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November 25, 2020

Andrew Wheeler
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Submitted electronically

Subject: Request for site-specific alternative deadline to initiate closure of CCR surface impoundment pursuant to 40 CFR 257.103(f)(2)
Lansing Generating Station
Interstate Power and Light Company
Lansing, Iowa

Mr. Wheeler:

On behalf of Interstate Power and Light Company (IPL), Alliant Energy is submitting the enclosed request for a site-specific alternative deadline to initiate closure of a CCR surface impoundment pursuant to 40 CFR 257.103(f)(2). The enclosed demonstration includes documentation that the criteria in paragraphs §257.103(f)(2)(i) through (iv) have been met and that the surface impoundment will complete closure no later than October 17, 2023.

We appreciate EPA's consideration of this request and the assistance from EPA staff during the development of the enclosed information. Please contact me at (608) 458-3853 or jeffreymaxted@alliantenergy.com if you have any questions or need additional information.

Sincerely,

Jeff Maxted
Manager – Environmental Services
Alliant Energy

Enclosures

Cc: Kirsten Hillyer, Frank Behan, Richard Huggins – U.S. EPA
Marty Mensen, Nichol Toomire, Jeff Hanson, Marney Hoefer – Alliant Energy

Application for Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment

Lansing Generating Station
2320 Power Plant Road
Lansing, Iowa 52151

Prepared for:

Interstate Power and Light Company
2320 Power Plant Road
Lansing, Iowa 52151

SCS ENGINEERS

25220100.00 | November 25, 2020

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EXECUTIVE SUMMARY

The Interstate Power and Light Company (IPL) Lansing Generating Station (LAN) is a steam-electric generating station located near Lansing, Iowa. IPL will end coal-fired operation of the boiler by December 31, 2022, and cease operations at LAN.

IPL currently operates one coal-fired boiler at LAN and uses one existing coal combustion residual (CCR) surface impoundment to manage CCR and non-CCR wastestreams. The CCR surface impoundment is less than 40 acres in size and is unlined. The surface impoundment must close due to the requirements of 40 CFR §257.101(a) and (b)(1)(i).

IPL is submitting this application to demonstrate absence of alternative capacity for managing CCR and non-CCR wastestreams and is requesting U.S. Environmental Protection Agency (USEPA) approval to continue disposal of these wastestreams beyond April 11, 2021, as allowed by §257.103(f)(2). With USEPA approval, IPL will cease placement of CCR and non-CCR wastestreams in the CCR surface impoundment by December 31, 2022, and will complete closure of the unlined CCR surface impoundment by October 17, 2023.

No existing alternate disposal capacity is available on or off site for managing an average 2.16 million gallons per day (MGD) of CCR and non-CCR wastestreams generated at LAN.

- All existing, suitable space for treatment and disposal of these wastestreams on IPL property is occupied by the existing CCR surface impoundment or other infrastructure necessary to LAN operations.
- No existing conveyance system is available to discharge these wastestreams offsite for treatment and disposal.
- Hauling these wastestreams off site for treatment and disposal is not feasible due to waste volume and the high number of trucks/truckloads required to manage the volume.
- No existing temporary facilities are available at LAN, nor is there adequate space on site to deploy temporary/portable treatment capacity.

IPL has provided certification of compliance with all other requirements of the CCR Rule as of the date of application submittal, including the requirement to conduct any necessary corrective action, as required in §257.103(f)(2)(iii). Arsenic has been detected at statistically significant levels (SSL) above the groundwater protection standard (GPS) in samples from one downgradient monitoring well at LAN. IPL has completed an Assessment of Corrective Measures and recently completed an addendum to the assessment. IPL is working to address these existing groundwater impacts through the CCR Rule Corrective Action process. IPL is actively designing a remedy that includes closing the CCR surface impoundments. Pursuant to §257.103(f)(2)(v)(B), IPL has prepared a risk mitigation plan to address groundwater impacts. As required in §257.103(f)(2)(ii), potential risks to human health and the environment during continued operation of the CCR surface impoundment are adequately mitigated.

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1.0 INTRODUCTION AND PURPOSE

The Interstate Power and Light Company (IPL) Lansing Generating Station (LAN) is a steam-electric generating station located near Lansing, Iowa. The station operates one coal-fired boiler (Unit 4) and uses one coal combustion residual (CCR) surface impoundment, the LAN Upper Ash Pond, to manage wet-handled CCR and non-CCR wastestreams generated by LAN operations. The LAN facility includes a CCR landfill, the LAN Landfill, where dry CCR is also placed for disposal.

The LAN Upper Ash Pond is subject to the USEPA *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (USEPA, 2015), and subsequent amendments. Specifically, the amended Final Rule *"A Holistic Approach to Closure Part A: Deadline To Initiate Closure"* that became effective September 28, 2020. The impoundment is unlined and less than 40 acres in size. Pursuant to 40 CFR §257.101(a), the impoundments must cease receiving CCR and non-CCR wastestreams no later than April 11, 2021, unless the facility complies with the alternative closure provisions of §257.103.

With this Application, IPL is requesting a new site-specific alternative deadline to initiate closure of the LAN Upper Ash Pond pursuant to §257.103(f)(2). USEPA approval of a new site-specific alternative closure deadline allows the CCR surface impoundment to continue to receive CCR and/or non-CCR wastestreams if the facility will cease operation of the coal-fired boiler and complete closure of the impoundments by October 17, 2023, for impoundments that are 40 acres or smaller, and the facility must continue to use the CCR surface impoundments due to the absence of alternative disposal capacity both on and off-site prior to ceasing coal-fired operations.

Pursuant to 40 CFR §257.103(f)(2), IPL requests USEPA approval to continue receiving CCR and non-CCR wastes after April 11, 2021. IPL will cease placement of CCR and non-CCR wastes by December 31, 2021, following permanent cessation of a coal-fired boiler by a date certain, and will complete closure of the existing CCR surface impoundment no later than October 17, 2023.

2.0 FACILITY INFORMATION AND BACKGROUND

2.1 FACILITY INFORMATION

LAN is owned and operated by IPL, a subsidiary of Alliant Energy Corporation.

Site Location: Interstate Power and Light Company
Lansing Generating Station
2320 Power Plant Drive
Lansing, IA 52151
USEPA EPA Registry ID: 110015649592

Project Contact:	Jeff Maxted (Alliant Energy Corporate Services) Manager – Environmental Services, Generation Operations Support 4902 N Biltmore Lane Madison, WI 53718 (608) 458-3853 jeffreymaxted@alliantenergy.com
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Consultant Contact:	Eric J. Nelson, PE (SCS Engineers) Project Director 2830 Dairy Drive Madison, WI 53718 (608) 216-7352 enelson@scsengineers.com

2.2 BACKGROUND

LAN is located along the west bank of the Mississippi River, south of the City of Lansing, in Allamakee County, Iowa (**Figure 1**). The LAN site is approximately 170 acres and began operations in 1948. Currently, the steam-electric generating facility includes a single coal-fired unit with a nameplate rating of 275 megawatts (MW) (Hard Hat, 2016). Significant site features that support LAN operations include:

- Substation
- Coal stockpile
- Coal pile runoff pond
- One existing CCR surface impoundment (LAN Upper Ash Pond) that is unlined and less than 40 acres
- One existing CCR landfill (LAN Landfill)

The two CCR units at LAN (Upper Ash Pond and Landfill) are contiguous and monitored with a multi-unit system in accordance with 40 CFR §257.91. A map showing the CCR units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR Rule groundwater monitoring program is provided as **Figure 2**.

The LAN Upper Ash Pond is operated with discharges regulated under individual National Pollutant Discharge Elimination System (NPDES) Permit Number IA0300100.

The LAN Landfill is operated under a sanitary disposal project permit (Permit #03-SDP-05-01P) administered by the Iowa Department of Natural Resources (IDNR). A separate groundwater monitoring system has been established to monitor the landfill for the state permit. Once the permitted airspace in the landfill is fully utilized, the landfill will close by installing a state-permitted final cover design that also meets the CCR Rule minimum design requirements in 40 CFR

§257.102(d)(3). Monitoring wells installed for the state monitoring program for the CCR landfill are also shown on **Figure 2**.

3.0 DEMONSTRATION FOR CESSATION OF COAL-FIRED BOILERS

IPL is requesting USEPA approval to continue placing wet-handled CCR and non-CCR wastestreams in the LAN Upper Ash Pond after April 11, 2021, and then complete closure of the CCR surface impoundment no later than October 17, 2023. The following text and supporting information is provided to document that the requirements in 40 CFR §257.103(f)(2)(i) through (iv) have been met.

3.1 ALTERNATIVE DISPOSAL CAPACITY ASSESSMENT

To demonstrate that no alternative disposal capacity is currently available on- or off-site as required by 40 CFR §257.103(f)(2)(i), information about the wastestreams generated at LAN that are managed using the LAN Upper Ash Pond is provided below along with a discussion of existing alternate disposal capacity.

LAN generates the following CCR and non-CCR wastestreams during plant operations. These wastestreams are wet handled or are wastewaters managed within the on-site CCR surface impoundment. A water balance diagram representing these wastestreams is provided as **Figure 8**.

CCR

- Bottom ash and sluice water – On average 1.7 million gallons per day (MGD) of bottom ash sluice water is discharged to the LAN Upper Ash Pond along with bottom ash. Bottom ash is stored in the LAN Upper Ash Pond and dredged on an as-needed basis to maintain flow through the LAN Upper Ash Pond. Dredged bottom ash is stockpiled in upland areas of the LAN Upper Ash Pond and dewatered before it is disposed of in the on-site landfill (LAN Landfill). Water is discharged to an unnamed creek that is a tributary to the Mississippi River through Outfall 002 in accordance with the facility's individual NPDES permit.

- Fly ash and sluice water – LAN is capable of wet sluicing fly ash to the LAN Upper Ash Pond. However, LAN currently manages all fly ash on a dry basis. Fly ash is collected dry and managed off site through beneficial use. Fly ash that is not recycled is placed in the LAN Landfill for disposal.

Non-CCR

- Unit 4 service water for non-contact cooling of auxiliary equipment – On average 0.371 MGD of non-contact cooling water is discharged to the LAN Upper Ash Pond via the sump that services Unit 4.

- Water treatment area floor drains, reverse osmosis (RO) system reject, and demineralizer regeneration wastes – Approximately 0.055 MGD of RO system reject and demineralizer regeneration wastewaters are directed to the LAN Upper Ash Pond.

- Stormwater – Stormwater from industrial use areas including the LAN Landfill and upland areas of the LAN Upper Ash Pond are managed in the LAN Upper Ash Pond. Some non-industrial stormwater runoff from areas adjacent to the LAN Upper Ash Pond is also managed with this CCR unit.

A portion of the CCR generated at LAN (fly ash and flue gas desulfurization [FGD] byproduct) are already managed off site through beneficial use and IPL intends to continue beneficially using CCR when and where it is appropriate. However, after review of the on-site and off-site alternative capacity for disposal of the wet-handled CCR and sluice water or non-CCR wastestreams described above, the conclusion is that there is no current on-site or off-site alternative capacity. New alternative disposal capacity would be needed to enable IPL to cease discharges of these wastestreams to the CCR surface impoundments. The development of that alternative disposal capacity would require the installation of significant new infrastructure (e.g., new storage and/or treatment facilities, force mains, etc.) to access potential off-site disposal alternatives.

On-site Capacity

The LAN Upper Ash Pond is subject to the closure requirements in 40 CFR §257.101(a). Additionally, there are no additional on-site impoundments that can be placed into service to provide alternative on-site disposal capacity. No current alternate on-site capacity in the form of tanks is available. Based on the flows described above and on Figure 8, an average of 2.16 MGD and up to 5.9 MGD (approximately 1,500 gallons per minute [gpm] or up to 4,100 gpm) of CCR and non-CCR wastestreams need to be treated. This would require as many as 80 temporary portable weir tanks with a capacity of 50 gpm for a 6-hour residence time (CCG 2020) and an estimated 2.6 acres of space (minimum) to manage these wastestreams on site. There is not 2.6 acres of available space within the developed areas of the site and space to the northeast cannot be developed due to terrain or impacts to cultural resources, as described below. This number of tanks also creates a risk of leaks in the interconnected piping, which would be considered an unauthorized bypass by the facility's NPDES permit. For these reasons, the installation of a temporary tank farm is not considered a feasible option at LAN.

IPL owns land to the northeast of the LAN Upper Ash Pond and LAN Landfill, but these areas include steep wooded terrain (see Figure 1 and Figure 9) and sensitive cultural resources (UI 2005). The terrain and potential impacts to cultural resources prevent the use of this property. IPL does not own additional land to the west or south of the site. The Mississippi River is directly north and east of the plant, and it is not possible to develop capacity within a major waterway due to the environmental impact and because it would encroach on floodways.

Off-site Capacity

Alternative treatment and disposal of some of these wastestreams using publicly owned treatment works (POTW) might be possible if LAN was located in an existing service area of a local POTW, and it was allowed under current regulations for the facility to accept the wastestreams. However, the facility is not located in an existing POTW service area, and there is no existing connection to a POTW that provides conveyance of the wastestreams from LAN. Off-site disposal of these wastestreams at a POTW would require IPL to develop significant new infrastructure, including pumps, interconnected piping, tanks, and loadout equipment for hauling by trucks, or new conveyance infrastructure (a force main and lift station) to send wastewaters off site. Hauling these wastestreams offsite for treatment and disposal is not feasible based on the number of trucks and truckloads required to transport the wastewater (estimated at over 280 truckloads per day on average assuming a

7,500-gallon tanker truck is used to take wastewater to a POTW approximately 2.6 miles away). This number of truckloads would require a truck to fill and depart LAN every 5 minutes for 24 hours each day, which is not feasible or safe. The number of trucks required traveling the rural highway, including residential areas where residents must cross the highway to access waterfront facilities such as boat docks, between LAN and the POTW also presents a safety hazard. Off-site capacity has been evaluated but is not available for the reasons stated above.

Due to the short period of time that the coal-fired unit at LAN will operate after April 11, 2021 (approximately 21 months), it is illogical for IPL to develop new alternative disposal capacity. Activities to develop new on- or off-site alternate disposal capacity for wet-handled wastestreams or to install alternative technologies to transition LAN from wet to dry handling of remaining CCR wastestreams will not provide a significant benefit to the environment over the short period of remaining operations at LAN. If undertaken, these activities will only serve to distract from the work required to plan, design and permit the closure of the existing CCR surface impoundment. This opinion is consistent with the discussion by EPA in the preamble to both the proposed Part A revisions and the final rule revisions published in the Federal Register (USEPA, 2019; USEPA, 2020).

CCR wastestreams that are dry handled include fly ash and FGD byproduct. Nearly 100% of the fly ash is beneficially used. FGD byproduct is disposed in the LAN Landfill.

3.2 RISK MITIGATION PLAN

To demonstrate that potential risks to human health and the environment from the continued operation of the LAN Upper Ash Pond have been adequately mitigated as required by 40 CFR §257.103(f)(2)(ii), a risk mitigation plan addressing the items in 40 CFR §257.103(f)(2)(iv)(B)(1) through (3) is provided in the sections that follow.

3.2.1 Limiting Groundwater Releases

Per 40 CFR §257.103(f)(2)(iv)(B)(*1*), the following text provides a discussion of the potential physical or chemical measures LAN can take to limit future releases to groundwater during continued operation of the CCR surface impoundments.

Arsenic has been detected at SSL above the groundwater protection standard (GPS) in samples from one downgradient monitoring well at LAN. IPL is working to address these existing groundwater impacts through the Corrective Action process in 40 CFR §257.96-98. All of the potential Corrective Measures identified during the Assessment of Corrective Measures for arsenic impacts involve closing the LAN Upper Ash Pond and LAN Landfill to provide source control along with additional controls to ensure exposure pathways are adequately addressed. IPL is currently designing a remedy that is consistent with the pond closure that must be completed by October 17, 2023. Additional detail on the groundwater impacts and the corrective action process are provided in Section 3.3.2 through 3.3.6.

LAN will be improving the fly ash conveyance system to improve reliability and permanently remove the capacity to send fly ash to the Upper Ash Pond. Currently, fly ash is dry handled unless there is a malfunction in the hydroveyor system that results in small amounts of fly ash in the pond. The new system will improve system reliability and eliminate the possibility that fly ash would reach the pond and potentially lead to additional groundwater impacts.

Note that immediate retirement of LAN is not an option because the facility must remain available to meet current capacity requirements for electric grid reliability. Operationally, the CCR surface impoundment is currently needed to meet the limits established in the NPDES permit for LAN. In addition, any changes to process chemistry must pass an antidegradation analysis required by the Clean Water Act and be approved through an amendment to the facility's NPDES permit. Both of these considerations limit flexibility during the remaining operational life of the impoundment.

3.2.2 Mitigating Groundwater Exposures

Per 40 CFR §257.103(f)(2)(iv)(B)(2), the following sections provide a discussion of the CCR surface impoundment's groundwater monitoring data and any found exceedances; the delineation of the plume (if necessary based on the groundwater monitoring data); identification of any nearby receptors that might be exposed to current or future groundwater contamination; and how such exposures could be promptly mitigated.

Groundwater Monitoring and Found Exceedances

IPL uses a multi-unit groundwater monitoring system to monitor groundwater quality in the area of the LAN Upper Ash Pond and LAN Landfill. The groundwater monitoring system includes the following:

- One background monitoring well (MW-6) screened in the uppermost aquifer upgradient of the CCR units at LAN, which is a sandstone aquifer of the Jordan formation.
- Six shallow downgradient monitoring wells (MW-301, MW-302, MW-303, MW-304, MW-305, and MW-306) screened in the uppermost aquifer, which is an alluvial aquifer consisting mainly of sand and silt.
- Three deeper monitoring wells (MW-302A, MW-304A, and MW-306A) screened deeper in the alluvial aquifer.

Groundwater monitoring well locations are shown on **Figure 2**. The CCR surface impoundment monitoring system at LAN is discussed further in **Section 3.2.2**.

The CCR units at LAN are currently in Corrective Action due to arsenic concentrations in groundwater samples from MW-302. Based on groundwater monitoring completed to date, arsenic and molybdenum have been detected at concentrations greater than the GPS in at least one sample from the following monitoring wells:

- Arsenic – MW-302 and MW-306 (one event, determined not to be statistically significant)
- Molybdenum – MW-304A (A fourth sample was collected in October 2020. An SSL evaluation will be completed by January 2021. If an SSL is confirmed and a current investigation of the source of molybdenum at MW-304A concludes that the molybdenum SSL is naturally occurring, then an Alternate Source Demonstration (ASD) for molybdenum will be completed by April 2021).

Additional details regarding the groundwater monitoring results for LAN are provided in **Section 3.3.3** and the attached tables. Pursuant to 40 CFR §257.96(b), groundwater continues to be monitored in accordance with the assessment monitoring program while in Corrective Action.

Plume Delineation and Potential Receptors

An Assessment of Corrective Measures (ACM) for the arsenic impacts at MW-302 was completed in September 2019 (see **Appendix C1**), and the remedy selection process was initiated. An addendum to the ACM (Addendum No. 1) was issued in November 2020 to provide an update of available site data obtained since the ACM was completed and to evaluate additional Corrective Measures. A copy of Addendum No, 1 is provided in **Appendix C2**.

Part of the remedy selection process has included the installation of additional monitoring wells to refine information presented in the ACM regarding the nature and extent of groundwater impacts. As discussed in the recent September 2020 semiannual remedy selection report and the ACM addendum, the three deeper monitoring wells were recently sampled for a third time (see **Appendix C2** and **Appendix D**). Based on the groundwater monitoring data obtained to date, the horizontal and vertical extents of arsenic in groundwater at LAN have been delineated.

As noted above, the molybdenum detected in ground water samples from MW-304A is believed to be naturally occurring. An Alternate Source Demonstration (ASD) is currently being prepared in accordance with 40 CFR §257.95(g)(3)(ii). Additional details regarding the groundwater monitoring data obtained at LAN, the ACM, and remedy selection process are provided in **Sections 3.3.3** through **3.3.6**.

The unnamed tributary to the Mississippi River adjacent to MW-302, or more specifically the human, plant, and animal users of this surface water, is the only potential nearby receptor identified in the September 2019 ACM report. The pathway to exposure of the nearby surface water as a receptor is the interaction of arsenic-impacted groundwater with the river. Preliminary analysis suggests that groundwater discharge to the river is small relative to the volume of flow in the river. No downgradient or sidegradient water supply wells were identified in the search conducted as part of the ACM, and the on-site water supply wells at LAN are deep and did not contain arsenic in the most recent sample (April 2014). Additional detail regarding the identification of potential receptors and exposure pathways is provided in the ACM and Addendum No. 1 (see **Appendix C1** and **C2**).

Activities since the ACM was completed are summarized in Addendum No. 1 and have included the delineation of arsenic impacts in groundwater and the evaluation of the pathways of exposure. Additional groundwater monitoring wells have been installed and groundwater samples collected. Based on the latest available groundwater data, SCS completed a preliminary evaluation of the groundwater to surface water interactions of arsenic in groundwater. The preliminary evaluation completed by SCS included:

- Review of USEPA and state surface water standards for arsenic
- Review of geochemistry field data
- Review of application materials and studies conducted by IPL for the renewal of the NPDES permit for LAN

Based on our evaluation to date, the arsenic impacts to groundwater at LAN are unlikely to impact the adjacent surface water.

Mitigation Options

The corrective measures identified in the September 2019 ACM and Addendum No. 1 that were deemed viable all anticipated the cessation of coal-fired operations and closure of the CCR surface impoundments at LAN. The review of potential receptors, pathways to exposure, and risks associated with the groundwater impacts at LAN completed with the September 2019 ACM indicated that the timeline for the cessation of coal-fired operation of Unit 1, receipt of CCR and non-CCR wastestreams by the CCR surface impoundments, and final closure by various methods combined with monitored natural attenuation (MNA) was a suitable approach for the site. Additional groundwater data and the ongoing evaluation of the MNA mechanisms active at LAN and the attenuation capacity of the site are discussed in Addendum No. 1 (see **Appendix C2**). Additional corrective measure alternatives that include new source control and containment alternatives have been evaluated in Addendum No. 1, and a final closure approach is yet to be selected.

Should the concentrations of arsenic observed in groundwater at LAN increase significantly or new constituents be identified at concentrations greater than their respective GPS, IPL will evaluate the nature and extent of the emergent concern and, as needed, will deploy additional groundwater plume containment options. Additional mitigation measures may include plume containment options such as:

- In-situ permeable reactive barriers
- Slurry wall(s)
- Groundwater pump and treat

These groundwater plume containment options are described further in **Section 3.2.3**. Other mitigation scenarios may be evaluated by IPL as appropriate based on the specifics of the identified exposure pathway. The efficacy of any option will require additional evaluation prior to implementation.

3.2.3 Containing Groundwater Impacts

Per 40 CFR §257.103(f)(2)(iv)(B)(3) the following text discusses options for expediting and maintaining the containment of any contaminant plume that is either present or identified during continued operation of the CCR surface impoundment at LAN.

Based on the current groundwater monitoring data and evaluation of receptors and potential exposures to the arsenic, IPL is designing a remedy, pursuant to 40 CFR §257.97, that is intended to control the source of impacts and monitor changes to ensure that exposure pathways do not emerge. Source control is most likely achieved through closure of the CCR surface impoundments under a final cover system that meets the performance standards in 40 CFR §257.102. Current design considerations include consolidation of the material on site to reduce the size of potential sources and minimizing future potential for interaction with groundwater. Prior to pond closure, IPL will implement interim measures intended to provide additional source control. Specifically, this includes improvement of the fly ash conveyance system to eliminate the capacity for fly ash to reach the upper ash pond.

