Semiannual Progress Report
Selection of Remedy – OGS Ash Pond

Ottumwa Generating Station
Ottumwa, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220083.00 | September 10, 2021

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1.0 INTRODUCTION AND PURPOSE

The Semiannual Progress Report for remedy selection at the Interstate Power and Light Company (IPL) Ottumwa Generating Station (OGS) was prepared to comply with U.S. Environmental Protection Agency (USEPA) regulations regarding the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities [40 CFR 257.50-107], or the "CCR Rule" (Rule). Specifically, the selection of remedy process was initiated to fulfill the requirements of 40 CFR 257.97.

1.1 BACKGROUND

The Assessment of Corrective Measures (ACM) for the OGS Ash Pond was completed on September 12, 2019. The ACM was completed in response to the detection of cobalt at a statistically significant level (SSL) above the Groundwater Protection Standard (GPS) in groundwater samples from downgradient monitoring well MW-305.

IPL initially completed a Selection of Remedy (SOR) Report in September 2020, but a subsequent revision to the Assessment of Corrective Measures, completed in November 2020, resulted in a retraction of the SOR Report. The initial SOR Report is now considered to be the September 2020 semiannual progress report because it discusses activities completed during the March 2020 through September 2020 reporting period.

This Semiannual Progress Report summarizes data collected and remedy evaluation progress made since the September 2019 ACM and November 2020 revised ACM, and outlines planned future activities to complete the selection of remedy process. This is the fourth semiannual progress report, and covers the 6-month period of March 2021 through August 2021.

1.2 SITE INFORMATION AND MAPS

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 OGS Zero Liquid Discharge (ZLD) Pond, a coal stockpile, and a hydrated fly ash stockpile.

The two CCR units at the facility (OGS Ash Pond and OGS ZLD Pond) are each monitored with single-unit groundwater monitoring systems. The OGS Ash Pond is the subject of this Semiannual Progress Report.

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**.

Groundwater flow at the site is generally to the east-northeast, and the groundwater flow direction and water levels fluctuate seasonally due to the proximity to the river. Depth to groundwater as measured in the site monitoring wells varies from 1 to 25 feet below ground surface due to topographic variations across the facility and seasonal variations in water levels.

In September 2020, IPL discontinued the use of the existing wet bottom ash handling system at OGS and ceased the discharge of bottom ash transport water to the OGS Ash Pond. A dry bottom ash handling system is installed and operating as of December 2020.

2.0 SUMMARY OF WORK COMPLETED

Work completed to support remedy selection for the OGS Ash Pond is summarized in Table 1. Activities completed within the 6-month period of March 2021 through August 2021 covered by this semiannual report are discussed in more detail below.

2.1 MONITORING NETWORK CHANGES

Planning, well design, permit application preparation (Joint Application for Iowa Department of Natural Resources and U.S. Army Corps of Engineers), and access coordination for the installation of two additional monitoring wells was completed from March 2021 through June 2021. The proposed wells will be located between existing monitoring wells MW-305/305A and MW-310/310A. Groundwater results from the new wells will be used to evaluate monitored natural attenuation (MNA) processes occurring downgradient of the ash pond.

The locations of existing monitoring wells at OGS are shown on Figure 2.

2.2 GROUNDWATER MONITORING

Since March 2021, groundwater samples were collected during two events in April and July 2021:

- The April 2021 monitoring event was part of the routine semiannual assessment monitoring program. The wells sampled included the six wells in the original monitoring system (MW-301 through MW-306), two additional wells (MW-310 and MW-311), and three additional piezometers (MW-305A, MW-310A, and MW-311A).

- The July 2021 monitoring event was a quarterly or additional sampling event targeting cobalt at MW-306 and MW-307, lithium at MW-310, and fluoride at MW-311A.

A summary of groundwater samples collected since the completion of the September 2019 ACM is provided in Table 2.

2.3 STATISTICAL EVALUATION

Statistical evaluation of sampling results during the period covered by this update will be discussed in the 2021 Annual Groundwater Monitoring and Corrective Action Report, to be dated January 2022. Based on the April 2021 statistical evaluation, the SSLs above the GPS are cobalt at compliance well MW-305 and lithium at MW-310A and MW-311A. The SSLs above the lithium GPS at MW-310A and MW-311A are newly observed at OGS. An ASD for lithium is being prepared. The ASD must be completed by October 13, 2021.

