Semiannual Progress Report Selection of Remedy – Lansing Generating Station

Lansing Generating Station
Lansing, Iowa

Prepared for:

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SCS ENGINEERS

25220082.00 | March 11, 2022

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1.0 INTRODUCTION AND PURPOSE

The Semiannual Progress Report for remedy selection at the Interstate Power and Light Company (IPL) Lansing Generating Station (LAN) 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 LAN Landfill and Upper Ash Pond was completed on September 12, 2019. The ACM was completed in response to the detection of arsenic at a statistically significant level (SSL) above the Groundwater Protection Standard (GPS) in groundwater samples from downgradient monitoring well MW-302. An ACM Addendum was completed on November 25, 2020.

This Semiannual Progress Report summarizes data collected and remedy evaluation progress made since the September 2019 ACM and November 2020 ACM Addendum, and outlines planned future activities to complete the selection of remedy process. This semiannual progress report covers the 6-month period of September 2021 through February 2022.

1.2 SITE INFORMATION AND MAPS

LAN is located along the west bank of the Mississippi River, south of the City of Lansing, in Allamakee County, Iowa. The address of the generating station is 2320 Power Plant Drive in Lansing, Iowa (**Figure 1**). The facility includes a coal-fired generating plant, a CCR landfill, the LAN Upper Ash Pond, and a coal stockpile. LAN will cease operations by the end of 2022.

The two CCR units at the facility (LAN Landfill and Upper Ash Pond) are monitored with a multi-unit groundwater monitoring system and are 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 as **Figure 2**.

Groundwater flow at the site is generally to the north-northwest, 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 75 feet below ground surface due to topographic variations across the facility and seasonal variations in water levels.

2.0 SUMMARY OF WORK COMPLETED

Work completed to support remedy selection for the LAN Landfill and Upper Ash Pond is summarized in **Table 1**. Activities completed within the 6-month period covered by this Semiannual Progress Report are discussed in more detail below.

2.1 MONITORING NETWORK CHANGES

There were no additional changes to the LAN monitoring well network between September 2021 and February 2022. The monitoring well locations are shown on **Figure 2**.

2.2 GROUNDWATER MONITORING

Since the September 2021 semiannual update, groundwater samples were collected during two events in August and October 2021. The two events included the following:

- Groundwater samples and water levels were collected in August 2021 for a full analysis of assessment monitoring parameters for wells MW-307 and MW-307A, which were newly installed in July 2021.

- The October monitoring event was part of the routine semiannual assessment monitoring program. The wells sampled and water levels measured included the wells in the original monitoring program (MW-6, MW-301, MW-302, and MW-303) and eight additional wells (MW-302A, MW-304, MW-304A, MW-305, MW-306, MW-306A, MW-307, and MW-307A).

A surface water sample was collected in February 2022. The sample was obtained from the combined outfall and stream water located immediately north of monitoring well MW-302. A full round of monitoring well and staff gauge measurements was also performed in February 2022. Both CCR Rule monitoring wells and state monitoring program wells were included.

A summary of groundwater samples collected since submittal of the ACM is provided in Table 2.

2.3 STATISTICAL EVALUATION

Statistical evaluation of sampling results during the period covered by this update was discussed in the 2021 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2022. Based on the October 2021 statistical evaluation, the SSLs above the GPS include arsenic at compliance well MW-302 and molybdenum at delineation well MW-304A. Both SSLs are consistent with previous results at LAN.

2.4 LANDFILL AND ASH POND CLOSURE

IPL completed permitting required for preconstruction testing and conducted the following activities in support of the landfill and ash pond closure. The information obtained from each of these activities will be used to further evaluate corrective measure alternatives 3 through 8 since the activities described below are relevant to alternatives that include excavation, consolidation, or capping.

- In August 2021, IPL performed test pits in and around the Upper Ash Pond to evaluate site conditions and CCR behavior during excavation, moisture conditioning, and placement.

- In August and September 2021, IPL performed test fills on the CCR in the Upper Ash Pond. Geotechnical monitoring instruments including settlement plates and vibrating wire piezometers were installed in the test fills and underlying CCR. Settlement plate monitoring was conducted through mid-December 2021. Monitoring of the vibrating wire piezometers is ongoing.