IPL is also evaluating the capacity of the site and the local hydrogeology to naturally contain and attenuate the observed impacts. MNA may also be used to verify improvements in groundwater quality. Tributary surface waters and the Mississippi River are located immediately adjacent to the facility. The current site data suggests that natural attenuation of arsenic and possibly other constituents that could potentially be released by continued operation of the CCR surface impoundment could mitigate migration of trace elements from groundwater to surface water. The likely mechanism for attenuation at LAN is the aeration of surface water that would oxidize sulfides and iron and provide a means for the adsorption and/or co-precipitation of arsenic. This mechanism would also be applicable to many of the other potential constituents that may be present in the groundwater.

Organic matter and fine-textured, clay-rich sediment that may be present on the bottom of the surface waters could also provide sites for the adsorption of trace elements. Monitoring of groundwater and surface water would provide the means to demonstrate the continued operation of this risk mitigation option. Further investigations are required to determine whether the aquifer sustains natural attenuation. IPL is currently evaluating MNA as part of the remedy selection process defined in 40 CFR §257.97.

In the event that significant changes in groundwater quality are observed as described in Section 3.2.2, IPL will evaluate additional containment measures. IPL has evaluated these containment measures to address the current arsenic impacts to groundwater at LAN, and the measures are discussed in the ACM addendum (see Appendix C2). The additional containment measures are also described below.

In-situ Permeable Reactive Barriers (PRB)

PRBs are a well-established technology that have been applied at industrial and mining sites to mitigate the migration of a variety of trace and radioactive elements in groundwater. Several reagents, both chemical and biological, can be placed in the PRB to tailor the sequestration to the specific elements of concern. Laboratory treatability studies are needed to identify the appropriate reagent(s) and assess physical design parameters. Reagent emplacement could be by either physical emplacement (excavation) or injection into the site soil. Long-term performance of the PRB would be evaluated with on-going groundwater monitoring. A single PRB or several shorter PRBs can be installed depending on the contaminants and plume to be contained.

Slurry Wall

A slurry wall, typically constructed by placing a soil, bentonite, water, and possibly cement mixture placed in a trench, will act as a physical barrier to the migration of contaminated groundwater or to divert clean groundwater from the source of contamination. At LAN, slurry walls could be strategically installed to impede contaminated groundwater migration. The effectiveness of slurry walls at LAN may be impacted by the lack of a low permeable geologic unit to provide a “key” for the bottom of the wall. Instead, slurry walls at LAN may be installed as “hanging” walls, which may need to be combined with another technology to provide the containment necessary. The installation will depend on the contaminants and plume being contained (Federal Remediation Technologies Roundtable [FRTR], Version 4.0). Notably, a slurry wall was previously installed on the west side of the Upper Ash Pond to enhance embankment stability.

Groundwater Pump and Treat

Groundwater pumping with ex situ treatment is a proven method for containing groundwater contaminant plumes (FRTR, Groundwater Pump and Treat). The technology involved is relatively simple and can be deployed rapidly in the event of a significant new release. Groundwater treatment will depend on the constituents in the contaminant plume. The type of specific treatment for CCR-related constituents will be considered at the time when it is determined that a treatment technology needs to be evaluated. Readily available treatment technologies could be considered for many of the constituents (e.g., ion exchange treatment technology), but the evaluation of the best individual treatment technology will depend on the following:

1. Groundwater contaminant and that constituent’s concentration
2. Competing ionic constituent concentration(s)
3. Design flow rate of the groundwater to be treated
4. Required post-treatment discharge concentrations
5. Technology feasibility and operation

Because the groundwater pump and treatment approach can be complex and require significant long-term operation and maintenance support, this approach to plume containment will likely be most applicable to new releases that pose a significant risk to groundwater receptors.

These preliminary groundwater plume containment strategies may be pursued in response to changes to current releases or in the event of a new release. They may also be employed along with source control methods, such as closure of the CCR surface impoundments as described in the September 2019 ACM and Addendum No. 1, or enhancements such as chemical stabilization, should MNA be determined ineffective. The groundwater conditions will continue to be monitored, and in the event the data indicate that an exposure pathway is complete, IPL will advance appropriate containment measures.

3.3 COMPLIANCE WITH CCR REQUIREMENTS

Per 40 CFR §257.103(f)(2)(v)(C)(*1*) through (*8*), **Section 3.3** and related subsections are provided along with the supporting tables, figures, and appendices to support the demonstration and owner/operator certification of compliance with the CCR Rule.

There is one CCR surface impoundment, the Upper Ash Pond, at LAN, which is the subject of this demonstration. There is one additional CCR unit, the LAN Landfill, at the facility. As described in detail below, the facility, including both CCR units, is in compliance with all other requirements of the CCR Rule, including the requirement to conduct any necessary corrective action.

3.3.1 Certification by Owner/Operator

Per 40 CFR §257.103(f)(2)(v)(C)(*1*), a certification statement signed by a responsible official with Interstate Power and Light Company, the operator of LAN, that the facility is in compliance with all of the requirements of 40 CFR §257, Subpart D is included in **Appendix A.**

3.3.2 Groundwater Monitoring System

Per 40 CFR §257.103(f)(2)(v)(C)(*2*), the following text and supporting figures and appendices provide a visual representation of hydrogeologic information at and around the CCR unit(s) that supports the design, construction and installation of the groundwater monitoring system.

The original groundwater monitoring system established in accordance with the CCR Rule consists of one upgradient (background) monitoring well and three downgradient (compliance) monitoring wells. The background monitoring well is MW-6. The three initial downgradient monitoring wells are MW-301, MW-302, and MW-303, which were installed in November 2015. Three additional downgradient monitoring wells, MW-304, MW-305, and MW-306, were installed in May 2019 in accordance with the requirements of 40 CFR §257.95(g)(1). Monitoring wells MW-301 through MW-306 were installed in the upper portion of the uppermost aquifer at LAN, and the well depths range from approximately 14.5 to 91 feet below ground surface. Three deeper monitoring wells (MW-302A, MW-304A, and MW-306A) were installed in December 2019 to provide information on vertical groundwater flow and the vertical distribution of target groundwater quality parameters. Each of these new wells was installed adjacent to a pre-existing well (MW-302, MW-304, and MW-306), and is 30 feet deeper than the adjacent well.

A map of groundwater monitoring well locations in relation to the CCR units is included as **Figure 2.** Well construction diagrams and drilling logs are included in **Appendix B.**

Shallow groundwater at the site generally flows to the north-northwest (**Figures 3** and **4**). Seasonal variation in shallow groundwater flow only varies slightly between a north-northwest and northwest flow direction within the valley as it is controlled by the steep topographic rise of the bluffs on both sides of the valley. Deeper groundwater flow, based on groundwater elevation data from MW-302A, MW-304A, and MW-306A, was to the northeast during May and July 2020 (**Figures 5** and **6**). There is no apparent seasonal variation in the deeper groundwater flow.

3.3.3 Groundwater Monitoring Results

Per 40 CFR §257.103(f)(2)(v)(C)(*3*), the following text, supporting tables, and appendices provide constituent concentrations at each groundwater monitoring well monitored during each sampling event.

Groundwater monitoring samples have been collected and analyzed in accordance with the Sampling and Analysis Plan (SAP) for LAN (see **Appendix B4**). Statistical analysis of groundwater monitoring results at LAN is conducted as described in Appendix C of the SAP, and is performed in general accordance with the USEPA's Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities dated March 2009 (Unified Guidance) (EPA 530-R-09-007, March 2009) and generally accepted procedures.

Background Sampling and Detection Monitoring Results

Background sampling began in December 2015 and concluded in August 2017. Eight groundwater samples were collected from each CCR monitoring well for the establishment of background. Background samples were analyzed for both Appendix III and Appendix IV constituents. A summary including the complete list of groundwater results for the eight background monitoring events is provided in table form in **Appendix B**. A copy of the most recent Annual Groundwater Quality Report is also provided in **Appendix B**.

Following completion of eight background groundwater monitoring events, compliance monitoring was initiated at LAN. The complete results for all compliance sampling events are summarized in **Table 1**.

The statistical evaluation of the October 2017 detection monitoring results, completed in January 2018, identified statistically significant increases (SSIs) in detection monitoring constituents at the downgradient wells. SSIs were identified for boron, calcium, fluoride, sulfate, and total dissolved solids (TDS) at one or more wells based on the October 2017 detection monitoring event (**Table 1**). Assessment monitoring began in April 2018, in accordance with §257.95(b).

Assessment Monitoring Results and Assessment of Corrective Measures

Following the initiation of assessment monitoring, the detection of arsenic at SSL above the GPS in samples from MW-302 (**Table 1**).

The (USEPA's) Unified Guidance recommends the use of confidence intervals for comparison of assessment monitoring data to fixed GPS values. Specifically, the suggested approach for comparing assessment groundwater monitoring data to GPS values based on long-term chronic health risk, such as drinking water Maximum Contaminant Levels (MCLs), is to compare the lower confidence limit (LCL) around the arithmetic mean with the fixed GPS. Although a confidence interval approach is recommended, a minimum of four samples are required for this approach.

Following the collection of four rounds of groundwater data, the LCL was determined with the arsenic concentrations at MW-302 (**Table 2**). The LCL comparison confirmed arsenic concentrations in samples from MW-302 were greater than the GPS at statistically significant levels as summarized below.

Assessment Monitoring Appendix IV Parameters	Location of GPS Exceedance(s)	Historic Range of Detections at Wells Exceeding GPS	Groundwater Protection Standard (GPS)
Arsenic (µg/L)	MW-302	30.8 to 53	10

µg/L = micrograms per liter

Note: Historic range includes results from assessment monitoring from April 2018 through April 2020.

The ACM was initiated in February 2019 and was completed in September 2019. Addendum No. 1 to the ACM was completed in November 2020. The ACM and Addendum No. 1 are discussed further in **Section 3.3.5**.

The Selection of Remedy Process

The Selection of Remedy process was initiated following the completion of the ACM. As mentioned in **Section 3.3.2**., additional monitoring wells were installed in May and December 2019 to expand the network. Arsenic was detected at a concentration higher than the GPS in the sample collected from MW-306 during the June 2019 event. Following additional groundwater sampling, a LCL was determined but the arsenic concentrations were not confirmed to be present at a statistically significant level at MW-306 (**Table 2**).

The groundwater sample collected from piezometer MW-304A in May 2020 contained a molybdenum concentration greater than the GPS (**Table 1**). MW-304A was installed in December 2019. Three samples have been collected at MW-304A to date for molybdenum analysis as shown in **Table 1**. To evaluate whether molybdenum is present in groundwater at MW-304A at statistically significant levels above the GPS, the LCL for the mean will be calculated once four results are available, as recommended by the Unified Guidance document Statistical Analysis of Groundwater Monitoring at RCRA Facilities, March 2009. Based on the results obtained to date, molybdenum has not been determined to be at a statistically significant level above the GPS.

Additional evaluation of the source and significance of the molybdenum detections above the GPS at monitoring well MW-304A will be completed as part of the ongoing Selection of Remedy process.

Monitored Natural Attenuation Results

In August 2020, MNA parameters were analyzed in support of the Selection of Remedy process. The complete list of MNA results is provided in **Table 1**.

3.3.4 Hydrogeology

Per 40 CFR §257.103(f)(2)(v)(C)(*4*), the following text, supporting figures, and appendices provide a description of site hydrogeology including stratigraphic cross-sections.

The uppermost geologic formation beneath LAN that meets the definition of the "uppermost aquifer," as defined under 40 CFR §257.53, is the shallow alluvial aquifer in combination with the hydraulically connected lower Cambrian-Ordovician sandstone unit (Jordan sandstone).

The uppermost bedrock unit in the site area is the Jordan aquifer, which is the lower Cambrian-Ordovician sandstone interbedded with dolostone. The thickness of the Jordan aquifer varies from 50 to more than 120 feet thick in most areas of Allamakee County.

A geologic cross section was prepared along a line through the CCR units and in alignment with the direction of groundwater flow. The cross-section location is provided on **Figure 2** and the geologic cross section is provided on **Figure 7**. The cross-section line runs through the landfill, the LAN Upper Ash Pond, and the coal pile, and also shows upgradient monitoring well MW-6, several borings or monitoring wells near the landfill and surface impoundment, and downgradient assessment monitoring wells MW-306 and MW-306A. Sandstone bedrock, unconsolidated geologic material, and estimated groundwater levels are identified on the cross section.

3.3.5 Assessment of Corrective Measures

Per 40 CFR §257.103(f)(2)(v)(C)(5) this section provides a brief summary and reference to the ACM and subsequent addendum completed for the CCR surface impoundments at LAN as required by 40 CFR §257.96. A copy of the completed ACM and Addendum No. 1 are provided in **Appendix C**.

The corrective measures presented in that report are intended to bring the levels of arsenic in groundwater below USEPA standards. In addition to stopping landfill disposal of CCR and the discharge of CCR and non-CCR wastestreams to the surface impoundment, these corrective measures include:

- Cap CCR in Place with MNA
- Consolidate CCR and Cap with MNA
- Excavate and Dispose CCR on Site with MNA
- Excavate and Dispose CCR in Off-site Landfill with MNA
- Consolidate and Cap with Chemical Amendment (added with Addendum No. 1)
- Consolidate and Cap with Groundwater Collection (added with Addendum No. 1)
- Consolidate and Cap with Barrier Wall (added with Addendum No. 1)

IPL has also presented a “No Action” alternative for comparison purposes only.

The September 2019 ACM includes a preliminary evaluation of five initial options using factors identified in the Rule. Based on what is currently known, the groundwater impacts at LAN are limited, but are not completely understood. IPL is working to understanding groundwater impacts at LAN, and will use this information to select one of the Corrective Measures identified above.

Since the September 12, 2020 ACM report, IPL has continued to provide semiannual updates on its progress in evaluating Corrective Measures to address the groundwater impacts at LAN. The most recent semiannual update was provided in September 2020. Based on information obtained to date, Addendum No. 1 to the ACM was prepared to summarize the current understanding of the groundwater impacts at LAN, identify additional potential corrective measure alternatives, and revisit the evaluation of corrective measure alternatives in accordance with 40 CFR 257.96.

IPL held a public meeting on October 12, 2020, to discuss the contents of the September 2019 ACM, as required by 40 CFR §257.96(e). An additional public meeting will be held with interested and affected parties to discuss the results of Addendum No. 1 at least 30 days before a remedy is selected.

3.3.6 Selection of Remedy

Per 40 CFR §257.103(f)(2)(v)(C)(*6*) this section provides a brief summary of progress on remedy selection and design required by 40 CFR §257.97(a). IPL has advanced the Selection of Remedy process in accordance with Section §257.97(a). The Semiannual updates have been provided in both March 2020 and September 2020 since the issuance of the September 12, 2019 ACM report. Copies of the semiannual updates are included in **Appendix D**.

The ACM was updated with Addendum No. 1 in November 2020. Additional groundwater data collection and analysis is still needed to evaluate the MNA option. Updates to the assessment, and development of the quantitative evaluation system discussed in the ACM and Addendum No. 1, will be completed in the future based on updates to the conceptual site model, delineation of the nature and extent of impacts, and collection of additional data relevant to remedy selection.

Planned activities related to the remedy selection process are described in Addendum No. 1 (see **Appendix C2**) and include the following:

- Continue semiannual assessment monitoring for the existing monitoring well network and new monitoring wells.
- Evaluate MNA feasibility, including additional evaluation of groundwater flow and groundwater quality.
- Update conceptual site model based on findings of nature and extent investigation.
- Update and evaluate CCR volume estimates involved with remedial options.
- Evaluate potential interactions between endangered resources and remedies.
- Design surface impoundment closures to reduce the size of potential sources and minimize future potential for interaction with groundwater.
- Evaluate permits and approvals required for surface impoundment closure.
- Continue evaluation of remedial options.
- Conduct a public meeting to discuss Addendum No. 1 (40 CFR §257.96(e)).

IPL is pursuing these remedy selection activities to finalize the selection of remedy process and complete the closure of the surface impoundment at LAN by October 17, 2023.

3.3.7 Structural Stability Assessment

Per 40 CFR §257.103(f)(2)(v)(C)(*7*) this section provides a brief summary of the Structural Stability Assessment completed in October 2017 (**Appendix E**). The assessment was performed in accordance with the 40 CFR §257.73(d). The assessment indicates that the CCR unit has been designed, constructed, operated, and maintained to meet the CCR Rule requirements. A summary of the Structural Stability Assessment is listed below.

- **Stable Foundations and Abutments**: Foundation soils at the south end of the surface impoundment are suitable. Improvements to the north end of the surface impoundment to correct the effects of weaker foundation soils consisted of closing and filling the lower ash pond. Following improvements to correct the pond conditions, the operation of the LAN Upper Ash Pond is acceptable as designed and modified.

- **Slope Protection**: The CCR unit embankments are protected from erosion primarily with shallow-rooted vegetation. The toe of the downstream west embankment has rip rap for protection during flooding from Unnamed Creek #1.

- **Embankment Density**: The CCR unit embankments are constructed of dredge sand. The results of a 2015 embankment soil and foundation investigation (**Appendix E**) indicate that the sand is medium dense to dense. The sand compaction during construction was adequate to provide an acceptable embankment density.

- **Vegetation Management**: The CCR unit embankments have been managed to remove woody deep-rooting vegetation and maintain the grassy vegetation.

- **Spillway Management**: The CCR unit discharges at a stop log weir. After flowing through a series of weirs and culvert pipes, the flow discharges to Unnamed Creek #1. Inspection of the weirs and pipes indicates that they are designed to carry the expected sustained flows. The CCR unit has a significant hazard potential classification requiring an evaluation of a 1,000-year rainfall event. Analysis shows that flow from a 1,000-year rainfall event will drain through the culvert pipes without overtopping the CCR unit embankments.

- **Hydraulic Structures**: In June 2016, three sections of the culvert pipes were inspected using remote camera video. The inspection showed there was minimal deterioration, deformation, distortion, sedimentation, and debris with no observed bedding deficiencies. A fourth section of pipe between Weir Box #1 and Weir Box #2 was inspected with a video camera system. The camera indicated some solids buildup in the pipe. In September 2017, the solids were removed from the pipe by pipe jetting. A subsequent video camera inspection confirmed that the solids had been removed and that there were no significant signs of deterioration, deformation, distortion, sedimentation, debris, or bedding deficiencies.

- **Sudden Drawdown**: The toe of the CCR unit north embankment is above the 100-year flood elevation. The toe of the CCR unit west embankment could be flooded by backwater from Unnamed Creek #1. However, the creek loses 15 feet of elevation under the Power Plant Drive bridge and is unlikely to have a significant flood elevation along the west embankment. The CCR unit design, construction, operation, and maintenance information indicates that sudden drawdown conditions from an adjacent water body do not occur for the CCR unit.

3.3.8 Safety Factor Assessment

Per 40 CFR §257.103(f)(2)(v)(C)(8) this section provides a brief summary of the Safety Factor Assessment that was completed in September 2016 (**Appendix F**). The assessment was performed in accordance with the CCR Rule Section §257.73(e). The assessment indicates that the LAN Upper Ash Pond has acceptable minimum safety factors for the critical cross section of the embankment under the loading conditions analyzed. A summary of the Safety Factor Assessment is listed below.

- **Safety Factor under Long-Term, Maximum Storage Pool Loading Condition**: The maximum storage pool of the CCR unit under normal operations is elevation 649 feet above mean sea level (amsl). The minimum calculated safety factor for this condition is 1.8. This exceeds the minimum required safety factor of 1.5.

- **Safety Factor under Maximum Surcharge Pool Loading Condition**: The CCR unit pool elevation for the design 1,000-year storm is elevation 653 feet amsl. The minimum calculated safety factor for this condition is 1.7. This exceeds the minimum required safety factor of 1.4.

- **Seismic Safety Factor**: The CCR unit has a seismic Site Class D and a corresponding surface peak ground acceleration of 0.044 g. Based on these values, the minimum calculated seismic safety factor is 1.4. This exceeds the minimum required safety factor of 1.0.
- **Liquefaction Safety Factor**: Based on the analyses, the CCR unit embankment and foundation soils will not liquefy during the design earthquake. A post-liquefaction slope stability assessment for the CCR unit is not required.

3.4 SCHEDULE

Per 40 CFR §257.103(f)(2)(v)(D) this section provides a narrative that specifies and justifies the day by which IPL intends to cease receipt of waste into the CCR surface impoundment at LAN in order to meet the closure deadline of October 17, 2023. Also provided in **Appendix G** is an updated closure plan that reflects the proposed schedule as required by 40 CFR §257.102(b).

Another critical schedule element is the remedy selection process. As discussed in **Section 3.3.6** and the most recent semiannual update report provided in **Appendix D**, the evaluation of remedial options is ongoing for the LAN Upper Ash Pond. The findings of a recently completed geotechnical investigation of the LAN Upper Ash Pond indicate that the geotechnical properties of some of the CCR in the LAN Upper Ash Pond requires additional evaluation as part of the remedy selection process. Once completed, the remedy selection can proceed more rapidly toward completion.

The schedule developed for CCR surface impoundment closure by October 17, 2023, assumes a hybrid approach will be used and requires the relocation and consolidation of an estimated 220,000 cubic yards (cy) of CCR and sediment from the north end of the CCR surface impoundment with the remaining CCR closed in place. Based on the volume of materials to be managed during the closure and preliminary estimates of capped areas, closure construction will be completed in approximately 6 months.

IPL is committed to completing the closure of the CCR surface impoundment by pursuing the following schedule:

- November 2020 – Complete impoundment closure options analysis
- September 2021 – Complete design of CCR surface impoundment closure
- December 2021 - Complete permitting for CCR surface impoundment closure
- April 2022 – Complete procurement for CCR surface impoundment closure
- December 31, 2022 - End coal-fired operation of Unit 4, stop receiving CCR and non-CCR wastestreams at CCR surface impoundment, and start CCR surface impoundment closure construction
- Complete CCR surface impoundment closure – October 17, 2023.