The lithium GPS exceedances are most likely due to natural background conditions in the Mississippian bedrock aquifer. As discussed in the November 2020 ACM Addendum, lines of evidence supporting this finding include:

- No lithium GPS exceedances have been detected in monitoring wells located adjacent to the OGS Ash Pond.
- The lithium concentrations detected in samples from MW-310A and MW-311A are well within the range if concentrations naturally present in the Mississippian aquifer.
- Analysis of major anions and cations indicates that water quality in the deep piezometers MW-310A and MW-311A is similar to regional water quality for the Mississippian aquifer.

- Vertical gradients at monitoring well pairs MW-310/310A and MW-311/311A indicate that groundwater flow is at least intermittently upward from the Mississippian bedrock into the overlying unconsolidated material.

2.4 SURFACE IMPOUNDMENT CLOSURE

Construction for the closure of the OGS ZLD Pond and OGS Ash Pond began in May 2021. The closure of the OGS ZLDP enables construction of the new lined treatment pond, redirection of non-CCR waste waters from the OGS Ash Pond, and subsequent closure of the OGS Ash Pond. Construction activities during the current semiannual report period included:

- Dewatering of the ZLD Pond
- C-Stone relocation at West Boundary of ZLD Pond
- Excavation of CCR from ZLD Pond to OGS Ash Pond
- Placement of general fill material in ZLD pond for use in embankment construction and subgrade stabilization

2.5 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

A qualitative assessment of potential Corrective Measure Alternatives using the selection criteria in 40 CFR 257.97(b) and (c) was provided in the September 2019 ACM and revised in the November 2020 Addendum #1. Table 3 summarizes the assessment completed for the ACM Addendum. No updates or changes to the assessment have been made based on additional information obtained since the issue of the ACM Addendum.

Groundwater data collection and analysis continues to demonstrate that the MNA option is favorable at OGS. Although dilution by mixing with upward flowing deep groundwater may be a factor in cobalt reduction, the potential mixing does not appear to be sufficient to account for the cobalt concentration reduction. Precipitation, coprecipitation or adsorption likely account for the remaining decrease. The additional MNA evaluation activities are described below.

In addition, IPL has developed a design for closure of the OGS Ash Pond and initiated closure construction as discussed in Section 2.4.

Updates to the quantitative assessment discussed in the ACM and development of a new SOR Report will be completed in the future based on updates to the conceptual site model, delineation of the nature and extent of impacts, ash pond closure design and construction activities, and collection of additional data relevant to remedy selection.

3.0 PLANNED ACTIVITIES

Planned activities related to the remedy selection process include the following:

- Install two additional monitoring wells between existing monitoring wells MW-305 and MW310 to further evaluate attenuation processes in groundwater downgradient of the OGS Ash Pond and to refine the estimate of cobalt mass in the groundwater downgradient of the ash pond.
- Collect additional MNA parameters for ongoing MNA evaluation. Data collection will include:
  - Field parameters and both total and dissolved laboratory parameters to better define the downgradient chemistry and evolution with flow.

  - Dissolved cobalt and iron to assess potential adsorption of cobalt to colloidal iron.
  - Filtration of turbid groundwater produced by the monitoring wells and analysis of the solid filtrate for aluminum, iron and cobalt to determine the degree to which the cobalt is associated with suspended solids.
- Laboratory analyses of the degree of iron precipitation and cobalt coprecipitation and adsorption from MW-305 groundwater with aeration (i.e. redox increase) to better understand the degree to which cobalt adsorption and coprecipitation contributes to attenuation.
- Samples of the saturated sand will be collected to
  - Assess the potential for adsorption
  - Assess the degree to which cobalt has adsorbed or coprecipitated on to the sand matrix.
  - Prepare cobalt adsorption isotherms to assess capacity of the sand to absorb cobalt and determine maximum adsorption capacity.
- Update conceptual site model based on findings of nature and extent investigation.

