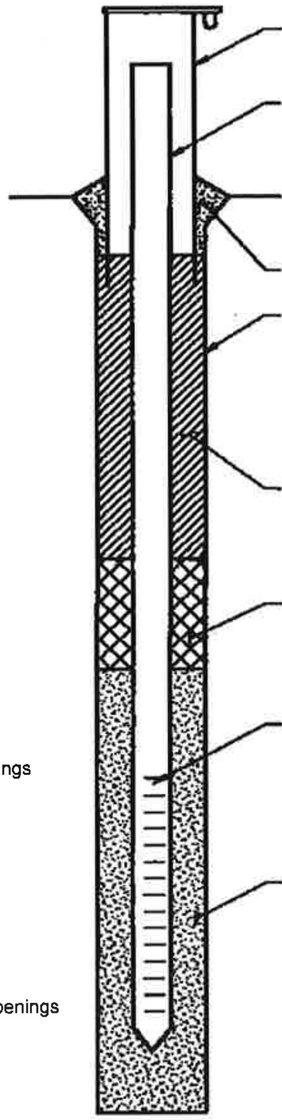
Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

JOB: 011-05718-005

PLATE 73

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
862.66	3.30	Top of Cover
862.20	2.84	Top of PVC
859.4	0.0	Ground Surface
N/A	0.0	Top of Grout
836.4	23.0	Top of Bentonite
834.4	25.0	Top of Filter Pack
#VALUE!	?	Top of Aquifer
831.9	27.5	Top of Screen Openings
822.3	37.1	Bottom of Screen Openings
821.9	37.5	Bottom of Well
N/A	N/A	Bottom of Aquifer
818.2	41.2	Bottom of Boring


(NOT TO SCALE)

4 - Inch Diameter Protective Steel Casing

2 - Inch Diameter Flush-Thread PVC Casing

Ground Surface

Concrete

Boring Diameter (in inches)

6 1/4 "	**0.0**	to	**74.5**
5 5/8 "	**74.5**	to	**97.5**
"		to	

Grout: **Benseal**

Bentonite Seal: **Hole Plug**

20 - Slot Screen

Filter Pack: **No. 5 Quartz Sand**

Static Water Elevation:	851.90	848.80	851.90		
Date:	5/5/10	5/5/10	7/1/10		

Well Development:

- Well surged prior to hand bailing
- 5/5 Hand bailed 5 gallons of water (approx. 10 well volumes)
  (0-3 gallons - clear; 3-5 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
1st reading after surging, 2nd reading after bailing

Well Location:
Plant Coordinates: N. -485.88; E. 20,013.12

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-21

Date Well Installed:
5/4/2010

Page 1 of 2
DATE: 4/21/10 - 4/28/10

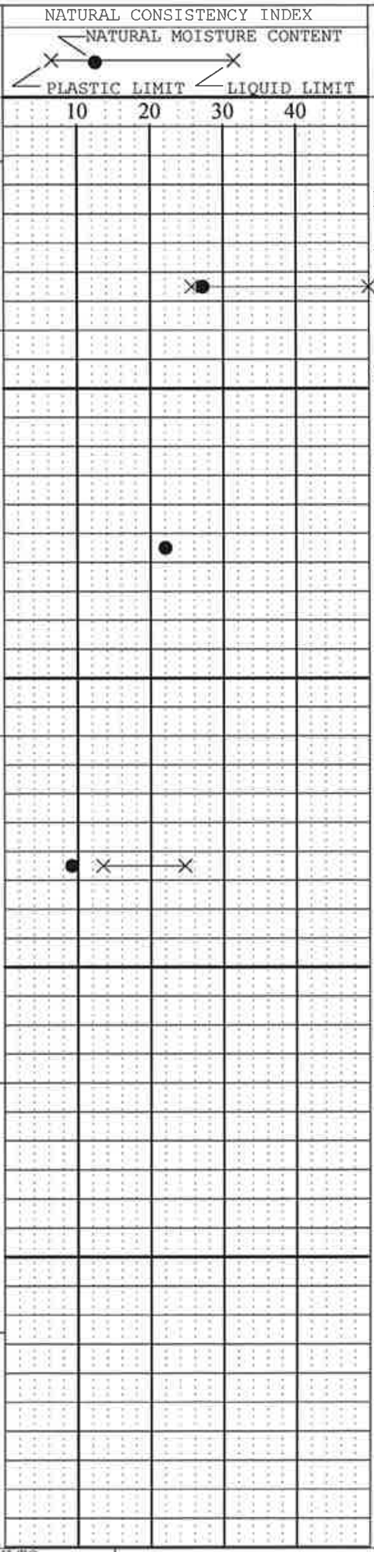
LOG OF BORING NO. MW-22
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N -99.7; E 19123.4** ELEVATION: **864.4**
DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **37.5'**
SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N60	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0							TOPSOIL - 13 INCHES	
863.3							CH	Stiff to very-stiff brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, few roots near bottom of stratum, damp.	
		1		3/4/2	9	47			H=1.0
		2		3/3/4	10	53			LL=65 H=2.25-2.5 G
860.4							CL	Very-stiff to hard brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, damp,	
	5	3		1/2/3	7	67			H=2.0
		4		3/5/9	20	73			H=3.0
		5		4/6/14	28	100			H=3.0-3.25
	10	6		P					
853.4							CL	Hard brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, numerous cobbles, damp.	
		8		14/26/50-5"R		100			H=4.5+
		9		31/35/50-3"R		80			H=4.5+
		10		50-2"R		100			
	15								
		11		32/50-4"R		20			
847.4							CL	Hard gray silty clay, some fine to coarse sand, trace fine gravel, numerous cobbles, damp.	
		12		15/50-5"R		36			
		13		19/43/50-2"R		79			
	20	▽ 14		34/50-3"R		67			
843.1								Soft gray shale interbedded with hard gray limestone. 57% SHALE, 43% LIMESTONE	
		15		RQD 0%					
		16							
	25								



WATER LEVEL:	▽ 20.5	▼ 0.5'
WATER NOTE:	Inside HSA	Prior to Coring
DATE:	4/21/10	4/26/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

JOB: 011-05718-005

-CONTINUED-

Page 2 of 2

DATE: 4/21/10 - 4/28/10

LOG OF BORING NO. MW-22
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked** COORDINATES : **N -99.7; E 19123.4** ELEVATION: **864.4**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **37.5'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	N60	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	25	17					Soft gray shale interbedded with hard gray limestone. 57% SHALE, 43% LIMESTONE	
837.1		18	RQD 0%				Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many horizontal and vertical fractures. 56% LIMESTONE, 44% SHALE	
	30	19	RQD 37%					
	35	20	RQD 32%					
826.9								
	40							
	45							
	50							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT: 10 20 30 40

- Encountered seepage at 4.0' and 19.0'.
- Encountered cobbles at 11.0'.
- Encountered water at 13.7'.
- Boring converted to groundwater monitoring well-see separate well log MW-22 for well completion diagram.
- Boring location and elevation surveyed by ALS, Inc.

	▽	▼
WATER LEVEL:	20.5	0.5'
WATER NOTE:	Inside HSA	Prior to Coring
DATE:	4/21/10	4/26/10

SYMBOLS USED TO INDICATE TEST RESULTS

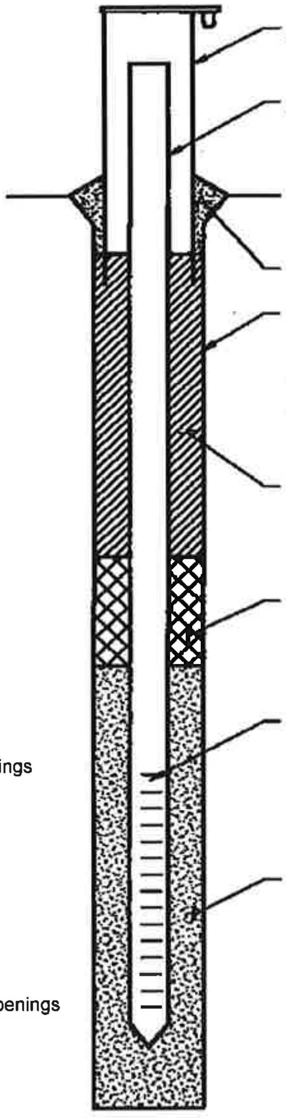
G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
867.33	2.89	Top of Cover
867.11	2.67	Top of PVC
864.4	0.0	Ground Surface
N/A	0.0	Top of Grout
838.4	26.0	Top of Bentonite
836.5	27.9	Top of Filter Pack
#VALUE!	?	Top of Aquifer
836.5	27.9	Top of Screen Openings
826.8	37.6	Bottom of Screen Openings
826.4	38.0	Bottom of Well
N/A	N/A	Bottom of Aquifer
825.9	38.5	Bottom of Boring


(NOT TO SCALE)

4 - Inch Diameter Protective Steel Casing

2 - Inch Diameter Flush-Thread PVC Casing

Ground Surface

Concrete

Boring Diameter (in inches)

6 1/4	"	**0.0**	to	**21.3**
5 5/8	"	**21.3**	to	**38.5**
	"		to	

Grout: **Benseal**

Bentonite Seal: **Hole Plug**

20 - Slot Screen

Filter Pack: **No. 5 Quartz Sand**

Static Water Elevation:	**854.11**	**845.61**	**849.31**	**849.61**	
Date:	**4/28/10**	**4/29/10**	**4/30/10**	**7/1/10**	

Well Development:

- Well surged prior to hand bailing
- 4/15 Hand bailed 7 gallons of water (approx. 10 well volumes
  (0-2 gallons - clear; 2-7 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
1st reading after surging, 2nd reading after bailing

Well Location:
Plant Coordinates: N. -99.68; E. 19,123.36

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-22

Date Well Installed:
4/28/2010

Page 1 of 2

DATE: 2/8/10 - 2/9/10

LOG OF BORING NO. MW-24
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

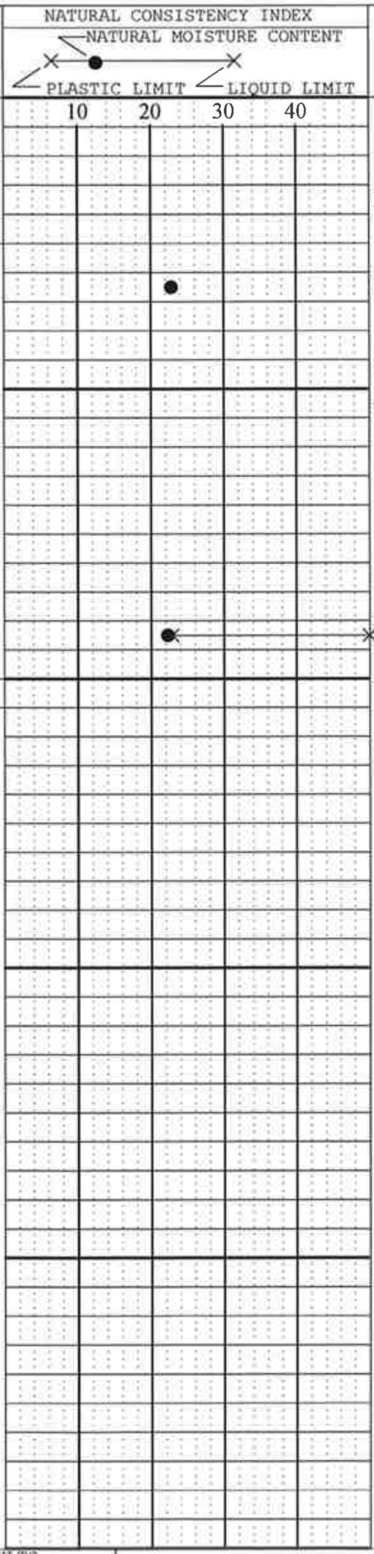
BBCM

LOCATION: **As Staked** COORDINATES : **N 1764.1; E 17056.9** ELEVATION: **850.9**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **34.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE EFFORT	N60	SAMPLE REC-%	USCS	DESCRIPTION	TEST RESULTS
	0					CH	FILL: Hard brown mottled with dark-brown silty clay, little fine to coarse sand, trace fient o coarse gravel, damp.	
		1	2/10/10	28				H=3.75-4.5+
848.4						CH	Very-stiff to hard brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, contains silt seams near top of stratum, few lenses of silt near 6.0', damp.	
		2	5/6/8	20				H=3.5-3.75
	5	3	3/6/12	26				H=3.5-4.5+
		4	7/8/10	26				H=4.0-4.5
		5	3/5/7	17				H=4.5+
		6	3/4/14	26				LL=55 H=3.5-4.5+
840.9	10	7	3/50-0"R			CH	Hard brown silty clay, trace fine sand.	H=4.0-4.5+
840.4							Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many diagonal and horizontal fractures, few fossils (limestone 53%; Shale 47%).	
		8	RQD 0%		64			
	15	9	RQD 0%		55			
	20	10	RQD 15%		80			
	25							



