Selection of Remedy
OGS Ash Pond and
Former OGS Zero Liquid Discharge Pond

Ottumwa Generating Station
Ottumwa, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220083.00 | March 13, 2025

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EXECUTIVE SUMMARY

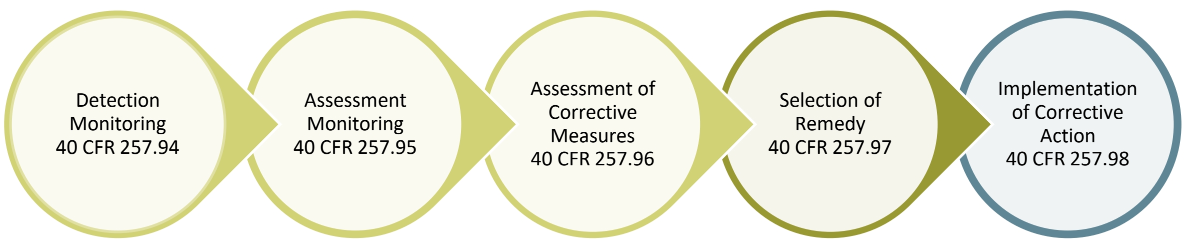
Interstate Power and Light Company (IPL), an Alliant Energy company, operated two ash ponds at the Ottumwa Generating Station (OGS), including the Main Ash Pond (OGS Ash Pond) and the Zero Liquid Discharge Pond (OGS ZLD Pond). The ponds were used to manage coal combustion residuals (CCR) and wastewater from the power plant, which burns coal to generate electricity. All CCR was removed from the OGS ZLD Pond in 2021, and a new lined Low Volume Wastewater Treatment Pond (LVWTP) was constructed in its place. The OGS Ash Pond was closed by dewatering, excavating, consolidating, and capping CCR. Closure of the OGS Ash Pond was completed in June 2023.

IPL samples and tests the groundwater in the area of the ash ponds to comply with U.S. Environmental Protection Agency (U.S. EPA) standards for the Disposal of CCR from Electric Utilities, or the "CCR Rule" (Rule).

Groundwater samples from three of the wells installed to monitor the OGS Ash Pond and two of the wells installed to monitor the OGS ZLD Pond contain cobalt at levels higher than the Groundwater Protection Standards (GPS) defined in the Rule. Cobalt occurs naturally and can also be present in coal and CCR.

IPL has prepared this Selection of Remedy Report in accordance with the requirements of the CCR Rule. The information in this report builds on the Assessment of Corrective Measures (ACM) Report issued in September 2019, ACM Addendum No. 1 issued in November 2020, and ACM Addendum No. 2 issued in August 2022. The ACM and ACM Addenda were prepared in response to the groundwater sampling results at the OGS facility.

The Selection of Remedy process is one step in a series of steps defined in the Rule and shown below.



The Selection of Remedy Report provides an update to the nature and extent of groundwater impacts discussed in the ACM and ACM Addenda No. 1 and No. 2. Since the ACM and subsequent addenda were issued, IPL has continued to develop an understanding of the following:

- Types of soil and rock deposits in the area of the OGS facility.
- Depth of groundwater.
- Direction that groundwater is moving.
- Potential sources of cobalt in groundwater.
- The area where cobalt levels are higher than the U.S. EPA standards.
- The people, plants, and animals that may be affected by levels of cobalt in groundwater that are above the GPS.

IPL has installed new wells to evaluate groundwater concentrations beyond the location of the wells with GPS exceedances. Groundwater monitoring data continue to show cobalt is present in groundwater near the OGS ash ponds.

The Selection of Remedy Report also presents the following:

- A comparison to the minimum criteria set forth in 40 CFR 257.97(b).
- A discussion of the evaluating criteria in 40 CFR 257.97(c) and the remedy selection scoring methodology used to help select an appropriate corrective measure.
- A summary of the selected remedy.

IPL has identified capping and consolidating CCR in place with groundwater pump and treat as the selected remedy for cobalt impacts to groundwater. The selected remedy meets the minimum criteria established in the Rule, and includes:

- Stopping all CCR and wastewater discharges to the OGS Ash Pond and OGS ZLD Pond.
- Removing CCR from the OGS ZLD Pond and consolidating the CCR in the OGS Ash Pond.
- Removing CCR from portions of the OGS Ash Pond and closing the pond with CCR in place according to 40 CFR 257.102(d).
- Implementing groundwater extraction with treatment for cobalt.

In accordance with 40 CFR 257.96(e), IPL held a public meeting with interested and affected parties to discuss the ACM as required by the Rule on June 4, 2020. However, the ACM was updated with ACM Addendum No. 1 in November 2020, so IPL held an additional public meeting on February 18, 2021. The ACM was updated again to include the OGS ZLD Pond in August 2022. A final public meeting was held on August 19, 2024, to discuss ACM Addendum No. 2 and the upcoming remedy selection with interested and affected parties.

Within 90 days of this Selection of Remedy Report, IPL will initiate implementation of the selected remedy as required in 40 CFR 257.98(a). This report describes the status of remedy design and an anticipated construction schedule. An estimated schedule for the implementation and completion of the selected remedy has been developed, and the design of a groundwater collection system is underway.

For more information on Alliant Energy, view the Alliant Energy Corporate Responsibility Report at https://www.alliantenergy.com/who-we-are/responsibility-report.

PE CERTIFICATION

LICENSED PROFESSIONAL ENGINEER
ERIC J. NELSON
23136
IOWA

I, Eric J. Nelson, hereby certify that the selected groundwater remedy described herein meets the requirements of 40 CFR 257.97. This Selection of Remedy report was prepared by me or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

3/13/2025

(signature) (date)

Eric J. Nelson

(printed or typed name)

License number 23136

My license renewal date is December 31, 2026.

Pages or sheets covered by this seal:

Selection of Remedy – OGS Ash Pond and Former OGS Zero Liquid Discharge Pond, Ottumwa Generating Station

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1.0 INTRODUCTION AND PURPOSE

This Selection of Remedy Report was prepared to support compliance with the groundwater monitoring requirements of the "Coal Combustion Residuals (CCR) Final Rule" published by the U.S. Environmental Protection Agency (U.S. EPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residual from Electric Utilities; Final Rule*, date April 17, 2015 (U.S. EPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of a final report identified in 40 CFR 257.97(a) and identify the remedy selected to address the cobalt Groundwater Protection Standard (GPS) exceedances observed in groundwater samples from detection monitoring wells for the Ottumwa Generating Station (OGS) Ash Pond and former OGS Zero Liquid Discharge Pond (ZLD Pond). These GPS exceedances for cobalt were initially identified in the following:

- Notification of Groundwater Protection Standard Exceedance dated February 13, 2019.
- Notification of Groundwater Protection Standard Exceedance dated August 12, 2020.

This Selection of Remedy report includes a description of the selected remedy and how it meets the requirements of 40 CFR 257.97(b), which are described in **Section 3.1**.

This report also provides a brief summary of the activities completed to further define the nature and extent of the groundwater impacts attributed to the OGS Ash Pond and former OGS ZLD Pond since Assessment of Corrective Measures (ACM) report Addendum No. 2 was issued on August 5, 2022.

2.0 BACKGROUND

2.1 SITE INFORMATION AND MAP

OGS is located southwest of the Des Moines River, approximately 8 miles northwest of the City of Ottumwa in Wapello County, Iowa (**Figure 1**). The address of the plant is 20775 Power Plant Road, Ottumwa, Iowa. In addition to the coal-fired generating station, the property also contains the OGS Ash Pond, the Low Volume Wastewater Treatment Pond (LVWTP) (constructed in the location of the former ZLD Pond, which was completely excavated in 2021), a coal stockpile, and a hydrated fly ash stockpile.

The OGS Ash Pond and former ZLD Pond are monitored with separate groundwater detection monitoring networks. A map showing the CCR units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program is provided on **Figure 2**. A list of the site monitoring wells is provided in **Table 1**. Although the detection monitoring networks are separate, Interstate Power and Light Company (IPL) is addressing the delineation of cobalt impacts in groundwater and the remedy selection process for both CCR units holistically.

The closure of the OGS impoundments was discussed in the most recent amendment to the written closure plan (Burns & McDonnell [BMcD], 2022). IPL issued a Notification of Intent to Close for the OGS ZLD Pond in November 2020. The OGS ZLD Pond was dewatered and all CCR material was removed and relocated to the OGS Ash Pond (completed in October 2021). A new low-volume wastewater treatment pond with a new geosynthetic pond liner was constructed in the former OGS ZLD Pond footprint. The new low-volume wastewater treatment pond is not a CCR unit. Excavation activities for the OGS ZLD Pond were completed in December 2021 and are documented in the

April 14, 2022 Construction Documentation Report – ZLDP Closure and Low Volume Wastewater Treatment Pond (LVWTP) Construction (SCS, 2022b).

The OGS Ash Pond permanently ceased receipt of all CCR and non-CCR waste as of May 2, 2022. Closure of the OGS Ash Pond was completed on June 21, 2023, according to the closure completion certification issued by BMcD (BMcD, 2023). The OGS Ash Pond was closed with CCR remaining within the footprint of the existing impoundment under a final cover system that meets the requirements of 40 CFR 257.102(d)(3). Closure activities for the OGS Ash Pond are documented in the August 21, 2023 Construction Documentation Report – Main Ash Pond Closure (SCS, 2023h).

In accordance with 40 CFR 257.96(a), IPL prepared an ACM in response to the cobalt detected in groundwater samples above the GPS, which was issued in September 2019. Two addenda to the ACM were issued in November 2020 (Addendum No. 1 [SCS, 2020e]) and August 2022 (Addendum No. 2 [SCS, 2022d]).

In accordance with 40 CFR 257.96(e), IPL held a public meeting in June 2020 to discuss the ACM. The meeting was open to interested and affected parties. Additionally, public meetings were held to present the ACM Addendum No. 1 in February 2021 and to present the ACM Addendum No. 2 in August 2024.

2.2 UPDATED NATURE AND EXTENT OF GROUNDWATER IMPACTS

This section provides an update of the nature and extent of groundwater impacts since the ACM Addendum No. 2 was completed. The additional work further defined the nature and extent of groundwater impacts and includes:

- **September 2022** – Submitted a joint permit application was to the U.S. Army Corps of Engineers (Corps) and Iowa Department of Natural Resources (IDNR) for three proposed delineation monitoring wells (MW-316, MW-316A, and MW-317) along the banks of the Des Moines River. Completed documentation for installation of water level only wells surrounding the OGS Ash Pond.

- **October 2022** – Conducted a semiannual assessment groundwater monitoring event with additional monitored natural attenuation (MNA) parameters for the Selection of Remedy process. Received confirmation that no county floodplain permit is required for the installation of OGS ZLD Pond compliance well MW-315. A letter was received by the Corps that an archeological and geomorphological survey will be required prior to the installation of three delineation wells (MW-316, MW-316A, and MW-317) along the banks of the Des Moines River.

- **November 2022 –** Completed permitting for installation of compliance well MW-315.

- **December 2022 –** Received an IDNR approval letter for the installation of three delineation monitoring wells (MW-316, MW-316A, and MW-317) along the banks of the Des Moines River. Monitoring well MW-315 was installed downgradient of the OGS ZLD Pond. The fieldwork for the archaeology and geomorphological survey was completed to support federal approvals for the installation of the three delineation monitoring wells (MW-316, MW-316A, and MW-317) along the banks of the Des Moines River.

- **January 2023** – Received the archaeological and geomorphological survey report. Nothing was discovered that would prevent the installation of delineation monitoring wells. The Corps authorized the installation of three delineation wells (MW-316, MW-316A, and MW-317), but it was rescinded because the Corps did not coordinate the archaeological survey with the State Historic Preservation Office (Department of the Army [DA], 2023).

- **February 2023** – Conducted the first supplemental groundwater sampling event in the new OGS ZLD Pond compliance well MW-315.

- **March 2023** – Conducted the second supplemental groundwater sampling event in the new compliance well MW-315 for the former OGS ZLD Pond. A flood plain permit waiver was requested from the county engineer; the permit was waived. Well construction reports were submitted for MW-312 and MW-313 in one report and for MW-315 in another report. Delineation wells MW-316, MW-316A, and MW-317 were installed and hydraulic conductivity testing on the new wells was completed. Staff gauges SG-2 and SG-3 were installed in Middle Avery Creek.

- **April 2023** – Completed the semiannual groundwater sampling event. A Joint Permit Notice of Completion was filed.

- **July 2023 –** Submitted a Groundwater Monitoring System Update Recertification for the former OGS ZLD Pond MW-315 compliance well to the Operating Record with supporting documentation.

- **August 2023** – Completed a Monitoring Well Construction Report for MW-316, MW-316A, MW-317, SG-2, and SG-3 was completed.

- **October 2023** – Completed a semiannual groundwater sampling event. A proposal for remedy selection and design was completed.

- **January 2024** – Performed capture zone analysis for the design and installation of an extraction well to be used for a pumping test.

- **February 2024** – Submitted applications for well, flood plain, and pump test water discharge permitting for the pumping test extraction well and pumping test observation well.

- **April 2024** – Installed an extraction well and piezometer for the aquifer pumping test. Surveyed extraction and piezometer locations. Completed a pumping test and collected a post-pumping test cobalt sample at MW-307. Conducted a semiannual groundwater sampling event for the Ash Pond and the ZLD Pond.

- **June 2024** – Collected an additional assessment monitoring sample at MW-307 for cobalt analysis.

- **August 2024** – Submitted the final ZLD Pond Annual Report for 2023. Drafted a pumping test memo that includes well installation documentation. Held a public meeting to present the groundwater corrective action remedy selected for the site.

- **September 2024 – February 2025** – Revised leach testing and pumping test technical memo.

- **September 2024– March 2025 –** Revised the draft Selection of Remedy Report.

- **November 2024** – Began design of a larger scale aquifer pumping test. Completed an archaeological and geomorphological survey for planned installation of a new MW-318.

- **February 2025** – Submitted a flood plain permit application for installation of the new delineation well MW-318.

- **March 2025 –** Finalized a Semiannual Corrective Action and Selection of Remedy update.

2.2.1 Potential Sources

The source of cobalt in monitoring wells exceeding GPSs is believed to be the monitored CCR units that include the following:

- OGS Ash Pond
- Former OGS ZLD Pond

As described in the ACM and subsequent addenda, potential sources of cobalt or factors that may be contributing to the groundwater impacts observed include:

- CCR materials discharged to the OGS Ash Pond and/or the former OGS ZLD Pond including bottom ash, economizer ash, precipitator fly ash, hydrated fly ash, and pyrites.

- Precipitation and storm water formerly managed within the OGS Ash Pond and/or former OGS ZLD Pond.

- Wastewater formerly managed in the OGS Ash Pond.

No additional sources have been identified since the ACM and subsequent addenda were issued.

2.2.2 Updated Groundwater Assessment

The ACM process was triggered by the detection of cobalt at statistically significant levels (SSLs) exceeding the GPS in samples collected from compliance wells MW-305 (OGS Ash Pond) and MW-307 (former OGS ZLD Pond). Since the ACM Addendum No. 2, cobalt was identified as an SSL in the October 2022, April 2023, and October 2023 sampling events. Cobalt was also determined to be an SSL in the MW-315 compliance well during the October 2023 sampling event, which is the first SSL identification for cobalt at this sampling location. The October 2023 sampling event was the fourth sampling event for MW-315, which is the minimum number of samples needed to run lower confidence level (LCL) calculations.

Cobalt was also determined to be an SSL for both April and October 2024 events in compliance wells MW-305, MW-306, MW-307, and MW-315; the SSL determination of cobalt in MW-306 is new as of the April 2024 event. The historical and updated CCR Program sampling analytical and field data results are summarized in **Tables 4** and **5.** The October 2023 cobalt data are shown on **Figure 3.**

Based on the results of assessment monitoring conducted through the October 2024 event, SSLs exceeding the GPSs have been identified for the following wells and parameters:

Appendix Monitoring Appendix IV Parameter	Location of GPS Exceedance	Historic Range of Detections at Wells with SSL Above GPS in µg/L	GPS in µg/L
Cobalt	MW-305	13.7 - 21	6
Cobalt	MW-306	4.8 - 9.9	6
Cobalt	MW-307	0.62 - 64	6
Cobalt	MW-312	4.9 - 13	6
Cobalt	MW-315	6.4 - 7.8	6

µg/L = micrograms per liter GPS = Groundwater Protection Standard SSL = Statistically Significant Level

Note: Thallium was detected above the GPS in MW-302 during the April 2023 event; however, it was determined that the detected thallium is likely a false positive due to carryover in the analytical equipment. Thallium was not detected above the GPS during the October 2023 event. The April 2023 sampling event was the only event where it was detected above the GPS.

The uppermost aquifer unit at the site, as defined under 40 CFR 257.53, is the Mississippian bedrock aquifer and hydraulically connected overlying unconsolidated deposits. Regionally, unconsolidated alluvial aquifers near the Des Moines River and deeper bedrock aquifers are both used for water supply. The thickness and water-producing capacity of the unconsolidated material in the area is variable. A summary of the regional hydrogeologic stratigraphy is included in the 2024 Annual Groundwater Monitoring and Corrective Action Report, Ottumwa Generating Station – Ash Pond dated January 31, 2025 (SCS, 2025c). Geologic cross sections that show monitoring well depth and construction with respect to the shallow potentiometric surface are included as **Figures 4**, **5**, and **6.**

The CCR compliance monitoring wells for the OGS Ash Pond include the background well MW-301 and downgradient compliance wells MW-302 through MW-306. In 2022, four water table monitoring wells, MW-302WT, MW-304WT, MW-306WT, and MW-314WT, and one piezometer, MW-314, were installed to support closure activities for the OGS Ash Pond. Additional delineation wells were added (MW-305A, MW-310/310A, MW-311/311A, MW-312, and MW-313) following the initiation of assessment monitoring and the determination that cobalt concentrations in MW-305 and MW-306 exceeded the GPS. Three additional delineation monitoring wells were installed in March 2023, including MW-316/316A and MW-317. Another delineation well (MW-318) downgradient of MW-315 is planned for installation in 2025.

For the former OGS ZLD Pond, the CCR compliance monitoring well system includes MW-307, MW-308, MW-309, and MW-315. MW-301 also serves as the background well for the ZLD Pond monitoring system. The fourth compliance well, MW-315, was added to the network in November 2022 and was certified in 2023 as part of the CCR monitoring network. A summary of the current monitoring well network is included in **Table 1.** A summary of groundwater sampling events for the OGS Ash Pond is in **Table 2A**, and a summary for the OGS ZLD Pond is in **Table 2B.**

Updated depth to water measurements and groundwater elevations collected since the ACM Addendum No. 2 are summarized in **Table 3.** The 2024 groundwater potentiometric maps are shown on **Figures 7** through **12.**

2.2.3 Updated Conceptual Site Model

Additional investigation efforts were completed following the August 5, 2022 ACM Addendum No. 2, which addressed both the OGS Ash Pond and former OGS ZLD Pond. The OGS Ash Pond and the former OGS ZLD Pond are both identified as possible sources of statistically significant exceedances above the GPS for cobalt. The evaluation of corrective action includes a holistic analysis for both CCR units at the OGS site.

Cobalt is present at statistically significant concentrations greater than the GPS beyond the waste boundaries of the OGS Ash Pond and the former OGS ZLD Pond. Lithium and fluoride have also been detected above their respective GPSs in bedrock wells away from the ponds; however, these compounds have not been observed in monitoring wells along the CCR waste boundary and have been assessed to be unrelated to historical disposal activities. Groundwater analytical data collected from the newly installed monitoring well MW-315 downgradient of the CCR units reinforces the previously detailed site conceptual model described in the ACM Addendum No. 2. Cobalt impacts in groundwater appear to be localized to groundwater within a few hundred feet of the CCR units; cobalt was not detected above the GPS in wells located further downgradient of the CCR units near the property boundary. Wells installed further downgradient from the ponds (MW-310/310A, MW-313, MW-316/316A, and MW-317) remain below the GPS of 6 μg/L.

Cobalt SSLs are also not present in the OGS ZLD Pond compliance monitoring well MW-308, which is located between SSL-impacted compliance wells MW-307 and MW-312. The cobalt SSL at well MW-315 was recently determined and the same pumping and treat remedy selected in the Selection of Remedy (SOR) can be extended to cover the cobalt SSL in the vicinity of well MW-315, if necessary.

Depth to groundwater, as measured in the site CCR monitoring wells, that are screened in the uppermost aquifer varies from approximately 1 to 40 feet below ground surface due to topographic variations across the facility and seasonal variations in water levels. Groundwater flow at the site within the uppermost aquifer is generally to the east-northeast. There are minor groundwater flow direction fluctuations seasonally due to the proximity to the river. Water levels fluctuate seasonally; however, there is no indication of a reversal of flow in the recorded data. The groundwater elevations in wells MW-310 and MW-311 show a close correlation to the river elevation (SG-1). Groundwater elevations and flow directions in the uppermost aquifer are shown on the April, August, and October 2024 potentiometric surface maps (**Figures 7** through **12**).

For the April and October events, cobalt was identified as an SSL above the GPS at the OGS Ash Pond in MW-305 and 306. For both events, cobalt was identified as an SSL above the GPS at the OGS ZLD Pond in MW-307 and MW-315.

A treatability study was conducted and included in the ACM Addendum No. 2 for cobalt. In this study it was observed that cobalt concentrations in groundwater increased upon acidification of samples in the laboratory. ReSolution Partners, LLC interpreted this rise in cobalt as the result of the release of cobalt to the aqueous phase that had been adsorbed to suspended sediment prior to acidification. This interpretation suggests that in the field, as groundwater flows away from the OGS Ash Pond, cobalt adsorbs to iron oxyhydroxide minerals that are present (or are forming) in the aquifer matrix. The finding that cobalt adsorption is occurring in groundwater downgradient from impacted wells supports MNA as part of a viable remedial alternative for cobalt.

In summary, cobalt is present in groundwater at SSLs above the GPS immediately downgradient of the CCR units, but due to natural attenuation caused by adsorption to iron minerals, cobalt is not detected above the GPS in downgradient delineation wells further downgradient of the CCR units. The additional groundwater delineation data available to date suggests that exposure pathways that may impact human health or the environment are incomplete, due to adsorption of cobalt to iron minerals before reaching the Des Moines River. We understand the nature and extent of impacts near the other wells and believe the selected remedy, as described below, will achieve the GPS and comply with CCR Rule requirements. IPL believes the remedy should be implemented to expedite corrective action in areas where nature and extent is fully understood. Further, we anticipate that the selected remedy will also be appropriate for the area near MW-315, but because this exceedance is new, additional delineation of the extent is needed prior to implementation.

A delineation well is currently being designed for installation downgradient of well MW-315. The groundwater exposure pathway appears to be incomplete due to the lack of water supply wells present in the impacted groundwater area. Cobalt does not appear to be migrating to a location where it can impact human health or the environment, and therefore no complete exposure pathway was identified for cobalt.

3.0 CORRECTIVE MEASURES AND REMEDY SELECTION

Several corrective measure options were presented in detail in Assessment of Corrective Measures OGS Ash Pond Addendum No. 2 and OGS Zero Liquid Discharge Pond, OGS report, dated August 5, 2022.

This report identified the following corrective measure alternatives for the cobalt impacts to groundwater associated with the OGS Main Ash Pond and ZLD Pond:

- Alternative 1 (A1) – No Action
- Alternative 2 (A2) – Cap CCR in Place with MNA
- Alternative 3 (A3) – Consolidate and Cap with MNA
- Alternative 4 (A4) – Excavate and Dispose On Site with MNA
- Alternative 5 (A5) – Excavate and Dispose in Off Site Landfill with MNA
- Alternative 6 (A6) – Consolidate and Cap with Chemical Amendment and Groundwater Collection
- Alternative 7 (A7) – Consolidate and Cap with Groundwater Collection
- Alternative 8 (A8) – Consolidate and Cap with Barrier Wall and Groundwater Collection

The following sections present:

- A comparison to the minimum criteria set forth in 40 CFR 257.97(b).
- A discussion of the evaluating criteria in 40 CFR 257.97(c).
- A summary of the selected remedy.

3.1 APPLICABILITY OF CORRECTIVE MEASURES

In accordance with 40 CFR 257.97(b)(2), a groundwater remedy must attain the GPS and, per 40 CFR 257.98(c)(1), cannot be deemed complete until the GPS has been achieved within the contaminant plume area beyond the groundwater monitoring system established under 40 CFR 257.91. Based on our current understanding of the CCR rule, meeting this standard is required regardless of the present risk to human or ecologic health discussed in the ACM, ACM addenda, and Section 2.2. SCS has reviewed the potential groundwater corrective measures based on our current CCR rule understanding and considered the updated groundwater assessment and conceptual model, along with the operational needs of the OGS facility. Based on our updated review, some of the potential corrective measures are no longer applicable and have been eliminated from further consideration.

A1

Alternative 1 is no action and is only included as a baseline condition and a point of comparison for the other alternatives. This alternative did not satisfy all five criteria in 40 CFR 257.97(b)(1) through (5), so it is not an acceptable corrective measure under the CCR Rule and is eliminated from further consideration.

A2

Alternative 2 includes closing and capping CCR in place with MNA, but is eliminated due to the operational needs of the facility. The former OGS ZLD Pond was fully excavated and portions of the OGS Ash Pond were excavated to make room for additional infrastructure to meet the future needs of OGS.

A3 through A5

A3 through A5 rely on the elimination of CCR sluicing and plant process water discharges to regulated CCR impoundments and the excavation and disposal or consolidation of the CCR footprint, along with the installation of a cap to reduce infiltration through the CCR. Excavation with on-site disposal, off-site disposal, or consolidation of CCR into a smaller footprint during closure eliminates the volume of potential source materials that may be in contact with groundwater after closure. These actions are expected to address exposure of CCR material to precipitation/surface water infiltration, which is a significant contributor to groundwater impacts from surface impoundments. Further leaching of metals and migration within groundwater will be reduced and may be eliminated. MNA is included with these alternatives to monitor changes in groundwater impacts, and evaluate the natural degradation mechanisms that are active and the effectiveness of those degradation mechanisms at reducing groundwater concentrations over time.

OGS has ceased CCR sluicing and plant process water discharges to the OGS ZLD Pond and the OGS Ash Pond. The excavation and consolidation of CCR described under A3 (see ACM Addendum No. 2) has already occurred at OGS. All of the CCR from the OGS ZLD Pond was removed and consolidated into the OGS Ash Pond. A new, lined, non-CCR wastewater pond was constructed in the location of the former OGS ZLD Pond. In the OGS Ash Pond, areas of potential CCR and interaction with groundwater in the uppermost aquifer at the time of closure were eliminated by removing the CCR, placing imported fill to raise the bottom of the pond, and replacing the CCR before capping. On July 19, 2023, the closure of the OGS Ash Pond was certified as complete in accordance with 40 CFR 257.102(f)(3). The closure of the OGS ZLD Pond has not been certified due to the groundwater impacts described in **Section 2.2.2**.

A3 through A5 also involves MNA for mitigating CCR-impacted groundwater. Based on the investigations discussed in the ACM and ACM Addenda, MNA mechanisms, including precipitation, coprecipitation, and dispersion, are active at OGS, and the active mechanisms are generally long-lasting. MNA is a viable alternative for site remediation.

The inclusion of A3 through A5 considers whether a “receptor” or “exposure” to the affected groundwater is possible or likely. Additionally, A3 through A5 considers MNA for mitigating CCR-impacted groundwater. Although MNA mechanisms at this location were evaluated and determined to be active, MNA alone may not ultimately be viable if the time required to reduce cobalt concentrations in groundwater to meet the GPS with MNA is significantly greater than other alternatives or dispersion is the only active MNA process. However, for this process of evaluating and selecting a remedy, Alternatives 3 through 5 are retained for further evaluation.

A6

Alternative 6 includes closing the OGS ash ponds, relocating and consolidating CCR into a smaller footprint within the CCR surface impoundments, adding a chemical amendment to the CCR to reduce the mobilization of cobalt prior to relocating, covering the CCR materials with a cap, and establishing vegetation in accordance with the requirements for closure in place in 40 CFR 257.102(d).

This alternative requires the identification and application of a suitable chemical amendment to the CCR during ash pond closure, which did not occur prior to closure of the ponds as required by the CCR Rule. Therefore, Alternative 6 is eliminated from further consideration.

A7

Alternative 7 is similar to A3 with a potential increased reduction of risk due to the removal of CCR constituents from the aquifer. This alternative includes consolidation and capping of CCR materials on site with groundwater collection and subsequent treatment. Alternative 7 is retained for further evaluation.

A8

This alternative is also similar to A3 with a potential reduction in long-term risk provided by the additional containment of a barrier wall. This alternative includes consolidation and capping of CCR materials on site with a groundwater barrier wall and groundwater collection with subsequent treatment. Alternative 8 is retained for further evaluation.

3.2 MINIMUM CRITERIA

The selected remedy must meet the minimum criteria set forth in 40 CFR 257.97(b). These criteria and the ability of the alternatives evaluated to satisfy the criteria are summarized in Table 8.

It is our opinion that Alternatives 3, 4, 5, 7, and 8 can meet the requirements in 40 CFR 257.97(b)(1) through (5) based on the information currently available.

3.3 EVALUATION FACTORS

Each alternative remedy was evaluated based on the criteria set forth in 257.97(c). The retained remedies were compared with each other to assess the remedy that best satisfies the collective criteria. The comparison is presented in Table 8 based on the following evaluation criteria:

- Long- and Short-Term Effectiveness [257.97(c)(1)]
  - Magnitude of reduction of existing risks.
  - Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy.
  - The type and degree of long-term management required, including monitoring, operation, and maintenance.
  - Short-term risks to human health and the environment associated with:
    - Excavation
    - Transportation
    - Re-disposal
  - Time until full protection is achieved.

- Potential for exposure for humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment.
  - Long-term reliability of the engineering and institutional controls.
  - Potential need for replacement of the remedy.

- Source Control to Reduce Future Releases [257.97(c)(2)]
  - The extent to which containment practices will reduce further releases.
  - The extent to which treatment technologies may be used.

- Ease or Difficulty of Implementation [257.97(c)(3)]
  - Degree of difficulty associated with constructing the technology.
  - Expected operation reliability of the technologies.
  - Need to coordinate with and obtain necessary approvals and permits from other agencies.
  - Availability of necessary equipment and specialists.
  - Available capacity and location of needed treatment, storage, and disposal.

- Community Acceptance [257.97(c)(4)]
  - The degree to which community concerns are addressed by a potential remedy.

3.3.1 Long- and Short-Term Effectiveness [257.97(c)(1)]

The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following per 257.97(c)(1):

Magnitude of Existing and Residual Risks

Each of the retained alternatives serves to reduce the magnitude of existing risks similarly because the existing risk is already minimal based on the discussion in **Section 2.2.3**, consistent with 257.97 (c)(1)(i) and (ii).

The likelihood for potential future release of CCR to the environment is listed in order of least to most likely, as follows:

- A5 eliminates the potential for future releases of CCR at OGS because the material would no longer remain at the facility. This alternative creates new risks at the destination facility, although those risks would be expected to be low.

- A4 also reduces the likelihood of further releases at OGS because CCR would be re-disposed in a lined disposal area, but to a lesser degree than A5 because the CCR remains on site.

- A8 presents a potential release of CCR in the form of materials leaching to groundwater in the event of a significant change in potentiometric surface conditions in the uppermost aquifer. However, CCR with the greatest potential for future exposure to groundwater has been excavated and consolidated above the shallow potentiometric surface of the uppermost aquifer, and therefore the risk of further release has been minimized. Under groundwater conditions observed to date, this alternative does not provide any significant added benefit.

- A3 and A7 present a slightly increased risk over alternative A8 as no barrier wall component is a part of these remedies.

Type and Degree of Long-Term Management

Potential remedies were evaluated with respect to "the type and degree of long-term management required, including monitoring, operation and maintenance," 257.97 (c)(1)(iii).

- A5 relies on a separate landfill location, and IPL's remaining responsibility for operation, maintenance, and monitoring (OM&M) depends on IPL's ownership stake in the facility. There may be no remaining responsibility for OM&M by IPL if the facility is owned by a separate party (e.g., municipal or other private owner). IPL would retain OM&M responsibility if the disposal occurs at an IPL-owned disposal facility. The responsibility for OM&M is the same for A4 and A5. IPL's additional OM&M responsibility for A7 includes groundwater pump operations and maintenance and treatment system monitoring and reporting through National Pollutant Discharge Elimination System (NPDES) permit requirements.

- A8 is similar to A7 with the following exceptions:

  - A8 requires additional monitoring of barrier wall performance with complex and extensive implementation of repairs, if required.

  - A8 requires a less robust groundwater pumping system, reducing operations and maintenance activities associated with this element. The provision of a barrier wall will inhibit inflow of groundwater from the perimeter, allowing more efficient dewatering. This can allow for fewer pumping wells or lower horsepower pumps.

- In the event IPL maintains OM&M responsibility, A3 is the least intensive and is limited to the current and ongoing groundwater monitoring conducted by IPL.

- A3, A4, A5, A7, and A8 each rely upon an engineered cover system to minimize or eliminate infiltration through the CCR material and require 30-year post-closure groundwater monitoring, groundwater monitoring network maintenance with as-needed repair/replacement, final cover maintenance such as mowing and as-needed repairs, periodic final cover inspections, and additional corrective action as required based on post-closure groundwater monitoring. A5 employs these elements at a separate landfill location. With A5, these responsibilities may be transferred to a third party.

Short-Term Risks

Potential remedies were evaluated with respect to short-term risks, "Short-term risks that might be posed to the community or the environment during the implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminant" 257.97(c)(1)(iv).

- The excavation of CCR required to implement A3, A7, and A8 has already been completed and poses no additional risk to the community and environment.

- A4 involves elevated risk to the environment compared to A3, A7, and A8 due to excavation and increased risk to the community from increased construction traffic to import materials used for the liner construction. During this excavation, there is a potential for changes to aerobic/anaerobic conditions of the CCR that could increase the mobility of trace metals within the CCR. A4 has a lower short-term risk profile than A5 because activity associated with excavation and re-disposal would take place at OGS.

- Implementing A5 requires the complete excavation of CCR material transported for re-disposal at a separate location. Similar to A4, there is a potential for changes to aerobic/anaerobic conditions of the CCR that could increase the mobility of trace metals within the CCR. The transportation required for A5 presents the most significant risks to the community and environment. This would affect the community by increasing air emissions from the additional haul vehicles and the deterioration of local roads due to significant traffic. A5 would require hauling approximately 420,000 cubic yards of CCR from the site and require an estimated 28,000 loaded truck trips on local roads, presenting additional safety, noise, and overall quality of life concerns. This could include traffic accidents leading to injuries and/or overturned vehicles releasing contents to the environment. Open-face excavation also poses a short-term risk of elevated groundwater and surface water impacts. The number of truck trips assumes each truckload contains 15 cubic yards of CCR and only considers loaded truck trips. If each truck returns to OGS empty, the actual truck trips is double. Additional risks for A5 occur at the receiving facility due to the construction activities required to develop adequate receiving capacity and facility operations to dispose of the CCR from OGS.

- Implementing A7 and A8 involves some increased risk due to drilling, trenching, and excavation for groundwater pumping and treatment system construction. When compared to A7, additional risk is present for A8 during the construction activities involved in the barrier wall installation. A8 involves increased traffic risk due to importing barrier wall system materials. When compared to A3, risks created by increased traffic volume are present for A7 and A8 due to the importation of groundwater collection and treatment system materials.

Time Until Full Protection is Achieved

The potential remedies were evaluated with respect to "time until full protection is achieved," 257.97(c)(1)(v).

- A5 likely presents the longest time to implement closure and extends the time required to achieve full protection. This is due to the time required to identify and secure off-site disposal capacity or develop the capacity at an existing IPL-owned facility. If landfill capacity is not owned by IPL, additional time may be required to permit and develop the necessary disposal capacity. A prolonged construction timeframe is also likely due to the capacity of the receiving site to unload and place material. A5 also increases the time for groundwater to achieve the GPS due to significant and prolonged source disturbance during construction.

- The consolidation of CCR and capping for A3, A7, and A8 is complete, and each of these alternatives is anticipated to achieve the GPS in 2 to 10 years following closure. The GPS is expected to be achieved within the 30-year post-closure monitoring period. These timeframes are anticipated to be reduced following pumping associated with A7 and A8, and with the implementation of the barrier wall associated with A8. However, the implementation of A8 may be longer than A7 due to the time required to design, procure, and install the barrier wall.

- Full protection could be achieved for alternatives A4 and A5 once a final disposal location is identified and approved. It is possible that there could be substantial timing differences between these two alternatives depending on the disposal location. The time required to implement A4 and achieve full protection is anticipated to be similar to A5 but greater than A3, A7, or A8 due to the time required to permit a lined re-disposal area at OGS and implement A4 in the space available at the facility.

Potential for Exposure of Humans and Environmental Receptors

The potential remedies were evaluated with respect to the "potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, and re-disposal, or containment," 257.97(c)(1)(vi).

The ACM and subsequent addenda have described why the current risk to humans and the environment is low. Human and environmental exposure is increased during construction activities.

- A5 eliminates on-site exposure to remaining waste in the long-term because no CCR materials remain on site. However, the overall potential for exposure to humans and environmental receptors is the highest because of the on-site excavation, transportation, and re-disposal of materials at the receiving facility in the short-term. Unlike A3, A4, A7, and A8, the risk of potential exposure also includes the surrounding community and receiving facility personnel. The extended excavation and transportation of CCR off site for disposal poses the greatest risk of exposure and disturbance of the threatened and endangered species communities in the area relative to other options.

- A3, A7, and A8 each have low potential for exposure to humans and environmental receptors, with risk to construction workers during consolidation only, which is already complete.

- A4 has a lower environmental risk potential compared to A3, A7, and A8 due to the re-disposal of CCR in a lined facility, but potential for exposure is slightly higher due to higher material management volumes and additional construction period since the consolidation and capping required for A3, A7, and A8 is already complete.

- A7 and A8 have a slightly heightened risk over A3 due to potential for secondary impacts from releases of extracted groundwater, disruption in treatment, and additional groundwater pumping system and barrier wall construction and maintenance.

Long-Term Reliability

The potential remedies were evaluated with respect to "long-term reliability of the engineering and institutional controls," 257.97 (c)((1)(vii).

The long-term reliability for A5 depends on the engineering and institutional controls at the receiving facility. With respect to materials remaining on site, the reliability of the cap for A3, A4, A7, and A8 is projected to be high in the long term because:

- There is widely available personnel and industry experience with methods and controls.
- Construction consists of common earth movement practices.
- Capping is common for closure-in-place of remediation and solid wastes.

For materials remaining on site, A7 offers similar reliability of the engineering and institutional controls as A8. If there are any issues, A7 relies upon equipment that is readily available and serviceable by common trades. In the event the barrier, as part A8, requires repair or improvement, specialty equipment and personnel are required.

The long-term reliability for A4 is similar to A5 and provides improvements as compared A3, A7, and A8 due to re-disposal in a lined facility. The long-term reliability of A3, A4, and A5, which are similar with respect to addressing existing groundwater impacts using MNA, is likely less than A7 and A8 due to the active nature of the groundwater collection system.

Potential Need to Replace Remedy

Potential remedies were evaluated for the "potential need for replacement of the remedy," 257.97(c)(1)(viii).

- None of the alternatives will need to be replaced. By the nature of A5, there is no replacement possible and A4 is similar.

- A7 and A8 require ongoing monitoring and maintenance. A7 is expected to require replacement of components as part of system maintenance including pumps, conveyances, and treatment system media, if used. A8 requires repair of breaches or short-circuiting in the unlikely event they occur.

- A3, A4, and A5 may need to be supplemented or enhanced if MNA processes do not achieve the GPS. Supplementation or enhancement of the groundwater treatment system may be the closest to remedy replacement anticipated in the CCR Rule.

3.3.2 Source Control to Reduce Future Releases [257.97(c)(2)]

The effectiveness of the potential remedies in controlling the source to reduce further releases must be considered based on (i) the extent to which containment practices will reduce further releases; and (ii) the extent to which treatment technologies may be used per 257.97(c)(2) i and ii.

Extent Containment will Reduce Further Releases

A3, A7, and A8 reduce further releases by minimizing infiltration through CCR. A4 further reduces the risk of releases through the use of a composite liner and 5-foot groundwater separation as required by the CCR Rule.

A5 eliminates the possibility of further releases on site and relies upon the receiving facilities' controls to prevent further releases; however, during transportation of the material to the receiving facility, there is a significant risk of release by way of a spill or accident while in transit. Also, the risk of releasing CCR as particulate material during transport is significant.

A3, A7, and A8 reduce the potential for further releases by consolidating (reducing) the source area and installing a final cover system that minimizes infiltration in accordance with CCR Rule performance requirements. A7 and A8 offer the ability to contain or limit future groundwater impacts by creating an inward gradient. A8 relies upon the continuity of the barrier wall without a breach to reduce further releases.

Extent Treatment Technologies May be Used

A3 through A5 do not rely on treatment technologies. A7 relies on conventional pump and treat remediation. A8 relies on the identification and availability of a suitable barrier wall technology, and implementation of and contact with barrier wall materials will require specialized field implementation methods and health and safety measures.

3.3.3 Implementation [257.97(c)(3)]

Degree of Difficulty Constructing the Technology

A3 through A8 include elements of construction of a cap or an excavation with on- or off-site disposal. These construction projects can be accomplished with readily available materials and technology. A3, A5, and A7 have a low complexity construction, where cap and excavation remain on site. A4 is moderately complex to construct and involves designing a liner and on-site excavation. A8 is estimated to have a highly complex construction effort, which requires construction of a barrier wall with special equipment and requires highly specialized experience and contractors. A3, A7, and A8 are anticipated to have moderate levels of logistical complexity; A4 and A5 are expected to have high levels of logistical complexity.

Expected Operation Reliability of the Technology

A4 and A5 do not rely on specialized technologies, but the overall success relies upon the constructed on-site re-disposal or off-site disposal facility. The same is true for the final cover system components of A3, A7, and A8 with an expectation of similar outcomes; however, off-site disposal under A5 may eliminate the control of CCR materials by the Owner if they do not also own the off-site disposal facility. A3 relies on MNA, which does not require the application of additional technology. The success of A7 relies on the successful design and operation of a site-specific groundwater extraction and treatment system. The success of A8 relies on the successful selection, design, application, and operation of a barrier system and, similar to A7, a site-specific groundwater extraction and treatment system.

Need to Coordinate with and Obtain Approvals and Permits from Other Agencies

With the exception of the completed components of A3, A7, and A8, which do not require additional permitting, each remaining alternative will require a State Closure Permit and State and local construction storm water management permits.

The need for coordination and approval of permits from other agencies is the highest with A5, and will require approval of the off-site disposal site owner and may require Iowa solid waste comprehensive planning approval. Based on research and knowledge of nearby facilities, the capacity to dispose of the CCR from the CCR units at OGS does not currently exist within 50 miles of OGS and would need to be developed, whether or not the off-site disposal facility is owned by IPL. Disposal at a third-party facility will likely require significant additional siting and permitting.

A7 and A8 will require State and local groundwater well permitting for extraction well installation; a State Water Use Permit for groundwater extraction depending on the design capacity; a State Wastewater Construction permit for the groundwater treatment system; an NPDES permit for the treated groundwater discharge; and may require Federal, State, and/or local permits for system construction related to erosion control, stormwater management, floodplains, and wetlands. Depending on the methods of constructing the barrier, A8 may require additional permitting related to underground injection control (UIC).

Availability of Necessary Equipment and Specialists

The equipment and specialists for all of the alternatives are readily available. Some specialty materials are needed for the composite liner construction for A4 and A5. For A5, the off-site air space needed for CCR disposal is not readily available. The air space needed for A4 will need to be developed on site in the same location as the existing closed OGS Ash Pond. A4 is potentially limited by the availability of contractors with the necessary experience to logistically manage the phased construction needed to construct/complete this alternative with success.

A7 is similar to A3, but would require trained employees to operate the groundwater collection and treatment system. A8 is similar to A3 and A7, but would require specialized equipment for the barrier installation, and the number of suppliers with the equipment and expertise available to implement A8 are limited.

Available Capacity and Location of Needed Treatment, Storage, and Disposal Services

The capacity and location of treatment, storage, and disposal services is unlikely to be a factor for A3, A7, and A8. Disposal under A5 is limited by the receiving facility's logistical capacity, the time required to develop the necessary capacity, and the transportation of CCR material off site. All are significant limiting factors. Disposal under A4 will be constrained by the space available on site to complete this alternative.

3.3.4 Community Acceptance [257.97(c)(4)]

No comments were received during the initial public meeting held on June 4, 2020, presenting the ACM. Additionally, no comments related to the ACM Addendum No. 1 were received during the public meeting held on February 18, 2021, presenting the November 2020 addendum to the ACM.

An additional public meeting was held on August 19, 2024, to present information from the August 2022 ACM Addendum and the proposed remedy discussed in this Selection of Remedy Report. No comments were received during this meeting.

In addition, the IDNR has issued a Sanitary Disposal Project Closure Permit (Permit Number 90-SDP-16-15C) to accommodate the construction of the final cover at the OGS Ash Pond, which is now complete, and the post-closure care of the consolidated and capped CCR at OGS (as required by A3, A7, and A8). A wastewater construction permit has also been issued by IDNR for the construction of the new LVWTP. While A7 and A8 still require coordination with and approvals from IDNR wastewater and potentially water use staff, IPL assumes that the required permits can be obtained as required prior to implementation of these alternatives.

The likely selected alternative presented at the public meetings did not include off-site disposal. If, in the future, A5 is presented as the likely selected alternative, community acceptance will be revisited once the receiving disposal facility is identified and potential traffic patterns are contemplated. These details may have a significant impact on the participation in the public involvement process and the level of acceptance within the surrounding communities.

3.4 SELECTED REMEDY

The remedy selected includes Alternative 7 (A7) – Consolidate and Cap with Groundwater Collection.

A7 - Consolidate and Cap with Groundwater Collection has been selected based on the evaluation of factors defined in 257.97(c), presented above, and is the selected remedy. This alternative results in low long-term and short-term risks. A7 does not completely remove the CCR from the facility; however, the CCR and existing groundwater impacts are controlled and it does not present additional exposure risks to the surrounding community. The implementation of A7 can be achieved more quickly than the other possible alternatives, and is expected to achieve the GPS more quickly as a result.

3.4.1 Remedy Description

A7 includes closing the impoundments after eliminating all wastewater discharges to the ash pond, relocating and consolidating CCR into a smaller footprint within the existing CCR surface impoundments, covering the CCR materials with a cap, and establishing vegetation in accordance with the requirements for closure in place in 40 CFR 257.102(d). This measure is consistent with landfill cover systems to minimize, control, or eliminate infiltration of surface water into the CCR. Impacted groundwater will be collected using pumps and treated prior to discharge according to state and federal requirements. It also includes groundwater collection and treatment at targeted locations downgradient of the ponds.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will minimize, control, or eliminate infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is the exposure of CCR material to ash sluice water, low-volume plant wastewaters, and precipitation/surface water infiltration. The reasonable potential of exposure to human health and the environment will be reduced and may be eliminated as impacted groundwater is collected near the waste boundary to contain and restore cobalt concentrations in groundwater to levels below the GPS. A discussion of how this alternative meets the minimum standards in 257.97(b) is provided below. Drawings showing the closed OGS Ash Pond and OGS ZLD Pond are provided in **Appendix B.**

3.4.2 Satisfying Minimum Criteria

The selected remedy is expected to meet the minimum criteria established in 257.97(b) and described in **Section 3.2**. Each requirement is discussed below. The selected remedy was evaluated along with other potential corrective measures considering the factors in 40 CFR 257.97(c), which are discussed in **Section 3.3** and outlined in **Table 8.**

257.97(b)(1) – Be protective of human health and the environment:

As discussed in the ACM Addendum No. 1 and Addendum No. 2, and **Section 2.2** above, the available data indicates that there is no active exposure pathway for cobalt. A7 sustains or improves the current level of protectiveness by capturing CCR-impacted groundwater and providing an inward gradient. A7 provides active groundwater recovery.

In addition, the selected remedy minimizes the handling of CCR and therefore the exposure of construction workers, the public, and other sensitive receptors (e.g., nearby communities or threatened or endangered species, if present) to CCR. It also reduces secondary impacts from the remedy implementation such as fine particulates from fugitive dust (e.g., dust generated while traveling local gravel roads), and particulate in equipment exhaust, noise, and traffic.

257.97(b)(2) – Attain the groundwater protection standard as specified pursuant to § 257.95(h):

Capturing impacted groundwater and preventing migration past the impoundment boundary will serve to attain the GPS for cobalt. Furthermore, as supported by the treatability study completed in 2022, natural attenuation of cobalt is occurring at OGS. This serves as an effective supplemental remedy to attain the GPS within the 30-year post-closure monitoring period in conjunction with the chosen alternative.

Although additional work is being performed to delineate GPS exceedances downgradient of the excavated former OGS ZLD Pond near MW-315, based on what is known of the site as of this Report, the selected remedy is expected to be able to attain the GPS at the impoundment boundary.

257.97(b)(3) – Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment:

The source of cobalt release to groundwater is attributed to CCR in the OGS Ash Pond and the former OGS ZLD Pond, which had CCR materials removed and consolidated into the OGS Ash Pond. In addition, CCR in the OGS Ash Pond with the highest potential for future contact with groundwater was excavated and consolidated within the closure area following the placement of imported clean fill to provide separation between the CCR that remained in the OGS Ash Pond and the shallow potentiometric surface in the uppermost aquifer. The selected remedy reduces or eliminates, to the maximum extent feasible, infiltration through the CCR and further releases of CCR constituents into the environment by consolidating CCR from the former OGS ZLD Pond into the OGS Ash Pond.

The installation of a cap in accordance with 40 CFR 257.102(d)(3)(i), will reduce, control, or eliminate infiltration through CCR. This is expected to address the major contributor to the observed GPS exceedances, which is the exposure of CCR material to precipitation/surface water infiltration. The groundwater collection system is capable of capturing future releases, if any, for treatment at the surface prior to discharge.

257.97(b)(4) – Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems:

As described above, addressing infiltration in combination with groundwater collection and treatment is expected to eliminate cobalt impacts to groundwater by removing CCR-impacted groundwater (the only contaminated material that was released from the CCR unit) from the environment without disturbing sensitive ecosystems.

IPL evaluated the potential presence of threatened and endangered species at OGS in preparation for the closure of the CCR units. No potential impacts were identified. Due to the long history of industrial activity at the facility and a lack of habitat within the existing facility, there is little risk of disturbing threatened and endangered species during on-site closure and groundwater remedy activities.

257.97(b)(5) – Comply with standards for management of wastes as specified in § 257.98(d):

All wastes associated with the selected remedy are anticipated to be non-hazardous. All CCR or other waste generated during the implementation of the selected remedy can be managed in accordance with all applicable Resource Conservation and Recovery Act (RCRA) requirements. The selected remedy will comply with the standards for management of wastes described in 40 CFR 257.98(d) by monitoring the generation, transportation, treatment, storage, and disposal of wastes subject to RCRA requirements. IPL will work with project management, corporate, and on-site environmental staff, consultants, contractors, and vendors to identify the materials generated during the construction, operation, and maintenance of the selected remedy. The management of wastes subject to RCRA will be documented through appropriate recordkeeping, reporting, labeling, exportation, and containerization to uphold the RCRA program's principal objectives as described by U.S. EPA (U.S. EPA, 2023):

- Protect human health and the environment from potential adverse effects of improper solid waste management.
- Conserve material and energy resources through waste recycling and recovery.
- Reduce or eliminate the generation of waste as expeditiously as possible.

4.0 SCHEDULE

An estimated schedule for the implementation of the selected groundwater corrective action is provided in **Appendix C**. The estimated schedule for the groundwater collection system builds on the estimated ash pond closure schedule provided in the latest written closure plan (BMcD, 2022). As described above, the on-site consolidation and capping of CCR was completed in June 2023.

The schedule provided in **Appendix C** includes 1 year of groundwater collection system OM&M. The full duration and final completion of the groundwater corrective action at OGS are not represented on the enclosed Gantt chart schedule to provide clarity on short-term activities. The current estimate for the completion of the groundwater corrective action at OGS is 2 to 10 years. This estimated range will continue to be refined as the groundwater collection system design progresses.

The schedule described above and provided in **Appendix C** is based on the following considerations, as described in 257.97(d) and discussed below.

257.97(d)(1) – Extent and nature of contamination, as determined by the characterization required under §257.95(g):

Investigations of the nature and extent of cobalt in groundwater attributed to the OGS Ash Pond and former OGS ZLD Pond are complete except in the area downgradient of compliance well MW-315 and near Avery Creek to the southeast of the OGS Ash Pond where coarse-grained creek bed deposits represent a potential preferential pathway for groundwater flow. However, given the lack of human and ecological receptors identified to date, ongoing monitoring and the remedy schedule enclosed should be protective of human health and the environment even as the investigation of the nature and extent of cobalt impacts near MW-315 is completed. The final design of the selected remedy will include remediation of any identified impacts at MW-315 and downgradient.

Groundwater monitoring will continue as the selected remedy is implemented and, unless significant changes in the nature of the impacts are observed, the schedule described above will not be impacted.

257.97(d)(2) – Reasonable probabilities of remedial technologies in achieving compliance with the GPSs established under §257.95(h) and other objectives of the remedy:

The cessation of wastewater discharges and capping the consolidated CCR from the former OGS ZLD Pond and OGS Ash Pond is expected to be a reliable method of attaining the GPS for cobalt. Capping is a common practice and standard method for site remediation and solid waste management projects. There is significant industry experience with the design and construction of this method.

The addition of groundwater collection and treatment is expected to increase the probability of achieving the GPS and is expected to accelerate remediation. The combination of capping with groundwater collection and treatment is consistent with prior industry practice and the U.S. EPA's presumptive remedy approach for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) municipal landfills where high-volume waste poses a low long-term risk and it is not practical, technically feasible, or prudent to treat or re-dispose of the waste off site (U.S. EPA, 1993 and 1994). Both elements of the selected remedy are also listed in the Federal Remediation Technologies Roundtable (FRTR) Technology Screening Matrix as full-scale, commercially available, and proven to have attained cleanup goals at multiple sites with inorganic contaminants. As such, it is reasonable to expect the selected remedy will achieve the GPS. It is also reasonable to expect that cobalt concentrations in groundwater may fluctuate (increase or decrease) in the near term as CCR is disturbed during remedy implementation.

257.97(d)(3) – Availability of treatment or disposal capacity for CCR managed during implementation of the remedy:

The availability of treatment or disposal capacity is not a factor for the selected remedy schedule. The capacity to manage CCR from the former OGS ZLD Pond and the OGS Ash Pond is available on site within the current footprint of the OGS Ash Pond in accordance with the Closure Plan and 257.102(d).

257.97(d)(4) – Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy:

As discussed in the ACM, ACM Addendum No. 1, ACM Addendum No. 2, and Section 2.0, there is minimal risk to human health and the environment due to the cobalt in groundwater that is attributable to the OGS Ash Pond and former OGS ZLD Pond because no exposure pathways are currently shown to be completed. Although additional work is required downgradient of MW-315, based on what is known of the site as of this Report, there is little reason to expect the receptors or potential exposure pathways will change prior to the completion of the remedy. The potential risk of new or increased exposure to receptors over the period of time required to implement the selected remedy is low.

257.97(d)(5) – Resource value of the aquifer:

The aquifer in the area of cobalt impacts (downgradient of the OGS Ash Pond and former OGS ZLD Pond) is not currently used as a water supply for human or animal consumption or irrigation. The value of the aquifer in this area is unlikely to change significantly over the time required to implement the selected remedy, as the facility will continue to operate as it currently does over the near term. Due to the availability of an alternative local water supply (Rathburn Rural Water System) to the uppermost aquifer where the groundwater impacts exist, it is also unlikely that the resource value of the aquifer will change over the 30-year post-closure period for the CCR units.

257.97(d)(6) – Other relevant factors:

The schedule provided in **Appendix C** captures the remedy-specific components that are in development. These aspects are essential to properly size the groundwater collection system for effectiveness prior to installation. These elements include:

- Pilot-scale field testing and optimize pumping protocol.
- Final groundwater collection system design.

5.0 CONCLUSION

The Selection of Remedy Report was prepared to fulfill the requirements of the final report identified in 40 CFR 257.97(a) and identify the remedy selected to address the cobalt GPS exceedances at OGS. Based on the site information currently available, A7 - Consolidate and Cap with Groundwater Collection has been selected as the remedy that meets the requirements of 40 CFR 257.97(b) based on the evaluation factors described in 257.97(c).

A schedule for the implementation and completion of the selected remedies was established under 40 CFR 257.97(d) that describes how IPL will initiate remedial activities within 90 days of this Selection of Remedy Report as required in 40 CFR 257.98(a). Consolidation and capping of CCR on site has been completed as of June 2023. Because these activities are part of the selected remedy, the schedule reflects that remedial activities will continue with the design of the groundwater extraction system.

6.0 REFERENCES

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SCS, 2023d, Semiannual Progress Report Selection of Remedy – OGS Ash Pond and Zero Liquid Discharge Pond, March 13, 2023.

SCS, 2023e, 2022 Annual Groundwater Monitoring and Corrective Action Report, Ottumwa Generating Station – Ash Pond, Ottumwa, IA, August 1, 2023.

SCS, 2023f, Assessment Groundwater Monitoring Results – April 2023, Ottumwa Generating Station Zero Liquid Discharge Pond, Ottumwa, IA, August 7, 2023.

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SCS 2025b, Assessment Groundwater Monitoring Results – October 2024, Ottumwa Generation Station Zero Liquid Discharge Pond, Ottumwa, Iowa, February 14, 2025.

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Tables

Table 1. Groundwater Monitoring Well Network
Ottumwa Generating Station / SCS Engineers Project #25220081.00

Monitoring Well	Location in Monitoring Network	Role in Monitoring Network	CCR Unit
MW-301	Upgradient	Background	Background (Ash Pond and ZDLP)
MW-302	Downgradient	Compliance	Ash Pond
MW-303	Downgradient	Compliance	
MW-304	Downgradient	Compliance	
MW-305	Downgradient	Compliance	
MW-305A	Downgradient, deeper	Delineation	
MW-306	Downgradient	Compliance	
MW-307	Downgradient	Compliance	ZLDP
MW-308	Downgradient	Compliance	
MW-309	Downgradient	Compliance	
MW-310	Downgradient	Delineation	Ash Pond
MW-310A	Downgradient, deeper	Delineation	
MW-311	Downgradient	Delineation	
MW-311A	Downgradient, deeper	Delineation	
MW-312	Downgradient	Delineation	
MW-313	Downgradient	Delineation	
MW-315	Downgradient	Compliance	ZLDP
MW-316	Downgradient	Delineation	Ash Pond
MW-316A	Downgradient, deeper	Delineation	
MW-317	Downgradient	Delineation	

Note:

1. Monitoring wells MW-302WT, MW-304WT, MW-306WT, MW-314, and MW-314WT were installed to monitor water levels for the 2022-2023 closure project, but are not part of the CCR Rule groundwater monitoring network.

Created by:	MDB	Date:	12/17/2021
Last revision by:	RM	Date:	2/22/2024
Checked by:	NLB	Date:	3/8/2024

Table 2A. CCR Rule Groundwater Samples Summary - Ash Pond Events Since the ACM Submittal
Ottumwa Generating Station - Ash Pond / SCS Engineers Project #25220083.00

Sample Dates	Background Well	Compliance Wells					Delineation Wells									
	MW-301	MW-302	MW-303	MW-304	MW-305	MW-306	MW-305A	MW-310	MW-310A	MW-311	MW-311A	MW-312	MW-313	MW-316	MW-316A	MW-317
10/23-24/2019	A	A	A	A	A	A	NI	A-NE	NI	A-NE	NI	NI	NI	NI	NI	NI
2/5/2020	A	--	--	--	--	--	NI	A-NE	NI	A-NE	NI	NI	NI	NI	NI	NI
3/12-13/2020	Add.	--	--	--	Add.	--	Add.	Add.	Add.	Add.	Add.	NI	NI	NI	NI	NI
4/13-14/2020	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	NI	NI	NI	NI	NI
6/30/2020	--	--	--	--	--	--	--	--	--	--	A - R	NI	NI	NI	NI	NI
10/8-12/2020	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	NI	NI	NI	NI	NI
2/23/2021	--	--	--	--	--	Add.	--	Add.	--	--	Add.	NI	NI	NI	NI	NI
4/12-16/2021	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	NI	NI	NI	NI	NI
7/6/2021	--	--	--	--	--	Add.	--	Add.	--	--	Add.	NI	NI	NI	NI	NI
10/6-8/2021	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE[(1)]	A-NE	NI	NI	NI	NI	NI
1/12/2022	--	--	--	--	--	--	--	--	--	--	--	Add.	Add.	NI	NI	NI
2/14/2022	--	--	--	--	--	--	--	--	--	--	--	Add.	Add.	NI	NI	NI
4/12/2022	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	NI	NI	NI
8/25/2022	--	--	--	--	--	--	--	--	--	--	--	Add.	Add.	NI	NI	NI
10/26-28/2022	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	NI	NI	NI
4/4-6/2023	A	A	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE
10/10-13/2023	A	A[(2)]	A[(2)]	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE
4/4-5/2024	A	A[(3)]	A	A	A	A	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE	A-NE
6/6/2024	--	Add.	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/5/2024	--	Add.	Add.	--	--	--	--	--	--	--	--	--	--	--	--	--
10/9-11/2024	A	A	A[(4)]	A	A	A	A-NE	A-NE	A-NE	A-NE[(4)]	A-NE	A-NE	A-NE	A-NE[(4)]	A-NE	A-NE
Total Samples	13	13	12	11	12	13	11	15	11	13	14	9	9	4	4	4

Abbreviations:
A = Assessment Monitoring Program
NI = Not Installed
Add. = Additional sampling event for selected parameters
-- = Not sampled
A-R = Assessment Resample
A-NE - Assessment monitoring for nature and extent, well sampled for select Appendix IV and selection-of-remedy parameters

Notes:
(1): MW-311 had insufficient water for sample collection during the October 2021 sampling event.
(2): MW-302 and MW-303 had insufficient water for sample collection during the October 2023 sampling event.
(3): MW-302 had insufficient water for sample collection during the April 2024 sampling event.
(4): MW-303, MW-311, and MW-316 had insufficient water for sample collection during the October 2024 sampling event.