Continue semiannual assessment monitoring for the existing monitoring well network, new monitoring wells, and new piezometers.

- Finalize evaluation of remedial options and issue a final Selection of Remedy report per 40 CFR 257.97(a)

Tables

Table 1. Timeline for Completed Work - Selection of Remedy
Ottumwa Generating Station / SCS Engineers Project #25220083.00

Date	Activity
August 2019	Additional monitoring wells installed to investigate nature and extent (MW-310 and MW-311)
September 2019	Completed ACM
October 2019	Conducted semiannual assessment monitoring event
November 2019	Completed Well Construction Documentation for new monitoring wells
January 2020	Completed Statistical Evaluation of October 2019 groundwater monitoring results
January 2020	Completed 2019 Annual Groundwater Monitoring and Corrective Action Report
August 2019 - February 2020	OGS Ash Pond closure design (ongoing)
December 2019 to February 2020	Planning, permitting, and access for three additional monitoring wells (piezometers) to investigate the vertical extent of impacts
February 2020	Collected second round of groundwater samples from the new monitoring wells (MW-310 and MW-311) and background well
February 2020 to March 2020	Complete the installations of three piezometers (MW-305A, MW-310A, and MW-311A)
March 2020	Completed groundwater sampling for specific metals and MNA parameters from selected monitoring wells as well as the newly installed piezometers
April 2020	Conducted semiannual assessment monitoring event
June 2020	Completed monitoring results letter for February 2020 sampling
June 2020	Conduct assessment monitoring resample for selected parameters and monitoring well
June 2020	Completed monitoring results letter for March 2020 sampling
July 2020	Completed monitoring results letter for April 2020 sampling and June 2020 resampling
June 2020	Held public ACM meeting
September 2020	Completed Semiannual Progress Report for the Selection of Remedy
September 2020	Complet Well Documentation Report for additional peizometers (MW-305A, MW-310A, and MW-311A).
September 2020	Discontinued wet bottom ash sluicing at OGS
October 2020	Conducted semiannual assessment monitoring event and additional MNA parameter samples for the selection of remedy process
November 2020	Complete the ACM Addendum No. 1
January 2021	Completed Statistical Evaluation of October 2020 groundwater monitoring results

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Date	Activity
January 2021	Completed 2021 Annual Groundwater Monitoring and Corrective Action Report
February 2021	Held public ACM Addendum meeting on February 18, 2021
February 2021	Conduct additional assessment monitoring for selected parameters and monitoring wells
March 2021	Completed Semiannual Progress Report for the Selection of Remedy
March 2021 - June 2021	Planning, design, draft permit preparation, and access evaluaiton for two additional monitoring wells to evaluate MNA processess.
April 2021	Conducted semiannual assessment monitoring event
June 2021	Completed groundwater monitoring results letter for February 2021 sampling event
July 2021	Submitted joint permit application to the United State Army Corps of Engineers and Iowa Department of Natural Resources
July 2021	Completed groundwater monitoring results letter for April 2021 sampling event
July 2021	Submitted Notification of Groundwater Protection Standard Exceedance for lithium at MW-310A and MW-311A
July 2021	Conduct assessment monitoring resample for selected parameters and monitoring wells

A-R = Resampling event under Assessment Monitoring Program
* = Resampling event completed in 2019 but analytical results will be used for evaluation for the October 2018 sampling event.

Created by:	SCC	Date:	2/17/2020
Last revision by:	RM	Date:	8/13/2021
Checked by:	NDK	Date:	8/13/2021

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

Sample Dates	Compliance Wells				Delineation Well	Compliance Well	Delineation Wells				Background Well
	MW-302	MW-303	MW-304	MW-305	MW-305A	MW-306	MW-310	MW-310A	MW-311	MW311A	MW-301
10/23-24/2019	A	A	A	A	NI	A	A	NI	A	NI	A
2/5/2020	--	--	--	--	NI	--	A	NI	A	NI	A
3/12-13/2020	--	--	--	Add.	Add.	--	Add.	Add.	Add.	Add.	Add.
4/13-14/2020	A	A	A	A	A	A	A	A	A	A	A
6/30/2020	--	--	--	--	--	--	--	--	--	A - R	--
10/8-12/2020	A	A	A	A	A	A	A	A	A	A	A
2/23/2021	--	--	--	--	--	Add.	Add.	--	--	Add.	--
4/12-16/2021	A	A	A	A	A	A	A	A	A	A	A
7/6/2021	--	--	--	--	--	Add.	Add.	--	--	Add.	--
Total Samples	4	4	4	5	4	6	8	4	6	7	6