- In October 2021, IPL installed four groundwater dewatering pilot-test wells along the west side of the Upper Ash Pond and completed a pump test to evaluate the design of a groundwater dewatering system for the closure of the Upper Ash Pond.

- In October 2021, IPL also pilot-tested in-situ stabilization of CCR using portland cement grout within the Upper Ash Pond. The closure of the Upper Ash Pond will utilize in-situ stabilization to improve the shear strength of a select portion of the existing CCR within the pond. The shear strength improvements will facilitate the consolidation and capping of CCR within the Upper Ash Pond.

- In October and November 2021, IPL completed a small-scale test of CCR dredging and dewatering methods at the Upper Ash Pond. Approximately 1,000 cubic yards of CCR was dredged from the northern open water portion of the ash pond into geotextile tubes staged at the south end of the pond to evaluate the method for CCR removal and the CCR moisture conditions in the geotextile tubes over the month following the test dredging.

- In November 2021, IPL began incorporating the results of preconstruction testing into the closure design for the landfill and ash pond. Design activities included updating material volumes that will be managed during closure, grading design, geotechnical evaluations, dredging/excavation planning, and water management planning. The design effort is ongoing.

- In January 2022, IPL began developing permit applications for ash pond closure activities. The permitting effort is ongoing.

- In February 2022, IPL completed an evaluation of a nearby off-site fill source that will be used during the closure of the Upper Ash Pond. A significant volume of imported soil is required to backfill portions of the ash pond where CCR is removed for closure. The evaluation supports the procurement of a local source of material to support the pond closure.

- In February 2022, following receipt of pilot-test data from their preconstruction services contractor, IPL began evaluating discharge requirements for a full-scale groundwater dewatering system to support the ash pond closure.

Landfill and ash pond closure activities are included in the summary provided in **Table 1**.

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 ACM Addendum #1. **Table 3** summarizes the assessment completed for the ACM Addendum.

The ACM Report and ACM Addendum were originally prepared based on the potential relationship of the arsenic impacts to the disposal of CCR. Based on continued assessment of the nature and extent of arsenic, current data indicate that the source of the arsenic is unrelated to the dry ash landfill and ash pond.

The ACM Report originally presented closure and capping in-place with monitored natural attenuation as Alternative 2. Based on the absence of relationship between the presence of arsenic in groundwater and the dry ash landfill and ponds, IPL revisited the proposed alternatives within the ACM and monitored natural attenuation is no longer a component of the remedy. This will be presented in further detail as IPL finalizes the Selection of Remedy report.

2.6 PUBLIC MEETING

In accordance with 40 CFR 257.96(e), IPL held a public meeting to discuss the ACM on October 12, 2020. The meeting was open to interested and affected parties, and, due to the COVID-19 pandemic, was held virtually using an interactive online meeting platform.

IPL conducted a second public meeting to discuss the content of the ACM Addendum on January 11, 2022. Again, the meeting was open to interested and affected parties, and was conducted on the same interactive online meeting platform used for the October 2020 meeting.

3.0 PLANNED ACTIVITIES

Planned activities within the next reporting period include the following:

- Continue semiannual assessment monitoring for the existing monitoring well network and new monitoring wells.
- Perform quarterly monitoring for arsenic at monitoring well MW-306.
- Continued evaluation of groundwater flow and groundwater quality.
- Update conceptual site model based on findings of the ongoing groundwater sampling.
- Complete the Selection of Remedy report.
- Complete ash pond closure design and permitting.
- Initiate Upper Ash Pond closure construction.
- Advance landfill closure design and permitting.

Tables

Table 1. Timeline for Completed Work - Selection of Remedy
Lansing Generating Station / SCS Engineers Project #25220082.00