Created by:	NDK	Date:	2/17/2021
Last revision by:	RM	Date:	3/6/2025
Checked by:	NLB	Date:	3/6/2025

Table 2B. CCR Rule Groundwater Samples Summary - ZLD Pond
Ottumwa Generating Station / SCS Engineers Project #25220083.00

Sample Dates	Downgradient Wells				Background Well
	MW-307	MW-308	MW-309	MW-315	MW-301
4/26/2016	NI	NI	NI	NI	B
6/23/2016	NI	NI	NI	NI	B
8/9/2016	NI	NI	NI	NI	B
10/26/2016	NI	NI	NI	NI	B
1/18-19/2017	B	B	B	NI	B
4/19-20/2017	B	B	B	NI	B
6/20-21/2017	B	B	B	NI	B
8/21-23/2017	B	B	B	NI	B
11/8/2017	B	B	B	NI	D
4/16-18/2018	B	B	B	NI	A
5/30/2018	B-R	B-R	B-R	NI	--
6/28/2018	B	B	B	NI	--
7/18/2018	B-R	B-R	B-R	NI	--
10/16/2018	B	B	B	NI	A
4/8/2019	D	D	D	NI	D
10/23-24/2019	D	D	D	NI	D
12/11/2019	A	A	A	NI	A
2/5/2020	A	A	A	NI	A
4/13-14/2020	A	A	A	NI	A
10/7-8/2020	A	A	A	NI	A
2/23/2021	A-R	--	--	NI	--
4/14/2021	A	A	A	NI	A
7/6/2021	A-R	--	--	NI	--
10/7/2021	A	A	A	NI	A
2/14/2022	Add.	--	--	NI	--
4/11-14/2022	A	A	A	NI	A
8/25/2022	Add.	--	--	NI	--
10/25-26/2022	A	A	A	NI	A
2/2/2023	--	--	--	Add.	--
3/6/2023	--	--	--	Add.	--
4/4-6/2023	A	A	A	A	A
10/10-13/2023	A	A	A	A	A
4/4-5/2024	A	A	A	A	A
6/6/2024	Add.	--	--	--	--
10/9-11/2024	A	A	A	A	A
Total Samples	29	24	24	6	25

Abbreviations:
B = Background Sample Event
B-R = Background Resampling Event
D = Detection Monitoring Sampling Event
A = Assessment Monitoring Event
A-R = Assessment Monitoring Resampling Event
Add. = Additional Assessment Monitoring Sampling Event
NI = Not Installed
-- = Not Applicable

Created by: JAO Date: 7/8/2022
Last revision by: RM Date: 3/6/2025
Checked by: NLB Date: 3/6/2025

Table 3. Groundwater Elevations - CCR Rule Monitoring Well Networks
IPL - Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Ground Water Elevation in feet above mean sea level (amsl)													
Well Number	**MW-301**	**MW-302**	**MW-302WT**	**MW-303**	**MW-304**	**MW-304WT**	**MW-305**	**MW-305A**	**MW-306**	**MW-306WT**	**MW-307**	**MW-308**	**MW-309**	**MW-310**
Top of Well Casing Elevation / Surface Water Reference Elevation (feet amsl)	686.47	673.90	674.53	661.07	682.84	682.20	683.91	684.03	683.47	684.05	657.56	655.39	654.94	658.63
Screen Length (ft)	10.0	5.0	10.0	5.0	5.0	10.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0
Total Depth (ft from top of casing)	17.0	25.8	19.23	17.5	52.3	37.7	51.5	81.91	36.6	24.05	28.0	25.0	27.5	25.9
Top of Well Screen Elevation (ft)	679.47	653.10	665.3	648.57	635.54	654.5	637.41	607.12	651.87	670.00	634.56	635.39	632.44	637.76
Measurement Date														
April 26, 2016	682.80	655.63	NI	652.42	655.37	NI	661.67	NI	670.86	NI	NI	NI	NI	NI
June 23, 2016	682.58	655.65	NI	652.89	656.53	NI	662.36	NI	670.64	NI	NI	NI	NI	NI
August 9, 2016	682.27	655.52	NI	651.76	653.79	NI	660.78	NI	670.35	NI	NI	NI	NI	NI
October 26-27, 2016	682.04	655.67	NI	652.17	655.03	NI	661.37	NI	670.21	NI	NI	NI	NI	NI
May 17, 2022	681.75	654.56	655.69	652.47	653.60	648.16	657.78	650.77	663.45	<660	649.70	648.06	647.45	644.67
May 20, 2022	NM	654.63	655.66	NM	653.50	648.68	NM	NM	663.49	<660	NM	NM	NM	NM
May 23, 2022	NM	NM	NM	NM	652.66	648.40	NM	NM	NM	<660	NM	NM	NM	NM
June 2, 2022	681.69	654.22	655.68	651.53	652.37	650.38	656.18	649.53	661.42	<660	648.33	646.68	646.38	644.61
June 9, 2022	681.80	654.24	655.70	651.44	654.18	650.89	656.34	649.80	661.25	<660	648.90	647.05	647.32	648.23
June 10, 2022	NM	NM	NM	NM	652.97	650.97	NM	NM	NM	NM	NM	NM	NM	NM
June 21, 2022	681.60	654.29	655.69	651.35	652.89	651.48	656.25	650.52	660.87	<660	649.54	648.47	648.34	646.29
June 27, 2022	681.60	654.06	655.68	651.14	652.16	651.55	656.15	649.70	661.41	<660	648.61	647.13	646.34	643.87
July 5, 2022	681.47	653.92	655.68	650.70	651.03	651.73	655.33	648.51	660.86	<660	647.34	645.41	644.14	641.58
July 12, 2022	681.46	653.78	655.66	651.39	650.62	651.68	655.03	647.95	660.62	660.77	646.83	644.85	644.17	641.75
July 27, 2022	681.19	653.60	655.66	649.74	649.56	651.48	654.03	646.85	660.76	662.38	645.67	643.58	642.46	639.61
August 25, 2022	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	644.25	NM	NM	NM
October 26-28, 2022	680.68	652.95	655.65	648.22	647.26	650.81	651.48	644.38	657.11	672.92	643.46	641.13	640.43	638.55
February 2, 2023	NM	NM	655.72	NM	NM	651.25	NM	NM	NM	670.66	NM	NM	NM	NM
April 4-6, 2023	681.89	653.30	655.39	652.57	650.29	647.77	655.02	647.70	659.12	662.18	647.28	645.16	644.41	641.71
October 10-13, 2023	680.20	652.32	DRY	648.07	646.02	648.68	650.21	643.60	655.40	673.91	642.85	640.79	640.18	638.32
April 4-5, 2024	680.79	651.81	662.07	649.52	648.39	647.95	650.62	645.43	654.47	669.99	645.09	643.32	644.51	643.51
June 6, 2024	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	651.37	NM	NM	NM
August 20, 2024	681.34	653.32	655.70	652.19	650.95	651.74	654.54	649.69	658.59	672.98	649.17	647.35	646.01	643.01
September 5, 2024	NM	Below Top of Pump	NM	651.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
October 8-11, 2024	680.49	Below Top of Pump	655.65	649.42	646.30	650.16	650.11	644.16	655.30	673.67	643.26	641.21	640.25	637.99
Bottom of Well Elevation (ft)	669.47	648.10	655.30	643.57	630.54	644.50	632.41	602.12	646.87	660.00	629.56	630.39	627.44	632.76

	Ground Water Elevation in feet above mean sea level (amsl)											Surface Water Elevation (ft amsl)		
Well Number	**MW-310A**	**MW-311**	**MW-311A**	**MW-312**	**MW-313**	**MW-314**	**MW-314WT**	**MW-315**	**MW-316**	**MW-316A**	**MW-317**	**SG-1**	**SG-2**	**SG-3**
Top of Well Casing Elevation / Surface Water Reference Elevation (feet amsl)	657.93	654.18	653.54	655.36	655.84	684.71	684.61	655.65	657.30	657.74	656.33	656.31	642.84	643.50
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	5.0	10.0	5.0	10.0	NA	NA	NA
Total Depth (ft from top of casing)	55.55	17.9	47.68	29.87	23.82	33.24	24.81	26.6	24.94	54.81	27.91	NA	NA	NA
Top of Well Screen Elevation (ft)	607.38	641.24	610.86	630.49	637.02	656.47	669.80	634.06	642.36	607.93	638.42	NA	NA	NA
Measurement Date														
April 26, 2016	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
June 23, 2016	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
August 9, 2016	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
October 26-27, 2016	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 17, 2022	650.07	644.22	645.13	647.57	646.08	667.07	667.19	NI	NI	NI	NI	NM	NI	NI
May 20, 2022	NM	NM	NM	NM	NM	667.44	667.46	NI	NI	NI	NI	NM	NI	NI
May 23, 2022	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NM	NI	NI
June 2, 2022	645.23	643.36	644.93	646.43	645.48	666.15	666.21	NI	NI	NI	NI	NM	NI	NI
June 9, 2022	646.20	644.14	644.61	647.78	648.65	665.82	665.91	NI	NI	NI	NI	NM	NI	NI
June 10, 2022	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NM	NI	NI
June 21, 2022	647.63	644.88	645.60	647.87	647.17	665.61	665.68	NI	NI	NI	NI	NM	NI	NI
June 27, 2022	644.85	643.64	645.37	646.42	644.80	665.16	665.27	NI	NI	NI	NI	NM	NI	NI
July 5, 2022	642.91	644.16	644.30	644.50	642.44	665.14	665.24	NI	NI	NI	NI	NM	NI	NI
July 12, 2022	642.89	644.26	641.00	644.17	642.65	664.69	664.85	NI	NI	NI	NI	NM	NI	NI
July 27, 2022	641.24	638.41	642.41	643.14	640.83	663.93	664.07	NI	NI	NI	NI	639.23	NI	NI
August 25, 2022	NM	NM	NM	640.80	639.38	NM	NM	NI	NI	NI	NI	NM	NI	NI
October 26-28, 2022	639.49	638.46	640.27	639.64	639.16	661.58	661.64	NI	NI	NI	NI	638.41	NI	NI
February 2, 2023	NM	NM	NM	NM	NM	662.71	662.79	642.40	NI	NI	NI	NM	NI	NI
April 4-6, 2023	643.11	641.88	643.59	644.08	642.02	663.84	664.37	645.12	642.78	643.49	642.84	643.06	640.89	642.99
October 10-13, 2023	640.13	638.31	639.84	639.45	639.04	660.35	660.40	641.10	639.15	639.79	639.08	DRY	NM	NM
April 4-5, 2024	642.81	below pun	635.54	643.94	644.49	659.64	660.17	644.23	644.09	643.94	644.11	644.29	>642.836	>643.501
June 6, 2024	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
August 20, 2024	644.75	644.30	646.46	646.20	644.16	663.07	663.16	646.77	643.67	645.12	643.85	646.08	NM	NM
September 5, 2024	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
October 8-11, 2024	639.39	DRY	641.01	640.17	638.87	660.28	660.30	641.37	DRY	639.96	638.82	641.49	Damaged	Damaged
Bottom of Well Elevation (ft)	602.38	636.24	605.86	625.49	632.02	651.47	659.80	629.06	632.36	602.93	628.42	--	--	--

Notes:
NM = not measured
NI = not installed
NS = not surveyed
NA = not applicable
ft amsl = feet above mean sea level

Created by: NDK Date: 1/15/2018
Last rev. by: RM Date: 10/22/2024
Checked by: KMV Date: 10/22/2024

Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Background Well						Compliance Wells						
				MW-301						MW-302						
Parameter Name	UPL Method	UPL	GPS	4/12/2022	10/26/2022	4/6/2023	10/13/2023	4/4/2024	10/11/2024	4/12/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	9/5/2024	10/10/2024
Groundwater Elevation (ft amsl)				682.08	680.68	682.05	680.20	680.79	680.49	654.77	652.95	653.30	652.32	651.81	Below top of pump	Below top of pump
Appendix III																
Boron, ug/L	P	839		640	780	530	760	410	520	1,300	1,700	1,800	--	--	1,700	1,700
Calcium, mg/L	P	103		92	110	76	94	85	71	170	220	200 B	--	--	180	200
Chloride, mg/L	P	210		140	160	120	150	87	93	170	200	160	--	--	130	150
Fluoride, mg/L	P	0.381		<0.22	<0.22	<0.22	<0.38	<0.38	<0.38	<0.22	<0.22	<0.22	--	--	<0.38	<0.38
Field pH, Std. Units	P	6.74		6.37	6.29	6.25	6.24	6.65	6.11	6.43	6.56	6.62	--	--	6.49	6.49
Sulfate, mg/L	P	208		160	180	160	190	240	150	750	920	820	--	--	710	780
Total Dissolved Solids, mg/L	P	697		610	690	580	680	550	530	1,100	1,600	1,400	--	--	1,400	1,500
Appendix IV		UTL	GPS													
Antimony, ug/L	NP	1.10	6	<0.69	<0.69	<1.0	<1.0	<1.0	<1.0 ^3+	<0.69	<0.69	<1.0	--	--	<1.0	<1.0
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	<0.53	<0.53	<0.53	<0.53	<0.75	<0.75	<0.53	--	--	<0.53	<0.53
Barium, ug/L	P	71.0	2,000	40	44	31	48	33	36	17	21	21	--	--	29	29
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33	<0.27	<0.27	<0.33	--	--	<0.33	<0.33
Cadmium, ug/L	P	0.149	5	<0.055	0.055 J	<0.10	<0.10	<0.10	<0.10	0.21	0.28	0.17 J	--	--	0.15 J	0.16 J
Chromium, ug/L	NP	1.10	100	<1.1	1.2 J	<1.1	<1.1	<1.2	<1.2	1.4 J	8.8	1.6 J	--	--	<1.2	<1.2
Cobalt, ug/L	P	5.26	6	0.23 J	0.29 J	0.21 J	0.20 J	<0.17	0.22 J	1.3	1.8	0.82	--	--	0.68	1.1
Fluoride, mg/L	P	0.417	4	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38	<0.22	<0.22	<0.22	--	--	<0.38	<0.38
Lead, ug/L	NP	0.270	15	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26	<0.24	<0.24	<0.24	--	--	<0.26	<0.26
Lithium, ug/L	P	31.8	40	19	30 J	17	25	21	20 B	9.1 J	11	11	--	--	12	12
Mercury, ug/L	DQ	DQ	2	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11 H	<0.11	<0.11	<0.14	--	--	<0.11	<0.11
Molybdenum, ug/L	NP	1.3	100	<1.2	<8.4	<0.91	1.1 J	<1.3	<1.3	2.6	4.9	3.0	--	--	1.5 J	1.7 J
Selenium, ug/L	P	9.01	50	6.0	6.9	4.7 J	5.8	5.1	3.9 J	2.4 J	<0.96	<1.4	--	--	<1.4	<1.4
Thallium, ug/L	NP	0.500	2	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57	<0.26	<0.26	3.2	--	--	<0.57	<0.57
Radium 226/228 Combined, pCi/L	P	1.71	5	0.378	0.973	0.0491	0.681	0.452	0.371	0.294	0.627	0.178	--	--	0.505	0.266
Additional Parameters Collected for Selection of Remedy																
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				<36	<36	--	--	--	--	<36	49 J	<36	--	--	--	--
Iron, ug/L				<36	<36	<36	<36	<36	<36	45 J	80 J	--	--	--	<36	41 J
Magnesium, ug/L				36,000	28,000	--	--	--	--	49,000	43,000	--	--	--	--	--
Manganese, dissolved, ug/L				5.0 J	7.9 J	--	--	--	--	91	91	--	--	--	--	--
Manganese, ug/L				8.1 J	8.0 J	--	--	--	--	110	90	--	--	--	--	--
Potassium, ug/L				1,100	980	--	--	--	--	1,600	1,500	--	--	--	--	--
Sodium, ug/L				89,000	73,000	--	--	--	--	240,000	210,000	--	--	--	--	--
Bicarbonate Alkalinity, mg/L				190	250	--	--	--	--	100	87	--	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<4.6	<4.6	--	--	--	--	--
Total Alkalinity, mg/L				190	250	--	--	--	--	100	87	--	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of Monitored Natural Attenuation.

Abbreviations:

UPL = Upper Prediction Limit
UTL= Upper Tolerance Limits
GPS = Groundwater Protection Standard
NP = Nonparametric UPL (highest background value
P = Parametric UPL with 1-of-2 retesting
DQ = Double Quantification Rule (not detected in background)
LOD = Limit of Detection
LOQ = Limit of Quantitation
mg/L = milligrams per liter
ug/L = micrograms per liter
-- = Not Analyzed

Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD Recovery is outside acceptance limits.
B = Analyte was detected in the associated Method Blank.
H = Sample was prepped or analyzed beyond the specified holding time.
^3+ = Reporting Limit Check Standard is outside acceptance limits, high biased

Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (USEPA) Maximum Contamination Level (MCLs), if established; otherwise, the values from 40 CFR 257.95(h)(2).
3. Interwell UPLs and UTLs calculated based on results from background well MW-301. UPLs and UTLs were updated in April 2022.
4. Compliance wells represent the groundwater monitoring network at the boundary of the CCR unit. The delineation wells were installed during the selection of remedy process to evaluate an extension of the downgradient groundwater monitoring network.
5. For compliance wells, only results confirmed above the LOQ are evaluated as potential SSIs above background.

Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Compliance Wells												
				MW-303							MW-304					
Parameter Name				4/12/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	9/5/2024	10/10/2024	4/12/2022	10/26/2022	4/6/2023	10/10/2023	4/4/2024	10/10/2024
Groundwater Elevation (ft amsl)	UPL Method	UPL	GPS	652.95	648.22	652.57	648.07	649.52	651.03	649.42	652.14	647.26	650.29	646.02	648.39	646.30
Appendix III																
Boron, ug/L	P	839		620	--	430	--	560	780	--	940	750	930	870	970	950
Calcium, mg/L	P	103		190	--	210 B	--	210	190	--	130	110	110 B	110	110	120
Chloride, mg/L	P	210		58	--	22	--	56	10	--	270	270	260	230	240	220
Fluoride, mg/L	P	0.381		<0.22	--	<0.22	--	<0.38	<0.38	--	1.7	1.1	0.93	0.79 J	0.97 J	0.92 J
Field pH, Std. Units	P	6.74		6.71	--	6.65	--	6.82	6.56	--	6.95	6.77	6.70	6.85	6.88	6.86
Sulfate, mg/L	P	208		200	--	260	--	360	260	--	260	280	270	230	240	240
Total Dissolved Solids, mg/L	P	697		630	--	880	--	980	880	--	1,700	1,200	1,200	1,100	1,000	1,100
Appendix IV		**UTL**	**GPS**													
Antimony, ug/L	NP	1.10	6	<0.69	--	<1.0	--	<1.0	<1.0	--	<0.69	<0.69	<1.0	<1.0	<1.0	<1.0
Arsenic, ug/L	NP	0.88	10	<0.75	--	<0.53	--	0.80 J	<0.53	--	0.76 J	0.96 J	0.63 J	1.0 J	0.71 J	0.70 J
Barium, ug/L	P	71.0	2,000	64	--	48	--	44	55	--	78	85	75	77	77	77
Beryllium, ug/L	NP	0.270	4	<0.27	--	<0.33	--	<0.33	<0.33	--	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium, ug/L	P	0.149	5	0.15	--	0.11 J	--	0.10 J	0.13 J	--	<0.055	0.15	<0.10	0.12 J	<0.10	<0.10
Chromium, ug/L	NP	1.10	100	<1.1	--	<1.1	--	1.2 J	<1.2	--	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt, ug/L	P	5.26	6	1.6	--	0.41 J	--	3.8	0.25 J	--	0.41 J	0.47 J	0.37 J	0.43 J	0.34 J	0.33 J
Fluoride, mg/L	P	0.417	4	<0.22	--	<0.22	--	<0.38	<0.38	--	1.7	1.1	0.93	0.79 J	0.97 J	0.92 J
Lead, ug/L	NP	0.270	15	<0.24	--	<0.24	--	0.63	<0.26	--	<0.24	0.38 J	<0.24	0.35 J	<0.26	<0.26
Lithium, ug/L	P	31.8	40	4.0 J	--	4.9 J	--	3.9 J	5.7 J	--	3.4 J	3.3 J	3.5 J	4.1 J	3.6 J	3.3 J
Mercury, ug/L	DQ	DQ	2	<0.11	--	<0.14	--	<0.11 H, F1	<0.11	--	<0.11	<0.11	<0.14	<0.14	<0.11 H	<0.11
Molybdenum, ug/L	NP	1.3	100	2.7	--	2.0	--	3.2	1.3 J	--	1.9 J	1.9 J	1.8 J	1.9 J	1.9 J	2.5
Selenium, ug/L	P	9.01	50	8.3	--	15	--	35	13	--	1.3 J	1.1 J	<1.4	1.5 J	<1.4	<1.4
Thallium, ug/L	NP	0.500	2	0.26 J	--	0.42 J	--	<0.57	<0.57	--	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57
Radium 226/228 Combined, pCi/L	P	1.71	5	0.619	--	0.145	--	1.38	0.442	--	2.87	2.66	2.10	3.18	2.54	2.29
Additional Parameters Collected for Selection of Remedy																
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				<36	--	--	--	--	--	--	3,800	5,500	--	--	--	--
Iron, ug/L				<36	--	64 J	--	1,200	60 J	--	4,800	4,700	5,400	4,800	5,300	5,300
Magnesium, ug/L				26,000	--	--	--	--	--	--	45,000	34,000	--	--	--	--
Manganese, dissolved, ug/L				410	--	--	--	--	--	--	3,500	4,100	--	--	--	--
Manganese, ug/L				490	--	--	--	--	--	--	4,200	3,600	--	--	--	--
Potassium, ug/L				930	--	--	--	--	--	--	8,700	6,700	--	--	--	--
Sodium, ug/L				110,000	--	--	--	--	--	--	240,000	180,000	--	--	--	--
Bicarbonate Alkalinity, mg/L				520	--	--	--	--	--	--	380	390	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	--	--	--	--	--	--	<4.6	<4.6	--	--	--	--
Total Alkalinity, mg/L				520	--	--	--	--	--	--	380	390	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
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Abbreviations:

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NP = Nonparametric UPL (highest background valu
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LOD = Limit of Detection
LOQ = Limit of Quantitation
mg/L = milligrams per liter
ug/L = micrograms per liter
-- = Not Analyzed

Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD Recovery is outside acceptance limits.
B = Analyte was detected in the associated Method Blank.
H = Sample was prepped or analyzed beyond the specified holding time.
^3+ = Reporting Limit Check Standard is outside acceptance limits, high biased

Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Compliance Wells											
				MW-305						MW-306					
Parameter Name	UPL Method	UPL	GPS	4/11/2022	10/25/2022	4/4/2023	10/12/2023	4/4/2024	10/11/2024	4/12/2022	10/25/2022	4/6/2023	10/12/2023	4/4/2024	10/9/2024
Groundwater Elevation (ft amsl)				657.62	651.48	655.02	650.21	650.62	650.11	664.61	657.11	659.12	655.40	654.47	655.30
Appendix III															
Boron, ug/L	P	839		850	640	830	750	840	790	760	560	780	850	920	860
Calcium, mg/L	P	103		120	99	120 B	110	110	110	110	93	100 B	91	100	120
Chloride, mg/L	P	210		200	220	220	220	240	260	260	300	310	290	260	240
Fluoride, mg/L	P	0.381		<0.22	<0.22	0.39 J	0.42 J	<0.38	0.49 J	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH, Std. Units	P	6.74		6.90	6.76	6.70	6.88	6.90	6.79	6.66	6.53	6.61	6.63	6.64	6.54
Sulfate, mg/L	P	208		150	190	250	230	220	180	70	86	78	93	250	310
Total Dissolved Solids, mg/L	P	697		950	1,000	1,100	970	1,000	1,000	710	1,100	1,000	980	1,000	1,100
Appendix IV		**UTL**	**GPS**												
Antimony, ug/L	NP	1.10	6	<0.69	<0.69	<1.0	<1.0	<1.0	<1.0	<0.69	<0.69	<1.0	<1.0	<1.0	<1.0
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	0.57 J	0.91 J	0.54 J	0.54 J	<0.75	<0.75	<0.53	0.62 J	<0.53	<0.53
Barium, ug/L	P	71.0	2,000	120	120	120	110	110	110	94	95	85	82	90	97
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium, ug/L	P	0.149	5	<0.055	<0.055	<0.10	0.13 J	<0.10	<0.10	1.3	1.1	1.2	1.1	1.3	1.3
Chromium, ug/L	NP	1.10	100	<1.1	<1.1	<1.1	<1.1	<1.2	1.3 J	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt, ug/L	P	5.26	6	21	17	21	17	17	18	9.1	7.0	7.7	7.1	8.5	9.4
Fluoride, mg/L	P	0.417	4	<0.22	<0.22	0.39 J	0.42 J	<0.38	0.49 J	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Lead, ug/L	NP	0.270	15	<0.24	<0.24	<0.24	0.26 J	<0.26	<0.26	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium, ug/L	P	31.8	40	<2.5	<2.5	<2.5	2.7 J	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Mercury, ug/L	DQ	DQ	2	<0.11	<0.11	<0.14	<0.14	<0.11 H	<0.11	<0.11	<0.11	<0.14	<0.14	<0.11 H	<0.11
Molybdenum, ug/L	NP	1.3	100	7.8	7.4	7.7	8.3	8.3	8.0	14	12	13	12	11	11
Selenium, ug/L	P	9.01	50	1.1 J	<0.96	<1.4	1.9 J	<1.4	<1.4	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4
Thallium, ug/L	NP	0.500	2	0.42 J	0.44 J	0.39 J	<0.26	<0.57	<0.57	<0.26	<0.26	<0.26	0.62 J	<0.57	<0.57
Radium 226/228 Combined, pCi/L	P	1.71	5	1.03	0.910	0.706	0.963	0.989	1.32	2.03	1.03	0.455	0.661	0.998	0.788
Additional Parameters Collected for Selection of Remedy															
Cobalt, dissolved, ug/L	UPL or GPS not applicable			17	21	21	17	18	18	7.6	8.2	8.6	7.0	8.9	9.6
Lithium, dissolved, ug/L				--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				55 J	66 J	--	--	--	--	<250	72 J	--	--	--	--
Iron, ug/L				76 J	76 J	72 J	73 J	51 J	72 J	68 J	100	81 J	80 J	66 J	87 J
Magnesium, ug/L				53,000	40,000	--	--	--	--	44,000	33,000	--	--	--	--
Manganese, dissolved, ug/L				3,200	3,800	--	--	--	--	23,000	30,000	--	--	--	--
Manganese, ug/L				4,000	3,200	--	--	--	--	26,000	27,000	--	--	--	--
Potassium, ug/L				8,700	6,800	--	--	--	--	6,000	4,900	--	--	--	--
Sodium, ug/L				210,000	150,000	--	--	--	--	180,000	150,000	--	--	--	--
Bicarbonate Alkalinity, mg/L				520	440	--	--	--	--	470	370	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<4.6	<4.6	--	--	--	--
Total Alkalinity, mg/L				520	440	--	--	--	--	470	370	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
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Abbreviations:

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mg/L = milligrams per liter
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-- = Not Analyzed

Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD Recovery is outside acceptance limits.
B = Analyte was detected in the associated Method Blank.
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Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Compliance Wells													
				MW-307								MW-308					
Parameter Name	UPL Method	UPL	GPS	4/14/2022	8/25/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	6/6/2024	10/10/2024	4/14/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	10/10/2024
Groundwater Elevation (ft amsl)				648.4	644.25	643.46	647.28	642.85	645.09	651.37	643.26	645.75	641.13	645.16	640.79	643.32	641.21
Appendix III																	
Boron, ug/L	P	839		200	--	250	250	210	220	--	180	220	260	280	230	350	230
Calcium, mg/L	P	103		250	--	260	230	220	240	--	210	230	240	210	210	220	220
Chloride, mg/L	P	210		210	--	260	<2.3	270	260	--	250	150	160	150	170	150	150
Fluoride, mg/L	P	0.381		<0.28	--	<0.22	<0.22	<0.38	<0.38	--	<0.38	<0.28	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH, Std. Units	P	6.74		6.59	6.71	6.50	6.62	6.56	6.52	6.32	6.53	6.7	6.50	6.70	6.66	6.61	6.65
Sulfate, mg/L	P	208		92 F1	--	130	130	140	140	--	130	270	290	300	300	300	290
Total Dissolved Solids, mg/L	P	697		1,000	--	1,100	1,200	1,100	1,000	--	1,100	1,100	1,000	1,100	1,100	1,000	1,100
Appendix IV		**UTL**	**GPS**														
Antimony, ug/L	NP	1.10	6	<1.1	--	<0.69	<1.0	<1.0	<1.0	--	<1.0	<1.1	<0.69	<1.0	<1.0	<1.0	<1.0
Arsenic, ug/L	NP	0.88	10	<0.75	--	<0.75	<0.53	0.62 J	<0.53	--	<0.53	<0.75	<0.75	<0.53	0.53 J	<0.53	<0.53
Barium, ug/L	P	71.0	2,000	160	--	130	130	120	130	--	110	140	120	110	120	120	120
Beryllium, ug/L	NP	0.270	4	<0.27	--	<0.27	<0.33	<0.33	<0.33	--	<0.33	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium, ug/L	P	0.149	5	<0.051	--	<0.055	<0.10	<0.10	<0.10	--	<0.10	<0.051	<0.055	<0.10	<0.10	<0.10	<0.10
Chromium, ug/L	NP	1.10	100	<1.1	--	<1.1	<1.1	<1.1	<1.2	--	<1.2	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt, ug/L	P	5.26	6	46	25	27	30	36	38	63	34	0.16 J	0.24 J	0.45 J	0.17 J	<0.17	0.18 J
Fluoride, mg/L	P	0.417	4	<0.28	--	<0.22	<0.22	<0.38	<0.38	--	<0.38	<0.28	<0.22	<0.22	<0.38	<0.38	<0.38
Lead, ug/L	NP	0.270	15	<0.21	--	<0.24	<0.24	<0.24	<0.26	--	<0.26	<0.21	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium, ug/L	P	31.8	40	14	--	10	11	12	13	--	10	16	14	14	15	16	15
Mercury, ug/L	DQ	DQ	2	<0.15	--	<0.11	<0.14	<0.14	<0.11	--	<0.11	<0.15	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum, ug/L	NP	1.3	100	<1.3	--	<1.2	<0.91	<0.91	<1.3	--	<1.3	<1.3	<1.2	<0.91	<0.91	<1.3	<1.3
Selenium, ug/L	P	9.01	50	<0.96	--	<0.96	<1.4	<1.4	<1.4	--	<1.4	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4
Thallium, ug/L	NP	0.500	2	<0.26	--	<0.26	<0.26	<0.26	<0.57	--	<0.57	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57
Radium 226/228 Combined, pCi/L	P	1.71	5	3.08	--	3.01	1.51	1.83	2.55	--	2.15	2.87	2.15	1.81	2.29	1.94	1.54
Additional Parameters Collected for Selection of Remedy																	
Cobalt, dissolved, ug/L	UPL or GPS not applicable			49	--	30	--	--	44	--	39	--	--	--	--	--	--
Lithium, dissolved, ug/L				--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				3,400	--	3,100	--	--	--	--	--	3,900	3,800	--	--	--	--
Iron, ug/L				3,700	--	2,700	2,700	2,900	3,300	--	2,800	3,900	4,000	3,200	3,600	3,400	3,600
Magnesium, ug/L				30,000	--	28,000	--	--	--	--	--	26,000	23,000	--	--	--	--
Manganese, dissolved, ug/L				360	--	270	--	--	--	--	--	1,300	1,400	--	--	--	--
Manganese, ug/L				330	--	230	--	--	--	--	--	1,300	1,300	--	--	--	--
Potassium, ug/L				2,000	--	1,800	--	--	--	--	--	4,400	4,300	--	--	--	--
Sodium, ug/L				98,000	--	91,000	--	--	--	--	--	100,000	110,000	--	--	--	--
Bicarbonate Alkalinity, mg/L				490	--	500	--	--	--	--	--	370	390	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	--	<4.6	--	--	--	--	--	<4.6	<4.6	--	--	--	--
Total Alkalinity, mg/L				490	--	500	--	--	--	--	--	370	390	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of Monitored Natural Attenuation.

Abbreviations:

UPL = Upper Prediction Limit
UTL= Upper Tolerance Limits
GPS = Groundwater Protection Standard
NP = Nonparametric UPL (highest background valu
P = Parametric UPL with 1-of-2 retesting

DQ = Double Quantification Rule (not detected in background)
LOD = Limit of Detection
LOQ = Limit of Quantitation
mg/L = milligrams per liter
ug/L = micrograms per liter
-- = Not Analyzed

Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD Recovery is outside acceptance limits.
B = Analyte was detected in the associated Method Blank.
H = Sample was prepped or analyzed beyond the specified holding time.
^3+ = Reporting Limit Check Standard is outside acceptance limits, high biased

Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (USEPA) Maximum Contamination Level (MCLs), if established; otherwise, the values from 40 CFR 257.95(h)(2).
3. Interwell UPLs and UTLs calculated based on results from background well MW-301. UPLs and UTLs were updated in April 2022.
4. Compliance wells represent the groundwater monitoring network at the boundary of the CCR unit. The delineation wells were installed during the selection of remedy process to evaluate an extension of the downgradient groundwater monitoring network.
5. For compliance wells, only results confirmed above the LOQ are evaluated as potential SSIs above background.

Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Compliance Wells											
				MW-309						MW-315					
Parameter Name	UPL Method	UPL	GPS	4/14/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	10/10/2024	2/2/2023	3/6/2023	4/5/2023	10/10/2023	4/4/2024	10/10/2024
Groundwater Elevation (ft amsl)				644.32	640.43	644.41	640.18	644.51	640.25	642.40	648.55	645.12	641.10	644.23	641.37
Appendix III															
Boron, ug/L	P	839		1,400	1,400	1,400	1,300	1,400	1,300	1,300	--	1,100	1,100	1,200	1,200
Calcium, mg/L	P	103		130	160	140	140	160	150	140	--	120	120	130	130
Chloride, mg/L	P	210		57	67	65	68	65	64	45 B	--	45	55	63	61
Fluoride, mg/L	P	0.381		<0.28	<0.22	<0.22	<0.38	<0.38	<0.38	<0.22	--	0.22 J	<0.38	<0.38	<0.38
Field pH, Std. Units	P	6.74		7	6.89	<0.22	7.01	6.93	6.97	6.94	6.86	6.96	6.93	6.85	6.89
Sulfate, mg/L	P	208		360	420	450	480	470	480	450	--	460	500	470	460
Total Dissolved Solids, mg/L	P	697		940	1,100	1,000	1,100	1,000	1,100	940	--	1,100	1,000	1,000	1,100
Appendix IV		**UTL**	**GPS**												
Antimony, ug/L	NP	1.10	6	<1.1	<0.69	<1.0	<1.0	<1.0	<1.0	<0.69	--	<1.0	<1.0	<1.0	<1.0
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	<0.53	0.59 J	<0.53	<0.53	1.3 J	--	1.3 J	1.6 J	1.5 J	1.4 J
Barium, ug/L	P	71.0	2,000	52	51	51	55	56	56	36	--	35	35	36	37
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33	<0.27	--	<0.33	<0.33	<0.33	<0.33
Cadmium, ug/L	P	0.149	5	<0.051	<0.055	<0.10	<0.10	<0.10	<0.10	<0.055	--	<0.10	<0.10	<0.10	<0.10
Chromium, ug/L	NP	1.10	100	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2	<1.1	--	<1.1	<1.1	<1.2	<1.2
Cobalt, ug/L	P	5.26	6	2.3	2.2	2.0	2.3	2.4	2.2	7	6.4	7.0	6.6	7.8	7.4
Fluoride, mg/L	P	0.417	4	<0.28	<0.22	<0.22	<0.38	<0.38	<0.38	<0.22	--	0.22 J	<0.38	<0.38	<0.38
Lead, ug/L	NP	0.270	15	<0.21	<0.24	<0.24	<0.24	<0.26	<0.26	<0.24	--	<0.24	<0.24	<0.26	<0.26
Lithium, ug/L	P	31.8	40	8.9 J	7.3 J	7.8 J	8.3 J	9.5 J	8.2 J	6.2 J	--	5.3 J	5.4 J	6.0 J	5.6 J
Mercury, ug/L	DQ	DQ	2	<0.15	<0.11	<0.14	<0.14	<0.11	<0.11	<0.11	--	<0.14	<0.14	<0.11	<0.11
Molybdenum, ug/L	NP	1.3	100	<1.3	<1.2	<0.91	<0.91	<1.3	<1.3	1.5 J	--	1.4 J	1.3 J	1.6 J	1.6 J
Selenium, ug/L	P	9.01	50	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4	<0.96	--	<1.4	<1.4	<1.4	<1.4
Thallium, ug/L	NP	0.500	2	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57	<0.26	--	<0.26	<0.26	<0.57	<0.57
Radium 226/228 Combined, pCi/L	P	1.71	5	1.05	2.16	0.88	1.27	1.50	1.47	1.46	--	1.42	1.29	1.23	1.85
Additional Parameters Collected for Selection of Remedy															
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	7.0	6.5	6.9	7.3	7.5	7.0
Lithium, dissolved, ug/L				--	--	--	--	--		--	--	--	--	--	--
Iron, dissolved, ug/L				660	710	--	--	--	--	3,000 B	--	2,700	2,400	2,300	2,500
Iron, ug/L				900	740	720	990	800	680	3,000	--	2,800	2,900	2,700	2,600
Magnesium, ug/L				19,000	18,000	--	--	--	--	22,000	--	--	21,000	21,000	21,000
Manganese, dissolved, ug/L				640	750	--	--	--	--	6,400	--	6,800	6,800	7,400	7,600
Manganese, ug/L				630	750	--	--	--	--	6,300	--	--	12,000	7,600	7,900
Potassium, ug/L				750	720	--	--	--	--	2,000	--	--	1,800	1,600	1,900
Sodium, ug/L				180,000	180,000	--	--	--	--	220,000	--	--	200,000	210,000	200,000
Bicarbonate Alkalinity, mg/L				280	260	--	--	--	--	300	--	--	280	280	280
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<2.3	--	--	<2.5	<2.5	<2.5
Total Alkalinity, mg/L				280	260	--	--	--	--	300	--	--	280	280	280

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
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Abbreviations:

UPL = Upper Prediction Limit
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J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
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Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Delineation Wells											
				MW-305A						MW-310					
Parameter Name	**UPL Method**	**UPL**	**GPS**	4/12/2022	10/26/2022	4/6/2023	10/13/2023	4/5/2024	10/11/2024	4/11/2022	10/25/2022	4/4/2023	10/10/2023	4/4/2024	10/9/2024
Groundwater Elevation (ft amsl)				649.24	644.38	647.70	643.60	645.43	644.16	640.79	638.55	641.71	638.32	643.51	637.99
Appendix III															
Boron, ug/L	P	839		210	140	--	--	--	--	640	340	--	--	--	--
Calcium, mg/L	P	103		180	150	--	--	--	--	190	150	--	--	--	--
Chloride, mg/L	P	210		160	170	150	--	--	--	200	140	48	--	--	--
Fluoride, mg/L	P	0.381		<0.22	<0.22	--	--	--	--	<0.22	0.80	--	--	--	--
Field pH, Std. Units	P	6.74		7.19	7.11	6.74	6.87	6.95	7.09	6.86	6.70	6.91	7.06	7.05	6.74
Sulfate, mg/L	P	208		160	160	140	--	--	--	630	480	180	--	--	--
Total Dissolved Solids, mg/L	P	697		700	690	770	--	--	--	1,400	1,200	650	--	--	--
Appendix IV		**UTL**	**GPS**												
Antimony, ug/L	NP	1.10	6	<0.69	<0.69	--	--	--	--	0.89 J	<0.69	--	--	--	--
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	--	--	--	--	1.0 J	<0.75	--	--	--	--
Barium, ug/L	P	71.0	2,000	91	93	--	--	--	--	75	78	--	--	--	--
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	--	--	--	--	<0.27	<0.27	--	--	--	--
Cadmium, ug/L	P	0.149	5	<0.055	<0.055	--	--	--	--	0.23	0.24	--	--	--	--
Chromium, ug/L	NP	1.10	100	<1.1	<1.1	--	--	--	--	<1.1	<1.1	--	--	--	--
Cobalt, ug/L	P	5.26	6	1.7	1.7	1.4	1.2	0.96	0.76	0.93	0.75	0.24 J	<0.17	0.29 J	0.57
Fluoride, mg/L	P	0.417	4	<0.22	<0.22	--	--	--	--	<0.22	0.80	--	--	--	--
Lead, ug/L	NP	0.270	15	<0.24	0.32 J	--	--	--	--	<0.24	<0.24	--	--	--	--
Lithium, ug/L	P	31.8	40	17	13	--	--	--	--	54	36	--	--	--	--
Mercury, ug/L	DQ	DQ	2	<0.11	<0.11	--	--	--	--	<0.11	<0.11	--	--	--	--
Molybdenum, ug/L	NP	1.3	100	4.5	3.7	--	--	--	--	47	24	--	--	--	--
Selenium, ug/L	P	9.01	50	<0.96	<0.96	--	--	--	--	2.3 J	2.6 J	--	--	--	--
Thallium, ug/L	NP	0.500	2	<0.26	<0.26	--	--	--	--	<0.26	<0.26	--	--	--	--
Radium 226/228 Combined, pCi/L	P	1.71	5	3.44	3.70	--	--	--	--	0.316	0.827	--	--	--	--
Additional Parameters Collected for Selection of Remedy															
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				--	--	--	--	--	--	52	45	--	--	--	--
Iron, dissolved, ug/L				<36	<36	--	--	--	--	<36	<36	--	--	--	--
Iron, ug/L				<36	42 J	<36	58 J	<36	<36	<36	<36	<36	<36	<36	<36
Magnesium, ug/L				32,000	24,000	--	--	--	--	90,000	57,000	--	--	--	--
Manganese, dissolved, ug/L				120	140	--	--	--	--	400	1,300	--	--	--	--
Manganese, ug/L				140	120	--	--	--	--	520	1,100	--	--	--	--
Potassium, ug/L				4,200	3,400	--	--	--	--	16,000	12,000	--	--	--	--
Sodium, ug/L				60,000	42,000	--	--	--	--	170,000	93,000	--	--	--	--
Bicarbonate Alkalinity, mg/L				320	300	--	--	--	--	260	250	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<4.6	<4.6	--	--	--	--
Total Alkalinity, mg/L				320	300	--	--	--	--	260	250	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
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Abbreviations:

UPL = Upper Prediction Limit	DQ = Double Quantification Rule (not detected in background)
UTL= Upper Tolerance Limits	LOD = Limit of Detection
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P = Parametric UPL with 1-of-2 retesting	ug/L = micrograms per liter
	-- = Not Analyzed

Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Delineation Wells											
				MW-310A						MW-311					
Parameter Name	UPL Method	UPL	GPS	4/12/2022	10/26/2022	4/5/2023	10/10/2023	4/5/2024	10/9/2024	4/11/2022	10/26/2022	4/4/2023	10/11/2023	4/5/2024	10/9/2024
Groundwater Elevation (ft amsl)				640.83	639.49	643.11	640.13	628.24	639.39	641.44	638.46	641.88	638.31	Below top of pump	DRY
Appendix III															
Boron, ug/L	P	839		1,500	1,500	--	--	--	--	79 J	75 J	--	--	--	--
Calcium, mg/L	P	103		99	69	--	--	--	--	150	130	--	--	--	--
Chloride, mg/L	P	210		120	120	130	--	--	--	17	17	18	--	--	--
Fluoride, mg/L	P	0.381		0.40 J	2.0	--	--	--	--	<0.22	<0.22	--	--	--	--
Field pH, Std. Units	P	6.74		7.43	7.64	7.46	7.50	7.43	7.53	6.74	6.61	6.56	7.01	6.78	--
Sulfate, mg/L	P	208		1,200	1,200	1200	--	--	--	78	76	66	--	--	--
Total Dissolved Solids, mg/L	P	697		2,100	2,200	2,300	--	--	--	480	550	630	--	--	--
Appendix IV		**UTL**	**GPS**												
Antimony, ug/L	NP	1.10	6	0.85 J	<0.69	--	--	--	--	<0.69	<0.69	--	--	--	--
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	--	--	--	--	<0.75	<0.75	--	--	--	--
Barium, ug/L	P	71.0	2,000	14	13	--	--	--	--	170	200	--	--	--	--
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	--	--	--	--	<0.27	<0.27	--	--	--	--
Cadmium, ug/L	P	0.149	5	<0.055	<0.055	--	--	--	--	<0.055	<0.055	--	--	--	--
Chromium, ug/L	NP	1.10	100	<1.1	<1.1	--	--	--	--	<1.1	<1.1	--	--	--	--
Cobalt, ug/L	P	5.26	6	0.41 J	0.56	0.51	0.52	1.1	0.39 J	<0.19	<0.19	0.38 J	0.25 J	0.24 J	--
Fluoride, mg/L	P	0.417	4	0.40 J	2.0	--	--	--	--	<0.22	<0.22	--	--	--	--
Lead, ug/L	NP	0.270	15	<0.24	<0.24	--	--	--	--	<0.24	<0.24	--	--	--	--
Lithium, ug/L	P	31.8	40	260	230	--	--	--	--	6.3 J	4.4 J	--	--	--	--
Mercury, ug/L	DQ	DQ	2	<0.11	<0.11	--	--	--	--	<0.11	<0.11	--	--	--	--
Molybdenum, ug/L	NP	1.3	100	4.4	1.4 J	--	--	--	--	<1.2	<1.2	--	--	--	--
Selenium, ug/L	P	9.01	50	1.4 J	<0.96	--	--	--	--	2.0 J	1.3 J	--	--	--	--
Thallium, ug/L	NP	0.500	2	<0.26	<0.26	--	--	--	--	<0.26	<0.26	--	--	--	--
Radium 226/228 Combined, pCi/L	P	1.71	5	4.61	4.40	--	--	--	--	0.224	--	--	--	--	--
Additional Parameters Collected for Selection of Remedy															
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				260	270	--	--	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				<140	52 J	--	--	--	--	<36	<36	--	--	--	--
Iron, ug/L				56 J	96 J	69 J	68 J	140	<36	<36	<36	<36	510	<36	--
Magnesium, ug/L				42,000	32,000	--	--	--	--	37,000	27,000	--	--	--	--
Manganese, dissolved, ug/L				20 J	43	--	--	--	--	<3.6	8.7 J	--	--	--	--
Manganese, ug/L				26	24	--	--	--	--	4.6 J	7.4 J	--	--	--	--
Potassium, ug/L				11,000	8,600	--	--	--	--	860	740	--	--	--	--
Sodium, ug/L				650,000	620,000	--	--	--	--	6,300	4,800	--	--	--	--
Bicarbonate Alkalinity, mg/L				360	350	--	--	--	--	440	490	--	--	--	--
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<4.6	<4.6	--	--	--	--
Total Alkalinity, mg/L				360	350	--	--	--	--	440	490	--	--	--	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of Monitored Natural Attenuation.

Abbreviations:

UPL = Upper Prediction Limit
UTL= Upper Tolerance Limits
GPS = Groundwater Protection Standard
NP = Nonparametric UPL (highest background valu
P = Parametric UPL with 1-of-2 retesting

DQ = Double Quantification Rule (not detected in background)
LOD = Limit of Detection
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mg/L = milligrams per liter
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Lab Notes:

J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD Recovery is outside acceptance limits.
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Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (USEPA) Maximum Contamination Level (MCLs), if established; otherwise, the values from 40 CFR 257.95(h)(2).
3. Interwell UPLs and UTLs calculated based on results from background well MW-301. UPLs and UTLs were updated in April 2022.
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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Delineation Wells												
				MW-311A						MW-312						
Parameter Name				4/14/2022	10/26/2022	4/6/2023	10/11/2023	4/5/2024	10/11/2024	4/11/2022	8/25/2022	10/25/2022	4/5/2023	10/12/2023	4/4/2024	10/9/2024
Groundwater Elevation (ft amsl)	**UPL Method**	**UPL**	**GPS**	643.23	640.27	643.59	639.84	635.54	641.01	644.62	640.80	639.64	644.08	639.45	643.94	640.17
Appendix III																
Boron, ug/L	P	839		1500	1,400	--	--	--	--	560	--	580	--	--	--	--
Calcium, mg/L	P	103		54	46	--	--	--	--	200	180	160	170	180	170	170
Chloride, mg/L	P	210		140	140	140	--	--	--	170	--	170	130	--	--	--
Fluoride, mg/L	P	0.381		2.4	4.3	--	--	--	--	<0.22	--	0.38 J	--	--	--	--
Field pH, Std. Units	P	6.74		7.53	7.80	7.54	7.72	7.64	7.84	7.07	7.14	7.10	7.11	6.96	6.89	6.86
Sulfate, mg/L	P	208		1,200	1,200	1,200	--	--	--	550	--	610	510	--	--	--
Total Dissolved Solids, mg/L	P	697		2,200	2,300	2,400	--	--	--	1,100	--	1,300	1,200	--	--	--
Appendix IV		**UTL**	**GPS**													
Antimony, ug/L	NP	1.10	6	<0.69	0.83 J	--	--	--	--	<0.69	--	<0.69	--	--	--	--
Arsenic, ug/L	NP	0.88	10	<0.75	<0.75	--	--	--	--	4.4	--	2.8	--	--	--	--
Barium, ug/L	P	71.0	2,000	10	12	--	--	--	--	50	--	45	--	--	--	--
Beryllium, ug/L	NP	0.270	4	<0.27	<0.27	--	--	--	--	<0.27	--	<0.27	--	--	--	--
Cadmium, ug/L	P	0.149	5	<0.055	<0.055	--	--	--	--	<0.055	--	<0.055	--	--	--	--
Chromium, ug/L	NP	1.10	100	<1.1	<1.1	--	--	--	--	<1.1	--	<1.1	--	--	--	--
Cobalt, ug/L	P	5.26	6	0.32 J	0.60	0.66	<0.17	0.44 J	0.38 J	9.1	11	11	11	10	8.5	11
Fluoride, mg/L	P	0.417	4	2.4	4.3	--	--	--	--	<0.22	--	0.38 J	--	--	--	--
Lead, ug/L	NP	0.270	15	<0.24	<0.24	--	--	--	--	<0.24	--	<0.24	--	--	--	--
Lithium, ug/L	P	31.8	40	280	230	--	--	--	--	40	--	35	--	--	--	--
Mercury, ug/L	DQ	DQ	2	<0.11	<0.11	--	--	--	--	<0.11	--	<0.11	--	--	--	--
Molybdenum, ug/L	NP	1.3	100	1.6 J	2.2	--	--	--	--	1.3 J	--	1.4 J	--	--	--	--
Selenium, ug/L	P	9.01	50	1.3 J	<0.96	--	--	--	--	<0.96	--	<0.96	--	--	--	--
Thallium, ug/L	NP	0.500	2	<0.26	<0.26	--	--	--	--	<0.26	--	<0.26	--	--	--	--
Radium 226/228 Combined, pCi/L	P	1.71	5	3.99	4.21	--	--	--	--	0.357	--	1.29	--	--	--	--
Additional Parameters Collected for Selection of Remedy																
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	13	--	--	--	--	--
Lithium, dissolved, ug/L				310	280	--	--	--	--	37	43	41	--	--	--	--
Iron, dissolved, ug/L				<140	<36	--	--	--	--	510	240	250	150	210	280 B	400
Iron, ug/L				<36	<36	<36	44 J	<36	<36	350	330	260	370	540	420	520 J
Magnesium, ug/L				25,000	18,000	--	--	--	--	65,000	58,000	52,000	59,000	62,000	59,000	59,000
Manganese, dissolved, ug/L				<14	7.0 J	--	--	--	--	1,200	1,100	1,200	930 B	1,400	730	1,200
Manganese, ug/L				3.7 J	9.4 J	--	--	--	--	1,400	1,200	1,000	960	1,500	910	1,200
Potassium, ug/L				10,000	7,800	--	--	--	--	4,800	4,600	4,800	5,700	5,200	5,000	4,800
Sodium, ug/L				800,000	720,000	--	--	--	--	170,000	140,000	130,000	140,000	120,000	110,000	92,000
Bicarbonate Alkalinity, mg/L				370	380	--	--	--	--	240	250	230	250	250	290	280
Carbonate Alkalinity, mg/L				<4.6	<4.6	--	--	--	--	<4.6	<4.6	<4.6	<2.5	<2.5	<2.5	<2.5
Total Alkalinity, mg/L				370	380	--	--	--	--	240	250	230	250	250	290	280

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Abbreviations:

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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Delineation Wells										
				MW-313							MW-316			
Parameter Name	UPL Method	UPL	GPS	4/11/2022	8/25/2022	10/25/2022	4/5/2023	10/10/2023	4/4/2024	10/9/2024	4/6/2023	10/12/2023	4/5/2024	10/9/2024
Groundwater Elevation (ft amsl)				642.06	639.38	639.16	642.02	639.04	644.49	638.87	642.78	639.15	644.09	DRY
Appendix III														
Boron, ug/L	P	839		570	--	540	--	--	--	--	--	--	--	--
Calcium, mg/L	P	103		200	180	170	220	210	140	170	210	190	82	--
Chloride, mg/L	P	210		170	--	170	<2.3	--	--	--	140	--	--	--
Fluoride, mg/L	P	0.381		<0.22	--	<0.22	--	--	--	--	--	--	--	--
Field pH, Std. Units	P	6.74		6.94	7.09	6.95	6.93	6.89	6.90	6.94	6.70	6.73	7.04	--
Sulfate, mg/L	P	208		500	--	580	650	--	--	--	480	--	--	--
Total Dissolved Solids, mg/L	P	697		3,200	--	1,300	1,400	--	--	--	1,200	--	--	--
Appendix IV		**UTL**	**GPS**											
Antimony, ug/L	NP	1.10	6	<0.69	--	<0.69	--	--	--	--	--	--	--	--
Arsenic, ug/L	NP	0.88	10	1.2 J	--	1.1 J	--	--	--	--	--	--	--	--
Barium, ug/L	P	71.0	2,000	44	--	53	--	--	--	--	--	--	--	--
Beryllium, ug/L	NP	0.270	4	<0.27	--	<0.27	--	--	--	--	--	--	--	--
Cadmium, ug/L	P	0.149	5	<0.055	--	<0.055	--	--	--	--	--	--	--	--
Chromium, ug/L	NP	1.10	100	<1.1	--	<1.1	--	--	--	--	--	--	--	--
Cobalt, ug/L	P	5.26	6	5.7	3.9	3.8	5.5	4.4	2.9	3.5	2.1	0.69	0.20 J	--
Fluoride, mg/L	P	0.417	4	<0.22	--	<0.22	--	--	--	--	--	--	--	--
Lead, ug/L	NP	0.270	15	<0.24	--	<0.24	--	--	--	--	--	--	--	--
Lithium, ug/L	P	31.8	40	28	--	30		--	--	--	--	--	--	--
Mercury, ug/L	DQ	DQ	2	<0.11	--	<0.11	--	--	--	--	--	--	--	--
Molybdenum, ug/L	NP	1.3	100	4.8	--	5.8	--	--	--	--	--	--	--	--
Selenium, ug/L	P	9.01	50	<0.96	--	<0.96	--	--	--	--	--	--	--	--
Thallium, ug/L	NP	0.500	2	<0.26	--	<0.26	--	--	--	--	--	--	--	--
Radium 226/228 Combined, pCi/L	P	1.71	5	0.543	--	1.56	--	--	--	--	--	--	--	--
Additional Parameters Collected for Selection of Remedy														
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	4.4	--	--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				26	29	32	--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				630	600	950	520	1,100	430 B	1,200	<36	<36 J	<36	--
Iron, ug/L				920	1,600	1,100	810	1,500	580	1,400	<36	74 J	<36	--
Magnesium, ug/L				68,000	52,000	49,000	72,000	69,000	46,000	55,000	65,000	66,000	27,000	--
Manganese, dissolved, ug/L				3,200	2,400	3,100	3,600 B	3,600	2,200	2,700	1,200 B	110	<3.6	--
Manganese, ug/L				3,800	2,700	2,600	3,600	3,700	2,000	2,700	1,200	110	15	--
Potassium, ug/L				6,100	4,500	4,300	6,100	5,600	4,300	5,400	1,900	2,000	930	--
Sodium, ug/L				140,000	110,000	100,000	150,000	150,000	120,000	130,000	110,000	100,000	53,000	--
Bicarbonate Alkalinity, mg/L				300	230	290	270	230	140	240	340	310	95	--
Carbonate Alkalinity, mg/L				<4.6	<4.6	<4.6	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	--
Total Alkalinity, mg/L				300	230	290	270	230	140	240	340	310	95	--

4.4	Blue highlighted cell indicates the compliance or delineation well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance or delineation well result exceeds the GPS.
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of Monitored Natural Attenuation.

Abbreviations:

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Table 4. Groundwater Analytical Results Summary – October 2022 through October 2024
Ottumwa Generating Station Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00

				Delineation Wells							
				MW-316A				MW-317			
Parameter Name	UPL Method	UPL	GPS	4/6/2023	10/10/2023	4/5/2024	10/9/2024	4/6/2023	10/12/2023	4/5/2024	10/9/2024
Groundwater Elevation (ft amsl)				643.49	639.79	643.94	639.96	642.84	639.08	644.11	638.82
Appendix III											
Boron, ug/L	P	839		--	--	--	--	--	--	--	--
Calcium, mg/L	P	103		74	71	51	55	200	190	100	190
Chloride, mg/L	P	210		54	--	--	--	240	--	--	--
Fluoride, mg/L	P	0.381		--	--	--	--	--	--	--	--
Field pH, Std. Units	P	6.74		7.40	7.53	7.36	7.32	6.57	6.54	6.68	6.53
Sulfate, mg/L	P	208		730	--	--	--	130	--	--	--
Total Dissolved Solids, mg/L	P	697		1,500	--	--	--	1,200	--	--	--
Appendix IV		**UTL**	**GPS**								
Antimony, ug/L	NP	1.10	6	--	--	--	--	--	--	--	--
Arsenic, ug/L	NP	0.88	10	--	--	--	--	--	--	--	--
Barium, ug/L	P	71.0	2,000	--	--	--	--	--	--	--	--
Beryllium, ug/L	NP	0.270	4	--	--	--	--	--	--	--	--
Cadmium, ug/L	P	0.149	5	--	--	--	--	--	--	--	--
Chromium, ug/L	NP	1.10	100	--	--	--	--	--	--	--	--
Cobalt, ug/L	P	5.26	6	0.30 J	0.35 J	<0.17	<0.17	5.6	4.7	1.7	4.7
Fluoride, mg/L	P	0.417	4	--	--	--	--	--	--	--	--
Lead, ug/L	NP	0.270	15	--	--	--	--	--	--	--	--
Lithium, ug/L	P	31.8	40	--	--	--	--	--	--	--	--
Mercury, ug/L	DQ	DQ	2	--	--	--	--	--	--	--	--
Molybdenum, ug/L	NP	1.3	100	--	--	--	--	--	--	--	--
Selenium, ug/L	P	9.01	50	--	--	--	--	--	--	--	--
Thallium, ug/L	NP	0.500	2	--	--	--	--	--	--	--	--
Radium 226/228 Combined, pCi/L	P	1.71	5	--	--	--	--	--	--	--	--
Additional Parameters Collected for Selection of Remedy											
Cobalt, dissolved, ug/L	UPL or GPS not applicable			--	--	--	--	--	--	--	--
Lithium, dissolved, ug/L				--	--	--	--	--	--	--	--
Iron, dissolved, ug/L				<36	<36	<36	<36	1,400	1,800	<36	1,300
Iron, ug/L				<36	400	<36	<36	1,600	3,200	350	2,000
Magnesium, ug/L				30,000	30,000	29,000	29,000	44,000	41,000	28,000	39,000
Manganese, dissolved, ug/L				240 B	1,100	20	50	1,700 B	1,700	320	1,800
Manganese, ug/L				210	1,200	22	34	1,800	1,900	350	1,800
Potassium, ug/L				8,000	8,100	7,800	8,400	3,400	3,400	1,600	3,700
Sodium, ug/L				430,000	450,000	470,000	440,000	130,000	130,000	68,000	140,000
Bicarbonate Alkalinity, mg/L				430	380	310	380	5,401	490	270	480
Carbonate Alkalinity, mg/L				<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Total Alkalinity, mg/L				430	380	310	380	540	490	270	480

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Created by: NDK Date: 5/1/2018
Last revision by: RM Date: 3/6/2025
Checked by: NLB Date: 3/6/2025

Table 5. Groundwater Field Parameters - CCR Program - Assessment Monitoring
Ottumwa Generating Station / SCS Project # 25220083.00
November 2017 - October 2024

Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-301	11/8/2017	681.54	13.9	6.41	4.16	743	201	1.03
	4/18/2018	681.53	7.2	6.41	6.52	770	106	0.66
	8/14/2018	680.91	20.4	6.26	3.18	867	-56	0.52
	8/29/2018	681.09	20.6	6.31	4.71	781	--	0.63
	10/16/2018	682.50	16.6	6.27	4.12	599	120	2.91
	1/8/2019	682.22	7.9	5.68	5.68	310	118	0.77
	4/8/2019	682.69	7.3	6.61	8.32	501	38	1.87
	10/24/2019	683.07	13.7	6.33	4.94	902	10	1.6
	2/5/2020	683.30	5.4	6.39	7.28	966	68	1.43
	3/12/2020	682.82	6.9	6.48	5.3	962	258.5	1.33
	4/14/2020	683.25	8.7	6.58	5.1	939	176.3	0.87
	10/8/2020	682.34	15.4	6.22	4.2	1,035	163.6	0.02
	4/14/2021	682.94	9.1	6.26	5.99	1,062	232.5	1.61
	10/7/2021	681.95	17.9	6.26	4.17	1,062	207.3	8.90
	4/12/2022	682.08	7.4	6.37	3.26	976	117.6	5.03
	10/26/2022	680.68	14.6	6.29	4.74	1036	26.9	0.62
	4/6/2023	682.05	7.1	6.25	5.05	832	124.5	2.37
	10/13/2023	680.20	17.6	6.24	3.2	1158	104.7	1.75
	4/4/2024	680.79	8.5	6.65	9.81	868	92.0	5.63
	10/11/2024	680.49	17.6	6.11	3.06	1017	204.5	3.02
MW-302	11/8/2017	655.40	13.8	6.55	0.4	2,274	191.7	1.63
	4/18/2018	655.71	10.7	6.47	0.2	2,248	82.6	2.41
	8/14/2018	656.05	14.3	6.76	0.17	2,304	-336.6	4.01
	8/29/2018	655.89	14.6	6.77	0.23	2,357	--	1.42
	10/16/2018	656.91	14.1	6.37	0.26	1,912	114.2	88.24
	1/8/2019	656.03	12.2	6.58	6.4	1,473	70.2	4.39
	4/8/2019	657.23	12.3	6.61	0.86	2,159	68.3	26.9
	10/24/2019	660.14	12.9	6.55	0.35	2,184	-0.5	11.9
	4/14/2020	656.45	10.5	6.70	0.22	1,971	135.6	31.1
	10/8/2020	655.80	14.4	7.00	0.14	2,100	34.5	18.7
	4/13/2021	656.05	11.9	6.44	0.37	2,087	198.2	22.9
	10/7/2021	654.86	14.9	6.49	0.30	1,920	211.5	15.6
	4/12/2022	654.77	11.4	6.43	0.41	1,741	145.2	5.13
	10/26/2022	652.95	12.8	6.56	2.13	2051	-27.1	8.02
	4/5/2023	653.30	11.2	6.62	1.86	1953	97.0	2.03
	10/10/2023	652.32	--	--	--	--	--	--
	4/4/2024	651.81	--	--	--	--	--	--
	9/5/2024	--	17.8	6.49	3.65	1,816	173.2	10.40
	10/10/2024	--	16.2	6.49	3.88	2556	143.3	5.65
MW-303	11/8/2017	651.34	15.2	6.60	0.5	1,896	176.8	3.67
	4/18/2018	652.47	8.2	6.63	0.17	1,862	3.2	3.69
	8/14/2018	652.57	17.2	6.83	0.19	1,833	-307.9	1.51
	8/29/2018	655.07	18.7	7.03	1.92	1,161	--	10.13
	10/16/2018	656.17	17.1	6.66	0.29	1,573	32.8	5.99
	1/8/2019	654.65	9.1	6.83	3.19	750	73.7	14.2
	4/8/2019	655.55	8.5	7.00	2.29	1,181	51.7	3.49
	10/24/2019	653.86	15.3	6.83	0.28	1,287	-5.1	4.24
	4/14/2020	654.08	8.9	6.98	1.94	1,097	104.3	12.1
	10/8/2020	650.37	17.0	8.28	0.13	1,602	-0.4	30.2
	4/13/2021	653.82	9.7	6.67	2.83	1,118	184.7	4.31
	10/7/2021	649.80	17.6	6.70	0.32	1,343	66.5	11.1
	4/12/2022	652.95	9.0	6.71	1.19	1,245	158.2	6.2
	10/26/2022	648.22	15.9	6.70	0.65	1660	-40.9	574.1
	4/5/2023	652.57	8.3	6.65	1.7	1215	62.9	3.54
	10/10/2023	648.07	--	--	--	--	--	--
	4/4/2024	649.52	8.6	6.82	3	1456	78.4	34.31
	9/5/2024	651.03	19.8	6.56	0.80	1,277	150.0	14.71
	10/10/2024	649.42	--	--	--	--	--	--

Table 5. Groundwater Field Parameters - CCR Program - Assessment Monitoring
Ottumwa Generating Station / SCS Project # 25220083.00
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Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-304	11/8/2017	653.03	13.3	7.00	0.25	2,205	162.7	3.88
	4/18/2018	655.55	12.8	6.90	0.15	2,141	137.5	39.29
	8/15/2018	656.35	15.1	7.34	0.21	2,085	35.5	81.42
	8/29/2018	657.82	13.7	7.22	0.16	2,123	--	55.94
	10/16/2018	658.20	13.5	6.86	0.11	2,058	-114.5	17.12
	1/8/2019	656.28	12.8	7.16	0.72	1,368	-62.1	4.38
	4/8/2019	659.33	13.8	7.17	0.41	1,876	-58.3	57.9
	10/23/2019	657.71	13.6	7.05	0.44	1,871	-57.5	18.9
	4/13/2020	656.42	11.9	7.12	0.24	1,764	-119.8	54.1
	10/8/2020	652.95	13.6	7.88	0.18	1,675	-113	11.1
	4/14/2021	654.34	13.1	6.94	0.20	1,797	-97.5	16.9
	10/8/2021	649.53	13.8	6.97	0.32	1,617	-78.7	7.3
	4/12/2022	652.14	13.3	6.95	0.13	1,772	-56.9	3.7
	10/26/2022	647.26	13.5	6.77	0	1,828	-86.3	3.6
	4/6/2023	650.29	13.1	6.70	-0.13	1888	-93.7	0.02
	10/10/2023	646.02	13.3	6.85	0.18	1948	-105.1	7.07
	4/4/2024	648.39	12.7	6.88	1.71	1744	-32.0	6.08
	10/10/2024	646.30	14.5	6.86	0.37	2294	-48.8	2.96
MW-305	11/8/2017	659.76	13.2	7.01	0.2	1,738	146.1	2.68
	4/18/2018	660.99	12.8	6.90	0.15	1,840	-32.7	7.37
	8/15/2018	661.56	14.8	7.21	0.18	1,832	31	14.9
	10/16/2018	663.37	13.9	6.86	0.09	1,836	-26.8	6.96
	1/8/2019	662.13	12.4	6.99	0.81	1,235	36.4	4.76
	4/8/2019	664.01	13.8	7.06	0.59	1,728	32.6	21.7
	10/23/2019	663.21	13.2	6.91	0.42	1,794	-6.7	6.21
	3/13/2020	661.41	12.4	7.02	0.2	1,788	192.6	42.68
	4/13/2020	662.44	9.1	7.00	0.28	1,772	6.6	21.7
	10/9/2020	659.81	14.0	7.44	0.13	1,810	-13	12.9
	4/16/2021	661.15	12.9	6.92	0.16	1,799	43.6	8.17
	10/6/2021	654.83	13.7	6.94	0.44	1,629	46.9	3.8
	2/14/2022	656.35	12.4	7.20	4.8	1,500	50	0.0
	4/11/2022	657.62	12.8	6.90	0.23	1,742	134.8	4.97
	10/25/2022	651.48	13.2	6.76	0.35	1633	-33.0	2.59
	4/4/2023	655.02	13.6	6.70	0.63	1896	166.4	0.02
	10/12/2023	650.21	13.7	6.88	0.26	1869	4.7	3.25
	4/4/2024	650.62	12.2	6.90	6.11	1708	47.3	6.22
	10/11/2024	650.11	14.5	6.79	0.42	2176	151.4	3.55
MW-305A	3/13/2020	651.64	11.8	8.09	3.79	745	204.2	63.2
	4/14/2020	653.69	11.2	7.63	2.26	807	106.7	4.91
	10/5/2020	648.01	14.2	7.46	0.19	1,102	11	NM
	4/15/2021	651.16	12.4	7.05	0.88	1,224	158.3	1.02
	10/8/2021	645.57	14.7	6.90	2.02	1,145	147.8	14.3
	4/12/2022	649.24	21.6	7.19	4.85	1,242	79.7	12.5
	10/26/2022	644.38	13.7	7.11	4.75	1127	-14.4	2.43
	4/6/2023	647.70	11.1	6.74	0.12	1224	198.2	0.02
	10/13/2023	643.60	17.8	6.87	5.74	1357	88.1	12.32
	4/5/2024	645.43	12.0	6.95	4.31	1169	71.8	6.28
	10/11/2024	644.16	19.9	7.09	6.50	1668	148.7	4.04

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Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-306	11/8/2017	669.04	13.6	6.49	0.18	1,186	174.1	0.82
	4/18/2018	668.92	13.1	6.42	0.14	1,228	14.2	0.59
	8/15/2018	668.66	14.6	6.74	0.15	1,271	22.8	3.95
	10/16/2018	670.24	13.4	6.42	0.08	1,340	13.3	7.07
	1/8/2019	669.84	13.3	6.65	0.47	965	59.5	0.89
	4/8/2019	670.96	13.6	6.66	0.92	1,350	49.1	28.5
	10/23/2019	671.28	13.1	6.74	0.29	1,266	-0.5	12.3
	4/14/2020	670.71	11.7	6.68	0.21	1,158	49.7	15.7
	10/9/2020	670.18	13.4	6.54	0.12	1,294	41.4	14
	2/23/2021	669.86	13.4	6.34	0.50	1,277	64.2	2.86
	4/13/2021	670.27	12.7	6.42	0.14	1,339	92	8.99
	7/6/2021	661.87	14.3	7.44	0.33	1,357	119.2	1.37
	10/8/2021	662.27	14.7	6.66	0.40	1,506	86	6.7
	2/14/2022	663.66	13.6	7.07	1.05	1,770	39	0.0
	4/12/2022	664.61	13.8	6.66	0.24	1,579	17.1	2.64
	10/25/2022	657.11	13.5	6.53	0.39	1597	-37.7	0.00
	4/6/2023	659.12	13.4	6.61	0.12	1583	103.1	3.09
	10/12/2023	655.40	13.6	6.63	0.29	1794	25.3	1.90
	4/4/2024	654.47	12.5	6.64	1.51	1724	69.9	5.98
	10/9/2024	655.30	14.8	6.54	0.36	2291	116.4	2.83
MW-307	11/8/2017	647.37	13.2	6.61	0.17	1,656	176.7	11.16
	4/16/2018	649.66	11.6	7.04	0.29	1,674	-105.9	11.93
	5/30/2018	652.45	12.7	6.44	0.18	1,710	-45.8	18.58
	6/28/2018	652.87	13.4	6.87	0.21	1,686	-43.4	53.34
	7/18/2018	652.27	12.9	6.62	0.21	1,718	-416.3	14.94
	10/16/2018	654.13	14.3	6.54	0.08	1,697	-65.7	14.08
	4/8/2019	654.90	12.5	6.76	0.51	1,599	-3.7	26
	10/23/2019	651.89	13.4	6.68	0.25	1,684	-24.8	12.5
	12/11/2019	649.59	11.5	6.37	0.18	1,576	-45.8	43.13
	2/5/2020	649.88	11.7	6.67	0.9	1,681	-15.6	9.74
	4/14/2020	650.66	10.6	6.76	0.69	1,554	-52.9	28.9
	10/7/2020	646.18	13.2	6.97	0.08	1,637	-62.2	4.56
	2/23/2021	646.80	12.2	6.50	0.20	1,632	0.8	2.41
	4/14/2021	649.53	11.5	6.59	0.41	1,675	-39.9	21.2
	7/6/2021	647.03	13.2	7.05	0.21	1,705	14.7	17.91
	10/7/2021	644.49	14.4	6.71	0.19	1,552	-23.8	10.0
	2/14/2022	645.82	12.3	7.03	0.97	1,810	-51	0.0
	4/11/2022	648.40	11.8	6.63	0.13	1,718	46.3	4.1
	8/25/2022	644.25	13.0	6.71	0.56	1,727	67.5	2.2
	10/25/2022	643.46	12.9	6.50	0.22	1604	-36.4	7.21
	4/5/2023	647.28	11.9	6.62	0.00	1,776	31.9	0.0
	10/10/2023	642.85	12.6	6.56	0.20	1856	-35.0	6.40
	4/4/2024	645.09	12.4	6.52	0.75	1693	-31.8	3.69
	6/6/2024	651.37	12.9	6.32	0.35	2009	-26.8	23.65
	10/10/2024	643.26	15.0	6.53	0.26	2271	19.0	3.43

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Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-308	11/8/2017	644.99	13.0	6.76	0.12	1,577	169.7	0.73
	4/16/2018	647.91	11.8	7.14	0.35	1,577	-47.2	0.93
	5/30/2018	651.05	12.1	6.61	0.14	1,611	-48.2	3.34
	6/28/2018	651.43	13.1	7.08	0.19	1,584	-60.3	5.87
	7/18/2018	650.67	12.6	6.73	0.13	1,628	-415.4	1.54
	10/16/2018	NM	13.1	6.68	0.08	1,594	-80.8	5.49
	4/8/2019	653.70	12.5	6.90	0.66	1,539	-23	6.87
	10/23/2019	651.31	13.2	6.78	4.42	1,637	-38.7	7.42
	12/11/2019	647.39	10.5	6.55	0.43	1,532	-56.6	15.72
	2/5/2020	650.12	11.4	6.78	1.48	1,630	-35.9	3.49
	4/14/2020	650.09	10.9	6.90	0.28	1,502	-69.1	5.12
	10/7/2020	642.85	13.2	7.24	0.11	1,575	-56.5	1.15
	4/15/2021	647.66	11.5	6.70	0.44	1,598	-49.3	4.47
	10/7/2021	641.81	13.0	6.83	0.17	1,453	-26.1	12.80
	4/12/2022	645.75	12.7	6.70	0.26	1,491	-30.9	6.0
	10/26/2022	641.13	12.8	6.50	0.00	1507	-5.7	1.98
	4/5/2023	645.16	11.7	6.70	0.18	1634	7.3	1.55
	10/10/2023	640.79	12.7	6.66	0.22	1704	-54.0	6.31
	4/4/2024	643.32	12.0	6.61	0.79	1524	-44.0	4.04
	10/10/2024	641.21	14.4	6.65	1.50	2081	24.1	6.99
MW-309	11/8/2017	644.20	13.1	7.11	0.13	1,431	149.7	3.71
	4/16/2018	647.65	11.2	7.52	0.37	1,445	-58.5	36.7
	5/30/2018	650.98	12.4	6.92	0.12	1,484	-38	40.55
	6/28/2018	651.47	13.8	7.36	0.17	1,477	-45.5	241.4
	7/18/2018	650.69	12.6	7.02	0.11	1,501	-432.6	40.38
	10/16/2018	651.61	13.5	6.95	0.03	1,464	-81.6	28.27
	4/8/2019	653.55	12.4	7.18	0.66	1,396	-3.3	72.1
	10/23/2019	651.28	12.8	6.98	0.36	1,461	-27.5	42.6
	12/11/2019	647.24	11.5	6.67	0.26	1,350	-37.8	413.6
	2/5/2020	648.34	11.4	7.09	1.07	1,433	-7.8	18.1
	4/14/2020	649.19	11.2	7.21	0.16	1,322	-51.5	100.1
	10/7/2020	641.50	13.3	7.57	0.09	1,371	-71.1	7.7
	4/14/2021	646.46	11.7	7.00	0.36	1,411	-40.6	9.32
	10/7/2021	640.71	13.1	7.18	0.21	1,297	-8.1	19.60
	4/14/2022	644.32	11.7	7.16	0.70	1,305	28.1	14
	10/26/2022	640.43	12.6	6.89	0.00	1378	4.9	0.79
	4/5/2023	644.41	11.7	7.10	0.42	1511	-7	0.02
	10/10/2023	640.18	13.3	7.01	0.25	1598	-54.3	8.35
	4/4/2024	644.51	12.2	6.93	0.56	1459	-48.0	3.68
	10/10/2024	640.25	13.5	6.97	0.66	1997	31.7	19.38
MW-310	10/24/2019	649.31	13.7	7.15	0.41	1,906	-9.3	2.29
	2/5/2020	644.71	12.5	7.08	0.68	1,723	42.2	0.9
	3/12/2020	645.45	12.8	6.89	0.3	1,902	252.2	2.77
	4/13/2020	645.91	10.3	7.00	0.22	1,823	179.4	0.87
	10/12/2020	638.46	13.9	7.07	0.16	1,709	146.5	0.02
	2/23/2021	638.77	13.6	7.11	0.09	962	91.3	0.02
	4/13/2021	642.70	12.6	7.07	0.46	2,362	161	2.38
	7/6/72021	639.32	13.0	8.23	0.21	1,852	88.6	0.0
	10/6/2021	638.19	15.4	7.20	0.48	1,425	96.8	1.0
	4/11/2022	640.79	12.6	6.86	0.30	2,007	161.1	4.0
	10/25/2022	638.55	13.3	6.70	0.03	1856	113.6	0.73
	4/4/2023	641.71	11.8	6.91	4.34	852	252.5	0.02
	10/10/2023	638.32	14.7	7.06	0.45	1344	7.5	6.05
	4/4/2024	643.51	11.3	7.05	7.89	1363	71.6	5.97
	10/9/2024	637.99	14.3	6.74	0.41	1780	152.5	4.96