2010 N60 WITH USCS/COOR 15718005.GPJ BBCM.GDT 12/28/10

WATER LEVEL: ▽ "Dry" ▼

WATER NOTE: Prior to Coring

DATE: 2/9/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85

Last Calibration Date : 02/17/09

Drill Rig Number : ATV 550X

JOB: 011-05718-005

-CONTINUED-

Page 2 of 2

DATE: 2/8/10 - 2/9/10

LOG OF BORING NO. MW-24
ZIMMER LANDFILL EXPANSION
MOSCOW, OHIO

BBCM

LOCATION: **As Staked**

COORDINATES : **N 1764.1; E 17056.9**

ELEVATION: **850.9**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger**

COMPLETION DEPTH: **34.2'**

SAMPLER(S): **2-1/2" O.D. Split-barrel Sampler NQ Rock Core Barrel**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	USCS	DESCRIPTION	NATURAL CONSISTENCY INDEX NATURAL MOISTURE CONTENT PLASTIC LIMIT LIQUID LIMIT 10 20 30 40	TEST RESULTS
	25	11	■	RQD 0%		100		Hard gray limestone interbedded with soft to medium-hard gray shale, nearly horizontally bedded, many diagonal and horizontal fractures, few fossils (limestone 53%; Shale 47%).		
	30	12	■	RQD 29%		95				
816.8										
	35							- Encountered seepage at 3.0'. - Encountered water at 17.6'. - Packer testing performed in rock stratum. - Boring converted to groundwater monitoring well-see separate well log MW-24 for well completion diagram. - Boring location and elevation surveyed by ALS, Inc.		
	40									
	45									
	50									

WATER LEVEL: ▽ "Dry" ▼

WATER NOTE: Prior to Coring

DATE: 2/9/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation Q - Uncon Comp T - Triax Comp C - Consol.	See Separate Curves	H - Penetrometer (tsf) W - Unit Dry Wt (pcf) D - Relative Dens (%)

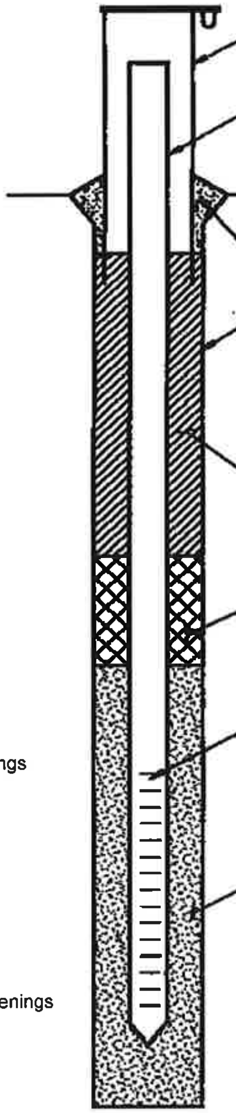
Drill Rod Energy Ratio : 0.85

Last Calibration Date : 02/17/09

Drill Rig Number : ATV 550X

BBCM
SOLUTIONS TO BUILD ON

Elevation (Feet above MSL)	Depth Below Ground Surface (Feet)	
852.71	1.79	Top of Cover
852.59	1.67	Top of PVC
850.9	0.0	Ground Surface
N/A	0.0	Top of Grout
829.9	21.0	Top of Bentonite
827.9	23.0	Top of Filter Pack
#VALUE!	?	Top of Aquifer
825.9	25.0	Top of Screen Openings
816.3	34.6	Bottom of Screen Openings
815.9	35.0	Bottom of Well
N/A	N/A	Bottom of Aquifer
815.9	35.0	Bottom of Boring



(NOT TO SCALE)

4 - Inch Diameter Protective Steel Casing

2 - Inch Diameter Flush-Thread PVC Casing

Ground Surface

Concrete

Boring Diameter (in inches)

6 1/4 " **0.0** to **21.3**

5 5/8 " **21.3** to **38.5**

" to

Grout: **Benseal**

Bentonite Seal: **Hole Plug**

20 - Slot Screen

Filter Pack: **No. 5 Quartz Sand**

Static Water Elevation:	827.19	828.99	820.89	830.99	830.99	830.99
Date:	4/14/10	4/15/10	4/15/10	4/22/10	4/30/10	7/1/10

Well Development:

- Well surged prior to hand bailing
- 4/15 Hand bailed 7 gallons of water (approx. 10 well volumes
  (0-2 gallons - clear; 2-7 gallons slightly silty)
- Top cover set in 3'x3' concrete pad.

Notes: See boring log for stratigraphy - aquifer determined from log.
Packer testing performed prior to well installation.
1st reading prior to packer test, 2nd reading after surging,
3rd reading after bailing.

Well Location:
Plant Coordinates: N. 1,764.12; E. 17,056.91

WELL COMPLETION DIAGRAM

Project Name:
Zimmer Landfill Lateral Expansion PTI

Project Location:
Moscow, Ohio

Project Number:
011-05718-005

Boring Number:
MW-24

Date Well Installed:
4/14/2010

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

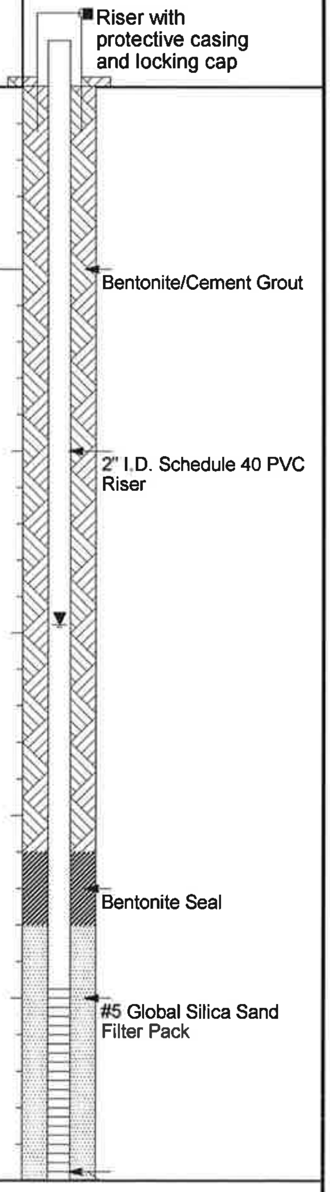
Monitoring Well MW-D

Sheet 1 of 2

Date(s) Drilled	12/14/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	35.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	849.59 feet, msl
Depth to Groundwater	14.77 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	852.34 feet, msl
Diameter of Hole (inches)	6.0	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Diameter of Well (inches)	2	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Type of Sand Pack	#5 Silica Sand				
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Orangish brown clayey laminated SILT with trace angular shale fragments and trace gray laminar and black mottling, medium stiff, slightly moist
845	5		100		Dark gray fossiliferous crystaline LIMESTONE with alternating layers of bluish gray SHALE
840	10		100		
					grades to light gray micritic limestone with alternating layers of gray shale
			86		
835	15				
					grades to gray fossiliferous crystaline limestone with alternating layers of bluish gray shale
830	20		100		
825	25		100		
820	30				

WELL CONSTRUCTION DETAILS

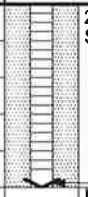


Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-D

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30	▮	100	▦		2" I.D. Schedule 40 0.010" Slotted Screen
815	35				End of boring at 35' bgs	End Cap
810	40					
805	45					
800	50					
795	55					
790	60					
785	65					
780	70					



DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number
2057043
Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

Owner/Builder DYNEGY - ZIMMER

Address of Well Location 1781 SR 52

City MOSCOW Zip Code +4 45153

Permit No. Section; *and or* Lot No.

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N ☒ X 318015 +/- 4593 ft.

S ☐ Y 1494268 +/- 5285 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 852.3 +/- ft.

Datum Plane: ☐ NAD27 ☒ NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-D

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 14 ft. Date 12/14/2015

Measured from TOP OF CASING

Pumping test method

Test Rate gpm Duration of Test hrs.

Feet of Drawdown ft. Sustainable Yield gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☒ No Flowing Well? ☐ Yes ☒ No

PUMP/PITLESS

Type of pump Capacity gpm

Pump set at ft. Pitless Type

Pump installed by

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016
(Filed Electronically)

ODH Registration Number 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 35 ft.
Casing Diameter 2 in. Length 25 ft. Thickness 0.154 in.

2 Borehole Diameter inches Depth ft.
Casing Diameter in. Length ft. Thickness in.

Casing Height Above Ground 2.5 ft.

Type 1: PVC
2:

Joints 1: Threaded
2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 35 ft. and 25 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 250 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 35 ft. To: 23 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 4.5 cubic feet

Method of Installation Pumped w/Tremie pipe

Depth: Placed From: 21 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	CLAYEY	SILT	0	5
DARK GRAY		LIMESTONE AND SHALE	5	35

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/14/2015 Total Depth of Well 35 ft.

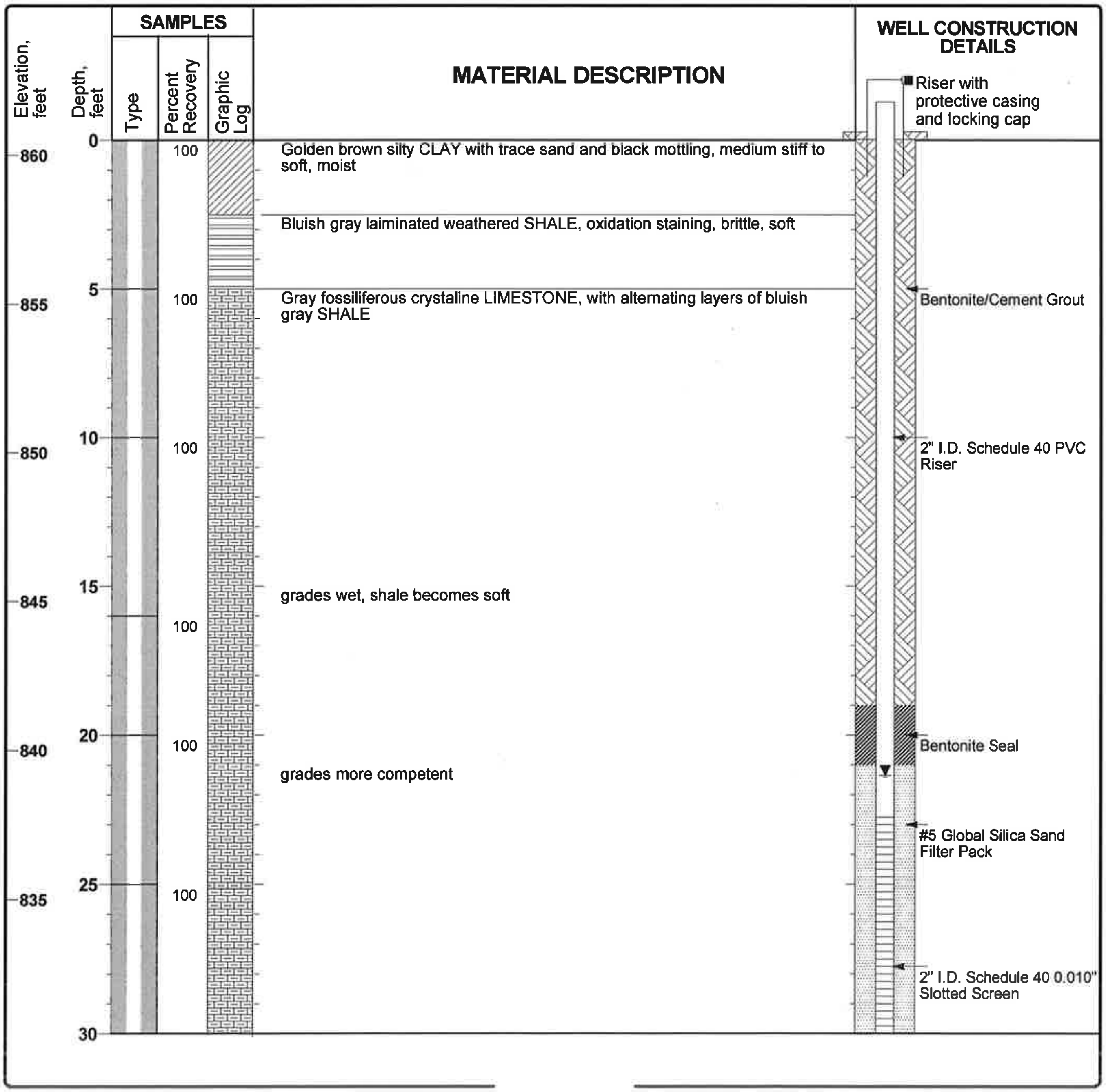
Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-E

Sheet 1 of 2

Date(s) Drilled	12/17/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	33.0 feet
Date of Groundwater Measurement	12/18/15	Sampler Type	Sonic Sleeve	Surface Elevation	860.51 feet, msl
Depth to Groundwater	21.35 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	863.42 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					



Golden brown silty CLAY with trace sand and black mottling, medium stiff to soft, moist

Bluish gray laiminated weathered SHALE, oxidation staining, brittle, soft

Gray fossiliferous crystaline LIMESTONE, with alternating layers of bluish gray SHALE

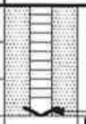
grades wet, shale becomes soft

grades more competent

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-E
Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	 Percent Recovery	 Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
830	30		100	▨		
					End of boring at 33' bgs	End Cap
825	35					
820	40					
815	45					
810	50					
805	55					
800	60					
795	65					
	70					



DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number
2057045
Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

Owner/Builder DYNEGY - ZIMMER

Address of Well Location 1781 SR 52

City MOSCOW Zip Code +4 45153

Permit No. Section; and or Lot No.

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N ☒ X 316677 +/- 2666 ft.

S ☐ Y 1495460 +/- 6258 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 863.4 +/- ft.

Datum Plane: ☐ NAD27 ☒ NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-E

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 21 ft. Date 12/17/2015

Measured from TOP OF CASING

Pumping test method

Test Rate gpm Duration of Test hrs.

Feet of Drawdown ft. Sustainable Yield gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☒ No Flowing Well? ☐ Yes ☒ No

PUMP/PITLESS

Type of pump Capacity gpm

Pump set at ft. Pitless Type

Pump installed by

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016

(Filed Electronically)

ODH Registration Number 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 33 ft.
Casing Diameter 2 in. Length 23 ft. Thickness 0.154 in.