Abbreviations:
A = Assessment Monitoring Program
-- = Not sampled
NI = Not Installed
A - R = Assessment Resample
Add. = Additional sampling event for selected parameters

Created by: NDK Date: 2/17/2021
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\\Mad-fs01\data\Projects\25220083.00\Deliverables\2021 Semiannual - Remedy Selection\2021 Sept Semiannual Update\Tables\[Table 2_GW_Samples_Summary_Table_OGS.xlsx]GW Summary

Table 3. Preliminary Evaluation of Corrective Measure Alternatives
Ottumwa Generating Station / SCS Engineers Project #25220083.00

	Alternative #1 No Action	Alternative #2 Close and Cap in place with MNA	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	Alternative #6 Consolidate and Cap with Chemical Amendment	Alternative #7 Consolidate and Cap with Groundwater Collection	Alternative #8 Consolidate and Cap with Barrier Wall
CORRECTIVE ACTION ASSESSMENT - 40 CFR 257.97(b)								
257.97(b)(1) Is remedy protective of human health and the environment?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Unlikely	Yes	Yes	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?	No	Yes	Yes	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?	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR	Not Applicable - No release of CCR
257.97(b)(5) Can the remedy comply with standards for management of wastes as specified in §257.98(d)?	Not Applicable	Yes	Yes	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	No reduction of existing risk	Existing risk reduced by achieving GPS	Same as Alternative #2	Same as Alternative #2	Same as Alternative #2	Similar to Alternative #2. Long-term risk may be reduced with additional source control and in-situ stabilization/fixation of CCR that may be in contact with groundwater.	Similar to Alternative #2. Groundwater extraction and treatment presents an additional risk and potential exposure pathways via surface release or disruption of treatment processes.	Similar to Alternative #2. 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	No reduction of existing risk. Residual risk is limited for all alternatives due to limited extent of impacts and lack of receptors.	Magnitude of residual risk of further releases is lower than current conditions due to final cover eliminating infiltration through CCR; Residual risk is limited for all alternatives due to limited extent of impacts and lack of receptors	Same as Alternative #2 with potential further reduction in release risk due to CCR material footprint; However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #3 with potential further reduction in release risk due to composite liner and cover; However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #3 with potential further reduction in release risk due to removal of CCR from site; However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #2 with potential further reduction in release risk due to CCR material footprint; Residual risk is further reduced by way of chemical / physical alteration of the source of impacts. However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts.	Same as Alternative #2 with potential further reduction in release risk due to CCR material footprint; Residual risk is potentially reduced by way of the ability to respond to potential future/ongoing releases from CCR that might be in contact with groundwater following closure. However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts.	Same as Alternative #2 with potential further reduction in release risk due to CCR material footprint; Residual risk of source material in contact with groundwater is further reduced by the containment of groundwater impacts provided by barrier walls; However, limited to no overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts.
257.97(c)(1)(iii) The type and degree of long-term management required, including monitoring, operation, and maintenance	Not Applicable	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 #2	Same as Alternative #2	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 #2	Same as Alternative #2	Same as Alternative #2 with additional effort for groundwater pump operation and maintenance (O&M), groundwater treatment system O&M, and treatment system discharge monitoring/reporting.	Same as Alternative #2 with additional monitoring of wall performance.