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Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-310A	3/13/2020	645.45	12.5	7.73	6.28	3,160	178.9	109
	4/14/2020	645.91	8.8	7.85	6.39	2,915	146.1	--
	10/5/2020	640.20	13.1	7.48	0.48	3,122	89.7	NM
	4/15/2021	644.88	12.5	7.47	0.98	3,106	160.2	2.25
	10/8/2021	639.57	15.6	7.65	6.21	2,808	143.1	15
	4/12/2022	640.83	17.2	7.43	4.72	2,920	26.7	14.2
	10/26/2022	639.49	14.2	7.64	4.24	2964	81.2	3.85
	4/5/2023	643.11	12.1	7.46	0.49	3045	-15.5	1.97
	10/12/2023	640.13	14.3	7.50	5.60	3355	46.0	4.96
	4/5/2024	642.81	11.7	7.43	7.75	3020	50.2	7.57
	10/9/2024	639.39	17.9	7.53	5.82	3791	150.2	4.20
MW-311	10/24/2019	647.80	13.9	6.95	0.29	926	-24.7	3.88
	2/5/2020	645.00	10.2	6.72	2.11	891	21	1.89
	3/13/2020	644.18	10.0	7.11	0.23	877	222.6	3.44
	4/13/2020	646.79	8.8	6.86	0.29	912	103.4	0.44
	10/12/2020	638.73	14.4	6.93	7.12	1024	-53	NM
	4/14/2021	643.02	9.3	6.66	1.18	945	179.8	0.78
	7/7/2021	642.38	14.2	8.19	0.42	3381	80.8	0.0
	10/6/2021	Dry	--	--	--	--	--	--
	4/11/2022	641.44	10.1	6.74	0.51	880	125.4	3.57
	10/26/2022	638.46	14.6	6.61	0.68	846	52.8	0.84
	4/4/2023	641.88	10.5	6.56	0	932	257	0.02
	10/11/2023	638.31	19.6	7.01	7.69	685	37.9	--
	4/5/2024	--	10.4	6.78	0.29	834	42.6	8.69
	10/11/2024	Dry	--	--	--	--	--	--
MW-311A	3/13/2020	624.11	12.1	7.85	2.29	3,336	206	7.74
	4/13/2020	648.42	7.9	8.40	3.87	3,027	115.8	3.19
	6/30/2020	647.73	12.6	7.64	1.51	3,391	23.4	1.43
	10/6/2020	641.09	12.7	8.33	0.44	3,177	39.6	NM
	2/25/2021	641.16	11.5	7.55	3.23	3,243	129.7	0.02
	4/16/2021	644.16	12.3	7.76	0.77	3,332	146.9	0.02
	10/8/2021	640.58	15.1	8.12	1.68	2,930	140.7	9.6
	4/14/2022	643.23	14.1	7.53	4.66	3,211	54.6	9.61
	10/26/2022	640.27	14.1	7.80	4.68	3022	-21.6	5.88
	4/6/2023	643.59	11.5	7.54	2.47	3,037	47.7	0.02
	10/11/2023	639.84	13.2	7.72	3.15	3424	-4.2	14.16
	4/5/2024	635.54	11.5	7.64	2.18	3244	61.3	7.40
	10/11/2024	641.01	18.2	7.84	6.42	4134	135.7	3.74
MW-312	2/15/2022	641.86	13.0	7.24	1.34	1,800	-67.00	0.0
	4/11/2022	644.62	12.3	7.07	0.15	1,855	112.1	8.39
	8/25/2022	640.80	13.2	7.14	0.18	1949	116.7	1.47
	10/25/2022	639.64	13.1	7.10	0.00	1985	11.3	1.68
	4/5/2023	644.08	12.0	7.11	0.28	1576	0.5	1.32
	10/12/2023	639.45	14.6	6.96	0.23	1827	-26.5	5.45
	4/4/2024	643.94	12.3	6.89	0.29	1512	-11.7	8.53
	10/9/2024	640.17	13.9	6.86	0.25	1842	46.8	44.37
MW-313	2/15/2022	640.58	13.9	7.01	1.22	925	-29.00	0.0
	4/11/2022	642.06	13.2	6.94	0.09	1,788	126.5	7.44
	8/25/2022	639.38	13.2	7.09	0.16	1717	133.3	4.86
	10/25/2022	639.16	14.0	6.95	0.22	1937	-18.4	2.75
	4/5/2023	642.02	11.5	6.93	0.09	1878	-14.5	5.09
	10/10/2023	639.04	13.9	6.89	0.23	2106	-47.9	6.85
	4/4/2024	644.49	11.8	6.90	0.21	1395	-27.9	7.45
	10/9/2024	638.87	16.0	6.94	0.39	2027	-10.3	188.31
MW-315	2/2/2023	642.40	12.7	6.94	1.44	1293	-6.3	1.53
	3/6/2023	648.55	12.4	6.86	0.86	1539	-60.9	2.25
	4/5/2023	645.12	11.8	6.96	0.32	1523	-45.7	0.02
	10/10/2023	641.10	13.1	6.93	0.29	1615	-79.7	9.42
	4/4/2024	644.23	12.3	6.85	0.34	1479	-74.3	4.47
	10/10/2024	641.37	13.9	6.89	1.26	2008	2.7	9.56
MW-316	4/6/2023	642.78	10.6	6.70	-0.16	1694	104.1	0.02
	10/12/2023	639.15	16.1	6.73	0.74	1773	61.0	7.20
	4/5/2024	644.09	9.2	7.04	5.20	763	81.3	3.95
	10/9/2024	--	--	--	--	--	--	--
MW-316A	4/6/2023	643.49	11.2	7.40	3.29	1976	99.6	4.77
	10/10/2023	639.79	17.2	7.53	3.43	2399	49.5	43.00
	4/5/2024	643.94	10.6	7.36	3.57	2189	40.1	4.46
	10/9/2024	639.96	22.2	7.32	2.09	2838	107.3	28.77

Table 5. Groundwater Field Parameters - CCR Program - Assessment Monitoring
Ottumwa Generating Station / SCS Project # 25220083.00
November 2017 - October 2024

Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-317	4/6/2023	642.84	11.5	6.57	0.12	1561	-24.0	3.89
	10/12/2023	639.08	13.7	6.54	0.09	1853	-38.7	6.25
	4/5/2024	644.11	9.9	6.68	4.85	898	93.4	3.98
	10/9/2024	638.82	14.5	6.53	1.36	2137	68.0	8.38

Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
µmhos/cm = micromhos per centimeter
ft amsl = feet above mean sea level
mV = millivolts
Std. Units = Standard Units
NTU = Nephelometric Turbidity Units
Deg C = Degrees Celsius

Created: RM Date: 2/23/2024
Updated: RM Date: 2/28/2025
Checked By: NLB Date: 3/6/2025

Table 6. Horizontal Gradients and Flow Velocity
Ottumwa Generating Station - Ash Pond and ZLD Pond / SCS Engineers Project #25220083.00
January - December 2024

	Ash Pond Northeast Flow Path - Shallow - A				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
April 4 - 5, 2024	650.00	644.09	1101	0.005	0.0001
August 20, 2024	655.00	643.67	1108	0.010	0.0002
October 8 - 11, 2024	655.00	640.00	947	0.016	0.0003

	ZLD Pond Northeast Flow Path - Shallow - B				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
April 4 - 5, 2024	650.00	644.23	570	0.010	0.0000
August 20, 2024	655.00	646.77	750	0.011	0.0000
October 8 - 11, 2024	650.00	641.37	690	0.013	0.0000

	Ash Pond Northeast Flow Path - Deep - C				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
April 4 - 5, 2024	646.00	643.94	884	0.002	0.0001
August 20, 2024	649.69	645.00	1020	0.005	0.0001
October 8 - 11, 2024	644.16	640.00	880	0.005	0.0001

	Well	**K Values (cm/sec)**	**K Values (ft/d)**
Upgradient Well	MW-301	4.6E-03	13
Shallow Wells	MW-302	3.2E-03	9.1
	MW-303	1.2E-04	0.35
	MW-304	3.5E-04	0.98
	MW-305	2.5E-03	7.1
	MW-306	2.8E-03	8.1
	MW-310	2.9E-03	8.2
	MW-311	2.3E-02	64
	MW-316	4.2E-02	119
	MW-317	9.1E-03	26
	Geometric Mean	3.1E-03	8.7
Deep Wells	MW-305A	5.6E-06	0.02
	MW-310A	4.2E-07	0.001
	MW-311A	5.4E-07	0.002
	MW-316A	2.1E-05	0.060
	Geometric Mean	2.3E-06	0.006

Assumed Unconsolidated Porosity, n
0.40

Assumed Dolomite Porosity, n
0.25

Note: Geometric mean calculations do not include upgradient well MW-301

Groundwater flow velocity equation: V = [K*(Δh/Δl)] / n

ft = feet
ft/d = feet per day
K = hydraulic conductivity
n = effective porosity
V = groundwater flow velocity

h1, h2 = point interpreted groundwater elevation

Δl = distance between location 1 and 2
Δh/Δl = hydraulic gradient

Note:
1. See Figures 3, 4, 5, and 6 for velocity calculation flow path locations.

Revised By: NLB Date: 2/28/2025
Checked By: RM Date: 3/5/2025

Table 7. Vertical Gradients

IPL - Ottumwa Generating Station - Ash Pond and Zero Liquid Discharge Pond / SCS Engineers Project #25220083.00

	MW-305/MW-305A		MW-310/MW-310A		MW-311/MW-311A		MW-316/MW-316A	
Vertical Hydraulic Gradients								
Shallow Well	MW-305		MW-310		MW-311		MW-316	
Screen midpoint (feet amsl)	634.91		635.26		638.74		637.36	
Deep Well	MW-305A		MW-310A		MW-311A		MW-316A	
Screen midpoint (feet amsl)	604.62		604.88		608.36		605.43	
Measurement Date	**Distance between midpoints (ft)**	**Vertical Gradient (ft/ft)**	**Distance between midpoints (ft)**	**Vertical Gradient (ft/ft)**	**Distance between midpoints (ft)**	**Vertical Gradient (ft/ft)**	**Distance between midpoints (ft)**	**Vertical Gradient (ft/ft)**
April 4-5, 2024	30.3	-0.171	30.4	-0.023	30.4	NA	31.9	-0.005
August 20, 2024	30.3	-0.160	30.4	0.057	30.4	0.071	31.9	0.045
October 8-11, 2024	30.3	-0.196	30.4	0.046	30.4	NA	31.9	NA

Notes:
1: A positive vertical gradient indicates upward groundwater flow. A negative gradient indicates downward flow.
2: MW-311/MW-311A - Vertical gradient for the April, 2024 data was unable to be calculated due to the water level being below the pump. MW-311 was DRY in October, 2024.
3: MW-316 was DRY during the October 2024 event.
amsl = above mean sea level
NA = not applicable because one well was dry, so vertical gradient not calculated

Last rev. by: NLB Date: 11/4/2024
Checked by: LH Date: 11/27/2024

Table 8. Evaluation of Corrective Measure Alternatives
Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Alternative #3 Consolidate on Site and Cap with MNA	Alternative #4 Excavate and Dispose on site with MNA	Alternative #5 Excavate and Dispose in Off-Site Landfill with MNA	Alternative #7 Consolidate and Cap with Groundwater Collection	Alternative #8 Consolidate and Cap with Barrier Wall and Groundwater Collection
CORRECTIVE ACTION ASSESSMENT - 40 CFR 257.97(b)					
257.97(b)(1) Is remedy protective of human health and the environment?	Yes	Yes	Yes	Yes	Yes
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Yes	Yes	Yes	Yes	Yes
257.97(b)(3) Can the remedy control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment?	Yes	Yes	Yes	Yes	Yes
257.97(b)(4) Can the remedy remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible?	Yes, if MNA is feasible or coupled with an alternative groundwater restoration method.	Yes, if MNA is feasible or coupled with an alternative groundwater restoration method.	Yes, if MNA is feasible or coupled with an alternative groundwater restoration method.	Yes	Yes
257.97(b)(5) Can the remedy comply with standards for management of wastes as specified in §257.98(d)?	Yes	Yes	Yes	Yes	Yes
LONG- AND SHORT-TERM EFFECTIVENESS - 40 CFR 257.97(c)(1)					
257.97(c)(1)(i) Magnitude of reduction of existing risks	Existing risk reduced through consolidation of CCR into a smaller footprint thereby reducing or eliminating the volume of source material in contact with groundwater after closure. Risk is also reduced by achieving GPS.	Similar to Alternative #3 with potential increased reduction of risk due to CCR removal and elimination of groundwater interaction with CCR.	Same as Alternative #4.	Similar to Alternative #3 with increased reduction of risk due to removal of contaminant from the aquifer.	Similar to Alternative #7. Long-term risk may be reduced with additional containment offered by barrier wall.
257.97(c)(1)(ii) Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy	Magnitude of residual risk of further releases is lower than current conditions due to consolidation, reduction or elimination of CCR and groundwater interaction, and final cover eliminating infiltration through CCR.	Reduced risk over Alternative #3 due to improved CCR containment with composite liner and cover.	Similar to Alternative #4 with reduced risk due to removal of CCR from site.	Similar Alternative #3 with potential further reduction in release risk due to removal of contaminants from the environment.	Similar to Alternative #7 with potential further reduction in release risk due to the containment of groundwater impacts provided by barrier walls.
257.97(c)(1)(iii) The type and degree of long-term management required, including monitoring, operation, and maintenance	30-year post-closure groundwater monitoring; Groundwater monitoring network maintenance and as-needed repair/replacement Final cover maintenance (e.g., mowing and as-needed repair); Periodic final cover inspections; Additional corrective action as required based on post-closure groundwater monitoring.	Same as Alternative #3.	No on-site long-term management required; Limited on-site post-closure groundwater monitoring until GPS are achieved; Receiving disposal facility will have same/similar long-term monitoring, operation, and maintenance requirements as Alternative #3.	Similar to Alternative #3 with additional effort for groundwater pump operation and maintenance (O&M), groundwater treatment system O&M, and treatment system discharge monitoring/reporting.	Similar to Alternative #7 with additional monitoring of wall performance.

Table 8. Evaluation of Corrective Measure Alternatives
Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Alternative #3 **Consolidate on Site and Cap with MNA**	**Alternative #4** **Excavate and Dispose on site with MNA**	**Alternative #5** **Excavate and Dispose in Off-Site Landfill with MNA**	**Alternative #7** **Consolidate and Cap with Groundwater Collection**	**Alternative #8** **Consolidate and Cap with Barrier Wall and Groundwater Collection**
LONG- AND SHORT-TERM EFFECTIVENESS - 40 CFR 257.97(c)(1) (continued)					
257.97(c)(1)(iv) Short-term risks - Implementation					
Excavation	Limited risk to community and environment due to limited amount of excavation(likely >200K cy but <420K cy) required to establish final cover subgrades. Risk to environment due to increased excavation volumes required for consolidation.	Similar to Alternative #3 with increased risk to environment due to increased excavation volumes (~420K cy) and temporary CCR storage during disposal site construction required for removal and on-site re-disposal.	Similar to Alternative #4 with reduced risk to environment from excavation due to limited on-site storage.	Similar to Alternative #3 with increased construction risk due to drilling, trenching, and excavation for groundwater pumping and treatment system construction.	Similar to Alternative #7 with some increased construction risk due to excavation or installation of the barrier wall.
Transportation	No risk to community or environment from off-site CCR transportation; Typical risk due to construction traffic delivering final cover materials to site.	Similar to Alternative #3 with increased risk from construction traffic due to increased material import requirements (liner construction required).	Highest level of community and environmental risk due to CCR volume export (~420K cy).	Similar to Alternative #3 with increased risk from importing groundwater pumping and treatment system materials.	Similar to Alternative #7 with increased risk from importing barrier wall system materials.
Re-Disposal	Limited risk to community and environment due to limited volume of CCR re-disposal due to increased volumes (likely >200K cy but <420K cy) required for consolidation.	Similar to Alternative #3 with increased risk to environment due to increased excavation volumes (~420K cy) and temporary CCR storage during disposal site construction required for removal and on-site re-disposal.	Similar to Alternative #4 with increased risk to community and environment due to re-disposal of large CCR volume (~420K cy) at another facility; Re-disposal risks are managed by the receiving disposal facility.	Same as Alternative #3.	Same as Alternative #3.
257.97(c)(1)(v) Time until full protection is achieved	Consolidation of CCR and capping is complete (June 2023). Groundwater protection timeframe to reach GPS potentially 2 to 10 years following closure construction, achievable within 30-year post-closure monitoring period. Potential for increase in time to reach GPS due to significant source disturbance during construction. Potential for decrease in time to reach GPS due to consolidation of CCR.	Similar to Alternative #3 with Increased time required to implement remedy. Anticipated increase in time required to identify, site and develop on-site disposal capacity if located outside of existing impoundment footprint. Increased time required for closure construction due to CCR excavation, temporary storage, liner construction, and redisposal if completed within impoundment footprint. Potential for increase in time to reach GPS due to significant source disturbance during construction. Potential decrease in time to reach GPS due to source isolation within liner/cover system.	Expected to require the greatest length of time to achieve full protection. Implementation schedule extends the time required to achieve full protection. Extended implementation timeframe is driven by the time required to identifying and secure off-site disposal capacity, or develop the capacity at an existing Alliant-owned facility. If landfill capacity is not owned by Alliant, additional time may be required to permit and develop the necessary disposal capacity. Increased construction time likely required due to the capacity of the receiving site to unload and place material. Potential for increase in time to reach GPS due to significant source disturbance during construction. Potential decrease in time to reach GPS due to impounded CCR source removal.	Similar to Alternative #3. Potential decrease in time to reach GPS from implementation of groundwater pumping.	Similar to Alternative #7. Potential decrease in time to reach GPS upon implementation of barrier wall.
257.97(c)(1)(vi) Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment	Potential for exposure is low. Remaining waste is capped with risk to construction workers during consolidation of CCR.	Similar to Alternative #3 with increased risk to construction workers during excavation and re-disposal. Increased risk due to higher material management volumes.	No potential for on-site exposure to remaining waste since no waste remains on site; Risk of potential exposure is transferred to receiving disposal facility and is likely similar to Alternative #3 Highest level of risk due to excavation, transportation, and re-disposal for construction workers removing CCR and solid waste workers at receiving facility.	Similar to Alternative #3 with potential for secondary impacts from releases of extracted groundwater or disruption in treatment.	Same as Alternative #7.
257.97(c)(1)(vii) Long-term reliability of the engineering and institutional controls	Long-term reliability of cap is good; Significant industry experience with methods/controls; Capping is common practice/industry standard for closure in place for remediation and solid waste management	Same as Alternative #3	Success of remedy at OGS does not rely on long-term reliability of engineering or institutional controls; Overall success relies on reliability of the engineering and institutional controls at the receiving facility.	Similar to Alternative #3. Remedy relies upon active equipment that will require additional operations and maintenance.	Similar to Alternative #7. Remedy relies on continued hydraulic conductivity of the selected barrier. Breaches or short circuiting can develop and must be monitored.
257.97(c)(1)(viii) Potential need for replacement of the remedy	Limited potential for remedy replacement if maintained; Some potential for remedy enhancement due to residual groundwater impacts following source control.	Similar to Alternative #3 with further reduction in potential need for remedy enhancement due to composite with liner.	No potential for remedy replacement; Limited potential for remedy enhancement due to residual groundwater impacts following source control.	Similar to Alternative #3, with reduced potential of remedy replacement, but added expectation for pump, conveyance system and treatment system replacement.	Similar to Alternative #7, with reduced potential of remedy replacement, but added expectation for potential replenishment of barrier materials.

Table 8. Evaluation of Corrective Measure Alternatives
Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Alternative #3 **Consolidate on Site and Cap with MNA**	**Alternative #4** **Excavate and Dispose on site with MNA**	**Alternative #5** **Excavate and Dispose in Off-Site Landfill with MNA**	**Alternative #7** **Consolidate and Cap with Groundwater Collection**	**Alternative #8** **Consolidate and Cap with Barrier Wall and Groundwater Collection**
SOURCE CONTROL TO MITIGATE FUTURE RELEASES - 40 CFR 257.97(c)(2)					
257.97(c)(2)(i) The extent to which containment practices will reduce further releases	Cap will reduce further releases by minimizing infiltration through CCR.	Similar to Alternative #3 with further reduction due to composite liner and 5-foot groundwater separation required by CCR Rule.	Removal of CCR prevents further releases at OGS; Receiving disposal site risk similar to Alternative #4.	Similar to Alternative #3 with the added ability to contain or restore groundwater impacts if MNA mechanisms are not active or site attenuation capacity is not adequate.	Similar to Alternative #7 with the added ability to contain groundwater impacts if MNA mechanisms are not active or site attenuation capacity is not adequate.
257.97(c)(2)(ii) The extent to which treatment technologies may be used	Alternative does not rely on treatment technologies.	Alternative does not rely on treatment technologies.	Alternative does not rely on treatment technologies.	This alternative relies on conventional pump and treat remediation.	Alternative relies on the identification and availability of a suitable barrier wall technology (e.g., permeable reactive barrier material or slurry wall). Implementation of and contact with barrier wall materials will require specialized field implementation methods and health and safety measures.
IMPLEMENTATION - 40 CFR 257.97(c)(3)					
257.97(c)(3)(i) Degree of difficulty associated with constructing the technology	Low complexity construction; Moderate degree of logistical complexity; Moderate level of dewatering effort - dewatering required for material excavation/placement and capping.	Moderately complex construction due to composite liner and cover; High degree of logistical complexity due to excavation and on-site storage of ~420K cy of CCR while new lined disposal area is constructed; High level of dewatering effort - dewatering required for excavation of full CCR volume.	Low complexity construction; High degree of logistical complexity including the excavation and off-site transport of ~420K cy of CCR and permitting/development of off-site disposal facility airspace; High level of dewatering effort - dewatering required for excavation of full CCR volume.	Low complexity construction; Moderate degree of logistical complexity; Moderate to low level of dewatering effort - dewatering required for material excavation/placement and capping. Moderate complexity construction for the installation of extraction wells and conveyance to a site-specific groundwater treatment plant.	High complexity construction; Barrier walls require specialty installation equipment and knowledge. Highly specialized and experience contractors required to achieve proper installation. Moderate degree of logistical complexity; Moderate to low level of dewatering effort - dewatering required for material excavation/placement and capping.
257.97(c)(3)(ii) Expected operational reliability of the technologies	High reliability based on historic use of capping as corrective measure.	Same as Alternative #3.	Success at OGS does not rely on operational reliability of technologies; Overall success relies on off-site disposal facility, which is likely same/similar to Alternative #3, but may not be controlled by the Owner.	Similar to Alternative #3; however, success of this remedy relies on the successful operation of a site-specific groundwater treatment plant.	Similar to Alternative #3; however, success this remedy relies on continued hydraulic conductivity of the selected barrier. Breaches or short circuiting can develop and must be monitored.
257.97(c)(3)(iii) Need to coordinate with and obtain necessary approvals and permits from other agencies	Need is low in comparison to other alternatives; State Closure Permit required.	Need is high in comparison to other alternatives State Closure Permit required; State Landfill Permit may be required.	Need is highest in comparison to other alternatives; State Closure Permit required; Approval of off-site disposal site owner required; May require State solid waste comprehensive planning approval; Local road use permits likely required.	Need is moderate in comparison to other alternatives; State Closure Permit required; Well permitting for extraction well installation; NPDES Permit for groundwater treatment and discharge; State and local erosion control/construction stormwater management permits required; Federal/State/Local Floodplain permitting likely required.	Need is moderate in comparison to other alternatives State Closure Permit required; Well permitting for barrier wall monitoring; Federal/State/Local Floodplain permitting required; State and local erosion control/construction stormwater management permits required.
257.97(c)(3)(iv) Availability of necessary equipment and specialists	Necessary equipment and specialists are highly available. Cap construction materials are readily available and accessible in the area. Requires dewatering, treatment, and conditioning of CCR.	Same as Alternative #3; Similar level of demand for liner and cap construction material. Increase in demand for specialty materials and services due to composite liner construction.	Availability of necessary equipment to develop necessary off-site disposal facility airspace and transport ~420K cy of CCR to new disposal facility will be a limiting factor in the schedule for executing this alternative; No liner or cover material demands for on-site implementation of remedy.	Similar to Alternative #3; Moderate level of demand for liner and cap construction material. A site-specific, trained employee will be required to operate the groundwater treatment system.	Similar to Alternative #3; Moderate level of demand for liner and cap construction material; Availability of the necessary specialized equipment and extensive experience required for barrier installation is potentially in high demand.
257.97(c)(3)(v) Available capacity and location of needed treatment, storage, and disposal services	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative.	Available temporary on-site storage capacity for ~420K cy of CCR while composite liner is constructed is significant limiting factor.	Off-site disposal capacity, facility logistical capacity, or the time required to develop the necessary off-site disposal and logistical capacity is a significant limiting factor.	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative.	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative.

Table 8. Evaluation of Corrective Measure Alternatives
Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Alternative #3 Consolidate on Site and Cap with MNA	Alternative #4 Excavate and Dispose on site with MNA	Alternative #5 Excavate and Dispose in Off-Site Landfill with MNA	Alternative #7 Consolidate and Cap with Groundwater Collection	Alternative #8 Consolidate and Cap with Barrier Wall and Groundwater Collection
COMMUNITY ACCEPTANCE - 40 CFR 257.97(c)(4)					
257.97(c)(4) The degree to which community concerns are addressed by a potential remedy (Anticipated)	No comments were received during the public meeting held in June 2020 or February 2021. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held in June 2020 or February 2021. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held in June 2020 or February 2021. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held in June 2020 or February 2021. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held in June 2020 or February 2021. Assume all alternatives are acceptable to interested/affected parties.

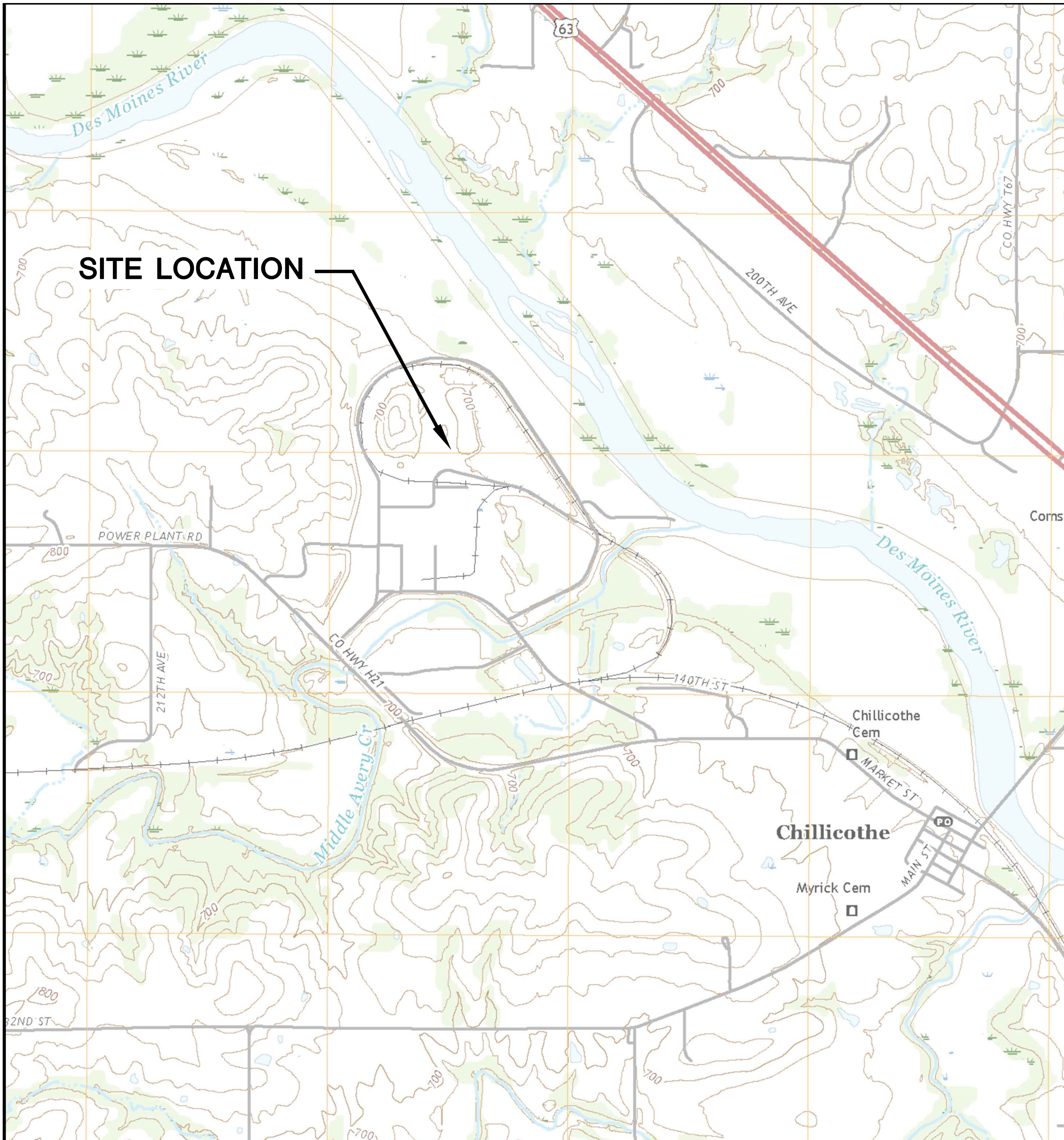
NOTES:

1) Alternatives #1 through #5 were developed and submitted within the Assessment of Corrective Measures Report (ACM), dated September 2019
2) Alternatives #6 through #8 were added in November 2020 as part of Addendum #1 to the September 2020 ACM Report
3) Former Alternative #2 (Close and Cap in Place with MNA) is not viable due to the completed removal of the OGS ZLD Pond and contents. Alternative #2 has been eliminated from further evaluation.
4) Former Alternatives #1 and #6 have been eliminated from further evaluation. See Selection of Remedy report text.

Created by: LAB/SK Date: 6/20/2019
Last revision by: SKK Date: 4/4/2024
Checked by: EJN Date: 3/9/2025

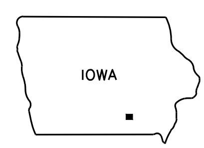
I:\25220083.00\Deliverables\2024 Selection of Remedy Report\Tables\[8_Evaluation of Assessment of Corrective Measure_OGS.xlsx]OGS_Evaluation Matrix

Figures



N

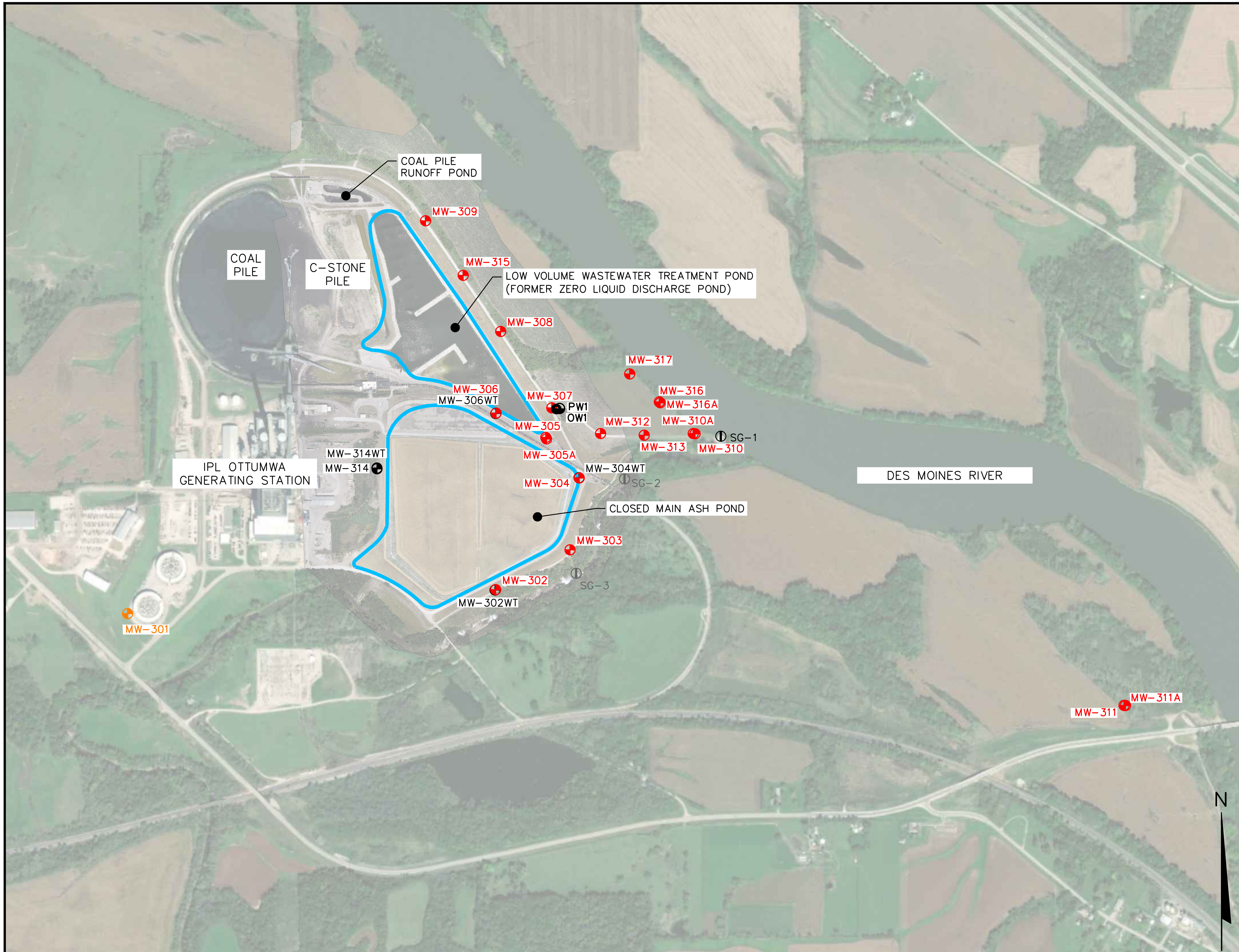
CHILLICOTHE QUADRANGLE
IOWA–WAPELLO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



CLIENT	SITE	
INTERSTATE POWER AND LIGHT CO. 20775 POWER PLANT ROAD OTTUMWA, IA 52501	ALLIANT ENERGY OTTUMWA GENERATING STATION OTTUMWA, IOWA	SITE LOCATION MAP

				ENGINEER	FIGURE
PROJECT NO.	25219072.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	1
DRAWN:	11/15/2019	CHECKED BY:	MDB		
REVISED:	01/10/2020	APPROVED BY:	TK 01/30/2020		

I:\25219072.00\Drawings\CCR 2019 Annual Report\Site Location Map.dwg, 1/30/2020 3:51:43 PM



LEGEND

- CCR UNIT
- CCR UNIT MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- RIVER ELEVATION MEASUREMENT LOCATION
- OBSERVATION WELL
- EXTRACTION WELL

NOTES:

1. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19TH, 2023.
2. MONITORING WELLS MW-301, MW-302, AND MW-304, WERE INSTALLED BY CASCADE DRILLING, LLP. UNDER THE SUPERVISION OF SCS ENGINEERS FROM NOVEMBER 11-12, 2015.
3. MONITORING WELLS MW-303 AND MW-305 WERE INSTALLED BY CASCADE DRILLING LLP. UNDER THE SUPERVISION OF SCS ENGINEERS ON DECEMBER 7-8, 2015.
4. MONITORING WELLS MW-307, MW-308, AND MW-309 WERE INSTALLED BY CASCADE DRILLING, LLP. UNDER THE SUPERVISION OF SCS ENGINEERS FROM OCTOBER 25-27, 2016.
5. MONITORING WELLS MW-310 AND MW-311 WERE INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING ON AUGUST 27, 2019.
6. MONITORING WELLS MW-305A, MW-310A, AND MW-311A WERE INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING BETWEEN FEBRUARY 27, 2020 AND MARCH 3, 2020.
7. STAFF GAUGE SG-1 WAS INSTALLED BY SCS ENGINEERS ON MARCH 3, 2020.
8. MONITORING WELLS MW-312 AND MW-313 WERE INSTALLED BY CASCADE DRILLING ON DECEMBER 14, 2021.
9. MONITORING WELLS MW-302WT, MW-304WT, MW-306WT, MW-314, AND MW-314WT WERE INSTALLED BY DIRECT PUSH ANALYTICAL ON APRIL 27-28, 2022.
10. MONITORING WELL MW-315 WAS INSTALLED BY DIRECT PUSH ANALYTICAL, UNDER THE SUPERVISION OF SCS ENGINEERS, ON NOVEMBER 29, 2022.
11. STAFF GAUGES SG-2 AND SG-3 WERE INSTALLED BY SCS ENGINEERS ON MARCH 27, 2023. SG-2 AND SG-3 WERE LOST IN 2024.
12. MONITORING WELLS MW-316, MW-316A, AND MW-317 WERE INSTALLED BY CASCADE DRILLING, LLP, UNDER THE SUPERVISION OF SCS ENGINEERS, ON MARCH 28-29, 2023.
13. MW-301 SERVES AS THE BACKGROUND CCR WELL.

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

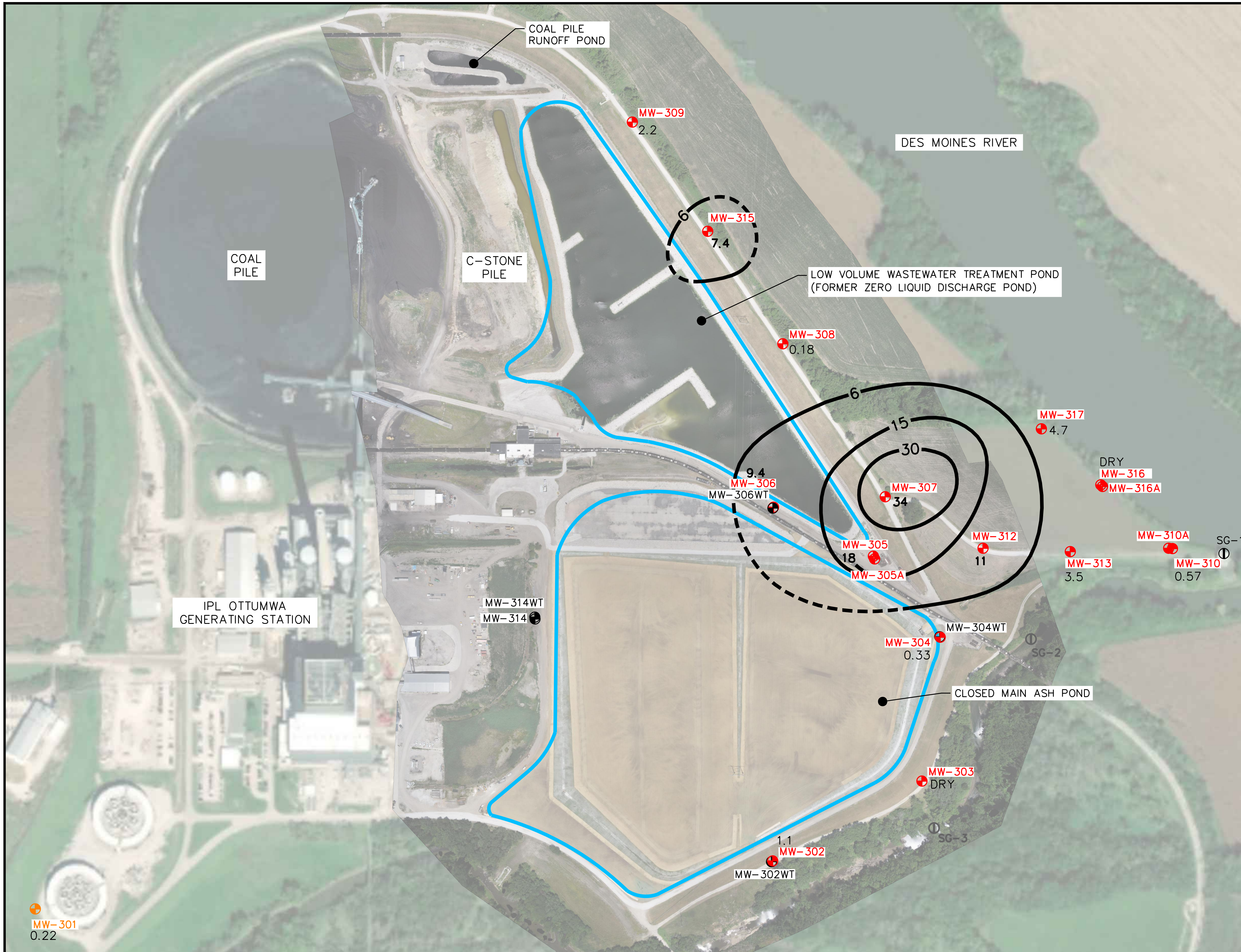
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE PLAN
AND MONITORING WELL LOCATIONS

FIGURE
2

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\02-04-05-06_Site Plan and Sections.dwg, 3/12/2025 7:22:24 AM



LEGEND

- CCR UNIT
- CCR UNIT MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- RIVER ELEVATION MEASUREMENT LOCATION
- 0.22 COBALT, TOTAL CONCENTRATION (μg/L)
- COBALT ISOCONCENTRATION CONTOUR (μg/L)

NOTES:

1. AERIAL PHOTOGRAPH SOURCE: AUTOCAD AND BING MAPS. UPDATED WITH AERIAL IMAGERY OBTAINED FROM ALLIANT ENERGY, DATED JUNE 19, 2023.
2. BOLD RESULTS INDICATE SSL FOR COBALT.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

N

400 0 400

SCALE: 1" = 400'

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

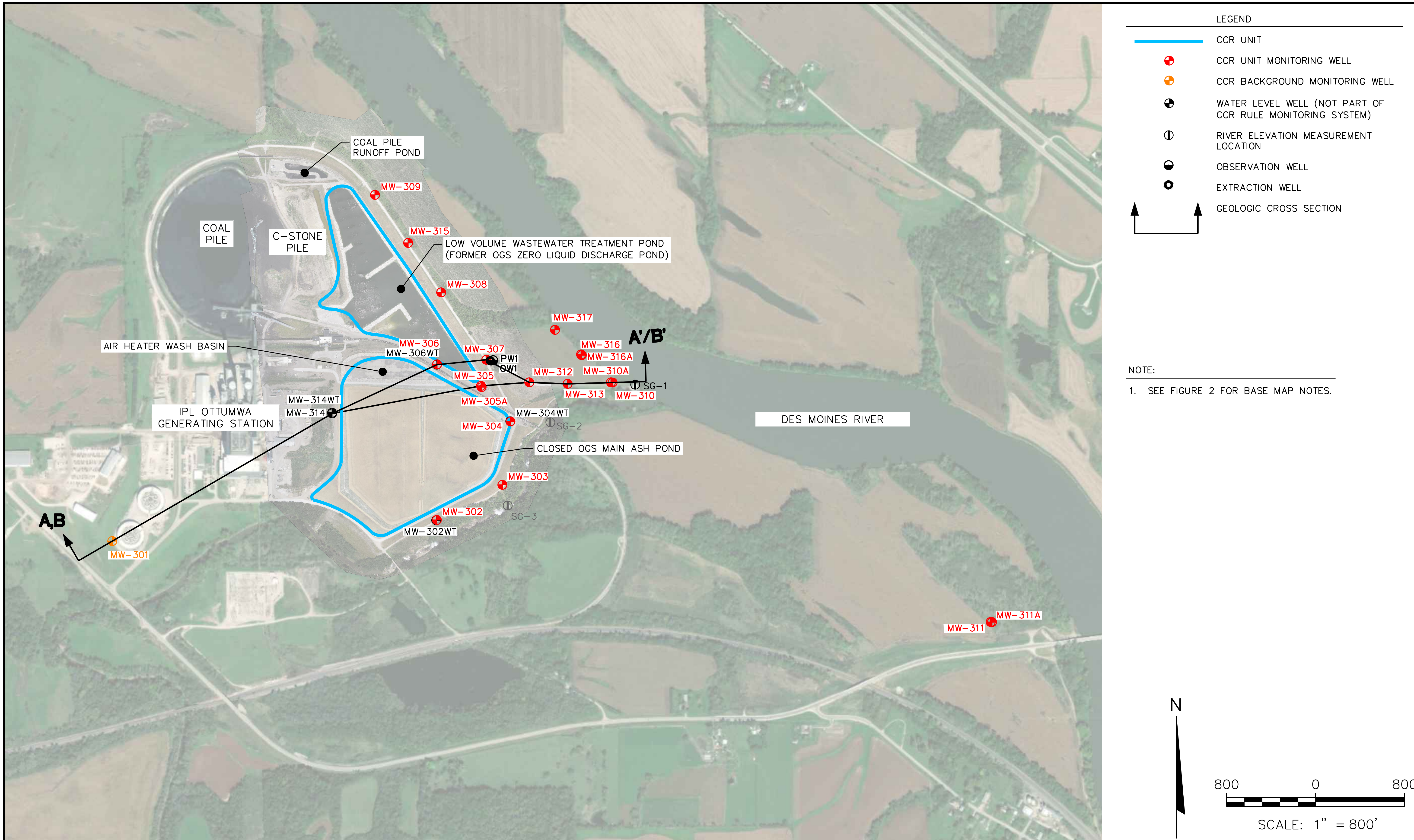
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

COBALT CONCENTRATIONS
OCTOBER 2024

FIGURE 3

I:\25220083.00\Drawings\Selection of Remedy\Oct 2024 Cobalt\03_Cobalt Concentrations Oct 2024.dwg, 3/12/2025 7:23:37 AM



PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

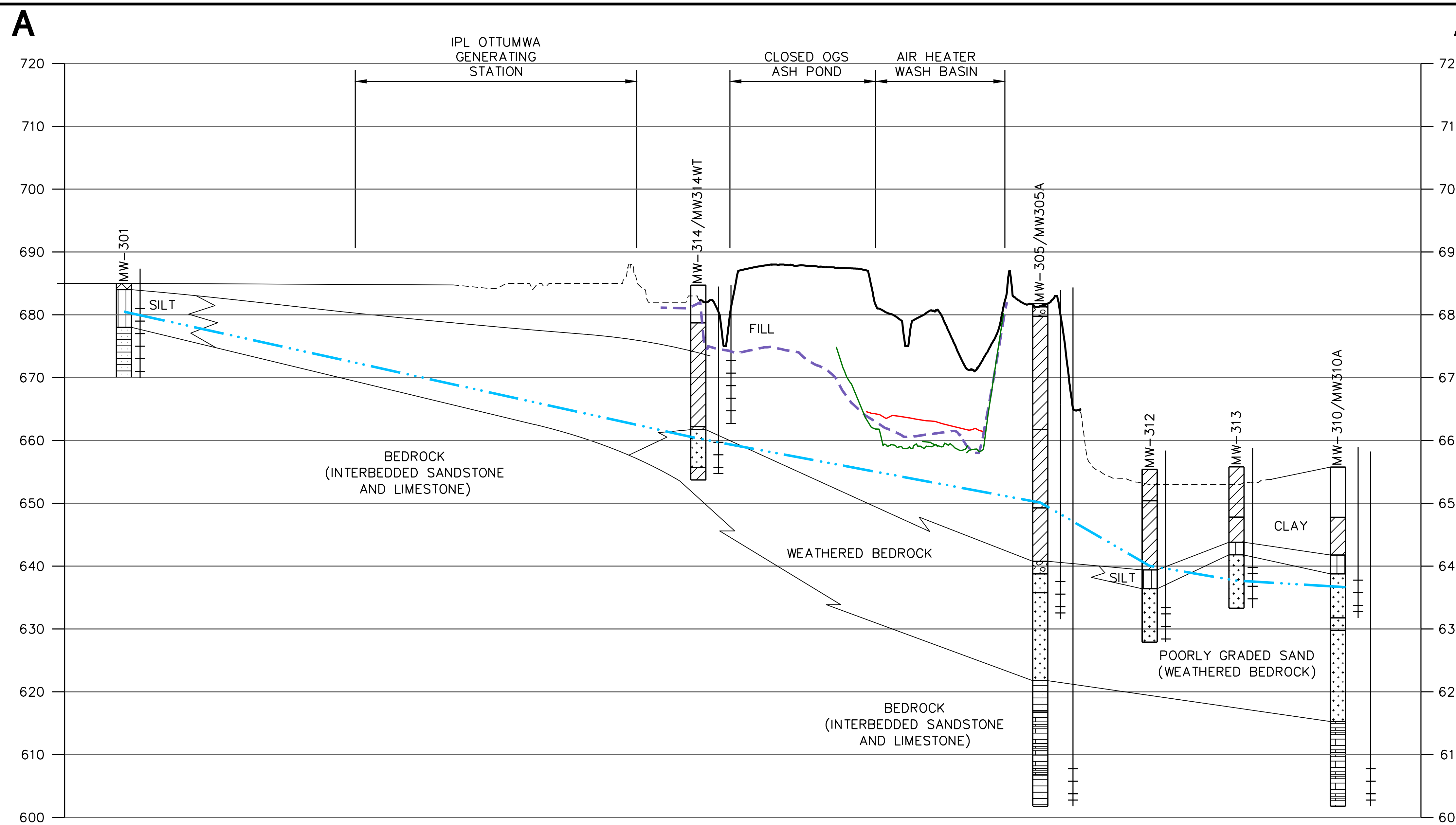
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

CROSS SECTION LOCATIONS

FIGURE 4

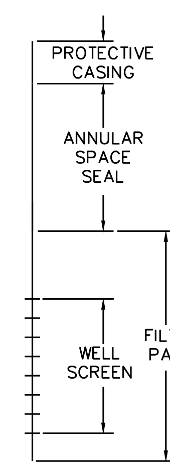
I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\02-04-05-06_Site Plan and Sections.dwg, 3/12/2025 7:22:47 AM



LEGEND

TOPSOIL/FILL
SAND, POORLY GRADED (SP)
SILT, WITH SAND AND GRAVEL (ML)
CLAY (CL)
FAT CLAY (CH)
GRAVEL, POORLY GRADED, LITTLE OR NO FINES (GP)
SANDSTONE
LIMESTONE

EXISTING GRADE
SHALLOW POTENTIOMETRIC SURFACE MEASURED OCTOBER 2024
ESTIMATED POND BOTTOM (FROM HARD HAT SERVICES BASED ON ALLIANT ENERGY DRAWING S1005)
EXCAVATION GRADE
CLEAN FILL GRADE



WELL DETAIL

0 500

HORIZONTAL SCALE: 1" = 500'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 25X

NOTES:

1. MW-305 AND MW-305A WERE HYDROVACED TO APPROXIMATELY 8.5'. MW-310 AND MW-310A WERE HYDROVACED TO APPROXIMATELY 8.0'. HYDROVACING IS PERFORMED TO DETERMINE IF UNDERGROUND UTILITIES ARE PRESENT. HIGH PRESSURE WATER AND A VACUUM ARE USED TO CLEAR THE BOREHOLE AND GEOLOGIC SAMPLES ARE NOT COLLECTED. NATIVE SOIL IN THE VICINITY OF MW-307 IS CLAY.
2. ASH POND BOTTOM ELEVATION IS BASED ON THE EMBANKMENT CREST ELEVATION (681 FEET) AND INTERNAL STORAGE DEPTH (25 FEET) REPORTED IN THE HISTORY OF CONSTRUCTION REPORT ISSUED SEPTEMBER 29, 2016, BY HARD HAT SERVICES.
3. EXISTING GRADES, EXCAVATION GRADES, AND CLEAN FILL GRADES BASED ON DOCUMENTED CONDITIONS FROM FROM ZLDP CLOSURE AND LVWTP CONSTRUCTION, AIR HEATER WASH BASIN CONSTRUCTION, AND MAIN ASH POND CLOSURE CONSTRUCTION DOCUMENTATION PREPARED BY SCS ENGINEERS.

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830

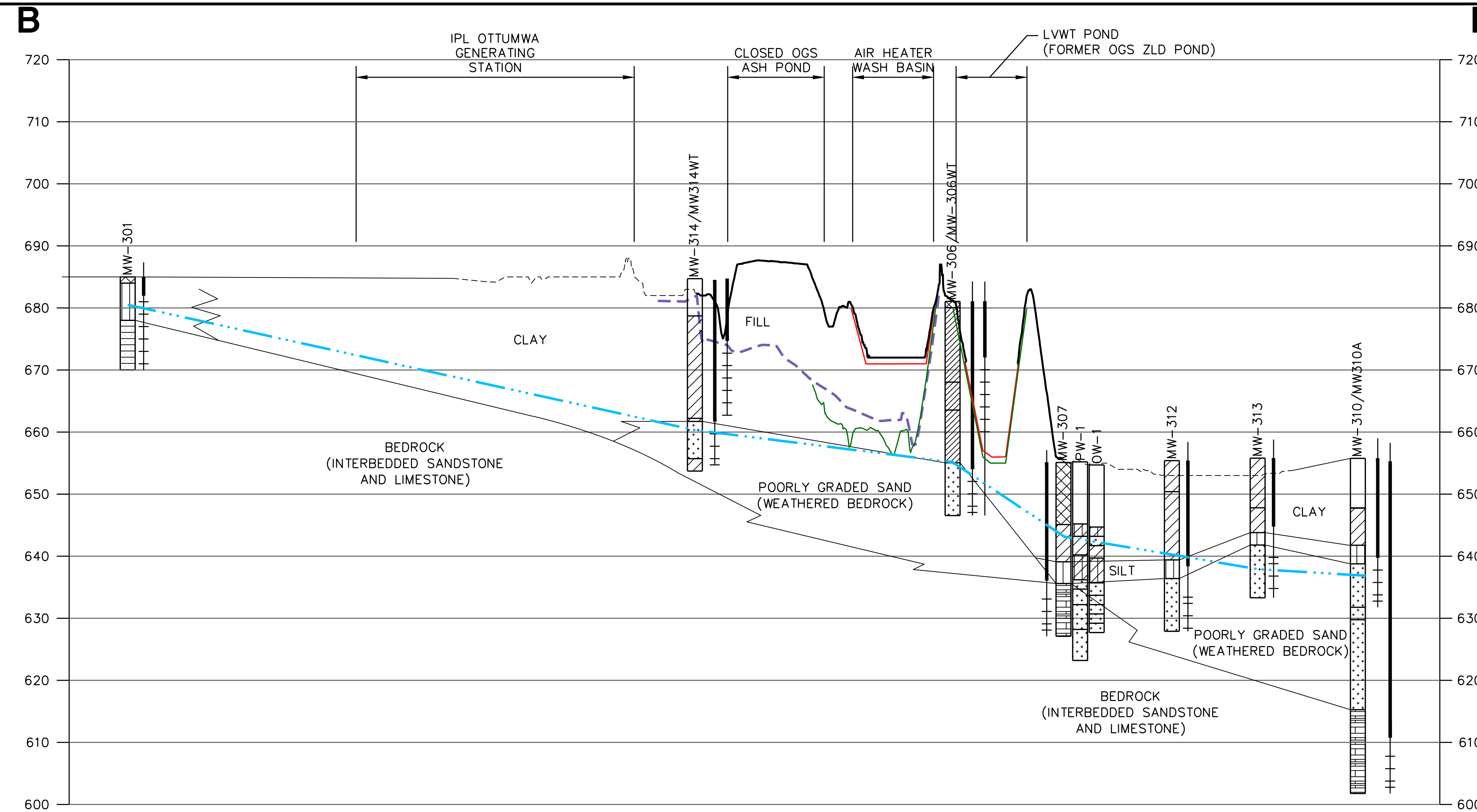
CLIENT: INTERSTATE POWER AND LIGHT CO., 20775 POWER PLANT ROAD, OTTUMWA, IA 52501

SITE: ALLIANT ENERGY, OTTUMWA GENERATING STATION, OTTUMWA, IOWA

GEOLOGIC CROSS SECTION A-A'

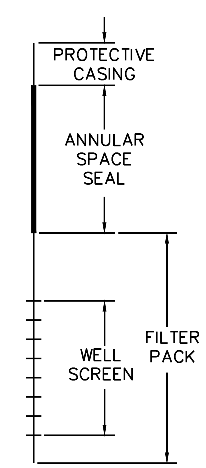
FIGURE 5

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\02-04-05-06_Site Plan and Sections.dwg, 3/12/2025 7:23:06 AM



LEGEND

- TOPSOIL/FILL
- SAND, POORLY GRADED (SP)
- SILT, WITH SAND AND GRAVEL (ML)
- CLAY (CL)
- FAT CLAY (CH)
- GRAVEL, POORLY GRADED, LITTLE OR NO FINES (GP)
- SANDSTONE
- LIMESTONE
- EXISTING GRADE
- SHALLOW POTENTIOMETRIC SURFACE MEASURED OCTOBER 2024
- ESTIMATED POND BOTTOM (FROM HARD HAT SERVICES BASED ON ALLIANT ENERGY DRAWING S1005)
- EXCAVATION GRADE
- CLEAN FILL GRADE
- SILTY CLAY (CL-ML)
- SAND, POORLY GRADED WITH SILT (SP-SM)



WELL DETAIL

0 500

HORIZONTAL SCALE: 1" = 500'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 25X

NOTES:

1. MW-305 AND MW-305A WERE HYDROVACED TO APPROXIMATELY 8.5'. MW-310 AND MW-310A WERE HYDROVACED TO APPROXIMATELY 8.0'. HYDROVACING IS PERFORMED TO DETERMINE IF UNDERGROUND UTILITIES ARE PRESENT. HIGH PRESSURE WATER AND A VACUUM ARE USED TO CLEAR THE BOREHOLE AND GEOLOGIC SAMPLES ARE NOT COLLECTED. NATIVE SOIL IN THE VICINITY OF MW-307 IS CLAY.
2. ASH POND BOTTOM ELEVATION IS BASED ON THE EMBANKMENT CREST ELEVATION (681 FEET) AND INTERNAL STORAGE DEPTH (25 FEET) REPORTED IN THE HISTORY OF CONSTRUCTION REPORT ISSUED SEPTEMBER 29, 2016, BY HARD HAT SERVICES.
3. EXISTING GRADES, EXCAVATION GRADES, AND CLEAN FILL GRADES BASED ON DOCUMENTED CONDITIONS FROM FROM ZLDP CLOSURE AND LVWTP CONSTRUCTION, AIR HEATER WASH BASIN CONSTRUCTION, AND MAIN ASH POND CLOSURE CONSTRUCTION DOCUMENTATION PREPARED BY SCS ENGINEERS.