Date	Activity
May 2019	Installed additional monitoring wells to investigate nature and extent (MW-304, MW-305, and MW-306).
June 2019	Sampled new monitoring wells (MW-304, MW-305, and MW-306).
September 2019	Completed ACM.
September 2019	Completed the Well Documentation Report for new wells.
October/November 2019	Planned field investigation for extent and quantity of source areas and geotechnical properties for remedy evaluation.
October to December 2019	Planning, permitting, and access arrangements for three additional monitoring wells (piezometers) to investigate the vertical extent of impacts.
December 2019	Installed additional monitoring wells (piezometers) to investigate vertical groundwater flow and groundwater quality.
December 2019	Sampled assessment well MW-306.
January 2020	Completed Statistical Evaluation of October 2019 groundwater monitoring results.
January 2020	Completed 2019 Annual Groundwater Monitoring and Corrective Action Report.
February 2020	Sampled assessment well MW-306.
March 2020	Completed Semiannual Progress Report for the Selection of Remedy.
May 2020	Completed hydrographic survey of the Upper Ash Pond and landfill topographic survey.
June 2020	Completed field phase of a geotechnical study of the CCR surface impoundments.
July 2020	Sampled new piezometers 302A, 304A, and 306A.
August 2020	Initiated planning for the public ACM meeting.
August 2020	Completed annual landfill Inspection.
September 2020	Completed Semiannual Progress Report for the Selection of Remedy.
October 2020	Held public ACM meeting.
November 2020	Submitted application to EPA for a site-specific alternative deadline to insitate closure of the Upper Ash Pond.
November 2020	Completed ACM Addendum No. 1.
December 2020	Completed additional Upper Ash Pond CCR sampling for bench scale testing.

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Date	Activity
January 2021	Completed benchtop dredge test and laboratory testing of residual CCR.
January 2021	Completed 2020 Annual Groundwater Monitoring and Corrective Action Report.
February 2021	Sampled MW-304A and MW-306 for selected parameters.
March 2021	Completed Semiannual Progress Report for the Selection of Remedy.
March 2021	Issued a Request for Proposal (RFP) to landfill and pond closure contractors to conduct pre-construction services.
June 2021	Sampled both plant water supply wells for molybdenum.
June 2021	Installed three additional monitoring wells and a piezometer to provide additional information on vertical and horizontal groundwater flow, as well as target groundwater quality parameters.
July 2021	Sampled MW-304A, MW-306, MW-307, and MW-307A for selected parameters.
July 2021	Selected a contractor to provide preconstruction services for ash pond and landfill closures.
August 2021	Performed research on regional molybdenum concentrations in bedrock.
August 2021	Completed Well Documentation Report for monitoring wells MW-307, MW-307A, MW-308, and MW-309.
August 2021	Completed additional sampling event at MW-307 and MW-307A.
August 2021	Conducted design reviews and site visits with pond and landfill closure preconstruction services contractor and evaluated permitting needs for preconstruction field testing. Initiated field testing.
August 2021	Performed test pits in and around the landfill and Upper Ash Pond to evaluate site conditions and CCR behavior during excavation, moisture conditioning, and placement.
August - September 2021	Performed test fills on the CCR in the Upper Ash Pond. Installed geotechnical monitoring instruments including settlement plates and vibrating wire piezometers in the test fills and underlying CCR.
September 2021	Completed Semiannual Progress Report for the Selection of Remedy.
October 2021	Completed semiannual assessment monitoring event, including additional groundwater quality parameters.
October 2021	Installed four groundwater dewatering pilot test wells along the west side of the Upper Ash Pond and completed a pump test to evaluate the design of a groundwater dewatering system for the closure of the Upper Ash Pond.
October 2021	Pilot-tested in-situ stabilization of CCR using portland cement grout within the Upper Ash Pond.
October - November 2021	Pilot-tested CCR dredging and geotextile tube dewatering of dredged materials at the Upper Ash Pond.
November 2021 - February 2022	Incorporated preconstruction testing into Upper Ash Pond closure design (ongoing effort).
January 2022	Completed Statistical Evaluation of October 2021 groundwater monitoring results.
January 2022	Completed 2021 Annual Groundwater and Monitoring and Corrective Action Report.
January - February 2022	Developed Upper Ash Pond closure permit applications (ongoing effort).

Table 1. Timeline for Completed Work - Selection of Remedy
Lansing Generating Station / SCS Engineers Project #25220082.00

Date	Activity
October 2021 - February 2022	Updated arsenic in groundwater evaluation and site conceptual model.
February 2022	Completed evaluation of potential off-site general fill material for use in Upper Ash Pond closure.
February 2022	Evaluated groundwater dewatering pump test discharge data (ongoing effort).
February 2022	Measured water levels in all site monitoring wells.
February 2022	Collected additional sample from combined outfall 001 and surface water near well MW-302.