Additional schedule detail is provided in **Appendix G.**

4.0 REFERENCES

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Tables

Table 1. Groundwater Analytical Results Summary - Compliance Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Background Well — MW-6

Parameter Name	UPL Method	UPL	GPS	10/16/2017	4/16/2018, 4/26/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/19/2020
Appendix III											
Boron, ug/L	P*	100		41.2 J	29.8 J	42.9 J	40.2 J	<110	<110	<73	NA
Calcium, mg/L	P	73.9		66.9	72.7	66.5	69.6	67	70	72	76
Chloride, mg/L	P	8.52		6.5	6.5	7.3	6.6	6.7	6.9	7.7	6.8
Fluoride, mg/L	P*	0.2		0.14 J	0.084 J	0.12 J	<0.19	0.63	<0.23	<0.23	NA
Field pH, Std. Units	P	7.9		7.03	7.34	7.18	7.06	7.59	7.46	7.34	7.98
Sulfate, mg/L	P	29.4		25.8	26.4	24.8	25.5	26	24	27	25
Total Dissolved Solids,	P	386.7		318	343	351	319	340	280	580	NA
Appendix IV		**UPL**	**GPS**								
Antimony, ug/L	NP*	0.037	6	NA	<0.026	<0.15	<0.078	<0.53	NA	<0.58	NA
Arsenic, ug/L	P*	0.37	10	NA	0.23 J	0.26 J	0.24 J	<0.75	<0.75	<0.88	NA
Barium, ug/L	P	48.5	2,000	NA	44.1	43.1	43	43	46	46	NA
Beryllium, ug/L	DQ	DQ	4	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA
Cadmium, ug/L	DQ	DQ	5	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA
Chromium, ug/L	P	1.20	100	NA	0.66 J	0.97 J	0.73 J	<0.98	<0.98	<1.1	NA
Cobalt, ug/L	NP*	0.34	6	NA	<0.014	<0.15	<0.062	<0.091	<0.091	<0.091	NA
Fluoride, mg/L	P*	0.2	4	NA	0.084 J	0.12 J	<0.19	0.63	<0.23	<0.23	NA
Lead, ug/L	NP*	0.13	15	NA	<0.033	<0.12	<0.13	<0.27	<0.27	<0.27	NA
Lithium, ug/L	NP*	3	40	NA	<4.6	NA	<4.6	<2.7	<2.7	<2.3	NA
Mercury, ug/L	DQ	DQ	2	NA	<0.090	<0.090	<0.090	<0.10	NA	<0.10	NA
Molybdenum, ug/L	P*	0.37	100	NA	0.26 J	0.28 J	<0.57	<1.1	<1.1	<1.1	<1.1
Selenium, ug/L	P*	0.72	50	NA	0.47 J	0.5 J	0.46 J	<1.0	NA	<1.0	NA
Thallium, ug/L	NP*	0.29	2	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA
Radium 226/228	P	1.88	5	NA	1.35	0.974	1.37	0.255	0.495	0.504	NA
Additonal Parameters - Selection of Remedy											
Arsenic, dissolved#, ug/L	UPL or GPS not applicable			NA	NA	NA	NA	NA	NA	NA	2.8
Iron, dissolved,# ug/L				NA	NA	NA	NA	NA	NA	NA	<50.0
Iron, ug/L				NA	NA	NA	NA	NA	NA	NA	<50.0
Magnesium, ug/L				NA	NA	NA	NA	NA	NA	NA	38,000
Manganese, dissolved, ug/L#				NA	NA	NA	NA	NA	NA	NA	6.6 J
Manganese, ug/L				NA	NA	NA	NA	NA	NA	NA	4
Molybdenum, dissolved#, ug/L				NA	NA	NA	NA	NA	NA	NA	4.7
Potassium, ug/L				NA	NA	NA	NA	NA	NA	NA	1.2
Sodium, ug/L				NA	NA	NA	NA	NA	NA	NA	5,000
Total Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	290
Cabonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	<3.8
Bicarbonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	290

Compliance Wells — MW-301

Parameter Name	10/16/2017	4/16/2018, 6/4/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/18/2020
Appendix III								
Boron, ug/L	436	198.0	279	357	250	360	150	NA
Calcium, mg/L	65.9	64.5	65.1	72.5	73	68	56	65
Chloride, mg/L	17.3	20.2	17.7	15.9	17	14	17	15
Fluoride, mg/L	0.24	0.24	0.23	0.27	0.9	0.23 J	0.56	NA
Field pH, Std. Units	7.66	8.4	8.08	8.16	8.47	8.11	7.85	8.33
Sulfate, mg/L	52.7	49.3	53.2	64.4	51	56	34	44
Total Dissolved Solids,	289	300.0	326	320	350	310	480	NA
Appendix IV								
Antimony, ug/L	NA	0.071 J	0.16 J	0.085 J	<0.53	NA	<0.58	NA
Arsenic, ug/L	NA	3.9	4.4	5.4	5.4	5.6	3.8	NA
Barium, ug/L	NA	163	156	155	160	180	140	NA
Beryllium, ug/L	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA
Cadmium, ug/L	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA
Chromium, ug/L	NA	1.1	<0.19	0.09 J	<0.98	<0.98	<1.1	NA
Cobalt, ug/L	NA	0.086 J	0.16 J	0.11 J	0.11 J	0.11 J	0.11 J	NA
Fluoride, mg/L	NA	0.24	0.23	0.27	0.90	0.23 J	0.56	NA
Lead, ug/L	NA	0.037 J	<0.12	<0.13	<0.27	<0.27	<0.27	NA
Lithium, ug/L	NA	<4.6	NA	9.1 J	8.7 J	8.0 J	7.0 J	NA
Mercury, ug/L	NA	0.31	<0.090	<0.090	<0.10	NA	<0.10	NA
Molybdenum, ug/L	NA	4.4	5.6	10.3	11	10	8.1	5.8
Selenium, ug/L	NA	<0.086	0.22 J	0.18 J	<1.0	NA	<1.0	NA
Thallium, ug/L	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA
Radium 226/228	NA	0.689	1.66	0.556	0.232	0.488	0.200	NA
Additonal Parameters - Selection of Remedy								
Arsenic, dissolved#, ug/L	NA	NA	NA	NA	NA	NA	NA	4.5
Iron, dissolved,# ug/L	NA	NA	NA	NA	NA	NA	NA	330
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	680
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	19,000
Manganese, dissolved, ug/L#	NA	NA	NA	NA	NA	NA	NA	810
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	800
Molybdenum, dissolved#, ug/L	NA	NA	NA	NA	NA	NA	NA	6.1
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	3,200
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	13,000
Total Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	200
Cabonate Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	<3.8
Bicarbonate Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	200

Compliance Wells — MW-302 and MW-302A

Parameter Name	MW-302 10/16/2017	MW-302 4/16/2018, 6/4/2018 ^	MW-302 8/7/2018	MW-302 10/8/2018	MW-302 4/15/2019	MW-302 10/2/2019	MW-302 5/20/2020	MW-302 8/19/2020	MW-302A 5/20/2020	MW-302A 7/6/2020	MW-302A 8/19/2020
Appendix III											
Boron, ug/L	708	489	648	694	530	690	480	NA	190	250	NA
Calcium, mg/L	116	120	116	122	130	130	120	130	79	78	81
Chloride, mg/L	13.9	13.0	13.9	13.5	13	12	14	12	7.8	6.9	7.1
Fluoride, mg/L	0.28	0.24	0.23	0.27	0.79	0.24 J	0.25 J	0.27 J	<0.23	<0.23	NA
Field pH, Std. Units	7.1	7.26	6.92	6.93	7.66	7.15	6.93	7.18	7.27	7.22	7.41
Sulfate, mg/L	<0.5	<0.24	<0.24	<0.24	<1.8	<1.8	<3.6	<3.6	53	47	49
Total Dissolved Solids,	507	543	562	518	450	480	710	NA	520	350	NA
Appendix IV											
Antimony, ug/L	NA	0.035 J	<0.15	<0.078	<0.53	NA	<0.58	NA	<0.58	<0.51	NA
Arsenic, ug/L	NA	30.8	47.6	50.4	37	**53**	**33**	NA	<0.88	<0.88	NA
Barium, ug/L	NA	789	661	603	690	740	610	NA	51	47	NA
Beryllium, ug/L	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA	<0.27	<0.27	NA
Cadmium, ug/L	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.039	<0.049	NA
Chromium, ug/L	NA	0.35 J	0.49 J	0.39 J	<0.98	<0.98	<1.1	NA	<1.1	<1.1	NA
Cobalt, ug/L	NA	1.1	1.1	1.1	1.5	1.3	1.0	NA	0.41 J	0.098 J	NA
Fluoride, mg/L	NA	0.24	0.23	0.27	0.79	0.24 J	0.25 J	NA	<0.23	<0.23	NA
Lead, ug/L	NA	0.084 J	0.23 J	<0.13	<0.27	<0.27	<0.27	NA	0.48 J	0.14 J	NA
Lithium, ug/L	NA	<4.6	NA	<4.6	<2.7	<2.7	<2.3	NA	<2.3	<2.5	NA
Mercury, ug/L	NA	0.35	<0.090	<0.090	<0.10	NA	<0.10	NA	<0.10	<0.10	NA
Molybdenum, ug/L	NA	0.91 J	1.2	1.5	<1.1	1.4 J	<1.1	<1.1	<1.1	<1.1	<1.1
Selenium, ug/L	NA	<0.086	0.3 J	0.26 J	<1.0	NA	<1.0	NA	1.3 J	1.1 J	NA
Thallium, ug/L	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	<0.26	<0.26	NA
Radium 226/228	NA	1.96	2.09	3.52	0.146	1.48	1.54	NA	0.24	0.0963	NA
Additonal Parameters - Selection of Remedy											
Arsenic, dissolved#, ug/L	NA	NA	NA	NA	NA	NA	NA	46	NA	NA	<0.88
Iron, dissolved,# ug/L	NA	NA	NA	NA	NA	NA	NA	32,000	NA	NA	330
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	33,000	NA	NA	230
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	43,000	NA	NA	39, 000
Manganese, dissolved, ug/L#	NA	NA	NA	NA	NA	NA	NA	2,800	NA	NA	38
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	2,800	NA	NA	19
Molybdenum, dissolved#, ug/L	NA	NA	NA	NA	NA	NA	NA	1.4 J	NA	NA	<1.1
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	4,700	NA	NA	1,200
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	17,000	NA	NA	7,500
Total Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	530	NA	NA	290
Cabonate Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	<7.6	NA	NA	<3.8
Bicarbonate Alkalinity, mg/L	NA	NA	NA	NA	NA	NA	NA	530	NA	NA	290

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance well result exceeds the GPS.
17	Yellow highlighted cell with bold text indicates the compliance well result exceeds the GPS and the result was determined to be statistically significant (1).
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of MNA.

See Page 3 for abbreviations and notes.

Table 1. Groundwater Analytical Results Summary - Compliance Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Compliance Wells (MW-303, MW-304)

Parameter Name	UPL Method	UPL	GPS	MW-303 10/16/2017	MW-303 4/16/2018, 6/4/2018 ^	MW-303 8/7/2018	MW-303 10/8/2018	MW-303 4/15/2019	MW-303 10/2/2019	MW-303 5/19/2020	MW-303 8/18/2020	MW-304 6/20/2019	MW-304 10/2/2019	MW-304 5/20/2020	MW-304 8/19/2020
Appendix III															
Boron, ug/L	P*	100		592	144	675	474	150 J	520	150	NA	<110	<110	<73	NA
Calcium, mg/L	P	73.9		84.7	54.6	46.0	35.3	49	46	54	58	82	72	70	77
Chloride, mg/L	P	8.52		17.2	24.1	14.6	16.3	18	16	15	16	5.9	7.0	6.2	7.7
Fluoride, mg/L	P*	0.2		0.25	0.32	0.47	0.72	1.0	0.42 J	0.38 J	NA	<0.23	<0.23	<0.23	NA
Field pH, Std. Units	P	7.9		7.20	8.00	7.66	7.91	7.95	7.83	7.67	7.65	7.01	7.16	7.32	7.55
Sulfate, mg/L	P	29.4		69.9	43.5	52.5	29.1	35	39	42	33	20	17	17	15
Total Dissolved Solids,	P	386.7		379	296	262	181	280	210	450	NA	350	300	470	NA
Appendix IV		**UPL**	**GPS**												
Antimony, ug/L	NP*	0.037	6	NA	0.16 J	0.34 J	0.19 J	<0.53	NA	<0.58	NA	<0.53	NA	<0.58	NA
Arsenic, ug/L	P*	0.37	10	NA	1.2	2.3	2.3	1.4 J	2.5	1.4 J	NA	<0.75	<0.75	<0.88	NA
Barium, ug/L	P	48.5	2,000	NA	173	194	121	160	220	210	NA	54	47	42.0	NA
Beryllium, ug/L	DQ	DQ	4	NA	0.046 J	<0.12	<0.089	<0.27	NA	<0.27	NA	<0.27	NA	<0.27	NA
Cadmium, ug/L	DQ	DQ	5	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.077	NA	<0.039	NA
Chromium, ug/L	P	1.20	100	NA	0.51 J	0.44 J	0.089 J	<0.98	<0.98	<1.1	NA	1.6 J	1.0 J	8.2	NA
Cobalt, ug/L	NP*	0.34	6	NA	0.14 J	0.36 J	0.21 J	<0.091	0.12 J	<0.091	NA	1.1	0.19 J	0.22 J	NA
Fluoride, mg/L	P*	0.2	4	NA	0.32	0.47	0.72	1.0	0.42 J	0.38 J	NA	<0.23	<0.23	<0.23	NA
Lead, ug/L	NP*	0.13	15	NA	<0.033	0.24 J	<0.13	<0.27	<0.27	<0.27	NA	1.2	0.35 J	<0.27	NA
Lithium, ug/L	NP*	3	40	NA	<4.6	NA	8.1 J	3.3 J	9.1 J	4.2 J	NA	<2.7	<2.7	<2.3	NA
Mercury, ug/L	DQ	DQ	2	NA	<0.090	<0.090	<0.090	<0.10	NA	<0.10	NA	<0.10	NA	<0.10	NA
Molybdenum, ug/L	P*	0.37	100	NA	7.3	21.6	12	6.2	9.8	3.1	23	<1.1	<1.1	<1.1	1.2 J
Selenium, ug/L	P*	0.72	50	NA	3.3	0.38 J	0.39 J	<1.0	NA	1.4 J	NA	<1.0	NA	<1.0	NA
Thallium, ug/L	NP*	0.29	2	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	<0.27	NA	<0.26	NA
Radium 226/228	P	1.88	5	NA	0.787	0.929	1.87	0.543	0.463	0.131	NA	0.356	0.900	0.0689	NA
Additonal Parameters - Selection of Remedy															
Arsenic, dissolved#, ug/L	UPL or GPS not applicable			NA	NA	NA	NA	NA	NA	NA	2.1	NA	NA	NA	<0.88
Iron, dissolved,# ug/L				NA	NA	NA	NA	NA	NA	NA	<50	NA	NA	NA	<50.0
Iron, ug/L				NA	NA	NA	NA	NA	NA	NA	<50	NA	NA	NA	51 J
Magnesium, ug/L				NA	NA	NA	NA	NA	NA	NA	19,000	NA	NA	NA	36,000
Manganese, dissolved, ug/L#				NA	NA	NA	NA	NA	NA	NA	120	NA	NA	NA	6.9 J
Manganese, ug/L				NA	NA	NA	NA	NA	NA	NA	120	NA	NA	NA	11
Molybdenum, dissolved#, ug/L				NA	NA	NA	NA	NA	NA	NA	23	NA	NA	NA	1.6 J
Potassium, ug/L				NA	NA	NA	NA	NA	NA	NA	5,600	NA	NA	NA	1,500
Sodium, ug/L				NA	NA	NA	NA	NA	NA	NA	13,000	NA	NA	NA	5,600
Total Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	190	NA	NA	NA	300
Cabonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	<3.8	NA	NA	NA	<3.8
Bicarbonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	190	NA	NA	NA	300

Compliance Wells (MW-304A, MW-305, MW-306, MW-306A)

Parameter Name	UPL Method	UPL	GPS	MW-304A 5/20/2020	MW-304A 7/6/2020	MW-304A 8/19/2020	MW-305 6/20/2019	MW-305 10/2/2019	MW-305 5/19/2020	MW-305 8/18/2020	MW-306 6/20/2019	MW-306 10/2/2019	MW-306 12/5/2019	MW-306 2/5/2020	MW-306 5/19/2020	MW-306 8/18/2020	MW-306A 5/19/2020	MW-306A 7/6/2020	MW-306A 8/18/2020
Appendix III																			
Boron, ug/L	P*	100		1,800	1,700	NA	180 J	190 J	210	NA	860	660	NA	NA	720	NA	290	340	NA
Calcium, mg/L	P	73.9		54	41	50	92	97	82	90	240	260	NA	NA	340	290	83	82	86
Chloride, mg/L	P	8.52		15	13	13	6.8	3.2 J	7.5	6.9	24	40	NA	NA	32	28	7.8	7.1	7.4
Fluoride, mg/L	P*	0.2		0.57	0.42 J	NA	<0.23	<0.23	0.23 J	NA	<0.23	<0.23	NA	NA	<0.23	NA	<0.23	<0.23	NA
Field pH, Std. Units	P	7.9		8.04	7.90	8.48	7.19	7.03	6.90	7.23	6.87	9.00	6.76	6.95	6.66	7.12	6.99	7.04	7.38
Sulfate, mg/L	P	29.4		83	77	76	24	26	<3.6	<3.6	280	140	NA	NA	430	260	44	40	41
Total Dissolved Solids,	P	386.7		680	330	NA	440	380	540	NA	1,200	1,300	NA	NA	3,400	NA	610	360	NA
Appendix IV		**UPL**	**GPS**																
Antimony, ug/L	NP*	0.037	6	<0.58	<0.51	NA	<0.53	NA	<0.58	NA	<0.53	NA	NA	NA	<0.58	NA	<0.58	<0.51	NA
Arsenic, ug/L	P*	0.37	10	1.3 J	<0.88	NA	2.2	3.4	3.6	NA	8.6	12	9.3	9.4	8.5	NA	<0.88	<0.88	NA
Barium, ug/L	P	48.5	2,000	67.0	34.0	NA	170	190	220	NA	280	540	NA	NA	260	NA	61.0	58.0	NA
Beryllium, ug/L	DQ	DQ	4	<0.27	<0.27	NA	<0.27	NA	<0.27	NA	<0.27	NA	NA	NA	<0.27	NA	<0.27	<0.27	NA
Cadmium, ug/L	DQ	DQ	5	0.19	0.098 J	NA	<0.077	NA	<0.039	NA	<0.077	NA	NA	NA	<0.039	NA	<0.039	<0.049	NA
Chromium, ug/L	P	1.20	100	2.2 J	1.1 J	NA	<0.98	<0.98	<1.1	NA	<0.98	<0.98	NA	NA	<1.1	NA	<1.1	<1.1	NA
Cobalt, ug/L	NP*	0.34	6	3.2	0.83	NA	0.52	0.27 J	0.32 J	NA	1.0	0.98	NA	NA	0.53	NA	0.33 J	0.18 J	NA
Fluoride, mg/L	P*	0.2	4	0.57	0.42 J	NA	<0.23	<0.23	0.23 J	NA	<0.23	<0.23	NA	NA	<0.23	NA	<0.23	<0.23	NA
Lead, ug/L	NP*	0.13	15	4.3	1.2	NA	<0.27	<0.27	<0.27	NA	0.52	<0.27	NA	NA	<0.27	NA	<0.27	<0.11	NA
Lithium, ug/L	NP*	3	40	2.7 J	<2.5	NA	3.4 J	4.6 J	<2.3	NA	19	25	NA	NA	25	NA	<2.3	<2.5	NA
Mercury, ug/L	DQ	DQ	2	<0.10	<0.10	NA	<0.10	NA	<0.10	NA	<0.10	NA	NA	NA	<0.10	NA	<0.10	<0.10	NA
Molybdenum, ug/L	P*	0.37	100	110	140	140	1.7 J	1.6 J	<1.1	1.8 J	<1.1	<1.1	NA	NA	<1.1	<1.1	<1.1	<1.1	<1.1
Selenium, ug/L	P*	0.72	50	<1.0	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	<1.0	NA	<1.0	<1.0	NA
Thallium, ug/L	NP*	0.29	2	<0.26	<0.26	NA	<0.27	NA	<0.26	NA	<0.27	NA	NA	NA	<0.26	NA	<0.26	<0.26	NA
Radium 226/228	P	1.88	5	0.630	0.573	NA	0.553	0.557	0.837	NA	0.897	1.79	NA	NA	1.05	NA	1.12	1.05	NA
Additonal Parameters - Selection of Remedy																			
Arsenic, dissolved#, ug/L	UPL or GPS not applicable			NA	NA	<0.88	NA	NA	NA	6.4	NA	NA	NA	NA	NA	9.4	NA	NA	<0.88
Iron, dissolved,# ug/L				NA	NA	<50	NA	NA	NA	11,000	NA	NA	NA	NA	NA	44,000	NA	NA	1,900
Iron, ug/L				NA	NA	940	NA	NA	NA	13,000	NA	NA	NA	NA	NA	43,000	NA	NA	2,100
Magnesium, ug/L				NA	NA	21,000	NA	NA	NA	32,000	NA	NA	NA	NA	NA	54,000	NA	NA	38,000
Manganese, dissolved, ug/L#				NA	NA	16	NA	NA	NA	2,000	NA	NA	NA	NA	NA	5,100	NA	NA	1,200
Manganese, ug/L				NA	NA	99	NA	NA	NA	2,000	NA	NA	NA	NA	NA	5,200	NA	NA	1,200
Molybdenum, dissolved#, ug/L				NA	NA	160	NA	NA	NA	2.8	NA	NA	NA	NA	NA	<1.1	NA	NA	<1.1
Potassium, ug/L				NA	NA	830	NA	NA	NA	2,200	NA	NA	NA	NA	NA	8,200	NA	NA	1,400
Sodium, ug/L				NA	NA	69,000	NA	NA	NA	8,900	NA	NA	NA	NA	NA	110,000	NA	NA	12,000
Total Alkalinity, mg/L				NA	NA	190	NA	NA	NA	340	NA	NA	NA	NA	NA	850	NA	NA	330
Cabonate Alkalinity, mg/L				NA	NA	<7.6	NA	NA	NA	<7.6	NA	NA	NA	NA	NA	<7.6	NA	NA	<7.6
Bicarbonate Alkalinity, mg/L				NA	NA	190	NA	NA	NA	340	NA	NA	NA	NA	NA	850	NA	NA	330

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance well result exceeds the GPS.
17	Yellow highlighted cell with bold text indicates the compliance well result exceeds the GPS and the result was determined to be statistically significant [(1)].
17	Grayscale indicates Additi Yellow highlighted cell indicates the individual compliance well sampling result exceeds the GPS.

See Page 3 for abbreviations and notes.

Table 1. Groundwater Analytical Results Summary - Complance Monitoring
Lansing Generating Station / SCS Engineers Project #25220070.00

Abbreviations:

UPL = Upper Prediction Limit	LOD = Limit of Detection	DQ = Double Quanti
NA = Not Analyzed	LOQ = Limit of Quantitation	NP = Nonparametric UPL (highest background value)
µg/L = micrograms per liter		P = Parametric UPL with 1-of-2 retesting
mg/L = milligrams per liter		GPS = Groundwater Protection Standard

J = Estimated concentration at or above the LOD and below the LOQ.
DQ = Double Quantification rule applies (not detected in background samples)
# = Dissolved parameter samples collected for MNA data review

Notes:

1. An individual result above the UPL or GPS does not constitute a statistically significant increase (SSI) above background or statistically significant level above the GPS. The aresnic GPS exceedances at MW-302 have been determined to be statistically significant. The arsenic GPS exceedance at MW-306 has been determined not to be statistically significant. The molybdenum GPS exceedance has either been determined not to be statistically significant or the determination is ongoing. See the accompanying report text for additional information regarding determinations of statistical significance.
2. GPS is the United States Environmental Protection Agency (US EPA) Maximum Contamination Level (MCL), if established; otherwise, the value from 40 CFR 257.95(h)(2) is used.
3. Interwell UPLs calculated based on results from background well MW-6.