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830

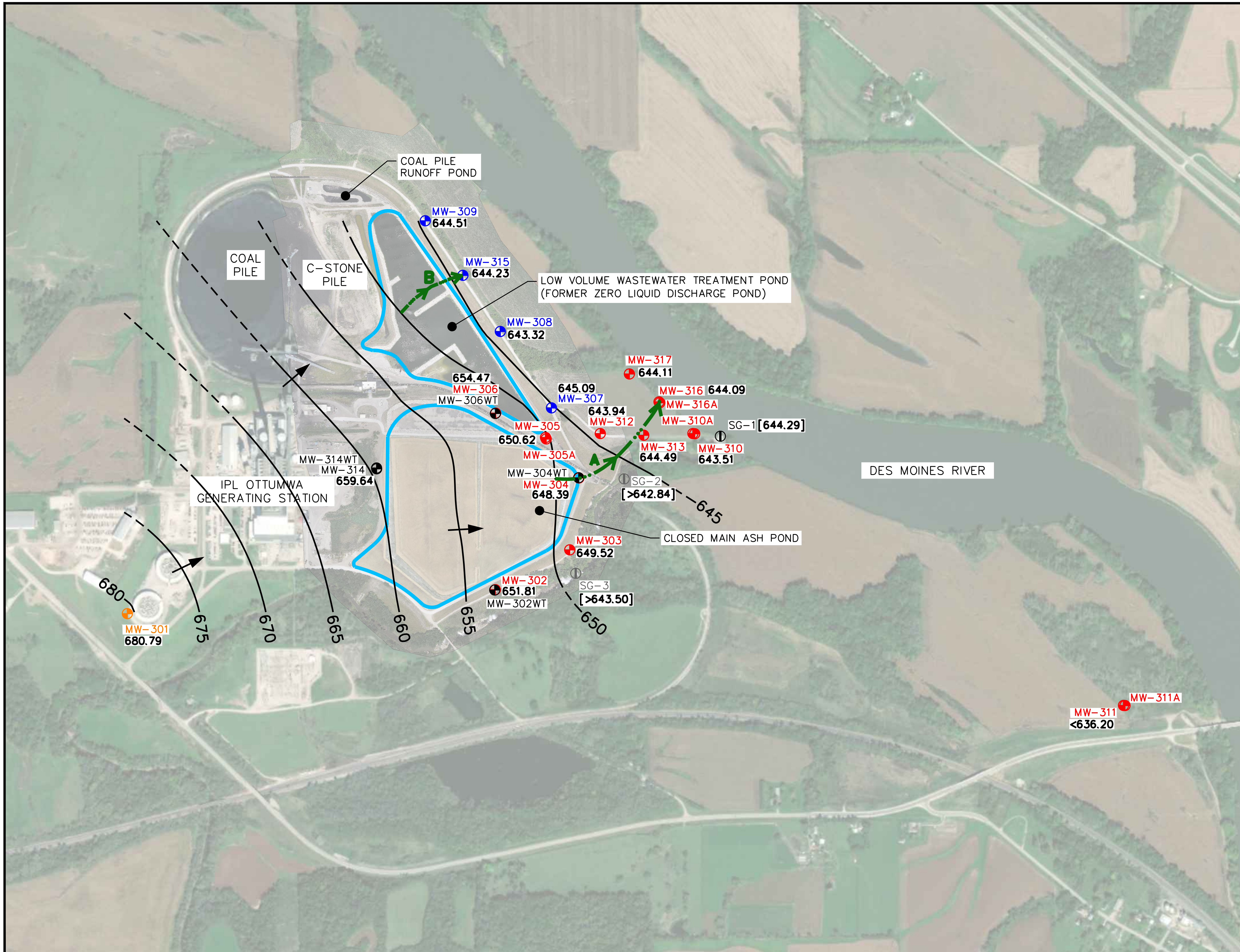
CLIENT: INTERSTATE POWER AND LIGHT CO., 20775 POWER PLANT ROAD, OTTUMWA, IA 52501

SITE: ALLIANT ENERGY, OTTUMWA GENERATING STATION, OTTUMWA, IOWA

GEOLOGIC CROSS SECTION B-B'

FIGURE 6

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\02-04-05-06_Site Plan and Sections.dwg, 3/12/2025 7:30:04 AM



LEGEND

- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [644.29] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (APRIL 2024)
- 644.09 SHALLOW POTENTIOMETRIC ELEVATION CONTOUR AT WELL (APRIL 2024)
- SHALLOW POTENTIOMETRIC ELEVATION CONTOUR (5-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ZERO LIQUID DISCHARGE POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

N

800 0 800

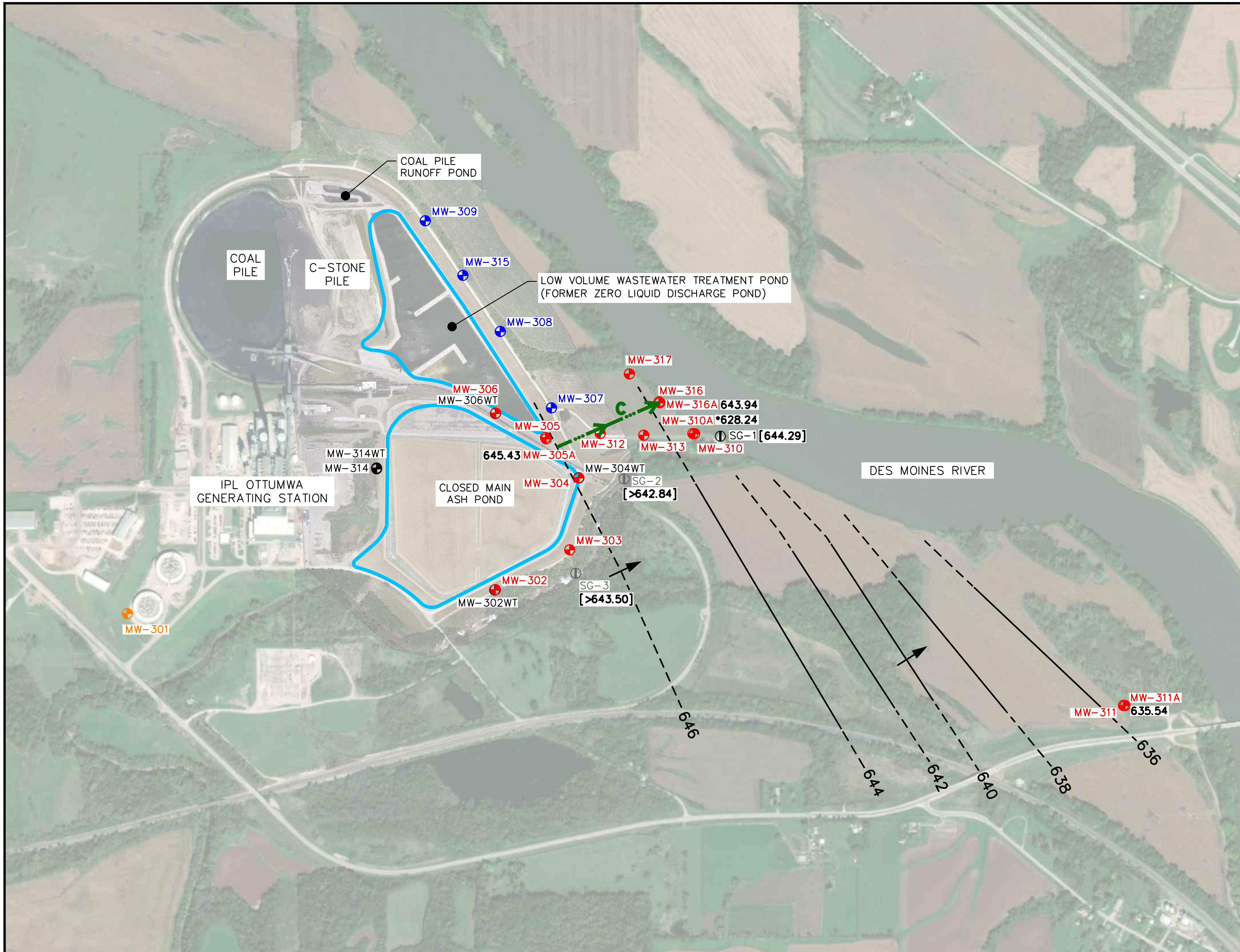
SCALE: 1" = 800'

PROJECT NO. 25220083.00	DRAWN BY: SB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT	INTERSTATE POWER AND LIGHT CO. 20775 POWER PLANT ROAD OTTUMWA, IA 52501	SITE	ALLIANT ENERGY OTTUMWA GENERATING STATION OTTUMWA, IOWA
DRAWN: 03/03/2025	CHECKED BY: NLB						
REVISED: 03/12/2025	APPROVED BY: TK (03/12/2025)						

SHALLOW POTENTIOMETRIC SURFACE CONTOUR MAP APRIL 4-5, 2024

FIGURE 7

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\07_April 2024 Shallow.dwg, 3/12/2025 7:23:59 AM



LEGEND

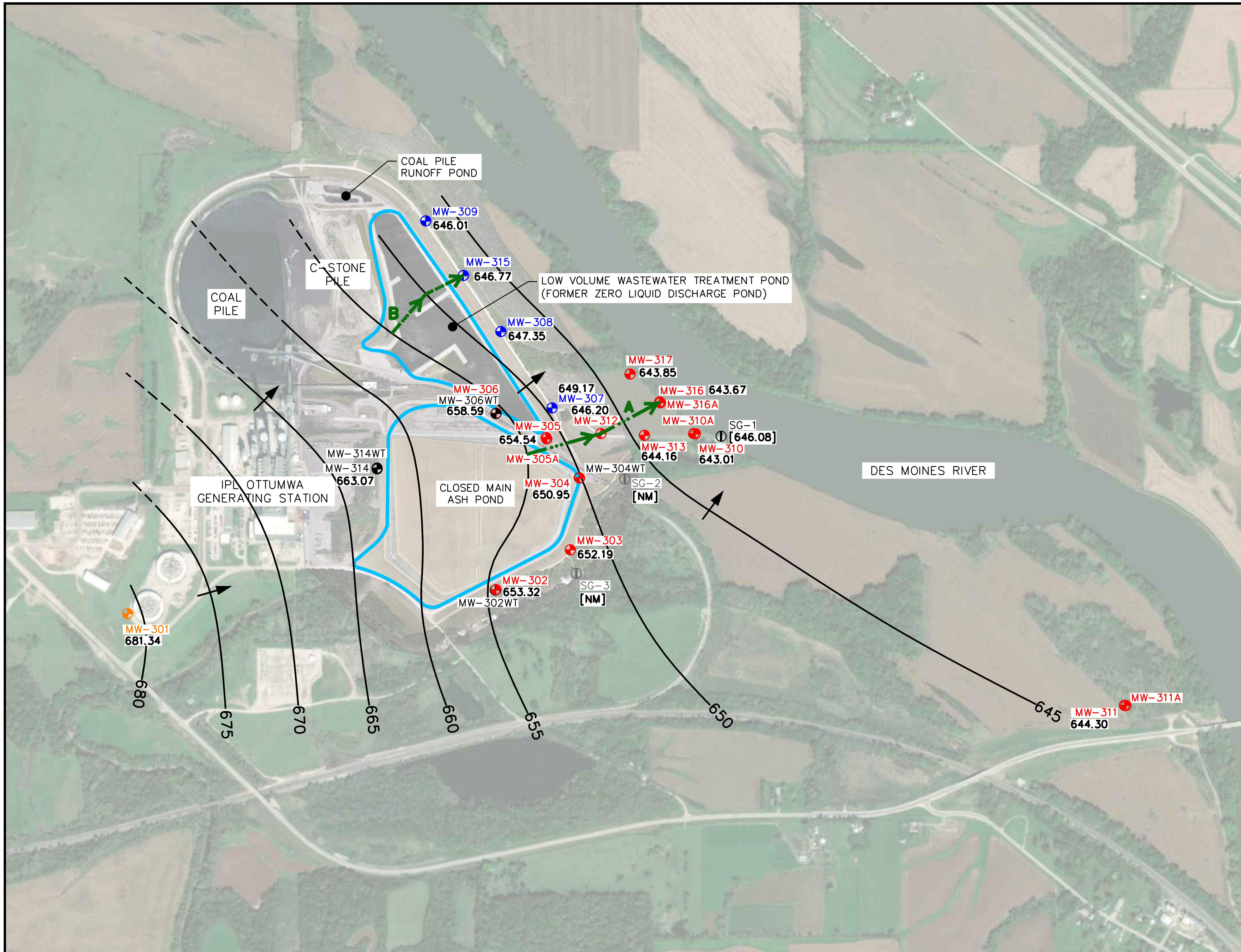
- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [644.29] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (APRIL 2024)
- 643.94 DEEP PIEZOMETER POTENTIOMETRIC ELEVATION AT WELL (APRIL 2024)
- • POTENTIAL ANOMALOUS READING (NOT USED FOR INTERPRETATION)
- POTENTIOMETRIC SURFACE CONTOUR (2-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTE:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ASH POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

PROJECT NO. 25220083.00	DRAWN BY: SB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT	INTERSTATE POWER AND LIGHT CO. 20775 POWER PLANT ROAD OTTUMWA, IA 52501	SITE	ALLIANT ENERGY OTTUMWA GENERATING STATION OTTUMWA, IOWA	DEEP PIEZOMETER POTENTIOMETRIC SURFACE CONTOUR MAP APRIL 4-5, 2024
DRAWN: 03/03/2025	CHECKED BY: NLB							FIGURE
REVISED: 03/12/2025	APPROVED BY: TK (03/12/2025)							8

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\08_April 2024 Deep.dwg, 3/12/2025 7:24:12 AM



LEGEND

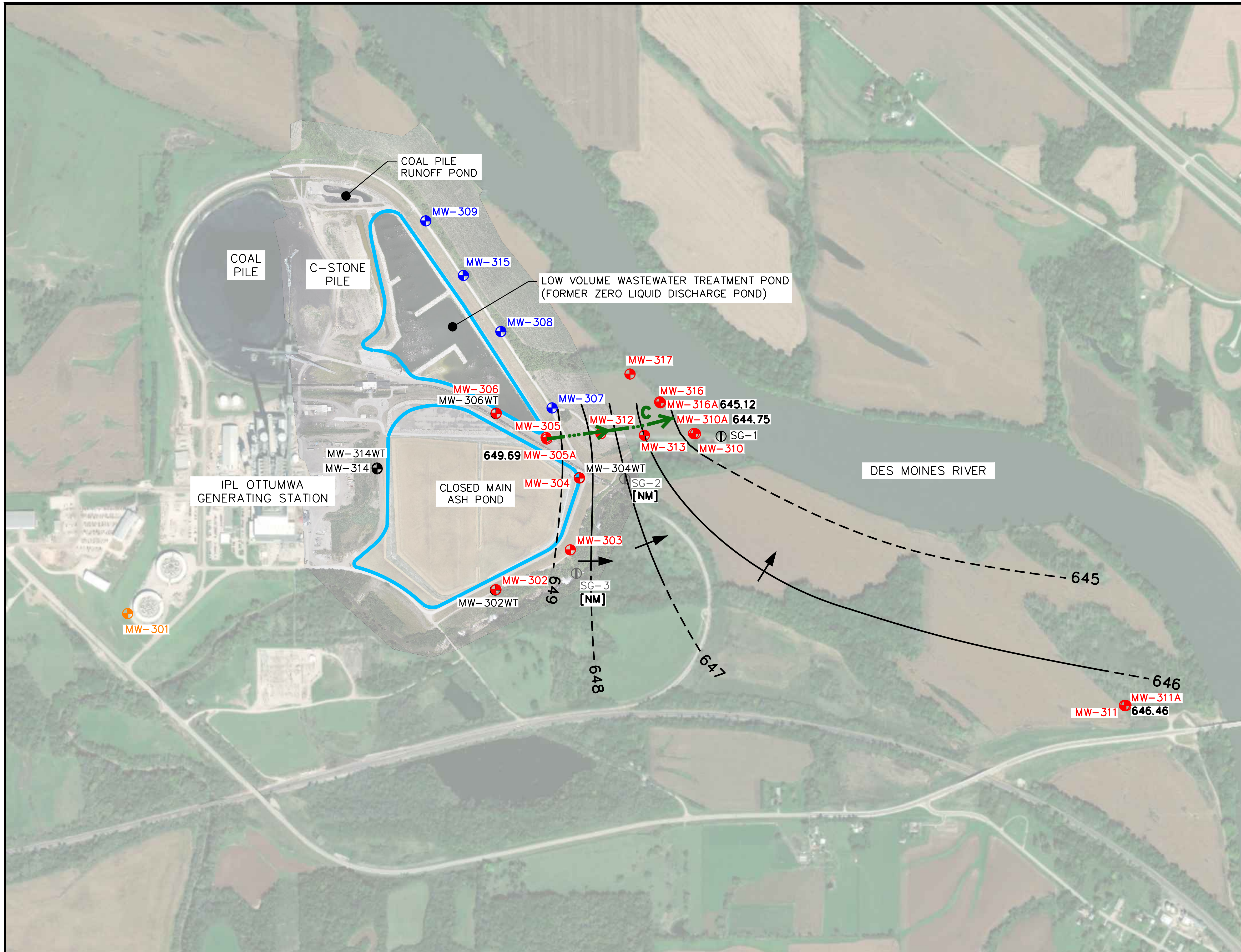
- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [646.08] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (AUGUST 2024)
- 681.34 SHALLOW POTENTIOMETRIC ELEVATION CONTOUR AT WELL (AUGUST 2024)
- SHALLOW POTENTIOMETRIC ELEVATION CONTOUR (5-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)

NOTES:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ZERO LIQUID DISCHARGE POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

PROJECT NO.	25220083.00	DRAWN BY:	SB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT	INTERSTATE POWER AND LIGHT CO. 20775 POWER PLANT ROAD OTTUMWA, IA 52501	SITE: ALLIANT ENERGY OTTUMWA GENERATING STATION OTTUMWA, IOWA
DRAWN:	03/03/2025	CHECKED BY:	NLB					SHALLOW POTENTIOMETRIC SURFACE CONTOUR MAP AUGUST 2024
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)					FIGURE 9

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\09_Augst 2024 Shallow GW Map.dwg, 3/12/2025 7:24:32 AM



LEGEND

- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [651.74] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (AUGUST 2024)
- 649.69 DEEP PIEZOMETER POTENTIOMETRIC ELEVATION AT WELL (AUGUST 2024)
- POTENTIOMETRIC SURFACE CONTOUR (1-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)

NOTES:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ASH POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

N

800 0 800

SCALE: 1" = 800'

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

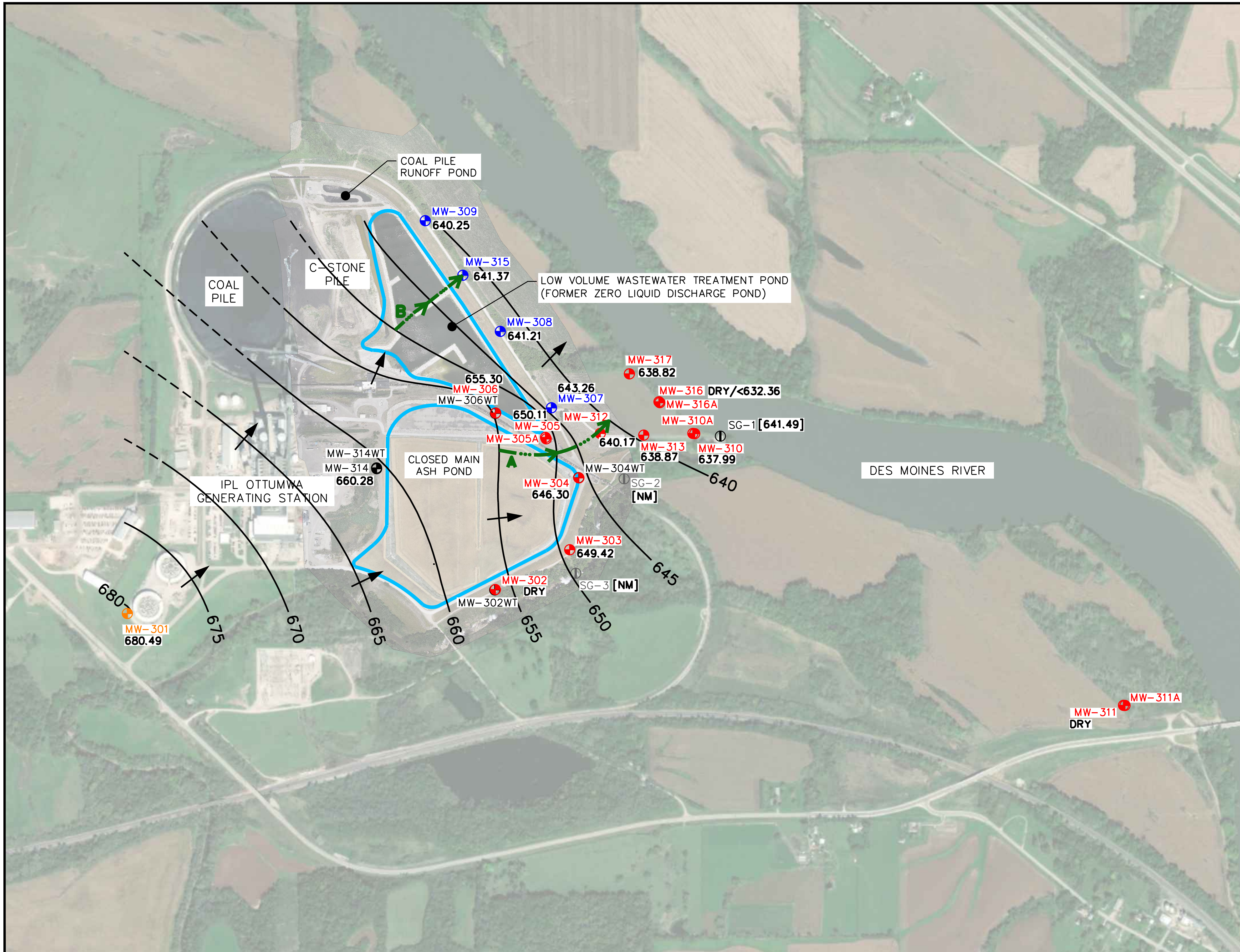
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

DEEP PIEZOMETER
POTENTIOMETRIC SURFACE CONTOUR MAP
AUGUST 2024

FIGURE 10

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\10_Augst 2024 Deep GW Maps.dwg, 3/12/2025 7:24:59 AM



LEGEND

- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [641.49] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (OCTOBER 2024)
- 680.49 SHALLOW POTENTIOMETRIC ELEVATION CONTOUR AT WELL (OCTOBER 2024)
- SHALLOW POTENTIOMETRIC ELEVATION CONTOUR (5-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)

NOTES:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ZERO LIQUID DISCHARGE POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

N

800 0 800

SCALE: 1" = 800'

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

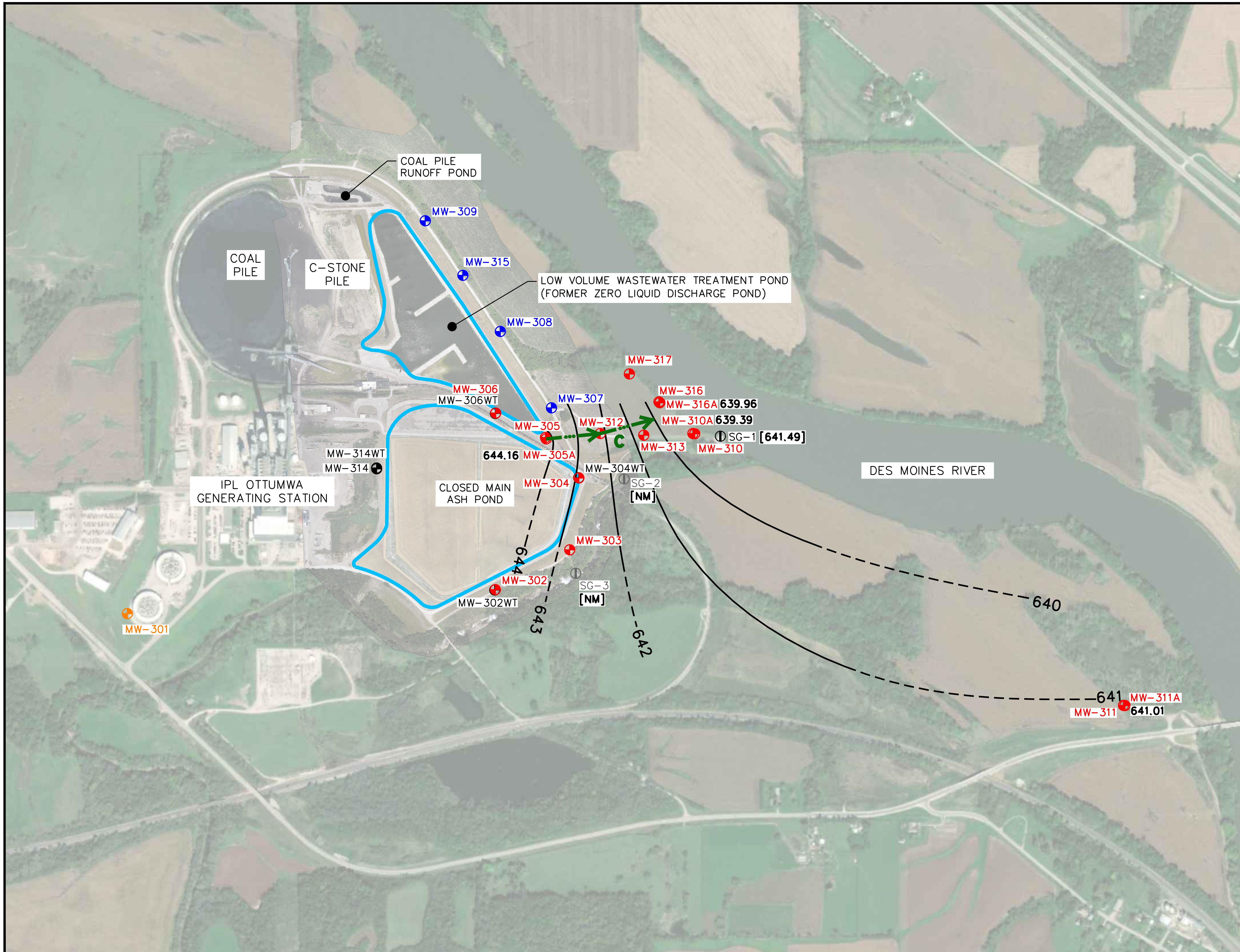
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SHALLOW POTENTIOMETRIC
SURFACE CONTOUR MAP
OCTOBER 2024

FIGURE
11

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\11_October 2024 Shallow GW Maps.dwg, 3/12/2025 7:25:23 AM



LEGEND

- CCR UNIT
- CCR ZLDP MONITORING WELL
- CCR ASH POND MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- WATER LEVEL WELL (NOT PART OF CCR RULE MONITORING SYSTEM)
- SURFACE WATER ELEVATION MEASUREMENT LOCATION
- [641.49] SURFACE WATER OR GROUNDWATER ELEVATIONS NOT USED IN CONTOURING (OCTOBER 2024)
- 644.16 DEEP PIEZOMETER POTENTIOMETRIC ELEVATION AT WELL (OCTOBER 2024)
- POTENTIOMETRIC SURFACE CONTOUR (1-FT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 6)

NOTES:

1. THE BACKGROUND MONITORING WELL FOR THE OGS ASH POND IS MW-301.
2. BACKGROUND AERIAL IMAGE IS A COMPOSITE OF A PHOTOGRAPH FROM ESRI DATED 2014 AND DRONE PHOTO BY RYAN INCORPORATED CENTRAL INC. DATED JUNE 19, 2023 IN THE CCR UNIT AREA.
3. SEE FIGURE 2 FOR BASE MAP DETAILS.

N

800 0 800

SCALE: 1" = 800'

PROJECT NO.	25220083.00	DRAWN BY:	SB
DRAWN:	03/03/2025	CHECKED BY:	NLB
REVISED:	03/12/2025	APPROVED BY:	TK (03/12/2025)

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CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

SITE: ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

DEEP PIEZOMETER
POTENTIOMETRIC SURFACE CONTOUR MAP
OCTOBER 2024

FIGURE 12

I:\Client\Alliant_PROJECT SITES\Ottumwa\CAD Master References OGS\Water Table Maps\2024 SOR Report\12_October 2024 Deep GW Maps.dwg, 3/12/2025 7:25:36 AM

Appendix A

Historical Groundwater Quality Data

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-301
Number of Sampling Dates: 28

Parameter Name	Units	4/26/2016	6/23/2016	8/10/2016	10/26/2016	1/18/2017	4/19/2017	6/20/2017	8/23/2017	11/8/2017	4/18/2018	8/14/2018	8/29/2018	10/16/2018	1/8/2019	4/8/2019	10/24/2019	2/5/2020	3/12/2020	4/14/2020	10/8/2020	4/14/2021	10/7/2021	4/12/2022	10/26/2022	4/6/2023	10/13/2023	4/4/2024	10/11/2024
Boron	ug/L	574	612	597	620	599	565	657	779	488	480	735	--	410	--	380	680	540	--	700	650	690	800	640	780	530	760	410	520
Calcium	mg/L	66.9	62.5	65.6	71.9	74.1	61.5	59.3	66.8	65.2	63	72.5	--	47.2	--	43	78	68	--	84	94	96	100	92	110	76	94	85	71
Chloride	mg/L	63.4	66.9	73.3	76.3	71.6	54.8	69.8	73.5	59.8	63.4	--	63.1	33.9	--	50	110	120	--	140	170	150	180	140	160	120	150	87	93
Fluoride	mg/L	0.22	0.2	0.44	0.27	0.17	0.24	0.26	0.34	0.27	0.22	--	0.27	0.3	--	0.44	<0.23	--	--	<0.23	<0.23	<0.28	<0.28	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH	Std. Units	6.54	6.06	6.08	6.26	6.47	6.64	6.31	6.16	6.41	6.41	6.26	6.31	6.27	5.68	6.61	6.33	6.39	6.48	6.58	6.22	6.26	6.26	6.37	6.29	6.25	6.24	6.65	6.11
Sulfate	mg/L	150	157	159	169	171	190	166	162	178	186	--	181	164	--	81	130	130	--	140	140	140	180	160	180	160	190	240	150
Total Dissolved Solids	mg/L	500	531	576	545	545	499	490	557	448	514	--	532	392	--	340	510	570	--	550	660	620	670	610	690	580	680	550	530
Antimony	ug/L	<0.058	0.13	0.12	<0.058	0.11	<0.026	0.054	0.063	--	<0.026	0.2	--	<0.078	--	<0.53	<0.53	--	--	<0.58	<0.51	<1.1	<1.1	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	0.38	0.38	0.26	0.14	0.23	0.22	0.15	0.14	--	0.074	0.29	--	0.16	--	<0.75	<0.75	<0.88	--	<0.88	<0.88	<0.75	<0.75	<0.75	<0.75	<0.53	<0.53	<0.53	<0.53
Barium	ug/L	51.6	55.8	52.3	53.3	42.4	35.5	39.9	44	--	31.6	44.5	--	28.1	--	25	56	43	--	54	58	52	61	40	44	31	48	33	36
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	<0.012	0.14	--	<0.089	--	<0.27	<0.27	--	--	<0.27	--	<0.27	<0.27	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	<0.029	<0.029	0.12	0.038	<0.029	0.035	0.044	0.037	--	0.023	0.16	--	<0.033	--	<0.077	0.04	<0.039	--	<0.039	0.075	<0.051	0.057	<0.055	0.055	<0.1	<0.1	<0.1	<0.1
Chromium	ug/L	0.59	0.74	0.64	<0.34	0.59	0.49	0.25	0.39	--	<0.054	0.25	--	0.11	--	<0.98	<0.98	<1.1	--	<1.1	<1.1	<1.1	<1.1	<1.1	1.2	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	4.1	3.1	1.8	1.8	1.3	0.97	1	0.96	--	0.46	1.4	--	0.36	--	0.44	0.6	1.1	0.43	0.52	0.41	0.29	0.48	0.23	0.29	0.21	0.2	<0.17	0.22
Lead	ug/L	<0.19	<0.19	<0.19	<0.19	<0.19	0.06	0.1	0.049	--	0.041	0.18	--	<0.13	--	<0.27	<0.27	<0.27	--	<0.27	<0.11	<0.21	<0.21	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium	ug/L	22.8	28.7	27.6	25.5	20.1	21.8	24.9	27.9	--	19.1	26.5	--	19.4	--	15	24	17	21	24	23	23	26	19	30	17	25	21	20
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	<0.083	--	--	<0.09	<0.1	<0.1	--	--	<0.1	--	<0.15	<0.15	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	1.2	1.2	0.89	1	0.76	0.54	0.79	1.3	--	0.67	1.3	--	0.72	--	<1.1	1.1	--	--	1.2	<1.1	<1.3	<1.3	<1.2	<8.4	<0.91	1.1	<1.3	<1.3
Selenium	ug/L	4.7	5.4	6.1	6.5	5.9	4.2	5.5	7.2	--	4.3	6.3	--	3.4	--	3.1	6.2	--	--	6.8	7.7	6.5	7.5	6	6.9	4.7	5.8	5.1	3.9
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.14	<0.036	0.067	--	<0.036	0.16	--	<0.099	--	<0.27	<0.27	--	--	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57
Total Radium	pCi/L	0.51	0.614	1.56	1.24	0.143	0.631	1.06	0.725	--	0.513	1.19	--	1.16	--	0.0956	0.956	0.228	--	0.315	0.407	0.598	1.04	0.378	0.973	0.0491	0.681	0.452	0.371
Radium-226	pCi/L	0.084	0	0.831	-0.13	0.143	0.139	0.501	0.123	--	0.145	0.417	--	0.529	--	0.0726	0.15	0.049	--	0.0921	0.324	0.133	<0.339	0.149	0.223	0.0491	0.25	0.0723	0.202
Radium-228	pCi/L	0.426	0.614	0.732	1.24	-0.403	0.492	0.562	0.602	--	0.368	0.773	--	0.627	--	0.023	0.753	0.179	--	0.223	0.0831	0.465	0.744	0.229	0.75	-0.135	0.431	0.38	0.169
Field Specific Conductance	umhos/cm	572	777	807	853	834	742	758	1107	743	770	867	781	599	310	501	902	966	962	939	1035	1062	1062	976	1036	832	1158	868	1017
Field Temperature	deg C	10.5	17.1	19.9	16.3	6.8	10.8	17.3	19.7	13.9	7.2	20.4	20.6	16.6	7.88	7.27	13.71	5.38	6.9	8.7	15.4	9.1	17.9	7.4	14.6	7.1	17.6	8.5	17.6
Groundwater Elevation	feet	682.8	682.58	682.27	682.04	681.67	682.15	681.91	681.28	681.54	681.53	680.91	681.09	682.5	682.22	682.69	683.07	683.3	682.82	683.25	682.34	682.94	681.95	682.08	680.68	682.05	680.2	680.79	680.49
Oxygen, Dissolved	mg/L	4.04	2.55	3.43	3.72	4.87	5.74	4.34	2.88	4.16	6.52	3.18	4.71	4.12	5.68	8.32	4.94	7.28	5.31	5.14	4.2	5.99	4.17	3.26	4.74	5.05	3.2	9.81	3.06
Turbidity	NTU	1.82	1.51	0.52	0.9	0.6	0.47	0.38	0.79	1.03	0.66	0.52	0.63	2.91	0.77	1.87	1.6	1.43	1.33	0.87	0.02	1.61	8.9	5.03	0.62	2.37	1.75	5.63	3.02
pH at 25 Degrees C	Std. Units	6.5	6.4	6.5	6.7	6.8	6.7	6.5	6.4	6.4	6.6	--	6.5	6.6	--	7.1	7.1	6.7	--	6.6	6.4	6.8	6.5	6.6	6.7	6.7	7	6.4	6.6
Field Oxidation Potential	millivolts	244.1	74.6	58.6	91.3	30.2	148	67.2	41.4	200.7	105.5	-55.5	--	119.7	118.3	37.6	9.9	68	258.5	176.3	163.6	232.5	207.3	117.6	26.9	124.5	104.7	92	204.5
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	150	160	170	210	190	250	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	<4.6	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	150	160	170	210	190	250	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50	<50	49	<36	<36	<36	58	<36	<36	<36
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	33000	38000	34000	36000	36000	28000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17	16	13	10	15	5	7.9	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1500	1500	1200	1300	1100	980	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	77000	87000	78000	88000	89000	73000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.32	0.44	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50	<36	<36	<36	<36	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16	19	14	14	18	8.1	8	--	--	--	--
Lithium, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	22	--	--	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-302

Number of Sampling Dates: 26

Parameter Name	Units	4/26/2016	6/23/2016	8/10/2016	10/26/2016	1/18/2017	4/19/2017	6/20/2017	8/22/2017	11/8/2017	4/18/2018	8/14/2018	8/29/2018	10/16/2018	1/8/2019	4/8/2019	10/24/2019	4/14/2020	10/8/2020	4/13/2021	10/7/2021	4/12/2022	10/26/2022	4/5/2023	4/4/2024	9/5/2024	10/10/2024
Boron	ug/L	1110	1130	1110	1180	1250	1200	1180	1250	1320	1200	1240	--	1100	--	1300	1200	1200	1300	1300	1200	1300	1700	1800	--	1700	1700
Calcium	mg/L	193	177	171	184	188	184	175	179	183	177	185	--	146	--	200	180	180	180	180	170	170	220	200	--	180	200
Chloride	mg/L	258	258	276	270	259	281	253	264	254	246	--	259	214	--	240	220	220	230	190	200	170	200	160	--	130	150
Fluoride	mg/L	0.22	0.17	0.21	0.21	0.21	0.2	0.26	0.27	0.2	0.26	--	0.26	0.24	--	<0.23	<0.23	<0.23	<0.23	0.33	<0.28	<0.22	<0.22	<0.22	--	<0.38	<0.38
Field pH	Std. Units	6.82	6.46	8.72	6.45	6.62	6.78	6.67	6.75	6.55	6.47	6.76	6.77	6.37	6.58	6.61	6.55	6.7	7	6.44	6.49	6.43	6.56	6.62	--	6.49	6.49
Sulfate	mg/L	752	865	835	819	777	907	858	858	786	899	--	847	785	--	840	810	790	840	360	850	750	920	820	--	710	780
Total Dissolved Solids	mg/L	1680	1480	1770	1650	1660	1670	1670	1620	1620	1690	--	1840	1400	--	1600	1600	1500	1700	1500	1300	1100	1600	1400	--	1400	1500
Antimony	ug/L	0.088	0.12	0.1	<0.058	0.11	<0.026	0.052	0.036	--	<0.026	<0.15	--	0.26	--	<0.53	<0.53	<0.58	<0.51	<1.1	<1.1	<0.69	<0.69	<1	--	<1	<1
Arsenic	ug/L	1.7	0.69	0.17	<0.1	0.23	0.25	0.083	0.19	--	0.16	0.3	--	1.9	--	<0.75	<0.75	<0.88	<0.88	<0.75	<0.75	<0.75	<0.75	<0.53	--	<0.53	<0.53
Barium	ug/L	31.5	23	20.7	21.2	20.4	19.4	18.2	18.5	--	17.7	18.3	--	28.9	--	19	21	23	18	22	18	17	21	21	--	29	29
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	<0.012	<0.12	--	0.22	--	<0.27	<0.27	<0.27	--	<0.27	<0.27	<0.27	<0.27	<0.33	--	<0.33	<0.33
Cadmium	ug/L	0.25	0.21	0.28	0.24	0.15	0.2	0.19	0.21	--	0.22	0.21	--	0.67	--	0.21	0.2	0.23	0.2	0.26	0.23	0.21	0.28	0.17	--	0.15	0.16
Chromium	ug/L	2.1	0.82	0.64	0.64	0.58	1	0.58	0.7	--	0.46	0.48	--	1.6	--	<0.98	<0.98	1.4	<1.1	3	1.3	1.4	8.8	1.6	--	<1.2	<1.2
Cobalt	ug/L	2.6	1.4	1.1	1	0.94	0.95	0.86	0.88	--	0.9	1.5	--	4	--	1.2	2.7	5.3	1.5	5.5	2.2	1.3	1.8	0.82	--	0.68	1.1
Lead	ug/L	1.1	0.2	<0.19	<0.19	<0.19	0.2	0.081	<0.033	--	0.098	0.12	--	3.9	--	<0.27	0.29	1	<0.11	0.59	0.22	<0.24	<0.24	<0.24	--	<0.26	<0.26
Lithium	ug/L	11.3	14.1	12.2	11.9	9.7	10.1	9.7	13.8	--	7.5	6.9	--	8.6	--	10	10	11	9.6	10	11	9.1	11	11	--	12	12
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	0.096	<0.083	--	--	<0.09	<0.1	<0.1	<0.1	--	<0.15	<0.15	<0.11	<0.11	<0.14	--	<0.11	<0.11
Molybdenum	ug/L	0.68	0.6	0.46	0.46	0.5	0.44	0.38	0.51	--	0.59	0.54	--	<0.57	--	<1.1	<1.1	<1.1	<1.1	<1.3	1.7	2.6	4.9	3	--	1.5	1.7
Selenium	ug/L	0.23	<0.18	<0.18	<0.18	<0.18	<0.086	<0.086	<0.086	--	<0.086	<0.16	--	0.84	--	<1	<1	<1	<1	<0.96	1.2	2.4	<0.96	<1.4	--	<1.4	<1.4
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.049	<0.036	<0.036	--	<0.036	<0.14	--	0.16	--	<0.27	<0.27	<0.26	<0.26	<0.26	0.56	<0.26	<0.26	3.2	--	<0.57	<0.57
Total Radium	pCi/L	1.03	0.527	0.606	0.211	0.136	0.776	1.29	1.61	--	0.746	1.12	--	0.299	--	0.116	0.752	1.26	0.447	0.901	1.45	0.294	0.627	0.178	--	0.505	0.266
Radium-226	pCi/L	0.4	0.375	0.26	0.211	0.136	0.342	0.13	0.406	--	0.251	0.624	--	0.191	--	0.116	0.134	0.499	0.158	0.486	1.32	0.202	0.182	0.178	--	0.165	0.266
Radium-228	pCi/L	0.631	0.152	0.346	-0.0147	-0.0781	0.434	1.16	1.2	--	0.495	0.499	--	0.108	--	-0.0591	0.619	0.759	0.289	0.415	<0.744	0.0914	0.445	-0.215	--	0.34	-0.0789
Field Specific Conductance	umhos/cm	1747	2228	2222	2279	2247	2220	2085	2991	2274	2248	2304	2357	1912	1473	2159	2184	1971	2100	2087	1920	1741	2051	1953	--	1816	2556
Field Temperature	deg C	11.9	13.2	14.4	13.9	12.9	12.8	13.4	14	13.8	10.7	14.3	14.6	14.1	12.21	12.27	12.91	10.5	14.4	11.9	14.9	11.4	12.8	11.2	--	17.8	16.2
Groundwater Elevation	feet	655.63	655.65	655.52	655.67	655.46	656.35	655.65	655.13	655.4	655.71	656.05	655.89	656.91	656.03	657.23	660.14	656.45	655.8	656.05	654.86	654.77	652.95	653.3	651.81	<653.08	0
Oxygen, Dissolved	mg/L	0.16	0.08	0.07	0.43	0.18	0.18	0.12	0.08	0.4	0.2	0.17	0.23	0.26	6.4	0.86	0.35	0.22	0.14	0.37	0.3	0.41	2.13	1.86	--	3.65	3.88
Turbidity	NTU	40.23	6.78	3.41	1.54	3.11	2.32	2.63	1.32	1.63	2.41	4.01	1.42	88.24	4.39	26.9	11.9	31.1	18.7	22.9	15.6	5.13	8.02	2.03	--	10.4	5.65
pH at 25 Degrees C	Std. Units	6.7	6.6	6.7	6.7	6.8	6.8	6.6	6.6	6.5	6.7	--	6.7	6.6	--	6.9	7.2	6.7	6.8	7.5	6.6	6.6	6.9	6.8	--	6.7	6.7
Field Oxidation Potential	millivolts	230.2	25	6.7	92.6	38.7	121.1	21	20.8	191.7	82.6	-336.6	--	114.2	70.2	68.3	-0.5	135.6	34.5	198.2	211.5	145.2	-27.1	97	--	173.2	143.3
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61	72	72	120	100	87	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<1.9	<3.2	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61	72	72	120	100	87	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	500	100	350	65	45	80	<36	--	<36	41
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50000	57000	50000	46000	49000	43000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	110	130	110	110	91	91	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1500	1900	1500	1400	1600	1500	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	250000	280000	240000	220000	240000	210000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.81	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<36	<36	<36	49	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200	140	200	120	110	90	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-303
Number of Sampling Dates: 25

Parameter Name	Units	4/26/2016	6/23/2016	8/10/2016	10/26/2016	1/18/2017	4/19/2017	6/20/2017	8/22/2017	11/8/2017	4/18/2018	8/14/2018	8/29/2018	10/16/2018	1/8/2019	4/8/2019	10/24/2019	4/14/2020	10/8/2020	4/13/2021	10/7/2021	4/12/2022	10/26/2022	4/5/2023	4/4/2024	9/5/2024
Boron	ug/L	417	579	726	811	738	577	834	1180	1070	987	1010	--	549	--	290	440	420	1100	420	860	620	--	430	560	780
Calcium	mg/L	179	172	180	204	173	226	210	200	234	212	213	--	195	--	170	170	170	210	160	190	190	--	210	210	190
Chloride	mg/L	109	155	234	230	190	141	186	268	185	198	--	64.8	57	--	22	35	47	210	29	140	58	--	22	56	10
Fluoride	mg/L	0.21	0.17	0.42	0.23	0.21	0.19	0.23	0.3	0.19	0.22	--	0.31	0.24	--	<0.23	<0.23	<0.23	0.26	<0.28	<0.28	<0.22	--	<0.22	<0.38	<0.38
Field pH	Std. Units	7.08	7.08	6.51	6.62	6.77	7.02	6.81	6.53	6.6	6.63	6.83	7.03	6.66	6.83	7	6.83	6.98	8.28	6.67	6.7	6.71	6.7	6.65	6.82	6.56
Sulfate	mg/L	183	190	200	208	168	333	284	215	348	328	--	164	389	--	260	180	180	190	140	170	200	--	260	360	260
Total Dissolved Solids	mg/L	856	988	1170	1120	1030	1170	1210	1220	1290	1300	--	832	1150	--	890	810	810	1100	720	720	630	--	880	980	880
Antimony	ug/L	0.23	0.32	0.25	0.14	0.19	0.16	0.19	0.3	--	0.098	0.16	--	0.2	--	<0.53	<0.53	<0.58	<0.51	<1.1	<1.1	<0.69	--	<1	<1	<1
Arsenic	ug/L	0.89	0.91	0.51	0.46	0.54	0.47	0.33	0.61	--	0.43	0.6	--	0.55	--	<0.75	<0.75	<0.88	<0.88	<0.75	<0.75	<0.75	--	<0.53	0.8	<0.53
Barium	ug/L	68.2	78.5	88.1	98.8	75.3	79.1	76.4	83.8	--	69.5	77.3	--	95.2	--	54	77	64	94	63	80	64	--	48	44	55
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	0.015	--	0.017	<0.12	--	<0.089	--	<0.27	<0.27	<0.27	--	<0.27	<0.27	<0.27	--	<0.33	<0.33	<0.33
Cadmium	ug/L	0.24	0.28	0.47	0.59	0.31	0.81	0.52	0.57	--	0.44	0.36	--	0.24	--	0.092	0.21	0.18	0.46	0.12	0.28	0.15	--	0.11	0.1	0.13
Chromium	ug/L	0.74	0.83	0.73	<0.34	0.52	0.27	0.37	0.61	--	0.12	0.19	--	0.15	--	<0.98	<0.98	<1.1	<1.1	<1.1	<1.1	<1.1	--	<1.1	1.2	<1.2
Cobalt	ug/L	2.2	2.5	2.6	3.1	2.6	1.8	1.9	2.8	--	2.1	2.2	--	1.7	--	0.42	1.2	0.87	2.4	0.43	4	1.6	--	0.41	3.8	0.25
Lead	ug/L	0.31	<0.19	<0.19	0.2	<0.19	0.068	0.07	0.19	--	0.069	0.13	--	<0.13	--	<0.27	<0.27	<0.27	<0.11	<0.21	<0.21	<0.24	--	<0.24	0.63	<0.26
Lithium	ug/L	<4.9	8.3	5	5.8	<4.9	<2.9	3.4	8.1	--	<4.6	6.9	--	<4.6	--	<2.7	<2.7	4.7	5.6	4.1	5.8	4	--	4.9	3.9	5.7
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	<0.083	--	--	<0.09	<0.1	<0.1	<0.1	--	<0.15	<0.15	<0.11	--	<0.14	<0.11	<0.11
Molybdenum	ug/L	3.3	3.6	0.77	0.87	0.64	3.9	0.81	0.64	--	0.61	0.98	--	5.5	--	7.5	5.2	3.6	<1.1	2.9	1.4	2.7	--	2	3.2	1.3
Selenium	ug/L	0.38	0.43	0.36	0.28	0.8	1.1	0.47	0.52	--	0.23	0.35	--	0.37	--	2.1	<1	5	<1	5.1	<0.96	8.3	--	15	35	13
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.16	<0.036	<0.036	--	<0.036	<0.14	--	<0.099	--	<0.27	<0.27	<0.26	<0.26	<0.26	<0.26	0.26	--	0.42	<0.57	<0.57
Total Radium	pCi/L	0.806	0.426	1.56	0.944	0.805	1.62	1.62	2.36	--	0.529	1.82	--	2.04	--	0.391	0.321	0.229	0.654	0.51	0.916	0.619	--	0.145	1.38	0.442
Radium-226	pCi/L	0.163	0.0636	0.716	0	0.145	1.06	0.556	1.4	--	-0.088	1.02	--	0.478	--	0.172	0.0551	0.149	0.147	0.178	0.639	0.156	--	-0.0263	0.066	0.143
Radium-228	pCi/L	0.643	0.362	0.842	0.944	0.66	0.556	1.06	0.958	--	0.529	0.799	--	1.56	--	0.22	0.265	0.0801	0.507	0.333	<0.514	0.463	--	0.145	1.31	0.298
Field Specific Conductance	umhos/cm	965	1176	1655	1730	1611	1687	1670	2474	1896	1862	1833	1161	1573	750	1181	1287	1097	1602	1118	1343	1245	1660	1215	1456	1277
Field Temperature	deg C	9.7	14.4	17.7	16.3	10.6	10.6	14.1	16.8	15.2	8.2	17.2	18.7	17.1	9.11	8.51	15.34	8.9	17	9.7	17.6	9	15.9	8.3	8.6	19.8
Groundwater Elevation	feet	652.42	652.89	651.76	652.17	651.74	654.57	652.42	650.58	651.34	652.47	652.57	655.07	656.17	654.65	655.55	653.86	654.08	650.37	653.82	649.8	652.95	648.22	652.57	649.52	651.03
Oxygen, Dissolved	mg/L	0.07	0.05	0.05	0.42	0.17	0.56	0.08	0.08	0.48	0.17	0.19	1.92	0.29	3.19	2.29	0.28	1.94	0.13	2.83	0.32	1.19	0.65	1.7	3	0.8
Turbidity	NTU	27.66	4.48	4.42	2.32	3.3	2.2	2.77	14.62	3.67	3.69	1.51	10.13	5.99	14.2	3.49	4.24	12.1	30.2	4.31	11.1	6.2	574.1	3.54	34.31	14.71
pH at 25 Degrees C	Std. Units	7	6.8	6.8	6.9	7.1	7.2	6.8	6.8	6.7	6.9	--	7.1	6.9	--	7.5	7.5	6.9	7	7	6.8	7	--	6.9	6.9	6.8
Field Oxidation Potential	millivolts	181.1	-20.5	31.5	14.8	21.3	99.5	8.6	20.9	176.8	3.2	-307.9	--	32.8	73.7	51.7	-5.1	104.3	-0.4	184.7	66.5	158.2	-40.9	62.9	78.4	150
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	440	470	440	490	520	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	440	470	440	490	520	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	280	310	44	120	<36	--	64	1200	60
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23000	31000	22000	26000	26000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	220	1600	340	1800	410	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	960	1100	800	800	930	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100000	150000	89000	94000	110000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.37	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<36	100	<36	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	260	1600	330	1900	490	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-304
Number of Sampling Dates: 26

Parameter Name	Units	4/26/2016	6/23/2016	8/11/2016	10/27/2016	1/18/2017	4/19/2017	6/21/2017	8/22/2017	11/8/2017	4/18/2018	8/15/2018	8/29/2018	10/16/2018	1/8/2019	4/8/2019	10/23/2019	4/13/2020	10/8/2020	4/14/2021	10/8/2021	4/12/2022	10/26/2022	4/6/2023	10/10/2023	4/4/2024	10/10/2024
Boron	ug/L	965	968	911	991	995	1030	982	1040	1040	991	1000	--	930	--	1100	970	1000	1000	990	990	940	750	930	870	970	950
Calcium	mg/L	124	123	112	125	122	129	126	130	136	131	138	--	123	--	130	120	130	120	120	120	130	110	110	110	110	120
Chloride	mg/L	311	316	336	364	383	430	382	409	417	400	--	375	410	--	320	280	250	250	240	260	270	270	260	230	240	220
Fluoride	mg/L	0.84	0.77	0.95	0.89	0.82	0.88	1	0.89	0.96	0.92	--	1	1	--	1.3	0.74	1.1	1.1	1.1	<0.28	1.7	1.1	0.93	0.79	0.97	0.92
Field pH	Std. Units	7.3	7.07	7.34	6.96	7.05	7.27	7.29	6.72	7	6.9	7.34	7.22	6.86	7.16	7.17	7.05	7.12	7.88	6.94	6.97	6.95	6.77	6.7	6.85	6.88	6.86
Sulfate	mg/L	230	234	225	241	204	208	254	194	194	198	--	185	184	--	180	190	220	230	200	230	260	280	270	230	240	240
Total Dissolved Solids	mg/L	1190	1160	1180	1270	1230	1310	1240	1250	1270	1300	--	3680	1180	--	1100	1100	1000	1200	1000	760	1700	1200	1200	1100	1000	1100
Antimony	ug/L	0.069	0.13	0.1	<0.058	0.1	<0.026	0.06	0.035	--	<0.026	0.19	--	<0.078	--	<0.53	<0.53	<0.58	<0.51	<1.1	<1.1	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	2.1	2.2	0.78	0.69	0.82	0.73	0.57	0.67	--	0.68	1.3	--	0.96	--	<0.75	0.83	0.96	<0.88	<0.75	0.88	0.76	0.96	0.63	1	0.71	0.7
Barium	ug/L	104	106	86.4	97.6	92.4	94.9	87.1	91.5	--	88.5	87.4	--	91	--	80	80	80	74	80	79	78	85	75	77	77	77
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	0.026	0.21	--	<0.089	--	<0.27	<0.27	<0.27	--	<0.27	<0.27	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	<0.029	<0.029	0.072	<0.029	<0.029	<0.018	<0.018	<0.018	--	<0.018	0.17	--	0.073	--	<0.077	<0.039	<0.039	<0.049	<0.051	<0.051	<0.055	0.15	<0.1	0.12	<0.1	<0.1
Chromium	ug/L	4.5	7.1	0.92	0.79	0.69	0.56	0.6	0.43	--	2	5.9	--	1.4	--	1.6	2	3.5	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	0.89	1.1	<0.5	<0.5	<0.5	0.37	0.36	0.3	--	0.39	0.92	--	0.45	--	0.4	0.5	0.57	0.41	0.43	0.42	0.41	0.47	0.37	0.43	0.34	0.33
Lead	ug/L	0.5	0.82	<0.19	<0.19	<0.19	0.13	0.081	0.041	--	0.37	0.81	--	0.66	--	<0.27	0.27	0.5	<0.11	<0.21	<0.21	<0.24	0.38	<0.24	0.35	<0.26	<0.26
Lithium	ug/L	5.1	7.5	<4.9	<4.9	<4.9	<2.9	<2.9	5.3	--	<4.6	<4.6	--	<4.6	--	3.3	2.8	4.8	3.1	3.3	4	3.4	3.3	3.5	4.1	3.6	3.3
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	<0.083	--	--	<0.09	<0.1	<0.1	<0.1	--	<0.15	<0.15	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	2.5	2.4	1.6	1.4	1.5	1.5	1.5	1.6	--	2	2.4	--	1.9	--	1.5	2.3	2	1.5	1.7	2	1.9	1.9	1.8	1.9	1.9	2.5
Selenium	ug/L	0.23	0.32	<0.18	0.19	<0.18	0.17	0.14	0.21	--	<0.086	0.5	--	0.26	--	<1	<1	<1	<1	<0.96	<0.96	1.3	0	<1.4	1.5	<1.4	<1.4
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.042	<0.036	<0.036	--	<0.036	0.15	--	<0.099	--	<0.27	<0.27	<0.26	<0.26	<0.26	<0.26	<0.26	1.5	<0.26	<0.26	<0.57	<0.57
Total Radium	pCi/L	1.66	1.56	2.39	1.52	2.94	2.44	3.55	3.2	--	2.08	3.74	--	2.76	--	2.42	2.58	2.46	2.41	2.49	3.49	2.87	2.66	2.1	3.18	2.54	2.29
Radium-226	pCi/L	0.706	0.431	0.465	0.327	1.33	0.894	1.62	1.2	--	1.22	1.78	--	1.21	--	1.23	1.08	1.2	1.21	1.24	1.84	1.29	1.25	0.863	1.1	1.03	1.15
Radium-228	pCi/L	0.952	1.13	1.92	1.19	1.61	1.55	1.93	2	--	0.862	1.96	--	1.55	--	1.19	1.5	1.26	1.2	1.25	1.65	1.58	1.41	1.23	2.08	1.51	1.14
Field Specific Conductance	umhos/cm	1580	1958	1948	2057	2052	2139	2029	2881	2205	2141	2085	2123	2058	1368	1876	1871	1764	1675	1797	1617	1772	1828	1888	1948	1744	2294
Field Temperature	deg C	13	13.3	13.4	13	12.9	13.4	13.3	13.4	13.3	12.8	15.1	13.7	13.5	12.81	13.75	13.64	11.9	13.6	13.1	13.8	13.3	13.5	13.1	13.3	12.7	14.5
Groundwater Elevation	feet	655.37	656.53	653.79	655.03	654.5	657.48	654.75	652.39	653.03	655.55	656.35	657.82	658.2	656.28	659.33	657.71	656.42	652.95	654.34	649.53	652.14	647.26	650.29	646.02	648.39	646.3
Oxygen, Dissolved	mg/L	0.13	0.05	0.06	0.47	0.16	0.12	0.1	0.08	0.25	0.15	0.21	0.16	0.11	0.72	0.41	0.44	0.24	0.18	0.2	0.32	0.13	0	-0.13	0.18	1.71	0.37
Turbidity	NTU	61.01	92.4	2.66	1.46	1.17	1.95	1.64	0.92	3.88	39.29	81.42	55.94	17.12	4.38	57.9	18.9	54.1	11.1	16.9	7.3	3.7	3.6	0.02	7.07	6.08	2.96
pH at 25 Degrees C	Std. Units	7	7	7.1	7	7.2	7.2	7.2	7	6.9	7	--	7.1	7	--	7.5	7.7	7.1	7.2	7.1	7.1	7.2	7.1	7.1	7.7	6.9	7
Field Oxidation Potential	millivolts	-97.5	-109	67.9	-105.1	-79.3	-40.5	-66.6	-10.1	162.7	137.5	35.5	--	-114.5	-62.1	-58.3	-57.5	-119.8	-113	-97.5	-78.7	-56.9	-86.3	-93.7	-105.1	-32	-48.8
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	370	380	360	470	380	390	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	<4.6	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	370	380	360	470	380	390	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5200	4200	4500	3700	4800	4700	5400	4800	5300	5300
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43000	40000	40000	36000	45000	34000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3700	3800	3800	3400	3500	4100	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7700	7800	8200	6800	8700	6700	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	210000	210000	210000	190000	240000	180000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.37	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4600	4200	4500	3900	3800	5500	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3700	3800	3600	3000	4200	3600	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-305

Number of Sampling Dates: 27

Parameter Name	Units	4/26/2016	6/23/2016	8/11/2016	10/27/2016	1/18/2017	4/19/2017	6/21/2017	8/23/2017	11/8/2017	4/18/2018	8/15/2018	10/16/2018	1/8/2019	4/8/2019	10/23/2019	3/13/2020	4/13/2020	10/9/2020	4/16/2021	10/6/2021	2/14/2022	4/11/2022	10/25/2022	4/4/2023	10/12/2023	4/4/2024	10/11/2024
Boron	ug/L	888	906	832	878	956	907	889	903	925	886	911	835	--	1000	880	--	920	900	860	880	--	850	640	830	750	840	790
Calcium	mg/L	98.1	92.1	88.8	93.2	98.5	96.2	93.8	95.8	99.5	97.6	102	96.2	--	110	100	--	100	110	110	110	--	120	99	120	110	110	110
Chloride	mg/L	310	312	316	325	289	312	290	295	282	289	265	281	--	250	280	--	270	290	240	230	--	200	220	220	220	240	260
Fluoride	mg/L	0.35	0.29	0.33	0.37	0.35	0.38	0.4	0.48	0.4	0.4	0.44	0.4	--	0.75	<0.23	--	0.35	0.38	0.37	<0.28	--	<0.22	<0.22	0.39	0.42	<0.38	0.49
Field pH	Std. Units	7.23	6.94	7.18	6.94	6.96	7.3	7.06	6.88	7.01	6.9	7.21	6.86	6.99	7.06	6.91	7.02	7	7.44	6.92	6.94	7.2	6.9	6.76	6.7	6.88	6.9	6.79
Sulfate	mg/L	65.7	71.3	74	79.5	90	109	121	124	138	147	139	129	--	110	76	--	63	93	120	150	--	150	190	250	230	220	180
Total Dissolved Solids	mg/L	1040	982	1040	1010	1020	1040	1010	1040	1040	1070	1060	1070	--	1000	1000	--	960	1100	900	680	--	950	1000	1100	970	1000	1000
Antimony	ug/L	0.14	0.2	0.19	0.094	0.18	0.063	0.12	0.12	--	0.089	<0.15	0.096	--	<0.53	<0.53	--	<0.58	<0.51	<1.1	<1.1	--	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	2.4	1.7	0.57	0.52	0.57	0.61	0.37	0.51	--	0.51	0.72	0.66	--	<0.75	<0.75	--	<0.88	<0.88	<0.75	0.75	--	<0.75	<0.75	0.57	0.91	0.54	0.54
Barium	ug/L	131	120	108	115	117	115	110	114	--	116	118	125	--	120	110	--	110	120	130	120	--	120	120	120	110	110	110
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	<0.012	<0.12	<0.089	--	<0.27	<0.27	--	<0.27	--	<0.27	<0.27	--	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	0.051	<0.029	0.1	<0.029	<0.029	0.052	0.039	0.034	--	0.054	0.086	0.044	--	<0.077	0.087	--	0.14	0.097	0.12	<0.051	--	<0.055	<0.055	<0.1	0.13	<0.1	<0.1
Chromium	ug/L	1.3	0.8	0.62	1.3	<0.34	0.36	0.22	0.45	--	0.26	0.41	0.3	--	<0.98	<0.98	--	<1.1	<1.1	<1.1	<1.1	--	<1.1	<1.1	<1.1	<1.1	<1.2	1.3
Cobalt	ug/L	14.8	15.1	13.7	14.8	15.2	14.6	14.4	14.7	--	14.5	15.6	17.2	16.4	17	17	18	16	17	18	18	20	21	17	21	17	17	18
Lead	ug/L	0.53	<0.19	<0.19	0.25	<0.19	0.093	<0.033	0.039	--	0.12	0.31	<0.13	--	<0.27	<0.27	--	0.27	<0.11	<0.21	0.29	--	<0.24	<0.24	<0.24	0.26	<0.26	<0.26
Lithium	ug/L	<4.9	<4.9	<4.9	<4.9	<4.9	<2.9	<2.9	<2.9	--	<4.6	<4.6	<4.6	--	<2.7	<2.7	2.3	3.2	<2.5	2.6	3.1	--	<2.5	<2.5	<2.5	2.7	<2.5	<2.5
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	<0.09	--	<0.09	<0.1	<0.1	--	<0.1	--	<0.15	<0.15	--	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	4.9	5.2	4.9	5.6	5.9	5.8	5.8	6	--	7.1	6.5	7.3	--	7.2	7.2	--	6.9	7.9	8.2	8.1	--	7.8	7.4	7.7	8.3	8.3	8
Selenium	ug/L	0.38	0.37	0.28	0.32	0.34	0.39	0.16	0.26	--	0.12	0.36	0.33	--	<1	<1	--	<1	<1	<0.96	<0.96	--	1.1	<0.96	<1.4	1.9	<1.4	<1.4
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.34	0.29	0.36	--	0.32	0.33	0.33	--	0.33	0.38	--	0.35	0.35	0.36	0.37	--	0.42	0.44	0.39	<0.26	<0.57	<0.57
Total Radium	pCi/L	0.693	0.716	2.17	1.3	1.46	0.673	0.996	1.08	--	0.676	1.33	1.56	--	0.685	0.383	--	0.909	0.483	0.327	1.66	--	1.03	0.91	0.706	0.963	0.989	1.32
Radium-226	pCi/L	0.281	0.127	0.583	0.714	0.162	0.494	0.301	0.291	--	0.278	0.96	0.635	--	0.339	0.186	--	0.42	0.217	0.279	0.835	--	0.433	0.387	0.345	0.384	0.35	0.406
Radium-228	pCi/L	0.412	0.589	1.59	0.589	1.3	0.179	0.695	0.793	--	0.398	0.366	0.921	--	0.347	0.197	--	0.489	0.265	0.0482	0.823	--	0.601	0.523	0.361	0.578	0.639	0.909
Field Specific Conductance	umhos/cm	1469	1796	1769	1831	1794	1822	1730	2422	1738	1840	1832	1836	1235	1728	1794	1788	1772	1810	1799	1629	1500	1742	1633	1896	1869	1708	2176
Field Temperature	deg C	13.1	13.2	13.1	13	12.8	13.2	13.3	13.3	13.2	12.8	14.8	13.9	12.43	13.8	13.2	12.4	9.1	14	12.9	13.7	12.38	12.8	13.2	13.6	13.7	12.2	14.5
Groundwater Elevation	feet	661.67	662.36	660.78	661.37	660.87	663.27	661.26	659	659.76	660.99	661.56	663.37	662.13	664.01	663.21	661.41	662.44	659.81	661.15	654.83	656.35	657.62	651.48	655.02	650.21	650.62	650.11
Oxygen, Dissolved	mg/L	0.11	0.05	0.07	0.47	0.09	0.15	0.06	0.12	0.2	0.15	0.18	0.09	0.81	0.59	0.42	0.2	0.28	0.13	0.16	0.44	4.8	0.23	0.35	0.63	0.26	6.11	0.42
Turbidity	NTU	35.09	5.77	1.32	0.84	0.5	0.51	1.9	0.58	2.68	7.37	14.9	6.96	4.76	21.7	6.21	42.68	21.7	12.9	8.17	3.8	0	4.97	2.59	0.02	3.25	6.22	3.55
pH at 25 Degrees C	Std. Units	7.1	7	7.1	7.2	7.3	7.4	7.1	7.1	7	7.3	7	7.1	--	7	7.5	--	7.2	7.2	7.1	7.1	--	7.1	7.3	7.1	7.8	6.9	7
Field Oxidation Potential	millivolts	52.5	-20.2	-38.9	5.8	24.2 mV	17.6	-4.5	-51.3	146.1	-32.7	31	-26.8	36.4	32.6	-6.7	192.6	6.6	-13	43.6	46.9	50	134.8	-33	166.4	4.7	47.3	151.4
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	460	300	470	500	--	520	440	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	<4.6	<4.6	--	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	460	300	470	500	--	520	440	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	390	330	200	170	75	--	76	76	72	73	51	72
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	47000	48000	47000	44000	--	53000	40000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3100	3400	3600	3800	3300	--	3200	3800	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7600	8300	7900	7000	--	8700	6800	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	210000	210000	200000	180000	--	210000	150000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16	16	17	20	17	--	17	21	21	17	18	18
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51	66	63	85	150	--	55	66	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3200	3300	3600	3500	3200	--	4000	3200	--	--	--	--
Lithium, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<2.3	--	--	--	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-305A
Number of Sampling Dates: 11

Parameter Name	Units	3/13/2020	4/14/2020	10/9/2020	4/15/2021	10/8/2021	4/12/2022	10/26/2022	4/6/2023	10/12/2023	4/5/2024	10/11/2024
Boron	ug/L	250	280	180	190	200	210	140	--	--	--	--
Calcium	mg/L	100	130	150	150	150	180	150	--	--	--	--
Chloride	mg/L	40	89	120	140	130	160	170	150	--	--	--
Fluoride	mg/L	0.77	0.73	0.73	0.56	<0.28	<0.22	<0.22	--	--	--	--
Field pH	Std. Units	8.09	7.63	7.46	7.05	6.9	7.19	7.11	6.74	6.87	6.95	7.09
Sulfate	mg/L	40	93	130	150	140	160	160	140	--	--	--
Total Dissolved Solids	mg/L	400	570	660	780	730	700	690	770	--	--	--
Antimony	ug/L	1.3	0.88	<0.51	<1.1	<1.1	<0.69	<0.69	--	--	--	--
Arsenic	ug/L	<0.88	<0.88	<0.88	<0.75	<0.75	<0.75	<0.75	--	--	--	--
Barium	ug/L	70	80	75	80	84	91	93	--	--	--	--
Beryllium	ug/L	<0.27	<0.27	--	<0.27	<0.27	<0.27	<0.27	--	--	--	--
Cadmium	ug/L	<0.039	<0.039	<0.049	<0.051	<0.051	<0.055	<0.055	--	--	--	--
Chromium	ug/L	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	--	--	--	--
Cobalt	ug/L	2.4	2.7	1.5	0.5	0.94	1.7	1.7	1.4	1.2	0.96	0.76
Lead	ug/L	0.68	<0.27	<0.11	<0.21	<0.21	<0.24	0.32	--	--	--	--
Lithium	ug/L	14	16	13	17	17	17	13	--	--	--	--
Mercury	ug/L	<0.1	<0.1	--	<0.15	<0.15	<0.11	<0.11	--	--	--	--
Molybdenum	ug/L	9	17	6.4	5.5	4.2	4.5	3.7	--	--	--	--
Selenium	ug/L	2.3	1.7	<1	<0.96	<0.96	<0.96	<0.96	--	--	--	--
Thallium	ug/L	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	--	--	--	--
Total Radium	pCi/L	1.97	1.26	2.05	2.67	2.96	3.44	3.7	--	--	--	--
Radium-226	pCi/L	1.23	1.03	1.92	2.33	2.45	2.96	2.51	--	--	--	--
Radium-228	pCi/L	0.735	0.23	0.132	0.34	0.514	0.481	1.19	--	--	--	--
Field Specific Conductance	umhos/cm	745	807	1102	1224	1145	1242	1127	1224	1357	1169	1668
Field Temperature	deg C	11.8	11.2	14.2	12.4	14.7	21.6	13.7	11.1	17.8	12	19.9
Groundwater Elevation	feet	--	--	648.01	651.16	645.57	649.24	644.38	647.7	643.6	645.43	644.16
Oxygen, Dissolved	mg/L	3.79	2.26	0.19	0.88	2.02	4.85	4.75	0.12	5.74	4.31	6.5
Turbidity	NTU	63.2	4.91	0	1.02	14.3	12.5	2.43	0.02	12.32	6.28	4.04
pH at 25 Degrees C	Std. Units	--	7.3	7.3	7.2	7	7.2	7.2	--	--	--	--
Field Oxidation Potential	millivolts	204.2	106.7	11	158.3	147.8	79.7	-14.4	198.2	88.1	71.8	148.7
Bicarbonate Alkalinity as CaCO3	mg/L	--	270	340	300	300	320	300	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	<1.9	<3.8	<4.2	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	270	340	300	300	320	300	--	--	--	--
Iron, total	ug/L	720	64	64	<36	<36	<36	42	<36	58	<36	<36
Magnesium, total	ug/L	--	28000	31000	29000	26000	32000	24000	--	--	--	--
Manganese, dissolved	ug/L	150	240	160	87	120	120	140	--	--	--	--
Potassium, total	ug/L	--	3800	4200	3600	3400	4200	3400	--	--	--	--
Sodium, total	ug/L	--	46000	64000	68000	52000	60000	42000	--	--	--	--
Cobalt, dissolved	ug/L	2.1	2.8	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	<50	<50	<50	<36	<36	<36	<36	--	--	--	--
Manganese, total	ug/L	180	260	150	78	100	140	120	--	--	--	--
Lithium, dissolved	ug/L	15	--	--	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-306
Number of Sampling Dates: 28

Parameter Name	Units	4/26/2016	6/23/2016	8/11/2016	10/27/2016	1/18/2017	4/19/2017	6/21/2017	8/23/2017	11/8/2017	4/18/2018	8/15/2018	10/16/2018	1/8/2019	4/8/2019	10/23/2019	4/14/2020	10/9/2020	2/23/2021	4/13/2021	7/6/2021	10/8/2021	2/14/2022	4/12/2022	10/25/2022	4/6/2023	10/12/2023	4/4/2024	10/9/2024
Boron	ug/L	540	575	574	702	809	814	784	822	881	919	915	862	--	1100	980	1000	1100	--	1000	--	730	--	760	560	780	850	920	860
Calcium	mg/L	101	88.5	85	90	85.9	81.3	75.6	73.9	73.1	74.1	78.9	80	--	95	77	73	80	--	74	--	130	--	110	93	100	91	100	120
Chloride	mg/L	85.8	77.6	67.9	64.9	57.2	58.5	56	54.4	50.4	54.4	58.2	83.3	--	98	47	41	43	--	35	--	180	--	260	300	310	290	260	240
Fluoride	mg/L	0.11	<0.073	0.086	0.11	0.087	0.11	<0.1	0.15	0.11	0.11	0.13	<0.19	--	0.27	<0.23	<0.23	<0.23	--	<0.28	--	<0.28	--	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH	Std. Units	7.08	6.17	6.72	6.44	6.51	6.79	6.71	6.46	6.49	6.42	6.74	6.42	6.65	6.66	6.74	6.68	6.54	6.34	6.42	7.44	6.66	7.07	6.66	6.53	6.61	6.63	6.64	6.54
Sulfate	mg/L	264	271	266	277	285	300	282	264	274	289	275	285	--	270	280	310	360	--	370	--	460	--	70	86	78	93	250	310
Total Dissolved Solids	mg/L	899	849	846	864	828	819	775	769	773	805	840	884	--	930	870	820	900	--	880	--	1100	--	710	1100	1000	980	1000	1100
Antimony	ug/L	0.2	0.25	0.18	0.12	0.18	0.051	0.13	0.1	--	0.094	<0.15	0.1	--	<0.53	<0.53	<0.58	<0.51	--	<1.1	--	<1.1	--	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	2.2	1.7	0.44	0.4	0.47	0.42	0.41	0.38	--	0.38	0.65	0.6	--	<0.75	0.78	<0.88	<0.88	--	<0.75	--	<0.75	--	<0.75	<0.75	<0.53	0.62	<0.53	<0.53
Barium	ug/L	93	80.5	58	60.5	56.4	54.3	48.7	47.4	--	48.2	51.6	56	--	58	51	48	49	--	49	--	71	--	94	95	85	82	90	97
Beryllium	ug/L	<0.08	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	<0.012	<0.12	<0.089	--	<0.27	<0.27	<0.27	--	--	<0.27	--	<0.27	--	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	0.87	0.98	0.93	0.91	0.74	0.72	0.65	0.72	--	0.88	0.76	0.96	--	1.1	0.89	0.83	0.92	--	0.95	--	1.7	--	1.3	1.1	1.2	1.1	1.3	1.3
Chromium	ug/L	1.9	2.3	0.82	0.6	0.68	0.52	0.57	0.58	--	0.37	0.7	0.46	--	<0.98	1	<1.1	<1.1	--	<1.1	--	<1.1	--	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	8.3	7.7	6.4	6.6	6	5.7	5.2	5	--	4.8	5.5	6.4	6.2	6.9	6.2	5.5	5.9	5.6	5.6	5.8	11	8.8	9.1	7	8.6	7.1	8.5	9.4
Lead	ug/L	0.74	0.74	<0.19	<0.19	<0.19	0.038	0.1	<0.033	--	0.04	0.2	<0.13	--	<0.27	0.34	0.37	<0.11	--	<0.21	--	<0.21	--	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium	ug/L	<4.9	<4.9	<4.9	<4.9	<4.9	<2.9	<2.9	<2.9	--	<4.6	<4.6	<4.6	--	<2.7	<2.7	<2.3	<2.5	--	<2.5	--	<2.5	--	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	<0.083	--	<0.09	<0.1	<0.1	<0.1	--	--	<0.15	--	<0.15	--	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	4.8	4.8	4.5	4.8	4.7	4.7	4.6	4.4	--	5.7	4.7	5.1	--	4.3	4.9	4.4	5.6	--	5.1	--	6.1	--	14	12	13	12	11	11
Selenium	ug/L	0.3	0.3	<0.18	0.24	0.2	<0.086	0.088	0.13	--	<0.086	0.21	0.22	--	<1	<1	<1	<1	--	<0.96	--	<0.96	--	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	0.14	0.082	<0.036	--	0.083	<0.14	0.12	--	<0.27	<0.27	<0.26	<0.26	--	<0.26	--	<0.26	--	<0.26	<0.26	<0.26	0.62	<0.57	<0.57
Total Radium	pCi/L	1.14	1.25	0.958	0.868	0.435	0.213	1.03	1.3	--	0.305	0.985	0.693	--	0.155	0.624	0.0738	0.889	--	0.334	--	0.794	--	2.03	1.03	0.455	0.661	0.998	0.788
Radium-226	pCi/L	0.179	0.475	0	0.253	-0.15	0.0761	0	0.517	--	0.305	0.482	0.263	--	0.0529	-0.00408	0.0738	0.163	--	0.0205	--	<0.439	--	0.115	0.12	0.19	0.0205	0.0259	0.0167
Radium-228	pCi/L	0.962	0.774	0.958	0.615	0.435	0.137	1.03	0.784	--	-0.109	0.503	0.43	--	0.102	0.624	-0.118	0.727	--	0.313	--	0.657	--	1.92	0.912	0.266	0.64	0.972	0.772
Field Specific Conductance	umhos/cm	960	1271	1228	1262	1215	1210	1151	1576	1186	1228	1271	1340	965	1350	1266	1158	1294	1277	1339	1357	1506	1770	1579	1597	1583	1794	1724	2291
Field Temperature	deg C	9.7	12.7	12.8	13.5	13.6	13.2	13.4	13.2	13.6	13.1	14.6	13.4	13.31	13.63	13.12	11.7	13.4	13.4	12.7	14.3	14.7	13.6	13.8	13.5	13.4	13.6	12.5	14.8
Groundwater Elevation	feet	670.86	670.64	670.35	670.21	669.89	670.69	669.94	668.77	669.04	668.92	668.66	670.24	669.84	670.96	671.28	670.71	670.18	669.86	670.27	661.87	662.27	663.66	664.61	657.11	659.12	655.4	654.47	655.3
Oxygen, Dissolved	mg/L	0.07	0.07	0.02	0.4	0.13	0.21	0.07	0.08	0.18	0.14	0.15	0.08	0.47	0.92	0.29	0.21	0.12	0.5	0.14	0.33	0.4	1.05	0.24	0.39	0.12	0.29	1.51	0.36
Turbidity	NTU	25.21	8.19	1.89	1	0.49	0.13	0.14	0.74	0.82	0.59	3.95	7.07	0.89	28.5	12.3	15.7	14	2.86	8.99	1.37	6.7	0	2.64	0	3.09	1.9	5.98	2.83
pH at 25 Degrees C	Std. Units	6.6	6.6	6.6	6.7	6.9	7	6.8	6.7	6.5	6.9	6.6	6.7	--	6.6	7.4	6.8	6.8	--	6.8	--	6.7	--	6.9	6.9	6.9	7.6	6.7	6.8
Field Oxidation Potential	millivolts	174.7	56	8.6	43.3	44.2	70.9	15.1	-10.5	174.1	14.2	22.8	13.3	59.5	49.1	-0.5	49.7	41.4	64.2	92	119.2	86	39	17.1	-37.7	103.1	25.3	69.9	116.4
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	280	160	--	270	--	270	--	470	370	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	--	<4.6	--	<4.6	--	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	280	160	--	270	--	270	--	470	370	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	590	340	--	220	--	<360	--	68	100	81	80	66	87
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26000	23000	--	25000	--	43000	--	44000	33000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16000	15000	--	15000	--	31000	--	23000	30000	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3700	3800	--	3500	--	3700	--	6000	4900	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	160000	170000	--	170000	--	170000	--	180000	150000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.4	5.1	--	6.1	--	9.9	--	7.6	8.2	7.7	7	8.9	9.6
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	140	100	--	110	--	100	--	<250	72	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16000	16000	--	15000	--	30000	--	26000	27000	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-307
Number of Sampling Dates: 29