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Checked by: TK Date: 2/25/2022

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Table 2. CCR Rule Groundwater Samples Summary
Lansing Generating Station / SCS Engineers Project #25220082.00

Sample Dates	Background Well	Downgradient Wells												
	MW-6	MW-301	MW-302	MW-302A	MW-303	MW-304	MW304A	MW-305	MW-306	MW-306A	MW-307	MW-307A	MW-308	MW-309
10/2/2019	A	A	A	NI	A	A	NI	A	A	NI	NI	NI	NI	NI
12/5/2019	--	--	--	NI	--	--	NI	--	Add.	NI	NI	NI	NI	NI
2/5/2020	--	--	--	--	--	--	--	--	Add.	--	NI	NI	NI	NI
5/20/2020	A	A	A	A	A	A	A	A	A	A	NI	NI	NI	NI
7/6/2020	--	--	--	A	--	--	A	--	--	A	NI	NI	NI	NI
8/18/2020	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.	NI	NI	NI	NI
10/19-20/2020	A	A	A	A	A	A	A	A	A	A	NI	NI	NI	NI
2/23/2021	--	--	--	--	--	--	Add.	--	Add.	--	NI	NI	NI	NI
4/7-9/2021	A	A	A	A	A	A	A	A	A	A	NI	NI	NI	NI
7/12/2021	--	--	--	--	--	--	Add.	--	Add.	--	A	A	--	--
8/13/2021	--	--	--	--	--	--	--	--	--	--	A	A	--	--
10/25-27/2021	A	A	A	A	A	A	A	A	A	A	A	A	--	--
Total Samples	6	6	6	6	6	6	8	6	10	6	3	3	N/A	N/A

Abbreviations:
A = Samples analyzed for assessment monitoring parameters
Add. = Additional sampling event for selected parameters
-- = Not Sampled
NI = Not Installed
N/A= not applicable

Notes:
Monitoring wells MW-308 and MW309 were installed for horizontal groundwater flow and sample collection is not currently planned for these two wells.

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Table 3. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25220082.00