2 Borehole Diameter inches Depth ft.
Casing Diameter in. Length ft. Thickness in.

Casing Height Above Ground 2.5 ft.

Type 1: PVC
2:

Joints 1: Threaded
2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 33 ft. and 23 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 215 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 33 ft. To: 21 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 4.5 cubic feet

Method of Installation Poured (gravity)

Depth: Placed From: 19 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	SILTY	CLAY	0	3
BLUE	BROKEN	SHALE	3	5
GRAY		LIMESTONE AND SHALE	5	33

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/17/2015 Total Depth of Well 33 ft.

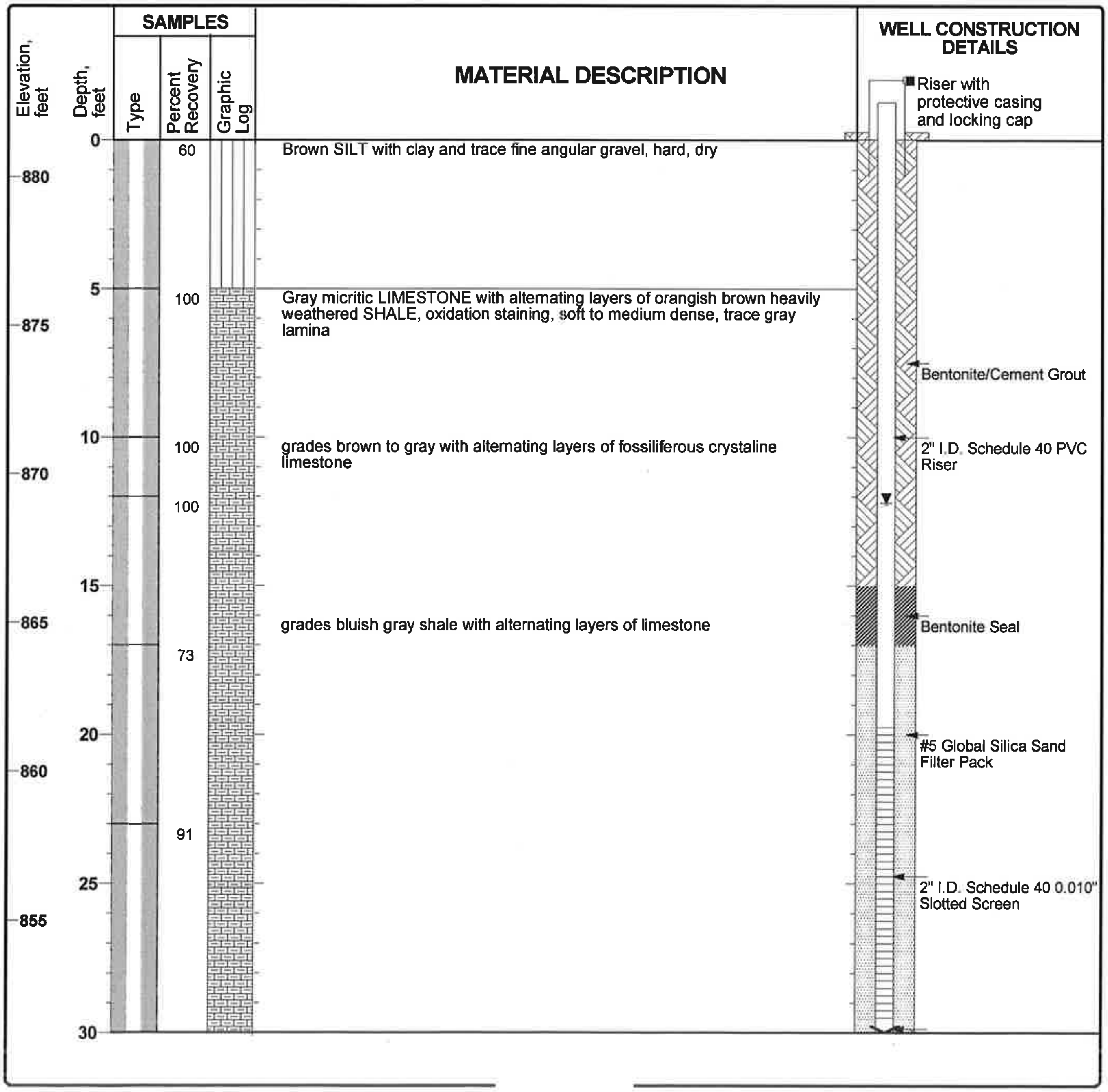
Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-F

Sheet 1 of 2

Date(s) Drilled	**12/16/15**	Logged By	**Becky Smolenski**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**30.0 feet**
Date of Groundwater Measurement	**12/18/15**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**881.23 feet, msl**
Depth to Groundwater	**12.21 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**884.02 feet, msl**
Diameter of Hole (inches)	**6.0**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Diameter of Well (inches)	**2**				
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					



Brown SILT with clay and trace fine angular gravel, hard, dry

Gray micritic LIMESTONE with alternating layers of orangish brown heavily weathered SHALE, oxidation staining, soft to medium dense, trace gray lamina

grades brown to gray with alternating layers of fossiliferous crystaline limestone

grades bluish gray shale with alternating layers of limestone

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well MW-F

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES			MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
		Type	Percent Recovery	Graphic Log		
	30				End of boring at 30' bgs	End Cap
850						
	35					
845						
	40					
840						
	45					
835						
	50					
830						
	55					
825						
	60					
820						
	65					
815						
	70					

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number 2057046

Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

Owner/Builder DYNEGY - ZIMMER

Address of Well Location 1781 SR 52

City MOSCOW Zip Code +4 45153

Permit No. Section; and or Lot No.

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N ☒ X 315312 +/- 3562 ft.

S ☐ Y 1495431 +/- 7322 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 884 +/- ft.

Datum Plane: ☐ NAD27 ☒ NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-F

Comments on water quality/quantity and well construction:

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 30 ft.
Casing Diameter 2 in. Length 15 ft. Thickness 0.154 in.

2 Borehole Diameter inches Depth ft.
Casing Diameter in. Length ft. Thickness in.

Casing Height Above Ground 2.5 ft.

Type 1: PVC
2:

Joints 1: Threaded
2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 30 ft. and 20 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 210 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 30 ft. To: 17 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 4.5 cubic feet

Method of Installation Pumped w/Tremie pipe

Depth: Placed From: 15 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	SILTY	CLAY	0	5
GRAY	BROKEN	LIMESTONE AND SHALE	5	30

Aquifer Type (Formation producing the most water.) LIMESTONE & SHALE

Date of Well Completion 12/16/2015 Total Depth of Well 30 ft.

WELL TEST *

Pre-Pumping Static Level 12 ft. Date 12/16/2015

Measured from TOP OF CASING

Pumping test method

Test Rate gpm Duration of Test hrs.

Feet of Drawdown ft. Sustainable Yield gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☒ No Flowing Well? ☐ Yes ☒ No

PUMP/PITLESS

Type of pump Capacity gpm

Pump set at ft. Pitless Type

Pump installed by

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016
(Filed Electronically)

ODH Registration Number 0120

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

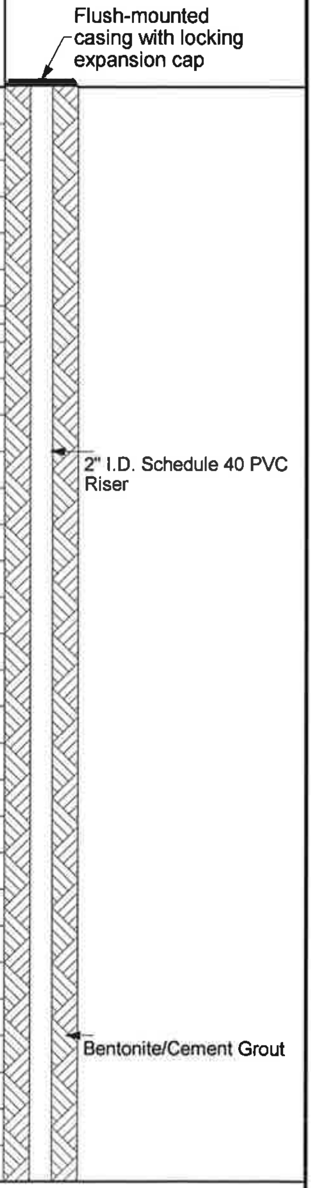
Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-G
Sheet 1 of 2

Date(s) Drilled	11/18/15	Logged By	Becky Smolenski	Checked By	Mike Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	69.0 feet
Date of Groundwater Measurement	12/21/15	Sampler Type	Sonic Sleeve	Surface Elevation	821.84 feet, msl
Depth to Groundwater	33.91 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	821.4 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					

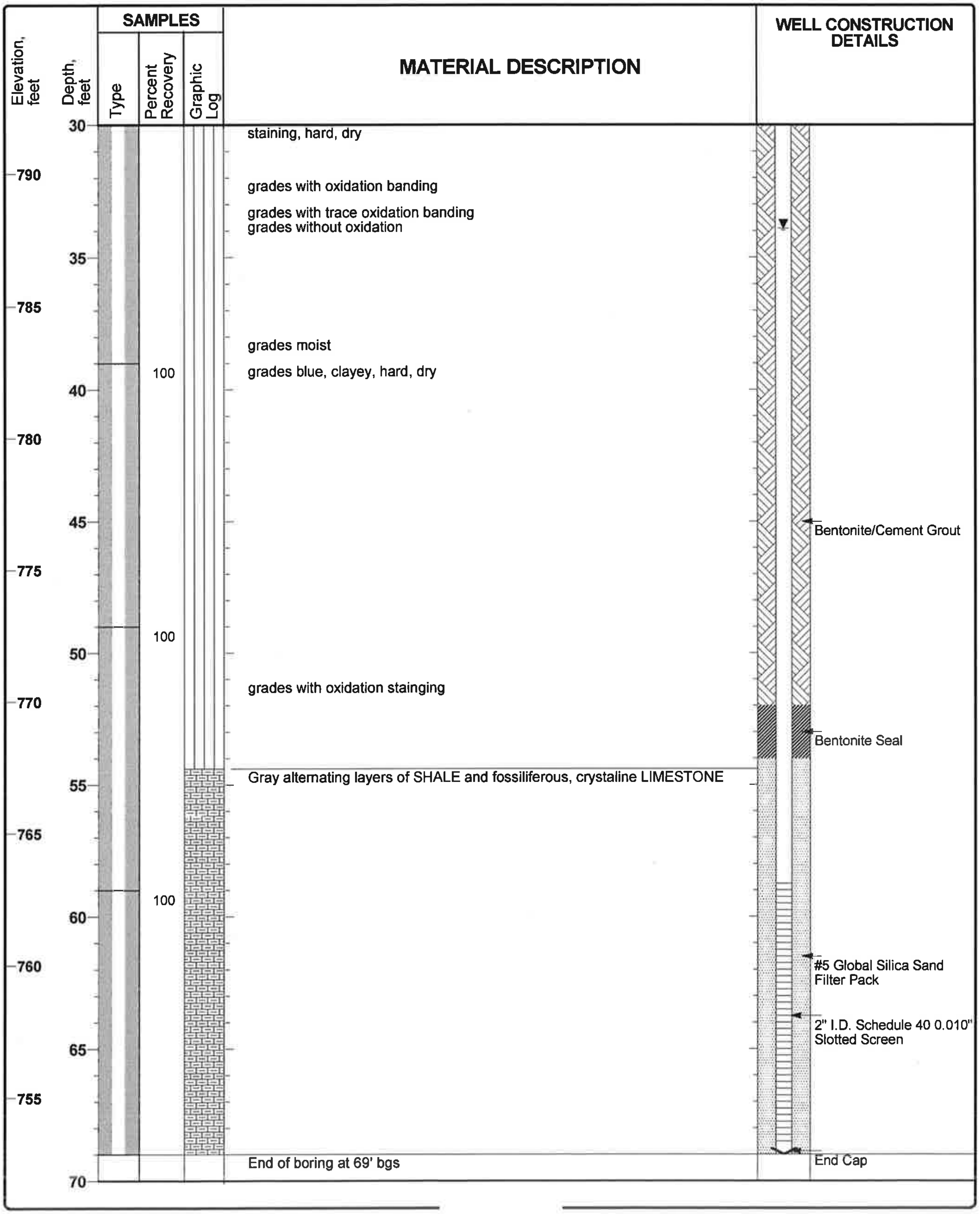
Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		56		Dark brown silty fine to coarse SAND with trace fine gravel, roots, loose, dry to slightly moist
820					Light brown to gray sandy fine to coarse angular limestone GRAVEL, with fines, dense to medium dense, dry [FILL]
	5		80		Brownish yellow high plasticity CLAY with trace fine subrounded gravel and gray and black motting, medium stiff, slightly moist [FILL]
815					Bluish gray silty non-plastic CLAY with trace fine subrounded gravel and brownish yellow mottling, medium stiff to stiff, slightly moist [FILL]
					grades sandy, with fine sand
	10		100		
810					grades gravelly, with fine to coarse angular to subrounded gravel and trace cobbles
					grades with less gravel, with trace brownish yellow and black mottling, hard, dry
	15				clayey fine to coarse angular 4" gravel layer
805					black medium to coarse 2" sand layer grades yellowish brown [NATIVE]
			100		grades with gray and black mottling, laminated, with horizontally oriented gravel
	20				
800					
	25				
795					grades with trace fine gravel
					trace wood fragments
			100		Gray SILT, with trace angular to subrounded fine gravel, heavy oxidation
	30				

WELL CONSTRUCTION DETAILS



Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-G
Sheet 2 of 2



staining, hard, dry

grades with oxidation banding

grades with trace oxidation banding
grades without oxidation

grades moist

grades blue, clayey, hard, dry

grades with oxidation stainging

Gray alternating layers of SHALE and fossiliferous, crystaline LIMESTONE

End of boring at 69' bgs

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number 2057047

Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

DYNEGY - ZIMMER
Owner/Builder

1781 SR 52
Address of Well Location

City MOSCOW Zip Code +4 45153

Permit No. Section; and or Lot No.