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LONG- AND SHORT-TERM EFFECTIVENESS - 40 CFR 257.97(c)(1) (continued)								
257.97(c)(1)(iv) Short-term risks - Implementation								
Excavation	None	Limited risk to community and environment due to limited amount of excavation (likely <200K cy) required to establish final cover subgrades and no off-site excavation	Same as Alternative #2 with increased risk to environment due to increased excavation volumes required for consolidation (likely >200K cy but <463K cy)	Same as Alternative #3 with increased risk to environment due to increased excavation volumes (~463K cy) and temporary CCR storage during disposal site construction required for removal and on-site re-disposal	Same as Alternative #4 with reduced risk to environment from excavation due to limited on-site storage	Similar to Alternative #3 with some increased potential risk due to exposure during the application of the chemical amendment.	Similar to Alternative #3 with some increased construction risk due to drilling, trenching, and excavation for groundwater pumping and treatment system construction.	Similar to Alternative #3 with some increased construction risk due to excavation or installation of the barrier wall.
Transportation	None	No risk to community or environment from off-site CCR transportation: Typical risk due to construction traffic delivering final cover materials to site	Same as Alternative #2 with reduced risk from construction traffic due to reduced final cover material requirements (smaller cap footprint)	Same as Alternative #2 with increased risk from construction traffic due to increased material import requirements (liner and cap construction required)	Highest level of community and environmental risk due to CCR volume export (~463K cy)	Similar to Alternative #3 with increased risk from importing chemical material for stabilization/treatment.	Similar to Alternative #3 with increased risk from importing groundwater pumping and treatment system materials.	Similar to Alternative #3 with increased risk from importing barrier wall system materials.
Re-Disposal	None	Limited risk to community and environment due to limited volume of CCR re-disposal (likely <200K cy)	Same as Alternative #2 with increased risk to environment due to increased excavation volumes (likely >200K cy but <463K cy) required for consolidation	Same as Alternative #3 with increased risk to environment due to increased excavation volumes (~463K cy) and temporary CCR storage during disposal site construction required for removal and on-site re-disposal	Same as Alternative #4 with increased risk to community and environment due to re-disposal of large CCR volume (~463K cy) at another facility; Re-disposal risks are managed by the receiving disposal facility	Similar to Alternative #3 with some increased potential risk due to exposure during the application of the chemical amendment.	Same as Alternative #3	Same as Alternative #3
257.97(c)(1)(v) Time until full protection is achieved	Unknown	Closure and capping can be completed by end of 2023. Groundwater protection timeframe to reach GPS potentially 2 to 10 years following closure construction, achievable within 30-year post-closure monitoring period.	Similar to Alternative #2. 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. Scoring is based on balance between potential increase or decrease due to factors listed.	Increased time required to implement remedy in comparison to Alternative #2. Anticipated increase in time required to identify, site and develop onsite disposal capacity if located outside of existing impoundment footprint. Increased time required for closure construction due 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.	Increased time required to implement remedy in comparison to Alternative #2, and potentially the longest required time to implement closure. 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 #2. Potential for reduction in time to reach GPS due to chemical/physical stability of CCR.	Similar to Alternative #2. Potential decrease in time to reach GPS from implementation of groundwater pumping.	Similar to Alternative #2. 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	No change in potential exposure	Potential for exposure is low. Remaining waste is capped.	Similar to Alternative #2 with increased risk to construction workers during consolidation of CCR.	Similar to Alternative #2 with increased risk to construction workers during excavation and re-disposal. Increased risk over Alternative #3 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 #2 Highest level of risk due to excavation, transportation, and re-disposal for construction workers removing CCR and solid waste workers at receiving facility.	Same as Alternative #2	Similar to Alternative #2 with potential for secondary impacts from releases of extracted groundwater or disruption in treatment.	Same as Alternative #2
257.97(c)(1)(vii) Long-term reliability of the engineering and institutional controls	Not Applicable	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 #2 with potentially increased reliability due to smaller footprint and reduced maintenance	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	Same as Alternative #3.	Same as Alternative #3. Remedy relies upon active equipment that will require additional operations and maintenance.	Same as Alternative #3. 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	Not Applicable	Limited potential for remedy replacement if maintained; Some potential for remedy enhancement due to residual groundwater impacts following source control	Same as Alternative #2 with reduced potential need for remedy enhancement with consolidated/smaller closure area footprint	Same as Alternative #2 with further reduction in potential need for remedy enhancement 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 further reduction in potential need for remedy enhancement due to stabilized/solidified CCR material.	Similar to Alternative #2, with reduced potential of remedy replacement, but added expectation for pump, conveyance system and treatment system replacement.	Similar to Alternative #2, with reduced potential of remedy replacement, but added expectation for potential replenishment of consumptive barrier product.