Parameter Name	Units	1/19/2017	4/20/2017	6/21/2017	8/21/2017	11/8/2017	4/16/2018	5/30/2018	6/28/2018	7/18/2018	10/16/2018	4/8/2019	10/23/2019	12/11/2019	2/5/2020	4/14/2020	10/7/2020	2/23/2021	4/14/2021	7/6/2021	10/7/2021	2/14/2022	4/11/2022	8/25/2022	10/25/2022	4/5/2023	10/10/2023	4/4/2024	6/6/2024	10/10/2024
Boron	ug/L	207	205	197	197	214	200	--	210	--	195	240	200	190	200	240	260	--	200	--	230	--	250	--	250	250	210	220	--	180
Calcium	mg/L	230	241	229	221	227	220	--	239	--	222	240	230	230	210	240	240	--	250	--	240	--	260	--	260	230	220	240	--	210
Chloride	mg/L	210	201	213	219	217	224	--	--	223	293	220	220	200	220	230	230	--	210	--	240	--	330	--	260	<2.3	270	260	--	250
Fluoride	mg/L	0.12	0.13	0.16	0.2	0.12	0.11	--	--	0.13	<0.19	0.28	<0.23	<0.23	--	<0.23	<0.23	--	<0.28	--	<0.28	--	<0.22	--	<0.22	<0.22	<0.38	<0.38	--	<0.38
Field pH	Std. Units	6.7	6.51	6.82	6.4	6.61	7.04	6.44	6.87	6.62	6.54	6.76	6.68	6.37	6.67	6.76	6.97	6.5	6.59	7.05	6.71	7.03	6.63	6.71	6.5	6.62	6.56	6.52	6.32	6.53
Sulfate	mg/L	105	105	110	102	102	103	--	--	105	104	100	95	92	100	99	100	--	92	--	110	--	140	--	130	130	140	140	--	130
Total Dissolved Solids	mg/L	1050	1100	1070	1050	1030	--	1100	--	1070	1070	1000	1000	1000	970	980	1000	--	1000	--	1000	--	1100	--	1100	1200	1100	1000	--	1100
Antimony	ug/L	0.1	<0.026	<0.026	<0.026	<0.026	<0.026	--	<0.15	--	<0.078	--	--	<0.53	--	<0.58	--	--	<1.1	--	<1.1	--	0.69	--	<0.69	<1	<1	<1	--	<1
Arsenic	ug/L	1.1	0.96	0.62	0.52	0.54	0.41	--	0.86	--	0.66	--	--	<0.75	<0.88	<0.88	<0.88	--	<0.75	--	<0.75	--	0.77	--	<0.75	<0.53	0.62	<0.53	--	<0.53
Barium	ug/L	127	139	132	128	131	126	--	147	--	145	--	--	140	130	140	140	--	160	--	140	--	150	--	130	130	120	130	--	110
Beryllium	ug/L	<0.08	0.029	0.016	<0.012	<0.012	<0.012	--	<0.12	--	<0.089	--	--	<0.27	--	<0.27	--	--	<0.27	--	<0.27	--	<0.27	--	<0.27	<0.33	<0.33	<0.33	--	<0.33
Cadmium	ug/L	<0.029	0.025	<0.018	<0.018	0.018	<0.018	--	<0.07	--	<0.033	--	--	<0.039	<0.039	<0.039	--	--	<0.051	--	<0.051	--	<0.055	--	<0.055	<0.1	<0.1	<0.1	--	<0.1
Chromium	ug/L	0.59	1.6	1	0.38	0.38	0.28	--	1.4	--	0.59	--	--	<0.98	<1.1	<1.1	<1.1	--	<1.1	--	<1.1	--	<1.1	--	<1.1	<1.1	<1.1	<1.2	--	<1.2
Cobalt	ug/L	0.62	1.6	1.1	1.1	1.3	1.3	--	2.9	--	4.8	--	--	11	13	20	18	64	46	60	48	24	31	25	27	30	36	38	63	34
Lead	ug/L	<0.19	0.49	0.26	0.085	0.075	0.13	--	0.48	--	0.13	--	--	0.71	<0.27	0.31	<0.11	--	<0.21	--	<0.21	--	<0.24	--	<0.24	<0.24	<0.24	<0.26	--	<0.26
Lithium	ug/L	10	9.4	11.2	15.2	12.9	9.3	--	13.2	--	11.6	--	--	12	9.1	13	11	--	14	--	14	--	14	--	10	11	12	13	--	10
Mercury	ug/L	<0.039	<0.046	<0.046	<0.046	<0.046	<0.09	--	<0.037	--	<0.09	--	--	<0.1	--	<0.1	--	--	<0.15	--	<0.15	--	<0.11	--	<0.11	<0.14	<0.14	<0.11	--	<0.11
Molybdenum	ug/L	0.5	0.56	0.31	0.31	0.37	0.3	--	0.39	--	<0.57	--	--	<1.1	--	<1.1	<1.1	--	<1.3	--	<1.3	--	<1.2	--	<1.2	<0.91	<0.91	<1.3	--	<1.3
Selenium	ug/L	<0.18	0.12	0.11	0.11	0.13	<0.086	--	0.25	--	0.13	--	--	<1	--	<1	<1	--	<0.96	--	<0.96	--	<0.96	--	<0.96	<1.4	<1.4	<1.4	--	<1.4
Thallium	ug/L	<0.5	<0.036	<0.036	<0.036	0.065	<0.036	--	<0.14	--	<0.099	--	--	<0.27	--	<0.26	--	--	<0.26	--	<0.26	--	<0.26	--	<0.26	<0.26	<0.26	<0.57	--	<0.57
Total Radium	pCi/L	2.66	2.77	2.83	3.07	2.88	2.96	--	2.47	--	3.1	--	--	2.46	2.23	2.06	2.36	--	3.08	--	3.9	--	2.84	--	3.01	1.51	1.83	2.55	--	2.15
Radium-226	pCi/L	1.55	1.72	1.87	1.69	1.76	1.31	--	1.84	--	2.11	--	--	1.65	1.51	1.5	1.47	--	1.99	--	2.52	--	1.51	--	1.51	1.17	1.3	1.43	--	1.65
Radium-228	pCi/L	1.11	1.05	0.96	1.38	1.12	1.65	--	0.629	--	0.991	--	--	0.81	0.718	0.562	0.885	--	1.09	--	1.38	--	1.34	--	1.5	0.343	0.527	1.11	--	0.5
Field Specific Conductance	umhos/cm	1640	1648	1557	2193	1656	1674	1710	1686	1718	1697	1599	1684	1576	1681	1554	1637	1632	1675	1705	1552	1810	1718	1727	1604	1776	1856	1693	2009	2271
Field Temperature	deg C	12.9	12	12.7	13	13.2	11.6	12.7	13.4	12.9	14.3	12.47	13.38	11.5	11.65	10.6	13.2	12.2	11.5	13.2	14.4	12.25	11.8	13	12.9	11.9	12.6	12.4	12.9	15
Groundwater Elevation	feet	648.81	653.62	649.85	645.78	647.37	649.66	652.45	652.87	652.27	654.13	654.9	651.89	649.59	649.88	650.66	646.18	646.8	649.53	647.03	644.49	645.82	648.4	644.25	643.46	647.28	642.85	645.09	651.37	643.26
Oxygen, Dissolved	mg/L	0.16	0.2	0.08	0.08	0.17	0.29	0.18	0.21	0.21	0.08	0.51	0.25	0.18	0.9	0.69	0.08	0.2	0.41	0.21	0.19	0.97	0.13	0.56	0.22	0	0.2	0.75	0.35	0.26
Turbidity	NTU	9.01	66.67	34.94	4.89	11.16	11.93	18.58	53.34	14.94	14.08	26	12.5	43.13	9.74	28.9	4.56	2.41	21.2	17.91	10	0	4.09	2.17	7.21	0.02	6.4	3.69	23.65	3.43
pH at 25 Degrees C	Std. Units	7	6.9	6.8	6.9	7	7.1	--	--	6.7	6.8	6.7	7.5	6.7	6.7	6.8	6.9	--	6.8	--	6.8	--	6.9	--	6.9	7	7.5	6.5	--	6.9
Field Oxidation Potential	millivolts	-42	-16	-23.1	23.7	176.7	-105.9	-45.8	-43.4	-416.3	-65.7	-3.7	-24.8	-45.8	-15.6	-52.9	-62.2	0.8	-39.9	14.7	-23.8	-51	46.3	67.5	-36.4	31.9	-35	-31.8	-26.8	19
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	520	480	--	490	--	550	--	470	--	500	--	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	--	<4.6	--	<4.6	--	<4.6	--	<4.6	--	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	520	480	--	490	--	550	--	470	--	500	--	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3800	3500	--	3700	--	3900	--	2600	--	2700	2700	2900	3300	--	2800
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28000	27000	--	30000	--	28000	--	26000	--	28000	--	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290	350	--	360	--	410	--	260	--	270	--	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1900	1900	--	2000	--	2000	--	1900	--	1800	--	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	97000	100000	--	98000	--	100000	--	110000	--	91000	--	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19	19	--	49	--	59	--	29	--	30	32	36	44	--	39
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3100	3600	--	3400	--	3400	--	2500	--	3100	--	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	310	290	--	330	--	440	--	260	--	230	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-308

Number of Sampling Dates: 24

Parameter Name	Units	1/19/2017	4/20/2017	6/21/2017	8/21/2017	11/8/2017	4/16/2018	5/30/2018	6/28/2018	7/18/2018	10/16/2018	4/8/2019	10/23/2019	12/11/2019	2/5/2020	4/14/2020	10/7/2020	4/14/2021	10/7/2021	4/12/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	10/10/2024
Boron	ug/L	218	146	182	214	240	210	--	153	--	162	190	220	160	220	210	270	220	200	300	260	280	230	350	230
Calcium	mg/L	212	222	209	218	212	229	--	215	--	209	240	240	220	210	240	220	230	230	240	240	210	210	220	220
Chloride	mg/L	151	149	146	151	156	153	--	--	158	158	160	160	150	160	170	160	150	170	180	160	150	170	150	150
Fluoride	mg/L	0.11	0.12	0.12	0.23	0.12	0.1	--	--	0.12	<0.19	<0.23	<0.23	<0.23	--	<0.23	<0.23	<0.28	<0.28	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH	Std. Units	6.85	6.7	6.93	6.52	6.76	7.14	6.61	7.08	6.73	6.68	6.9	6.78	6.55	6.78	6.9	7.24	6.7	6.83	6.7	6.5	6.7	6.66	6.61	6.65
Sulfate	mg/L	296	283	303	294	297	305	--	--	310	311	300	300	280	300	290	290	270	290	320	290	300	300	300	290
Total Dissolved Solids	mg/L	1060	1100	1050	1020	1120	--	1090	--	1080	1110	1200	1100	1100	1100	1000	1000	1100	1000	1000	1000	1100	1100	1000	1100
Antimony	ug/L	0.11	<0.026	0.039	<0.026	<0.026	<0.026	--	<0.15	--	<0.078	--	--	<0.53	--	<0.58	--	<1.1	<1.1	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	0.44	0.34	0.14	0.32	0.32	0.29	--	0.39	--	0.44	--	--	<0.75	<0.88	<0.88	<0.88	<0.75	<0.75	<0.75	<0.75	<0.53	0.53	<0.53	<0.53
Barium	ug/L	118	118	125	132	133	123	--	134	--	143	--	--	130	130	140	130	140	130	140	120	110	120	120	120
Beryllium	ug/L	<0.08	<0.012	<0.012	<0.012	<0.012	<0.012	--	<0.12	--	<0.089	--	--	<0.27	--	<0.27	--	<0.27	<0.27	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	<0.029	<0.018	<0.018	<0.018	<0.018	<0.018	--	<0.07	--	<0.033	--	--	<0.039	<0.039	<0.039	--	<0.051	<0.051	<0.055	<0.055	<0.1	<0.1	<0.1	<0.1
Chromium	ug/L	0.57	0.44	0.34	0.49	0.45	0.17	--	0.42	--	0.27	--	--	5.9	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	0.52	0.43	0.25	0.26	0.23	0.18	--	0.19	--	0.15	--	--	0.26	0.14	0.14	0.14	0.16	0.22	0.24	0.24	0.45	0.17	<0.17	0.18
Lead	ug/L	<0.19	0.066	<0.033	<0.033	<0.033	0.043	--	<0.12	--	<0.13	--	--	0.52	<0.27	<0.27	<0.11	<0.21	<0.21	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium	ug/L	10.3	13.3	12.7	19.1	12.6	12.3	--	17.6	--	13.7	--	--	16	12	17	14	16	16	17	14	14	15	16	15
Mercury	ug/L	<0.039	<0.046	<0.046	<0.046	<0.046	<0.09	--	<0.037	--	<0.09	--	--	<0.1	--	<0.1	--	<0.15	<0.15	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	0.95	0.53	0.5	0.61	0.75	0.6	--	0.46	--	<0.57	--	--	<1.1	--	<1.1	<1.1	<1.3	<1.3	1.4	<1.2	<0.91	<0.91	<1.3	<1.3
Selenium	ug/L	<0.18	<0.086	<0.086	<0.086	<0.086	<0.086	--	<0.16	--	<0.085	--	--	<1	--	<1	<1	<0.96	<0.96	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4
Thallium	ug/L	<0.5	<0.036	<0.036	<0.036	<0.036	<0.036	--	<0.14	--	<0.099	--	--	<0.27	--	<0.26	--	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57
Total Radium	pCi/L	1.45	0.496	3.3	2.17	1.47	1.63	--	1.88	--	2.85	--	--	2.73	2.13	1.69	2.67	2.87	3.22	2.29	2.15	1.81	2.29	1.94	1.54
Radium-226	pCi/L	0.282	-0.173	2	1.42	1.18	0.532	--	1.5	--	1.44	--	--	1.54	1.42	1.24	1.53	1.36	1.78	1.19	1.13	1.31	1.49	0.945	1.15
Radium-228	pCi/L	1.17	0.496	1.3	0.745	0.286	1.1	--	0.379	--	1.41	--	--	1.19	0.705	0.454	1.14	1.51	1.43	1.1	1.01	0.508	0.801	0.996	0.388
Field Specific Conductance	umhos/cm	1559	1509	1467	2042	1577	1577	1611	1584	1628	1594	1539	1637	1532	1630	1502	1575	1598	1453	1491	1507	1634	1704	1524	2081
Field Temperature	deg C	12.6	11.9	12.2	12.6	13	11.8	12.1	13.1	12.6	13.1	12.54	13.16	10.5	11.35	10.9	13.2	11.5	13	12.7	12.8	11.7	12.7	12	14.4
Groundwater Elevation	feet	647.42	651.09	648.26	643.12	644.99	647.91	651.05	651.43	650.67	--	653.7	651.31	647.39	650.12	650.09	642.85	647.66	641.81	645.75	641.13	645.16	640.79	643.32	641.21
Oxygen, Dissolved	mg/L	0.15	0.21	0.03	0.12	0.12	0.35	0.14	0.19	0.13	0.08	0.66	4.42	0.43	1.48	0.28	0.11	0.44	0.17	0.26	0	0.18	0.22	0.79	1.5
Turbidity	NTU	1.65	4.6	0.84	1.15	0.73	0.93	3.34	5.87	1.54	5.49	6.87	7.42	15.72	3.49	5.12	1.15	4.47	12.8	6	1.98	1.55	6.31	4.04	6.99
pH at 25 Degrees C	Std. Units	7.2	7.2	7	6.9	7	7.1	--	--	6.8	7	6.8	7.9	6.8	6.8	6.9	7.1	7.1	6.9	7	7	7	7.6	6.6	7
Field Oxidation Potential	millivolts	-44.4	1.7	-29.1	24.4	169.7	-47.2	-48.2	-60.3	-415.4	-80.8	-23	-38.7	-56.6	-35.9	-69.1	-56.5	-49.3	-26.1	-30.9	-5.7	7.3	-54	-44	24.1
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	380	390	370	410	380	390	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<3.8	<4.6	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	380	390	370	410	380	390	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5100	3800	3900	4700	3400	4000	3200	3600	3400	3600
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25000	23000	26000	24000	22000	23000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	770	1400	1300	950	1500	1400	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3900	4000	4400	4300	4100	4300	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	110000	100000	100000	110000	110000	110000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.11	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4400	4000	3900	300	3200	3800	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	800	1200	1300	1100	1500	1300	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-309
Number of Sampling Dates: 24

Parameter Name	Units	1/19/2017	4/20/2017	6/21/2017	8/21/2017	11/8/2017	4/16/2018	5/30/2018	6/28/2018	7/18/2018	10/16/2018	4/8/2019	10/23/2019	12/11/2019	2/5/2020	4/14/2020	10/7/2020	4/14/2021	10/7/2021	4/14/2022	10/26/2022	4/5/2023	10/10/2023	4/4/2024	10/10/2024
Boron	ug/L	1300	1280	1250	1320	1360	1340	--	1360	--	1280	1500	1300	1100	1300	1400	1200	1400	1300	1600	1400	1400	1300	1400	1300
Calcium	mg/L	134	152	136	135	135	150	--	181	--	139	160	150	150	130	150	120	130	120	150	160	140	140	160	150
Chloride	mg/L	73.1	73.7	75.5	78.4	78.1	78.9	--	--	76.4	80.6	72	74	66	68	69	68	57	67	61	67	65	68	65	64
Fluoride	mg/L	0.12	0.13	0.16	0.19	0.14	0.094	--	--	0.13	<0.19	0.27	<0.23	<0.23	--	0.36	<0.23	<0.28	<0.28	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38
Field pH	Std. Units	7.18	7.01	7.17	6.9	7.11	7.52	6.92	7.36	7.02	6.95	7.18	6.98	6.67	7.09	7.21	7.57	7	7.18	7.16	6.89	7.1	7.01	6.93	6.97
Sulfate	mg/L	406	393	415	395	402	373	--	--	417	453	410	400	370	370	390	380	360	400	420	420	450	480	470	480
Total Dissolved Solids	mg/L	1030	1030	1020	1010	1010	--	1050	--	1030	1040	1100	1100	980	990	1000	930	940	950	940	1100	1000	1100	1000	1100
Antimony	ug/L	0.095	<0.026	0.041	0.029	<0.026	0.079	--	<0.15	--	<0.078	--	--	<0.53	--	<0.58	--	<1.1	<1.1	<0.69	<0.69	<1	<1	<1	<1
Arsenic	ug/L	0.66	1.1	0.52	0.44	0.45	0.62	--	2	--	0.74	--	--	1.1	<0.88	0.88	<0.88	<0.75	<0.75	<0.75	<0.75	<0.53	0.59	<0.53	<0.53
Barium	ug/L	48.7	62.4	48.7	46.1	46	53.7	--	82.1	--	54.5	--	--	54	46	50	42	52	47	55	51	51	55	56	56
Beryllium	ug/L	<0.08	0.073	0.025	<0.012	0.016	0.056	--	0.28	--	<0.089	--	--	<0.27	--	<0.27	--	<0.27	<0.27	<0.27	<0.27	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	<0.029	0.042	0.033	0.018	<0.018	0.052	--	0.15	--	<0.033	--	--	0.09	<0.039	<0.039	--	<0.051	<0.051	<0.055	<0.055	<0.1	<0.1	<0.1	<0.1
Chromium	ug/L	1.4	3.2	1.8	1.2	1.2	2.7	--	5.4	--	1.6	--	--	1.7	<1.1	1.3	<1.1	<1.1	1.3	<1.1	<1.1	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	2	3.1	2.4	2.1	2	2.4	--	4.7	--	2.7	--	--	3.7	2.3	3.2	2	2.3	2	2	2.2	2	2.3	2.4	2.2
Lead	ug/L	<0.19	1	0.5	0.096	0.057	0.95	--	3.1	--	0.46	--	--	2.8	0.63	1.6	<0.11	<0.21	<0.21	<0.24	<0.24	<0.24	<0.24	<0.26	<0.26
Lithium	ug/L	5.8	9.3	7.3	9.4	6.9	8	--	16.2	--	8.8	--	--	8.2	6.3	9.6	6.9	8.9	7.5	9.2	7.3	7.8	8.3	9.5	8.2
Mercury	ug/L	<0.039	<0.046	<0.046	<0.046	<0.046	<0.09	--	<0.037	--	<0.09	--	--	<0.1	--	<0.1	--	<0.15	<0.15	<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	0.57	0.32	0.28	0.28	0.37	0.29	--	0.33	--	<0.57	--	--	<1.1	--	<1.1	<1.1	<1.3	<1.3	<1.2	<1.2	<0.91	<0.91	<1.3	<1.3
Selenium	ug/L	<0.18	0.22	<0.086	<0.086	<0.086	<0.086	--	1	--	0.24	--	--	<1	--	<1	<1	<0.96	<0.96	<0.96	<0.96	<1.4	<1.4	<1.4	<1.4
Thallium	ug/L	<0.5	<0.036	<0.036	<0.036	<0.036	<0.036	--	<0.14	--	<0.099	--	--	<0.27	--	<0.26	--	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.57	<0.57
Total Radium	pCi/L	0.606	2.23	1.63	1.65	1.11	1.59	--	2.36	--	2.2	--	--	1.77	1.02	0.957	1.77	1.05	1.6	0.922	2.16	0.882	1.27	1.5	1.47
Radium-226	pCi/L	0.143	0.968	1.37	0.783	0.284	0.974	--	1.83	--	1.09	--	--	1.08	0.771	0.868	0.863	0.604	1.14	0.576	0.621	0.71	0.808	0.656	0.778
Radium-228	pCi/L	0.463	1.26	0.259	0.866	0.825	0.614	--	0.534	--	1.11	--	--	0.683	0.251	0.0894	0.906	0.448	<0.525	0.346	1.54	0.172	0.462	0.843	0.688
Field Specific Conductance	umhos/cm	1426	1430	1363	1821	1431	1445	1484	1477	1501	1464	1396	1461	1350	1433	1322	1371	1411	1297	1305	1378	1511	1598	1459	1997
Field Temperature	deg C	12.7	12.1	12.4	12.6	13.1	11.2	12.4	13.8	12.6	13.5	12.4	12.83	11.5	11.42	11.2	13.3	11.7	13.1	11.7	12.6	11.7	13.3	12.2	13.5
Groundwater Elevation	feet	646.66	650.16	647.6	641.82	644.2	647.65	650.98	651.47	650.69	651.61	653.55	651.28	647.24	648.34	649.19	641.5	646.46	640.71	644.32	640.43	644.41	640.18	644.51	640.25
Oxygen, Dissolved	mg/L	0.09	0.16	0.06	0.08	0.13	0.37	0.12	0.17	0.11	0.03	0.66	0.36	0.26	1.07	0.16	0.09	0.36	0.21	0.7	0	0.42	0.25	0.56	0.66
Turbidity	NTU	8.56	77.74	20.33	2.34	3.71	36.7	40.55	241.4	40.38	28.27	72.1	42.6	413.6	18.1	100.1	7.7	9.32	19.6	14	0.79	0.02	8.35	3.68	19.38
pH at 25 Degrees C	Std. Units	7.4	7.4	7.2	7.2	7.4	7.3	--	--	7.3	7.2	7.2	7.2	7.1	7.2	7.1	7.4	7.3	7.3	7.3	7.3	7.3	7.8	6.9	7.4
Field Oxidation Potential	millivolts	-42.1	0.2	-34.8	-5	149.7	-58.5	-38	-45.5	-432.6	-81.6	-3.3	-27.5	-37.8	-7.8	-51.5	-71.1	-40.6	-8.1	28.1	4.9	-7	-54.3	-48	31.7
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290	290	280	300	250	260	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.9	<1.9	<4.6	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290	290	280	300	250	260	--	--	--	--
Iron, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1900	890	900	950	680	740	720	990	800	680
Magnesium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19000	18000	19000	18000	16000	18000	--	--	--	--
Manganese, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	660	660	640	600	610	750	--	--	--	--
Potassium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	670	670	750	740	690	720	--	--	--	--
Sodium, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	170000	180000	180000	180000	180000	180000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.2	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	590	690	660	680	590	710	--	--	--	--
Manganese, total	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	740	620	630	650	600	750	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-310
Number of Sampling Dates: 15

Parameter Name	Units	10/24/2019	2/5/2020	3/12/2020	4/13/2020	10/12/2020	2/23/2021	4/13/2021	7/6/2021	10/6/2021	4/11/2022	10/25/2022	4/4/2023	10/10/2023	4/4/2024	10/9/2024
Boron	ug/L	720	620	--	550	800	--	360	--	520	640	340	--	--	--	--
Calcium	mg/L	230	160	--	200	180	--	210	--	130	190	150	--	--	--	--
Chloride	mg/L	150	120	--	130	150	--	250	--	120	200	140	--	--	--	--
Fluoride	mg/L	0.31	0.85	--	1.1	1	--	1.3	--	<0.28	<0.22	0.8	--	--	--	--
Field pH	Std. Units	7.15	7.08	6.89	7	7.07	7.11	7.07	8.23	7.2	6.86	6.7	6.91	7.06	7.05	6.74
Sulfate	mg/L	610	530	--	590	570	--	720	--	470	630	480	--	--	--	--
Total Dissolved Solids	mg/L	260	1200	--	1300	1200	--	1600	--	930	1400	1200	--	--	--	--
Antimony	ug/L	<0.53	<0.58	--	<0.58	0.61	--	<1.1	--	<1.1	0.89	<0.69	--	--	--	--
Arsenic	ug/L	0.78	<0.88	--	<0.88	0.94	--	0.97	--	1.1	1	<0.75	--	--	--	--
Barium	ug/L	76	53	--	62	55	--	92	--	53	75	78	--	--	--	--
Beryllium	ug/L	<0.27	<0.27	--	<0.27	--	--	<0.27	--	<0.27	<0.27	<0.27	--	--	--	--
Cadmium	ug/L	0.22	0.12	--	0.16	0.29	--	0.51	--	0.21	0.23	0.24	--	--	--	--
Chromium	ug/L	<0.98	<1.1	--	<1.1	<1.1	--	<1.1	--	<1.1	<1.1	<1.1	--	--	--	--
Cobalt	ug/L	0.57	0.32	0.32	0.24	0.38	--	0.75	--	0.72	0.93	0.75	0.24	<0.17	0.29	0.57
Lead	ug/L	<0.27	<0.27	--	<0.27	<0.11	--	<0.21	--	<0.21	<0.24	<0.24	--	--	--	--
Lithium	ug/L	35	42	46	48	42	37	58	52	52	54	36	--	--	--	--
Mercury	ug/L	<0.1	<0.1	--	<0.1	--	--	<0.15	--	<0.15	<0.11	<0.11	--	--	--	--
Molybdenum	ug/L	26	29	--	31	39	--	83	--	70	47	24	--	--	--	--
Selenium	ug/L	5	3.3	--	4.5	2.4	--	2.4	--	2.3	2.3	2.6	--	--	--	--
Thallium	ug/L	<0.27	<0.26	--	<0.26	<0.26	--	<0.26	--	<0.26	<0.26	<0.26	--	--	--	--
Total Radium	pCi/L	0.411	0.0344	--	0.271	0.429	--	0	--	0.539	0.316	0.827	--	--	--	--
Radium-226	pCi/L	-0.0393	0.0344	--	0.0494	0.0766	--	-0.0354	--	<0.511	-0.0361	0.061	--	--	--	--
Radium-228	pCi/L	0.411	-0.137	--	0.222	0.353	--	-0.0334	--	<0.462	0.316	0.766	--	--	--	--
Field Specific Conductance	umhos/cm	1906	1723	1902	1823	1709	962	2362	1852	1425	2007	1856	852	1344	1363	1780
Field Temperature	deg C	13.74	12.49	12.8	10.3	13.9	13.6	12.6	13	15.4	12.6	13.3	11.8	14.7	11.3	14.3
Groundwater Elevation	feet	649.31	644.71	645.45	645.91	638.46	638.77	642.7	639.32	638.19	640.79	638.55	641.71	638.32	643.51	637.99
Oxygen, Dissolved	mg/L	0.41	0.68	0.3	0.22	0.16	0.09	0.46	0.21	0.48	0.3	0.03	4.34	0.45	7.89	0.41
Turbidity	NTU	2.29	0.9	2.77	0.87	0.02	0.02	2.38	0	1	4	0.73	0.02	6.05	5.97	4.96
pH at 25 Degrees C	Std. Units	7.2	7.1	--	7	7.3	--	7.4	--	7.1	7.1	7	--	--	--	--
Field Oxidation Potential	millivolts	-9.3	42.2	252.2	179.4	146.5	91.3	161	88.6	96.8	161.1	113.6	252.5	7.5	71.6	152.5
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	190	410	--	130	--	250	260	250	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	<1.9	<3.8	--	<4.6	--	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	190	410	--	130	--	250	260	250	--	--	--	--
Iron, total	ug/L	--	--	--	<50	<50	--	<36	--	<36	<36	<36	<36	<36	<36	<36
Magnesium, total	ug/L	--	--	--	86000	76000	--	100000	--	55000	90000	57000	--	--	--	--
Manganese, dissolved	ug/L	--	--	250	280	350	--	330	--	830	400	1300	--	--	--	--
Potassium, total	ug/L	--	--	--	12000	12000	--	17000	--	9900	16000	12000	--	--	--	--
Sodium, total	ug/L	--	--	--	100000	100000	--	150000	--	110000	170000	93000	--	--	--	--
Cobalt, dissolved	ug/L	--	--	0.31	0.23	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	<50	<50	<50	--	<36	--	<36	<36	<36	--	--	--	--
Manganese, total	ug/L	--	--	260	280	390	--	290	--	350	520	1100	--	--	--	--
Lithium, dissolved	ug/L	--	--	45	--	44	--	63	--	45	52	45	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-310A
Number of Sampling Dates: 11

Parameter Name	Units	3/13/2020	4/14/2020	10/12/2020	4/15/2021	10/8/2021	4/12/2022	10/26/2022	4/5/2023	10/12/2023	4/5/2024	10/11/2024
Boron	ug/L	1500	1600	1700	1500	1500	1500	1500	--	--	--	--
Calcium	mg/L	82	87	94	82	80	99	69	--	--	--	--
Chloride	mg/L	140	130	130	120	130	120	120	--	--	--	--
Fluoride	mg/L	1.7	1.8	2	1.9	0.28	0.4	2	--	--	--	--
Field pH	Std. Units	7.73	7.85	7.48	7.47	7.65	7.43	7.64	7.46	7.5	7.43	7.53
Sulfate	mg/L	1200	1100	1100	1100	1200	1200	1200	--	--	--	--
Total Dissolved Solids	mg/L	2300	2300	2200	2300	1800	2100	2200	--	--	--	--
Antimony	ug/L	<0.58	<0.58	<0.51	<1.1	<1.1	0.85	<0.69	--	--	--	--
Arsenic	ug/L	<0.88	<0.88	<0.88	<0.75	<0.75	<0.75	<0.75	--	--	--	--
Barium	ug/L	16	16	16	14	12	14	13	--	--	--	--
Beryllium	ug/L	<0.27	<0.27	--	<0.27	<0.27	<0.27	<0.27	--	--	--	--
Cadmium	ug/L	<0.039	<0.039	<0.049	<0.051	<0.051	<0.055	<0.055	--	--	--	--
Chromium	ug/L	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	--	--	--	--
Cobalt	ug/L	0.63	0.39	0.43	0.48	0.45	0.41	0.56	0.51	0.52	1.1	0.39
Lead	ug/L	<0.27	<0.27	<0.11	<0.21	<0.21	<0.24	<0.24	--	--	--	--
Lithium	ug/L	250	290	240	270	280	260	230	--	--	--	--
Mercury	ug/L	<0.1	<0.1	--	<0.15	<0.15	<0.11	<0.11	--	--	--	--
Molybdenum	ug/L	2.6	2.7	3	5	1.9	4.4	1.4	--	--	--	--
Selenium	ug/L	<1	<1	<1	<0.96	<0.96	1.4	<0.96	--	--	--	--
Thallium	ug/L	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	--	--	--	--
Total Radium	pCi/L	3.43	3.9	4.46	4.44	5.41	4.61	4.4	--	--	--	--
Radium-226	pCi/L	3.27	3.48	3.9	4.14	4.35	4.35	3.24	--	--	--	--
Radium-228	pCi/L	0.157	0.418	0.563	0.293	1.07	0.267	1.16	--	--	--	--
Field Specific Conductance	umhos/cm	3160	2915	3122	3106	2808	2920	2964	3045	3355	3020	3791
Field Temperature	deg C	12.5	8.8	13.1	12.5	15.6	17.2	14.2	12.1	14.3	11.7	17.9
Groundwater Elevation	feet	--	--	640.2	644.88	639.57	640.83	639.49	643.11	640.13	642.81	639.39
Oxygen, Dissolved	mg/L	6.28	6.39	0.48	0.98	6.21	4.72	4.24	0.49	5.6	7.75	5.82
Turbidity	NTU	109	--	0	2.25	15	14.2	3.85	1.97	4.96	7.57	4.2
pH at 25 Degrees C	Std. Units	--	7.5	7.7	7.7	7.7	7.7	7.7	--	--	--	--
Field Oxidation Potential	millivolts	178.9	146.1	89.7	160.2	143.1	26.7	81.2	-15.5	46	50.2	150.2
Bicarbonate Alkalinity as CaCO3	mg/L	--	320	260	340	370	360	350	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	<1.9	<3.8	<4.6	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	320	260	340	370	360	350	--	--	--	--
Iron, total	ug/L	99	230	280	<36	<140	56	96	69	68	140	<36
Magnesium, total	ug/L	--	41000	45000	37000	36000	42000	32000	--	--	--	--
Manganese, dissolved	ug/L	53	39	29	39	30	20	43	--	--	--	--
Potassium, total	ug/L	--	9900	11000	9200	8900	11000	8600	--	--	--	--
Sodium, total	ug/L	--	630000	620000	600000	570000	650000	620000	--	--	--	--
Cobalt, dissolved	ug/L	0.67	0.4	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	<50	220	<50	<36	38	<140	52	--	--	--	--
Manganese, total	ug/L	51	38	31	34	26	26	24	--	--	--	--
Lithium, dissolved	ug/L	250	--	230	300	240	260	270	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-311
Number of Sampling Dates: 11

Parameter Name	Units	10/24/2019	2/5/2020	3/13/2020	4/13/2020	10/12/2020	4/14/2021	4/11/2022	10/26/2022	4/4/2023	10/11/2023	4/5/2024
Boron	ug/L	<110	<100	--	<100	<80	64	79	75	--	--	--
Calcium	mg/L	170	130	--	170	160	160	150	130	--	--	--
Chloride	mg/L	13	14	--	13	14	11	17	17	--	--	--
Fluoride	mg/L	<0.23	<0.23	--	<0.23	<0.23	<0.28	<0.22	<0.22	--	--	--
Field pH	Std. Units	6.95	6.72	7.11	6.86	6.93	6.66	6.74	6.61	6.56	7.01	6.78
Sulfate	mg/L	47	54	--	54	70	75	78	76	--	--	--
Total Dissolved Solids	mg/L	530	520	--	570	640	590	480	550	--	--	--
Antimony	ug/L	<0.53	<0.58	--	<0.58	<0.51	<1.1	<0.69	<0.69	--	--	--
Arsenic	ug/L	<0.75	<0.88	--	<0.88	1.7	<0.75	<0.75	<0.75	--	--	--
Barium	ug/L	200	160	--	180	220	180	170	200	--	--	--
Beryllium	ug/L	<0.27	<0.27	--	<0.27	--	<0.27	<0.27	<0.27	--	--	--
Cadmium	ug/L	0.04	<0.039	--	<0.039	0.12	<0.051	<0.055	<0.055	--	--	--
Chromium	ug/L	<0.98	<1.1	--	<1.1	<1.1	<1.1	<1.1	<1.1	--	--	--
Cobalt	ug/L	0.78	0.11	<0.091	<0.091	2.2	<0.091	<0.19	<0.19	0.38	0.25	0.24
Lead	ug/L	<0.27	<0.27	--	<0.27	1.8	<0.21	<0.24	<0.24	--	--	--
Lithium	ug/L	4.7	2.9	4.7	6.2	4.6	5.9	6.3	4.4	--	--	--
Mercury	ug/L	<0.1	<0.1	--	<0.1	--	<0.15	<0.11	<0.11	--	--	--
Molybdenum	ug/L	<1.1	<1.1	--	<1.1	<1.1	<1.3	<1.2	<1.2	--	--	--
Selenium	ug/L	<1	1.2	--	<1	<1	2.1	2	1.3	--	--	--
Thallium	ug/L	<0.27	<0.26	--	<0.26	<0.26	<0.26	<0.26	<0.26	--	--	--
Total Radium	pCi/L	0.386	0.108	--	0.17	0.738	0.194	0.224	--	--	--	--
Radium-226	pCi/L	0.0831	0.0368	--	0.0742	0.247	0.0364	0.0305	--	--	--	--
Radium-228	pCi/L	0.303	0.0711	--	0.0963	0.491	0.158	0.194	--	--	--	--
Field Specific Conductance	umhos/cm	926	891	877	912	1024	945	880	846	932	685	834
Field Temperature	deg C	13.88	10.21	10	8.8	14.4	9.3	10.1	14.6	10.5	19.6	10.4
Groundwater Elevation	feet	647.8	645	644.18	646.79	638.73	643.02	641.44	638.46	641.88	638.31	--
Oxygen, Dissolved	mg/L	0.29	2.11	0.23	0.29	7.12	1.18	0.51	0.68	0	7.69	0.29
Turbidity	NTU	3.88	1.89	3.44	0.44	0	0.78	3.57	0.84	0.02	--	8.69
pH at 25 Degrees C	Std. Units	7	7.1	--	6.9	6.9	6.9	7	7	--	--	--
Field Oxidation Potential	millivolts	-24.7	21	222.6	103.4	-53	179.8	125.4	52.8	257	37.9	42.6
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	460	290	450	440	490	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	<1.9	<3.8	<4.6	<4.6	<4.6	--	--	--
Total Alkalinity as CaCO3	mg/L	--	--	--	460	290	450	440	490	--	--	--
Iron, total	ug/L	--	--	<50	<50	630	<36	<36	<36	<36	510	<36
Magnesium, total	ug/L	--	--	--	40000	40000	36000	37000	27000	--	--	--
Manganese, dissolved	ug/L	--	--	21	39	75	<4.4	<3.6	8.7	--	--	--
Potassium, total	ug/L	--	--	--	620	810	650	860	740	--	--	--
Sodium, total	ug/L	--	--	--	5000	5100	5200	6300	4800	--	--	--
Cobalt, dissolved	ug/L	--	--	0.11	<0.091	--	--	--	--	--	--	--
Iron, dissolved	ug/L	--	--	<50	<50	<50	<36	<36	<36	--	--	--
Manganese, total	ug/L	--	--	20	41	180	<4.4	4.6	7.4	--	--	--
Lithium, dissolved	ug/L	--	--	8	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-311A
Number of Sampling Dates: 14

Parameter Name	Units	3/13/2020	4/13/2020	6/30/2020	10/8/2020	2/25/2021	4/16/2021	7/7/2021	10/8/2021	4/14/2022	10/26/2022	4/6/2023	10/11/2023	4/5/2024	10/11/2024
Boron	ug/L	1400	1500	--	1600	--	1500	--	1400	1500	1400	--	--	--	--
Calcium	mg/L	44	48	--	51	--	42	--	40	54	46	--	--	--	--
Chloride	mg/L	130	140	--	150	--	130	--	140	140	140	--	--	--	--
Fluoride	mg/L	3.4	4.1	3.7	4.4	3.9	4	3.8	2	2.4	4.3	--	--	--	--
Field pH	Std. Units	7.85	8.4	7.64	8.33	7.55	7.76	8.19	8.12	7.53	7.8	7.54	7.72	7.64	7.84
Sulfate	mg/L	1200	1200	--	1200	--	1100	--	1100	1200	1200	--	--	--	--
Total Dissolved Solids	mg/L	2300	2400	--	2400	--	2200	--	2000	2200	2300	--	--	--	--
Antimony	ug/L	<0.58	<0.58	--	<0.51	--	<1.1	--	<1.1	<0.69	0.83	--	--	--	--
Arsenic	ug/L	<0.88	<0.88	--	<0.88	--	<0.75	--	<0.75	<0.75	<0.75	--	--	--	--
Barium	ug/L	20	20	--	15	--	12	--	8.7	10	12	--	--	--	--
Beryllium	ug/L	<0.27	<0.27	--	--	--	<0.27	--	<0.27	<0.27	<0.27	--	--	--	--
Cadmium	ug/L	<0.039	<0.039	--	<0.049	--	<0.051	--	<0.051	<0.055	<0.055	--	--	--	--
Chromium	ug/L	<1.1	<1.1	--	<1.1	--	<1.1	--	<1.1	<1.1	<1.1	--	--	--	--
Cobalt	ug/L	0.19	0.13	--	0.12	--	0.13	--	<0.19	0.32	0.6	0.66	<0.17	0.44	0.38
Lead	ug/L	<0.27	<0.27	--	<0.11	--	<0.21	--	<0.21	<0.24	<0.24	--	--	--	--
Lithium	ug/L	260	310	--	240	--	290	--	290	280	230	--	--	--	--
Mercury	ug/L	<0.1	<0.1	--	--	--	<0.15	--	<0.15	<0.11	<0.11	--	--	--	--
Molybdenum	ug/L	1.2	2.8	--	3.1	--	<1.3	--	<1.3	1.6	2.2	--	--	--	--
Selenium	ug/L	<1	<1	--	<1	--	<0.96	--	<0.96	1.3	<0.96	--	--	--	--
Thallium	ug/L	<0.26	<0.26	--	<0.26	--	<0.26	--	<0.26	<0.26	<0.26	--	--	--	--
Total Radium	pCi/L	1.47	2.31	--	3.1	--	3.85	--	4.44	3.99	4.21	--	--	--	--
Radium-226	pCi/L	1.42	2.1	--	2.22	--	3.25	--	3.67	3.38	2.99	--	--	--	--
Radium-228	pCi/L	0.0555	0.214	--	0.88	--	0.6	--	0.774	0.61	1.22	--	--	--	--
Field Specific Conductance	umhos/cm	3336	3027	3391	3177	3243	3332	3381	2930	3211	3022	3037	3424	3244	4134
Field Temperature	deg C	12.1	7.9	12.6	12.7	11.5	12.3	14.2	15.1	14.1	14.1	11.5	13.2	11.5	18.2
Groundwater Elevation	feet	--	--	647.73	641.09	641.16 ft	644.16	642.38	640.58	643.23	640.27	643.59	639.84	635.54	641.01
Oxygen, Dissolved	mg/L	2.29	3.87	1.51	0.44	3.23	0.77	0.42	1.68	4.66	4.68	2.47	3.15	2.18	6.42
Turbidity	NTU	7.74	3.19	1.43	0	0.02	0.02	0	9.6	9.61	5.88	0.02	14.16	7.4	3.74
pH at 25 Degrees C	Std. Units	--	7.9	--	7.9	--	7.8	--	7.9	7.7	7.9	--	--	--	--
Field Oxidation Potential	millivolts	206	115.8	23.4	39.6	129.7	146.9	80.8	140.7	54.6	-21.6	47.7	-4.2	61.3	135.7
Bicarbonate Alkalinity as CaCO3	mg/L	--	360	--	400	--	370	--	380	370	380	--	--	--	--
Carbonate Alkalinity as CaCO3	mg/L	--	<1.9	--	<3.8	--	<4.6	--	<4.6	<4.6	<4.6	--	--	--	--
Total Alkalinity as CaCO3	mg/L	--	360	--	400	--	370	--	380	370	380	--	--	--	--
Iron, total	ug/L	<50	<50	--	<50	--	<36	--	<140	<36	<36	<36	44	<36	<36
Magnesium, total	ug/L	--	23000	--	25000	--	21000	--	20000	25000	18000	--	--	--	--
Manganese, dissolved	ug/L	20	22	--	5.8	--	6.2	--	5.5	<14	7	--	--	--	--
Potassium, total	ug/L	--	9000	--	10000	--	8300	--	7700	10000	7800	--	--	--	--
Sodium, total	ug/L	--	710000	--	700000	--	720000	--	670000	800000	720000	--	--	--	--
Cobalt, dissolved	ug/L	0.36	0.12	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved	ug/L	<50	<50	--	<50	--	<36	--	<36	<140	<36	--	--	--	--
Manganese, total	ug/L	20	13	--	8.3	--	6.1	--	<18	3.7	9.4	--	--	--	--
Lithium, dissolved	ug/L	250	--	--	230	--	330	--	250	310	280	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-312
Number of Sampling Dates: 10

Parameter Name	Units	1/12/2022	2/14/2022	2/15/2022	4/11/2022	8/25/2022	10/25/2022	4/5/2023	10/12/2023	4/4/2024	10/9/2024
Boron	ug/L	380	--	420	560	--	580	--	--	--	--
Calcium	mg/L	180	--	180	200	180	160	170	180	170	170
Chloride	mg/L	150	--	150	170	--	170	--	--	--	--
Fluoride	mg/L	<0.28	--	0.37	<0.22	--	0.38	--	--	--	--
Field pH	Std. Units	7.18	--	7.24	7.07	7.14	7.1	7.11	6.96	6.89	6.86
Sulfate	mg/L	620	--	570	550	--	610	--	--	--	--
Total Dissolved Solids	mg/L	1200	--	930	1100	--	1300	--	--	--	--
Antimony	ug/L	<1.1	--	<0.69	<0.69	--	<0.69	--	--	--	--
Arsenic	ug/L	3.4	--	4.1	4.4	--	2.8	--	--	--	--
Barium	ug/L	87	--	63	50	--	45	--	--	--	--
Beryllium	ug/L	<0.27	--	<0.27	<0.27	--	<0.27	--	--	--	--
Cadmium	ug/L	0.053	--	<0.055	<0.055	--	<0.055	--	--	--	--
Chromium	ug/L	<1.1	--	<1.1	<1.1	--	<1.1	--	--	--	--
Cobalt	ug/L	4.9	--	6.1	9.1	11	11	11	10	8.5	11
Lead	ug/L	<0.21	--	<0.24	<0.24	--	<0.24	--	--	--	--
Lithium	ug/L	41	--	31	40	--	35	--	--	--	--
Mercury	ug/L	<0.15	--	<0.11	<0.11	--	<0.11	--	--	--	--
Molybdenum	ug/L	2.7	--	1.6	1.3	--	1.4	--	--	--	--
Selenium	ug/L	<0.96	--	<0.96	<0.96	--	<0.96	--	--	--	--
Thallium	ug/L	<0.26	--	<0.26	<0.26	--	<0.26	--	--	--	--
Total Radium	pCi/L	1.25	--	0.888	0.357	--	1.29	--	--	--	--
Radium-226	pCi/L	0.176	--	0.405	0.357	--	0.493	--	--	--	--
Radium-228	pCi/L	1.08	--	0.483	-0.907	--	0.802	--	--	--	--
Field Specific Conductance	umhos/cm	1762	--	1800	1855	1949	1985	1576	1827	1512	1842
Field Temperature	deg C	12.62	--	13.01	12.3	13.2	13.1	12	14.6	12.3	13.9
Groundwater Elevation	feet	--	--	--	--	640.8	639.64	644.08	639.45	643.94	640.17
Oxygen, Dissolved	mg/L	0.32	--	1.34	0.15	0.18	0	0.28	0.23	0.29	0.25
Turbidity	NTU	0	--	0	8.39	1.47	1.68	1.32	5.45	8.53	44.37
pH at 25 Degrees C	Std. Units	7.4	--	7.3	7.3	--	7.3	--	--	--	--
Field Oxidation Potential	millivolts	-53.4	--	-67	112.1	116.7	11.3	0.5	-26.5	-11.7	46.8
Bicarbonate Alkalinity as CaCO3	mg/L	220	230	--	240	250	230	250	250	290	280
Carbonate Alkalinity as CaCO3	mg/L	<4.6	<4.6	--	<4.6	<4.6	<4.6	<2.5	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	220	230	--	240	250	230	250	250	290	280
Iron, total	ug/L	--	440	--	350	330	260	370	540	420	520
Magnesium, total	ug/L	--	54000	--	65000	58000	52000	59000	62000	59000	59000
Manganese, dissolved	ug/L	1300	1100	--	1200	1100	1200	--	1400	730	1200
Potassium, total	ug/L	--	4300	--	4800	4600	4800	5700	5200	5000	4800
Sodium, total	ug/L	--	130000	--	170000	140000	130000	140000	120000	110000	92000
Cobalt, dissolved	ug/L	5.1	5.6	--	--	13	--	--	--	--	--
Iron, dissolved	ug/L	380	380	--	510	240	250	150	210	280	400
Manganese, total	ug/L	--	1300	--	1400	1200	1000	960	1500	910	1200
Lithium, dissolved	ug/L	--	31	--	37	43	41	--	--	--	--
Aluminum, dissolved	ug/L	<17	--	--	--	--	--	--	--	--	--
Potassium, dissolved	ug/L	4300	--	--	--	--	--	--	--	--	--
Calcium, dissolved	ug/L	180000	--	--	--	--	--	--	--	--	--
Magnesium, dissolved	ug/L	52000	--	--	--	--	--	--	--	--	--
Sodium, dissolved	ug/L	120000	--	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-313
Number of Sampling Dates: 10

Parameter Name	Units	1/12/2022	2/14/2022	2/15/2022	4/11/2022	8/25/2022	10/25/2022	4/5/2023	10/10/2023	4/4/2024	10/9/2024
Boron	ug/L	530	--	510	570	--	540	--	--	--	--
Calcium	mg/L	190	--	200	200	180	170	220	210	140	170
Chloride	mg/L	180	--	170	170	--	170	--	--	--	--
Fluoride	mg/L	<0.28	--	<0.22	<0.22	--	<0.22	--	--	--	--
Field pH	Std. Units	7	--	7.01	6.94	7.09	6.95	6.93	6.89	6.9	6.94
Sulfate	mg/L	620	--	570	500	--	580	--	--	--	--
Total Dissolved Solids	mg/L	1300	--	1100	3200	--	1300	--	--	--	--
Antimony	ug/L	<1.1	--	<0.69	<0.69	--	<0.69	--	--	--	--
Arsenic	ug/L	1.2	--	1	1.2	--	1.1	--	--	--	--
Barium	ug/L	48	--	44	44	--	53	--	--	--	--
Beryllium	ug/L	<0.27	--	<0.27	<0.27	--	<0.27	--	--	--	--
Cadmium	ug/L	<0.051	--	<0.055	<0.055	--	<0.055	--	--	--	--
Chromium	ug/L	<1.1	--	<1.1	<1.1	--	<1.1	--	--	--	--
Cobalt	ug/L	5.9	--	5.7	5.7	3.9	3.8	5.5	4.4	2.9	3.5
Lead	ug/L	<0.21	--	<0.24	<0.24	--	<0.24	--	--	--	--
Lithium	ug/L	33	--	26	28	--	30	--	--	--	--
Mercury	ug/L	<0.15	--	<0.11	<0.11	--	<0.11	--	--	--	--
Molybdenum	ug/L	6.1	--	5.3	4.8	--	5.8	--	--	--	--
Selenium	ug/L	<0.96	--	<0.96	<0.96	--	<0.96	--	--	--	--
Thallium	ug/L	<0.26	--	<0.26	<0.26	--	<0.26	--	--	--	--
Total Radium	pCi/L	1.29	--	1.25	0.543	--	1.56	--	--	--	--
Radium-226	pCi/L	0.354	--	0.252	0.308	--	0.21	--	--	--	--
Radium-228	pCi/L	0.931	--	0.999	0.235	--	1.35	--	--	--	--
Field Specific Conductance	umhos/cm	1857	--	925	1788	1717	1937	1878	2106	1395	2027
Field Temperature	deg C	14.6	--	13.89	13.2	13.2	14	11.5	13.9	11.8	16
Groundwater Elevation	feet	--	--	--	--	639.38	639.16	642.02	639.04	644.49	638.87
Oxygen, Dissolved	mg/L	0.15	--	1.22	0.09	0.16	0.22	0.09	0.23	0.21	0.39
Turbidity	NTU	0	--	0	7.44	4.86	2.75	5.09	6.85	7.45	188.31
pH at 25 Degrees C	Std. Units	7.1	--	7.1	7.2	--	7.2	--	--	--	--
Field Oxidation Potential	millivolts	-51	--	-29	126.5	133.3	-18.4	-14.5	-47.9	-27.9	-10.3
Bicarbonate Alkalinity as CaCO3	mg/L	230	250	--	300	230	290	270	230	140	240
Carbonate Alkalinity as CaCO3	mg/L	<4.6	<4.6	--	<4.6	<4.6	<4.6	<2.5	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	230	250	--	300	230	290	270	230	140	240
Iron, total	ug/L	--	380	--	920	1600	1100	810	1500	580	1400
Magnesium, total	ug/L	--	58000	--	68000	52000	49000	72000	69000	46000	55000
Manganese, dissolved	ug/L	3600	3200	--	3200	2400	3100	--	3600	2200	2700
Potassium, total	ug/L	--	5900	--	6100	4500	4300	6100	5600	4300	5400
Sodium, total	ug/L	--	120000	--	140000	110000	100000	150000	150000	120000	130000
Cobalt, dissolved	ug/L	5.9	5.2	--	--	4.4	--	--	--	--	--
Iron, dissolved	ug/L	240	290	--	630	600	950	520	1100	430	1200
Manganese, total	ug/L	--	3700	--	3800	2700	2600	3600	3700	2000	2700
Lithium, dissolved	ug/L	--	26	--	26	29	32	--	--	--	--
Aluminum, dissolved	ug/L	<17	--	--	--	--	--	--	--	--	--
Potassium, dissolved	ug/L	5700	--	--	--	--	--	--	--	--	--
Calcium, dissolved	ug/L	190000	--	--	--	--	--	--	--	--	--
Magnesium, dissolved	ug/L	58000	--	--	--	--	--	--	--	--	--
Sodium, dissolved	ug/L	110000	--	--	--	--	--	--	--	--	--

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-315
Number of Sampling Dates: 6

Parameter Name	Units	2/2/2023	3/6/2023	4/5/2023	10/10/2023	4/4/2024	10/10/2024
Boron	ug/L	1300	--	1100	1100	1200	1200
Calcium	mg/L	140	--	120	120	130	130
Chloride	mg/L	45	--	45	55	63	61
Fluoride	mg/L	<0.22	--	0.22	<0.38	<0.38	<0.38
Field pH	Std. Units	6.94	6.86	6.96	6.93	6.85	6.89
Sulfate	mg/L	450	--	460	500	470	460
Total Dissolved Solids	mg/L	940	--	1100	1000	1000	1100
Antimony	ug/L	<0.69	--	<1	<1	<1	<1
Arsenic	ug/L	1.3	--	1.3	1.6	1.5	1.4
Barium	ug/L	36	--	35	35	36	37
Beryllium	ug/L	<0.27	--	<0.33	<0.33	<0.33	<0.33
Cadmium	ug/L	<0.055	--	<0.1	<0.1	<0.1	<0.1
Chromium	ug/L	<1.1	--	<1.1	<1.1	<1.2	<1.2
Cobalt	ug/L	7	6.4	7	6.6	7.8	7.4
Lead	ug/L	<0.24	--	<0.24	<0.24	<0.26	<0.26
Lithium	ug/L	6.2	--	5.3	5.4	6	5.6
Mercury	ug/L	<0.11	--	<0.14	<0.14	<0.11	<0.11
Molybdenum	ug/L	1.5	--	1.4	1.3	1.6	1.6
Selenium	ug/L	<0.96	--	<1.4	<1.4	<1.4	<1.4
Thallium	ug/L	<0.26	--	<0.26	<0.26	<0.57	<0.57
Total Radium	pCi/L	1.46	--	1.42	1.29	1.23	1.85
Radium-226	pCi/L	0.665	--	0.738	0.595	0.555	0.873
Radium-228	pCi/L	0.797	--	0.682	0.694	0.672	0.975
Field Specific Conductance	umhos/cm	1293	1539	1523	1615	1479	2008
Field Temperature	deg C	12.7	12.4	11.8	13.1	12.3	13.9
Groundwater Elevation	feet	642.4	648.55	645.12	641.1	644.23	641.37
Oxygen, Dissolved	mg/L	1.44	0.86	0.32	0.29	0.34	1.26
Turbidity	NTU	1.53	2.25	0.02	9.42	4.47	9.56
pH at 25 Degrees C	Std. Units	7.1	--	7.2	8.3	6.9	7.1
Field Oxidation Potential	millivolts	-6.3	-60.9	-45.7	-79.7	-74.3	2.7
Bicarbonate Alkalinity as CaCO3	mg/L	300	--	320	280	280	280
Carbonate Alkalinity as CaCO3	mg/L	<2.3	--	<2.5	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	300	--	320	280	280	280
Iron, total	ug/L	3000	--	2800	2900	2700	2600
Magnesium, total	ug/L	22000	--	19000	21000	21000	21000
Manganese, dissolved	ug/L	6400	--	--	6800	7400	7600
Potassium, total	ug/L	2000	--	1400	1800	1600	1900
Sodium, total	ug/L	220000	--	200000	200000	210000	200000
Cobalt, dissolved	ug/L	7	6.5	--	7.3	7.5	7
Iron, dissolved	ug/L	3000	--	2700	2400	2300	2500
Manganese, total	ug/L	6300	--	6700	12000	7600	7900

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-316
Number of Sampling Dates: 3

Parameter Name	Units	4/6/2023	10/12/2023	4/5/2024
Calcium	mg/L	210	190	82
Field pH	Std. Units	6.7	6.73	7.04
Cobalt	ug/L	2.1	0.69	0.2
Field Specific Conductance	umhos/cm	1694	1773	763
Field Temperature	deg C	10.6	16.1	9.2
Groundwater Elevation	feet	642.78	639.15	644.09
Oxygen, Dissolved	mg/L	-0.16	0.74	5.2
Turbidity	NTU	0.02	7.2	3.95
Field Oxidation Potential	millivolts	104.1	61	81.3
Bicarbonate Alkalinity as CaCO3	mg/L	340	310	95
Carbonate Alkalinity as CaCO3	mg/L	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	340	310	95
Iron, total	ug/L	<36	74	<36
Magnesium, total	ug/L	65000	66000	27000
Manganese, dissolved	ug/L	--	110	<3.6
Potassium, total	ug/L	1900	2000	930
Sodium, total	ug/L	110000	100000	53000
Iron, dissolved	ug/L	<36	<36	<36
Manganese, total	ug/L	1200	110	15

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-316A
Number of Sampling Dates: 4

Parameter Name	Units	4/6/2023	10/12/2023	4/5/2024	10/9/2024
Calcium	mg/L	74	71	51	55
Field pH	Std. Units	7.4	7.53	7.36	7.32
Cobalt	ug/L	0.3	0.35	<0.17	<0.17
Field Specific Conductance	umhos/cm	1976	2399	2189	2838
Field Temperature	deg C	11.2	17.2	10.6	22.2
Groundwater Elevation	feet	643.49	639.79	643.94	639.96
Oxygen, Dissolved	mg/L	3.29	3.43	3.57	2.09
Turbidity	NTU	4.77	43	4.46	28.77
Field Oxidation Potential	millivolts	99.6	49.5	40.1	107.3
Bicarbonate Alkalinity as CaCO3	mg/L	430	380	310	380
Carbonate Alkalinity as CaCO3	mg/L	<2.5	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	430	380	310	380
Iron, total	ug/L	<36	400	<36	<36
Magnesium, total	ug/L	30000	30000	29000	29000
Manganese, dissolved	ug/L	--	1100	20	50
Potassium, total	ug/L	8000	8100	7800	8400
Sodium, total	ug/L	430000	450000	470000	440000
Iron, dissolved	ug/L	<36	<36	<36	<36
Manganese, total	ug/L	210	120	22	34

Single Location

Name: IPL - Ottumwa Generating Station

Location ID: MW-317
Number of Sampling Dates: 4

Parameter Name	Units	4/6/2023	10/12/2023	4/5/2024	10/9/2024
Calcium	mg/L	200	190	100	190
Field pH	Std. Units	6.57	6.54	6.68	6.53
Cobalt	ug/L	5.6	4.7	1.7	4.7
Field Specific Conductance	umhos/cm	1561	1853	898	2137
Field Temperature	deg C	11.5	13.7	9.9	14.5
Groundwater Elevation	feet	642.84	639.08	644.11	638.82
Oxygen, Dissolved	mg/L	0.12	0.09	4.85	1.36
Turbidity	NTU	3.89	6.25	3.98	8.38
Field Oxidation Potential	millivolts	-24	-38.7	93.4	68
Bicarbonate Alkalinity as CaCO3	mg/L	540	490	270	480
Carbonate Alkalinity as CaCO3	mg/L	<2.5	<2.5	<2.5	<2.5
Total Alkalinity as CaCO3	mg/L	540	490	270	480
Iron, total	ug/L	1600	3200	350	2000
Magnesium, total	ug/L	44000	41000	28000	39000
Manganese, dissolved	ug/L	--	1700	320	1800
Potassium, total	ug/L	3400	3400	1600	3700
Sodium, total	ug/L	130000	130000	68000	140000
Iron, dissolved	ug/L	1400	1800	<36	1300
Manganese, total	ug/L	1800	1900	350	1800

Appendix B

Select Ottumwa ZLD and Ash Pond Closure Drawings

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION

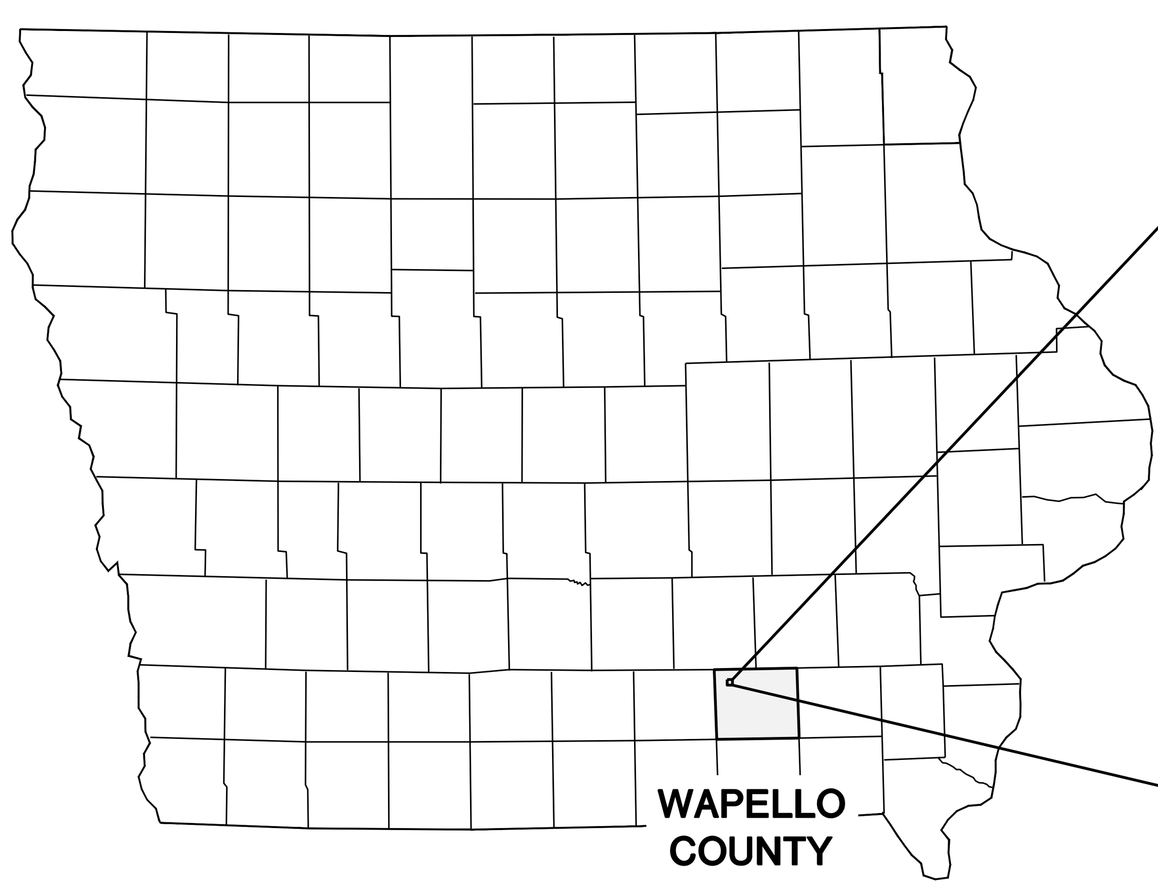
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

PREPARED FOR: INTERSTATE POWER AND LIGHT COMPANY
20755 POWER PLANT ROAD
OTTUMWA, IOWA

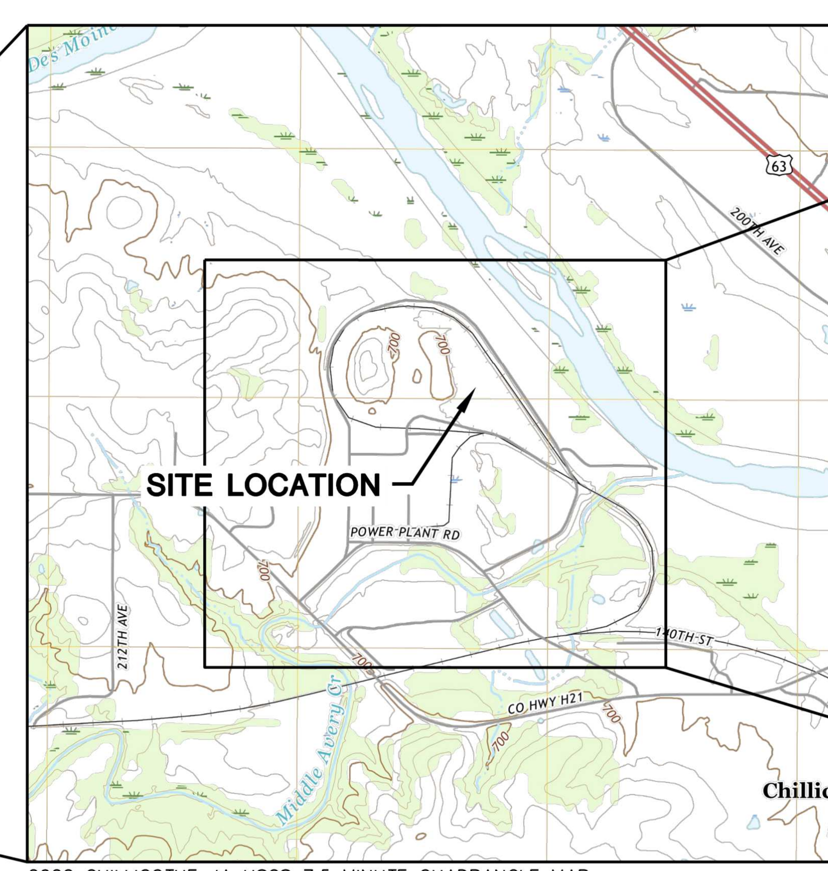
PREPARED BY: SCS ENGINEERS
MADISON, WISCONSIN

DATE: AUGUST 2023

LICENSED PROFESSIONAL ENGINEER
PHILLIP E. GEARING
P26161
08/21/2023
IOWA

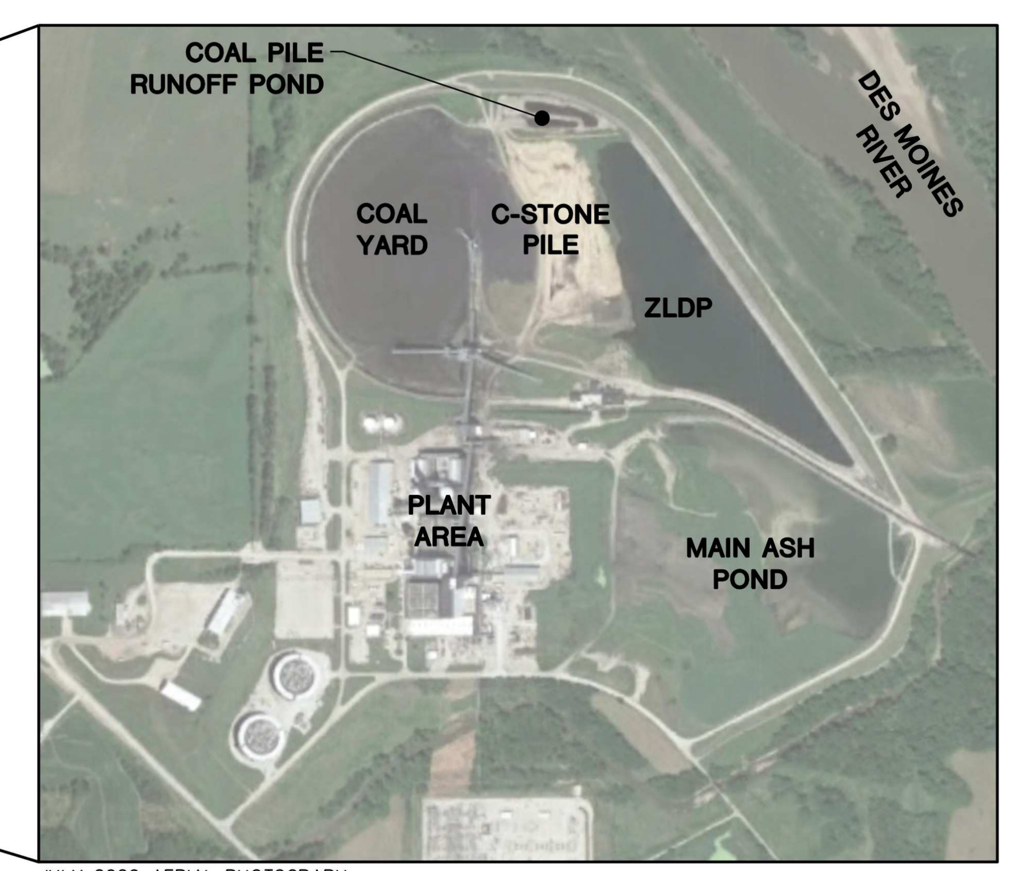


IOWA



2022 CHILLICOTHE, IA USGS 7.5 MINUTE QUADRANGLE MAP

SITE
LOCATOR MAP
APPROXIMATE SCALE: 1" = 2,000'



JULY 2020 AERIAL PHOTOGRAPH

SITE AERIAL
SCALE: 1" = 800'

INDEX

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
DRAWN:	02/21/2022	CHECKED BY:	BSS/EJN
REVISED:	08/17/2023	APPROVED BY:	PEG 08/21/2023

INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501
CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

TITLE SHEET

SHEET
1 OF 15

LEGEND

- PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- EDGE OF WATER
- BUILDING
- OVERHEAD UTILITY
- STORM SEWER
- TELEPHONE
- UNDERGROUND ELECTRIC
- WATER MAIN
- VEGETATION/TREES
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT

NOTES:

1. EXISTING BASE MAP FROM BURNS & MCDONNELL ISSUED FOR CONSTRUCTION DRAWINGS DATED JUNE 30, 2021.
2. EXISTING TOPOGRAPHIC LIDAR SURVEY PERFORMED BY WILSON AND COMPANY, DATED JUNE 6, 2019.
3. BATHYMETRIC SURVEY PERFORMED BY BURNS & MCDONNELL, DATED JULY 12, 2019.
4. COORDINATE GRID SHOWN IS IOWA STATE PLANE NAD27 SOUTH ZONE.