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N ☒ X 316282 +/- 484 ft.

S ☐ Y 1492978 +/- 7138 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 821.4 +/- ft.

Datum Plane: ☐ NAD27 ☒ NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-G

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 33 ft. Date 11/18/2015

Measured from TOP OF CASING

Pumping test method

Test Rate gpm Duration of Test hrs.

Feet of Drawdown ft. Sustainable Yield gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☒ No Flowing Well? ☐ Yes ☒ No

PUMP/PITLESS

Type of pump Capacity gpm

Pump set at ft. Pitless Type

Pump installed by

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016
(Filed Electronically)

ODH Registration Number 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 69 ft.
Casing Diameter 2 in. Length 53 ft. Thickness 0.154 in.

2 Borehole Diameter inches Depth ft.
Casing Diameter in. Length ft. Thickness in.

Casing Height Above Ground 1 ft.

Type 1: PVC
2:

Joints 1: Threaded
2:

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 69 ft. and 59 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 350 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 69 ft. To: 54 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 9.5 cubic feet

Method of Installation Pumped w/Tremie pipe

Depth: Placed From: 53 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
DARK BROWN	SILTY	SAND	0	2
BROWN-GRAY	SANDY	GRAVEL	2	5
GRAY-BROWN		SANDCLAYGRAVEL	5	29
GRAY		SILT	29	54
GRAY		SHALE AND LIMESTONE	54	69

Aquifer Type (Formation producing the most water.) SAND/CLAY/GRAVEL

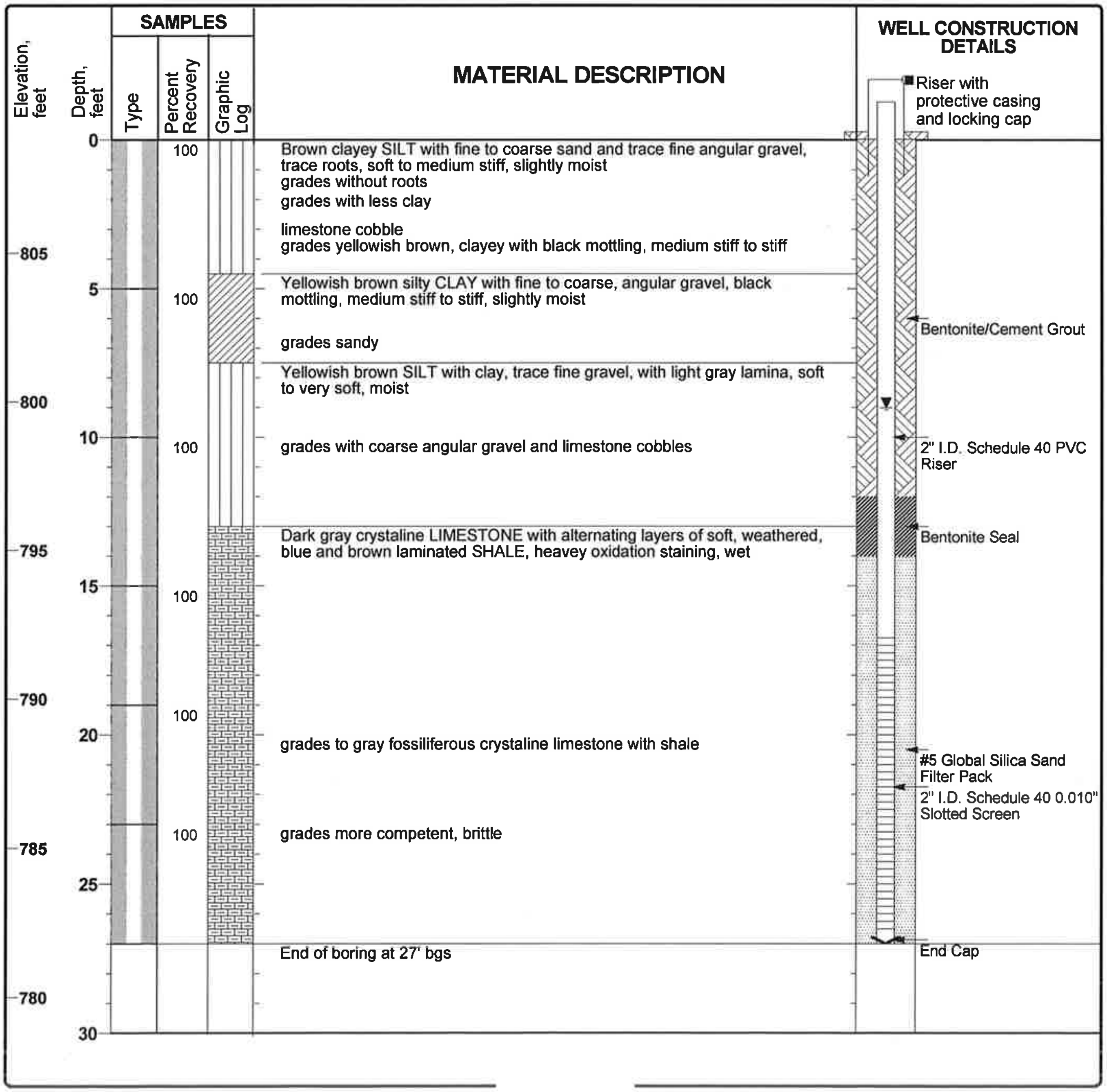
Date of Well Completion 11/18/2015 Total Depth of Well 69 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Project: Dynegy
Project Location: Zimmer Station
Project Number: 60442412

Monitoring Well
MW-H
Sheet 1 of 1

Date(s) Drilled	**11/19/15**	Logged By	**Becky Smolenski**	Checked By	**Mike Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**27.0 feet**
Date of Groundwater Measurement	**12/18/15**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**808.80 feet, msl**
Depth to Groundwater	**9.01 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**811.13 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					



Brown clayey SILT with fine to coarse sand and trace fine angular gravel, trace roots, soft to medium stiff, slightly moist
grades without roots
grades with less clay
limestone cobble
grades yellowish brown, clayey with black mottling, medium stiff to stiff

Yellowish brown silty CLAY with fine to coarse, angular gravel, black mottling, medium stiff to stiff, slightly moist
grades sandy

Yellowish brown SILT with clay, trace fine gravel, with light gray lamina, soft to very soft, moist
grades with coarse angular gravel and limestone cobbles

Dark gray crystaline LIMESTONE with alternating layers of soft, weathered, blue and brown laminated SHALE, heavey oxidation staining, wet
grades to gray fossiliferous crystaline limestone with shale
grades more competent, brittle

End of boring at 27' bgs

DNR 7802.05e

WELL LOG AND DRILLING REPORT

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number 2057048

Page 1 of 1 for this record.

WELL LOCATION

County CLERMONT Township WASHINGTON

Owner/Builder DYNEGY - ZIMMER

Address of Well Location 1781 SR 52

City MOSCOW Zip Code +4 45153

Permit No. ______ Section; ______ and or Lot No. ______

Use of Well MONITOR

Coordinates of Well (Use only one of the below coordinate systems)

State Plane Coordinates

N ☒ X 315757 +/- 4048 ft.

S ☐ Y 1492534 +/- 264 ft.

Latitude, Longitude Coordinates

Latitude: 0 Longitude: 0

Elevation of Well in feet: 811.1 +/- ______ ft.

Datum Plane: ☐ NAD27 ☒ NAD83 Elevation Source TERRESTRIAL

Source of Coordinates: TERRESTRIAL SURVEY

Well location written description:

MW-H

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level 9 ft. Date 11/19/2015

Measured from TOP OF CASING

Pumping test method ______

Test Rate ______ gpm Duration of Test ______ hrs.

Feet of Drawdown ______ ft. Sustainable Yield ______ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☒ No Flowing Well? ☐ Yes ☒ No

PUMP/PITLESS

Type of pump ______ Capacity ______ gpm

Pump set at ______ ft. Pitless Type ______

Pump installed by ______

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm FRONTZ DRILLING, INC.

Address 2031 RD MILLERSBURG

City, State, Zip WOOSTER OH 44691

Signed STEVE FRONTZ Date 5/13/2016

(Filed Electronically)

ODH Registration Number 0120

CONSTRUCTION DETAILS

Drilling Method: ROTOSONIC

BOREHOLE/CASING (Measured from ground surface)

1 Borehole Diameter 6 inches Depth 27 ft.

1 Casing Diameter 2 in. Length 12 ft. Thickness 0.154 in.

2 Borehole Diameter ______ inches Depth ______ ft.

2 Casing Diameter ______ in. Length ______ ft. Thickness ______ in.

Casing Height Above Ground 1 ft.

Type 1: PVC

Type 2: ______

Joints 1: Threaded

Joints 2: ______

SCREEN

Diameter 2 in. Slot Size 0.01 in. Screen Length 10 ft.

Type PREPACKED SLOTTED Material PVC

Set Between 27 ft. and 17 ft.

GRAVEL PACK (Filter Pack)

Material/Size #5 Silica Sand Vol/Wt. Used 210 lbs.

Method of Installation Poured (gravity)

Depth: Placed From: 27 ft. To: 14 ft.

GROUT

Material Bentonite/cement slurry Vol/Wt. Used 4.5 cubic feet

Method of Installation Pumped w/Tremie pipe

Depth: Placed From: 13 ft. To: 0 ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To
BROWN	CLAYEY	SILT	0	4
BROWN	SILTY	CLAY	4	13
DARK GRAY		LIMESTONE AND SHALE	13	27

Aquifer Type (Formation producing the most water.) CLAY

Date of Well Completion 11/19/2015 Total Depth of Well 27 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Deptartment.

Attachment B

Well Wizard Sampling Pumps, Equipment Specifications

PLEASE GIVE THIS INFORMATION PACKET TO THE PERSON(S) COMPLETING THE INSTALLATION

The Information provided within this packet is designed to assist in the installation of **WELL WIZARD**® Pump equipment.

This information has been produced specifically for the site at which this equipment is to be installed.

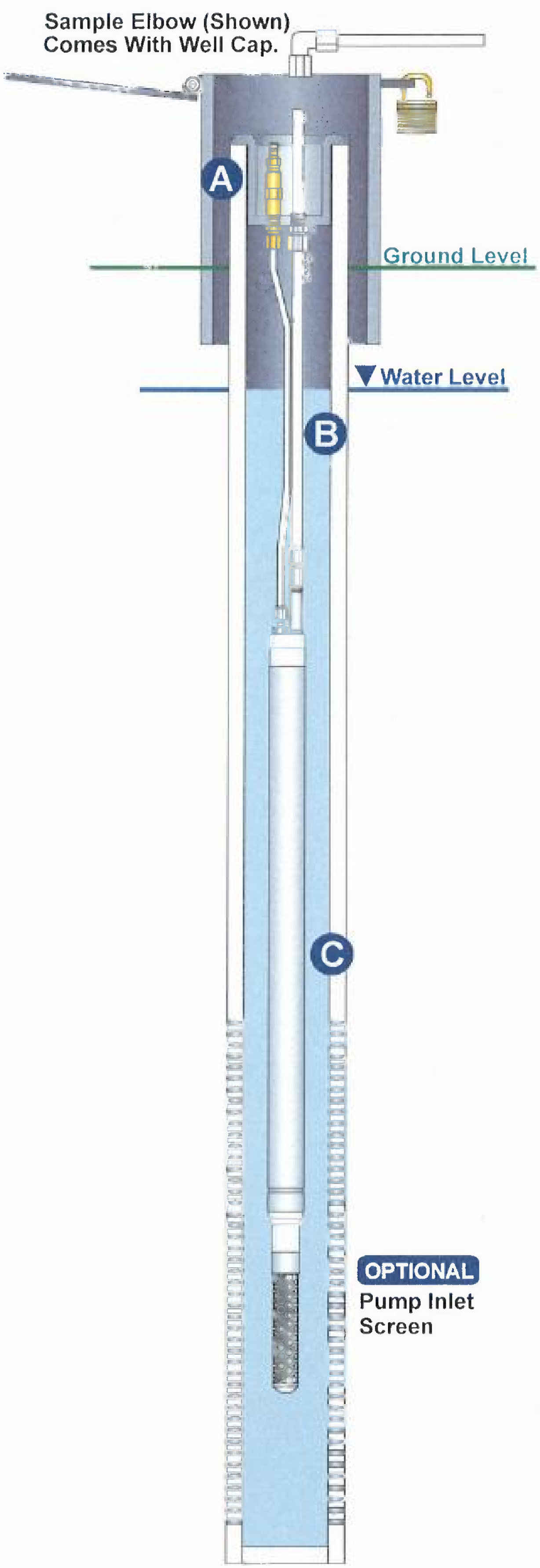
Every effort is made at the factory to include all of the down-well components for a single pump assembly or system in one package. On the outside of these packages, the well ID's and components are clearly labeled. However, there are times when components are too large to be included with the complete system. When this occurs, they are inside another package and that package is clearly marked with the item number and well ID.

When heading out to the well, please make sure to take along all of the components for that specific well. Include any tools or other supplies that will make installation easier.