Created by:	NDK	Date:	5/1/2018
Last revision by:	NDK	Date:	9/18/2020
Checked by:	RM	Date:	9/18/2020
Proj Mgr QA/QC:	TK	Date:	11/25/2020

Table 2. Results Comparison to GPS for Arsenic
Lansing Generating Station Ash Pond / SCS Engineers Project #25220100.00

Monitoring Well	Units	Groundwater Protection Standard (GPS)	Assessment Monitoring Results									Number of Samples	Mean	Lower Confidence Limit for Mean (α = 95%)	LCL Exceeds GPS?
			4/16/2018	8/7/2018	10/8/2018	4/15/2019	6/2/2019	10/2/2019	12/5/2019	2/5/2020	5/19/2020				
MW-302	µg/L	10	30.8	47.6	50.4	37	NA	53	NA	NA	33	6	42.0	35.0	YES
MW-306	µg/L	10	NA	NA	NA	NA	8.6	12	9.3	9.4	8.5	5	9.6	8.4	NO

30.8 Result exceeds GPS

Abbreviations:
µ/L = micrograms per liter
NA= Not Applicable

Prepared by:	SCC	Date:	1/19/2020
Revised by:	NDK	Date:	9/18/2020
Checked by:	MDB	Date:	9/28/2020
Proj Mgr QA/QC:	TK	Date:	9/28/2020

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Figures

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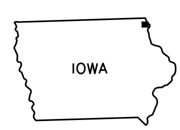
LANSING QUADRANGLE
IOWA–ALLAMAKEE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



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

				ENGINEER	FIGURE
PROJECT NO.	25219070.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	1
DRAWN:	11/27/2019	CHECKED BY:	MDB		
REVISED:	03/12/2020	APPROVED BY:	TK 02/12/2020		

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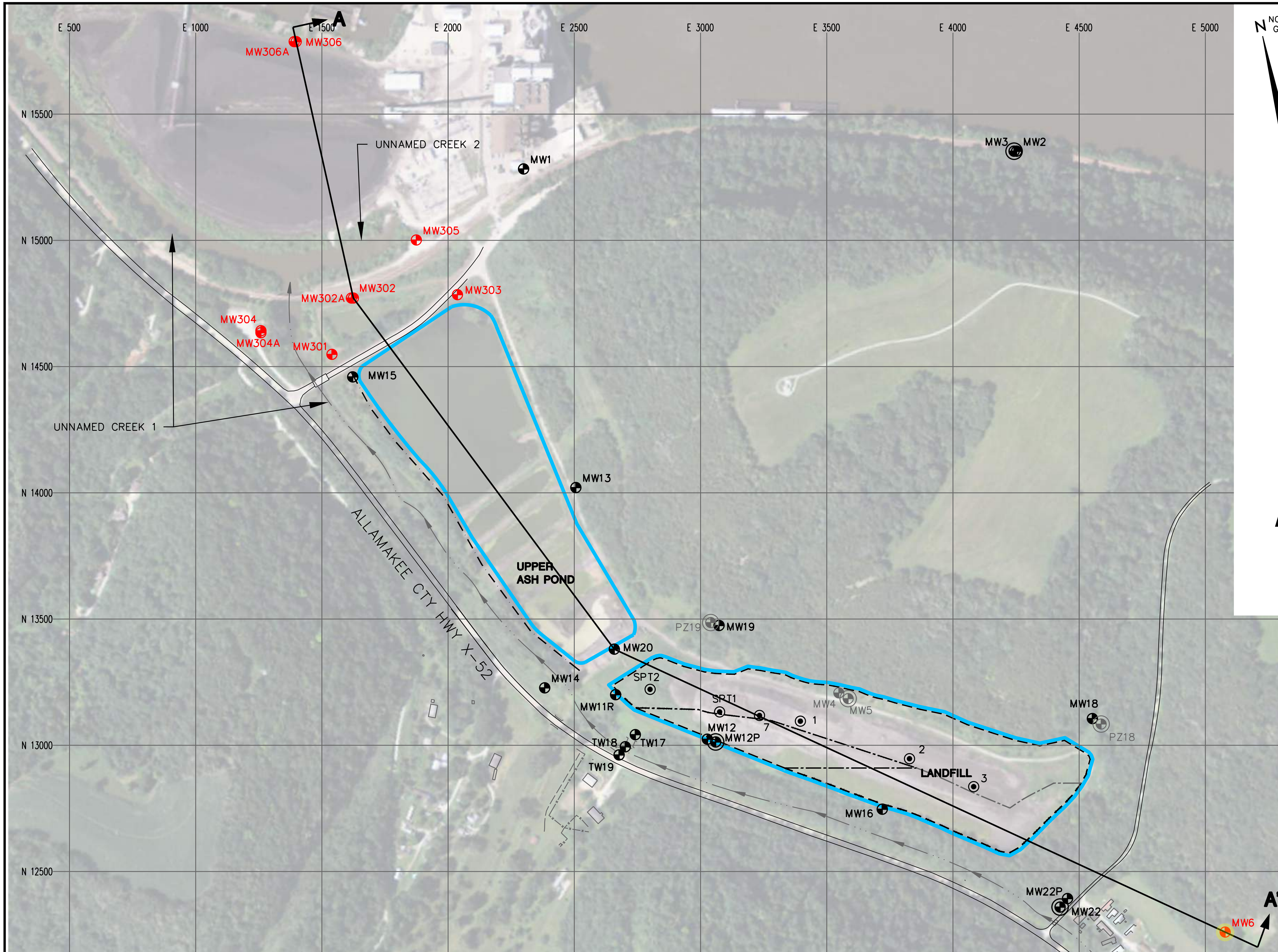

N NORTH GRID

400 0 400

SCALE: 1" = 400'

LEGEND

(dashed line)	APPROVED LIMITS OF WASTE
(dash-dot line)	LIMITS OF PHASE 1 FINAL COVER
(dash-dot line)	LIMITS OF PHASE 2 FINAL COVER
(dash line)	SLURRY WALL
(arrow line)	EXISTING STREAM
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
	SOIL BORING
	CCR UNITS
	CROSS SECTION LOCATION
	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. ONLY BORINGS USED FOR GEOLOGIC CROSS SECTION A-A' ARE SHOWN.
7. MW6 IS SAMPLED UNDER BOTH THE STATE AND CCR RULE MONITORING PROGRAMS.

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

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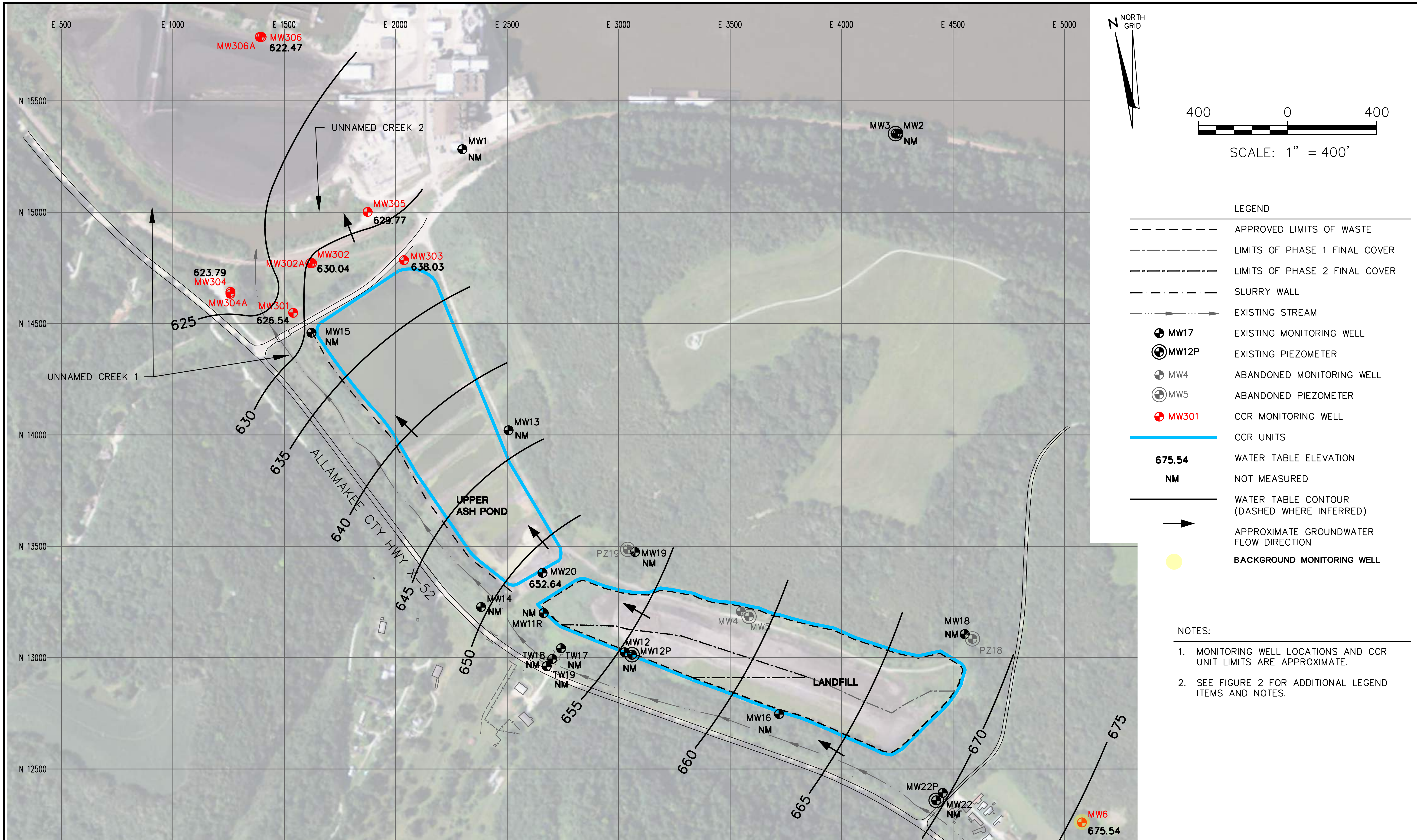

PROJECT NO.	25220100.00	DRAWN BY:	KP	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT: INTERSTATE POWER AND LIGHT 2320 POWER PLANT DRIVE LANSING, IA 52151-9733	SITE: ALLIANT ENERGY LANSING POWER STATION LANSING, IOWA	WATER TABLE MAP OCTOBER 9, 2019
DRAWN:	09/18/2020	CHECKED BY:	MDB				FIGURE
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020				3

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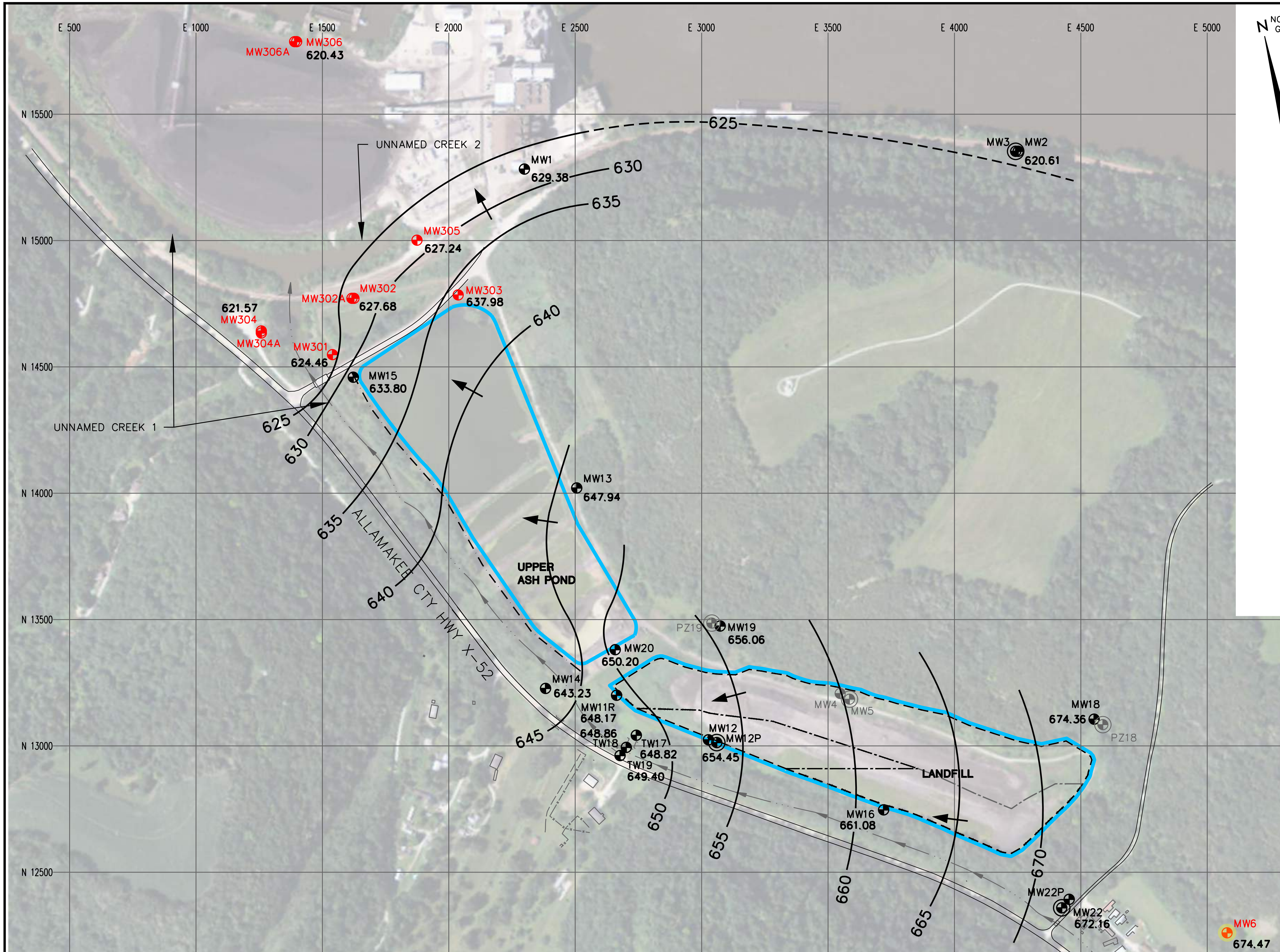
11/25/2020 - Classification: Internal - ECRM7804115



NORTH GRID
N

SCALE: 1" = 400' (400 0 400)

LEGEND

Symbol	Description
— — — —	APPROVED LIMITS OF WASTE
—·—·—·—	LIMITS OF PHASE 1 FINAL COVER
—·—·—·—	LIMITS OF PHASE 2 FINAL COVER
— · — · —	SLURRY WALL
···—►···—►	EXISTING STREAM
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
(blue line)	CCR UNITS
629.38	WATER TABLE ELEVATION
(solid line)	WATER TABLE CONTOUR (DASHED WHERE INFERRED)
→	APPROXIMATE GROUNDWATER FLOW DIRECTION
(yellow circle)	**BACKGROUND MONITORING WELL**

NOTES:

1. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
2. SEE FIGURE 2 FOR ADDITIONAL LEGEND ITEMS AND NOTES.

PROJECT NO.	25220100.00	DRAWN BY:	KP
DRAWN:	09/18/2020	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

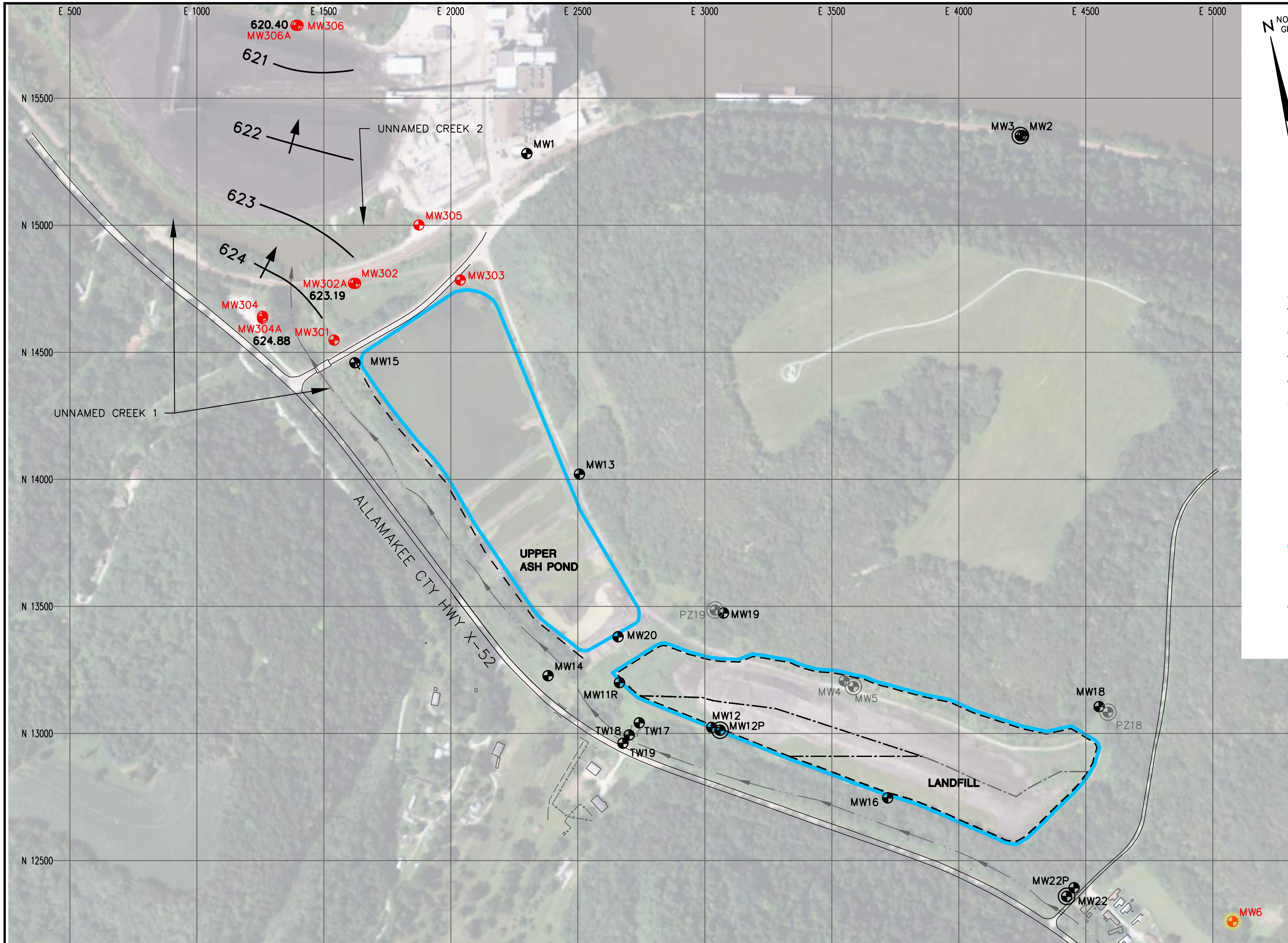
CLIENT: INTERSTATE POWER AND LIGHT, 2320 POWER PLANT DRIVE, LANSING, IA 52151-9733

SITE: ALLIANT ENERGY, LANSING POWER STATION, LANSING, IOWA

WATER TABLE MAP
MAY 20-21, 2020

FIGURE 4

I:\25220100.00\Drawings\ PA los re\Wt l Maps.dwg, 11/2 /2020 11:0 :37 AM



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
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
	CCR UNITS
623.19	POTENTIOMETRIC SURFACE ELEVATION MEASURED ON 05/20-21/2020
	POTENTIOMETRIC SURFACE CONTOUR
	APPROXIMATE GROUNDWATER FLOW DIRECTION
	BACKGROUND MONITORING WELL

NOTES:

1. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
2. SEE FIGURE 2 FOR ADDITIONAL LEGEND ITEMS AND NOTES.

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	07/31/2020	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

POTENTIOMETRIC SURFACE MAP
MAY 20-21, 2020

FIGURE 5

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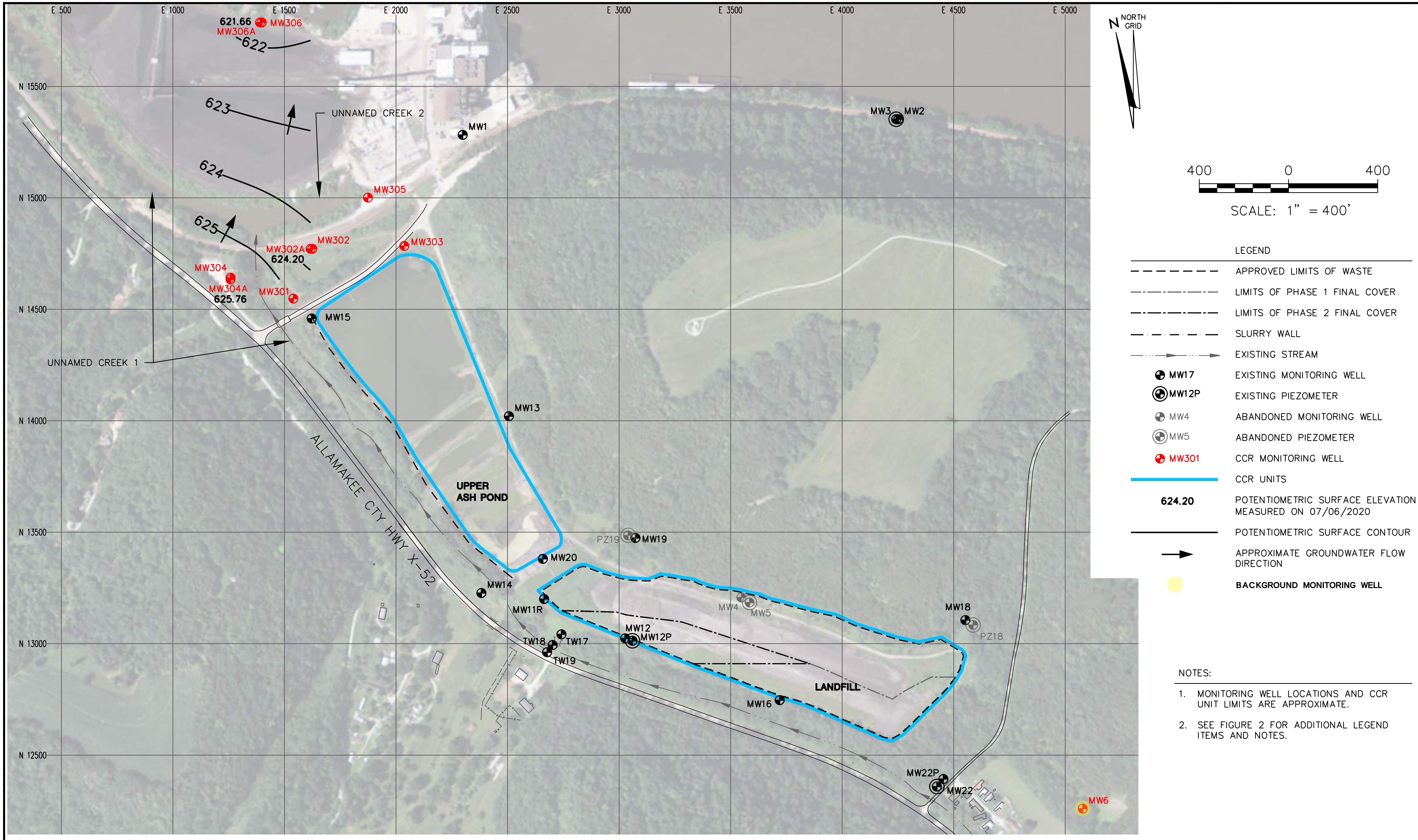

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	07/31/2020	CHECKED BY:	MDB
REVISED:	09/24/2020	APPROVED BY:	TK 11/24/2020