	Alternative #1 No Action	Alternative #2 Close and Cap in place with MNA	Alternative #3 Consolidate and Cap with MNA	Alternative #4 Excavate CCR and Dispose On Site with MNA	Alternative #5 Excavate CCR and Dispose Off Site	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?	Potentially	Yes	Yes	Yes	Yes	Yes	Yes	Yes
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Potentially	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 additional overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #3 with further reduction in release risk due to composite liner and cover However, limited to no additional overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #3 with further reduction in release risk due to removal of CCR from site However, limited to no additional 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 with increased effort for new leachate collection and management systems	Limited on-site post-closure groundwater monitoring until GPSs are achieved for impoundment Receiving disposal facility for impounded CCR 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 <100K 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 (>100K cy but <357K cy = published maximum CCR inventory as of February 2018 per Written Closure Plan)	Same as Alternative #3 with increased risk to environment due to increased excavation volumes (>840K 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 offsite 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 (>840K 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 <100K cy)	Same as Alternative #2 with increased risk to environment due to increased excavation volumes (likely >100K cy but <357K cy) required for consolidation	Same as Alternative #3 with increased risk to environment due to increased excavation volumes (~840K 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 (~840K 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	To be evaluated further during remedy selection Impoundment closure and capping anticipated by end of 2021 Landfill closure and capping anticipated by end of 2021 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 impounded CCR	Similar to Alternative #2 Potential for increase in time to reach GPS due to significant source disturbance during construction Potential decrease in time to reach GPS due to CCR source isolation within liner/cover system	Similar to Alternative #2 Potential for increase in time to reach GPS due to significant source disturbance during construction Potential decrease in time to reach GPS due to 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 at property line 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	Same as Alternative #2	Same as Alternative #2	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	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 LAN 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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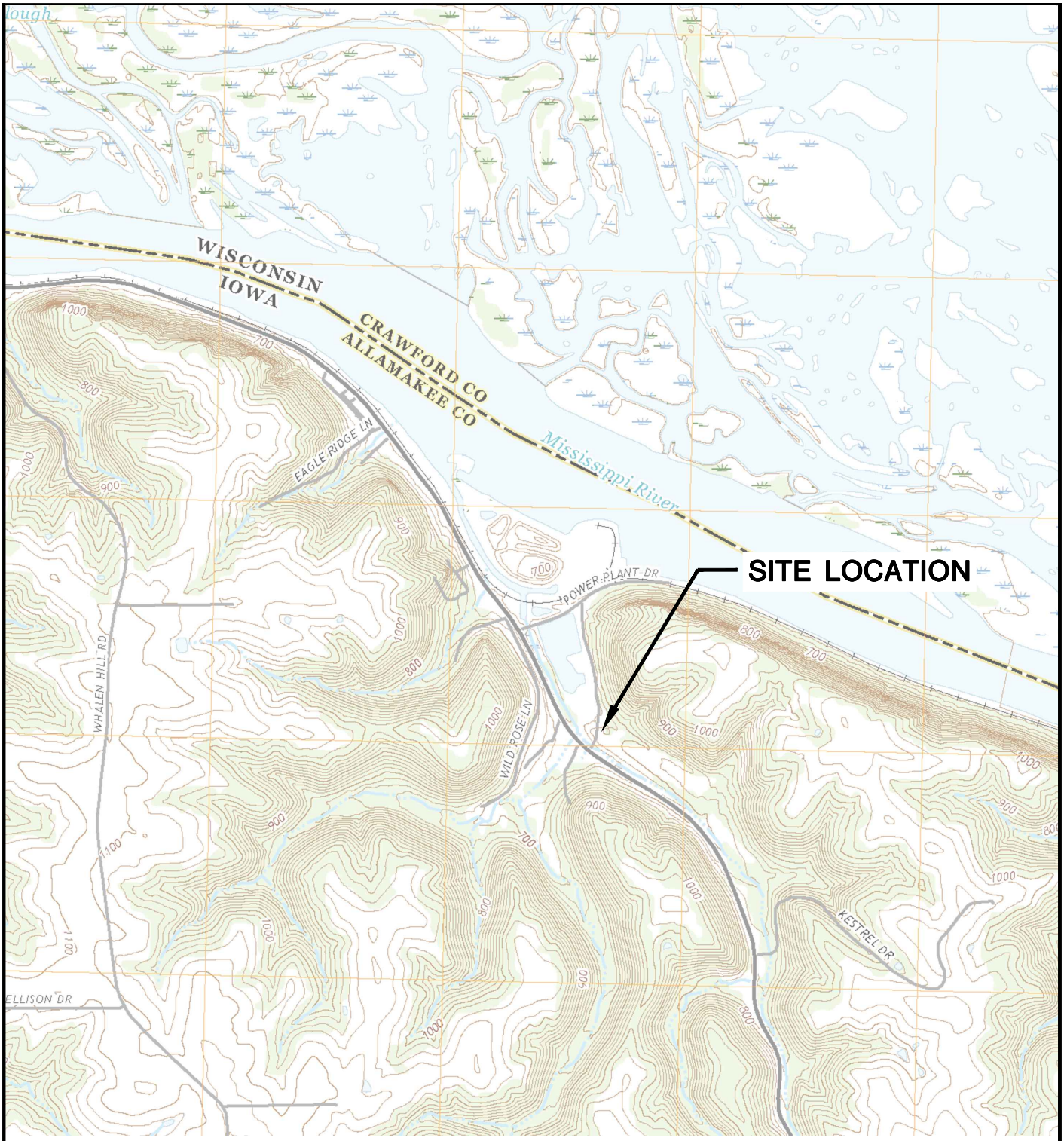
SOURCE CONTROL TO MITIGATE FUTURE RELEASES - 40 CFR 257.97(c)(2)								