QED Environmental Systems
Phone: 1-800-624-2026
After Hours Phone: 1-800-272-9559

WELL WIZARD®
Dedicated Monitoring Systems

SYSTEM "A" Bladder Pump Only



System Components Checklist:

Ⓐ Well Cap

Ⓑ Pump Tubing

Ⓒ Pump

Options: Pump Inlet Screen

System Components Instructions:

1. Attach pump inlet screen to pump inlet (if applicable).
2. Attach bladder pump tubing to pump.
3. Lower pump to desired depth.
4. Pass discharge tube through cap and attach air line under cap.

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Introducing Well Wizard

WELL WIZARD®

Contacting QED

Please call our Customer Service Department at one of the following numbers for assistance

- **Monday through Friday, 8:30 a.m. to 5:00 p.m. EST:** (734) 995-2547
- **After Hours and weekends:** 1-800-272-9559 (or 1-734-746-8045 if you are outside the U.S.)

Introduction

To monitor the quality of ground water, you need an efficient way to collect unbiased samples. Well Wizard® is a total system for meeting all your ground water monitoring needs - with the flexibility to meet your special requirements. This section describes the components of the Well Wizard System.

The Well Wizard system includes both dedicated and portable components. The water contacting components are dedicated; you permanently install them in each well. The control elements are portable; you transport them from well to well.

BASIC DEDICATED COMPONENTS

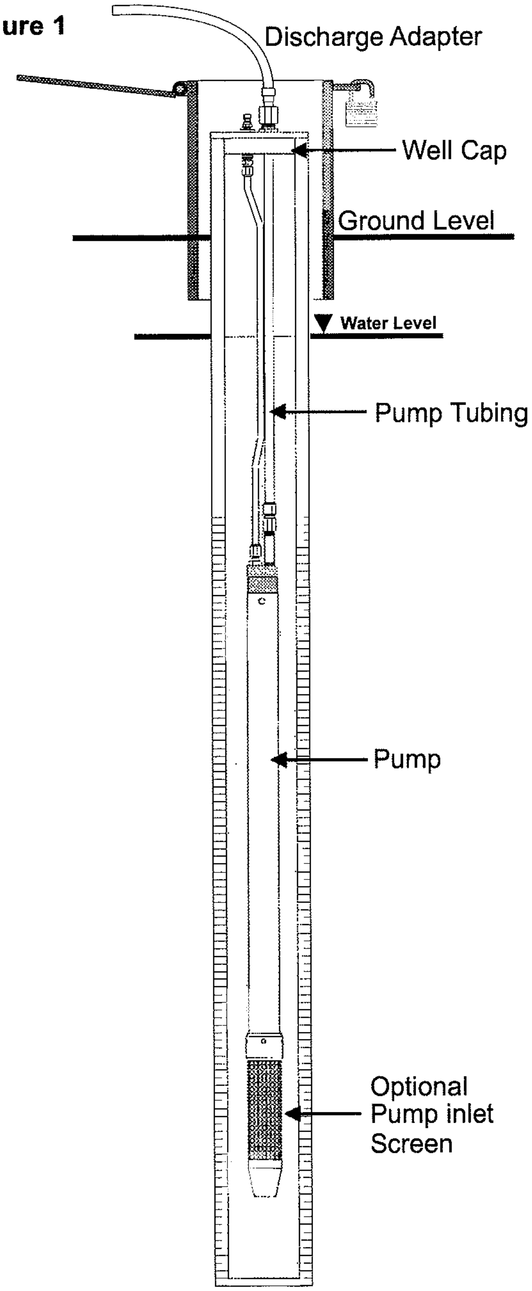
- A sampling pump
- Pump Tubing
- An optional inlet screen
- A well cap
- Discharge Adapter
- Freeze Protection

The following sections describe these components.

Sampling Pump

A Well Wizard® sampling pump is an air-actuated bladder pump that you permanently position in the well.

Figure 1



Sampling Pump

As figure 1 shows, you normally position the pump inlet midway in the screened section of the well, suspending it by two tubes that supply air to the pump and convey the water sample to the well cap. Whenever possible, pumps are shipped already preassembled to the tubing and the well cap assembly.

Several types of Well Wizard® bladder pumps are available.

1100 Series Pumps

The 1100 series pumps include 4 major components:

- Upper-end check valve assembly (polyvinyl chloride (PVC or Teflon®)
- Lower-end check valve assembly (PVC or Teflon)
- Bladder Cartridge (Teflon)
- Pump Body (PVC or Teflon)

You can totally disassemble the pump without tools by unscrewing each end cap and pushing the bladder cartridge out of the pump body (for more information refer to the instructions included with the field-replaceable bladder kit).

1200 Series Pumps

The 1200 series pumps include 2 major components

- Bladder Cartridge assembly (either Teflon and stainless steel or PVC and stainless steel)
- Pump Body (Stainless Steel)

You can partially disassemble the pump (for more information refer to the instructions included with the field-replaceable bladder kit).

How Bladder Pump Works

The bladder pump has two alternating cycles (refer to figures 2 & 3).

Discharge Cycle

During the discharge cycle, air forced into the space between the pump body and the pump bladder squeezes the water inside the bladder into the exit/entrance holes of the fill rod. As air pressure increases, liquid-having no place else to go - is forced up the discharge line and to the surface. At the same time, the top check ball rises with the discharging liquid while the bottom check ball is forced down by the air pressure; this seals the pump inlet so that no water can enter the bladder chamber.

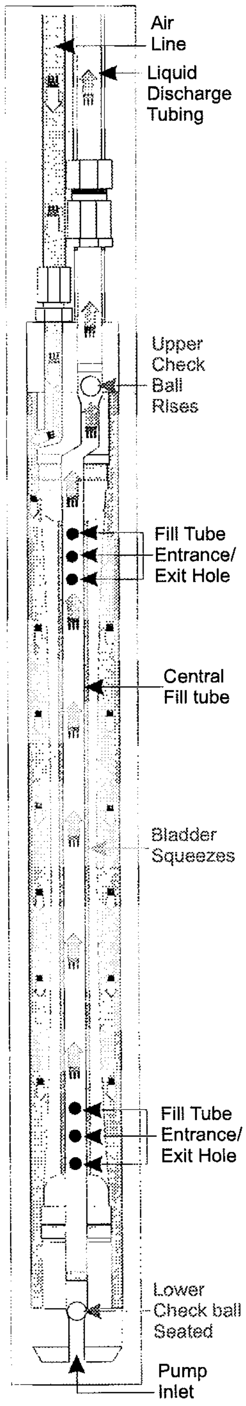


Figure 2

How Bladder Pump Works

Refill Cycle

During the refill cycle, with no air pressure holding it down, the water pressure pushes the bottom check ball up, allowing the water to reenter the bladder chamber. The bladder expands as it refills with water. Simultaneously, the top check ball is forced down and seals because of the force of the water pressure above it from the water in the discharge tubing, this prevents the water in the discharge tube from reentering the bladder chamber.

Caution: A Well Wizard® pump bladder can be punctured if you pump sand. So be sure to use an inlet screen in wells with high sand and sediment content, or when the inlet of the pump is placed within 2 feet of the bottom of the well. Remember, the Well Wizard 10-year warranty is void if you do not use an inlet screen.

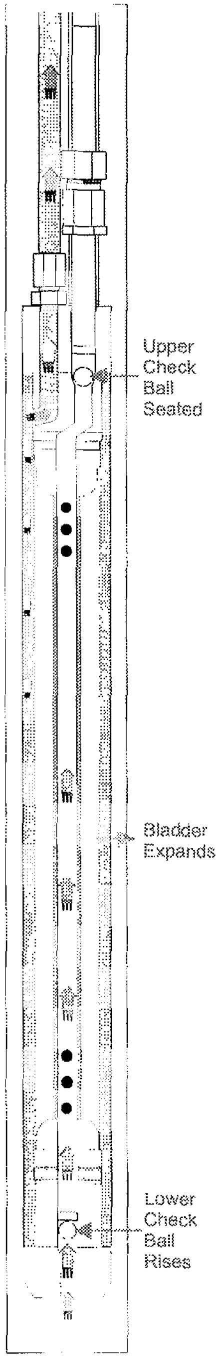


Figure 3

Pump Tubing/ Inlet Screen/ Well Cap

Pump Tubing

A ground water sample is only as good as the tubing it runs through. Your Well Wizard® was shipped with one of the following types of superior-quality tubing:

- Polyethylene
- Teflon® -lined polyethylene
- Teflon

Most tubing is supplied as a bonded pair (air supply and discharge), to save time and avoid tube entanglement.

Unless your order specified that you wanted *bulk* tubing, the tubing for your Well Wizard bladder pump is pre-cut to the correct length for your well.

Inlet Screen

An inlet screen can protect the bladder in your Well Wizard pump by preventing sand from contacting the bladder. If you install a screen on your dedicated Well Wizard bladder pump, QED warranties the pump for a full 10 years.

Well Cap

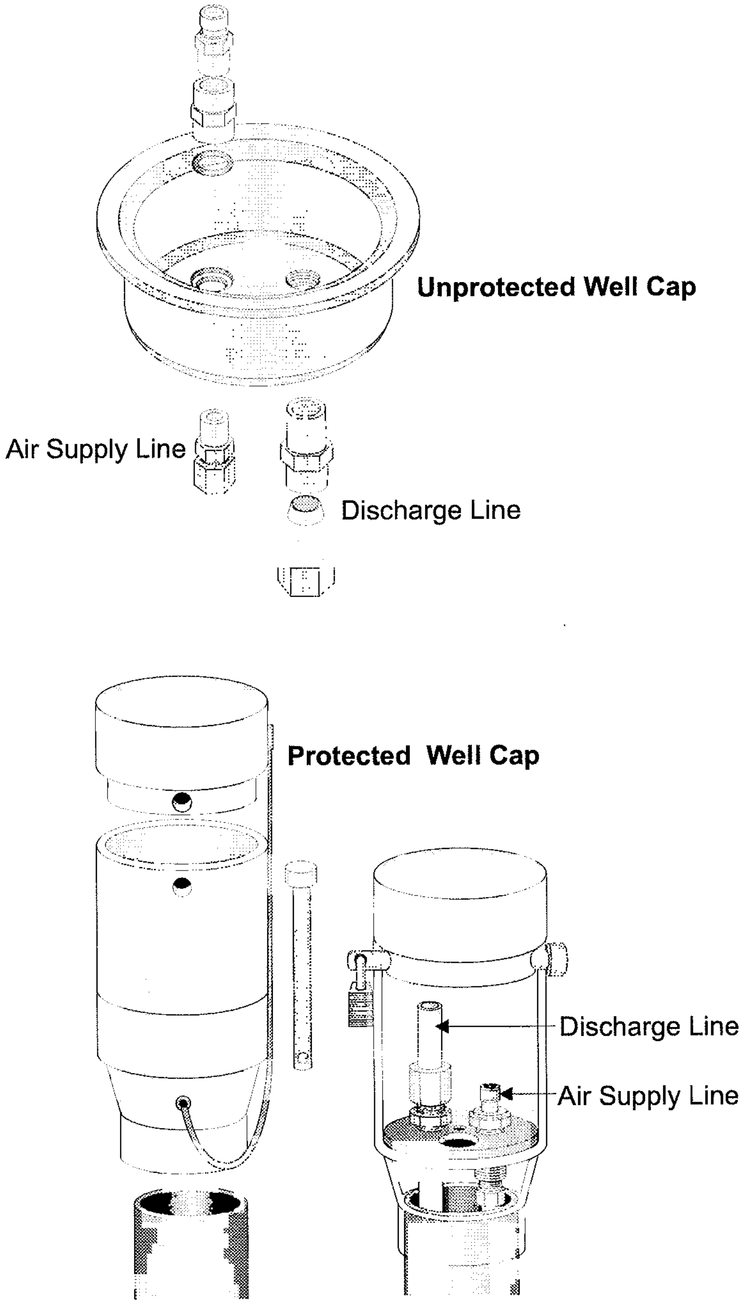
You fit a well cap to the top of the well casing to suspend the pump and tubing. There are two terminal fittings inside the basic well cap (see figure 4).

- A compression *through fitting* for the discharge line
- A short brass *quick-connect nipple* for the pump air-supply line

The *protected* well cap has a lid with a lock pin. You can record well identification and reference date information on the cap label. The *unprotected* well cap is meant for wells located within a user-supplied protected standpipe.

Well Cap (Figure 4)

Figure 4



Portable Components

Portable Well Wizard® components include a cycle controller, water-level meter, disposable sample filters, and a flow-through cell.

Controller

A controller controls operation of the Well Wizard pump by regulating the air flow from a compressed-gas source to the pump.When connected to an appropriate compressed-gas source, the controller alternately pressurizes then vents the air supply line to the pump, allowing the pump to discharge and then fill with water. For more information, please refer to the operation and installationmanuals for the individual controllers.

Water Level Meter

The model MP30 drawdown/water level meter can be connected to the QED cycle controllers to automatically control the drawdown during purging and sampling.

The series 6000 electronic water-level meters use a portable conductivity probe attached to a calibrated tape. There is a light and audio signal when the probe touches the water surface.

Flow Cell

The MP20 is QED's *optional* flow cell. The MP20 lets you know when it's okay to sample - generally saving you from spending a lot of time and from removing large volumes of purge water. The MP20 signals when stabilization has been achieved for selected water parameters.

QuickFilter®

To ensure accurate samples of dissolved metals, you can use an optional QED QuickFilter. It removes solids larger than 0.45 micron. Because QuickFilters are disposable - you use one for each sampling event - there's no need to try to clean or decontaminate the filter from well to well.

Installing the Components

If you've received a set of preassembled dedicated components, you'll find that unpacking them and installing them is easy when you follow the following instructions. Because not everyone needs to read this whole section, the first section helps you decide which of the other sections you need to read.