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

POTENTIOMETRIC SURFACE MAP
JULY 6, 2020

FIGURE 6

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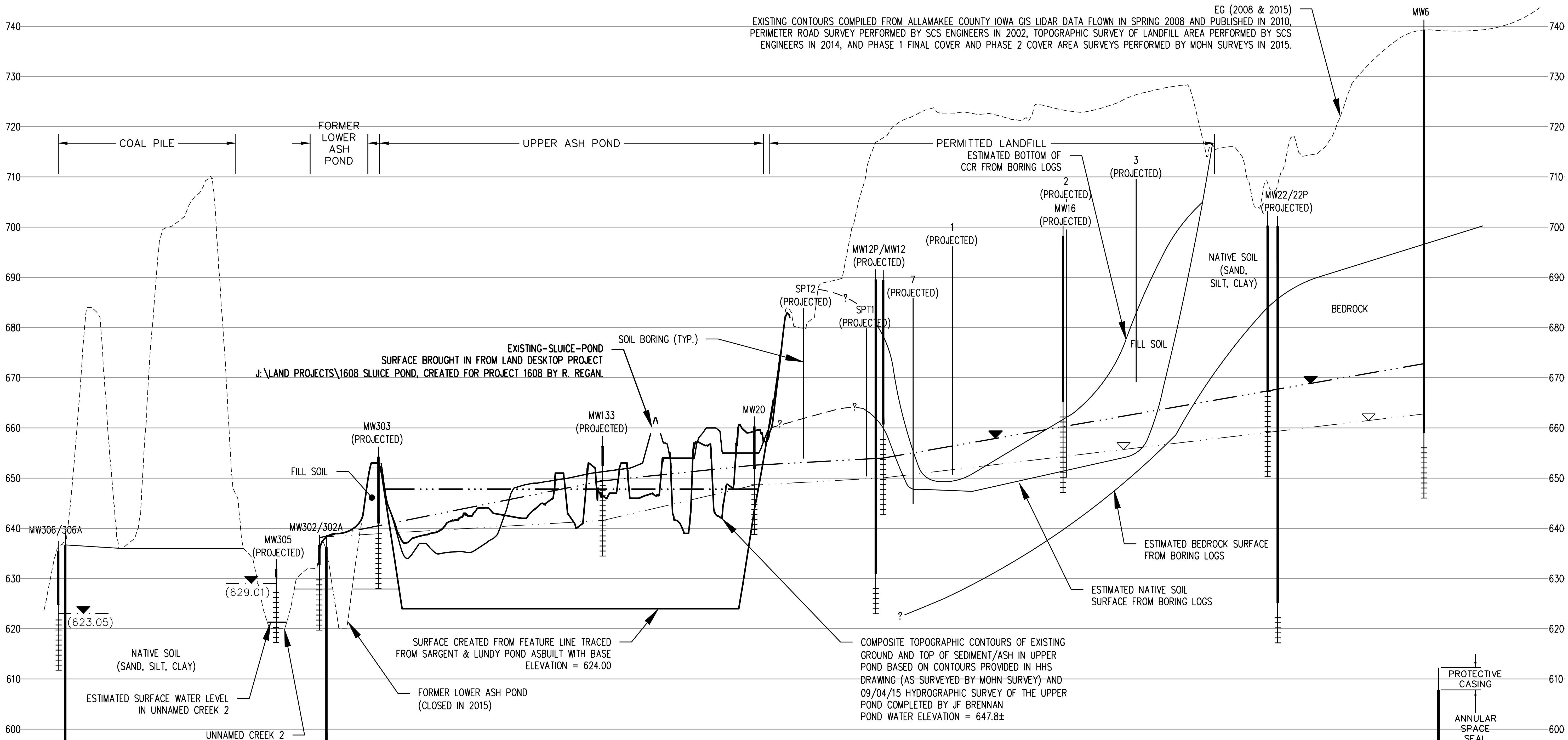
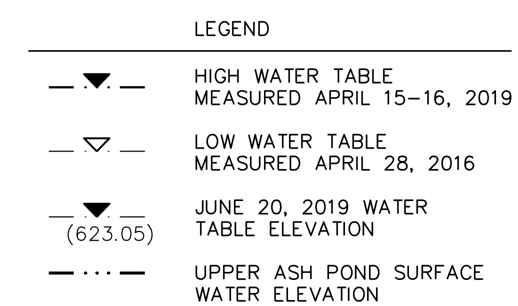
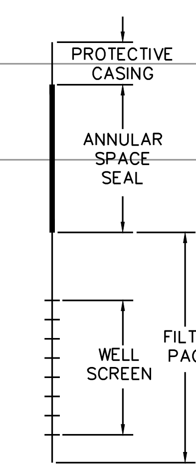


NOTES:

1. THE FOLLOWING MONITORING WELL AND BORING LOCATIONS ARE PROJECTED ALONG THE CROSS SECTION; MW22P/MW22, MW16, MW12/MW12P, MW13, MW303, MW305, 1, 2, 3, 7, SPT1, AND SPT2. SEE FIGURE 2 FOR CROSS SECTION LOCATION.
2. MONITORING WELLS MW305 AND MW306 WERE INSTALLED IN MAY 2019 AND FIRST SAMPLED ON JUNE 20, 2019. WATER TABLE ELEVATIONS FOR JUNE 20, 2019 ARE SHOWN AT THESE WELLS.

HORIZONTAL SCALE: 1" = 300'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 20X





WELL DETAIL

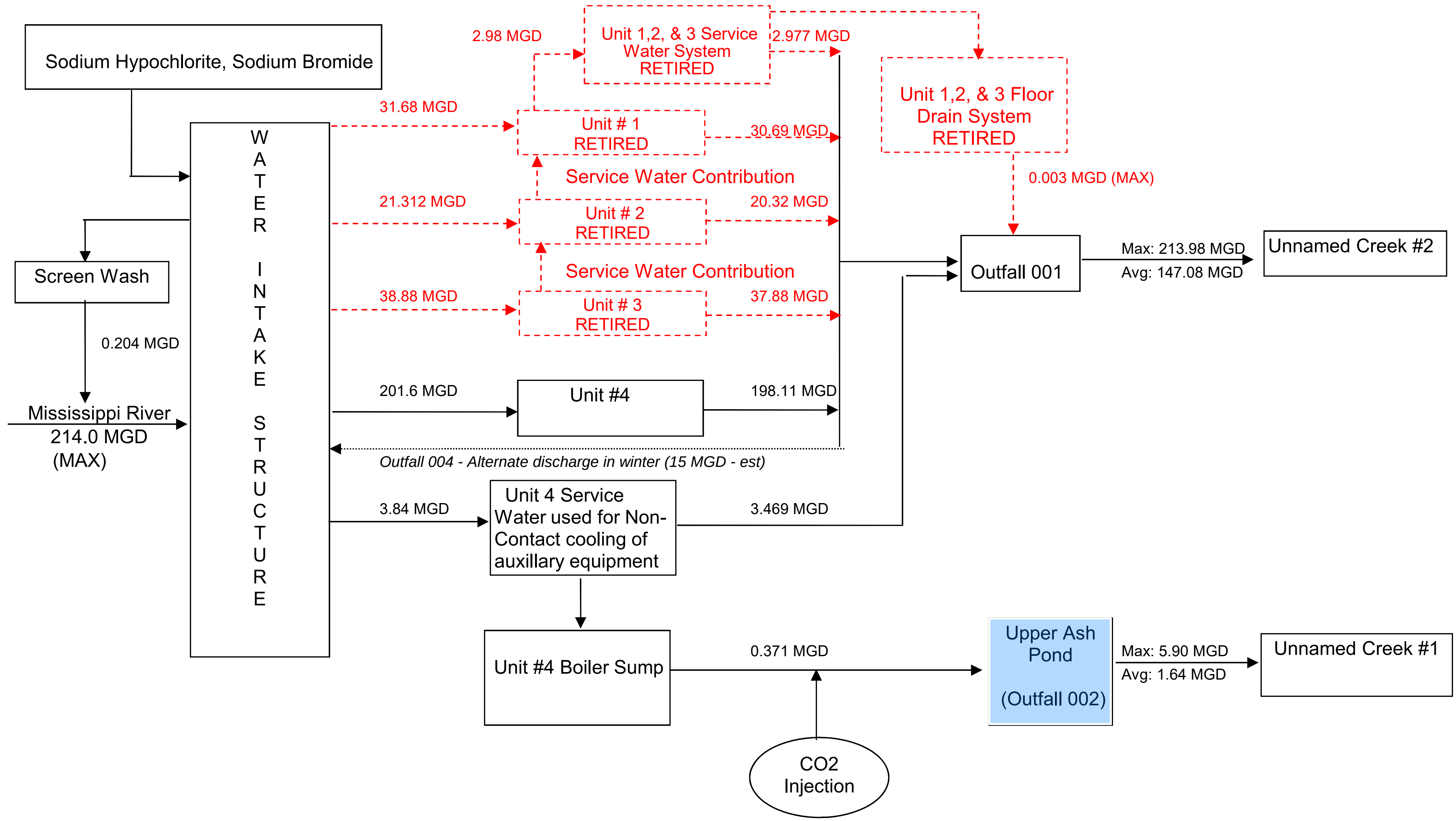
PROJECT NO.	25220100.00	DRAWN BY:	AHB/RJG	ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830	CLIENT: INTERSTATE POWER AND LIGHT, 2320 POWER PLANT DRIVE, LANSING, IA 52151-9733	SITE: ALLIANT ENERGY LANSING POWER STATION LANSING, IOWA	CROSS SECTION A-A'
DRAWN:	07/03/2019	CHECKED BY:	MDB				FIGURE
REVISED:	09/18/2020	APPROVED BY:	TK 11/24/2020				7

I:\25220100.00\Drawings\□PA □los□re\Section.dwg, 11/2□/2020 12:□0:3□PM

Figure 8A

IPL - Lansing Generating Station

Water Flow Diagram - Outfall 001



Created: 6/1/03
Revised: 8/29/20

Note: This figure shows the capability of discharging fly ash to the Upper Ash Pond, but the facility no longer managed fly ash in the Upper Ash Pond.

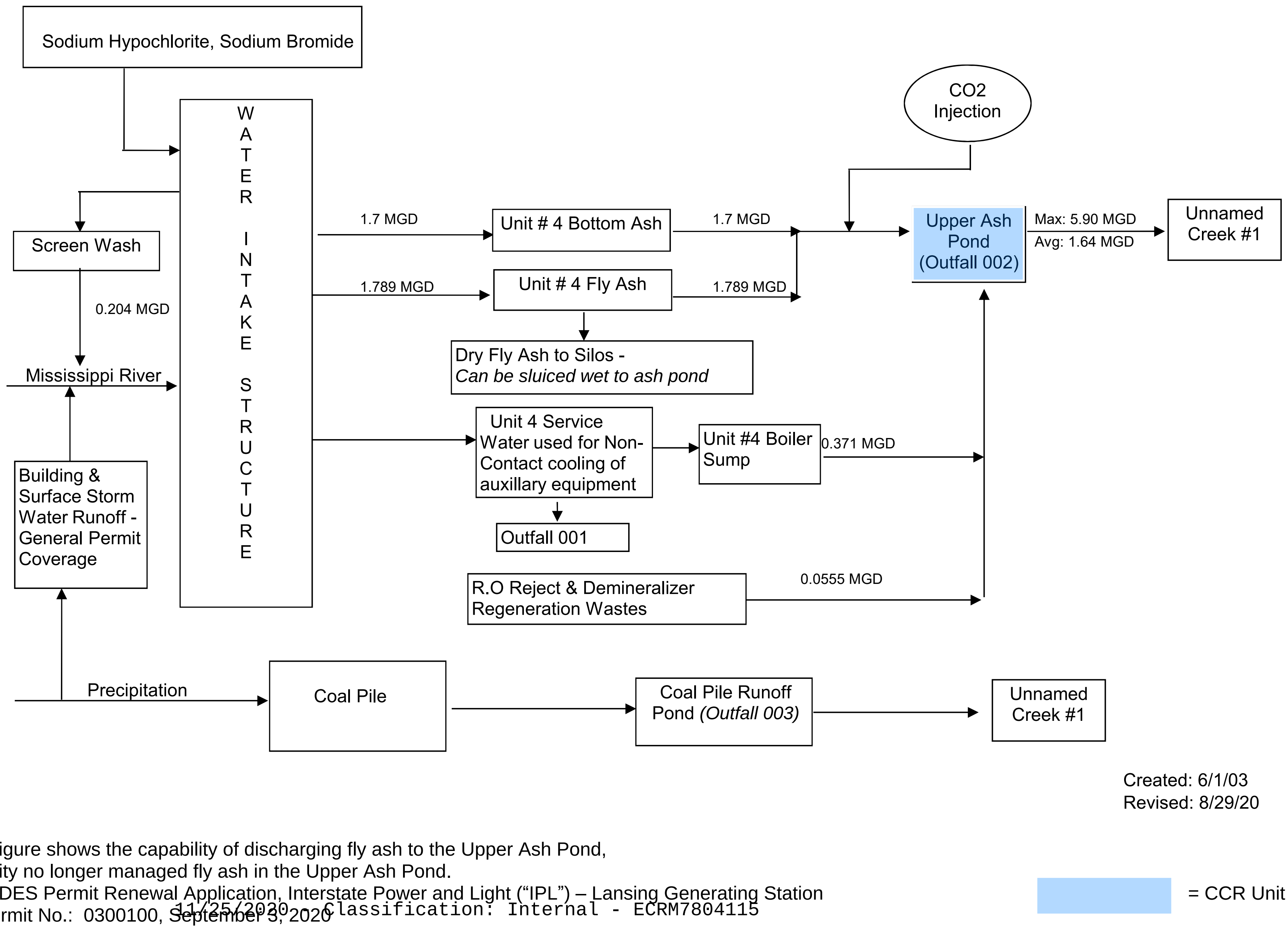
= CCR Unit

Source: NPDES Permit Renewal Application, Interstate Power and Light ("IPL") – Lansing Generating Station
NPDES Permit No.: 0300100, September 3, 2020

Figure 8B

IPL - Lansing Generating Station

Water Flow Diagram - Outfalls 002 and 003



Created: 6/1/03
Revised: 8/29/20

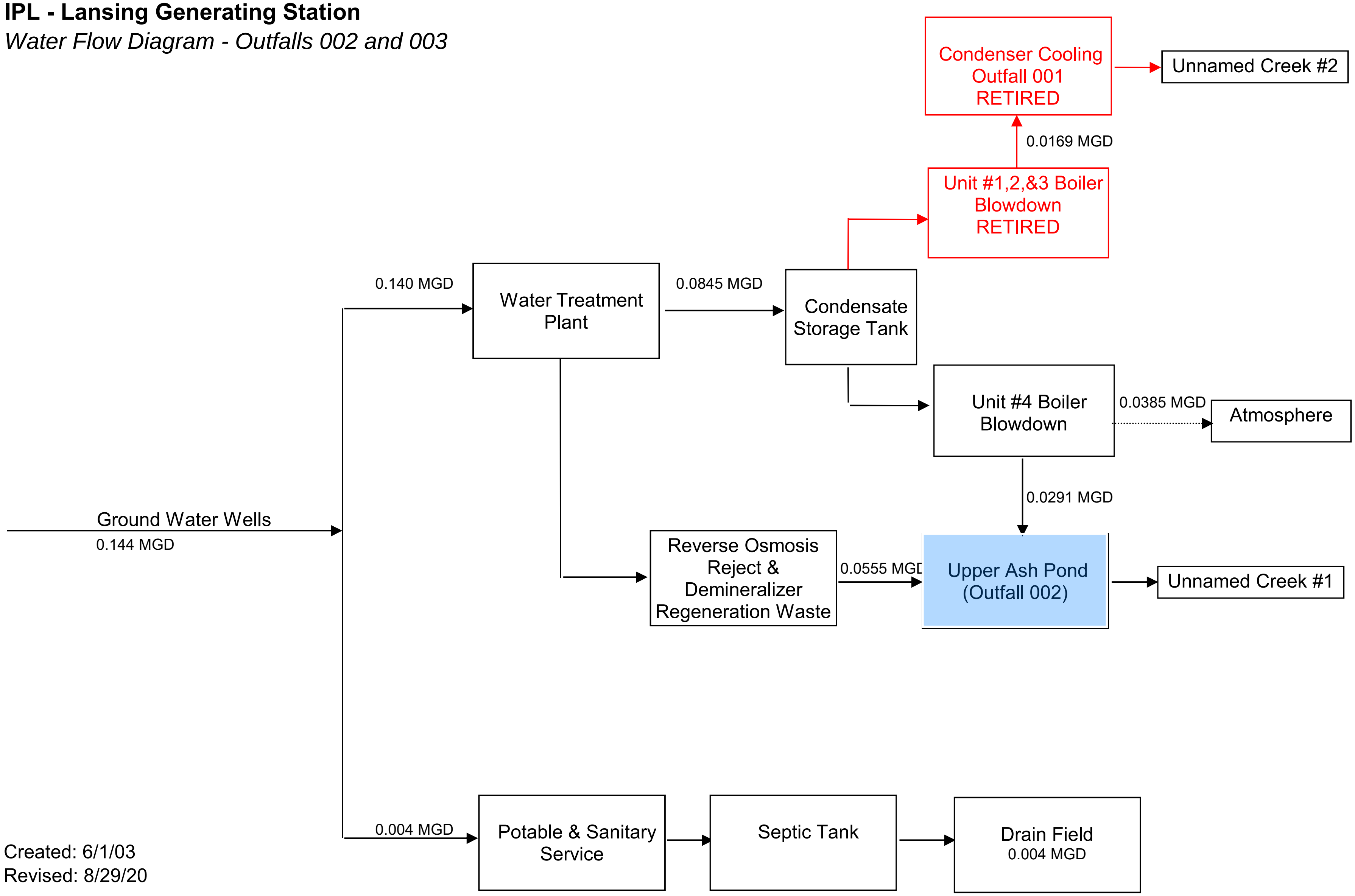
Note: This figure shows the capability of discharging fly ash to the Upper Ash Pond, but the facility no longer managed fly ash in the Upper Ash Pond.

Source: NPDES Permit Renewal Application, Interstate Power and Light ("IPL") – Lansing Generating Station NPDES Permit No.: 0300100, September 3, 2020

Figure 8C

IPL - Lansing Generating Station

Water Flow Diagram - Outfalls 002 and 003



Created: 6/1/03
Revised: 8/29/20

Note: This figure shows the capability of discharging fly ash to the Upper Ash Pond, but the facility no longer managed fly ash in the Upper Ash Pond.

Source: NPDES Permit Renewal Application, Interstate Power and Light ("IPL") – Lansing Generating Station NPDES Permit No.: 0300100, September 3, 2020

= CCR Unit

LEGEND

AREA OF STEEP OR DISCONNECTED TERRAIN AND CULTURAL RESOURCES (NOT SPECIFICALLY IDENTIFIED ON THIS FIGURE)

ACTIVE COAL COMBUSTION RESIDUAL (CCR) UNIT AREA

N

300 0 300

SCALE: 1" = 300'

PROJECT NO.	25220100.00	DRAWN BY:	KP
DRAWN:	11/10/20	CHECKED BY:	EJN
REVISED:	11/10/20	APPROVED BY:	TK, 11/25/20

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

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

SITE: ALLIANT ENERTY
LANSING GENERATING STATION
LANSING, IOWA

OVERALL SITE PLAN

FIGURE 9

Appendix A

Owner's Compliance Certification

OWNER OR OPERATOR CERTIFICATION OF COMPLIANCE

In accordance with 40 C.F.R. § 257.103(f)(2)(v)(C)(1), I hereby certify, based on information provided to me by, and my inquiry of, persons immediately responsible for compliance with the CCR rule at the Lansing Generating Station, that the Lansing Generating Station, including the existing CCR surface impoundment and CCR landfill, is in compliance with 40 C.F.R. Part 257, Subpart D -- Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. All the required CCR compliance information for the Lansing Generating Station is up-to-date and posted on the Alliant Energy CCR Rule Data and Compliance website.

Nichol Toomire	Nichol D. Toomire
Name	Signature
Director of Operations	November 25, 2020
Title	Date

Appendix B

Hydrogeological and Groundwater Monitoring Data

B1 Boring Logs and Well Construction Forms

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					734.0	5		
					729.0	10		
					724.0	15		
					719.0	20		
					714.0	25		
					709.0	30		
					704.0	35		
					699.0	40		
					694.0	45		
					689.0	50		

0.0 to 6.0 SILT
Topsoil developed in silt from 0.0 to 1.5. Topsoil is dark brown. Clayey silt, trace sand is loess or colluvium (slopewash) derived from loess. Medium brown, changing gradually to yellow brown below 5.0.

6.0 to 37.0 TALUS
Light brown sandy silt with dolomite chunks.

37.0 to 93.5 INTERBEDDED SANDSTONE AND SILTSTONE
Sandstone is fine-grained, with quartz silt matrix, glauconitic. Siltsone contains minor amount of very fine quartz sand and glauconite. Sandstone is laminated light greenish gray with creamy color. Siltstone is light greenish gray.

Sandstone from 37.0 to 58.0.

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT Interstate Power Company
PROJECT NUMBER 717680-J
SURFACE ELEVATION 739.3 Feet MSL
TOTAL DEPTH OF HOLE 93.5 Feet

LOG OF MW-6
LOCATION Lansing, Iowa
GEOLOGIST Barbara Torney

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					684.0	55		
								Siltstone from 58.0 to 68.0.
					679.0	60		
					674.0	65		
								Interbedded sandstone and siltstone from 68.0 to 78.0.
					669.0	70		
					664.0	75		
								Siltstone from 78.0 to 83.0
					659.0	80		
								No sample from 83.0 to 93.5. Likely interbedded sandstone and siltstone by comparison to same interval on log of MW-4 and MW-5. Lower few feet may be primarily siltstone.
					654.0	85		
					649.0	90		
					644.0	95		
					639.0	100		

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT Interstate Power Company
PROJECT NUMBER 717680-J
SURFACE ELEVATION 739.3 Feet MSL
TOTAL DEPTH OF HOLE 93.5 Feet

LOG OF MW-6

LOCATION Lansing, Iowa
GEOLOGIST Barbara Torney

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-301

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2015	11/2/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-301	Feet	639.4 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,744 N, 5,541,108 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–4.5	POORLY GRADED SAND, medium grained, very dark gray brown (10YR 3/2).	SP									
S1	23	10 31 38 48	3							M				
S2	24	32 47 50	4.5–7	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/4).	SP-SM					M				
S3	22	18 33 47 43	7–9.5	POORLY GRADED SAND WITH SILT AND GRAVEL, medium grained sand, large grained gravel, dark yellowish brown (10YR 3/6).	SP-SM					M				
S4	24	36 46 50	9.5–15	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/6).	SP-SM					S				Water @ 10 ft bgs
S5	22	13 9 7 10	13							S				

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

Signature	Firm	
[signature]	SCS Engineers 2830 Dairy Drive Madison, WI 53718	Tel: 608-224-2830 Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B-301

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	20	3 2 4	16, 17	SILT, black (10YR 3/1).	ML					S				
S7	24	2 2 2 2	18, 19	SILT WITH SAND, black (10YR 3/1).	ML					S				
S8	24	2 2 4	20, 21, 22	POORLY GRADED SAND WITH SILT, black (10YR 3/1).	SP-SM					S				
S9	24	2 9 12 14	23, 24, 25	SILT, dark olive gray (5Y 3/2).	ML					S				
			26	End of Boring at 26 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-302

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/4/2015	11/4/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-302	Feet	635.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,929 N, 5,541,179 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W

Lat ___° ___' ___"
Long ___° ___' ___"

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

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	POORLY GRADED SAND, medium grained, dark grayish brown (10YR 4/2).	SP									
S1	24	6 14 17 19	3							M				
S2	24	26 45 50	5.5	SANDY SILT, trace small gravel, black (10YR 3/1).	ML					M				
S3	24	12 13 10 8	8							M				
S4	11	9 11 13 12	10.5	Large gravel (11 ft)						S				Saturation @ 11 ft bgs
S5	8	32 23 30 36	13	Large gravel (13.5 ft)						S				

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

Signature	Firm	
[signature]	SCS Engineers 2830 Dairy Drive Madison, WI 53718	Tel: 608-224-2830 Fax:

Boring Number B-302

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	24	5 5 6 8	16, 17	SANDY SILT, trace small gravel, black (10YR 3/1). *(continued)*	ML					S				
S7	18		18, 19, 20	Silt, Black (10YR 3/1).	ML					S				
				End of Boring at 20 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name		License/Permit/Monitoring Number	Boring Number
IPL - Lansing Generating Station SCS#: 25218221.00			MW-302A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Paul Dickinson Cascade Drilling	12/16/2019	12/17/2019	Rotosonic

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			13.01 Feet	636.2 Feet	6 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3957930.08 N, 5541186.04 E S/C/N
SW 1/4 of NW 1/4 of Section 02 , T 98 N, R 03 W