SURVEY CONTROL INFORMATION

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	401,500.000	2,259,610.000	-	PLANT MON #1
6	400,612.000	2,260,010.000	-	PLANT MON #6
22	401,644.010	2,260,250.890	689.060	3/8" X 12" SPIKE ON LEVEE
25	400,949.540	2,260,417.770	684.880	DRILLED HOLE IN CONCRETE
26	400,956.500	2,260,517.760	684.880	DRILLED HOLE IN CONCRETE
27	400,964.220	2,260,640.820	684.980	DRILLED HOLE IN CONCRETE
29	401,063.500	2,260,501.170	685.030	DRILLED HOLE IN CONCRETE
30	401,175.900	2,260,547.530	684.710	DRILLED HOLE IN CONCRETE
32	400,979.130	2,260,776.870	685.370	DRILLED HOLE IN CONCRETE
38	401,012.690	2,260,596.860	684.910	DRILLED HOLE IN CONCRETE
39	401,430.290	2,260,552.030	685.490	DRILLED HOLE IN CONCRETE
40	401,595.860	2,260,529.850	685.510	DRILLED HOLE IN CONCRETE
41	401,049.450	2,260,443.370	684.810	DRILLED HOLE IN CONCRETE
50	400,469.040	2,260,796.460	684.430	3/8" X 12" SPIKE
51	400,909.240	2,260,859.550	685.000	1/2" X 36" REBAR
52	400,749.110	2,260,736.260	684.710	3/8" X 12" SPIKE
56	400,405.460	2,260,128.340	685.370	3/8" X 12" SPIKE
1001	401,499.970	2,259,610.010	-	FIELD LOCATION MON #1
1006	400,612.000	2,260,010.000	682.520	HOLD LOCATION MON #6
A	401,307.000	2,260,235.000	685.100	DRILLED HOLE AT SOUTHEAST CORNER OF CONCRETE PAD
B	401,609.000	2,260,227.000	684.970	FOUND CUT "X" AT NORTHEAST CORNER OF CONCRETE WALL
C	401,440.000	2,260,660.000	687.160	ARROW ON WEST SIDE OF FIRE HYDRANT
D	401,036.000	2,260,731.000	688.440	ARROW ON NORTHEAST SIDE OF FIRE HYDRANT
E	400,440.000	2,260,668.000	686.910	ARROW ON EAST SIDE OF FIRE HYDRANT
F	400,440.000	2,260,195.000	685.990	ARROW ON SOUTHWEST SIDE OF FIRE HYDRANT
200	401,499.990	2,262,527.587	681.160	-
201	403,529.126	2,260,653.577	683.616	-
202	401,653.130	2,260,289.460	-	-
203	400,453.260	2,260,356.316	-	-
204	403,376.344	2,260,687.256	682.264	-
205	403,399.859	2,260,843.727	679.764	-
300	399,997.537	2,261,808.765	678.525	5/8" X 30" REBAR
301	400,506.662	2,262,781.305	662.76	5/8" X 30" REBAR
302	401,037.120	2,263,075.397	666.299	5/8" X 30" REBAR

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25221129.00
DRAWN:	12/16/2021
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DRAWN BY:	BSS/KP
CHECKED BY:	BSS/EJN
APPROVED BY:	PEG 08/21/2023

INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

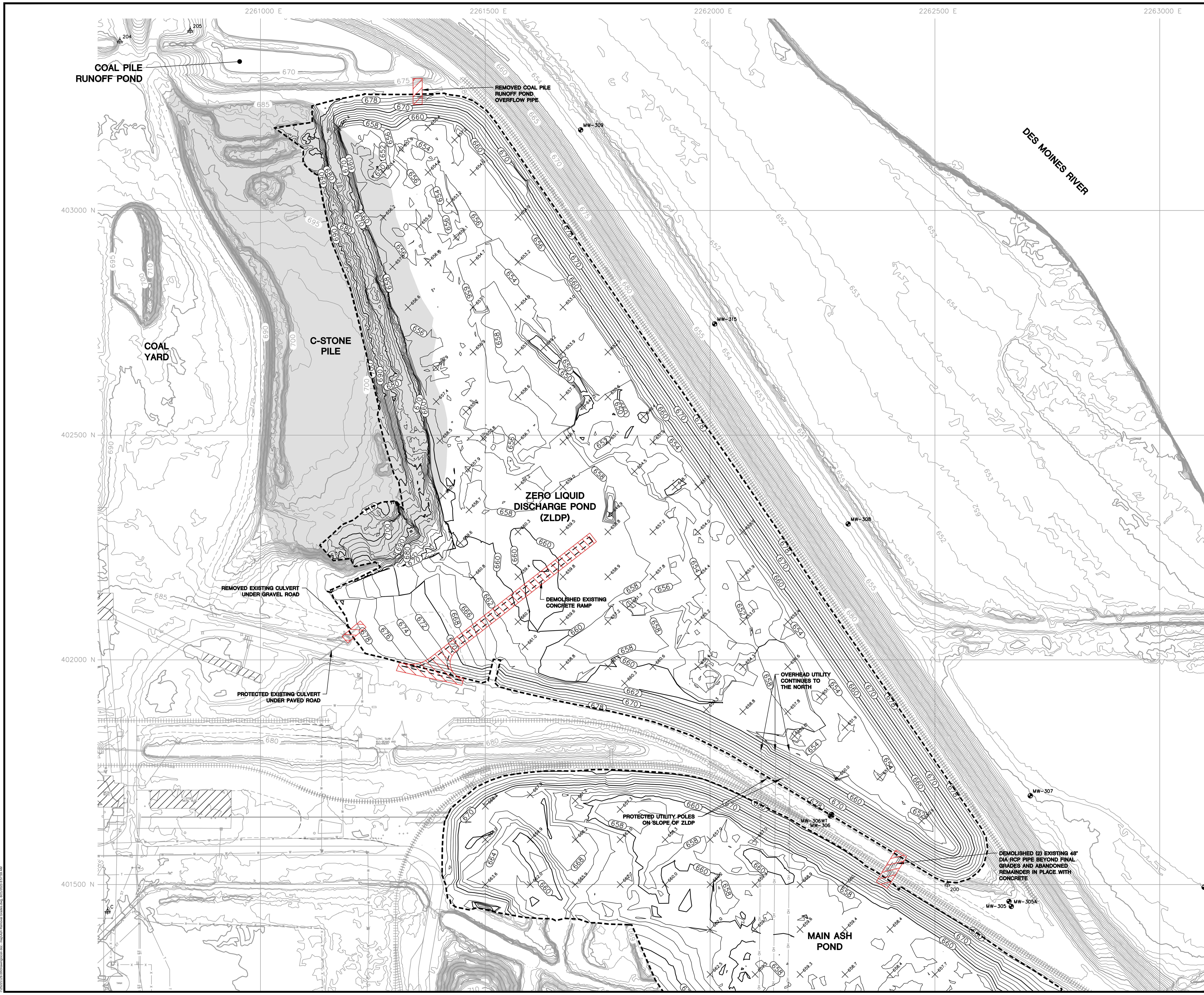
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

OVERALL SITE PLAN

SHEET
2 OF 15



LEGEND

660	DOCUMENTED EXCAVATION GRADE (10' CONTOUR)
658	DOCUMENTED EXCAVATION GRADE (2' CONTOUR)
653.0	DOCUMENTED EXCAVATION GRADE SPOT ELEVATION
	DOCUMENTED EXCAVATION LIMITS
660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	GRAVEL/DIRT ROAD
x x x	FENCE
	RAILROAD TRACKS
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	APPROXIMATE ORIGINAL EXTENTS OF C-STONE PILE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION (SHADED AREA IN DOCUMENTED EXCAVATION EXTENTS) WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. ZLD POND WAS DEWATERED AND WATER PUMPED TO THE MAIN ASH POND.
4. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE ZLD POND.
5. GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES AND C-STONE PILE RELOCATION.

PROJECT NO. 25221129.00	DRAWN BY: BSS/KP		
DRAWN: 02/18/2022	CHECKED BY: BSS/EJN		
REVISED: 08/21/2023	APPROVED BY: PEG 08/21/2023		

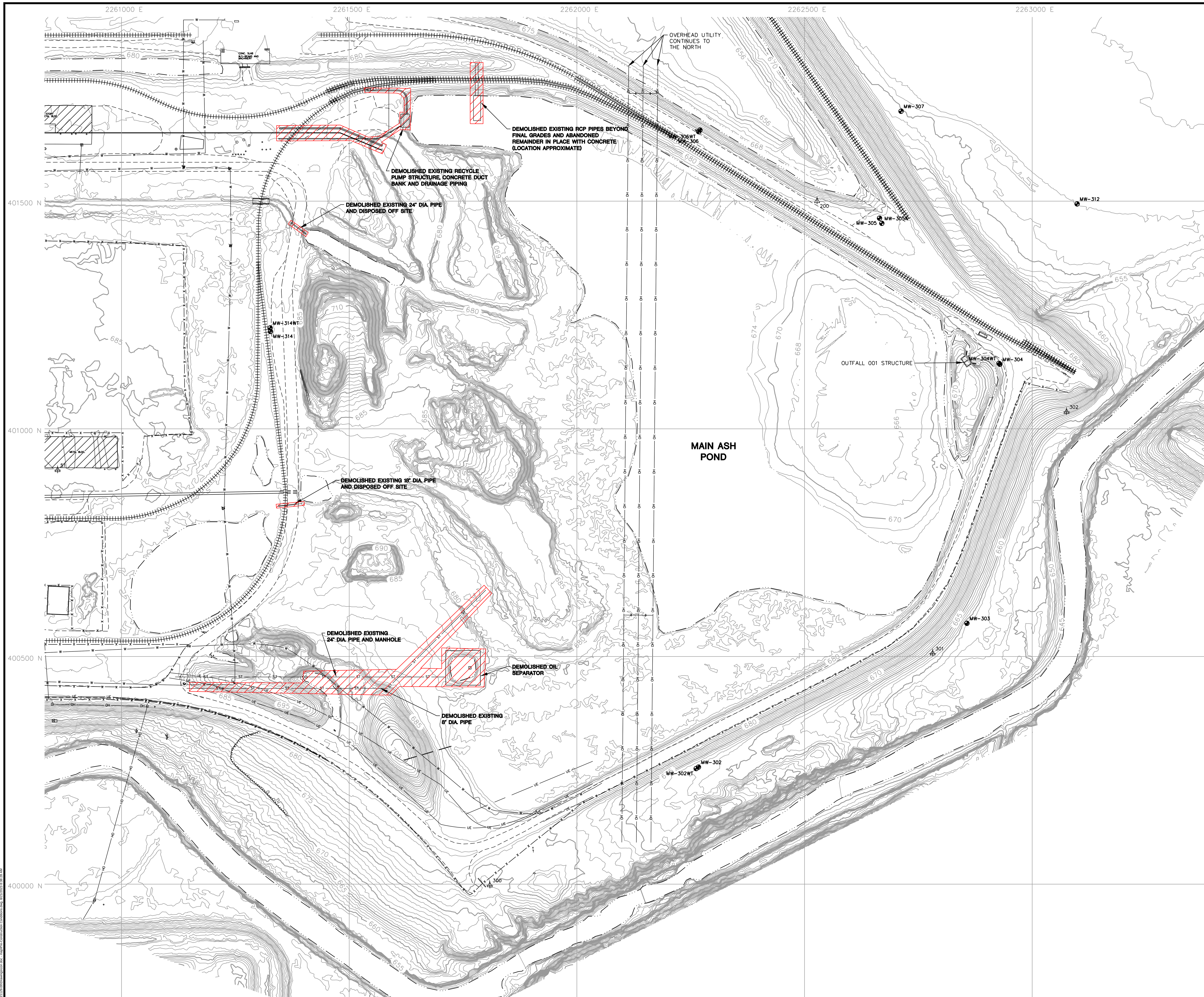
INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501
CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

ZLDP EXCAVATION GRADES

SHEET
3 OF 15



LEGEND	
660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	PAVED ROAD
	GRAVEL/DIRT ROAD
—x—x—x—	FENCE
	RAILROAD TRACKS
	EDGE OF WATER
—OH—	OVERHEAD UTILITY
—ST—	STORM SEWER
—T—	TELEPHONE
—UE—	UNDERGROUND ELECTRIC
—W—	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. LIMITS OF DEMOLITION SHOWN ARE APPROXIMATE.
3. CONCRETE DEMOLITION MATERIAL SEGREGATED FROM REBAR AND PRE-SIZED TO APPROXIMATE 1 FOOT DIAMETER PIECES AND PLACED WITHIN THE MAIN ASH POND UNDER THE FINAL COVER.
4. EXISTING PUMP STRUCTURE FOUNDATION REMOVED TO 3 FEET BELOW AIR HEATER WASH BASIN LINER SUBGRADES.
5. IMPACTED SOIL WITHIN THE OIL SEPARATOR FOOTPRINT DISPOSED OFF SITE BASED ON VISUAL INSPECTION BY OWNER'S REPRESENTATIVE.

N

100 0 100

SCALE: 1" = 100'

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
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INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
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PHONE: (608) 224-2830

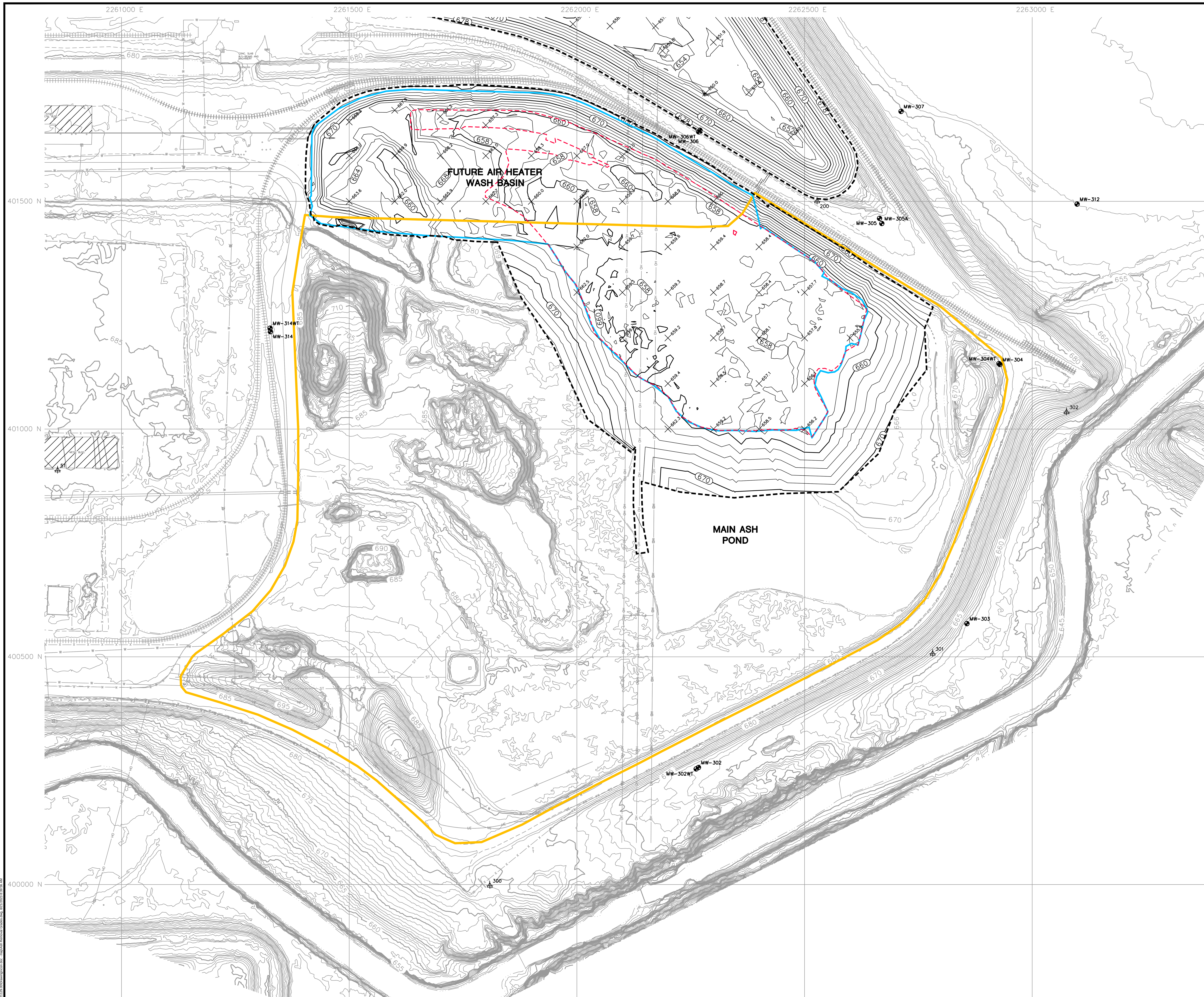
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

PRE-CONSTRUCTION CONDITIONS AND DEMOLITION

SHEET
4 OF 15



LEGEND

(660)	DOCUMENTED EXCAVATION GRADE (10' CONTOUR)
(658)	DOCUMENTED EXCAVATION GRADE (2' CONTOUR)
653.0	DOCUMENTED EXCAVATION GRADE SPOT ELEVATION
	DOCUMENTED EXCAVATION LIMITS
	DOCUMENTED LIMITS OF CCR REMOVAL AND CLEAN BACKFILL
660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	GRAVEL/DIRT ROAD
	FENCE
	RAILROAD TRACKS
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	LIMIT OF MAP FINAL COVER
	MAY 17, 2022 SHALLOW POTENTIOMETRIC SURFACE INTERSECTING ESTIMATED ORIGINAL DESIGN POND BOTTOM

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. MAIN ASH POND WAS DEWATERED AND WATER PUMPED TO THE NORTHEAST OUTFALL 001 STRUCTURE.
3. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE AIR HEATER WASH BASIN AREA AND PORTIONS OF THE MAIN ASH POND AND PLACED WITHIN THE MAIN ASH POND FINAL COVER AREA. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE MAIN ASH POND WITHIN THE EXCAVATION EXTENTS.
4. GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES.

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
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REVISED:	08/21/2023	APPROVED BY:	PEG 08/21/2023

INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
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PHONE: (608) 224-2830

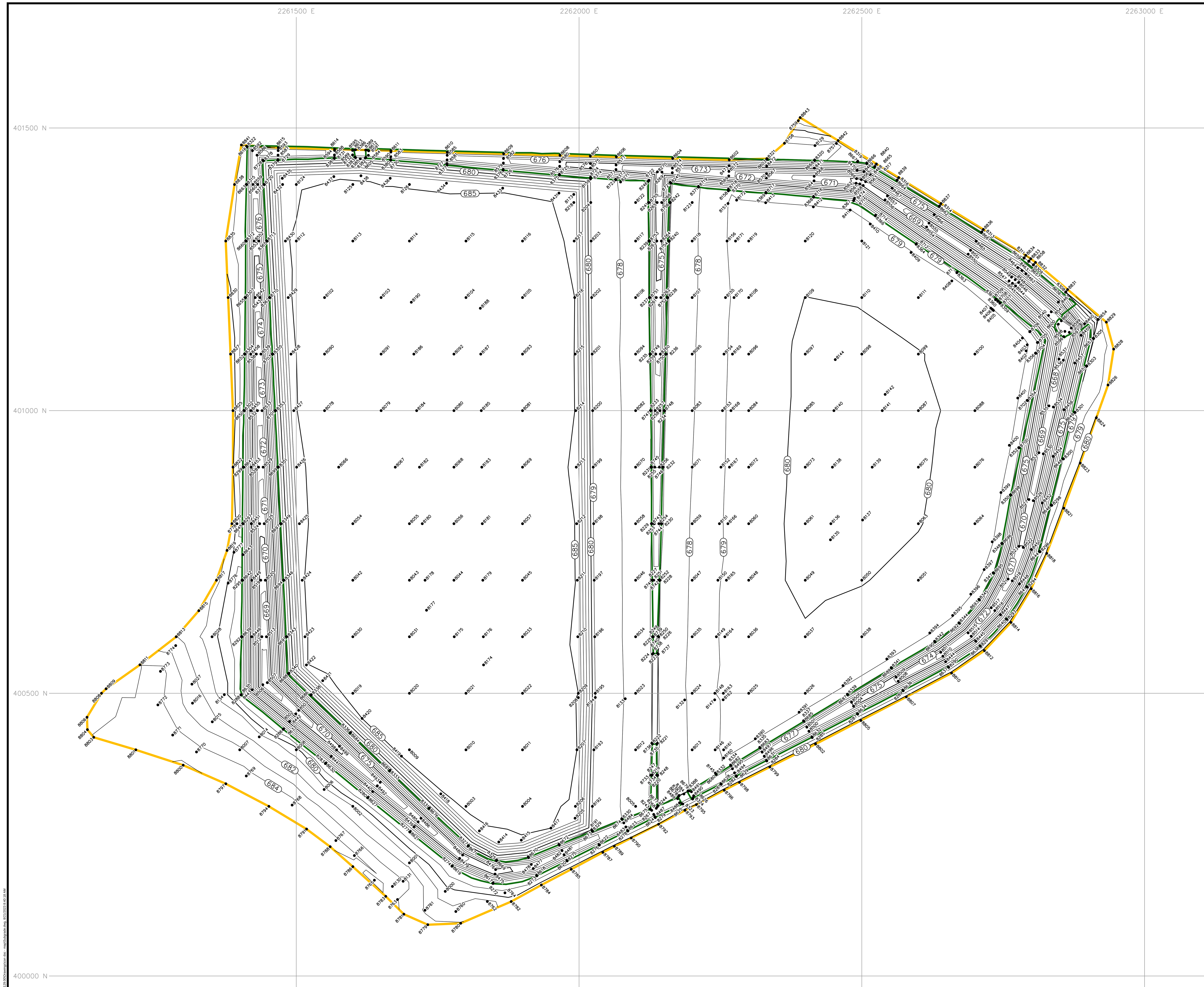
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

AHWB AND MAP EXCAVATION GRADES

SHEET
5 OF 15



LEGEND

685	DOCUMENTED MAP GRADE (5' CONTOUR)
681	DOCUMENTED MAP GRADE (1' CONTOUR)
8008	SURVEY DOCUMENTATION POINT
	LIMIT OF MAP FINAL COVER
	LIMIT OF HYDROTURF FINAL COVER

NOTES:

1. GRADES SHOWN REPRESENT DOCUMENTED MAP FINAL COVER SUBGRADES.

N

80 0 80

SCALE: 1" = 80'

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INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
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PHONE: (608) 224-2830

ENGINEER

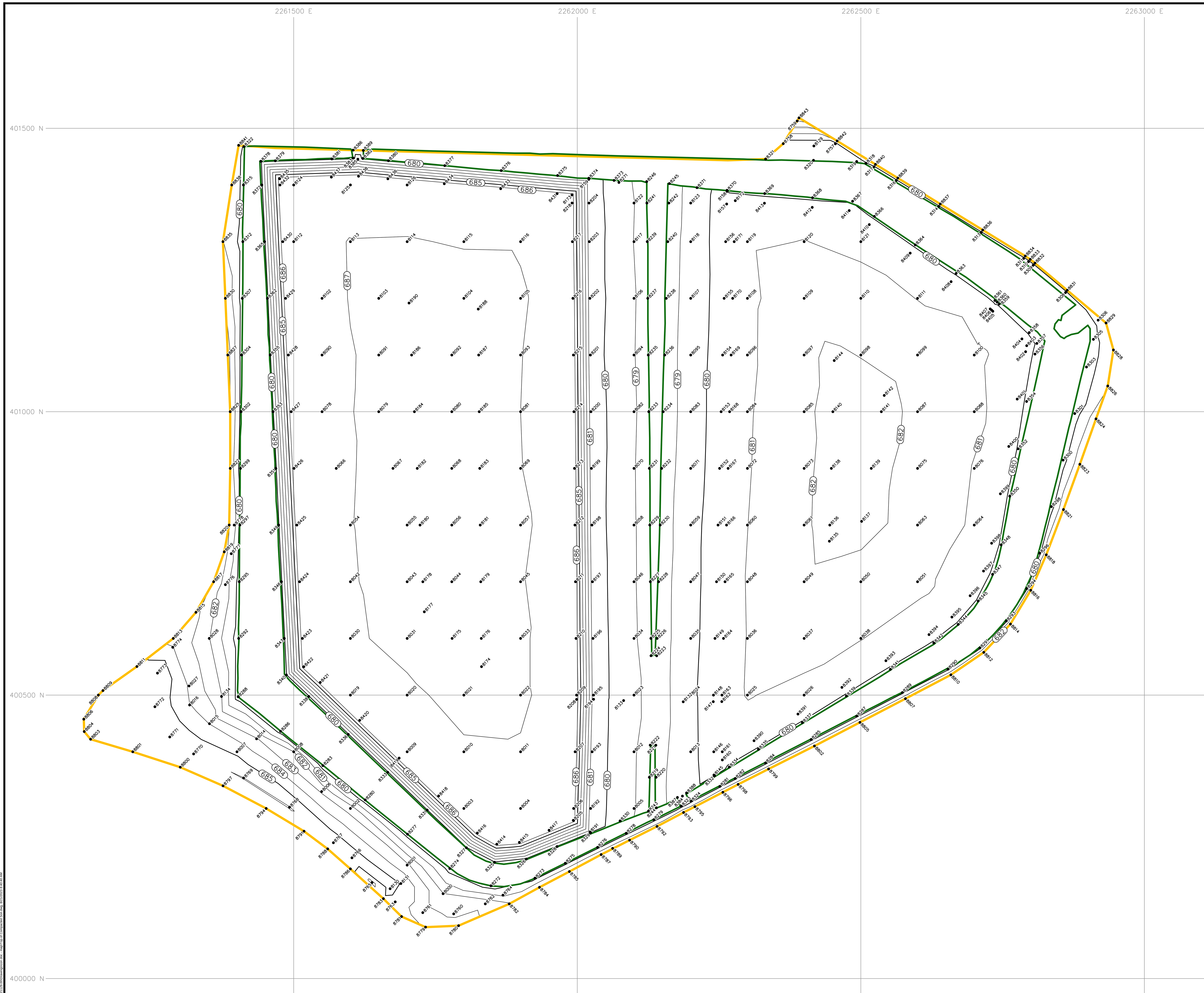
MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

FINAL COVER SUBGRADE WITH DOCUMENTATION POINTS

SHEET

6 OF 15



LEGEND

685	DOCUMENTED MAP GRADE (5' CONTOUR)
681	DOCUMENTED MAP GRADE (1' CONTOUR)
6008	SURVEY DOCUMENTATION POINT
	LIMIT OF MAP FINAL COVER
	LIMIT OF HYDROTURF FINAL COVER

NOTES:

1. GRADES SHOWN REPRESENT DOCUMENTED MAP TOP OF COMPACTED SOIL COVER GRADES.

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
DRAWN:	02/16/2022	CHECKED BY:	BSS/EJN
REVISED:	08/17/2023	APPROVED BY:	PEG 08/21/2023

CLIENT: INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

SITE: MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

TOP OF COMPACTED SOIL COVER WITH DOCUMENTATION POINTS

SHEET 7 of 15

LEGEND

- 685 DOCUMENTED MAP GRADE (5' CONTOUR)
- 681 DOCUMENTED MAP GRADE (1' CONTOUR)
- 8008 SURVEY DOCUMENTATION POINT
- LIMIT OF MAP FINAL COVER
- LIMIT OF HYDROTURF FINAL COVER

NOTES:

1. GRADES SHOWN REPRESENT DOCUMENTED MAP TOP OF TOPSOIL GRADES.

N

80 0 80

SCALE: 1" = 80'

DRAWN BY:	BSS/KP
CHECKED BY:	BSS/EJN
APPROVED BY:	PEG 08/21/2023
PROJECT NO.	25221129.00
DRAWN:	02/16/2022
REVISED:	08/21/2023

INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

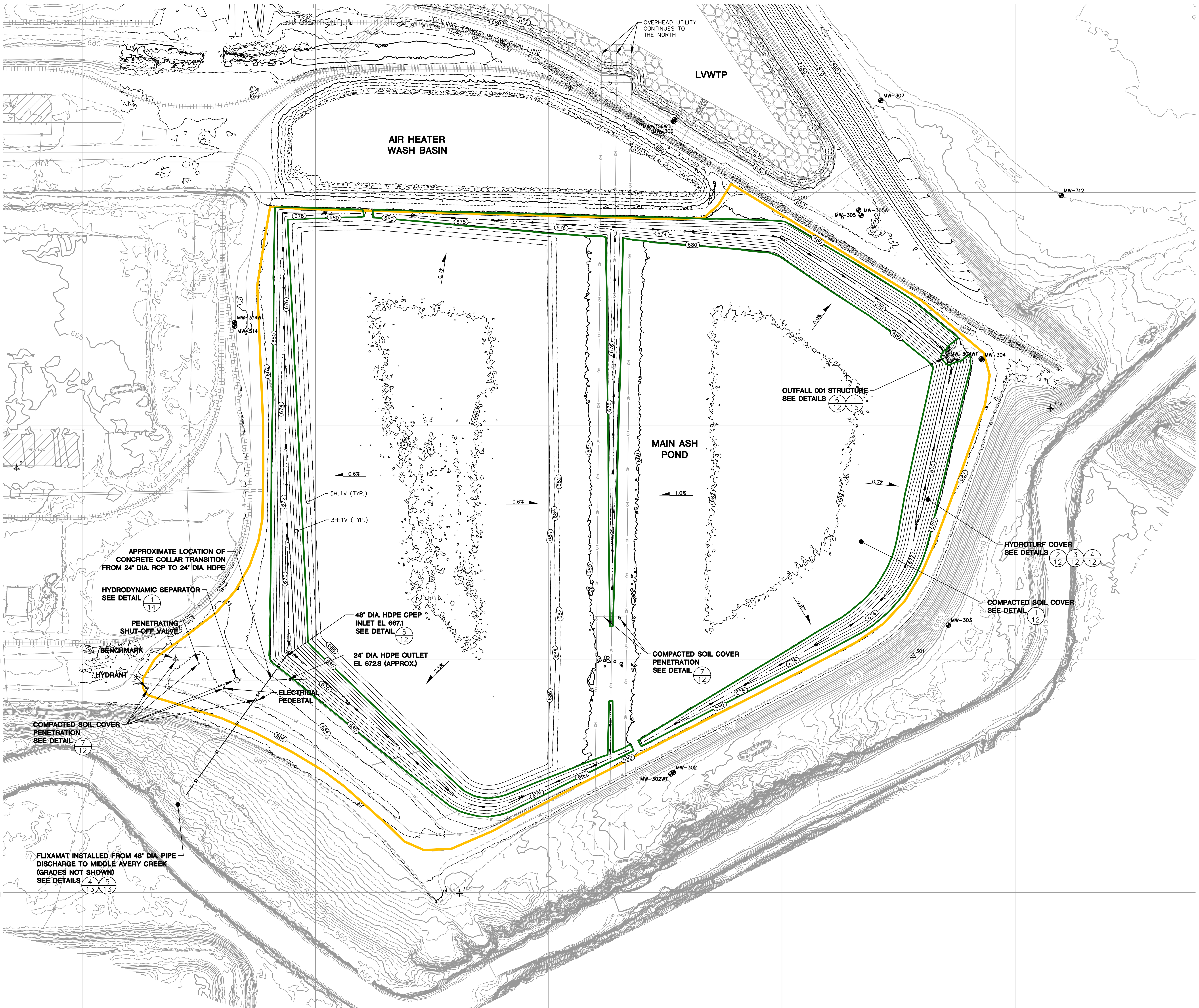
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

TOP OF TOPSOIL GRADES WITH
DOCUMENTATION POINTS

SHEET
8 of 15



LEGEND

680	DOCUMENTED FINAL GRADE (10' CONTOUR) (SEE NOTE 2)
682	DOCUMENTED FINAL GRADE (2' CONTOUR) (SEE NOTE 2)
660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	PAVED ROAD
	GRAVEL/DIRT ROAD
—X—X—X—	FENCE
	RAILROAD TRACKS
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	INSTALLED CULVERT
	LIMITS OF MAP FINAL COVER
	LIMIT OF HYDROTURF FINAL COVER
	SWALE
0.7%	SLOPE AND DIRECTION

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. CONTOURS REPRESENT DRONE SURVEY GRADES FROM JUNE 19, 2023 SURVEY BY RYAN INCORPORATED CENTRAL SUPPLEMENTED BY GROUND SURVEY BY FRENCH-RENEKER & ASSOCIATES.

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
DRAWN:	12/16/2021	CHECKED BY:	BSS/EJN
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INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

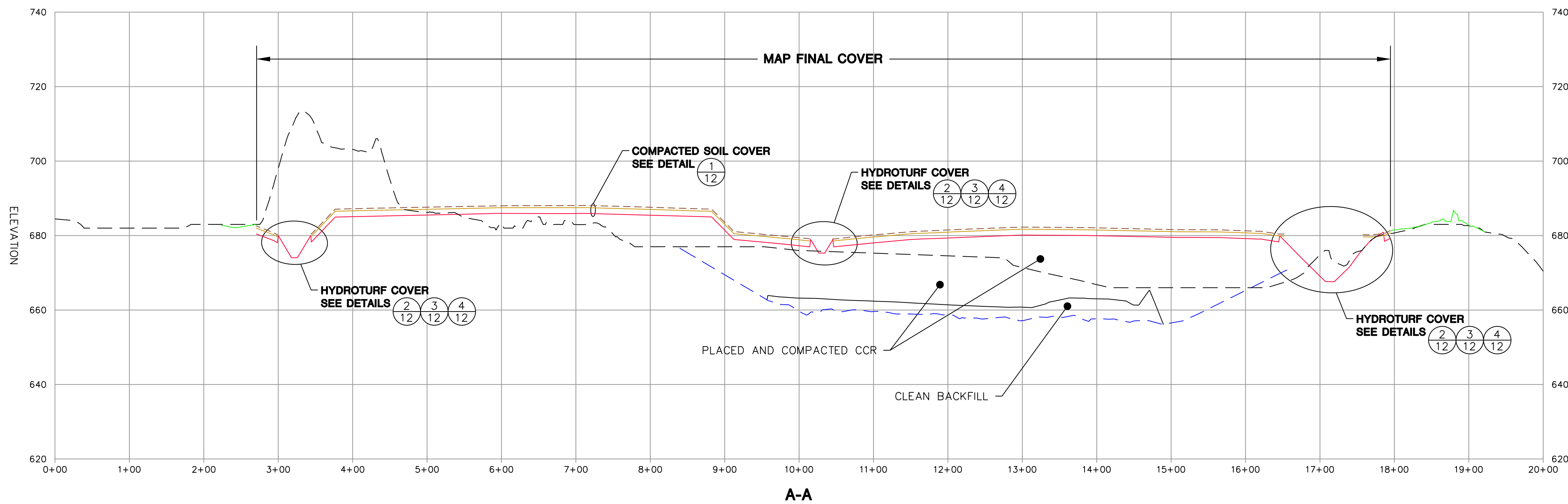
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

FINAL SITE CONDITIONS

SHEET
9 OF 15



A-A

LEGEND

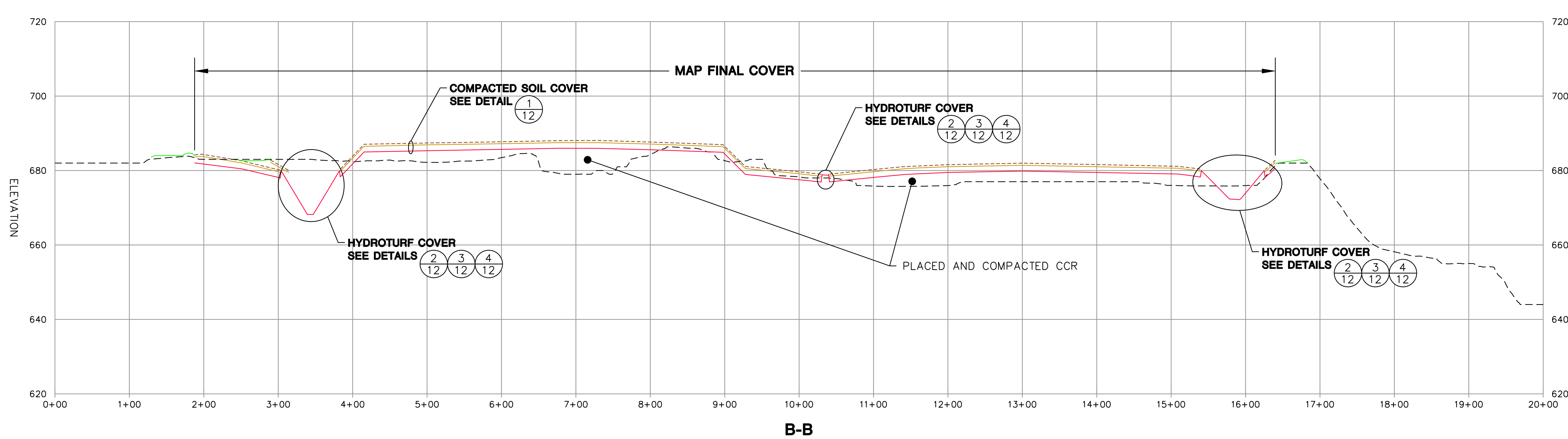
- PRE-CONSTRUCTION GRADE
- DOCUMENTED MAP/AHWB EXCAVATION GRADE
- DOCUMENTED TOP OF CLEAN BACKFILL
- DOCUMENTED MAP SUBGRADE
- DOCUMENTED MAP TOP OF COMPACTED SOIL
- DOCUMENTED MAP TOP OF TOPSOIL
- FINAL EXTERIOR GRADES (RIC)

NOTES:

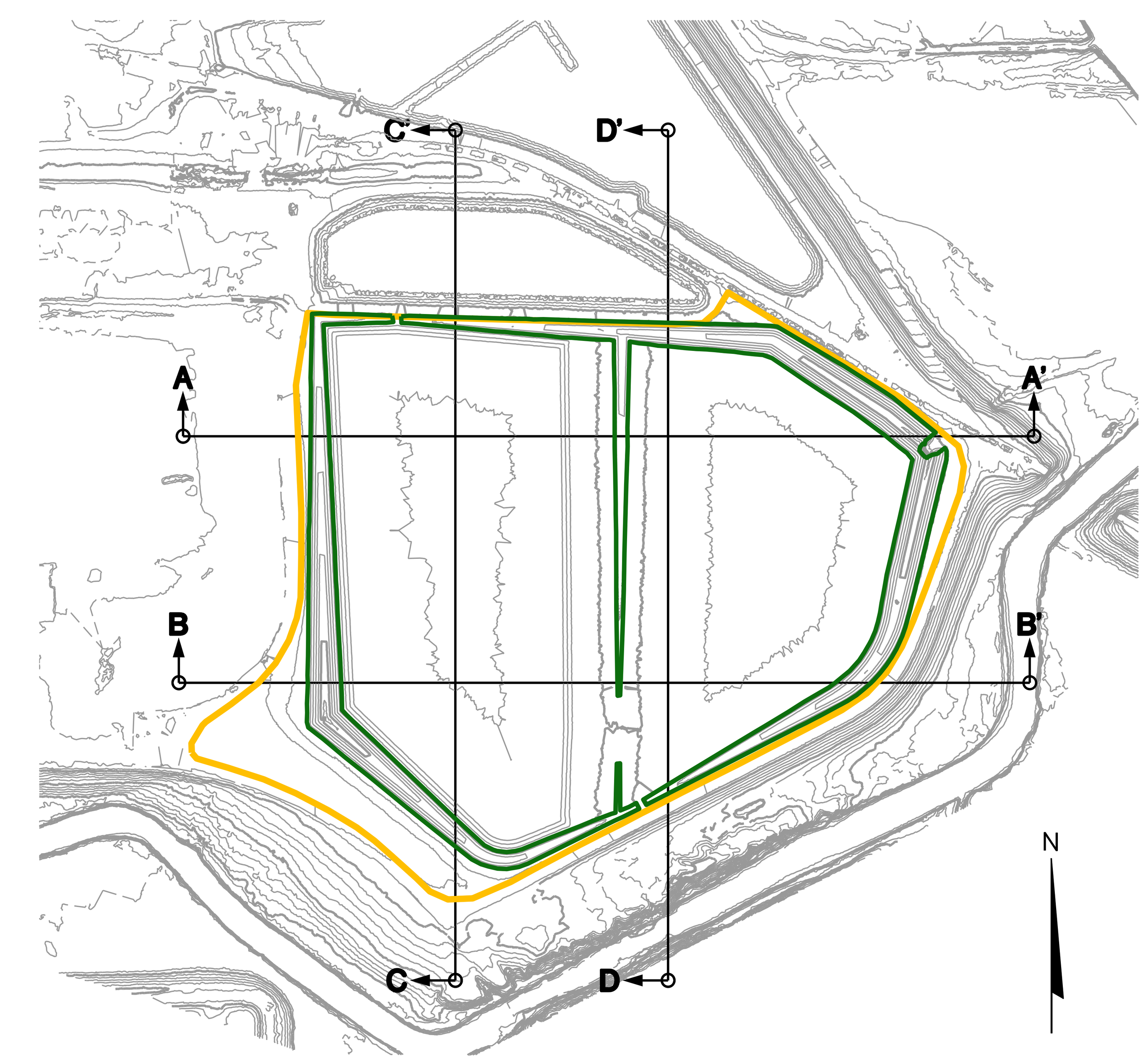
1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE AIR HEATER WASH BASIN AREA AND PORTIONS OF THE MAIN ASH POND AND PLACED WITHIN THE MAIN ASH POND FINAL COVER AREA. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE MAIN ASH POND WITHIN THE EXCAVATION EXTENTS.
3. EXCAVATION GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES.
4. CLEAN FILL BACKFILL GRADES SURVEYED BY RYAN INCORPORATED CENTRAL DURING CONSTRUCTION. CLEAN BACKFILL GRADES SHOWN IN THE AHWB AREA SURVEYED BY ABACI CONSULTING, INC. DURING CONSTRUCTION.
5. GRADES SHOWN WITHIN THE MAP FINAL COVER LIMITS DOCUMENTED BY FRENCH-RENEKER & ASSOCIATES DURING CONSTRUCTION. GRADES OUTSIDE THE MAP FINAL COVER LIMITS REPRESENT DRONE SURVEY GRADES FROM JUNE 19, 2023 SURVEY BY RYAN INCORPORATED CENTRAL.

100 0 100

SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION'



B-B



CROSS SECTION LOCATION MAP

SCALE: 1" = 300'

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
DRAWN:	12/16/2021	CHECKED BY:	BSS/EJN
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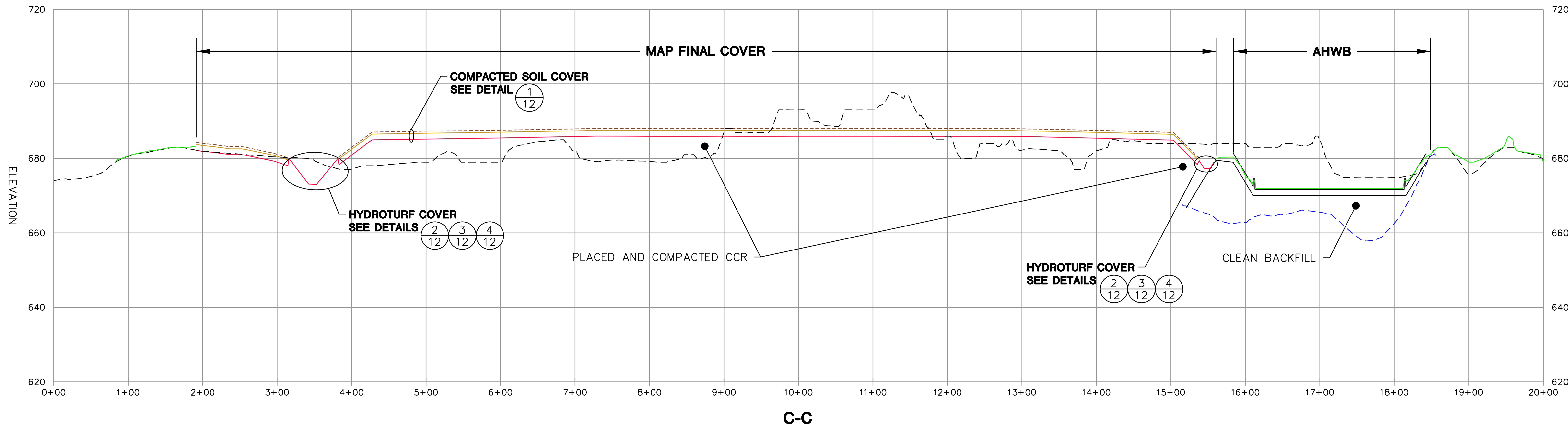
INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501
CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

CROSS SECTIONS

SHEET
10 OF 15



C-C

LEGEND

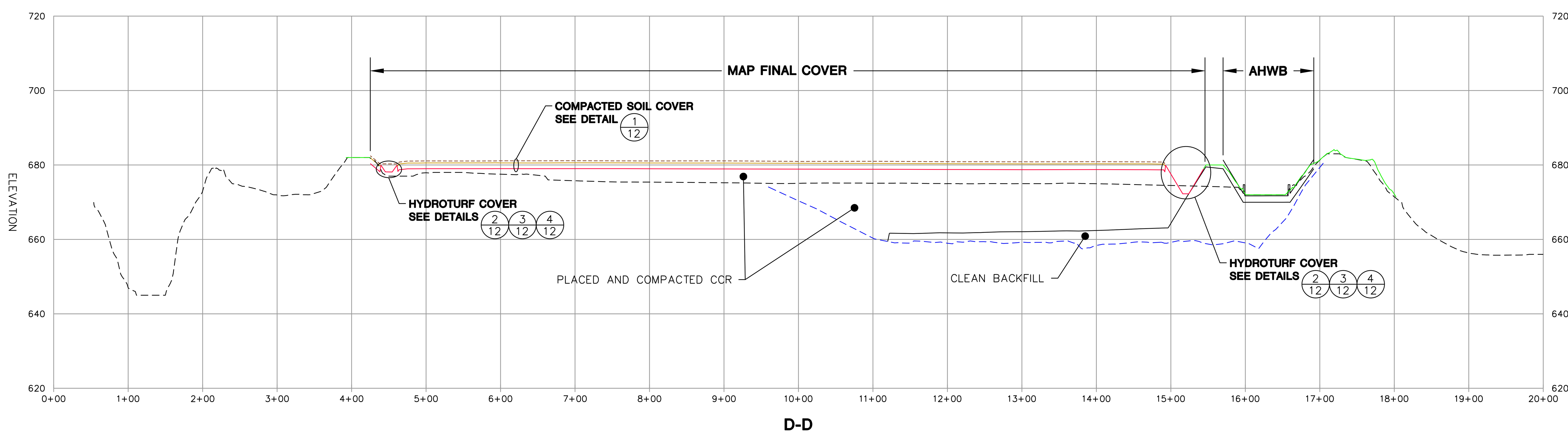
- PRE-CONSTRUCTION GRADE
- DOCUMENTED MAP/AHWB EXCAVATION GRADE
- DOCUMENTED TOP OF CLEAN BACKFILL
- DOCUMENTED MAP SUBGRADE
- DOCUMENTED MAP TOP OF COMPACTED SOIL
- DOCUMENTED MAP TOP OF TOPSOIL
- FINAL EXTERIOR GRADES (RIC)

NOTES:

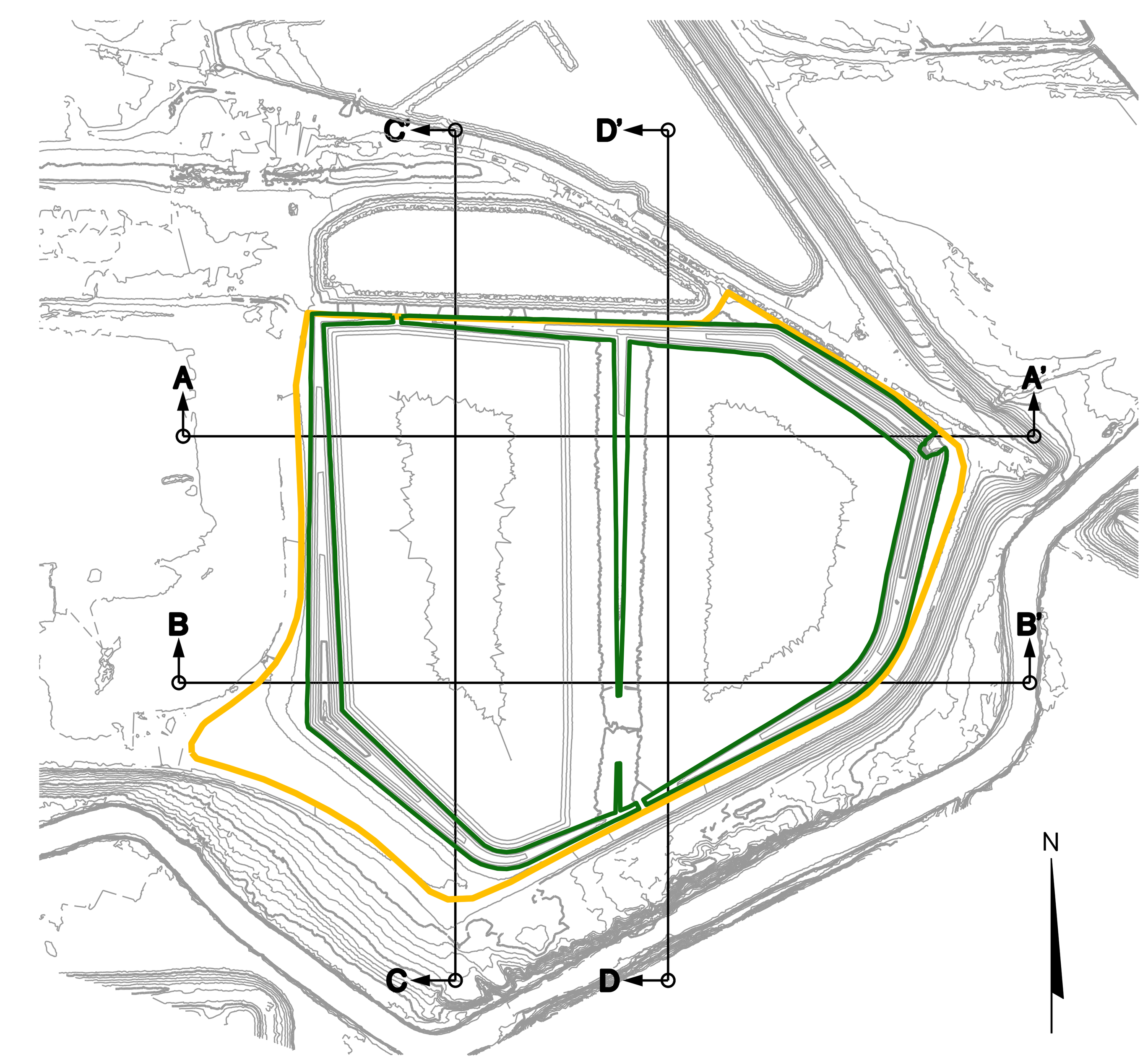
1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE AIR HEATER WASH BASIN AREA AND PORTIONS OF THE MAIN ASH POND AND PLACED WITHIN THE MAIN ASH POND FINAL COVER AREA. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE MAIN ASH POND WITHIN THE EXCAVATION EXTENTS.
3. EXCAVATION GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES.
4. CLEAN FILL BACKFILL GRADES SURVEYED BY RYAN INCORPORATED CENTRAL DURING CONSTRUCTION. CLEAN BACKFILL GRADES SHOWN IN THE AHWB AREA SURVEYED BY ABACI CONSULTING, INC. DURING CONSTRUCTION.
5. GRADES SHOWN WITHIN THE MAP FINAL COVER LIMITS DOCUMENTED BY FRENCH-RENEKER & ASSOCIATES DURING CONSTRUCTION. GRADES OUTSIDE THE MAP FINAL COVER LIMITS REPRESENT DRONE SURVEY GRADES FROM JUNE 19, 2023 SURVEY BY RYAN INCORPORATED CENTRAL.

100 0 100

SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION'



D-D



CROSS SECTION LOCATION MAP
SCALE: 1" = 300'

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
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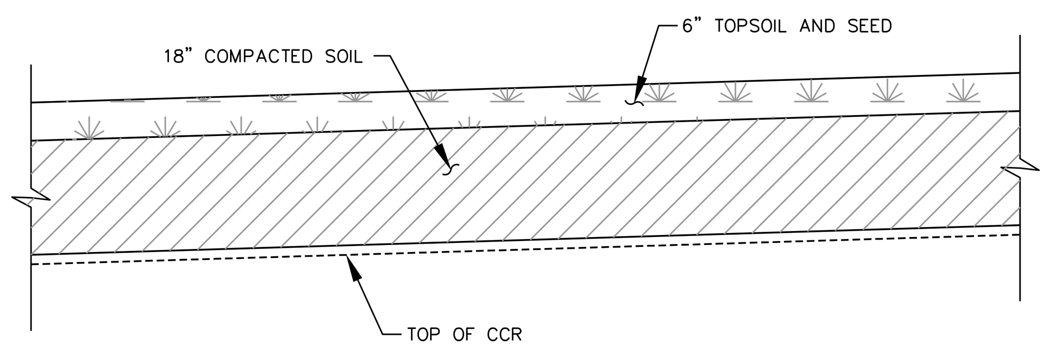
CLIENT: INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

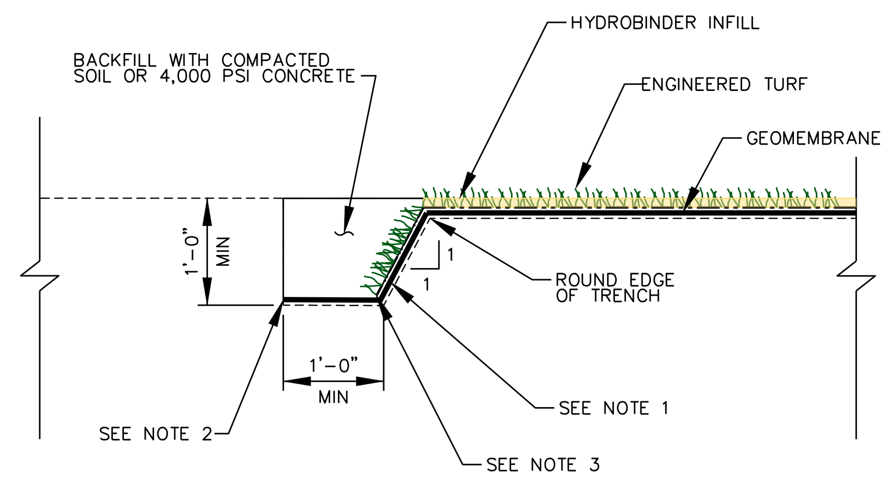
SITE: MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

CROSS SECTIONS

SHEET 11 of 15



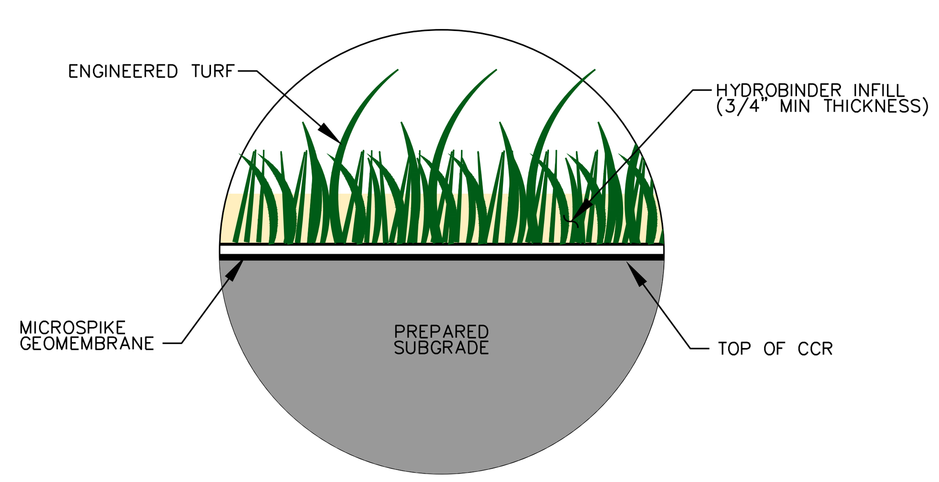
1/12 **COMPACTED SOIL COVER**
NOT TO SCALE



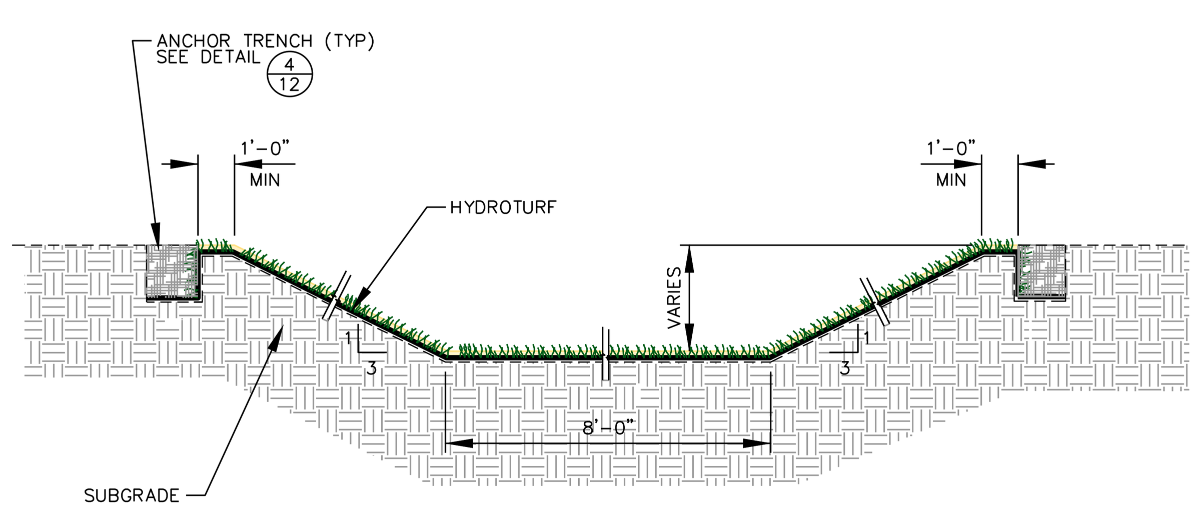
NOTES:

1. THE GEOMEMBRANE COMPONENT OF HYDROTURF CS IN INTIMATE CONTACT WITH THE ANCHOR TRENCH INSIDE WALL AND BOTTOM. WRINKLES, RIPPLES, FISH MOUTHS, AND / OR BUNCHING REMOVED AND PROPERLY PATCHED. DURING FILLING OF THE ANCHOR TRENCH WITH THE COMPACTED SOIL OR CONCRETE BACKFILL, GEOMEMBRANE IN INTIMATE CONTACT WITH THE TRENCH WALL AND BOTTOM MAINTAINED. CONCRETE BACKFILL VIBRATED IN PLACE IN ACCORDANCE WITH STANDARD INDUSTRY TECHNIQUES.
2. GEOMEMBRANE TRIMMED SHORT OF THE OUTSIDE WALL AND EXTENDED A MINIMUM OF 3/4 OF THE WIDTH OF THE ANCHOR TRENCH.
3. THE ENGINEERED TURF COMPONENT OF HYDROTURF CS IN INTIMATE CONTACT WITH THE GEOMEMBRANE. WRINKLES, RIPPLES, FISH MOUTHS, AND / OR BUNCHING REMOVED AND PROPERLY PATCHED. THE ENGINEERED SYNTHETIC TURF TRIMMED SO THAT IT DOES NOT EXTEND ONTO THE BOTTOM OF THE ANCHOR TRENCH. TRIMMED JUST SHORT OF THE BOTTOM AND EXTENDED A MINIMUM OF 3/4 OF THE DEPTH OF THE ANCHOR TRENCH.

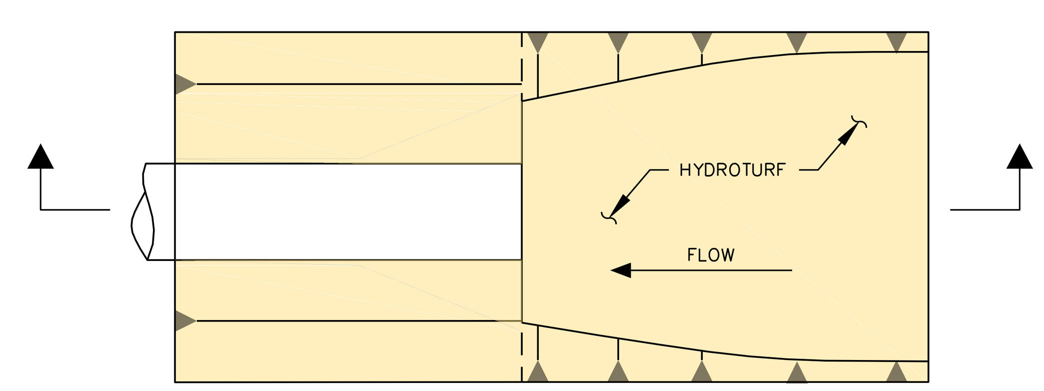
4/12 **HYDROTURF CS TYPICAL ANCHOR TRENCH TERMINATION**
NOT TO SCALE



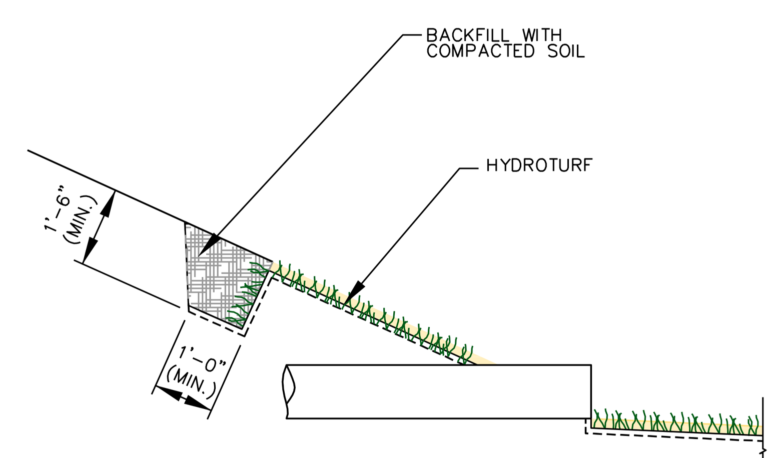
2/12 **HYDROTURF CS TYPICAL SECTION WITH MICROSPIKE GEOMEMBRANE**
NOT TO SCALE



3/12 **HYDROTURF REVETMENT SYSTEM**
NOT TO SCALE

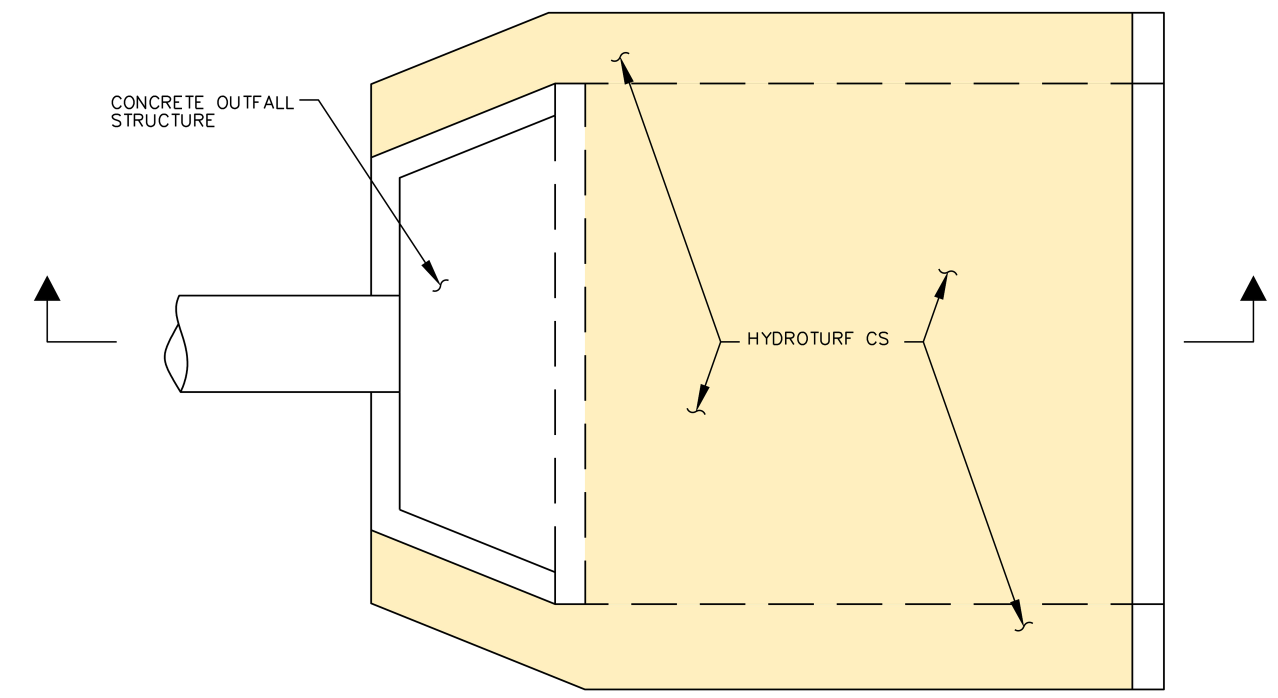


PLAN

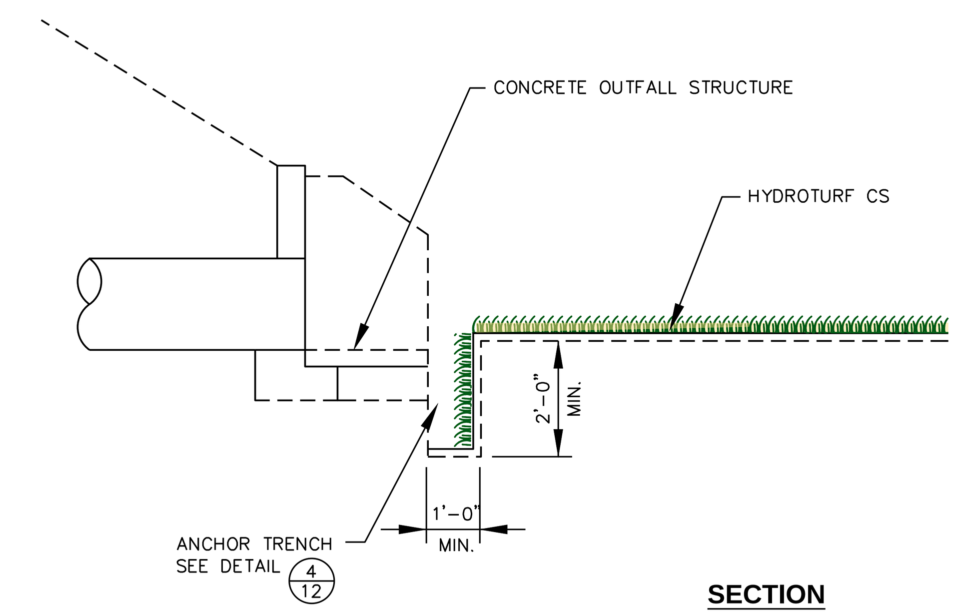


SECTION

5/12 **HYDROTURF REVETMENT SYSTEM AT OUTFALL PIPE**
NOT TO SCALE



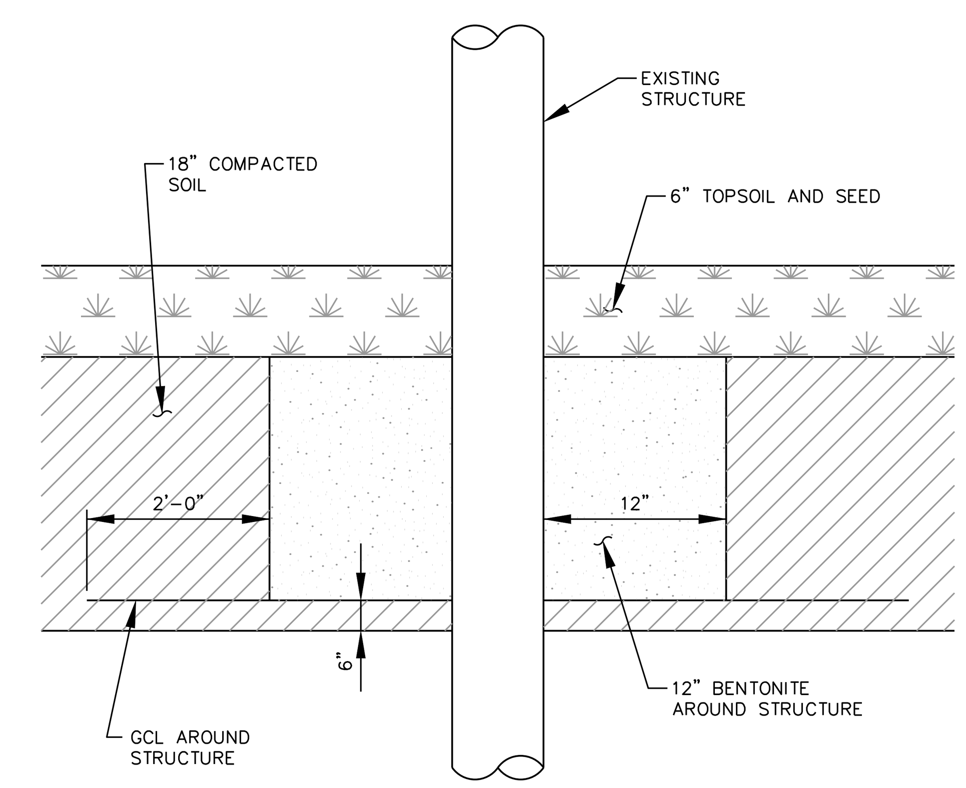
PLAN



SECTION

NOTES:
1. HYDROTURF INSTALLED PER DETAIL AT INTERFACE WITH OUTFALL 001 STRUCTURE.