257.97(c)(2)(i) The extent to which containment practices will reduce further releases	No reduction in further releases	Cap will reduce further releases by minimizing infiltration through CCR	Same as Alternative #2 with further 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 LAN 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	Moderately complex construction due to impounded CCR thixotropic characteristics Potentially lowest level of dewatering effort - dewatering required for cap installation only	Moderately complex construction due to impounded CCR thixotropic characteristics 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 ~840K cy of CCR while new lined disposal area is constructed High level of dewatering effort - dewatering required for excavation of full CCR volume	Moderately complex construction due to CCR thixotropic characteristics High degree of logistical complexity including the excavation and off-site transport of ~840K 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	Moderately complex construction due to impounded CCR thixotropic characteristics; Moderate degree of logistical complexity; Moderate level of dewatering effort - dewatering required for material excavation/placement and capping; 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.	Moderately complex construction due to impounded CCR thixotropic characteristics; Moderate degree of logistical complexity; Moderate 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.	Moderately complex construction due to impounded CCR thixotropic characteristics; Moderate degree of logistical complexity; Moderate level of dewatering effort - dewatering required for material excavation/placement and capping; High complexity construction - Barrier walls require specialty installation equipment and knowledge. Highly specialized and experience contractors required to achieve proper installation.
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 LAN does not rely on operational reliability of technologies; Overall success relies on offsite disposal facility, which is likely same/similar to Alternative #2	Similar to Alternative #2; however, success at BGS 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.
IMPLEMENTATION - 40 CFR 257.97(c)(3) (continued)								
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; Federal/State wetland permitting potentially 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	Same as Alternative #2 Lowest level of demand for cap construction material	Same as Alternative #2; Moderate level of demand for liner and cap construction material	Availability of necessary equipment to develop necessary off-site disposal facility airspace and transport ~840K 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 of staged re-disposal of ~840K 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 October 12, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on October 12, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on October 12, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on October 12, 2020. Assume all alternatives are acceptable to interested/affected parties.	No comments were received during the public meeting held on October 12, 2020. Assume all alternatives are acceptable to interested/affected parties.	To be determined. Alternative added after public meeting held on October 12, 2020.	To be determined. Alternative added after public meeting held on October 12, 2020.	To be determined. Alternative added after public meeting held on October 12, 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: SKK Date: 2/23/2021
Checked by: EJN Date: 11/23/2020