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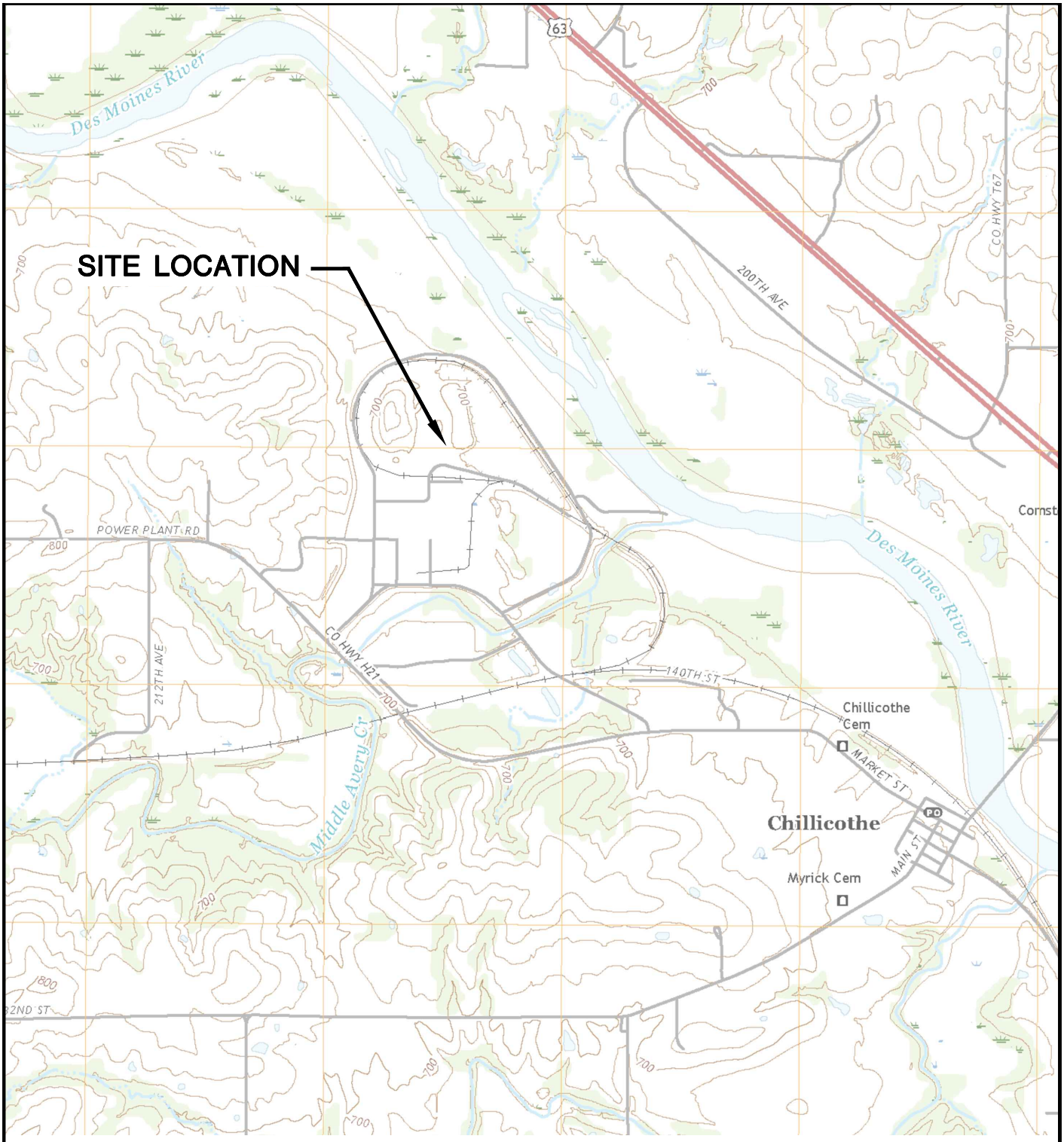
SOURCE CONTROL TO MITIGATE FUTURE RELEASES - 40 CFR 257.97(c)(2)								
257.97(c)(2)(i) The extent to which containment practices will reduce further releases	No reduction in further releases	Cap will reduce further releases by minimizing infiltration through CCR	Same as Alternative #2 with further reduction due to consolidated/smaller closure footprint	Same as 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 #3	Similar to Alternative #3 with further reduction due to lower mobility of contaminants in residual source material as a result of chemical amendment.	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 #3 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	Alternative does not rely on treatment technologies	Alternative does not rely on treatment technologies	Alternative relies on the identification and availability of a suitable chemical amendment. Implementation of and contact with physical/chemical stabilizing agent will require specialized field implementation methods and health and safety measures.	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	Not Applicable	Low complexity construction; Potentially lowest level of dewatering effort - dewatering required for cap installation only	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 ~463K 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 ~463K 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	Moderate complexity construction due to the equipment required to apply the selected amendment; requirements to ensure consistent contact and dosing of amendment; Medium degree of logistical complexity involving the import of specialty chemicals; Moderate to low level of dewatering effort - dewatering required for material excavation/placement and capping	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	Not Applicable	High reliability based on historic use of capping as corrective measure	Same as Alternative #2	Same as Alternative #2	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 #2, but may not be controlled by the Owner.	Similar to Alternative #2; however, success at OGS relies on the successful application of specialty chemicals.	