Lat ___° ___' ___"
Long ___° ___' ___"

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

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9	Hydrovac to 9' to check for utilities.										
S1	46"		9–11	POORLY GRADED SAND with silt, clay and trace gravel, dark gray.	SP					W				
			11–13	SILT, gray, trace gravel.	ML									
S2	39"		13–16	SILTY GRAVEL WITH SAND, gray, sand is fine to medium grained, gravel is subangular to angular.	GM					W				

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

Signature	Firm	
[signature]	SCS Engineers	Tel: Fax:

Boring Number MW-302A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			17	SILTY GRAVEL WITH SAND, gray, sand is fine to medium grained, gravel is subangular to angular. *(continued)*	GM									
			18–22	SILT, dark gray, trace roots.	ML									
S3	48"		21							W				
			22–29	LEAN CLAY, dark gray, roots.	CL									
S4	40"		26	Same but dark brown.						W				
			29–31	SILTY SAND, gray to dark gray, fine to medium grained.	SM									
S5	48"		31–33	LEAN CLAY, tan with yellow to brown mottling and gray layers, trace silt.	CL					W				
			33–36	LEAN CLAY, reddish brown, massive, very dense.	CL									
S6	48"		36–39	LEAN CLAY, gray.	CL					W				
			39	POORLY GRADED SAND, brown, fine to medium grain, trace gravel.	SP									
S7	48"		42	Same with trace shells						W				

Boring Number MW-302A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			43	POORLY GRADED SAND, brown, fine to medium grained, trace gravel. *(continued)*	SP									
			44–45	SILTY GRAVEL, light brown, subangular.	GM									
S8	48"		46–48	LEAN CLAY, mostly light brown, trace gray, trace silt.	CL					W				
			49	SILTY GRAVEL WITH SAND, light brown, gravel is subangular.	GM									
			50	End of boring at 50 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name		License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70			B-303

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2015	11/2/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-303	Feet	653.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,857 N, 5,541,622 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–2.5	SILTY SAND, very dark gray (5Y 3/1).	SM									
			2.5–7	POORLY GRADED SAND, medium grained, dark grayish brown (10 YR 4/2).	SP									
S1	24	5 16 17 24	3							M				
S2	24	11 8 10	5.5							M				
			7–15	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2).	SP									
S3	24	11 38 50	8							M				
S4	18	16 35 50	10.5							M				
S5	16	27 50 50	13							M				

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

Signature [signature] | Firm SCS Engineers, 2830 Dairy Drive Madison, WI 53718 | Tel: 608-224-2830 Fax:

Boring Number B-303

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	0	38 50	16	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2). *(continued)*						M				Rock in Spoon
			17		SP									
S7	18	17 25 40 47	18							S				Saturation @17 ft bgs.
			19											
			20	POORLY GRADED SAND, medium grained, very dark gray (5Y 3/1).										
S8	17	37 48 44	21							S				
			22											
S9	18	11 24 26 27	23		SP					S				
			24											
			25											
S10	24	37 50	26							S				
			27	End of Boring at 27 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IP&L Lansing Generating Station SCS#: 25218221.00		MW304

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/15/2019	5/15/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW304	Feet MSL	635.5 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,893 N, 5,540,876 E S/C/N
SE 1/4 of NE 1/4 of Section 3, T 98 N, R 3 W
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–3	SILT, mottled, (10YR 3/2), some black coal looking material	ML									
	12	3 6 3 3	2							M				
			3–5	LEAN CLAY, (10YR 4/3), soft, some organic material	CL									
	18	1 2 2 1	4							W				
			5–9	SILT, (10YR 2/2), uniform, trace fine sand and clay	ML									
	12	2 2 3 2	6							M				
	18	1 1 3 2	8							W				
			9–15	POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial)	SP									
	18	1 2 1 1	10							W				
	12	0 0 1 1	12							W				
	12	0 0 1 1	14							W				

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

Signature: [signature] for Zach Watson
Firm: SCS Engineers 2830 Dairy Drive, Madison, WI 53718
Tel:
Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW304

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial). *(continued)*										
		0 0 1 1	16							W				
			17	Same as above but more coarse, (2.5YR 5/4), trace silt	SP									
		2 5 6 6	18							W				
			19											
			20	End of Boring at 20 feet										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL - Lansing Generating Station SCS#: 25218221.00		MW-304A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Paul Dickinson Cascade Drilling	12/18/2019	12/19/2019	Rotosonic

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			10.7 Feet	635.6 Feet	6 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3957884.99 N, 5540876.5 E S/C/N
SE 1/4 of NE 1/4 of Section 03, T 98 N, R 03 W

Lat ___° ___' ___"
Long ___° ___' ___"

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

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–10	Hydrovac to 9' to check for utilities.										
			10–11	SILT, grayish brown, toots and sticks.	ML									
S1	49"		11–14	POORLY GRADED SAND WITH SILT AND GRAVEL, fine to medium grained, reddish brown.	SP-SM					W				
			14–16	POORLY GRADED SAND, reddish brown, fine to medium grained.	SP									

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

Signature	Firm	
[signature]	SCS Engineers	Tel: Fax:

Boring Number MW-304A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				POORLY GRADED SAND, reddish brown, fine to medium grained. *(continued)*	SP									
S2	21"		17–18							W				
			20	Same but light brown, mostly fine grained.										
S3	59"		22–23							W				
			23	SANDY SILT, brown, fine grained.	ML									
S4	24"		27–28							W				
			30	SILTY SAND, light brown, fine grained.	SM									
S5	30"		32–33							W				
			36	POORLY GRADED SAND, light brown, fine to medium grained.	SP									
S6	57"		37–38							W				
			41	POORLY GRADED SAND, orange, fine grained.	SP									
			42	SANDY SILT WITH GRAVEL, sand is fine grained.	ML									

Boring Number MW-304A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S7	54"		43–45	SANDY SILT WITH GRAVEL, sand is fine grained.*(continued)*	ML					W				
S8	9"		45–46	POORLY GRADED SAND, light brown, fine grain, trace coarse grained.	SP					W				
S9	48"		46–51	SANDY SILT WITH GRAVEL, light brown with trace yellow, fine grained.	ML					W				
			51	End of boring at 51 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IP&L Lansing Generating Station SCS#: 25218221.00		MW305

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/16/2019	5/16/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW305	Feet MSL	631.8 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,958,109 N, 5,541,533 E S/C/N
SE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9.5	Hydrovaced to 9.5 feet										
			9.5	FAT CLAY, dark greenish gray, (GLEY 1 3/10Y), soft, trace red sand, wood pieces and roots	CH									
	24	1 1 1 1	11							W				no sheen or indications of petroleum impacts
	24	0 0 0 2	13							W				
			14	Sand seams at 13.5 and 14.5 feet										

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

Signature	Firm		
[signature] for Zach Watson	SCS Engineers	2830 Dairy Drive, Madison, WI 53718	Tel: Fax:

Boring Number MW305

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			16	FAT CLAY, dark greenish gray, (GLEY 13/10Y), soft, trace red sand, wood pieces and roots *(continued)*	CH					W				
				End of Boring at 16 feet										

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name: IP&L Lansing Generating Station SCS#: 25218221.00	License/Permit/Monitoring Number		Boring Number: MW306
Boring Drilled By: Name of crew chief (first, last) and Firm: Eric Wetzel, Roberts Environmental Drilling, Inc.	Date Drilling Started: 5/16/2019	Date Drilling Completed: 5/16/2019	Drilling Method: 4.25" HSA
Unique Well No. / DNR Well ID No. / Common Well Name: MW306	Final Static Water Level: Feet MSL	Surface Elevation: 636.7 Feet MSL	Borehole Diameter: 8.5 in
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ State Plane 3,958,977 N, 5,541,203 E S/C/N; NE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W	Lat ° ' " Long ° ' "	Local Grid Location ☐ N Feet ☐ S	☐ E Feet ☐ W
Facility ID	County: Allamakee	Civil Town/City/ or Village: Lansing	

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–12	Hydrovaced to 12 feet										
	12	1 2 4 3	12–15	POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt	SP					W				

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

Signature: [signature] for Zach Watson | Firm: SCS Engineers | 2830 Dairy Drive, Madison, WI 53718 | Tel: Fax:

Boring Number **MW306**

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
	18	1 2 2 4		POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt *(continued)*						W				
			16	Same as above but gray, (10YR 4/2).										
	18	1 1 2 2	17							W				
			18											
	18		19							W				
			20		SP									
	18		21							W				
			22											
	18	3 1 2 2	23							W				
			24											
	18	2 1 3 2	25							W				
			26	End of Boring at 26 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL - Lansing Generating Station SCS#: 25218221.00		MW-306A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Paul Dickinson Cascade Drilling	12/17/2019	12/18/2019	Rotosonic

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			16.3 Feet	636.7 Feet	6 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3958980.99 N, 5541196.46 E S/C/N
NE 1/4 of NW 1/4 of Section 02, T 98 N, R 03 W
Lat ___° ___' ___" Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9	Hydrovac to 9' to check for utilities.										
S1	52"		10–16	POORLY GRADED SAND, reddish brown, trace shells, medium grained.	SP					W				

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

Signature	Firm	
[signature]	SCS Engineers	Tel: Fax:

Boring Number MW-306A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S2	56"		16–20	POORLY GRADED SAND, reddish brown, trace shells, medium grained. *(continued)*	SP					W				
S3	57"		20–25	POORLY GRADED SAND, gray, fine to medium grained, trace coarse grained and shells.	SP					W				
S4	54"		25–30	Same, mostly medium grained with fine grained.						W				
S5	58"		30–35	Same, fine to medium grained with trace coarse grained.						W				
S6	53"		35–40	Same with shell fragments.						W				
			41–42	LEAN CLAY, dark gray, massive, very dense with roots and sticks.	CL									

Boring Number MW-306A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S7	58"		43–44	LEAN CLAY, dark gray, massive, very dense with roots and sticks. *(continued)*	CL					W				
S8	52"		44–50	POORLY GRADED SAND, gray to dark gray, fine grained, trace coarse grain with shell fragments.	SP					W				
			50–52	POORLY GRADED SAND, light gray, fine to medium grained.	SP									
S9	58"		52–56	POORLY GRADED SAND, reddish tan, fine to medium grained with shell fragments.	SP					W				
			56	End of boring at 56 feet.										

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					734.0	5		0.0 to 6.0 SILT Topsoil developed in silt from 0.0 to 1.5. Topsoil is dark brown. Clayey silt, trace sand is loess or colluvium (slopewash) derived from loess. Medium brown, changing gradually to yellow brown below 5.0.
					729.0	10		6.0 to 37.0 TALUS Light brown sandy silt with dolomite chunks.
					724.0	15		
					719.0	20		
					714.0	25		
					709.0	30		
					704.0	35		
					699.0	40		37.0 to 93.5 INTERBEDDED SANDSTONE AND SILTSTONE Sandstone is fine-grained, with quartz silt matrix, glauconitic. Siltsone contains minor amount of very fine quartz sand and glauconite. Sandstone is laminated light greenish gray with creamy color. Siltstone is light greenish gray. *Sandstone from 37.0 to 58.0.*
					694.0	45		
					689.0	50		

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT: Interstate Power Company
PROJECT NUMBER: 717680-J
SURFACE ELEVATION: 739.3 Feet MSL
TOTAL DEPTH OF HOLE: 93.5 Feet

LOG OF MW-6

LOCATION: Lansing, Iowa
GEOLOGIST: Barbara Torney

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					684.0	55		
								Siltstone from 58.0 to 68.0.
					679.0	60		
					674.0	65		
								Interbedded sandstone and siltstone from 68.0 to 78.0.
					669.0	70		
					664.0	75		
								Siltstone from 78.0 to 83.0
					659.0	80		
								No sample from 83.0 to 93.5. Likely interbedded sandstone and siltstone by comparison to same interval on log of MW-4 and MW-5. Lower few feet may be primarily siltstone.
					654.0	85		
					649.0	90		
					644.0	95		
					639.0	100		

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT Interstate Power Company

PROJECT NUMBER 717680-J

SURFACE ELEVATION 738.3 Feet MSL

TOTAL DEPTH OF HOLE 93.5 Feet

LOG OF MW-6

LOCATION Lansing, Iowa

GEOLOGIST Barbara Torney

Print Form

IOWA DEPARTMENT OF NATURAL RESOURCES

MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL-Lansing Generating Station   Permit No.:

Well or Piezometer No: MW-301

Dates Started: 11/2/15   Date Completed: 11/2/15

A. SURVEYED LOCATIONS AND ELEVATIONS

Locations (± 0.5 ft):

Specify corner of site: NW

Distance & direction along boundary: 540' SE

Distance & direction from boundary to wall: 230' NE

Elevations (± 0.01 ft MSL):

Ground Surface: 639.35

Top of protective casing: 642.18

Top of well casing: 641.61

Benchmark elevation: 622.86, NAVD 1988 datum

Benchmark description: CP 300, iron rod in concrete

B. SOIL BORING INFORMATION

Name & Address of Construction Company:
Cascade Drilling
301 Alderson St.
Schofield, WI 54476

Name of Driller: Mike Mueller

Drilling Method: HSA

Drilling Fluid: None

Bore Hole Diameter: 8"

Soil Sampling Method: Spoon

Depth of Boring: 26

C. MONITORING WELL INSTALLATION

Casing material: PVC

Length of casing: 15 ft

Outside casing diameter: 2.40"

Inside casing diameter: 2"

Casing joint type: threaded

Casing/screen joint type: threaded

Screen material: PVC

Screen opening size: .010

Screen length: 10 ft

Depth of well: 25 ft

Filter Pack:

Material: Red Flint

Grain size: #40

Volume: 300 lbs

Seal (minimum 3 ft length above filter pack):

Material: 3/8" bentonite chips

Placement method: Gravity

Volume:

Backfill (if different from seal):

Material:

Placement method:

Volume:

Surface seal design:

Material of protective casing: Steel 6"

Material of grout between protective casing and well casing: sand

Protective cap:

Material: steel

Vented: ☒ Yes ☐ No   Locking: ☐ Yes ☐ No

Well Cap:

Material: PVC

Vented: ☐ Yes ☒ No

D. GROUNDWATER MEASURMENT (± 0.01 ft below top of inner well casing)

Water level: 17.63   Stabilization Time: 2 hrs.

Well development method: Surged and pumped. Turbidity reduced but not eliminated.

Average depth of frostline: 4 ft.

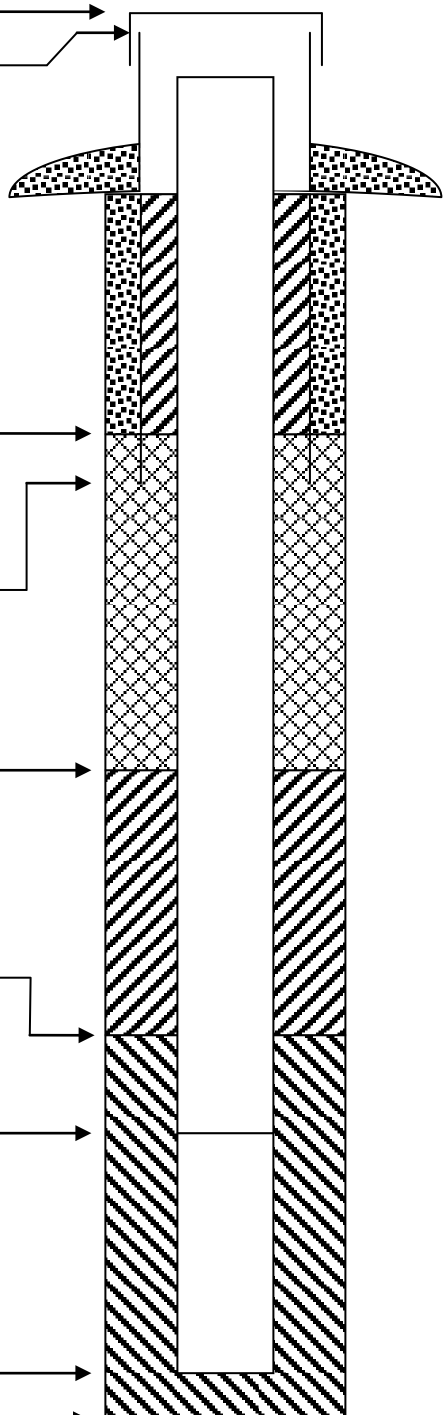
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)



TOP OF PROTECTIVE CASING
ELEVATION 642.18

TOP OF WELL CASING
ELEVATION 641.61

GROUND SURFACE
ELEVATION 639.35

TOP OF BACKFILL
BASE OF CONCRETE PLUG
AND BENTONITE GROUT
ELEVATION 634.35
DEPTH 5

BASE OF PROTECTIVE CASING
ELEVATION 637.18
DEPTH

BASE OF BACKFILL
TOP OF SEAL
ELEVATION
DEPTH

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 625.85
DEPTH 13.5

TOP OF SCREEN
ELEVATION 624.35
DEPTH 15

BOTTOM OF SCREEN
ELEVATION 614.35
DEPTH 25

BASE OF FILTER PACK
ELEVATION 613.35
DEPTH 26

Print Form

IOWA DEPARTMENT OF NATURAL RESOURCES

MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL-Lansing Generating Station
Permit No.:

Well or Piezometer No: MW-302

Dates Started: 11/4/15
Date Completed: 11/4/15

A. SURVEYED LOCATIONS AND ELEVATIONS

Locations (± 0.5 ft):

Specify corner of site: NW

Distance & direction along boundary: 465' SE

Distance & direction from boundary to wall: 405' NE

Elevations (± 0.01 ft MSL):

Ground Surface: 635.85

Top of protective casing: 638.72

Top of well casing: 638.40

Benchmark elevation: 633.86, NAVD 1988 datum

Benchmark description: CP 300, iron rod in concrete

B. SOIL BORING INFORMATION

Name & Address of Construction Company:
Cascade Drilling
301 Alderson St.
Schofield, WI 54476

Name of Driller: Mike Mueller

Drilling Method: HSA

Drilling Fluid: None

Bore Hole Diameter: 8"

Soil Sampling Method: Spoon

Depth of Boring: 20 ft

C. MONITORING WELL INSTALLATION

Casing material: PVC

Length of casing: 9'

Outside casing diameter: 2.40"

Inside casing diameter: 2"

Casing joint type: Threaded

Casing/screen joint type: Threaded

Screen material: PVC

Screen opening size: .01"

Screen length: 10'

Depth of well: 19'

Filter Pack:

Material: Red Flint

Grain size: #40

Volume: 120 lbs

Seal (minimum 3 ft length above filter pack):

Material: 3/8" hole plug

Placement method: Gravity

Volume:

Backfill (if different from seal):

Material:

Placement method:

Volume:

Surface seal design:

Material of protective casing: Steel 6"

Material of grout between protective casing and well casing: sand

Protective cap:

Material: steel

Vented: ☒ Yes ☐ No   Locking: ☐ Yes ☐ No

Well Cap:

Material: PVC

Vented: ☐ Yes ☒ No

D. GROUNDWATER MEASURMENT (± 0.01 ft below top of inner well casing)

Water level: 9.95
Stabilization Time: 2 hrs.

Well development method: Surged and pumped. Turbidity reduced but not removed.

Average depth of frostline: 4 ft.

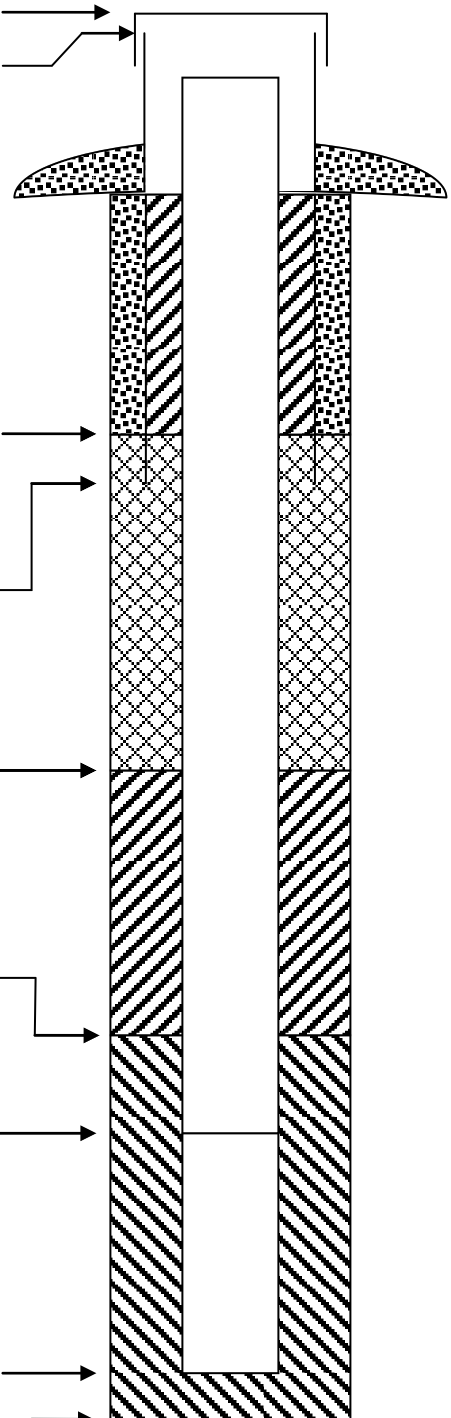
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)



TOP OF PROTECTIVE CASING
ELEVATION 638.72

TOP OF WELL CASING
ELEVATION 638.40

GROUND SURFACE
ELEVATION 635.85

TOP OF BACKFILL
BASE OF CONCRETE PLUG
AND BENTONITE GROUT
ELEVATION 630.85
DEPTH 5

BASE OF PROTECTIVE CASING
ELEVATION 633.72
DEPTH

BASE OF BACKFILL
TOP OF SEAL
ELEVATION
DEPTH

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 628.35
DEPTH 7.5

TOP OF SCREEN
ELEVATION 626.85
DEPTH 9

BOTTOM OF SCREEN
ELEVATION 616.85
DEPTH 19

BASE OF FILTER PACK
ELEVATION 615.85
DEPTH 20

MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station
Permit No.:
Well or Piezometer No.: MW-302A
Dates Started: 12/16/2019
Date Completed: 12/19/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW
Distance and direction along boundary: 375 E
Distance and direction from boundary to surface monitoring well: 0 S
Elevation (+0.01 ft. MSL):
Ground Surface: 636.2'
Top of protective casing: 638.93'
Top of well casing: 638.68'
Benchmark elevation: 653.26'
Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Cascade Drilling
Address: 301 Alderson St.
City, State, Zip Code: Schofield, WI. 54476
Name of driller: Paul Dickinson
Drilling method: Rotosonic
Drilling fluid: Water
Bore Hole diameter: 6"
Soil sampling method: Sample bag
Depth of boring: 50'

C. MONITORING WELL INSTALLATION

Casing material: Sch. 40 PVC
Length of casing: 52.45'
Outside casing diameter: 2.4"
Inside casing diameter: 2.04"
Casing joint type: Threaded
Casing/screen joint type: Threaded
Screen material: PVC
Screen opening size: 0.01'
Screen length: 5'
Depth of Well: 49'
Filter Pack:
- Material: Filter Sand
- Grain Size: #40 red flint, topped with #7
- Volume: 2 cu. ft.

Seal (minimum 3 ft. length above filter pack):
- Material: Bentonite Chips

Placement method: Poured
Volume: 2 cu. ft.
Backfill (if different from seal):
- Material: Bentonite grout
- Placement method: Pumped
- Volume: 60 gal.