6/12 **HYDROTURF REVETMENT SYSTEM OUTLET STRUCTURE WITH HEADWALL**
NOT TO SCALE



7/12 **COMPACTED SOIL COVER PENETRATION**
NOT TO SCALE

NOTES:
1. DETAILS ARE FROM THE BURNS & MCDONNELL MARCH 2021, AUGUST 2021, AND SEPTEMBER 2022 DRAWINGS SETS AND UPDATED BASED ON CONSTRUCTED CONDITIONS.

PROJECT NO. 2522129.00	DRAWN BY: BSS/KP		
DRAWN: 02/16/2022	CHECKED BY: BSS/EJN		
REVISED: 08/17/2023	APPROVED BY: PEG 08/21/2023		

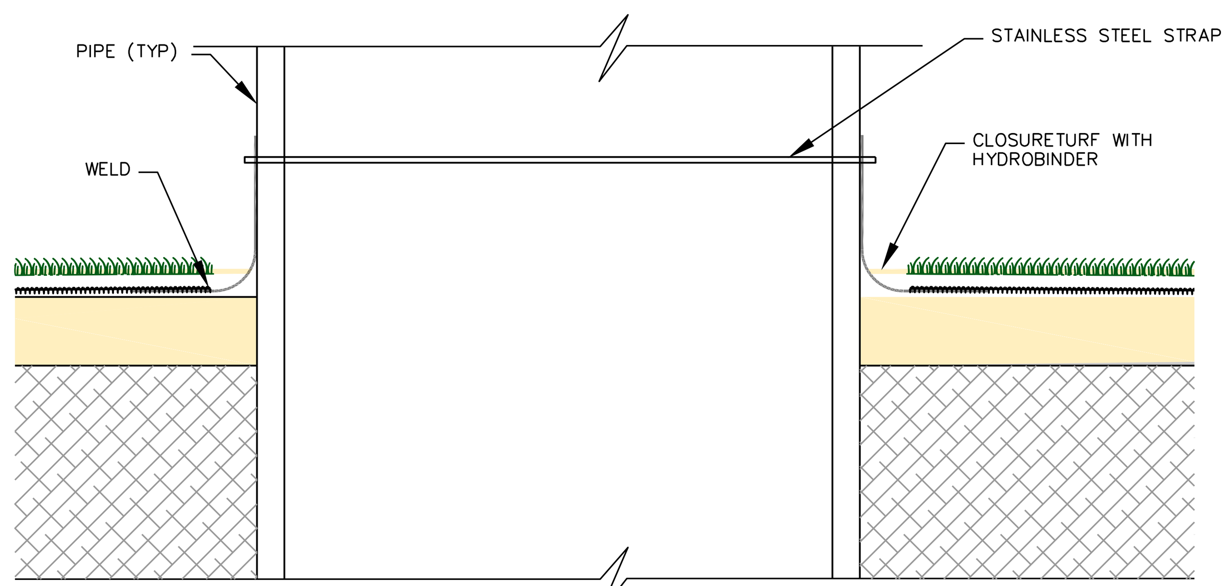
INTERSTATE POWER AND LIGHT COMPANY
20775 POWER PLANT ROAD
OTTUMWA, IA 52501
CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830
ENGINEER

MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

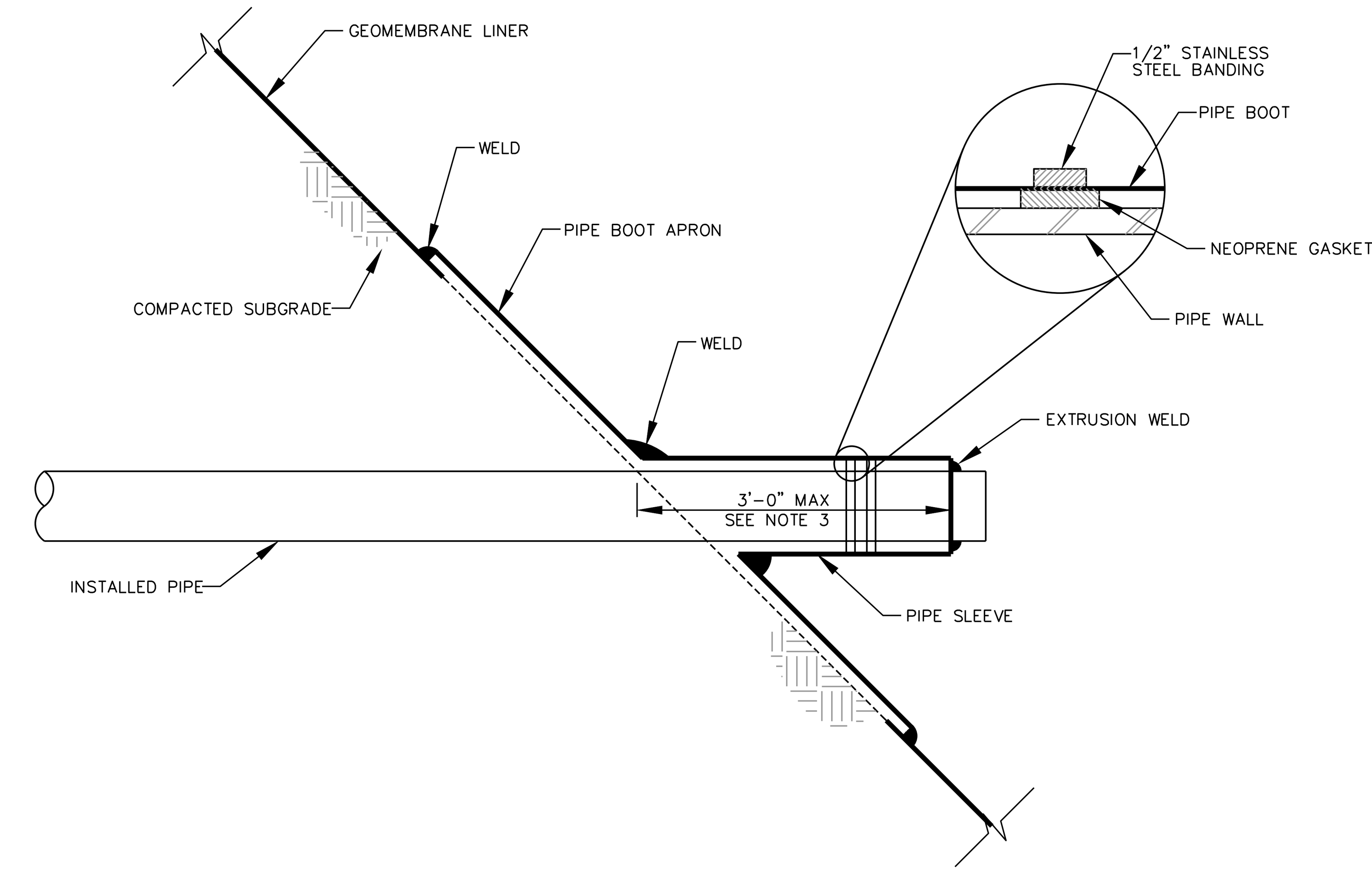
DETAILS

SHEET
12 OF 15



1/13 **TYPICAL PIPE BOOT**

NOT TO SCALE

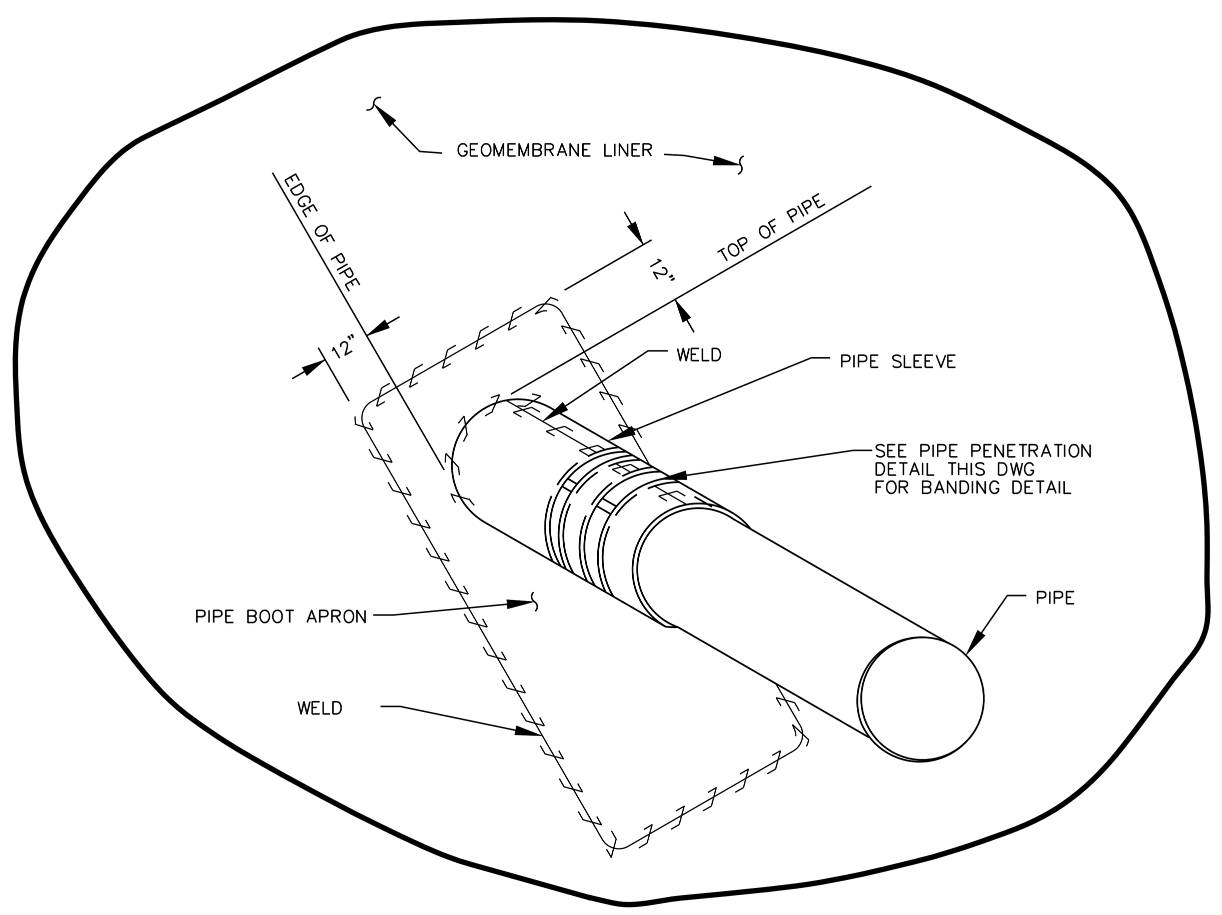


NOTES:

1. SEE PIPE PENETRATION ISOMETRIC FOR LIMITS OF PIPE BOOT APRON.
2. BOOT SAME MATERIAL AND THICKNESS AS MAIN GEOMEMBRANE LINER.
3. LINER COVER MATERIAL NOT SHOWN FOR THE SAKE OF CLARITY.

2/13 **PIPE PENETRATION DETAIL**

NOT TO SCALE

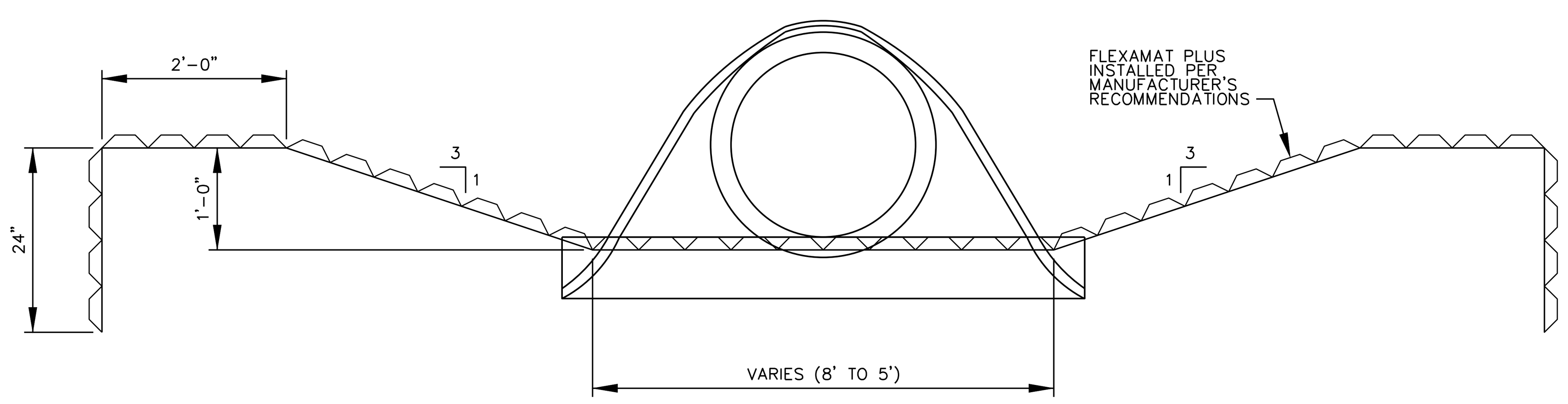


NOTES:

1. SEE PIPE PENETRATION DETAIL FOR LIMITS OF PIPE SLEEVE.
2. BOOT SAME MATERIAL AND THICKNESS AS MAIN GEOMEMBRANE LINER.
3. LINER COVER MATERIAL NOT SHOWN FOR THE SAKE OF CLARITY. SEE PLANS, SECTIONS, AND DETAILS FOR LINER COVER. NO LINER MATERIAL EXPOSED ON THE SLOPE.

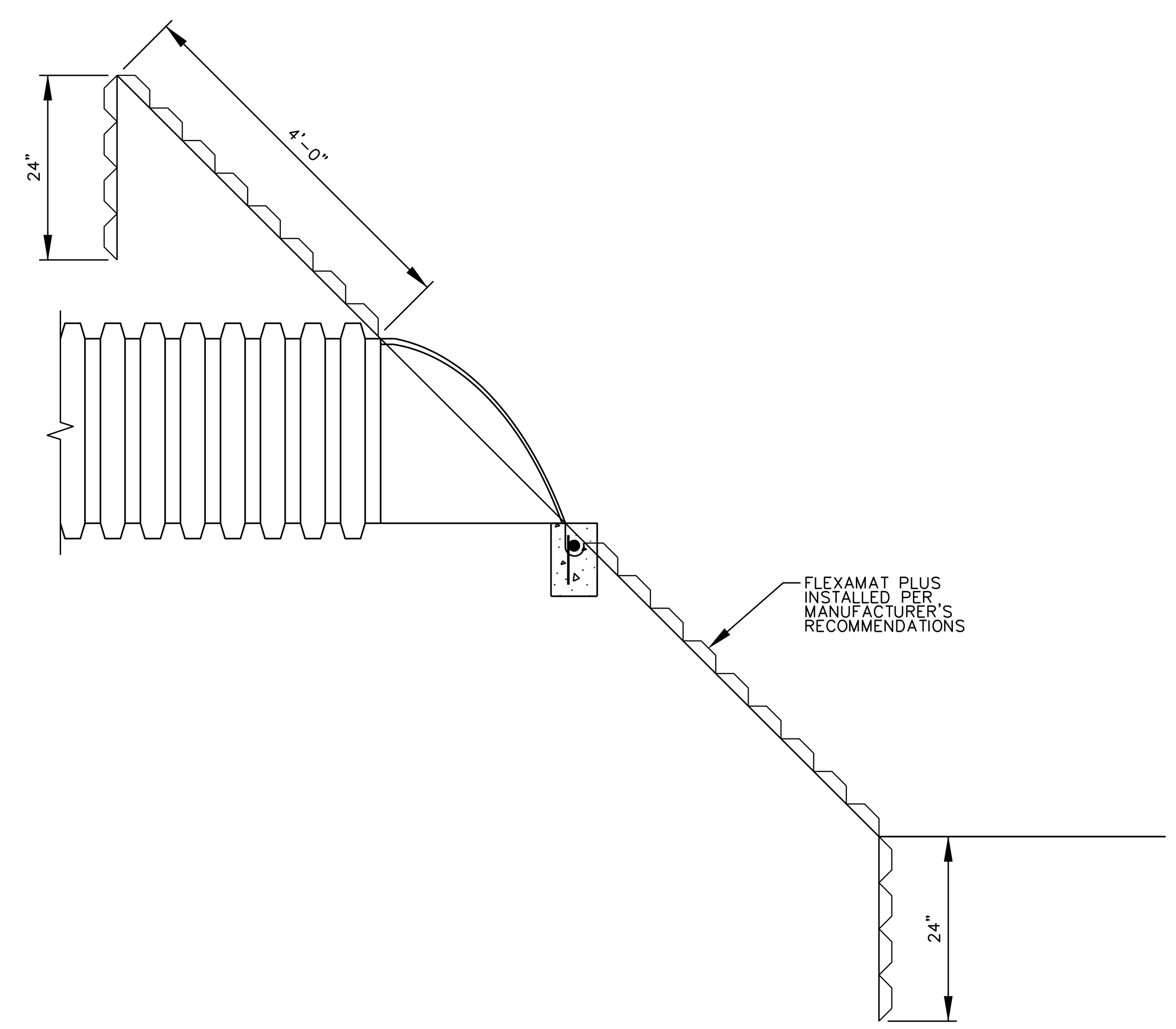
3/13 **PIPE PENETRATION ISOMETRIC**

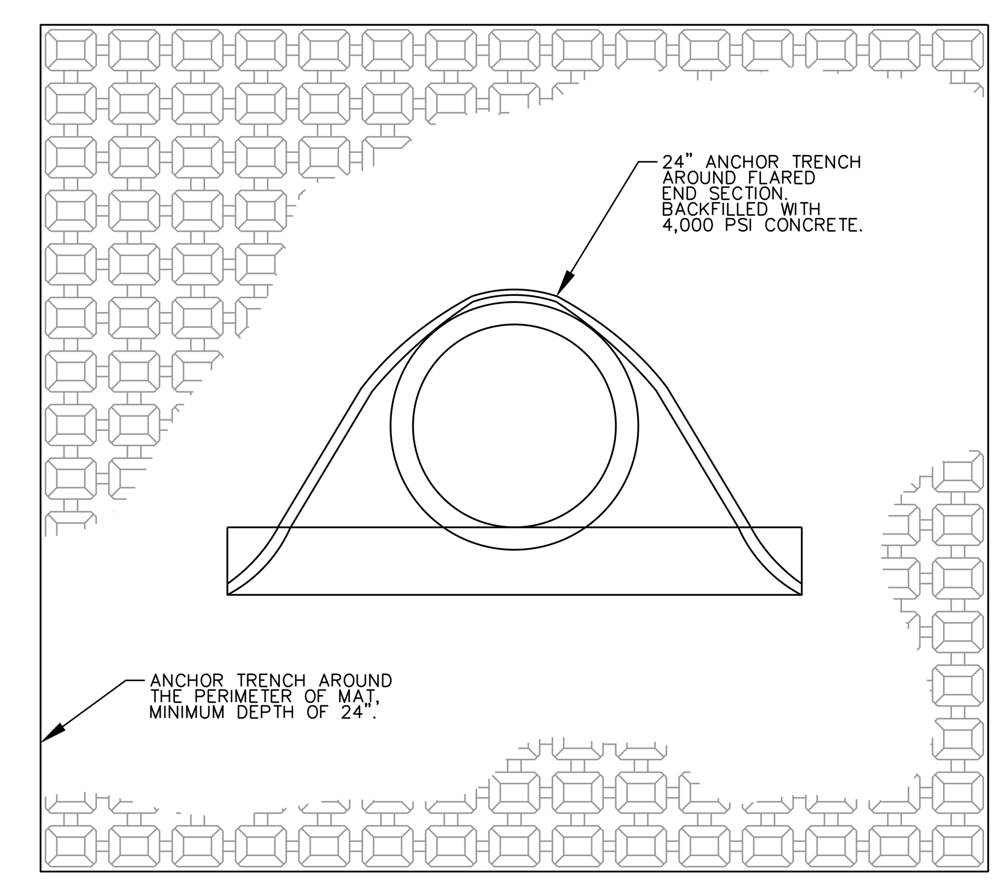
NOT TO SCALE



4/13 **FLEXAMAT LINED FBD**

NOT TO SCALE





5/13 **FLEXAMAT PLUS DETAIL**

NOT TO SCALE

NOTES:

1. DETAILS ARE FROM THE BURNS & MCDONNELL MARCH 2021, AUGUST 2021, AND SEPTEMBER 2022 DRAWINGS SETS AND UPDATED BASED ON CONSTRUCTED CONDITIONS.

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OTTUMWA, IOWA

SITE

DETAILS

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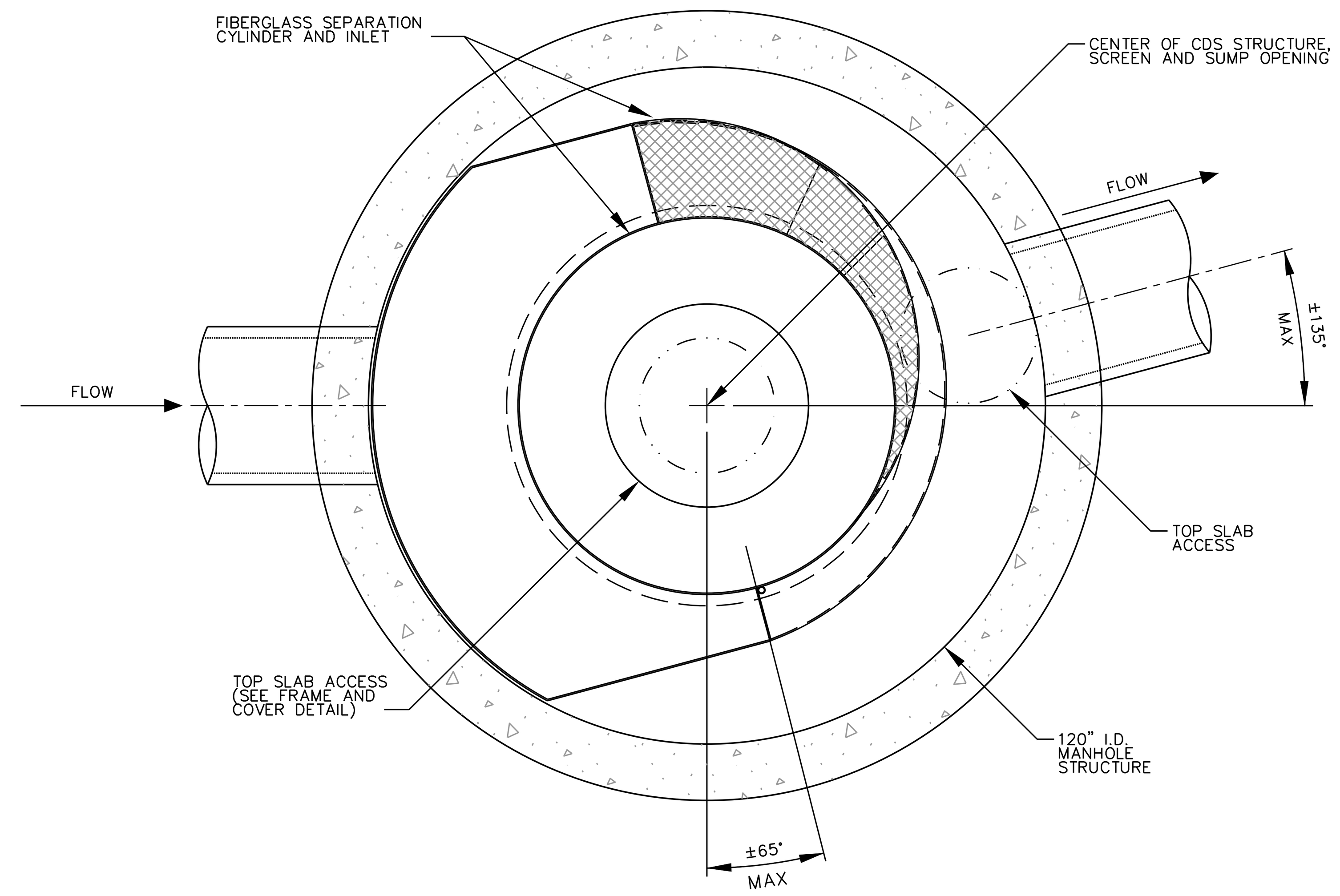
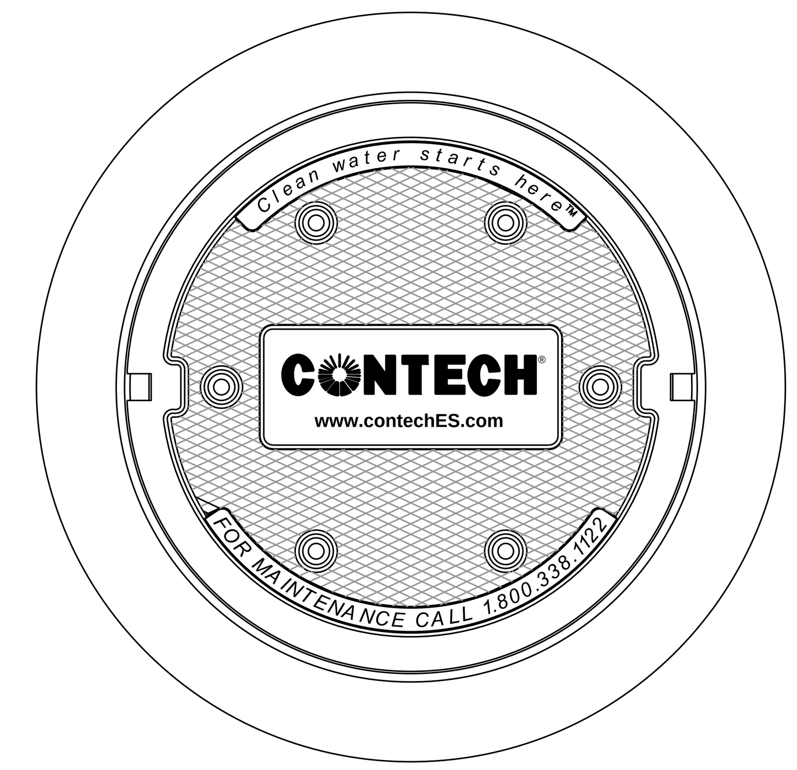
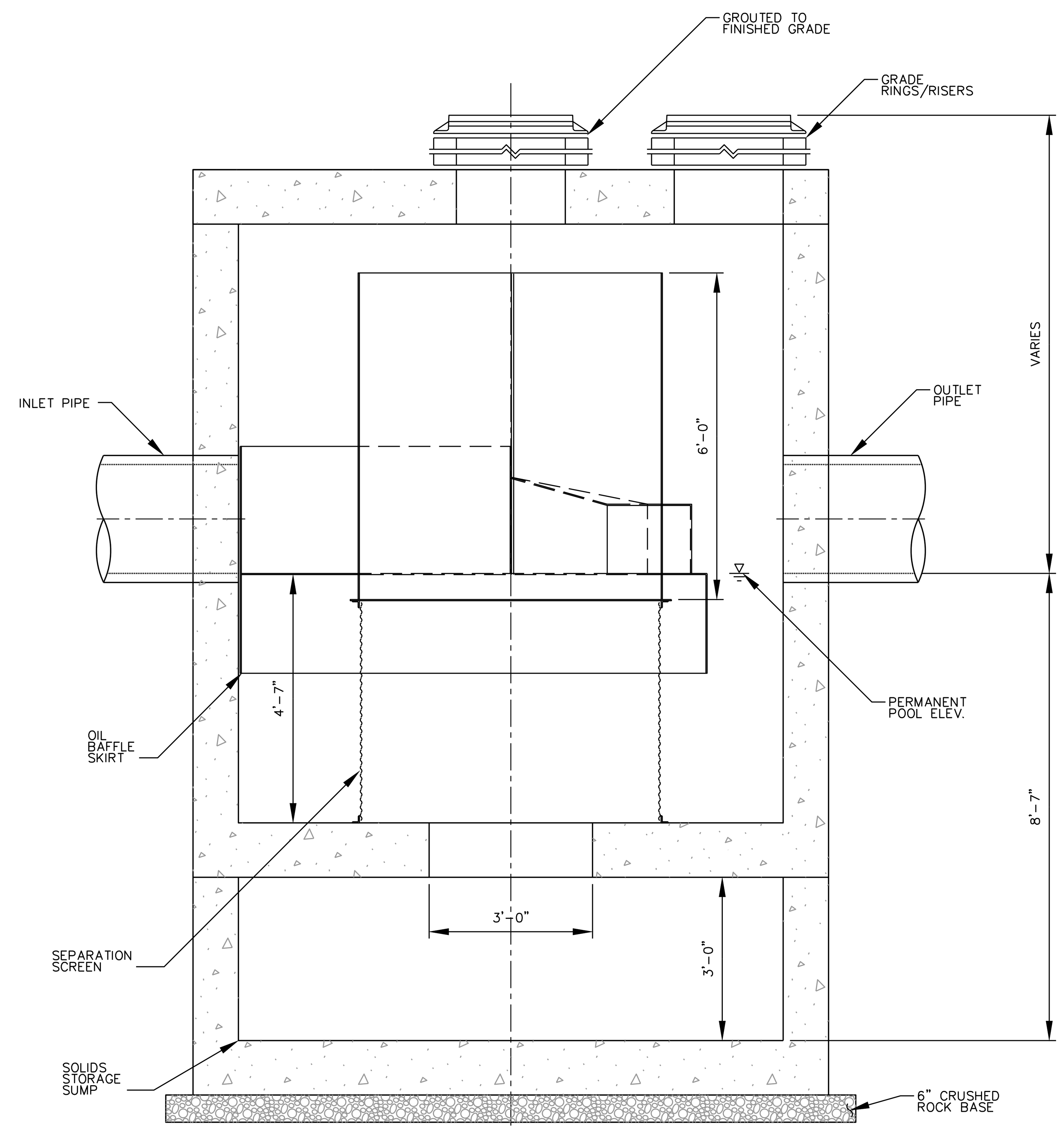


PLAN VIEW



FRAME AND COVER
(DIAMETER VARIES)



ELEVATION VIEW

GENERAL NOTES:

1. MATERIALS PROVIDED BY CONTECH.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. CDS WATER QUALITY STRUCTURE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. STRUCTURE MET AASHTO HS20 AND CASTINGS MET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION.
5. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES:

A. JOINT SEALANT ADDED BETWEEN ALL STRUCTURE SECTIONS DURING STRUCTURE ASSEMBLY.
B. PIPES GROUTED AT STRUCTURE INTERFACE DURING INSTALLATION.

1
14

HYDRONAMIC SEPARATOR
NOT TO SCALE

NOTES:

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20775 POWER PLANT ROAD
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MAIN ASH POND CLOSURE
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OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

DETAILS

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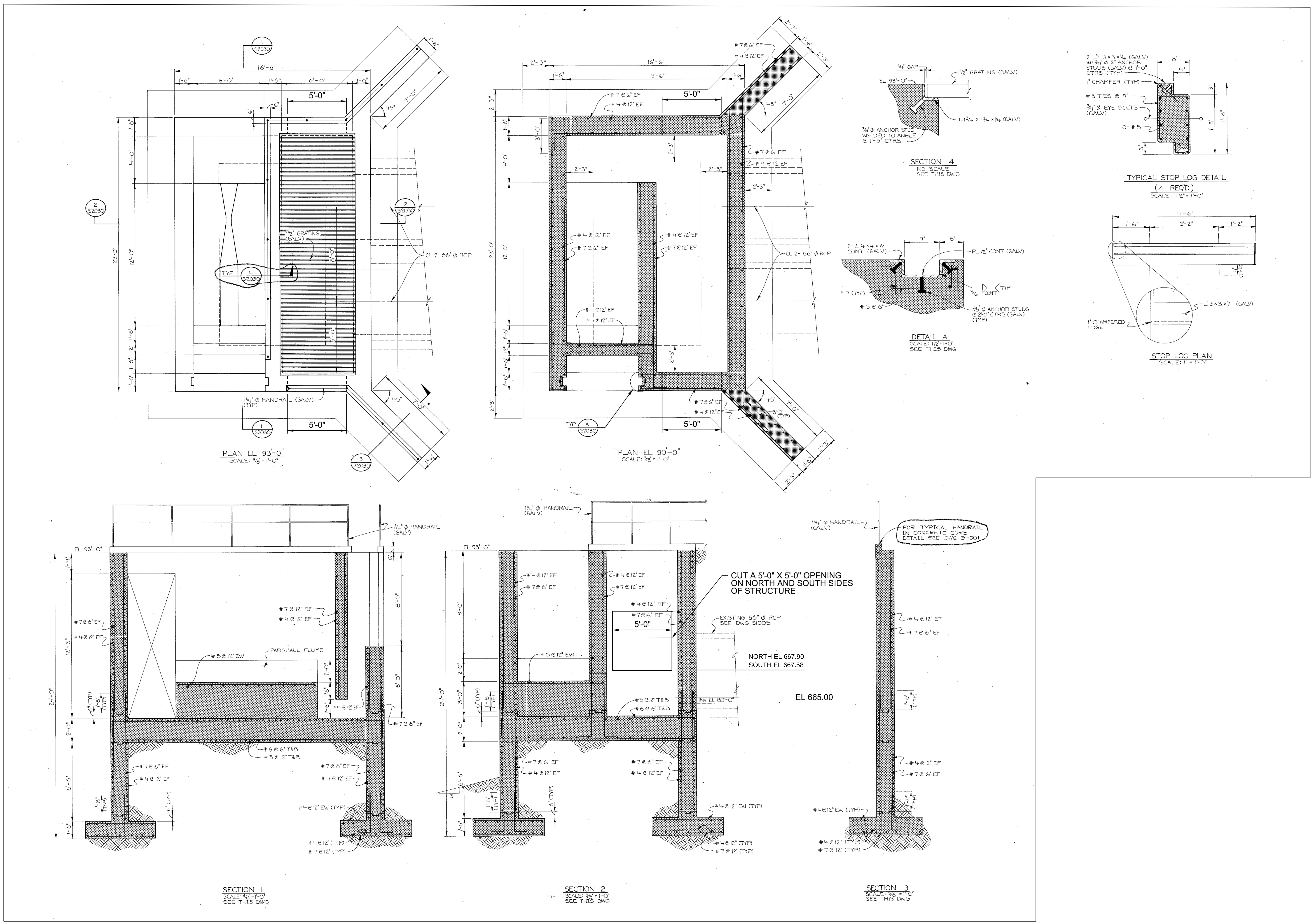
14 of 15



OUTFALL 001 STRUCTURE MODIFICATIONS

1/15 — NOT TO SCALE

NOTES:

1. DETAILS ARE FROM THE BURNS & MCDONNELL MARCH 2021, AUGUST 2021, AND SEPTEMBER 2022 DRAWINGS SETS AND UPDATED BASED ON CONSTRUCTED CONDITIONS.
2. ORIGINAL DETAIL FROM FEBRUARY 22, 1982 DATED BLACK & VEATCH DRAWING S2030 "YARD STRUCTURES – OUTFALL STRUCTURE PLANS SECTIONS & DETAILS". ONLY MODIFICATIONS TO THE STRUCTURE WERE DOCUMENTED AS PART OF THIS PLAN SET.

PROJECT NO.	25221129.00	DRAWN BY:	BSS/KP
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SITE: MAIN ASH POND CLOSURE
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

DETAILS

SHEET 15 of 15

ZLDP CLOSURE AND LVWTP CONSTRUCTION CONSTRUCTION DOCUMENTATION

OTTUMWA GENERATING STATION
OTTUMWA, IOWA

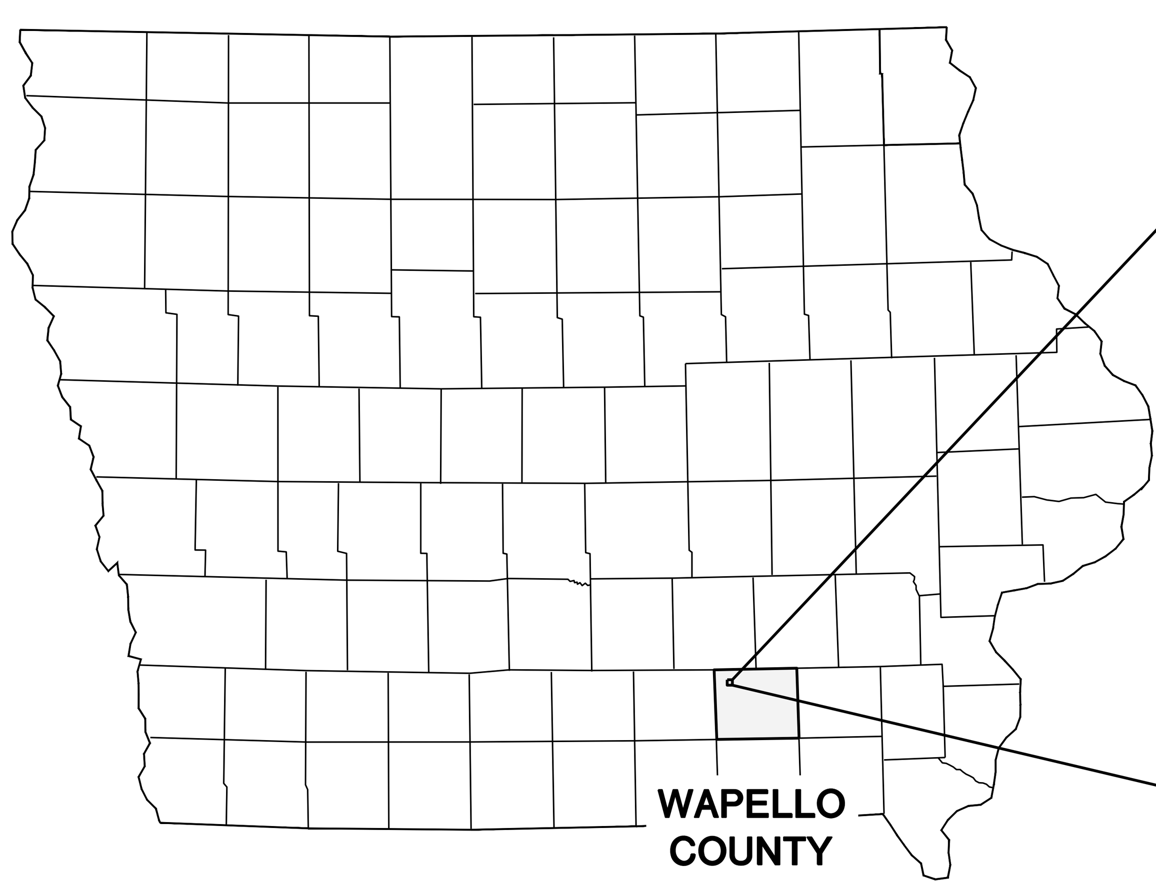
PREPARED FOR: INTERSTATE POWER AND LIGHT CO.
20755 POWER PLANT ROAD
OTTUMWA, IOWA

PREPARED BY: SCS ENGINEERS
MADISON, WISCONSIN

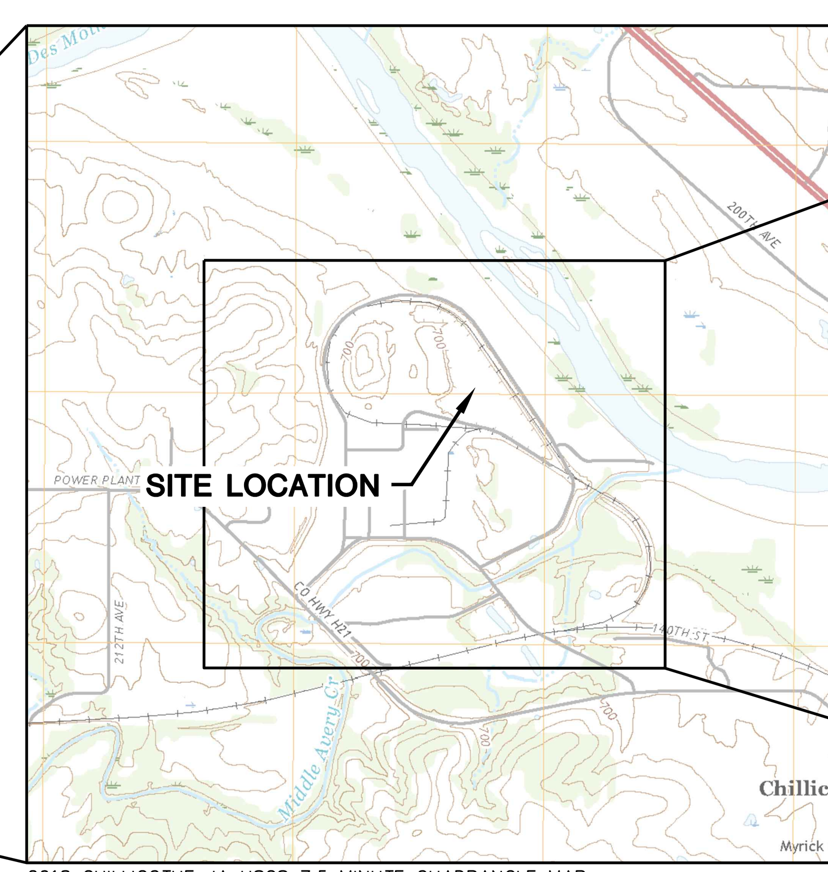
DATE: APRIL 2022

LICENSED PROFESSIONAL ENGINEER
PHILLIP E. GEARING
P26161
IOWA

4/14/22



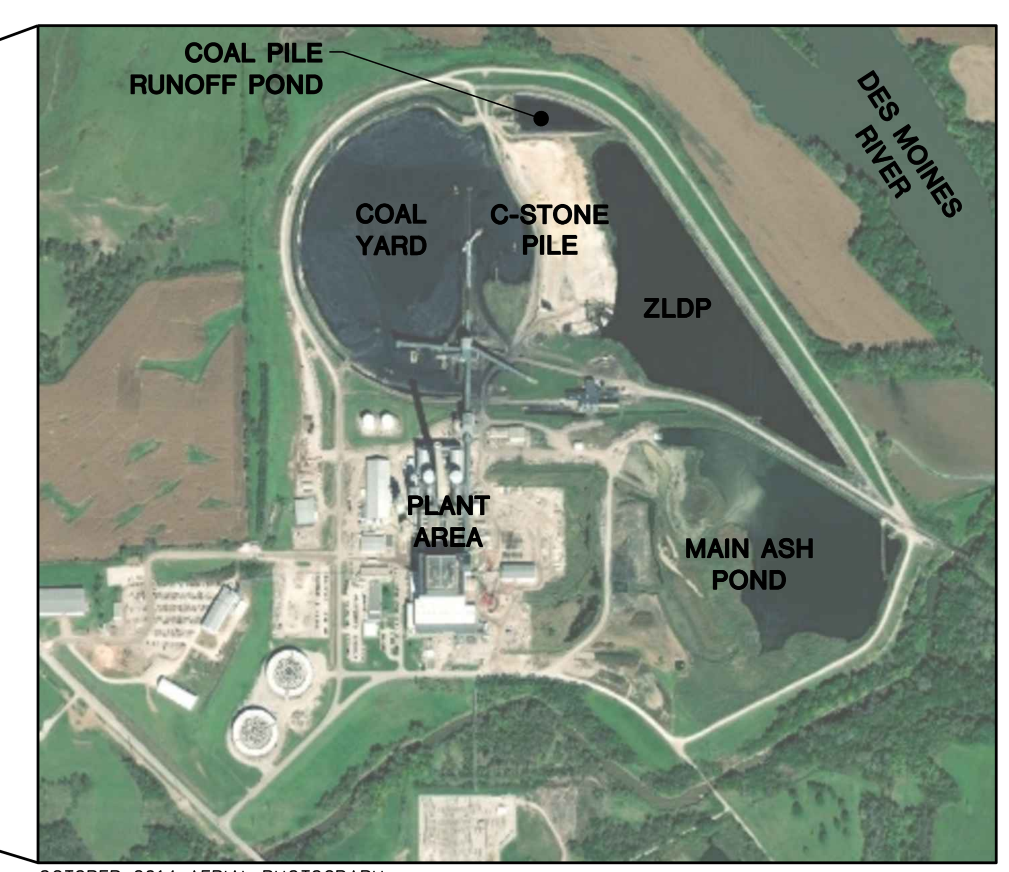
IOWA



2018 CHILLICOTHE, IA USGS 7.5 MINUTE QUADRANGLE MAP

SITE LOCATOR MAP

APPROXIMATE SCALE: 1" = 2,000'



OCTOBER 2014 AERIAL PHOTOGRAPH

SITE AERIAL

SCALE: 1" = 800'

INDEX

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1	TITLE SHEET
2	OVERALL SITE PLAN
3	PRE-CONSTRUCTION CONDITIONS
4	EXCAVATION GRADES
~~5~~	~~LVWTP SUBGRADES~~
~~6~~	~~LVWTP SUBGRADE WITH DOCUMENTATION POINTS~~
~~7~~	~~LVWTP GEOMEMBRANE PANEL LAYOUT~~
~~8~~	~~LVWTP TOP OF GRANULAR WITH DOCUMENTATION POINTS~~
~~9~~	~~LVWTP RIPRAP WITH DOCUMENTATION POINTS~~
10	FINAL SITE CONDITIONS
11	CROSS SECTIONS - A AND B
12	CROSS SECTIONS - C AND D
~~13~~	~~DETAILS~~
~~14~~	~~DETAILS~~
~~15~~	~~DETAILS~~

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OTTUMWA, IA 52501

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

SITE: ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

TITLE SHEET

SHEET 1 OF 15

LEGEND

- PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- EDGE OF WATER
- BUILDING
- OVERHEAD UTILITY
- STORM SEWER
- TELEPHONE
- UNDERGROUND ELECTRIC
- WATER MAIN
- VEGETATION/TREES
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT

NOTES:

1. EXISTING BASE MAP FROM BURNS & MCDONNELL ISSUED FOR CONSTRUCTION DRAWINGS DATED JUNE 30, 2021.
2. EXISTING TOPOGRAPHIC LIDAR SURVEY PERFORMED BY WILSON AND COMPANY, DATED JUNE 6, 2019.
3. BATHYMETRIC SURVEY PERFORMED BY BURNS & MCDONNELL, DATED JULY 12, 2019.
4. COORDINATE GRID SHOWN IS IOWA STATE PLANE NAD27 SOUTH ZONE.

SURVEY CONTROL INFORMATION

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	401,500.000	2,259,610.000	-	PLANT MON #1
6	400,612.000	2,260,010.000	-	PLANT MON #6
22	401,644.010	2,260,250.890	689.060	3/8" X 12" SPIKE ON LEVEE
25	400,949.540	2,260,417.770	684.880	DRILLED HOLE IN CONCRETE
26	400,956.500	2,260,517.760	684.880	DRILLED HOLE IN CONCRETE
27	400,964.220	2,260,640.820	684.980	DRILLED HOLE IN CONCRETE
29	401,063.500	2,260,501.170	685.030	DRILLED HOLE IN CONCRETE
30	401,175.900	2,260,547.530	684.710	DRILLED HOLE IN CONCRETE
32	400,979.130	2,260,776.870	685.370	DRILLED HOLE IN CONCRETE
38	401,012.690	2,260,596.860	684.910	DRILLED HOLE IN CONCRETE
39	401,430.290	2,260,552.030	685.490	DRILLED HOLE IN CONCRETE
40	401,595.860	2,260,529.850	685.510	DRILLED HOLE IN CONCRETE
41	401,049.450	2,260,443.370	684.810	DRILLED HOLE IN CONCRETE
50	400,469.040	2,260,796.460	684.430	3/8" X 12" SPIKE
51	400,909.240	2,260,859.550	685.000	1/2" X 36" REBAR
52	400,749.110	2,260,736.260	684.710	3/8" X 12" SPIKE
56	400,405.460	2,260,128.340	685.370	3/8" X 12" SPIKE
1001	401,499.970	2,259,610.010	-	FIELD LOCATION MON #1
1006	400,612.000	2,260,010.000	682.520	HOLD LOCATION MON #6
A	401,307.000	2,260,235.000	685.100	DRILLED HOLE AT SOUTHEAST CORNER OF CONCRETE PAD
B	401,609.000	2,260,227.000	684.970	FOUND CUT "X" AT NORTHEAST CORNER OF CONCRETE WALL
C	401,440.000	2,260,660.000	687.160	ARROW ON WEST SIDE OF FIRE HYDRANT
D	401,036.000	2,260,731.000	688.440	ARROW ON NORTHEAST SIDE OF FIRE HYDRANT
E	400,440.000	2,260,668.000	686.910	ARROW ON EAST SIDE OF FIRE HYDRANT
F	400,440.000	2,260,195.000	685.990	ARROW ON SOUTHWEST SIDE OF FIRE HYDRANT
200	401,499.990	2,262,527.587	681.160	-
201	403,529.126	2,260,653.577	683.616	-
202	401,653.130	2,260,289.460	-	-
203	400,453.260	2,260,356.316	-	-
204	403,376.344	2,260,687.256	682.264	-
205	403,399.859	2,260,843.727	679.764	-

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25221129.00	DRAWN BY:	BSS
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INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

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2830 DAIRY DRIVE MADISON, WI 53718-6751
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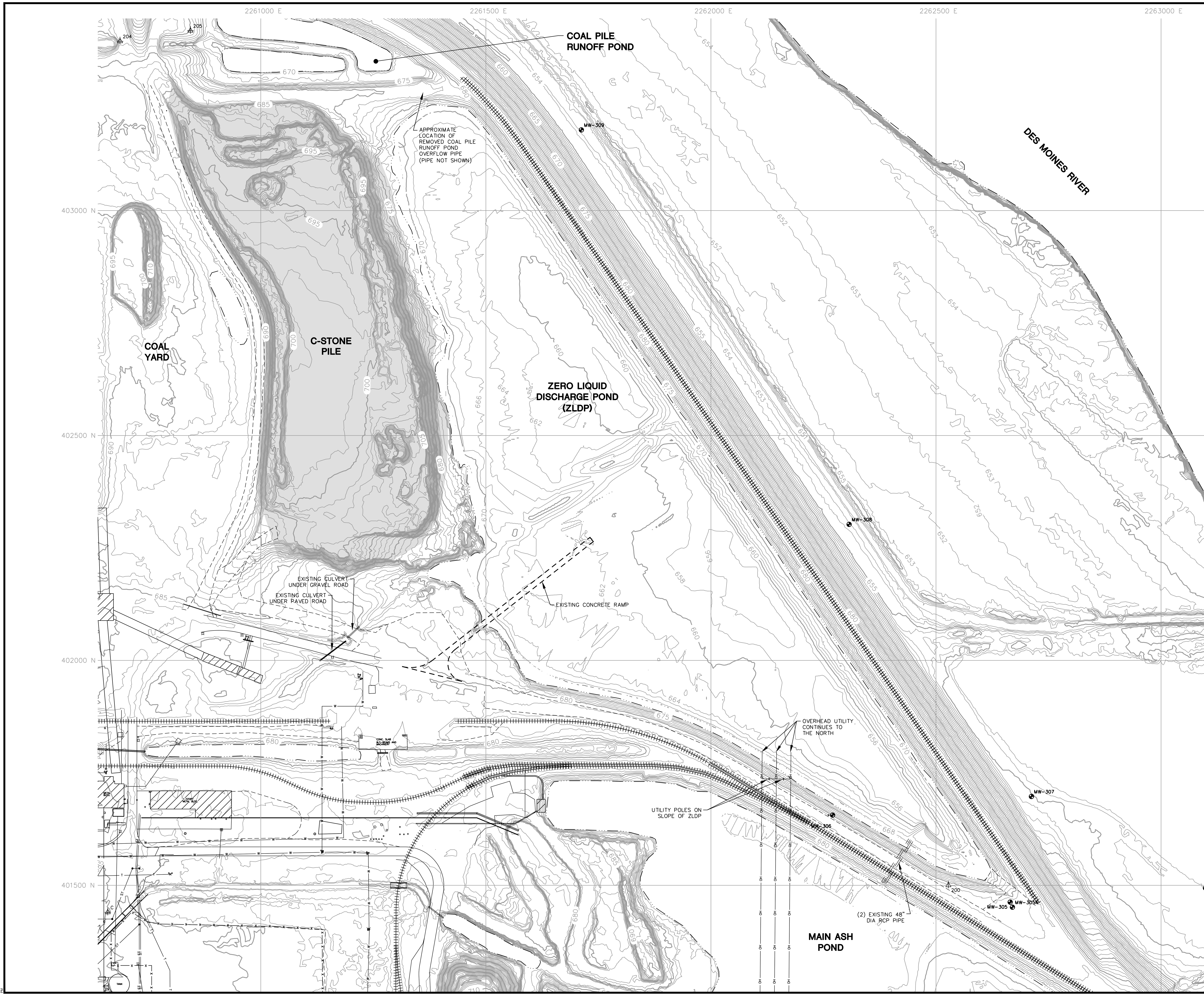
ENGINEER

ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

OVERALL SITE PLAN

SHEET
2 OF 15



LEGEND

660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	PAVED ROAD
	GRAVEL/DIRT ROAD
x	FENCE
	RAILROAD TRACKS
	EDGE OF WATER
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	APPROXIMATE ORIGINAL EXTENTS OF C-STONE PILE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.

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SITE: ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

PRE-CONSTRUCTION CONDITIONS

SHEET 3 OF 15

LEGEND

- DOCUMENTED EXCAVATION GRADE (10' CONTOUR)
- DOCUMENTED EXCAVATION GRADE (2' CONTOUR)
- DOCUMENTED EXCAVATION GRADE SPOT ELEVATION
- DOCUMENTED EXCAVATION LIMITS
- PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- OVERHEAD UTILITY
- STORM SEWER
- TELEPHONE
- UNDERGROUND ELECTRIC
- WATER MAIN
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT
- APPROXIMATE ORIGINAL EXTENTS OF C-STONE PILE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION (SHADED AREA IN DOCUMENTED EXCAVATION EXTENTS) WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. ZLD POND WAS DEWATERED AND WATER PUMPED TO THE MAIN ASH POND.
4. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE ZLD POND.
5. GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES AND C-STONE PILE RELOCATION.

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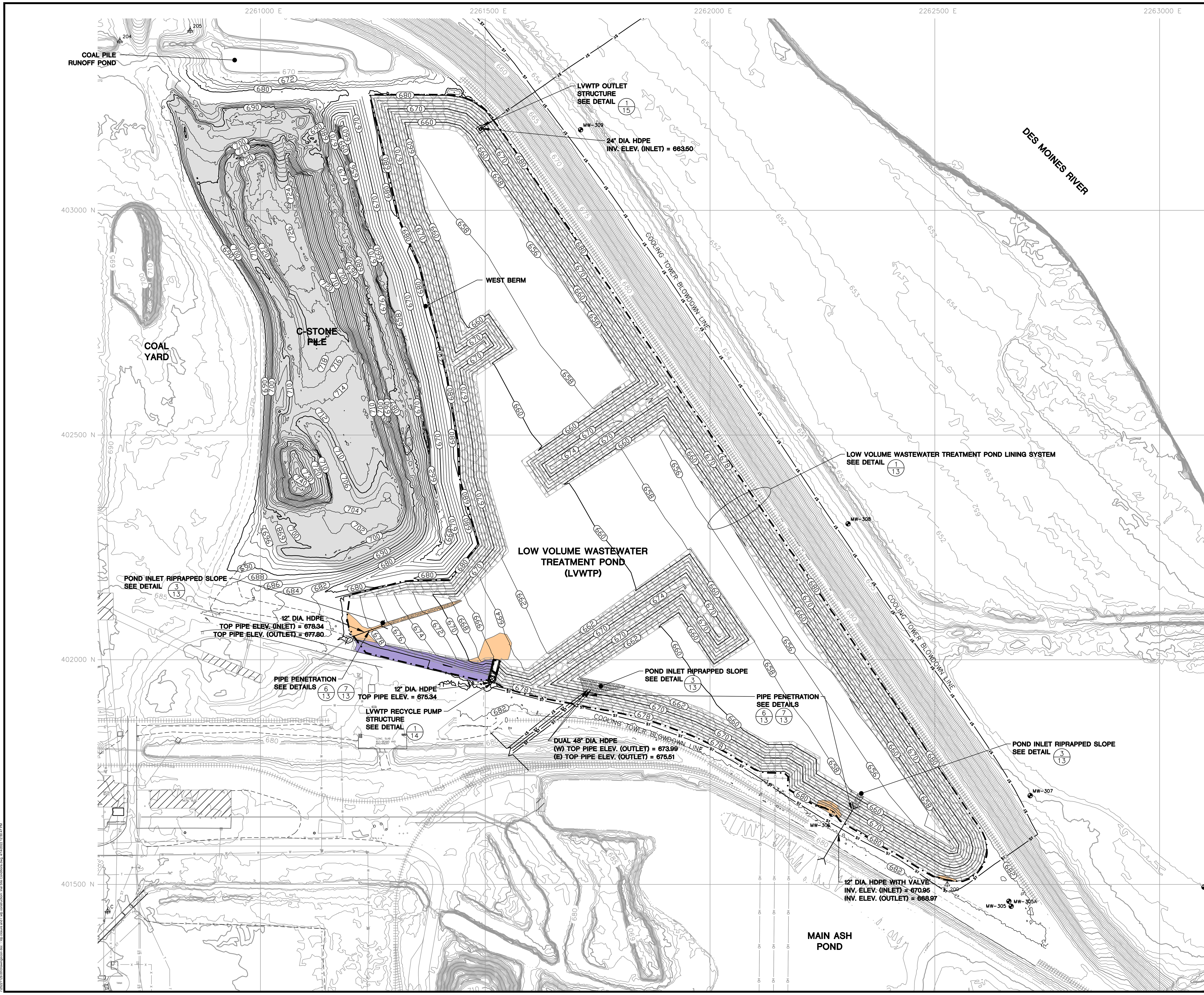
SITE

EXCAVATION GRADES

SHEET
4 OF 15



LEGEND

- 660 DOCUMENTED FINAL GRADE (10' CONTOUR) (SEE NOTE X)
- 658 DOCUMENTED FINAL GRADE (2' CONTOUR) (SEE NOTE X)
- 660 PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- OH OVERHEAD UTILITY
- ST STORM SEWER
- T TELEPHONE
- UE UNDERGROUND ELECTRIC
- W WATER MAIN
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT
- APPROXIMATE FINAL EXTENTS OF C-STONE PILE
- ST INSTALLED STORM SEWER PIPING
- INSTALLED CULVERT
- LIMITS OF DOCUMENTED GEOSYNTHETIC LINER
- AS-CONSTRUCTED SURVEYED AREA
- AS-CONSTRUCTED THICKER GRANULAR MATERIAL AREA
- INSTALLED RIPRAP
- INSTALLED RIPRAPPED INLET SLOPE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. GRADES SHOWN WITHIN THE DOCUMENTED GEOSYNTHETIC LINER LIMITS REPRESENT DOCUMENTED LVWTP TOP OF GRANULAR MATERIAL. GRADES OUTSIDE THE DOCUMENTED GEOSYNTHETIC LINER LIMITS IN THE WEST BERM REPRESENT DOCUMENTED LVWTP SUBGRADES.
3. GRADES IN THE APPROXIMATE EXTENTS OF THE C-STONE PILE AND PERIMETER OF THE LVWTP REPRESENT FINAL GRADES FROM DECEMBER 20, 2021 DRONE SURVEY BY RYAN INCORPORATED CENTRAL.
4. GEOSYNTHETIC LINER INSTALLED TO 679 FT ELEVATION.
5. INSTALLED PIPE ALIGNMENTS AND ELEVATIONS PROVIDED BY RYAN INCORPORATED CENTRAL.
6. THICKER GRANULAR MATERIAL WAS PLACED IN THE AS-CONSTRUCTED SURVEY LIMITS NEAR THE SOUTHWEST LIMITS OF THE LVWTP TO CREATE ADDITIONAL SPACE FOR VEHICLE TRAFFIC AROUND THE DUMPER HOUSE BUILDING.
7. AS-CONSTRUCTED SURVEY AREAS ARE FIELD MODIFICATIONS AND WERE DOCUMENTED AS CONSTRUCTED.

100 0 100

SCALE: 1" = 100'

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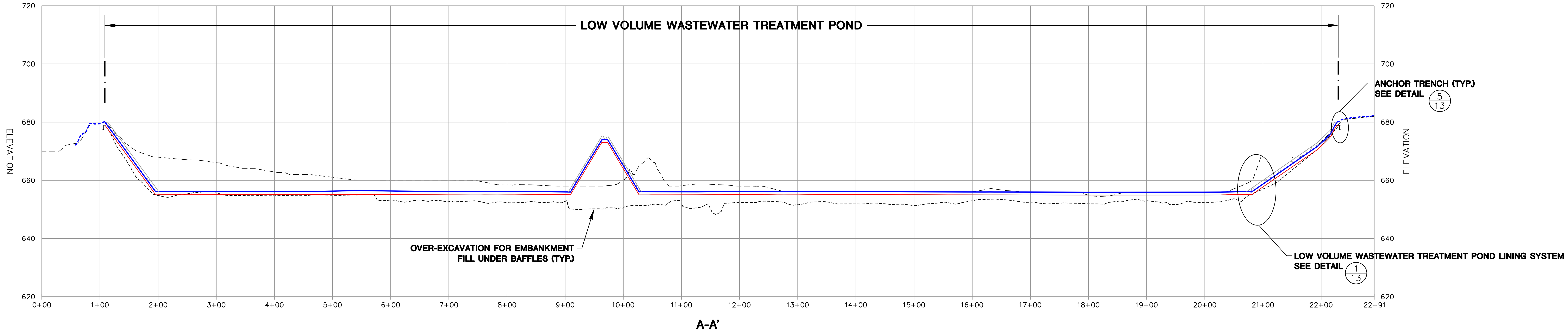
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

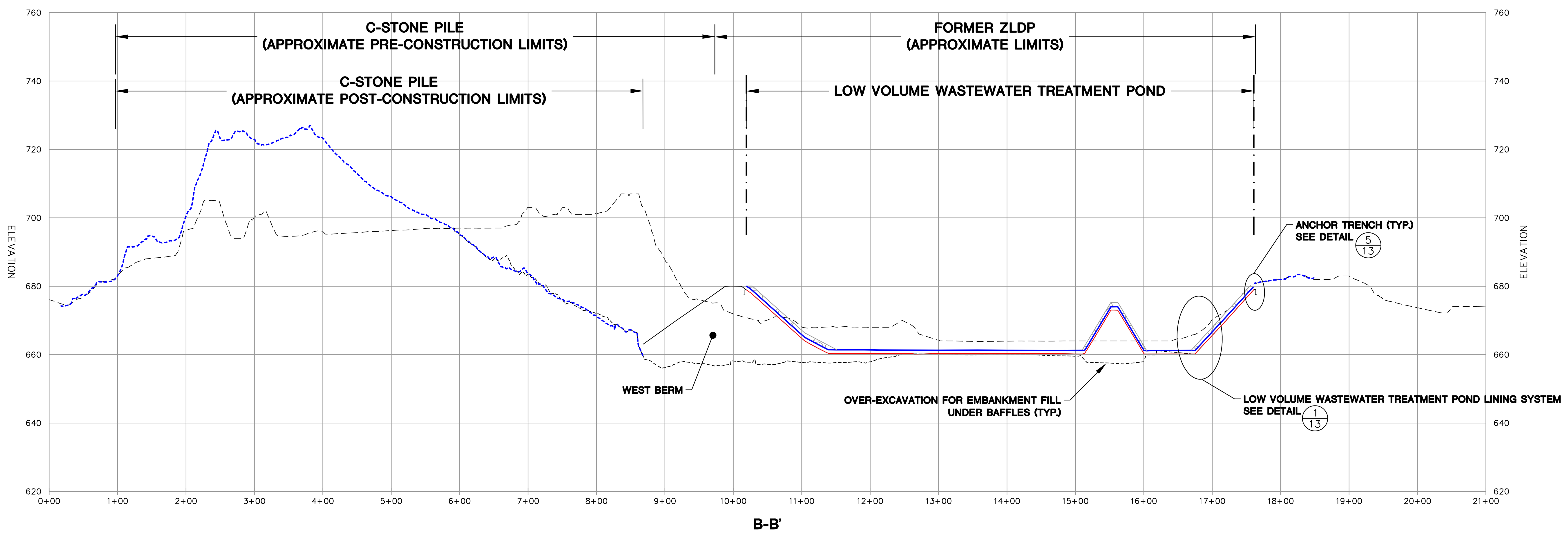
SITE

FINAL SITE CONDITIONS

SHEET
10 OF 15



A-A'



B-B'

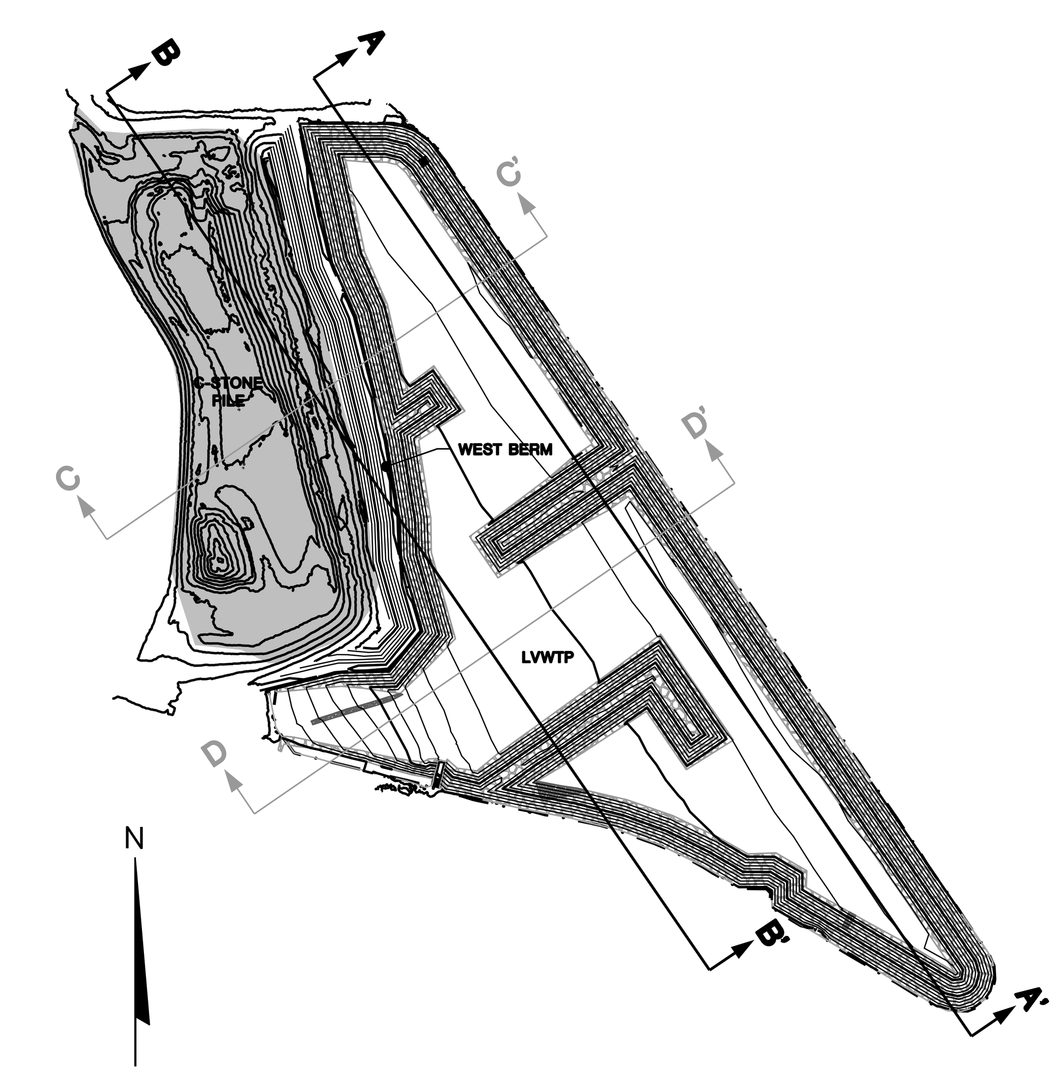
SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION

LEGEND

- PRE-CONSTRUCTION GRADE
- DOCUMENTED ZLDP EXCAVATION GRADE
- DOCUMENTED LVWTP SUBGRADE
- DOCUMENTED SUBGRADE OUTSIDE LVWTP LINER LIMITS
- DOCUMENTED LVWTP TOP GRANULAR
- INSTALLED RIPRAP
- DOCUMENTED PERIMETER FINAL GRADE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL PRE-CONSTRUCTION GRADE NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FORM THE ZLD POND.
4. GEOSYNTHETIC LINER INSTALLED TO 679 FT ELEVATION.
5. GRADES OUTSIDE THE DOCUMENTED GEOSYNTHETIC LINER LIMITS IN THE WEST BERM REPRESENT DOCUMENTED LVWTP SUBGRADES.
6. DOCUMENTED PERIMETER FINAL GRADES REPRESENT FINAL GRADES FROM DECEMBER 20, 2021 DRONE SURVEY BY RYAN INCORPORATED CENTRAL.