Similar to Alternative #2; however, success of this remedy relies on the successful operation of a site-specific groundwater treatment plant.	Similar to Alternative #2; 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	Not Applicable	Need is low in comparison to other alternatives; State Closure Permit required	Same as Alternative #2	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; Underground Injection Control Permit may be required if chemical materials placed within groundwater. 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 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	Not Applicable	Necessary equipment and specialists are highly available; Highest level of demand for cap construction material, which are readily available and accessible in the area.	Same as Alternative #2; Lowest level of demand for cap construction material. Potentially increased demand for dewatering, treatment and conditioning of CCR.	Same as Alternative #2; Moderate 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 ~463K 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. Specialized mixing equipment likely required to apply chemical amendment and achieve required dosing.	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 low or in high demand.
257.97(c)(3)(v) Available capacity and location of needed treatment, storage, and disposal services	Not Applicable	Capacity and location of treatment, storage, and disposal services is not a factor for this alternative	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 ~463K 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	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative
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 on June 4, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on June 4, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on June 4, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on June 4, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on June 4, 2020. Assume all alternatives are acceptable to interested/affected parties.	To be determined. Alternative added after public meeting held on June 4, 2020.	To be determined. Alternative added after public meeting held on June 4, 2020.	To be determined. Alternative added after public meeting held on June 4, 2020.