Surface seal design: Protop
- Material of protective casing: Steel
- Material of grout between protective casing and well casing: Sand

Protective cap: 6" Royer cap
- Material: Aluminum
- Vented?: ☒ Y ☐ N
- Locking?: ☒ Y ☐ N

Well cap:
- Material: Plastic and rubber
- Vented?: ☐ Y ☒ N

D. GROUNDWATER MEASUREMENT (+0.01 foot below top of inner well casing)

Water level 15.88'
Stabilization time < 1 minute
Well development method Surged and pumped
Average depth of frost line 4 ft

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

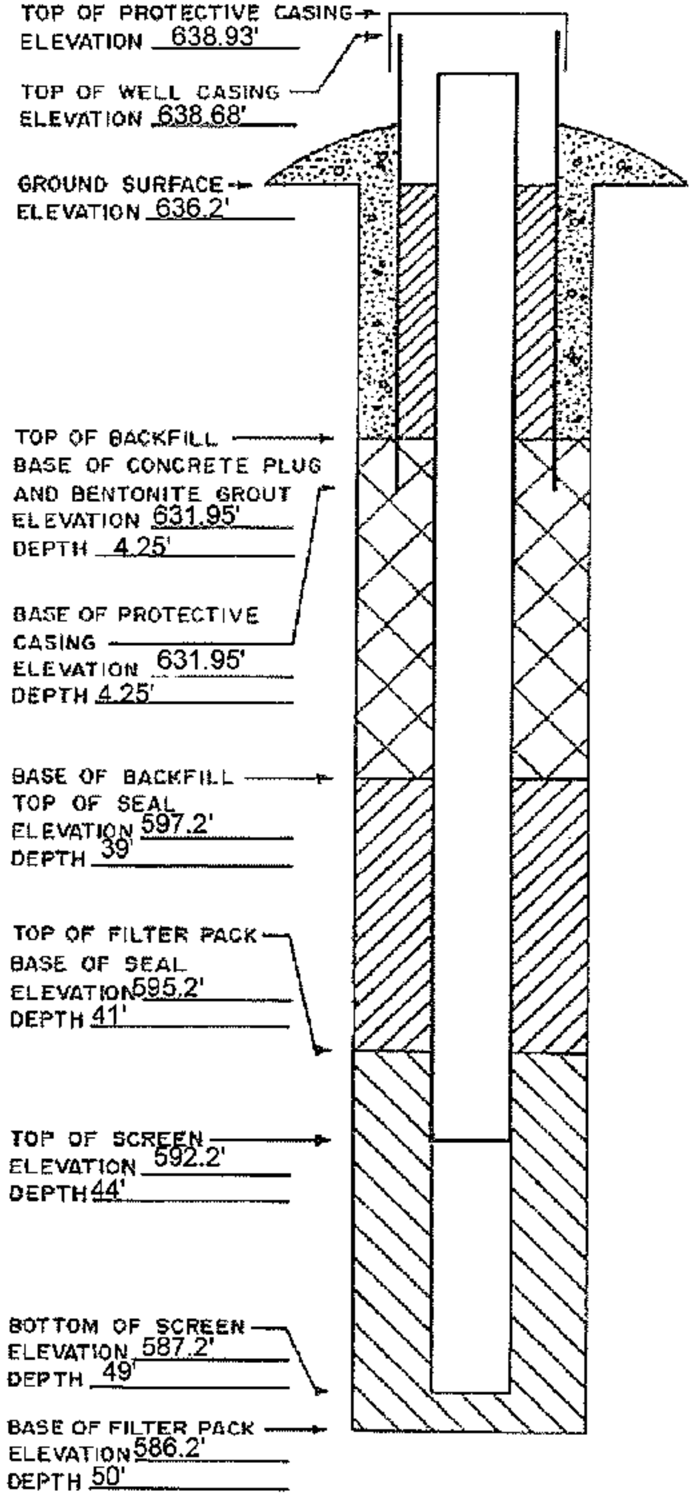
Signature [signature] **Certification #** 9361 **Date** 12-19-2019

Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL
DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



Print Form

IOWA DEPARTMENT OF NATURAL RESOURCES

MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL-Lansing Generating Station   Permit No.:

Well or Piezometer No: MW-303

Dates Started: 11/3/15   Date Completed: 11/4/15

A. SURVEYED LOCATIONS AND ELEVATIONS

Locations (± 0.5 ft):

Specify corner of site: NW

Distance & direction along boundary: 730' SE

Distance & direction from boundary to wall: 760' NE

Elevations (± 0.01 ft MSL):

Ground Surface: 653.85

Top of protective casing: 656.74

Top of well casing: 656.27

Benchmark elevation: 633.86, NAVD 1988 datum

Benchmark description: CP 300, iron rod in concrete

B. SOIL BORING INFORMATION

Name & Address of Construction Company:

Cascade Drilling
301 Alderson St
Schofield, WI 54476

Name of Driller: Mike Mueller

Drilling Method: HSA

Drilling Fluid: None

Bore Hole Diameter: 8"

Soil Sampling Method: Spoon

Depth of Boring: 27 feet

C. MONITORING WELL INSTALLATION

Casing material: PVC

Length of casing: 16

Outside casing diameter: 2.40"

Inside casing diameter: 2"

Casing joint type: threaded

Casing/screen joint type: threaded

Screen material: PVC

Screen opening size: .01"

Screen length: 10'

Depth of well: 26'

Filter Pack:

Material: Red Flint

Grain size: #40

Volume: 250 lbs

Seal (minimum 3 ft length above filter pack):

Material: 3/8" bentonite chips

Placement method: Gravity

Volume:

Backfill (if different from seal):

Material:

Placement method:

Volume:

Surface seal design:

Material of protective casing: Steel 6"

Material of grout between protective casing and well casing: sand

Protective cap:

Material: steel

Vented: ☒ Yes ☐ No   Locking: ☐ Yes ☐ No

Well Cap:

Material: PVC

Vented: ☐ Yes ☒ No

D. GROUNDWATER MEASURMENT (± 0.01 ft below top of inner well casing)

Water level: 16.35   Stabilization Time: < 1 hr.

Well development method: Surged and pumped to reduce turbidity

Average depth of frostline: 4'

Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)

TOP OF PROTECTIVE CASING
ELEVATION 656.74

TOP OF WELL CASING
ELEVATION 656.27

GROUND SURFACE
ELEVATION 653.85

TOP OF BACKFILL
BASE OF CONCRETE PLUG
AND BENTONITE GROUT
ELEVATION 648.85
DEPTH 5

BASE OF PROTECTIVE CASING
ELEVATION 651.74
DEPTH

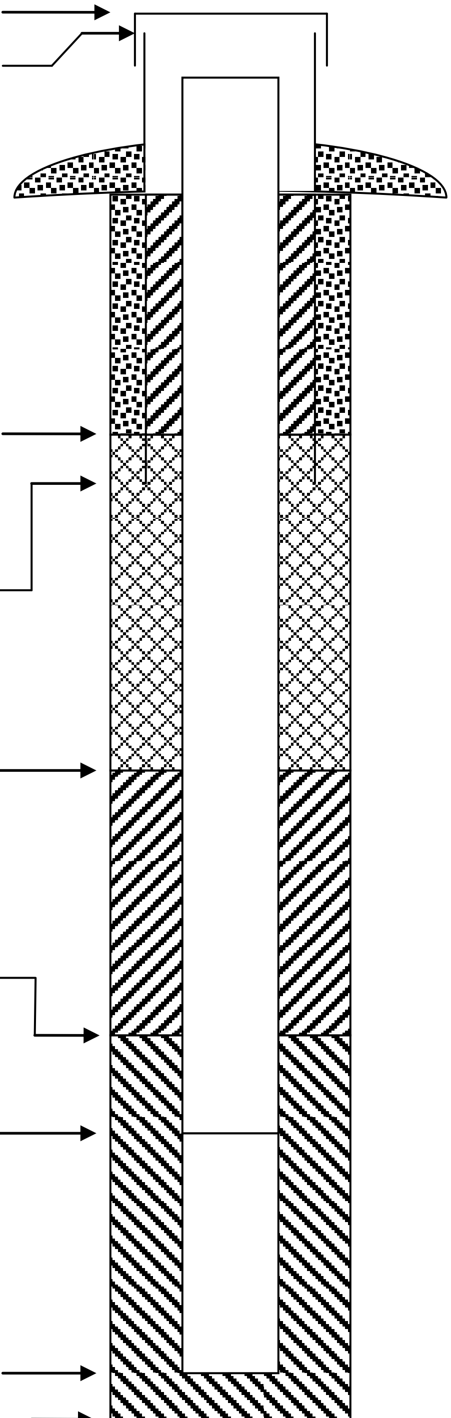
BASE OF BACKFILL
TOP OF SEAL
ELEVATION
DEPTH

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 639.35
DEPTH 14.5

TOP OF SCREEN
ELEVATION 637.85
DEPTH 16

BOTTOM OF SCREEN
ELEVATION 627.85
DEPTH 26

BASE OF FILTER PACK
ELEVATION 626.85
DEPTH 27



MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station
Permit No.:
Well or Piezometer No.: MW304
Dates Started: 5/15/2019
Date Completed: 5/15/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW
Distance and direction along boundary: 1,340 S
Distance and direction from boundary to surface monitoring well: 10 E
Elevation (+0.01 ft. MSL)
Ground Surface: 635.47
Top of protective casing: 636.68
Top of well casing: 636.43
Benchmark elevation: 653.26
Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Roberts Environmental Drilling Inc.
Address: 1107 South Mulberry Street
City, State, Zip Code: Millstadt, IL, 62260
Name of driller: Eric Wetzel
Drilling method: 4 1/4" HSA
Drilling fluid: None
Bore Hole diameter: 8.5"
Soil sampling method: Split Spoon
Depth of boring: 22'

C. MONITORING WELL INSTALLATION

Casing material: PVC
Length of casing: 20.26'
Outside casing diameter: 2.4"
Inside casing diameter: 2.0"
Casing joint type: Threaded
Casing/screen joint type: Threaded
Screen material: PVC
Screen opening size: 0.01'
Screen length: 10'
Depth of Well: 20'
Filter Pack:
Material: Filter Sand
Grain Size:
Volume: 19.4 cubic feet
Seal (minimum 3 ft. length above filter pack):
Material: Bentonite

Placement method: Gravity
Volume:
Backfill (If different from seal):
Material:
Placement method:
Volume:
Surface seal design: Concrete
Material of protective casing: Steel
Material of grout between protective casing and well casing: Bentonite chips
Protective cap:
Material: Steel
Vented?: ☒ Y ☐ N
Locking?: ☒ Y ☐ N
Well cap:
Material: Plastic
Vented?: ☒ Y ☐ N

D. GROUNDWATER MEASUREMENT (+0.01 foot below top of inner well casing)

Water level: 13.21'
Stabilization time: <1 hour
Well development method: Surged & pumped to reduce turbidity
Average depth of frost line: 4

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

Signature: [signature]
Certification #: 11509
Date: 8/8/2019

Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL

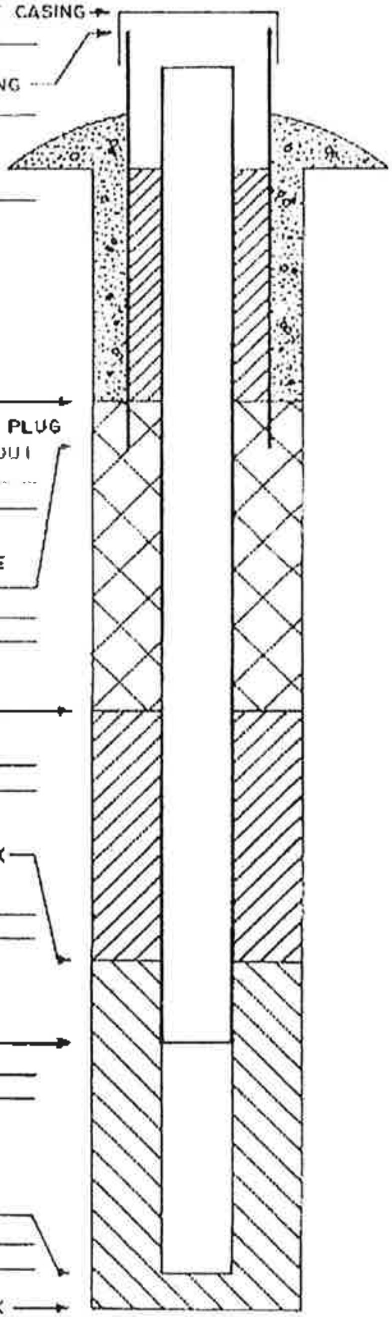
DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).

TOP OF PROTECTIVE CASING
ELEVATION 636.68

TOP OF WELL CASING
ELEVATION 636.43

GROUND SURFACE
ELEVATION 635.47



TOP OF BACKFILL
BASE OF CONCRETE PLUG AND BENTONITE GROUT
ELEVATION 631.5
DEPTH 4

BASE OF PROTECTIVE CASING
ELEVATION 630.4
DEPTH 5

BASE OF BACKFILL
TOP OF SEAL
ELEVATION N/A
DEPTH

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 626.5
DEPTH 9

TOP OF SCREEN
ELEVATION 625.5
DEPTH 10

BOTTOM OF SCREEN
ELEVATION 615.5
DEPTH 20

BASE OF FILTER PACK
ELEVATION 613.5
DEPTH 22

MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station   Permit No.:
Well or Piezometer No.: MW-304A   Dates Started: 12/18/2019   Date Completed: 12/19/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW   Distance and direction along boundary: 1340 S
Distance and direction from boundary to surface monitoring well: 10 E
Elevation (+0.01 ft. MSL):
Ground Surface: 635.6   Top of protective casing: 638.6
Top of well casing: 638.36   Benchmark elevation: 653.26
Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Cascade Drilling
Address: 301 Alderson St.   City, State, Zip Code: Schofield, WI. 54476
Name of driller: Paul Dickinson
Drilling method: Rotosonic   Drilling fluid: Water   Bore Hole diameter: 6"
Soil sampling method: Sample bag   Depth of boring: 51'

C. MONITORING WELL INSTALLATION

Casing material: Sch. 80 PVC
Length of casing: 52.45'
Outside casing diameter: 2.4"
Inside casing diameter: 1.939"
Casing joint type: Threaded
Casing/screen joint type: Threaded
Screen material: PVC
Screen opening size: 0.01'
Screen length: 5'
Depth of Well: 50'
Filter Pack:
Material: Filter Sand
Grain Size: #40 red flint, topped with #7
Volume: 1.5cu. ft.
Seal (minimum 3 ft. length above filter pack):
Material: Bentonite Chips

Placement method: Poured
Volume: 2 cu. ft.
Backfill (if different from seal):
Material: Bentonite grout
Placement method: Pumped
Volume: 60 gal.
Surface seal design: Protop
Material of protective casing: Steel
Material of grout between protective casing and well casing: Sand
Protective cap: 6" Royer cap
Material: Aluminum
Vented?: ☒ Y ☐ N   Locking?: ☒ Y ☐ N
Well cap:
Material: Plastic and rubber
Vented?: ☐ Y ☒ N

D. GROUNDWATER MEASUREMENT (±0.01 foot below top of inner well casing)

Water level 13.35'   **Stabilization time** >1hr
Well development method Surged and pumped
Average depth of frost line 4 ft

DRILLER'S CERTIFICATION
I certify under penalty of law I believe the information reported above is true, accurate, and complete.

Signature [signature]   **Certification #** 7361   **Date** 12-19-2019

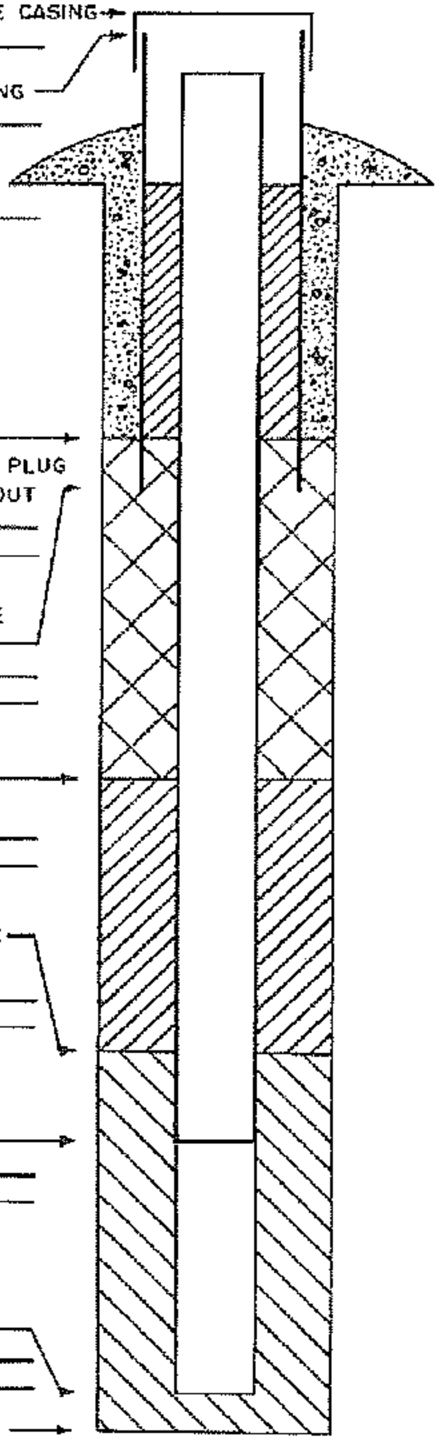
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL

DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



TOP OF PROTECTIVE CASING
ELEVATION 638.6'

TOP OF WELL CASING
ELEVATION 638.36'

GROUND SURFACE
ELEVATION 635.6'

TOP OF BACKFILL
BASE OF CONCRETE PLUG AND BENTONITE GROUT
ELEVATION 631.6'
DEPTH 4.05'

BASE OF PROTECTIVE CASING
ELEVATION 631.6'
DEPTH 4.05'

BASE OF BACKFILL
TOP OF SEAL
ELEVATION 596.1'
DEPTH 39.5'

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 593.6'
DEPTH 42'

TOP OF SCREEN
ELEVATION 590.6'
DEPTH 45'

BOTTOM OF SCREEN
ELEVATION 585.6'
DEPTH 50'

BASE OF FILTER PACK
ELEVATION 584.6'
DEPTH 51'

MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station Permit No.:

Well or Piezometer No.: MW305 Dates Started: 5/16/2019 Date Completed: 5/16/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW Distance and direction along boundary: 1,125 S

Distance and direction from boundary to surface monitoring well: 630 E

Elevation (+0.01 ft. MSL):

Ground Surface: 631.75 Top of protective casing: 634.32

Top of well casing: 633.87 Benchmark elevation: 653.26

Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Roberts Environmental Drilling Inc.

Address: 1107 South Mulberry Street City, State, Zip Code: Millstadt, IL, 62260

Name of driller: Eric Wetzel

Drilling method: 4 1/4" HSA Drilling fluid: Bore Hole diameter: 8.5"

Soil sampling method: Split Spoon Depth of boring: 16'

C. MONITORING WELL INSTALLATION

Casing material: PVC Placement method: Gravity

Length of casing: 5' Volume: 2.7 cubic ft

Outside casing diameter: 2.4" Backfill (if different from seal):

Inside casing diameter: 2.0" Material:

Casing joint type: Threaded Placement method:

Casing/screen joint type: Threaded Volume:

Screen material: PVC Surface seal design: Concrete

Screen opening size: 0.01' Material of protective casing: Steel

Material of grout between protective casing and well casing: Bentonite chips

Screen length: 10'

Depth of Well: 14.5' Protective cap:

Filter Pack: Material: steel

Material: Filter Sand Vented?: ☒ Y ☐ N Locking?: ☒ Y ☐ N

Grain Size: Well cap:

Volume: 23 bags Material: Plastic

Seal (minimum 3 ft. length above filter pack):   Vented?: ☒ Y ☐ N

Material: Bentonite

D. GROUNDWATER MEASUREMENT (+0.01 foot below top of inner well casing)

Water level 12.13' **Stabilization time** < 1 hr

Well development method Surged and pumped to remove turbidity

Average depth of frost line 4 ft

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

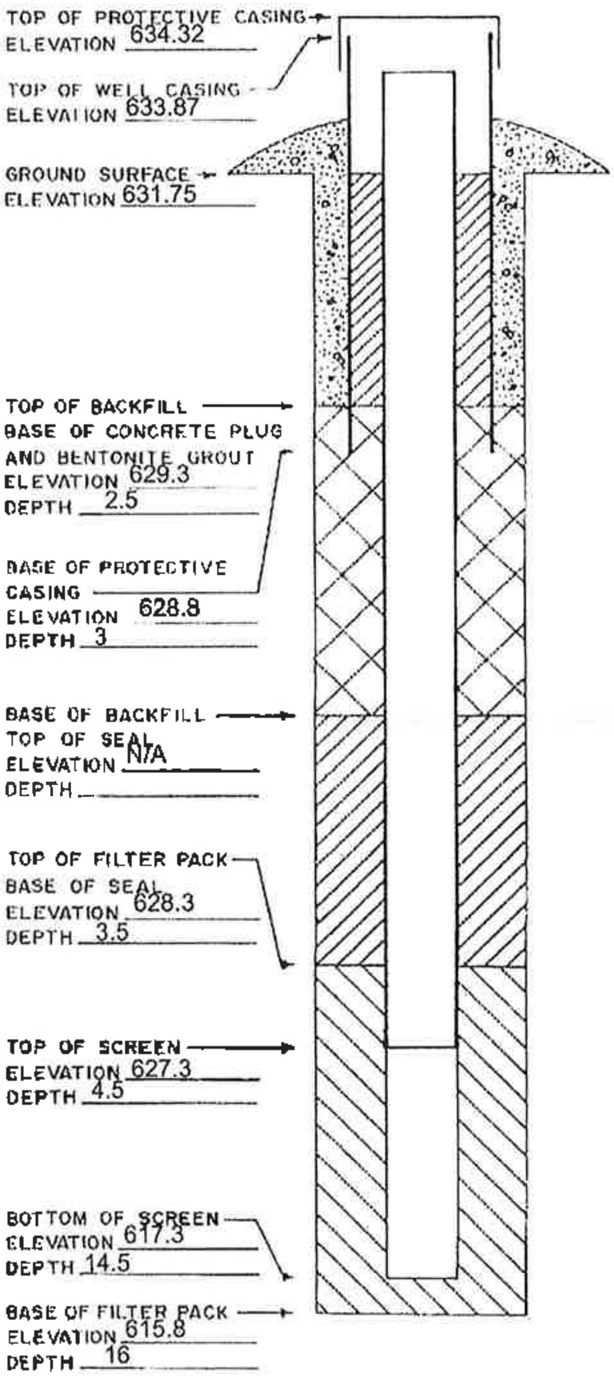
Signature [signature] **Certification #** 11509 **Date** 8/8/2019

Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL
DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station   Permit No.:

Well or Piezometer No.: MW306   Dates Started: 5/16/2019   Date Completed: 5/16/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW   Distance and direction along boundary: 420 SE

Distance and direction from boundary to surface monitoring well: 60 SW

Elevation (+0.01 ft. MSL):

Ground Surface: 636.74   Top of protective casing: 637.71

Top of well casing: 637.48   Benchmark elevation: 653.26

Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Roberts Environmental Drilling Inc.