If, instead of preassembled components you've received unassembled components and bulk tubing, read the section titled "Installing a Pump Using Bulk Tubing."

Unpack the Components

Here's how to unpack the Well Wizard® dedicated components.

1. If you need to install a Well Wizard system in more than one well, decide which well you want to do first. Then find the box of components with the correct well-identification number written on the outside of the box.
2. Carry the box to the well site, then open the box, but don't touch anything yet.
3. Open the box, then, before unpacking the rest of the box, put on a pair of latex gloves.

Caution: Touching well components with your bare hands can contaminate the components and degrade the quality of the samples obtained using the Well Wizard system, and at any other time when your hands might touch a water-contacting component.

4. Taking care to *not kink the tubing*, gently remove the plastic-wrapped pump and tubing from the box. A label on the package provides the well cap ID, cap, and tubing length. You may need this information later, so save the label.

Note: The plastic bag also contains the lab-clean certificate on which is recorded the pump batch serial number. Keep this tag for each pump you install. It's your proof that the pump is contaminant free - if you need to, you can call QED with the serial number to find out which lab certified the pump.

5. Open the plastic wrapping, then gently slide the pump out of the bag.

Installing the Inlet Screen

Install the Inlet Screen

Well Wizard bladder pumps have a 10 year warranty that is valid *only* if you use the appropriate inlet screen.

There are two types of inlet screens: One that you thread onto the pump inlet for 1100 series pumps, and one that you secure with *set screws* for 1200 and 1300 series pumps. The correct screen for each pump is usually included with the other components for the well - the box label tells you where to find the screen. The following sections describe how to install the two types of inlet screens.

Screens For 1100 Series Pumps

To install a screen on an 1100 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove the screen.
2. Thread the screen onto the male-threaded pump inlet, making sure the screen is firmly tight.

Screens For 1200 and 1300 Series Pumps

To install a screen on an 1200 & 1300 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove from the bag both the screen and the small plastic bag that contains spare set screws and a small Allen wrench.
2. Find the groove around the inlet end of the stainless steel pump body (the end opposite the air and water connectors), then slide the screen onto the bottom of the pump assembly, aligning the top rim of the screen with the top groove.

> **Note:** If you have difficulty installing the screen, use the Allen wrench to loosen the set screws a little.

3. Using the Allen wrench, *lightly* tighten each of the set screws, then make sure the screws have engaged the groove.
4. Using the Allen wrench, *firmly* tighten each of the set screws.
5. Check to make sure the screen is secure.

Installing the Sampling Pump

Caution: Make sure that you don't bring the tubing or other pump components in contact with the ground or any other surface. It's often helpful to spread out a polypropylene tarp next to the well during installation.

1. Still wearing the latex gloves, if you have a protected well cap, mark any necessary information - such as well ID and depth - on the label inside the well cap.
2. Slowly lower the pump into the well while uncoiling the tubing bundle, until the entire length of tubing is in the well.

Attaching Tubing to the Well Cap

To attach tubing to the well cap, follow the instructions included with the shipment for the appropriate well cap.

Installing a Pump with Bulk Tubing

This section is for you if you ordered your Well Wizard® components and tubing unassembled, The following sections tell you how to assemble the components and tubing.

Getting Ready

It's important to not contaminate pump components. Doing so can degrade the quality of the samples obtained using your Well Wizard system. Always wear latex gloves when unpacking and installing Well Wizard components, and any other time when your hands might touch a water-contacting component.

Install the Inlet Screen

Well Wizard bladder pumps have a 10 year warranty that is valid *only* if you use the appropriate inlet screen.

There are two types of inlet screen: One that you thread onto the pump inlet for 1100 series pumps, and one that you secure with *set screws* for 1200 and 1300 series pumps. The correct screen for each pump is usually included with the other components for the well - the box label tells you where to find the screen. The following sections describe how to install the two types of inlet screens.

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1. Still wearing the latex gloves, open the plastic wrapping, then remove the screen.
2. Thread the screen onto the male-threaded pump inlet, making sure the screen is firmly tight.

Screens For 1200 and 1300 Series Pumps

To install a screen on an 1200 & 1300 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove from the bag both the screen and the small plastic bag that contains spare set screws and a small Allen wrench.
2. Find the groove around the inlet end of the stainless steel pump body (the end opposite the air and water connectors), then slide the screen onto the bottom of the pump assembly, aligning the top rim of the screen with the top groove.

Installing a Pump with Bulk Tubing

Note: If you have difficulty installing the screen, use the Allen wrench to loosen the set screws a little.

3. Using the Allen wrench, *lightly* tighten each of the set screws, then make sure the screws have engaged the groove.
4. Using the Allen wrench, *firmly* tighten each of the set screws.
5. Check to make sure the screen is secure.

Connect the Pump to the Tubing

To connect the pump to the tubing, follow these steps:

1. Separate the discharge (larger) tubing from the air-supply (smaller) tube for 8-12 inches from one end.
2. Loosen the nut-and-ferrule assembly as much as possible without actually removing the nut.
3. Push the air-supply tube into the matching fitting on the top end of the pump.
4. Tighten the nut.
5. Cut off a short length from the end of the discharge tubing to compensate for the offset height of the discharge tube fitting.

Note: This is usually 3 to 4 inches. You determine the exact length by checking both fitting nuts for full tube insertion after loose assembly.

6. Make sure that the tube-to-pump fit is correct before proceeding.
7. If the discharge tubing is 3/8" O.D. or larger, or if it has a Teflon lining, you must use a tubing insert, just push the insert into the tubing before inserting the tubing into the tubing fitting.
8. Tighten both fitting nuts finger tight.
9. For each fitting nut, hold the fitting base with *one* wrench and the fitting nut with *another* wrench, then tighten the fitting nut one additional turn.

Cut Tubing to Length

To cut the tubing to the correct lengths, follow these steps:

1. Lower the pump into the well until the pump touches the bottom of the well.
2. Raise the pump up, as follows:
   - 1 foot, for low recovery wells
   - To the middle of the screen, for high recovery wells

Attaching Tubing to the Well Cap

To attach tubing to the well cap, follow the instructions included with the shipment for the appropriate well cap.

Bladder Pump Operation in Low-Submergence

Bladder Pump Operation in Low-Submergence Applications

Pump submergence is defined as the height of the static water column above the top of the pump. In wells in which this water column height is 5 feet or less, the pump is considered to be in a low-submergence application.

QED sampling bladder pumps fill by hydrostatic pressure. As the inside of the pump's bladder fills with water, the bladder expands. This filling and expanding of the bladder is referred to as the "refill" half of the pump cycle. When air pressure is applied to the outside of the bladder, the bladder is squeezed, forcing the water up the discharge tubing. This is referred to as the "discharge" half of the pump cycle. In low-submergence applications, there is less water pressure available to expand the bladder during the refill.

This can result in a smaller volume of water being pumped with each pump cycle because the bladder may not fully expand.

As a result of the lower volume per cycle, more time will be required to bring the water to the surface. An easy way to verify that the pump is working, prior to the water reaching the surface, is to submerge the pump's discharge tubing in a beaker of water. Each time the pump goes into discharge, air in the discharge tubing, which is displaced as the water level in the tubing rises, can be seen as air bubbles coming from the end of the tubing. To optimize the pumping rate, the refill time should be set long enough to achieve the maximum volume of air bubbles on each pump cycle, and the discharge time should be set long enough to ensure that the air has stopped bubbling out of the tube before the pump controller switches back into refill.

In low submergence wells, **it is critical that the air pressure driving the pump not be more than 10-15psi higher than the minimum requirement of 0.42psi per foot of pump depth.** Higher pressures than this can cause the bladder to be squeezed too tightly during discharge, a condition which can prevent the bladder from expanding during refill. To avoid this condition in deeper wells, it is suggested that the air pressure applied to the pump be gradually increased as the water level in the pump's discharge tubing rises. It is recommended that the air pressure be set at 15psi initially, and slowly increased in increments of 10psi as needed until the water reaches the surface. Submerging the end of the discharge tubing under water as described above will verify whether the air pressure is set high enough.

Install or Replace Pump Connectors

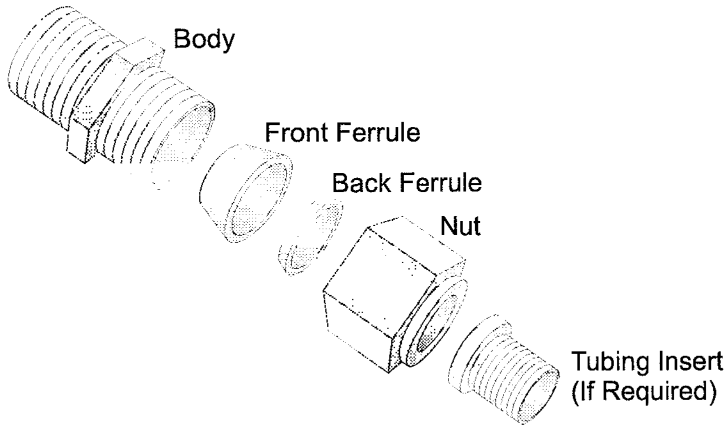
The following sections describe how to install or replace the three types of connectors that may be included in your Well Wizard system.

Stainless Steel Connectors

Swagelok™ tube fittings, which include four pieces (see figure 5), come to you completely assembled, finger tight.

Figure 5

Parts of the Swagelok Tube Fitting



> **Caution:** If you disassemble a connector before you use it, dirt or foreign material can get into the fitting and later cause a leak.

To install a stainless steel connector, follow these steps:

1. If you are working with a 1/2- or 3/4-inch connector, wrap the male threads under the nut with Teflon tape.
2. Insert the tubing into the Swagelok tube fitting as follows:
   - **For 1/4 -inch tubing**, insert it approximately 5/8 inch
   - **For 3/4 -inch tubing**, insert it up to 7/8 inch

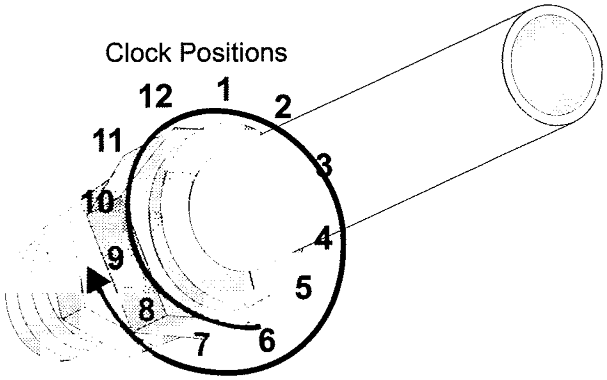
   Make sure that the tubing firmly contacts the shoulder of the fitting and that the nut is finger tight.

> **Note:** If the discharge tubing is 3/8 inch or larger, you must use a tubing insert, just push the stainless steel insert into the tubing before inserting the tubing into the tube fitting.

Install or Replace Pump Connectors

3. Referring to figure 6, scribe or mark the nut at the 6 o'clock position.

Figure 6



4. While holding the fitting body steady with a backup wrench or vise, tighten the nut as follows, depending on the size of the tube fitting:
    - **For fittings larger than 3/16 inch**, turn the fitting one and one quarter turns (watch the scribe mark make one complete turn, then continue to the 3 o'clock position).
    - **For fittings sizes 1/6, 1/8, and 3/16 inch**, turn the fitting three quarters of a turn (watch the scribe mark turn to the 9 o'clock position).

> **Note:** These are guidelines, you may need to further tighten the nut.

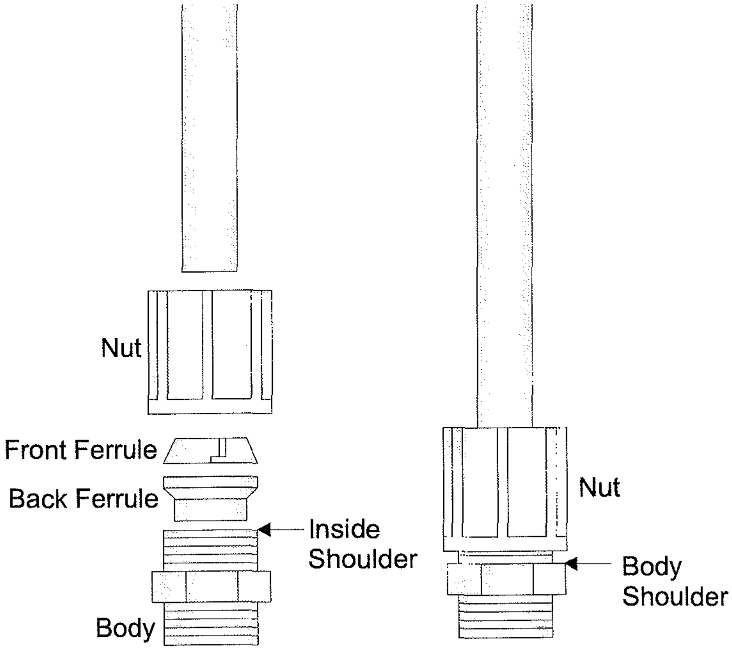
Install or Replace Pump Connectors

Polypropylene Connector

To install a polypropylene connector, follow these steps.

1. Cut the tubing cleanly and squarely to length.
2. If the tubing is larger than 1/2 inch, push an insert into the tube.
3. Push the tubing into the completely assembled connector until it contacts the shoulder inside the fitting (see figure 7).
4. Tighten the nut with a wrench, but be careful to not over tighten it; the nut should not come in contact with the shoulder of the body (see figure 7).