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

Created by: LAB/SK Date: 6/20/2019
Last revision by: SK Date: 2/23/2021
Checked by: EJN Date: 11/25/2020

\\Mad-fs01\data\Projects\25220083.00\Deliverables\2021 Semiannual - Remedy Selection\2021 Sept Semiannual Update\Tables\[Table 3_Evaluation of Assessment of Corrective Measure_OGS.xlsx]OGS_Evaluation Matrix

Figures



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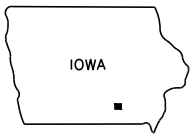
CHILLICOTHE QUADRANGLE
IOWA–WAPELLO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



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

SITE LOCATION MAP

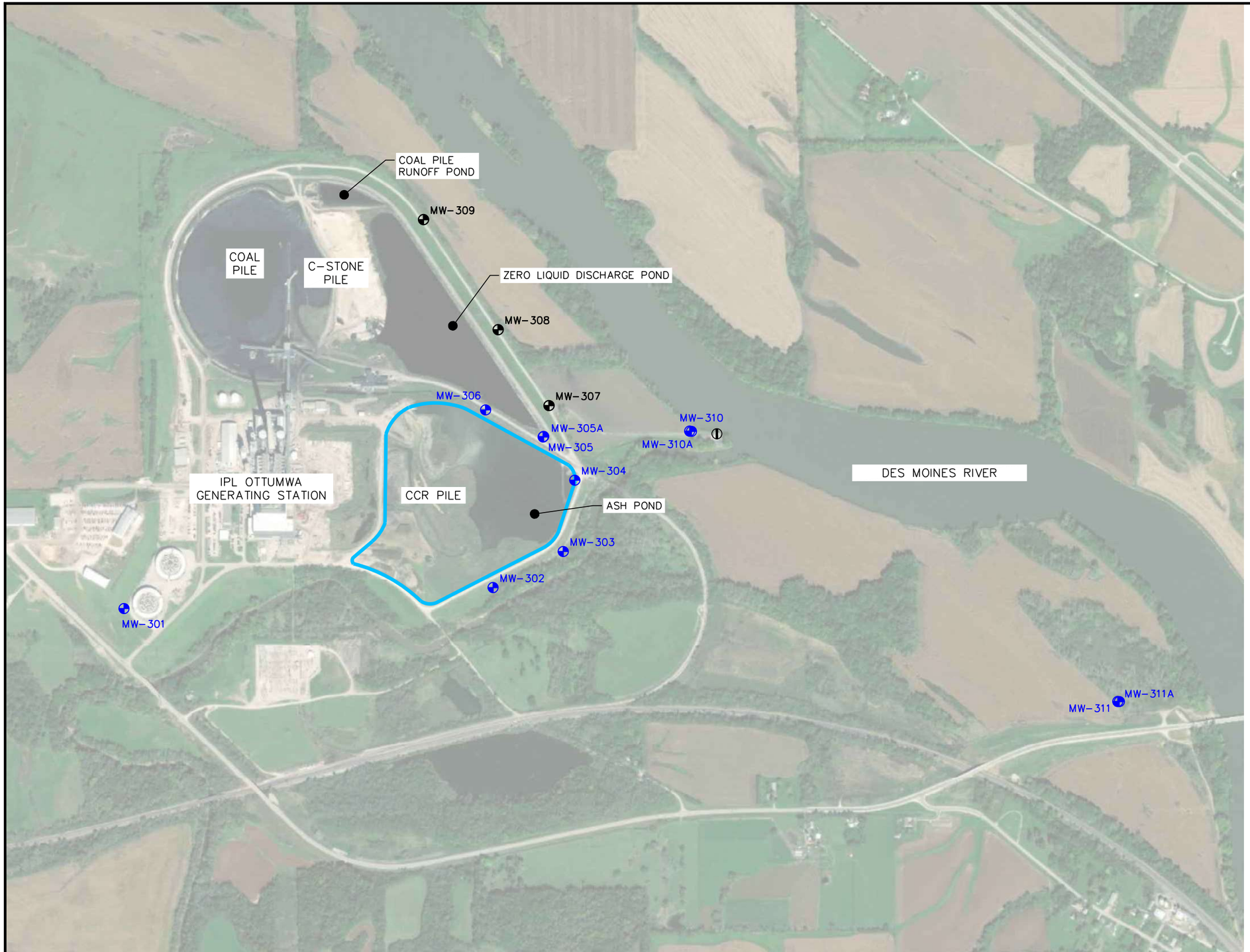
PROJECT NO.	25219072.00	DRAWN BY:	BSS
DRAWN:	11/15/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 01/30/2020

ENGINEER

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

FIGURE 1

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



LEGEND

- CCR UNIT
- OGS ASH POND CCR MONITORING WELL
- ADDITIONAL CCR MONITORING WELL
- RIVER ELEVATION MEASUREMENT LOCATION

NOTES:

1. 2014 AERIAL PHOTOGRAPH SOURCES: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY.
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.

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800 0 800

SCALE: 1" = 800'

PROJECT NO.	25220083.00	DRAWN BY:	BSS
DRAWN:	11/15/2019	CHECKED BY:	MDB
REVISED:	12/03/2020	APPROVED BY:	TK 3/11/2021

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:\25220083.00\Drawings\ACM Addendum\201203\Site Plan and Monitoring Well Locations.dwg, 12/3/2020 3:06:35 PM