CROSS SECTION LOCATION MAP

SCALE: 1" = 300'

PROJECT NO.	25221129.00	DRAWN BY:	BSS		
DRAWN:	02/21/2022	CHECKED BY:	PEG/EJN		
REVISED:	04/14/2022	APPROVED BY:	PEG, 04/14/2022		

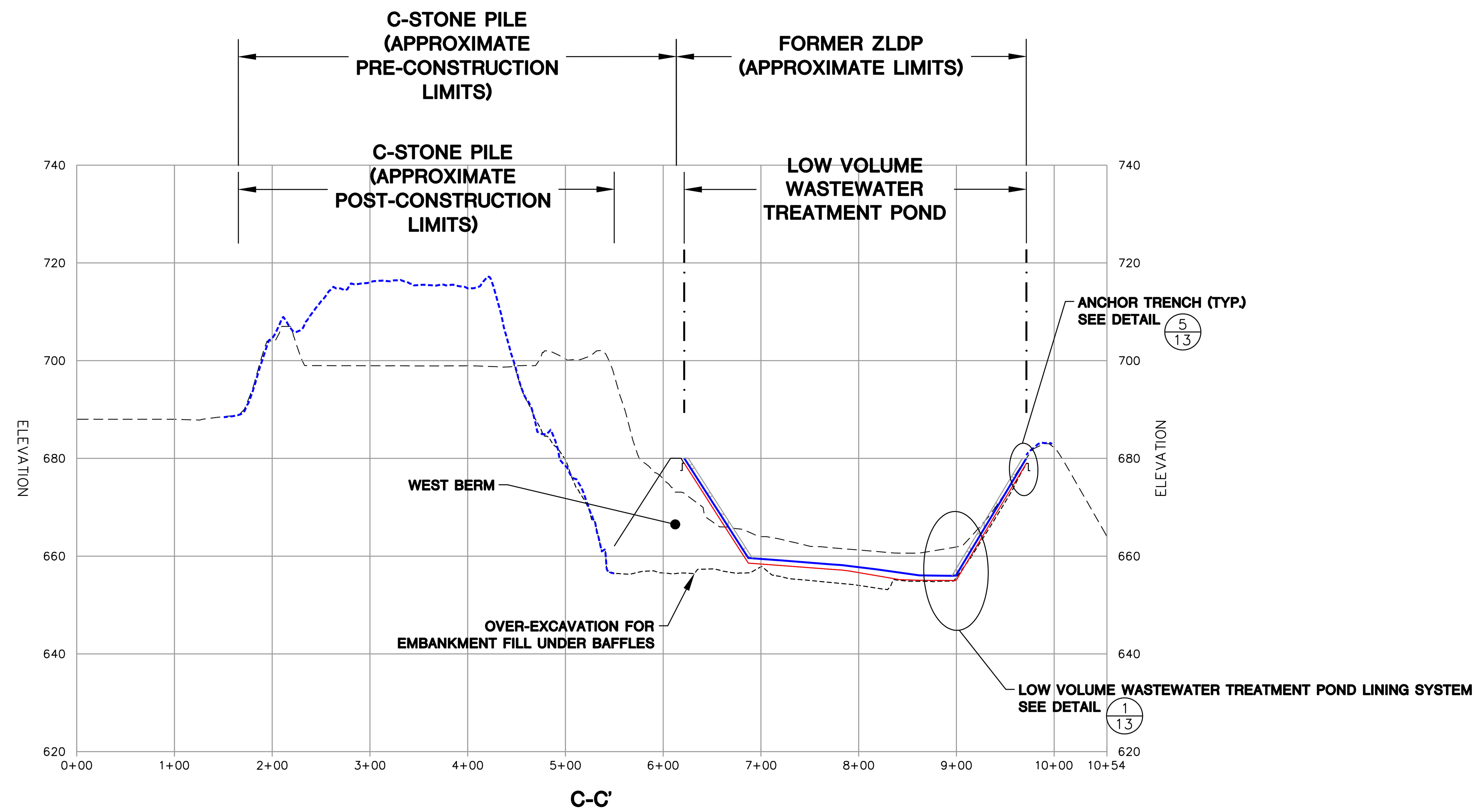
CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

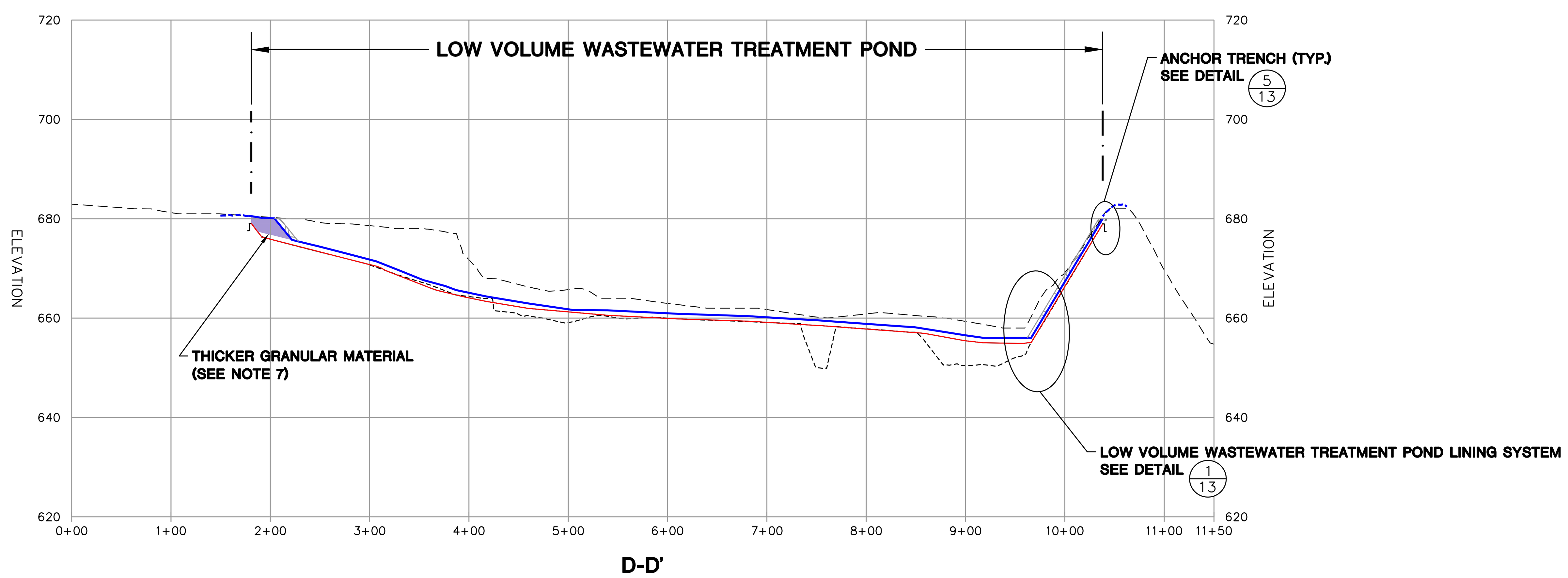
SITE: ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

CROSS SECTIONS - A AND B

SHEET 11 OF 15



C-C'



D-D'

100 0 100

SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION

LEGEND

- PRE-CONSTRUCTION GRADE
- DOCUMENTED ZLDP EXCAVATION GRADE
- DOCUMENTED LVWTP SUBGRADE
- DOCUMENTED SUBGRADE OUTSIDE LVWTP LINER LIMITS
- DOCUMENTED LVWTP TOP GRANULAR
- INSTALLED RIPRAP
- DOCUMENTED PERIMETER FINAL GRADE
- AS-CONSTRUCTED THICKER GRANULAR MATERIAL AREA

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL PRE-CONSTRUCTION GRADE NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FORM THE ZLD POND.
4. GEOSYNTHETIC LINER INSTALLED TO 679 FT ELEVATION.
5. GRADES OUTSIDE THE DOCUMENTED GEOSYNTHETIC LINER LIMITS IN THE WEST BERM REPRESENT DOCUMENTED LVWTP SUBGRADES.
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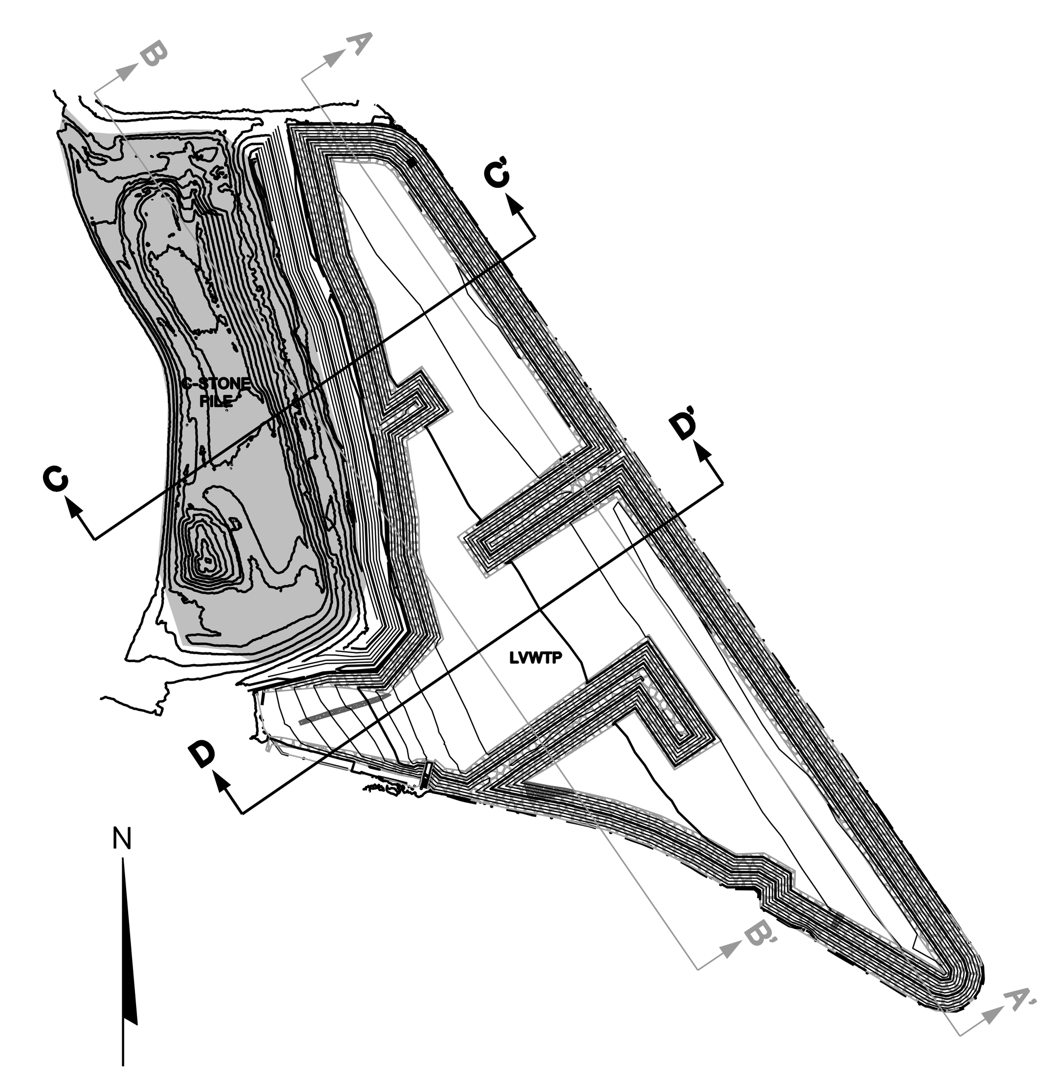
7. THICKER GRANULAR MATERIAL WAS PLACED IN THE AS-CONSTRUCTED SURVEY LIMITS SHOWN ON PLAN SHEET 10 NEAR THE SOUTHWEST LIMITS OF THE LVWTP TO CREATE ADDITIONAL SPACE FOR VEHICLE TRAFFIC AROUND THE DUMPER HOUSE BUILDING. AS-CONSTRUCTED SURVEY AREAS ARE FIELD MODIFICATIONS AND WERE DOCUMENTED AS CONSTRUCTED.



CROSS SECTION LOCATION MAP

SCALE: 1" = 300'

DRAWN BY:	BSS
CHECKED BY:	PEG/EJN
APPROVED BY:	PEG, 04/14/2022
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CLIENT: INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

SITE: ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

CROSS SECTIONS – C AND D

SHEET 12 of 15

ZLDP CLOSURE AND LVWTP CONSTRUCTION CONSTRUCTION DOCUMENTATION

OTTUMWA GENERATING STATION
OTTUMWA, IOWA

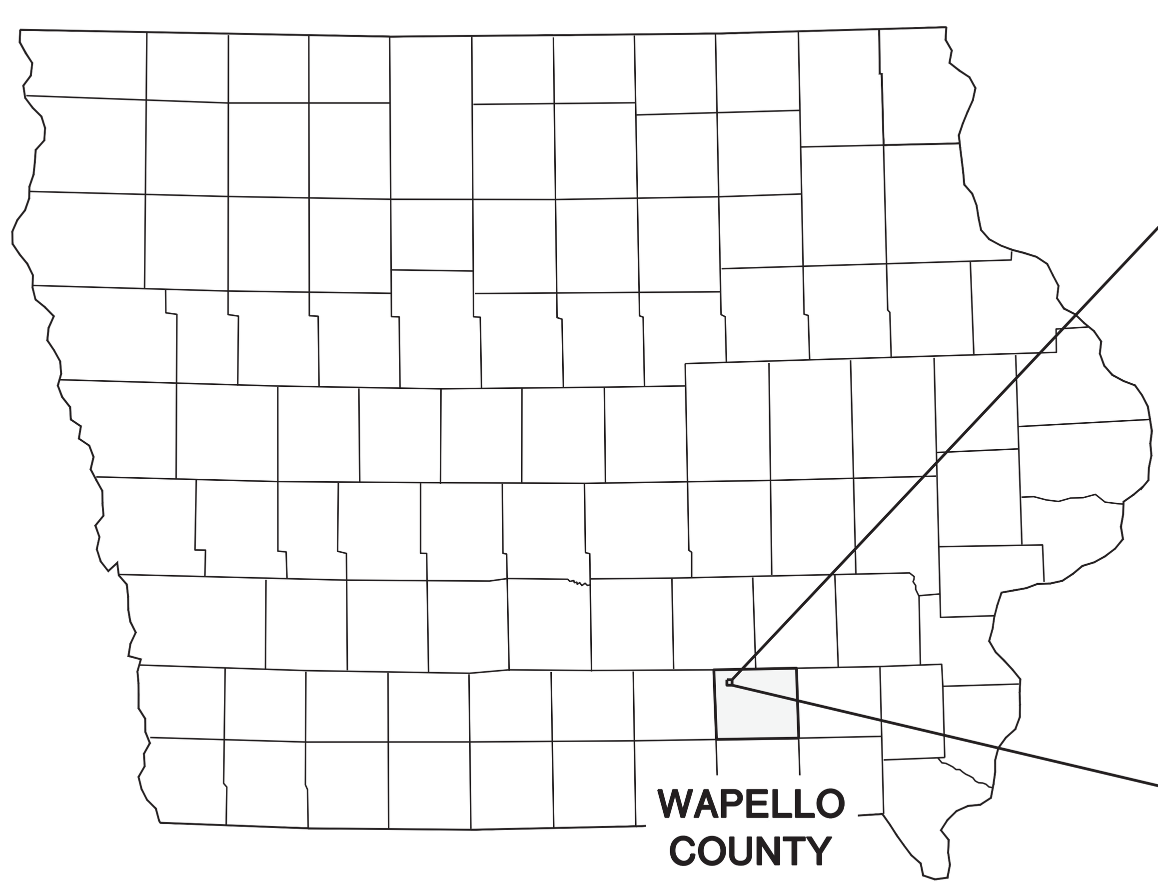
PREPARED FOR: INTERSTATE POWER AND LIGHT CO.
20755 POWER PLANT ROAD
OTTUMWA, IOWA

PREPARED BY: SCS ENGINEERS
MADISON, WISCONSIN

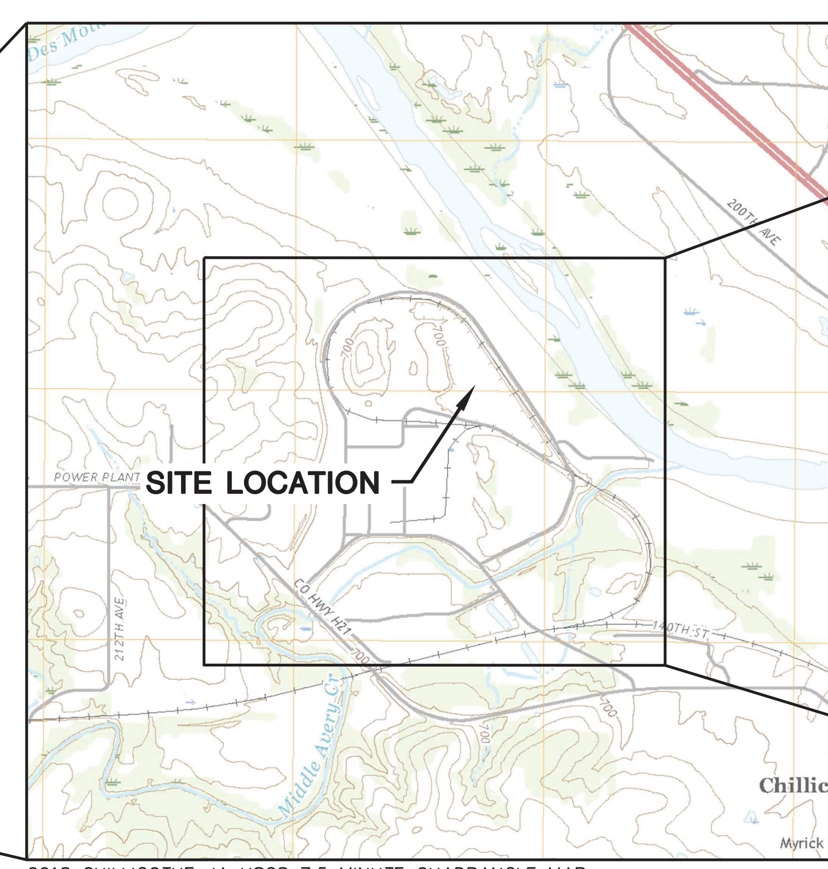
DATE: APRIL 2022

LICENSED PROFESSIONAL ENGINEER
PHILLIP E. GEARING
P26161
IOWA

4/14/22

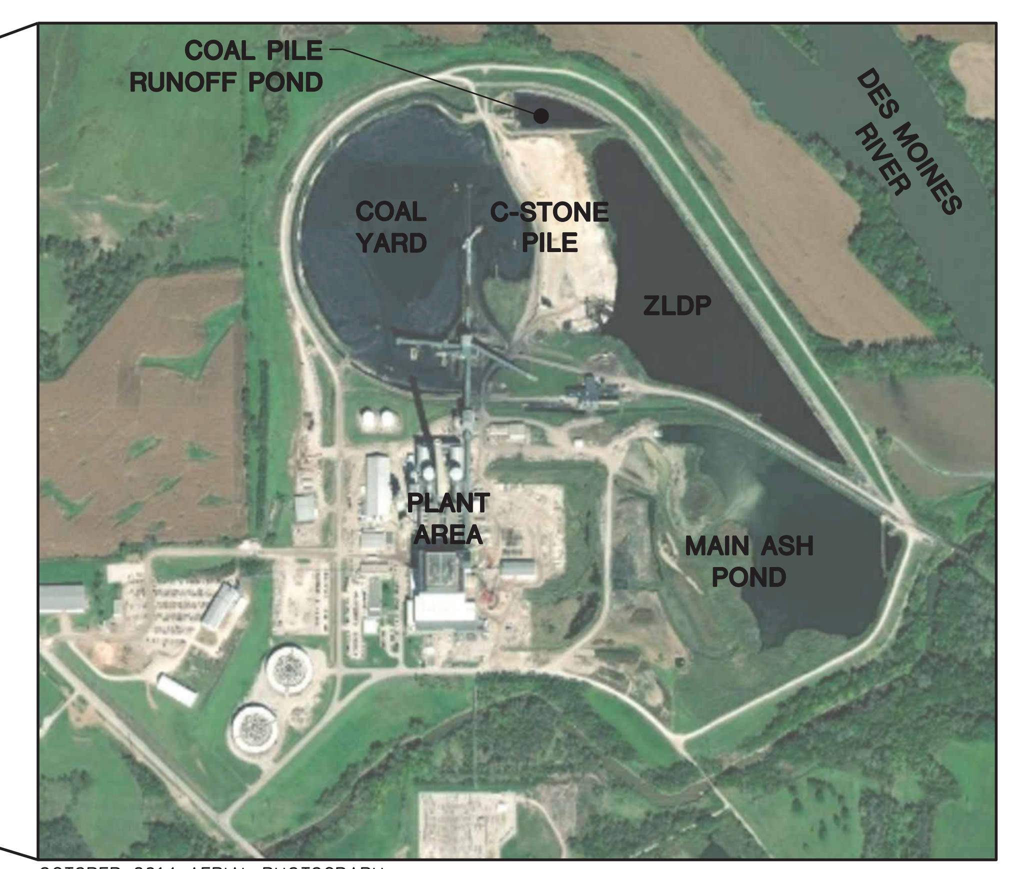


IOWA



2018 CHILLICOTHE, IA USGS 7.5 MINUTE QUADRANGLE MAP

SITE LOCATOR MAP
APPROXIMATE SCALE: 1" = 2,000'



OCTOBER 2014 AERIAL PHOTOGRAPH

SITE AERIAL
SCALE: 1" = 800'

INDEX

Sheet Number	Sheet Title
1	TITLE SHEET
2	OVERALL SITE PLAN
3	PRE-CONSTRUCTION CONDITIONS
4	EXCAVATION GRADES
~~5~~	~~LVWTP SUBGRADES~~
~~6~~	~~LVWTP SUBGRADE WITH DOCUMENTATION POINTS~~
~~7~~	~~LVWTP GEOMEMBRANE PANEL LAYOUT~~
~~8~~	~~LVWTP TOP OF GRANULAR WITH DOCUMENTATION POINTS~~
~~9~~	~~LVWTP RIPRAP WITH DOCUMENTATION POINTS~~
10	FINAL SITE CONDITIONS
11	CROSS SECTIONS - A AND B
12	CROSS SECTIONS - C AND D
~~13~~	~~DETAILS~~
~~14~~	~~DETAILS~~
~~15~~	~~DETAILS~~

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ENGINEER

ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA
SITE

TITLE SHEET

SHEET
1 OF 15

LEGEND

- PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- EDGE OF WATER
- BUILDING
- OVERHEAD UTILITY
- STORM SEWER
- TELEPHONE
- UNDERGROUND ELECTRIC
- WATER MAIN
- VEGETATION/TREES
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT

NOTES:

1. EXISTING BASE MAP FROM BURNS & MCDONNELL ISSUED FOR CONSTRUCTION DRAWINGS DATED JUNE 30, 2021.
2. EXISTING TOPOGRAPHIC LIDAR SURVEY PERFORMED BY WILSON AND COMPANY, DATED JUNE 6, 2019.
3. BATHYMETRIC SURVEY PERFORMED BY BURNS & MCDONNELL, DATED JULY 12, 2019.
4. COORDINATE GRID SHOWN IS IOWA STATE PLANE NAD27 SOUTH ZONE.

SURVEY CONTROL INFORMATION

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	401,500.000	2,259,610.000	-	PLANT MON #1
6	400,612.000	2,260,010.000	-	PLANT MON #6
22	401,644.010	2,260,250.890	689.060	3/8" X 12" SPIKE ON LEVEE
25	400,949.540	2,260,417.770	684.880	DRILLED HOLE IN CONCRETE
26	400,956.500	2,260,517.760	684.880	DRILLED HOLE IN CONCRETE
27	400,964.220	2,260,640.820	684.980	DRILLED HOLE IN CONCRETE
29	401,063.500	2,260,501.170	685.030	DRILLED HOLE IN CONCRETE
30	401,175.900	2,260,547.530	684.710	DRILLED HOLE IN CONCRETE
32	400,979.130	2,260,776.870	685.370	DRILLED HOLE IN CONCRETE
38	401,012.690	2,260,596.860	684.910	DRILLED HOLE IN CONCRETE
39	401,430.290	2,260,552.030	685.490	DRILLED HOLE IN CONCRETE
40	401,595.860	2,260,529.850	685.510	DRILLED HOLE IN CONCRETE
41	401,049.450	2,260,443.370	684.810	DRILLED HOLE IN CONCRETE
50	400,469.040	2,260,796.460	684.430	3/8" X 12" SPIKE
51	400,909.240	2,260,859.550	685.000	1/2" X 36" REBAR
52	400,749.110	2,260,736.260	684.710	3/8" X 12" SPIKE
56	400,405.460	2,260,128.340	685.370	3/8" X 12" SPIKE
1001	401,499.970	2,259,610.010	-	FIELD LOCATION MON #1
1006	400,612.000	2,260,010.000	682.520	HOLD LOCATION MON #6
A	401,307.000	2,260,235.000	685.100	DRILLED HOLE AT SOUTHEAST CORNER OF CONCRETE PAD
B	401,609.000	2,260,227.000	684.970	FOUND CUT "X" AT NORTHEAST CORNER OF CONCRETE WALL
C	401,440.000	2,260,660.000	687.160	ARROW ON WEST SIDE OF FIRE HYDRANT
D	401,036.000	2,260,731.000	688.440	ARROW ON NORTHEAST SIDE OF FIRE HYDRANT
E	400,440.000	2,260,668.000	686.910	ARROW ON EAST SIDE OF FIRE HYDRANT
F	400,440.000	2,260,195.000	685.990	ARROW ON SOUTHWEST SIDE OF FIRE HYDRANT
200	401,499.990	2,262,527.587	681.160	-
201	403,529.126	2,260,653.577	683.616	-
202	401,653.130	2,260,289.460	-	-
203	400,453.260	2,260,356.316	-	-
204	403,376.344	2,260,687.256	682.264	-
205	403,399.859	2,260,843.727	679.764	-

N

200 0 200

SCALE: 1" = 200'

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INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

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2830 DAIRY DRIVE MADISON, WI 53718-6751
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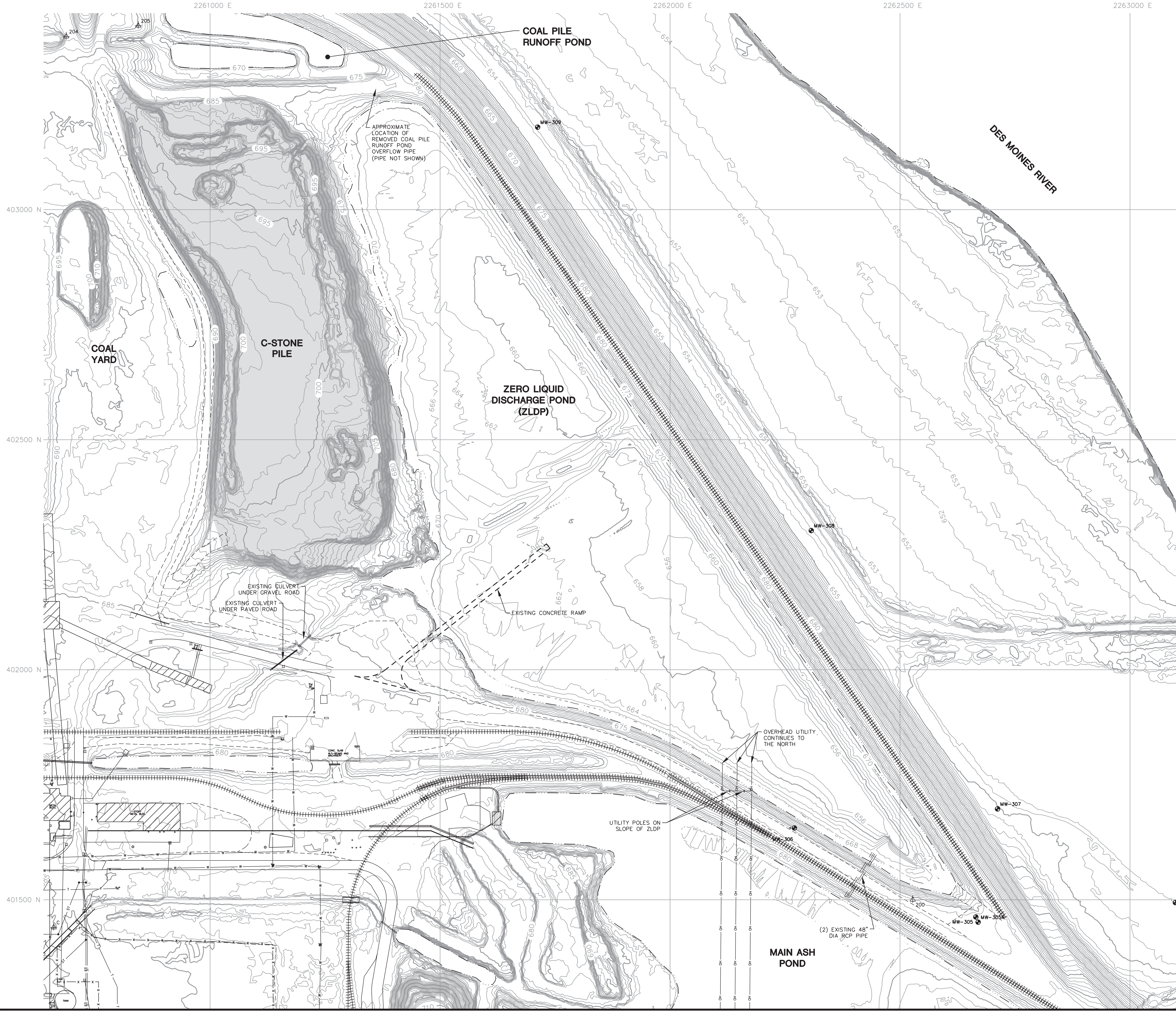
ENGINEER

ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

OVERALL SITE PLAN

SHEET
2 OF 15



LEGEND

660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	PAVED ROAD
	GRAVEL/DIRT ROAD
x	FENCE
	RAILROAD TRACKS
	EDGE OF WATER
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	APPROXIMATE ORIGINAL EXTENTS OF C-STONE PILE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.

N

100 0 100

SCALE: 1" = 100'

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OTTUMWA, IA 52501

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2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

ZLDP CLOSURE AND LWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

PRE-CONSTRUCTION CONDITIONS

SHEET

3 of 15

LEGEND

660	DOCUMENTED EXCAVATION GRADE (10' CONTOUR)
658	DOCUMENTED EXCAVATION GRADE (2' CONTOUR)
653.0	DOCUMENTED EXCAVATION GRADE SPOT ELEVATION
	DOCUMENTED EXCAVATION LIMITS
660	PRE-CONSTRUCTION GRADE (5' CONTOUR)
	PRE-CONSTRUCTION GRADE (1' CONTOUR)
	PAVED ROAD
	GRAVEL/DIRT ROAD
X X X	FENCE
	RAILROAD TRACKS
OH	OVERHEAD UTILITY
ST	STORM SEWER
T	TELEPHONE
UE	UNDERGROUND ELECTRIC
W	WATER MAIN
	MONITORING WELL
	UTILITY POLE
	SURVEY CONTROL POINT
	APPROXIMATE ORIGINAL EXTENTS OF C-STONE PILE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION (SHADED AREA IN DOCUMENTED EXCAVATION EXTENTS) WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. ZLD POND WAS DEWATERED AND WATER PUMPED TO THE MAIN ASH POND.
4. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FROM THE ZLD POND.
5. GRADES SHOWN REPRESENT DOCUMENTED EXCAVATION GRADES AND C-STONE PILE RELOCATION.

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OTTUMWA, IA 52501

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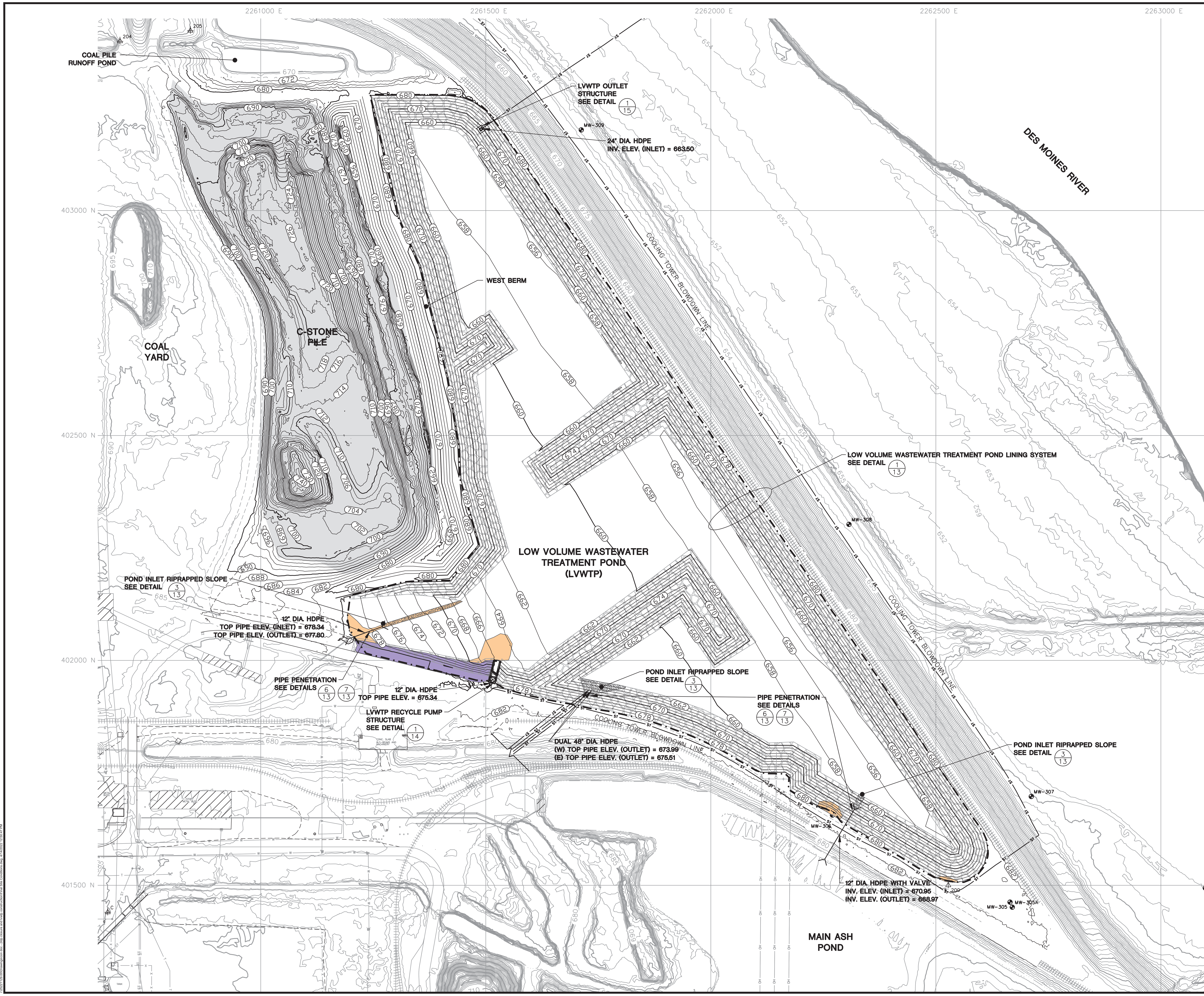
ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

EXCAVATION GRADES

SHEET
4 OF 15



LEGEND

- DOCUMENTED FINAL GRADE (10' CONTOUR) (SEE NOTE X)
- DOCUMENTED FINAL GRADE (2' CONTOUR) (SEE NOTE X)
- PRE-CONSTRUCTION GRADE (5' CONTOUR)
- PRE-CONSTRUCTION GRADE (1' CONTOUR)
- PAVED ROAD
- GRAVEL/DIRT ROAD
- FENCE
- RAILROAD TRACKS
- OVERHEAD UTILITY
- STORM SEWER
- TELEPHONE
- UNDERGROUND ELECTRIC
- WATER MAIN
- MONITORING WELL
- UTILITY POLE
- SURVEY CONTROL POINT
- APPROXIMATE FINAL EXTENTS OF C-STONE PILE
- INSTALLED STORM SEWER PIPING
- INSTALLED CULVERT
- LIMITS OF DOCUMENTED GEOSYNTHETIC LINER
- AS-CONSTRUCTED SURVEYED AREA
- AS-CONSTRUCTED THICKER GRANULAR MATERIAL AREA
- INSTALLED RIPRAP
- INSTALLED RIPRAPPED INLET SLOPE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP LEGEND ITEMS AND NOTES.
2. GRADES SHOWN WITHIN THE DOCUMENTED GEOSYNTHETIC LINER LIMITS REPRESENT DOCUMENTED LVWTP TOP OF GRANULAR MATERIAL. GRADES OUTSIDE THE DOCUMENTED GEOSYNTHETIC LINER LIMITS IN THE WEST BERM REPRESENT DOCUMENTED LVWTP SUBGRADES.
3. GRADES IN THE APPROXIMATE EXTENTS OF THE C-STONE PILE AND PERIMETER OF THE LVWTP REPRESENT FINAL GRADES FROM DECEMBER 20, 2021 DRONE SURVEY BY RYAN INCORPORATED CENTRAL.
4. GEOSYNTHETIC LINER INSTALLED TO 679 FT ELEVATION.
5. INSTALLED PIPE ALIGNMENTS AND ELEVATIONS PROVIDED BY RYAN INCORPORATED CENTRAL.
6. THICKER GRANULAR MATERIAL WAS PLACED IN THE AS-CONSTRUCTED SURVEY LIMITS NEAR THE SOUTHWEST LIMITS OF THE LVWTP TO CREATE ADDITIONAL SPACE FOR VEHICLE TRAFFIC AROUND THE DUMPER HOUSE BUILDING.
7. AS-CONSTRUCTED SURVEY AREAS ARE FIELD MODIFICATIONS AND WERE DOCUMENTED AS CONSTRUCTED.

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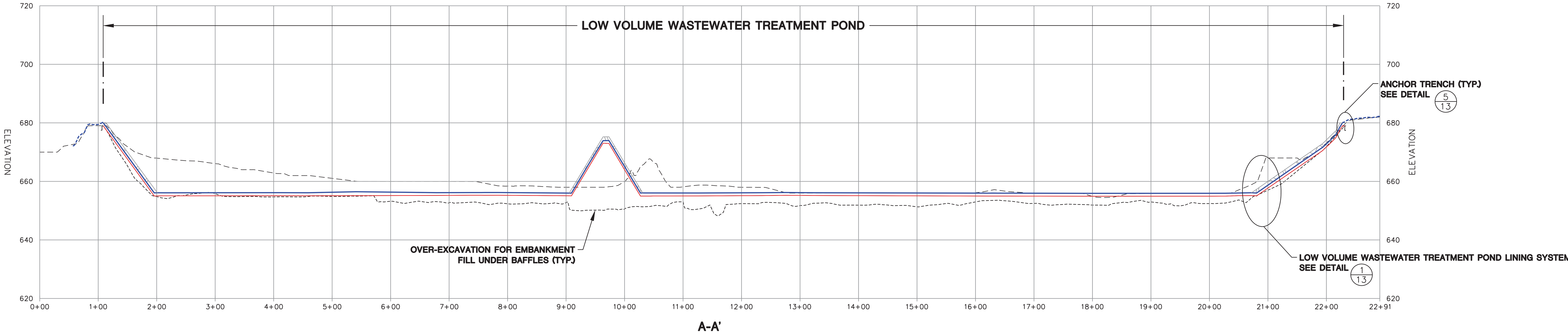
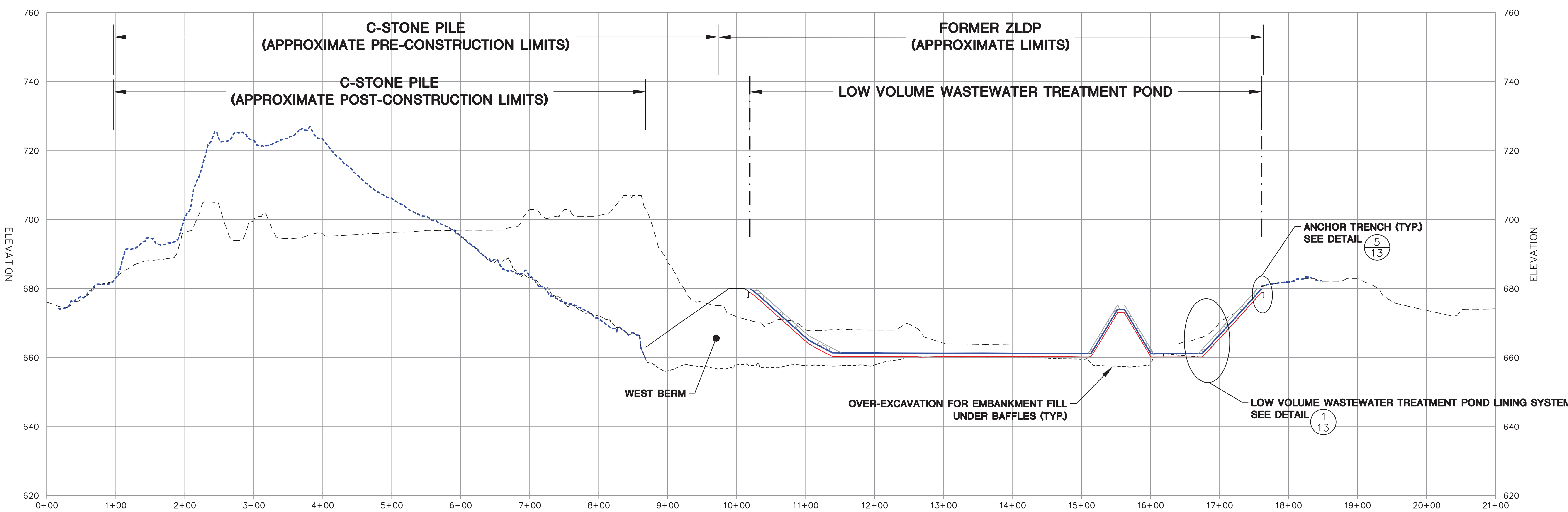
SITE

FINAL SITE CONDITIONS

SHEET
10 OF 15



A-A'



B-B'

100 0 100

SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION

LEGEND

- PRE-CONSTRUCTION GRADE
- DOCUMENTED ZLDP EXCAVATION GRADE
- DOCUMENTED LVWTP SUBGRADE
- DOCUMENTED SUBGRADE OUTSIDE LVWTP LINER LIMITS
- DOCUMENTED LVWTP TOP GRANULAR
- INSTALLED RIPRAP
- DOCUMENTED PERIMETER FINAL GRADE

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL PRE-CONSTRUCTION GRADE NOTES.
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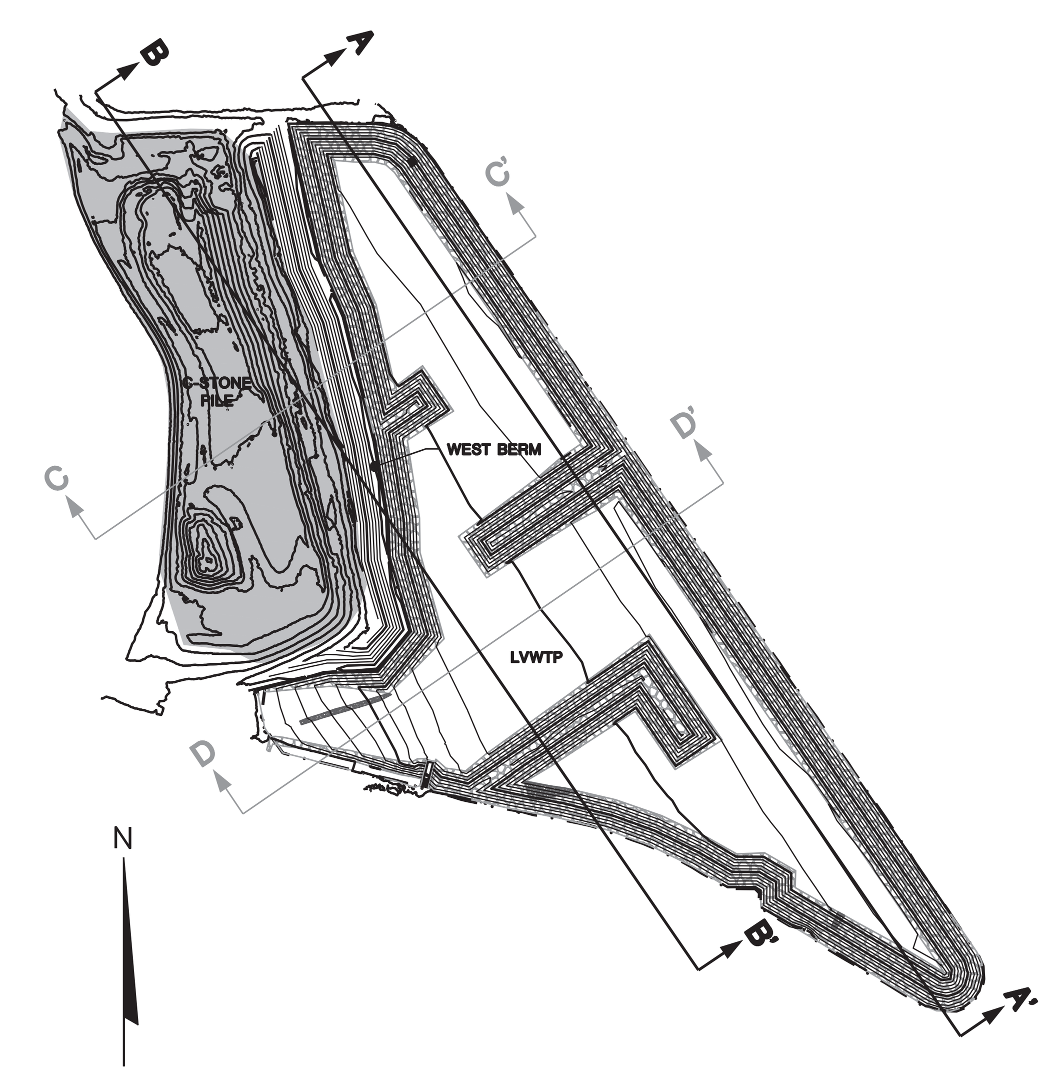

CROSS SECTION LOCATION MAP

SCALE: 1" = 300'

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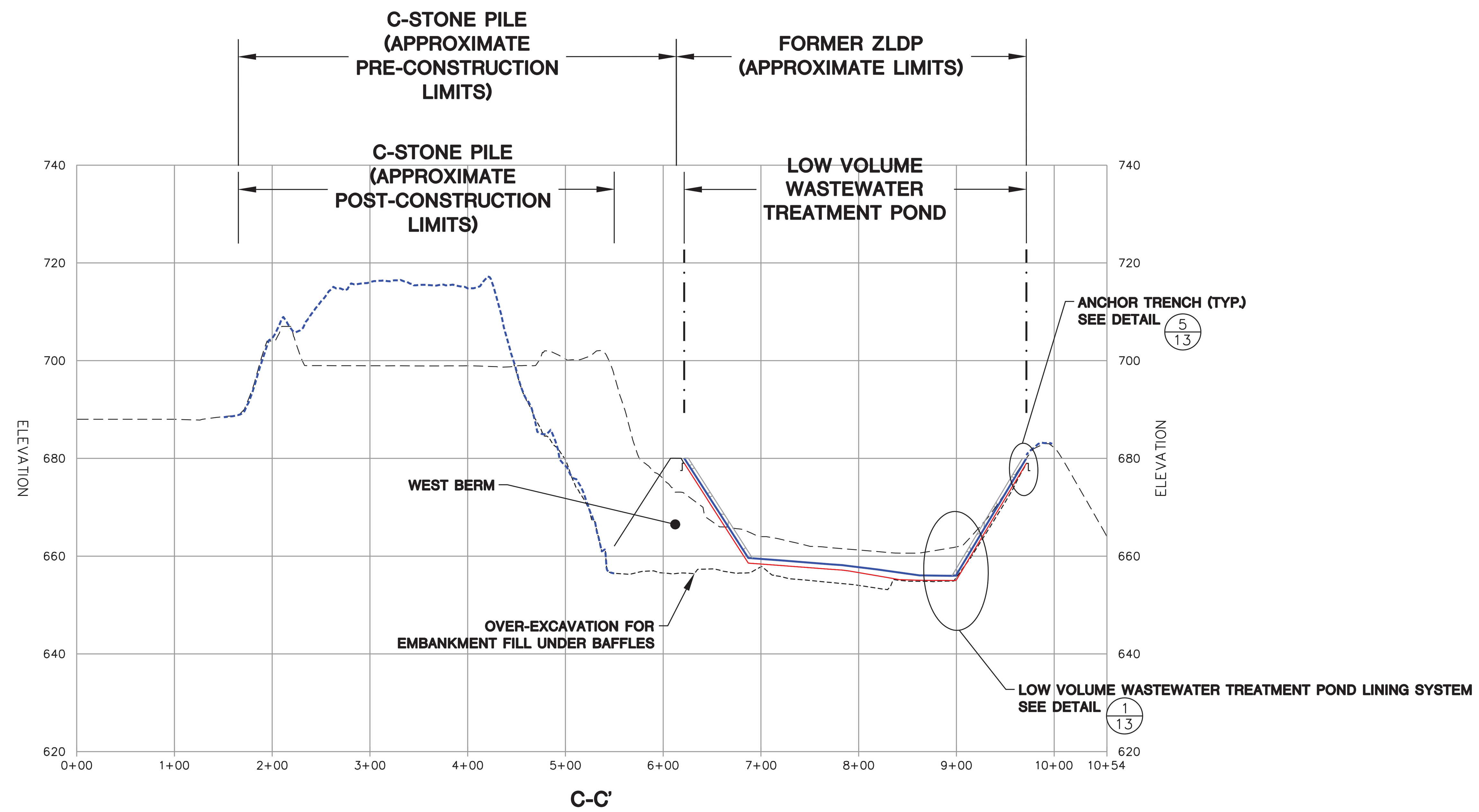
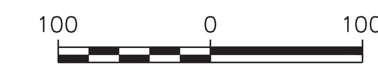
CROSS SECTIONS – A AND B

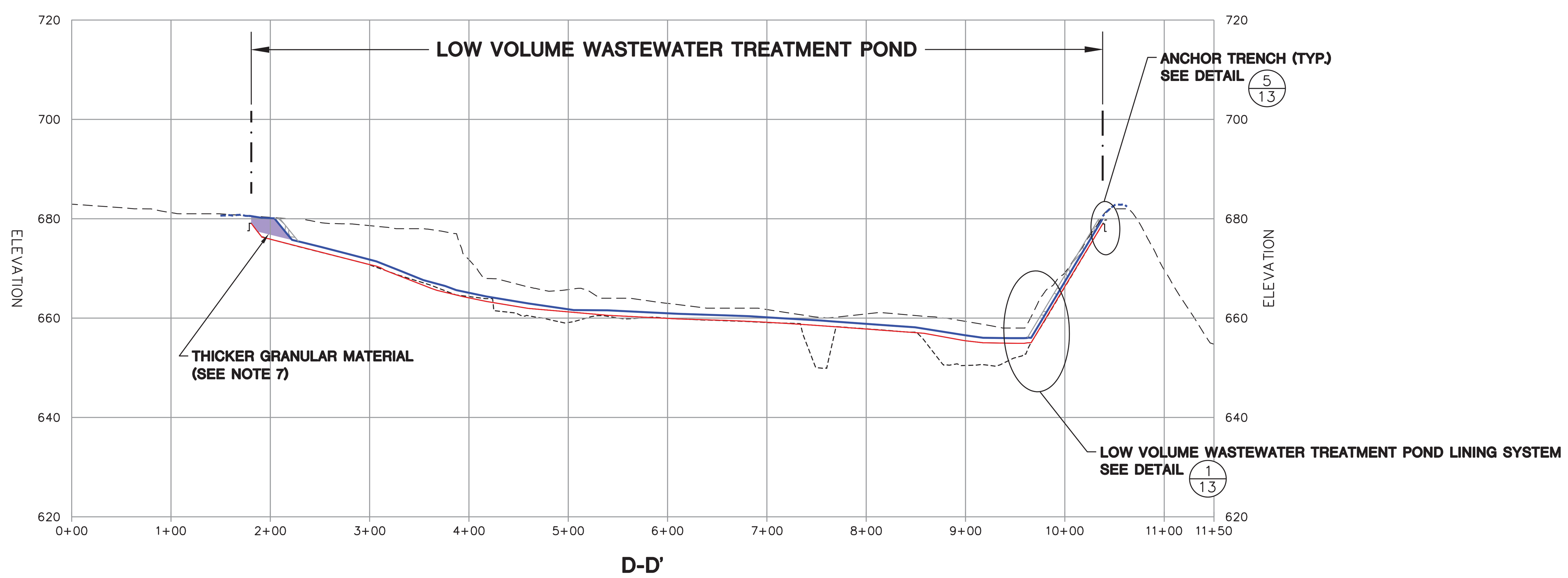
SHEET
11 OF 15



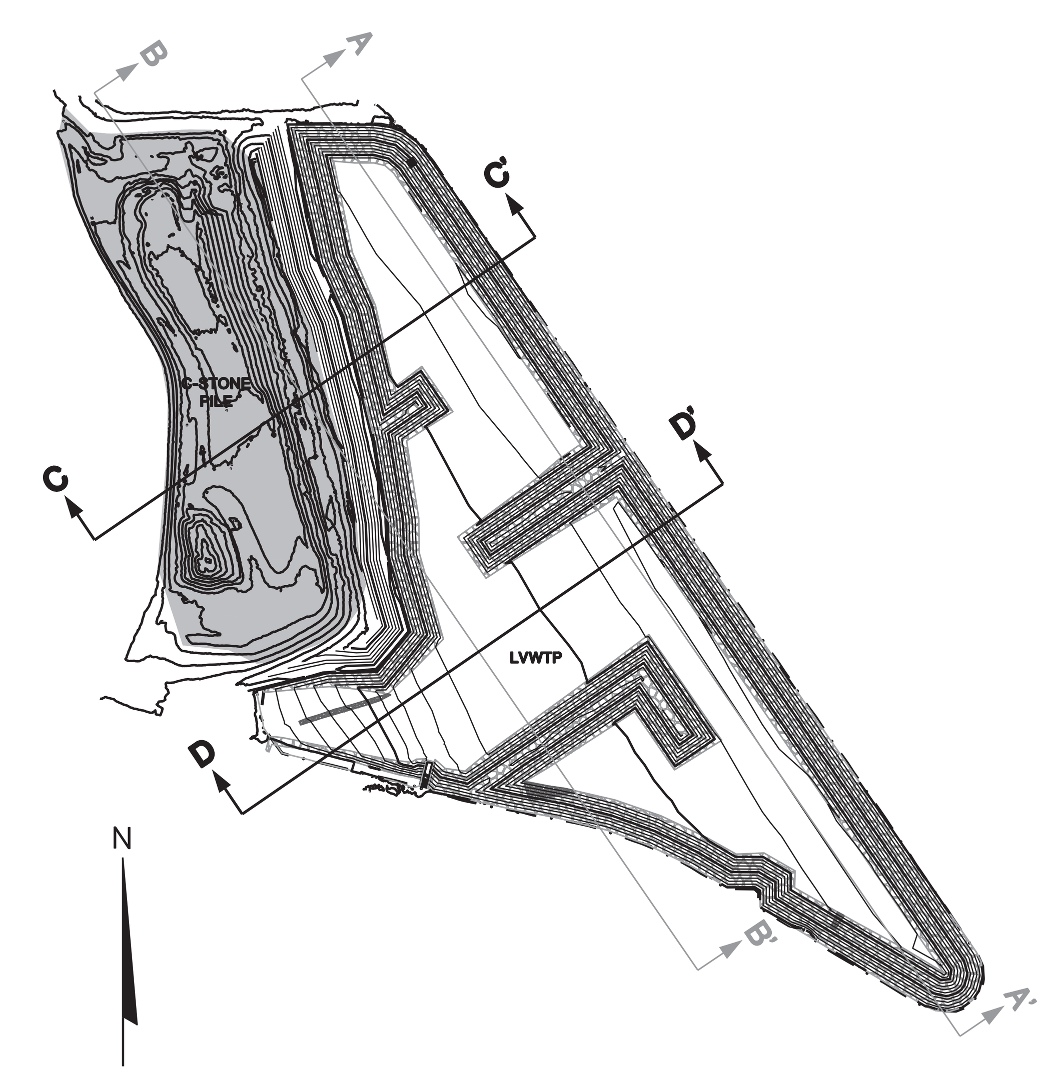
C-C'



SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
5X VERTICAL EXAGGERATION'



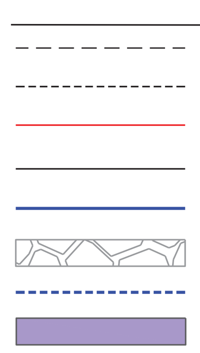
D-D'



CROSS SECTION LOCATION MAP

SCALE: 1" = 300'

LEGEND



- PRE-CONSTRUCTION GRADE
- DOCUMENTED ZLDP EXCAVATION GRADE
- DOCUMENTED LVWTP SUBGRADE
- DOCUMENTED SUBGRADE OUTSIDE LVWTP LINER LIMITS
- DOCUMENTED LVWTP TOP GRANULAR
- INSTALLED RIPRAP
- DOCUMENTED PERIMETER FINAL GRADE
- AS-CONSTRUCTED THICKER GRANULAR MATERIAL AREA

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL PRE-CONSTRUCTION GRADE NOTES.
2. C-STONE PILE MATERIAL IN AREA OF EXCAVATION WAS RELOCATED TO THE TOP OF THE C-STONE PILE. MATERIAL ENCOUNTERED UNDER THE C-STONE PILE IN THE DOCUMENTED EXCAVATION EXTENTS WAS REMOVED AND PLACED IN THE MAIN ASH POND.
3. CCR AND UNSUITABLE MATERIALS WERE EXCAVATED FROM THE ZLD POND AND PLACED IN THE MAIN ASH POND. OWNER'S REPRESENTATIVE PERFORMED VISUAL INSPECTION OF CCR REMOVAL FORM THE ZLD POND.
4. GEOSYNTHETIC LINER INSTALLED TO 679 FT ELEVATION.
5. GRADES OUTSIDE THE DOCUMENTED GEOSYNTHETIC LINER LIMITS IN THE WEST BERM REPRESENT DOCUMENTED LVWTP SUBGRADES.
6. DOCUMENTED PERIMETER FINAL GRADES REPRESENT FINAL GRADES FROM DECEMBER 20, 2021 DRONE SURVEY BY RYAN INCORPORATED CENTRAL.
7. THICKER GRANULAR MATERIAL WAS PLACED IN THE AS-CONSTRUCTED SURVEY LIMITS SHOWN ON PLAN SHEET 10 NEAR THE SOUTHWEST LIMITS OF THE LVWTP TO CREATE ADDITIONAL SPACE FOR VEHICLE TRAFFIC AROUND THE DUMPER HOUSE BUILDING. AS-CONSTRUCTED SURVEY AREAS ARE FIELD MODIFICATIONS AND WERE DOCUMENTED AS CONSTRUCTED.

PROJECT NO.	25221129.00	DRAWN BY:	BSS
DRAWN:	02/21/2022	CHECKED BY:	PEG/EJN
REVISED:	04/14/2022	APPROVED BY:	PEG, 04/14/2022

INTERSTATE POWER AND LIGHT CO.
20775 POWER PLANT ROAD
OTTUMWA, IA 52501

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

ZLDP CLOSURE AND LVWTP CONSTRUCTION
CONSTRUCTION DOCUMENTATION
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE

CROSS SECTIONS – C AND D

SHEET

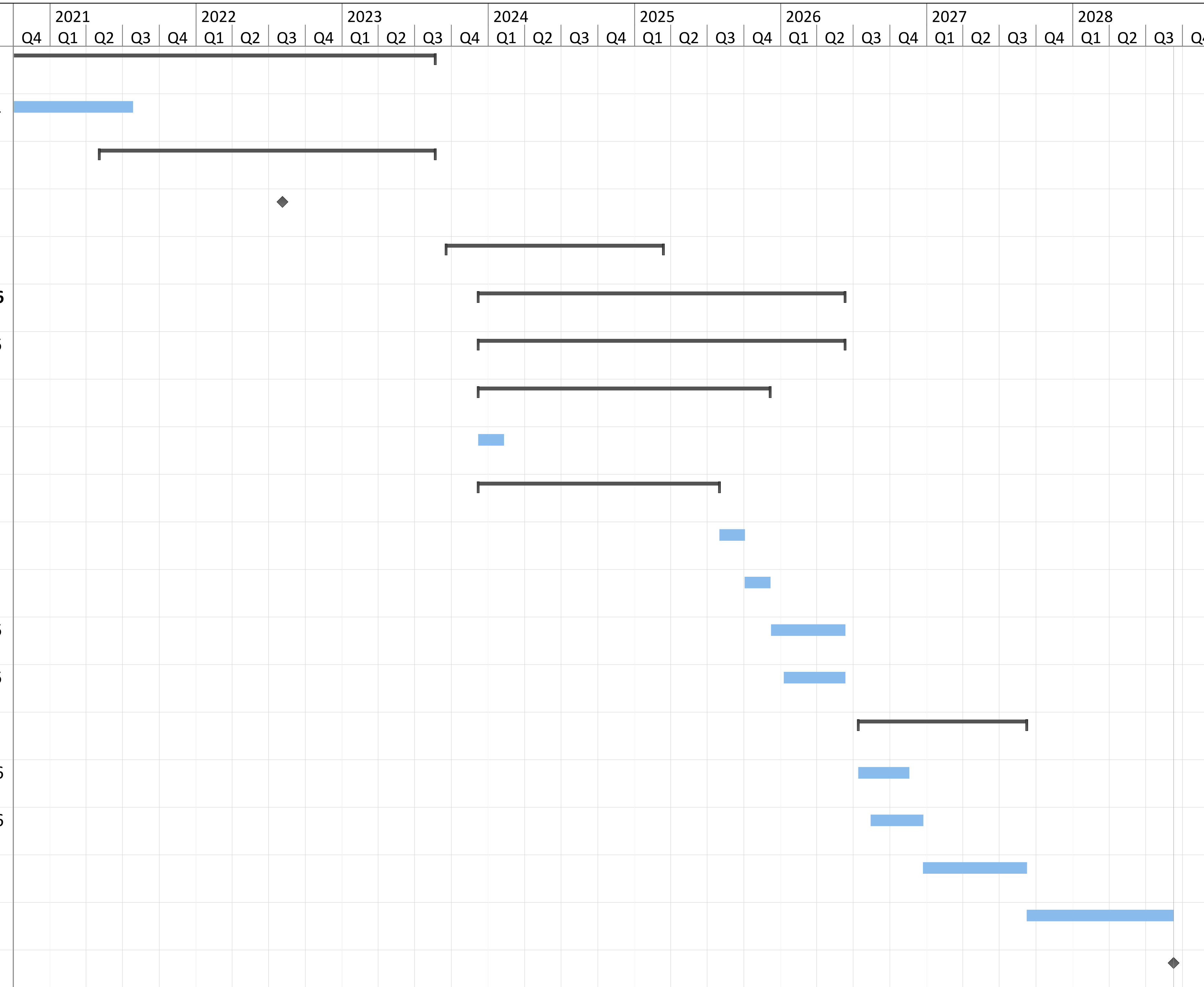
12 of 15

Appendix C

Estimated Groundwater Corrective Action Schedule

Estimated Groundwater Corrective Action
Ottumwa Generating Station (OGS)
SCS Engineers Project #25220083.01

ID	Task Name	Duration	Start	Finish
1	**Ash Pond Closure**	**1839 days**	**Mon 8/1/16**	**Tue 8/22/23**
2	Design/Bidding/Permitting	1301 days	Mon 8/1/16	Mon 7/26/21
3	Construction	**598 days**	**Tue 5/4/21**	**Tue 8/22/23**
12	**ACM Addendum No. 2**	**0 days**	**Fri 8/5/22**	**Fri 8/5/22**
14	**Remedy Selection**	**378 days**	**Mon 9/18/23**	**Thu 3/13/25**
32	**Remedy Design**	**638 days**	**Thu 12/7/23**	**Wed 6/10/26**
33	Groundwater Collection System	638 days	Thu 12/7/23	Wed 6/10/26
34	Extraction System Design	508 days	Thu 12/7/23	Fri 12/5/25
35	Capture Zone Analysis	44 days	Thu 12/7/23	Thu 2/8/24
36	Pilot-testing (Plan/Execute)	420 days	Thu 12/7/23	Thu 7/31/25
47	Well Layout and Design	44 days	Fri 8/1/25	Thu 10/2/25
48	Pump Selection	44 days	Fri 10/3/25	Fri 12/5/25
49	Treatment System Design	130 days	Mon 12/8/25	Wed 6/10/26
50	Facilities, Process and Control Design	108 days	Fri 1/9/26	Wed 6/10/26
51	**Remedy Implementation**	**293 days**	**Tue 7/14/26**	**Tue 9/7/27**
52	Procurement	90 days	Tue 7/14/26	Tue 11/17/26
53	Permitting	90 days	Fri 8/14/26	Tue 12/22/26
54	Construction	180 days	Wed 12/23/26	Tue 9/7/27
55	Remedy O&M	256 days	Wed 9/8/27	Fri 9/8/28
56	Ending Corrective Action	0 days	Fri 9/8/28	Fri 9/8/28



Project: OGS Corrective Action
Date: Mon 3/10/25

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	Manual Progress
Summary	Inactive Task	Duration-only	Finish-only	