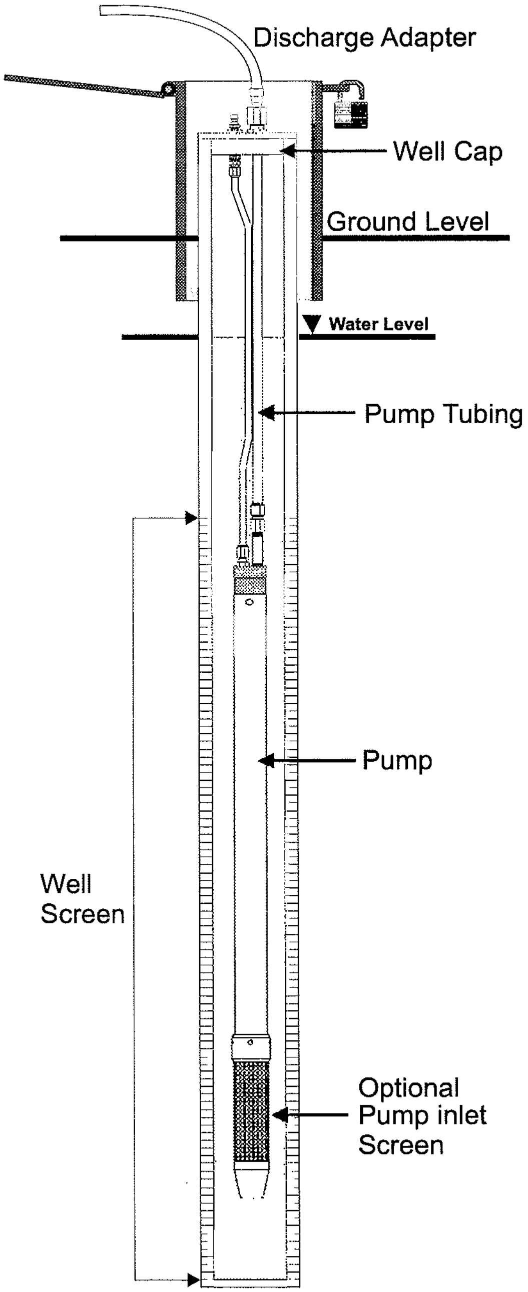
Figure 7



Sampling System Type A

Figure A-1 shows the Type A sampling system, the basic bladder pump

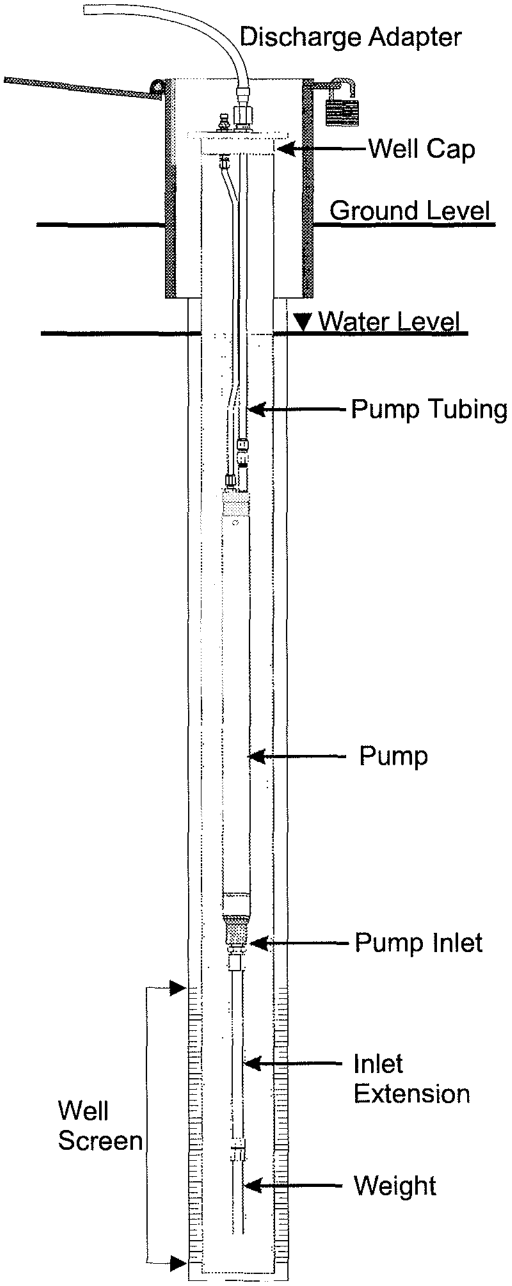
Figure A-1



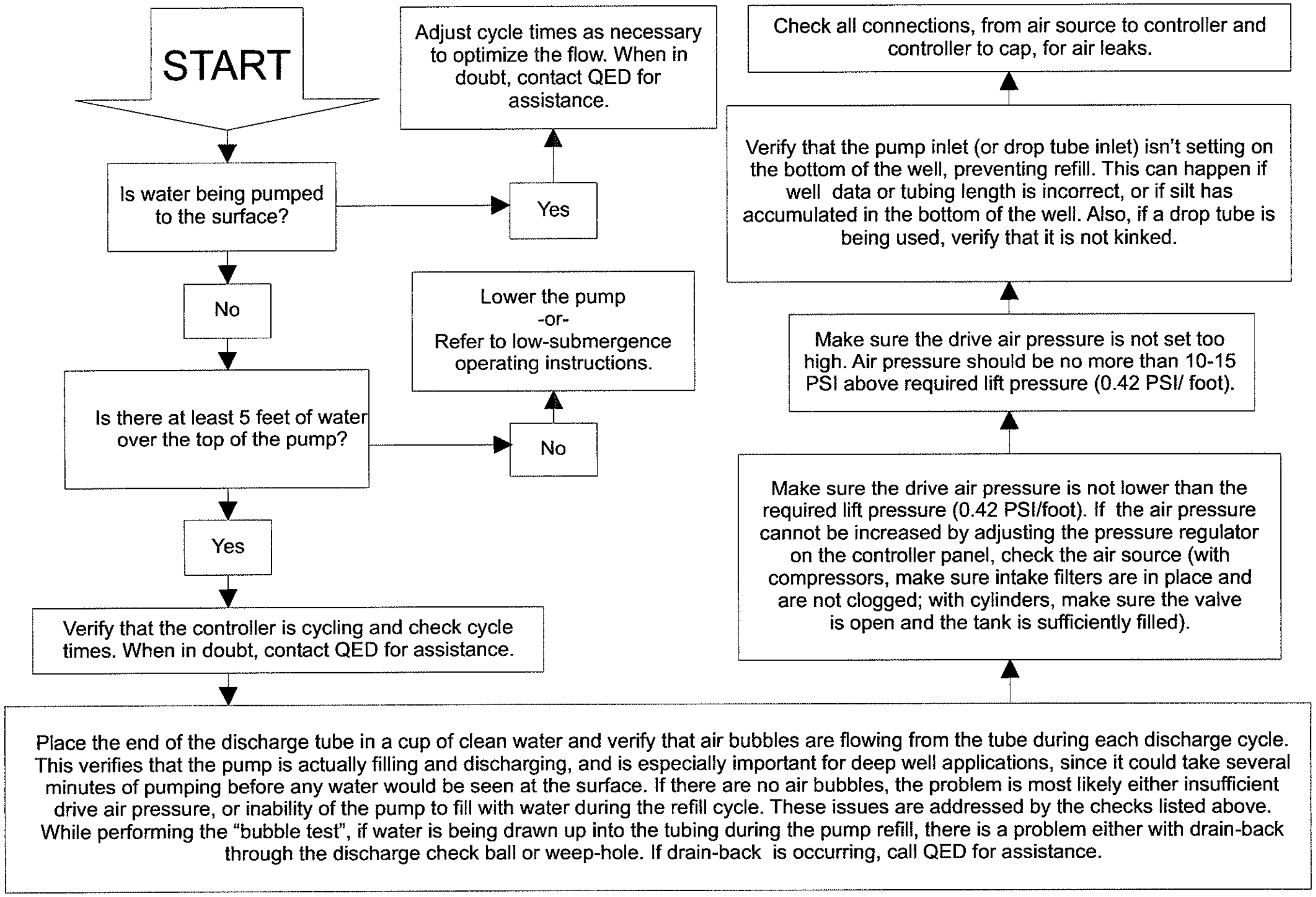
Sampling System Type L

Figure A-2 shows the Type L sampling system, a bladder pump with an inlet extension.

Figure A-2



Sampling Pump Troubleshooting Guide



Is water being pumped to the surface?

Adjust cycle times as necessary to optimize the flow. When in doubt, contact QED for assistance.

Is there at least 5 feet of water over the top of the pump?

Lower the pump
-or-
Refer to low-submergence operating instructions.

Verify that the controller is cycling and check cycle times. When in doubt, contact QED for assistance.

Place the end of the discharge tube in a cup of clean water and verify that air bubbles are flowing from the tube during each discharge cycle. This verifies that the pump is actually filling and discharging, and is especially important for deep well applications, since it could take several minutes of pumping before any water would be seen at the surface. If there are no air bubbles, the problem is most likely either insufficient drive air pressure, or inability of the pump to fill with water during the refill cycle. These issues are addressed by the checks listed above. While performing the “bubble test”, if water is being drawn up into the tubing during the pump refill, there is a problem either with drain-back through the discharge check ball or weep-hole. If drain-back is occurring, call QED for assistance.

Make sure the drive air pressure is not lower than the required lift pressure (0.42 PSI/foot). If the air pressure cannot be increased by adjusting the pressure regulator on the controller panel, check the air source (with compressors, make sure intake filters are in place and are not clogged; with cylinders, make sure the valve is open and the tank is sufficiently filled).

Make sure the drive air pressure is not set too high. Air pressure should be no more than 10-15 PSI above required lift pressure (0.42 PSI/ foot).

Verify that the pump inlet (or drop tube inlet) isn’t setting on the bottom of the well, preventing refill. This can happen if well data or tubing length is incorrect, or if silt has accumulated in the bottom of the well. Also, if a drop tube is being used, verify that it is not kinked.

Check all connections, from air source to controller and controller to cap, for air leaks.

Well Wizard® System Warranty

QED ENVIRONMENTAL SYSTEMS, INC. ("Q.E.D.") warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workman-ship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by Q.E.D. in the manner provided herein.

This warranty shall be limited to the duration and the conditions set forth below. All warranty durations are calculated from the original date of purchase.

1. *Dedicated-Use Systems Products*- 10 year warranty on dedicated bladder pumps equipped with Q.E.D. inlet screens, and purge pumps used in periodic, non continuous groundwater sampling (up to 52 sampling events per year.) All other components, equipment and accessories are warranted for one year.

2. *Portable-Use Systems*- Controllers and water level meters are warranted for one year. Hose reels, Pumps and Caps are warranted for ninety (90) days. Tubing and Purge Mizers are covered by a ninety (90) day material and workmanship warranty. There will be no warranty for application on tubing and Purge Mizers when used as part of a Portable System.

3. *Separately sold parts and Spare Parts Kits*- Separately sold parts and spare parts kits are warranted for ninety (90) days. Repairs performed by Q.E.D. are warranted for ninety (90) days from date of repair or for the full term of the original warranty, whichever is longer.

Buyers' exclusive remedy for breach of said warranty shall be as follows: if, and only if, Q.E.D. is notified in writing within applicable warranty period of the existence of any such defect in the said products, and Q.E.D. upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from Q.E.D. to Buyer, Q.E.D. will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Buyer. If Q.E.D. for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's/Buyer's notification of a warranty claim, then Q.E.D.'s sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Buyer, or to refund the full purchase price. In no event shall such allegedly defective products be returned to Q.E.D. without its consent, and Q.E.D.'s obligations of repair, replacement or refund are conditioned upon the Buyer's return of the defective product to Q.E.D. **IN NO EVENT SHALL QED ENVIRONMENTAL SYTEMS BE LIABLE FOR CONSEQUENTIAL DAMAGES OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.**

The foregoing warranty does not apply to major sub-assemblies and other equipment, accessories and parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties,if any, supplied by the respective manufacturers. Q.E.D. makes no warranty concerning products or accessories not manufactured by Q.E.D. In the event of failure of any such product accessory, Q.E.D. will give reasonable assistance to the Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Well Wizard® System Warranty

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of Q.E.D., neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that Q.E.D. shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty. Q.E.D. shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than Q.E.D.'s service personnel unless such repair by others is made with the written consent of Q.E.D.

If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact Q.E.D. for determination of warranty coverage. If the return of a component is determined to be necessary, Q.E.D. will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the purchaser.

RESPONSIBILITY OF THE PURCHASER

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify Q.E.D. of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of Q.E.D. and:

1. Identifying the product involved (by model or serial number or other sufficient description that will allow Q.E.D. to determine which product is defective).
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. Sending the malfunctioning component, after authorization by Q.E.D. to:

QED ENVIRONMENTAL SYSTEMS
P.O. Box 3726
Ann Arbor, MI 48106-3726 USA

APPENDIX C6 – STRUCTURAL STABILITY ASSESSMENT

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Coal Pile Runoff Pond

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Coal Pile Runoff Pond at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Coal Pile Runoff Pond is located near Moscow, Ohio in Clermont County, approximately 0.6 miles north of the Zimmer Power Station. The Coal Pile Runoff Pond receives leachate from the Zimmer Power Station's on-site landfill, discharge from the Chemical Metal Cleaning waste treatment tank, and pumped flows from the D Basin CCR surface impoundment and other non-CCR ponds at Zimmer Power Station.

The Coal Pile Runoff Pond 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 the Coal Pile Runoff Pond 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 the Coal Pile Runoff Pond 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, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. The Coal Pile Runoff Pond is a ring dike structure and does not have abutments.