I:\25220082.00\Deliverables\2022 Semiannual -Remedy Selection\March 2022 Semiannual Update\Tables\[Table 3_Evaluation of Assessment of Corrective Measures_LAN.xlsx]LAN_Evaluation Matrix

Figures



N

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

CLIENT	INTERSTATE POWER AND LIGHT 2320 POWER PLANT DRIVE LANSING, IA 52151-9733	SITE	ALLIANT ENERGY LANSING GENERATING STATION LANSING, IOWA

SITE LOCATION MAP

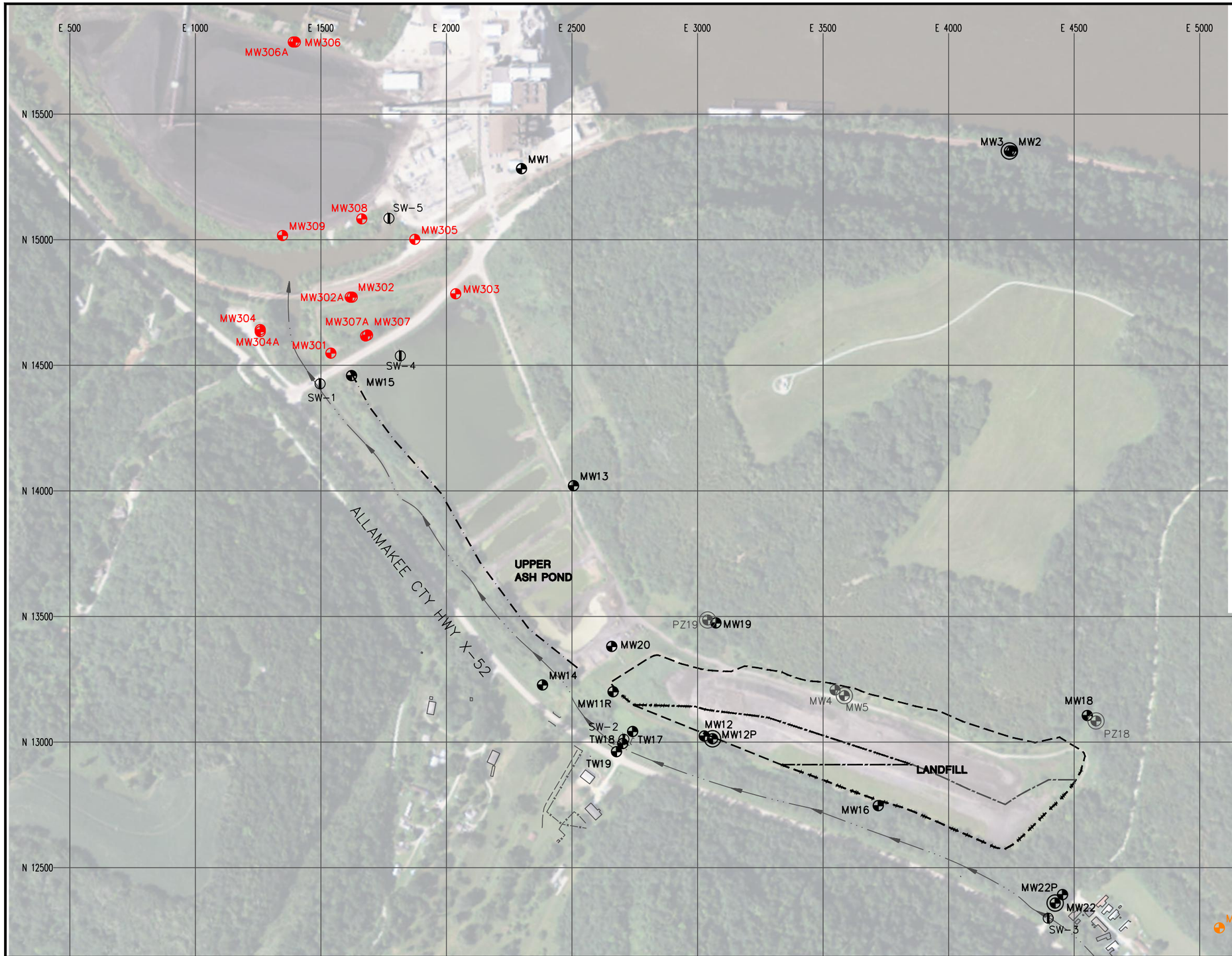
PROJECT NO.	25219070.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	11/27/2019	APPROVED BY:	TK 01/30/2020

ENGINEER

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

FIGURE
1

I:\25219070.00\Drawings\CCR 2019 Annual Report\Site Location Map.dwg, 1/30/2020 3:31:40 PM



N NORTH GRID

400 0 400

SCALE: 1" = 400'

LEGEND

	APPROVED LIMITS OF WASTE
	LIMITS OF PHASE 1 FINAL COVER
	LIMITS OF PHASE 2 FINAL COVER
	SLURRY WALL
	EXISTING STREAM
SW-1	EXISTING STAFF GAUGE
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
MW6	CCR BACKGROUND MONITORING WELL

NOTES:

1. 2011 AERIAL PHOTOGRAPH FROM THE USDA–FSA AERIAL PHOTOGRAPHY FIELD OFFICE.
2. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
3. MONITORING WELLS MW20, MW301, MW302, AND MW303 WERE INSTALLED BY CASCADE DRILLING IN NOVEMBER 2015.
4. MONITORING WELLS MW304, MW305, AND MW306 WERE INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING IN MAY 2019.
5. MONITORING WELLS MW302A, MW304A, AND MW306A WERE INSTALLED BY CASCADE DRILLING IN DECEMBER 2019.
6. MONITORING WELLS MW307, MW307A, MW308, AND MW309 WERE INSTALLED BY CASCADE DRILLING IN JUNE 2021.
7. MW6 IS SAMPLED UNDER BOTH THE STATE AND CCR RULE MONITORING PROGRAMS.
8. THE BACKGROUND MONITORING WELL FOR THE LANSING POWER STATION IS MW6.

PROJECT NO.	25221070.00	DRAWN BY:	BSS/KP
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	01/20/2022	APPROVED BY:	TK 01/28/2022

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

CLIENT: INTERSTATE POWER AND LIGHT
2320 POWER PLANT DRIVE
LANSING, IA 52151-9733

SITE: ALLIANT ENERGY
LANSING POWER STATION
LANSING, IOWA

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

I:\25221070.00\Drawings\Site Plan and Monitoring □ell Locations□PDA□□D.dwg, 1/20/2022 7:45:33 AM