The foundation consists of medium stiff to hard clay soil, underlain by loose to very dense sand, which indicates stable foundations. 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 Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). A review of information about operations and maintenance 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, the Coal Pile Runoff Pond was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the Coal Pile Runoff Pond 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, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the Coal Pile Runoff Pond. No evidence of significant areas of erosion or wave action were observed and slopes were covered in vegetation. The Zimmer Power Station regularly maintains the slopes, including repairing observed surface erosion and addressing areas of poor vegetation growth, as required. Due to the characteristics of the outfall structure for the

Coal Pile Runoff Pond, sudden drawdown conditions are not expected to occur on the interior slopes. Therefore, the Coal Pile Runoff Pond 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, information about operations and maintenance, 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 very stiff to hard clay 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 Coal Pile Runoff Pond at Zimmer Power Station* (October 2016); therefore, the original design and construction of the Coal Pile Runoff Pond included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the Coal Pile Runoff Pond 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, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the interior and exterior slopes is adequate as no substantial bare or overgrown areas were observed. Therefore, the original design and construction of the Coal Pile Runoff Pond included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance practices are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(iv).

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[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, information about operations and maintenance, 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 Coal Pile Runoff Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway consists of two, high-density polyethylene (HDPE) pipes, which is a non-erodible material that is 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 Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). Any issues with the spillway are repaired and debris or other obstructions are removed from the spillway during operations and maintenance, as appropriate and as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond 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.

The stability and structural integrity of the hydraulic structure penetrating the dike of the Coal Pile Runoff Pond, which includes two HDPE pipe conduits, was evaluated using design drawings, information about operations and maintenance, 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 the Coal Pile Runoff Pond.

AECOM's field observations found the HDPE pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structure. Operations and maintenance practices are in place to remove debris or other obstructions from the hydraulic structures, and address any deficiencies, as evidenced by conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the hydraulic structures. Therefore, the Coal Pile Runoff Pond 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 the Coal Pile Runoff Pond was evaluated by comparing the location of the Coal Pile Runoff Pond relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the Coal Pile Runoff Pond. No other downstream water bodies such as rivers, streams, or lakes are adjacent to the Coal Pile Runoff Pond. Several adjacent non-CCR surface impoundments are present, but they are not a river, stream, or lake.

A sudden drawdown slope stability analysis was performed for a cross section adjacent to the Ohio River considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating 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 normal to empty pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the Coal Pile Runoff Pond meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Zimmer Power Station; Coal Pile Runoff Pond

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

VICTOR A. MODEER JR

PE.79465

AECOM

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Gypsum Recycle Pond

At Zimmer Power Station

This Coal Combustion Residual (CCR) Rule Report documents that the Gypsum Recycle Pond at the Zimmer Power Station is exempt from the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Gypsum Recycle Pond is located near Moscow, Ohio in Clermont County, approximately 0.1 miles northeast of the Zimmer Power Station. The Gypsum Recycle Pond serves as a storage pond for miscellaneous CCRs from wash-down collection systems and stormwater runoff at the Zimmer Power Station.

The Gypsum Recycle Pond is an incised CCR surface impoundment, as defined in 40 CFR 257.53. Under 40 CFR §257.73(b) structural stability assessments (§257.73(d)) must be performed for an existing CCR surface impoundment that:

1. *Has a height of five feet or more and a storage volume of 20 acre-feet or more; or*

2. *Has a height of 20 feet or more.*

The Gypsum Recycle Pond does not satisfy the criteria of §257.73(b) because the incised impoundment does not have dikes. Therefore, the Gypsum Recycle Pond is not subject to the structural stability assessment requirements under §257.73(d).

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

D Basin

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the D Basin at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The D Basin is located near Moscow, Ohio in Clermont County, approximately 0.5 miles north of the Zimmer Power Station. The D Basin serves as a dewatering basin for CCR produced by the Zimmer Power Station.

The D Basin 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 the D Basin 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 the D Basin 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, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. The D Basin is a ring dike structure and does not have abutments.

The foundation consists of soft to stiff alluvial soil overlying medium dense to very dense alluvial soil. 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 D Basin at Zimmer 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 information about operations and maintenance 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, the D Basin was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the D Basin 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, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the D Basin. No evidence of significant areas of erosion or wave action were observed. Under normal operating conditions there is no free water present within the D Basin. The interior slopes are protected vegetation and a bottom ash protection layer. The exterior slopes are protected with vegetation. The bottom ash protection layer on the interior slopes isolates the embankment soils from surface erosion, wave action, and acts as a free-draining material that is not susceptible to the adverse effects of sudden drawdown. Therefore, the D Basin 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, information about operations and maintenance, 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 dense to very dense 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 D Basin at Zimmer Power Station* (October 2016); therefore, the original design and construction of the D Basin included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the D Basin 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, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior slopes, and vegetation where present on the interior slopes, is adequate as no substantial bare or overgrown areas were observed. Where vegetation is not present on the interior slopes, the bottom ash protection layer is used as an alternate form of slope protection, which is adequate as significant areas of erosion or wave action were not observed. Therefore, the original design and construction of the D Basin included adequate vegetation of the dikes and surrounding areas. Adequate information about operations and maintenance are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the D Basin meets the requirements in §257.73(d)(1)(iv).

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[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 §257.73(d)(1)(v)(A) requirements are not applicable to the D Basin at the Zimmer Power Station because a spillway is not present. However, the §257.73(d)(1)(v)(B) requirement was evaluated to determine if the D Basin meets the requirements without a spillway system present, as discussed below.

The ability of the D Basin to adequately manage flow without a spillway system was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the D Basin can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for D Basin at Zimmer Power Station* (October 2016). Therefore, the D Basin meets the requirements in §257.73(d)(1)(v)(B), even though a spillway system is not present.

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.

Based on an evaluation of design drawings, information about operations and maintenance, and conditions observed in the field by AECOM, no hydraulic structures are present that underlie the base or pass through the dike of the D Basin. Therefore, the §257.73(d)(1)(vi) requirements are not applicable to the D Basin.

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 the D Basin was evaluated by comparing the location of the D Basin relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the D Basin. No other downstream water bodies are adjacent to the D Basin. The adjacent C and B Basins do not retain a pool that inundates the downstream slope of the D Basin during normal conditions.

A sudden drawdown slope stability analysis was performed at a cross-section considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating 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 normal to low pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the D Basin meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Zimmer Power Station; D Basin

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

VICTOR A.
MODEER JR
PE.79465

APPENDIX C7 – SAFETY FACTOR ASSESSMENT

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Coal Pile Runoff Pond

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Coal Pile Runoff Pond at the Zimmer Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The Coal Pile Runoff Pond is located near Moscow, Ohio in Clermont County, approximately 0.6 miles north of the Zimmer Power Station. The Coal Pile Runoff Pond receives leachate from the Zimmer Power Station's on-site landfill, discharge from the Chemical Metal Cleaning waste treatment tank, and pumped flows from the D Basin CCR surface impoundment and other non-CCR ponds at Zimmer Power Station.

The Coal Pile Runoff Pond 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 the Coal Pile Runoff Pond. The exploration consisted of hollow-stem auger borings 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 Coal Pile Runoff Pond consist of very stiff to hard clay embankment fill underlain by medium stiff to hard alluvial clay. The alluvial clay layer is underlain by a layer of medium dense to very dense sand and gravel extending to bedrock. Phreatic water is within the foundation soils of the Coal Pile Runoff Pond.

Three (3) 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 Coal Pile Runoff Pond dikes. As a result, this loading condition is not applicable to the Coal Pile Runoff Pond.

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 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	2.28
Maximum Surcharge Pool Loading	(ii)	1.40	2.28
Seismic	(iii)	1.00	1.60
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, the Coal Pile Runoff Pond meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Zimmer Power Station; Coal Pile Runoff Pond

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

VICTOR A.
MODEER JR
PE.79465

AECOM

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Gypsum Recycle Pond

At Zimmer Power Station

This Coal Combustion Residual (CCR) Rule Report documents that the Gypsum Recycle Pond at the Zimmer Power Station is exempt from the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The Gypsum Recycle Pond is located near Moscow, Ohio in Clermont County, approximately 0.1 miles northeast of the Zimmer Power Station. The Gypsum Recycle Pond serves as a storage pond for miscellaneous CCRs from wash-down collection systems and stormwater runoff at the Zimmer Power Station.

The Gypsum Recycle Pond is an incised CCR surface impoundment as defined by 40 CFR 257.53. Under 40 CFR §257.73(b), a safety factor assessment (§257.73(e)) must be performed for an existing CCR surface impoundment that:

1. *Has a height of five feet or more and a storage volume of 20 acre-feet or more; or*

2. *Has a height of 20 feet or more.*

The Gypsum Recycle Pond does not satisfy the criteria of §257.73(b) because the incised impoundment does not have dikes. Therefore, the Gypsum Recycle Pond is not subject to safety factor assessment requirements under §257.73(e).

Submitted to
Zimmer Power Station
1781 US Route 52
Moscow, OH 45153

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

D Basin

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the D Basin at the Zimmer Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). The D Basin is located near Moscow, Ohio in Clermont County, approximately 0.5 miles north of the Zimmer Power Station. The D Basin serves as a dewatering basin for CCR produced by the Zimmer Power Station.

The D Basin 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 the D Basin. The exploration consisted of hollow-stem auger borings and laboratory program including strength, hydraulic conductivity, 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 D Basin consist of medium dense to dense sand overlying soft to stiff alluvial clay, which in turn overlies medium dense to very dense sand and gravel. Phreatic water is within the foundation of the D Basin.

A critical cross section was analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross section was located at the maximum embankment height for the D Basin. Due to the relatively short height of the D Basin embankments and uniform slope orientations, subsurface stratigraphy, and phreatic conditions, a cross section at the maximum embankment height is sufficient to represent the critical cross section. The 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 D Basin dikes. As a result, this loading condition is not applicable to the D Basin.

Results of the Initial Safety Factor Assessments 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	3.88
Maximum Surcharge Pool Loading	(ii)	1.40	2.63
Seismic	(iii)	1.00	1.79
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, the D Basin meets the requirements in §257.73(e)(1).

3 Certification Statement

CCR Unit: Zimmer Power Station; D Basin

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

VICTOR A. MODEER JR

PE.79465

APPENDIX C8 – CLOSURE PLANS (COAL PILE RUNOFF POND, GYPSUM RECYCLE POND, D BASIN)

ENVIRONMENT
& HEALTH

40 C.F.R. § 257.102(B)(3): Closure Plan Addendum
Zimmer Coal Pile Runoff Pond
August 13, 2021

ADDENDUM NO. 1
ZIMMER COAL PILE RUNOFF POND CLOSURE PLAN

This Addendum No. 1 to the Closure Plan for Existing Coal Combustion Residuals (CCR) Impoundment for the Zimmer Coal Pile Runoff Pond at the Zimmer Power Plant, Revision 0 – October 17, 2016 has been prepared to meet the requirements of 40 C.F.R. § 257.103(f)(2)(v)(D) as a component of the demonstration that the Zimmer Coal Pile Runoff Pond qualifies for a site-specific alternative deadline to initiate closure due to permanent cessation of a coal-fired boiler by a certain date.

The Zimmer Coal Pile Runoff Pond will begin construction of closure and cease receipt and placement of CCR and non-CCR wastestreams no later than October 17, 2022 as indicated in the Zimmer Power Plant Alternative Closure Demonstration dated August 13, 2021. Closure will be completed by October 17, 2023.

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.
Date: 8/13/2021

NICOLE M. PAGANO
E-85428

ENVIRONMENT
& HEALTH

40 C.F.R. § 257.102(B)(3): Closure Plan Addendum
Zimmer Gypsum Recycle Pond
August 13, 2021

ADDENDUM NO. 1
ZIMMER GYPSUM RECYCLE POND CLOSURE PLAN

This Addendum No. 1 to the Closure Plan for Existing Coal Combustion Residuals (CCR) Impoundment for the Zimmer Gypsum Recycle Pond at the Zimmer Power Plant, Revision 0 – October 17, 2016 has been prepared to meet the requirements of 40 C.F.R. § 257.103(f)(2)(v)(D) as a component of the demonstration that the Zimmer Gypsum Recycle Pond qualifies for a site-specific alternative deadline to initiate closure due to permanent cessation of a coal-fired boiler by a certain date.

The Zimmer Gypsum Recycle Pond will begin construction of closure and cease receipt and placement of CCR and non-CCR wastestreams no later than October 17, 2022 as indicated in the Zimmer Power Plant Alternative Closure Demonstration dated August 13, 2021. Closure will be completed by October 17, 2023.

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.
Date: 8/13/2021

NICOLE M. PAGANO
E-85428

RAMBOLL

ENVIRONMENT
& HEALTH

40 C.F.R. § 257.102(B)(3): Closure Plan Addendum
Zimmer D Basin
August 13, 2021

ADDENDUM NO. 1
ZIMMER D BASIN CLOSURE PLAN

This Addendum No. 1 to the Closure Plan for Existing Coal Combustion Residuals (CCR) Impoundment for the Zimmer D Basin at the Zimmer Power Plant, Revision 0 – October 17, 2016 has been prepared to meet the requirements of 40 C.F.R. § 257.103(f)(2)(v)(D) as a component of the demonstration that the Zimmer D Basin qualifies for a site-specific alternative deadline to initiate closure due to permanent cessation of a coal-fired boiler by a certain date.

The Zimmer D Basin will begin construction of closure and cease receipt and placement of CCR and non-CCR wastestreams no later than October 17, 2022 as indicated in the Zimmer Power Plant Alternative Closure Demonstration dated August 13, 2021. Closure will be completed by October 17, 2023.

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.
Date: 8/13/2021

NICOLE M. PAGANO
E-85428

BURNS & McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com