Address: 1107 South Mulberry Street   City, State, Zip Code: Millstadt, IL, 62260

Name of driller: Eric Wetzel

Drilling method: 4 1/4" HSA   Drilling fluid: Bore Hole diameter: 8.5"

Soil sampling method: Split Spoon   Depth of boring: 26'

C. MONITORING WELL INSTALLATION

Casing material: PVC   Placement method: Gravity

Length of casing: 26'   Volume:

Outside casing diameter: 2.4"   Backfill (if different from seal):

Inside casing diameter: 2.0"   Material:

Casing joint type: Threaded   Placement method:

Casing/screen joint type: Threaded   Volume:

Screen material: PVC   Surface seal design: Concrete

Screen opening size: 0.01'   Material of protective casing: Steel

Screen length: 10'   Material of grout between protective casing and well casing: Bentonite chips

Depth of Well: 25'   Protective cap:

Filter Pack: Material: Steel

Material: Filter Sand   Vented?: ☒ Y ☐ N   Locking?: ☒ Y ☐ N

Grain Size: Well cap:

Volume: 37 cubic feet   Material: Plastic

Seal (minimum 3 ft. length above filter pack):   Vented?: ☒ Y ☐ N

Material: Bentonite

D. GROUNDWATER MEASUREMENT (+0.01 foot below top of inner well casing)

Water level: 13.11'   **Stabilization time**: <1 hr

Well development method: Surged and pumped to reduce turbidity

Average depth of frost line: 4 ft

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

Signature: [signature]   **Certification #**: 11509   **Date**: 8/8/2019

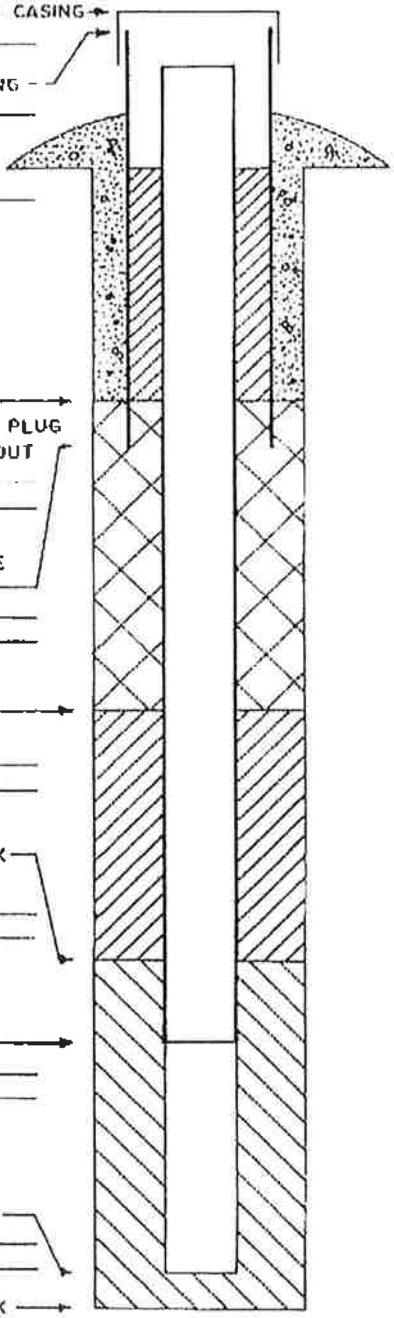
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

09/2017 cmc   DNR Form 542-1277

ELEVATIONS: ± 0.01 FT. MSL
DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



TOP OF PROTECTIVE CASING
ELEVATION 637.71

TOP OF WELL CASING
ELEVATION 637.48

GROUND SURFACE
ELEVATION 636.74

TOP OF BACKFILL
BASE OF CONCRETE PLUG AND BENTONITE GROUT
ELEVATION 632.7
DEPTH 4

BASE OF PROTECTIVE CASING
ELEVATION 632.7
DEPTH 4

BASE OF BACKFILL
TOP OF SEAL
ELEVATION
DEPTH N/A

TOP OF FILTER PACK
BASE OF SEAL
ELEVATION 622.7
DEPTH 14

TOP OF SCREEN
ELEVATION 621.7
DEPTH 15

BOTTOM OF SCREEN
ELEVATION 611.7
DEPTH 25

BASE OF FILTER PACK
ELEVATION 610.7
DEPTH 26

MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Lansing Generating Station
Permit No.:
Well or Piezometer No.: MW-306A
Dates Started: 5/17/2019
Date Completed: 12/19/2019

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: NW
Distance and direction along boundary: 420 SE
Distance and direction from boundary to surface monitoring well: 60 SW
Elevation (+0.01 ft. MSL):
Ground Surface: 636.7
Top of protective casing: 639.56
Top of well casing: 639.33
Benchmark elevation: 653.26
Benchmark description: Brass cap in PCC walkway to weir structure on north side of entrance road

B. SOIL BORING INFORMATION

Construction Company Name: Cascade Drilling
Address: 301 Alderson St.
City, State, Zip Code: Schofield, WI. 54476
Name of driller: Paul Dickinson
Drilling method: Rotosonic
Drilling fluid: Water
Bore Hole diameter: 6"
Soil sampling method: Sample bag
Depth of boring: 56'

C. MONITORING WELL INSTALLATION

Casing material: Sch. 80 PVC
Length of casing: 58.06'
Outside casing diameter: 2.4"
Inside casing diameter: 1.939"
Casing joint type: Threaded
Casing/screen joint type: Threaded
Screen material: PVC
Screen opening size: 0.01'
Screen length: 5'
Depth of Well: 55'
Filter Pack:
Material: Filter Sand
Grain Size: #40 red flint, topped with #7
Volume: 1.5cu. ft.
Seal (minimum 3 ft. length above filter pack):
Material: Bentonite Chips

Placement method: Poured
Volume: 2 cu. ft.
Backfill (if different from seal):
Material: Bentonite grout
Placement method: Pumped
Volume: 60 gal.
Surface seal design: Protop
Material of protective casing: Steel
Material of grout between protective casing and well casing: Sand
Protective cap: 6" Royer cap
Material: Aluminum
Vented?: ☒ Y ☐ N
Locking?: ☒ Y ☐ N
Well cap:
Material: Plastic and rubber
Vented?: ☐ Y ☒ N

D. GROUNDWATER MEASUREMENT (+0.01 foot below top of inner well casing)

Water level 19.56'
Stabilization time < 1 minute
Well development method Surged and pumped
Average depth of frost line 4 ft

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

Signature [signature] **Certification #** 9361 **Date** 12-19-2019

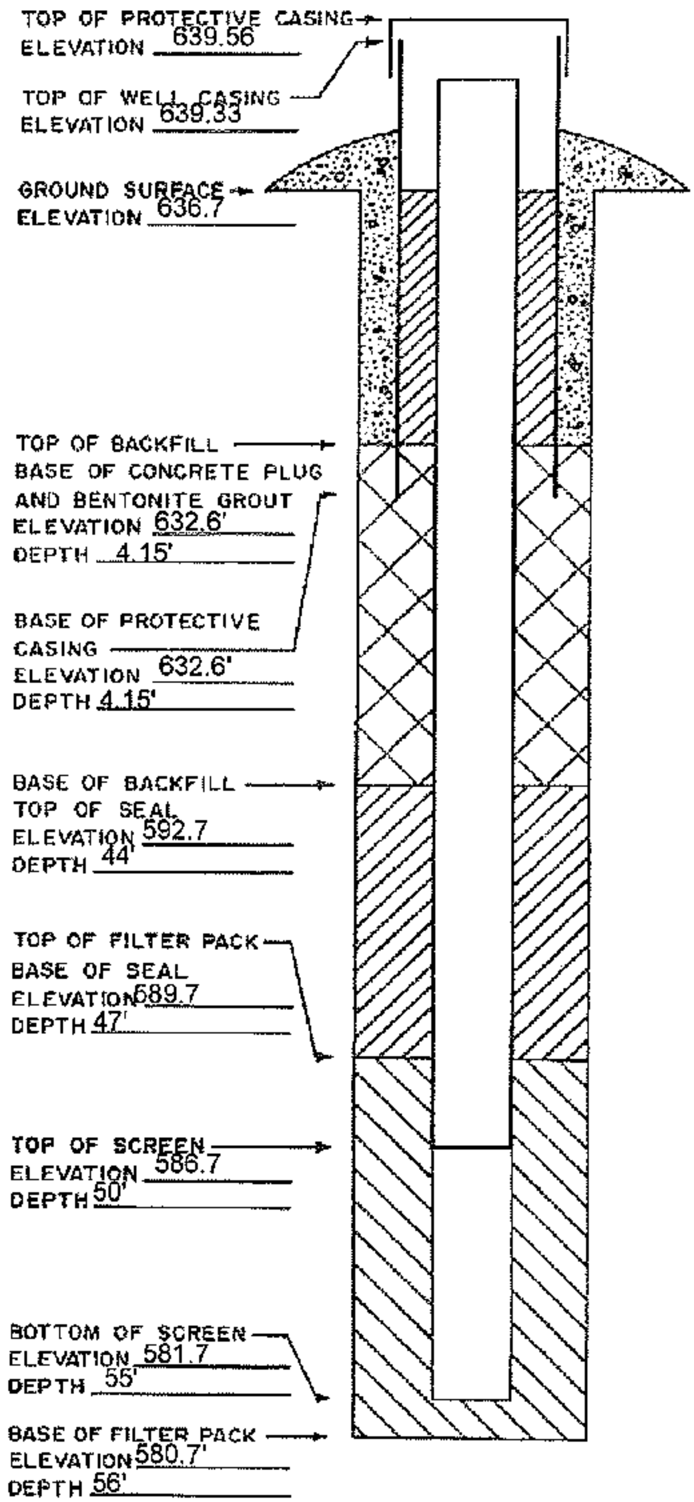
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-725-8309, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL

DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



B2 Groundwater Monitoring Results

Single Location

Name: IPL - Lansing

Location ID: MW-6
Number of Sampling Dates: 17

Parameter Name	Units	12/10/2015	4/29/2016	7/20/2016	10/27/2016	1/18/2017	4/19/2017	6/19/2017	8/15/2017	10/16/2017	4/16/2018	4/26/2018	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/20/2020	8/19/2020
Boron	ug/L	25.7	<50	<50	<50	<50	31.9	42.1	40	41.2	--	29.8	42.9	40.2	<110	<110	<73	--
Calcium	mg/L	64	72.6	68.9	68.6	68.6	67.8	64.6	68.2	66.9	--	72.7	66.5	69.6	67	70	72	76
Chloride	mg/L	7.5	7.6	8.1	6.8	6.5	6.3	6.2	6.5	6.5	--	6.5	7.3	6.6	6.7	6.9	7.7	6.8
Fluoride	mg/L	0.094	0.15	0.082	0.12	0.092	<0.1	0.1	0.12	0.14	--	0.084	0.12	<0.19	0.63	<0.23	<0.23	--
pH at 25 Degrees C	Std. Units	8	7.7	7.4	7.7	8.1	7.8	7.2	7.5	7.5	--	7.7	7.5	7.4	7.5	7.5	7.5	--
Field pH	Std. Units	7.44	7.64	7.25	7.56	7.62	7.48	7.4	7.48	7.03	--	7.34	7.18	7.06	7.59	7.46	7.34	7.98
Sulfate	mg/L	23	22.2	22.5	25.2	24.8	25.5	27.4	26.9	25.8	--	26.4	24.8	25.5	26	24	27	25
Total Dissolved Solids	mg/L	382	328	352	337	324	350	337	333	318	--	343	351	319	340	280	580	--
Antimony	ug/L	0.18	<0.058	<0.058	<0.058	<0.058	<0.026	0.027	0.037	--	--	<0.026	<0.15	<0.078	<0.53	--	<0.58	--
Arsenic	ug/L	<4.5	0.28	0.26	0.19	0.23	0.28	0.18	0.28	--	--	0.23	0.26	0.24	<0.75	<0.75	<0.88	--
Barium	ug/L	45.5	45.6	43.8	44.6	46.5	45.4	41.9	44	--	--	44.1	43.1	43	43	46	46	--
Beryllium	ug/L	<0.17	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	--	<0.012	<0.12	<0.089	<0.27	--	<0.27	--
Cadmium	ug/L	<0.56	<0.029	<0.029	<0.029	<0.029	<0.018	<0.018	<0.018	--	--	<0.018	--	<0.033	<0.077	--	<0.039	--
Chromium	ug/L	<0.96	0.82	0.81	0.81	1.1	0.76	0.68	0.71	--	--	0.66	0.97	0.73	<0.98	<0.98	<1.1	--
Cobalt	ug/L	<0.1	<0.5	<0.5	<0.5	<0.5	0.034	0.021	<0.014	--	--	<0.014	<0.15	<0.062	<0.091	<0.091	<0.091	--
Lead	ug/L	<1.9	<0.19	<0.19	<0.19	<0.19	0.13	<0.033	0.065	--	--	<0.033	<0.12	<0.13	<0.27	<0.27	<0.27	--
Lithium	ug/L	<2.5	<4.9	<4.9	<4.9	<4.9	<2.9	<2.9	3	--	--	<4.6	--	<4.6	<2.7	<2.7	<2.3	--
Mercury	ug/L	<0.012	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	<0.09	<0.09	<0.09	<0.1	--	<0.1	--
Molybdenum	ug/L	<1.5	0.25	0.24	0.31	0.21	0.25	0.26	0.31	--	--	0.26	0.28	<0.57	<1.1	<1.1	<1.1	<1.1
Selenium	ug/L	<5.8	0.57	0.46	0.54	0.36	0.5	0.36	0.52	--	--	0.47	0.5	0.46	<1	--	<1	--
Thallium	ug/L	0.18	<0.5	<0.5	<0.5	<0.5	0.11	<0.036	0.29	--	--	<0.036	--	<0.099	<0.27	--	<0.26	--
Radium-226	pCi/L	0.599	0.232	0.0668	0.126	0	-0.07	0.457	0.633	--	0	--	0.547	0.705	--	0.237	0.151	--
Radium-228	pCi/L	0.913	0.226	0.657	0.474	0.397	0.0972	0.606	0.193	--	1.35	--	0.427	0.668	--	0.259	0.354	--
Total Radium	pCi/L	1.51	0.458	0.724	0.6	0.397	0.0972	1.06	0.826	--	1.35	--	0.974	1.37	--	0.495	0.504	--
Field Oxidation Potential	mV	166.8	243.7	45.8	122	163	321	251	142	282	--	34.6	233	119	274	88.9	119.6	113.9
Field Specific Conductance	umhos/cm	606.4	596.2	582.4	590	589	589	580	588	591	--	569.1	609	587	618	590	597	597
Field Temperature	deg C	9.6	9.7	9.9	10	8	10.3	11.2	11.4	10.2	--	11.1	10.5	11.5	10	10	10	9.8
Groundwater Elevation	feet	662.28	662.08	663.21	670.82	666.28	669.82	670.65	670.61	669.58	--	667.96	668.13	664.71	672.78	675.54	674.47	674.64
Oxygen, Dissolved	mg/L	9.44	7.7	4.98	8.6	9.8	7.1	3.7	5.8	8.8	--	3.46	7.4	9.1	8.7	10.29	9.2	9.45
Turbidity	NTU	--	0.41	0.01	2.1	0	1.71	1.35	0	0	--	0.81	1.77	0.01	0.75	0.7	0.01	0
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<3.8
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.05
Magnesium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	38
Manganese, total	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.004
Potassium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2
Sodium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5

Single Location

Name: IPL - Lansing

Location ID: MW-301
Number of Sampling Dates: 17

Parameter Name	Units	12/10/2015	4/29/2016	7/20/2016	10/26/2016	1/17/2017	4/19/2017	6/19/2017	8/15/2017	10/16/2017	4/16/2018	6/4/2018	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/18/2020
Boron	ug/L	739	436	417	554	471	405	333	365	436	198	--	279	357	250	360	150	--
Calcium	mg/L	41	39.1	45.1	55.5	56.4	61.7	59.5	66.4	65.9	64.5	--	65.1	72.5	73	68	56	65
Chloride	mg/L	25.5	18.5	18.2	15.8	16	18.3	18	16.2	17.3	20.2	--	17.7	15.9	17	14	17	15
Fluoride	mg/L	0.3	0.32	0.25	0.26	0.21	0.19	0.23	0.26	0.24	0.24	--	0.23	0.27	0.9	0.23	0.56	--
pH at 25 Degrees C	Std. Units	7.8	8	7.8	7.8	7.8	7.8	7.7	8.1	7.9	8	--	8.1	8	7.9	8.1	8.1	--
Field pH	Std. Units	7.96	8.23	7.86	8.1	8.37	8.5	8.25	8.19	7.66	8.39	8.1	8.08	8.16	8.47	8.11	7.85	8.33
Sulfate	mg/L	62.2	38.8	37.5	45.7	55.6	48.7	44.7	49.4	52.7	49.3	--	53.2	64.4	51	56	34	44
Total Dissolved Solids	mg/L	280	176	218	246	271	289	278	285	289	--	300	326	320	350	310	480	--
Antimony	ug/L	0.078	0.086	<0.058	<0.058	0.088	<0.026	0.08	0.079	--	0.071	--	0.16	0.085	<0.53	--	<0.58	--
Arsenic	ug/L	<4.5	2.3	2.8	3.5	3.8	3.1	3	3.8	--	3.9	--	4.4	5.4	5.4	5.6	3.8	--
Barium	ug/L	146	139	182	220	227	182	175	196	--	163	--	156	155	160	180	140	--
Beryllium	ug/L	<0.17	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	<0.012	--	<0.12	<0.089	<0.27	--	<0.27	--
Cadmium	ug/L	<0.56	<0.029	<0.029	<0.029	<0.029	0.021	<0.018	<0.018	--	<0.018	--	--	<0.033	<0.077	--	<0.039	--
Chromium	ug/L	<0.96	<0.34	<0.34	0.35	0.49	0.97	0.21	0.23	--	1.1	--	<0.19	0.09	<0.98	<0.98	<1.1	--
Cobalt	ug/L	0.13	<0.5	<0.5	<0.5	<0.5	0.098	0.074	0.07	--	0.086	--	0.16	0.11	0.11	0.11	0.11	--
Lead	ug/L	<1.9	<0.19	0.23	<0.19	0.23	0.36	0.041	<0.033	--	0.037	--	<0.12	<0.13	<0.27	<0.27	<0.27	--
Lithium	ug/L	5	5.3	5	6.4	<4.9	<2.9	4.2	7.3	--	<4.6	--	--	9.1	8.7	8	7	--
Mercury	ug/L	<0.012	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	0.31	--	<0.09	<0.09	<0.1	--	<0.1	--
Molybdenum	ug/L	2.5	5.5	5	8.1	9.3	6.9	5.5	6.8	--	4.4	--	5.6	10.3	11	10	8.1	5.8
Selenium	ug/L	<5.8	<0.18	<0.18	<0.18	<0.18	0.12	0.1	0.13	--	<0.086	--	0.22	0.18	<1	--	<1	--
Thallium	ug/L	0.064	<0.5	<0.5	<0.5	<0.5	0.14	0.05	0.31	--	<0.036	--	--	<0.099	<0.27	--	<0.26	--
Radium-226	pCi/L	0.349	0.111	0.126	0.236	0.334	0.374	0.0591	1.03	--	0	--	0.692	0.115	--	0.372	0.0998	--
Radium-228	pCi/L	0.087	0.414	-0.0306	0.791	0.313	0.378	0.394	0.826	--	0.689	--	0.972	0.441	--	0.116	0.1	--
Total Radium	pCi/L	0.436	0.525	0.126	1.03	0.647	0.752	0.453	1.86	--	0.689	--	1.66	0.556	--	0.488	0.2	--
Field Oxidation Potential	mV	-94.9	-134.2	-166.3	-156	-98	-181	-230	-178	-221	-40	-145.5	-149	-180	-171	-156.8	-77.6	-115.3
Field Specific Conductance	umhos/cm	431.4	355.2	377.4	456	491	471	468	498	497	505	507	524	545	539	501.8	474	476
Field Temperature	deg C	13.6	8.9	13.3	15.4	12.3	10.6	12.2	14.7	17	9.5	12.2	14.6	17.4	11.3	15.6	11.3	15
Groundwater Elevation	feet	623.54	622.19	624.76	624.97	624.09	624.7	624.89	624.09	625.7	624.29	624.62	624.51	625.73	629.19	626.54	624.46	625.02
Oxygen, Dissolved	mg/L	1.08	0.34	0.16	0	1.6	0.3	0	0	0	1	0.89	0.2	0.3	0.2	0.13	0.75	0.16
Turbidity	NTU	--	1.9	2	6.79	4.27	3.04	0.2	4.87	0.05	8.31	2.72	5.5	9.19	9.33	1.36	1.39	1.65
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<3.8
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.68
Magnesium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19
Manganese, total	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.8
Potassium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.2
Sodium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13

Single Location

Name: IPL - Lansing

Location ID: MW-302
Number of Sampling Dates: 17

Parameter Name	Units	12/10/2015	4/29/2016	7/20/2016	10/26/2016	1/17/2017	4/19/2017	6/19/2017	8/15/2017	10/16/2017	4/16/2018	6/4/2018	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/20/2020	8/19/2020
Boron	ug/L	564	468	579	673	576	527	558	645	708	489	--	648	694	690	690	480	--
Calcium	mg/L	95.1	96.5	97.8	110	116	112	110	118	116	120	--	116	122	130	130	120	130
Chloride	mg/L	17	14.9	15.1	15.5	15.7	12.9	14.4	15	13.9	13	--	13.9	13.5	13	12	14	12
Fluoride	mg/L	0.26	0.28	0.22	0.26	0.21	0.22	0.25	0.25	0.28	0.24	--	0.23	0.27	0.79	0.24	0.25	0.27
pH at 25 Degrees C	Std. Units	7.3	7.2	7	7	6.9	7.2	7.2	7	7	7.3	--	7	6.9	7	7	7	--
Field pH	Std. Units	7.15	7.41	6.86	7.12	7.25	7.25	7.03	6.96	7.1	7.26	6.97	6.92	6.93	7.66	7.15	6.93	7.18
Sulfate	mg/L	9.8	0.72	0.29	0.32	<0.15	<0.5	<0.5	<0.5	<0.5	<0.24	--	<0.24	<0.24	<1.8	<1.8	<3.6	<3.6
Total Dissolved Solids	mg/L	503	422	438	499	497	503	512	517	507	--	535	562	518	450	480	710	--
Antimony	ug/L	0.091	<0.058	<0.058	<0.058	0.14	<0.026	0.048	0.069	--	0.035	--	<0.15	<0.078	<0.53	--	<0.58	--
Arsenic	ug/L	33.9	30.4	41	50.2	45	31.7	36.7	47.3	--	30.8	--	47.6	50.4	37	53	33	--
Barium	ug/L	483	479	540	648	706	559	597	660	--	789	--	661	603	690	740	610	--
Beryllium	ug/L	<0.17	<0.08	<0.08	<0.08	0.1	0.016	<0.012	0.012	--	<0.012	--	<0.12	<0.089	<0.27	--	<0.27	--
Cadmium	ug/L	<0.56	<0.029	<0.029	<0.029	0.074	<0.018	<0.018	<0.018	--	<0.018	--	--	<0.033	<0.077	--	<0.039	--
Chromium	ug/L	<0.96	0.56	0.39	0.56	3.5	1	0.51	0.44	--	0.35	--	0.49	0.39	<0.98	<0.98	<1.1	--
Cobalt	ug/L	1.6	1.1	1.2	1.1	3.2	1.1	1.2	1.2	--	1.1	--	1.1	1.1	1.5	1.3	1	--
Lead	ug/L	<1.9	<0.19	0.32	<0.19	3.3	0.36	0.14	0.075	--	0.084	--	0.23	<0.13	<0.27	<0.27	<0.27	--
Lithium	ug/L	<2.5	<4.9	<4.9	<4.9	<4.9	<2.9	<2.9	<2.9	--	<4.6	--	--	<4.6	<2.7	<2.7	<2.3	--
Mercury	ug/L	<0.012	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	0.35	--	<0.09	<0.09	<0.1	--	<0.1	--
Molybdenum	ug/L	<1.5	0.81	0.98	1.2	1.1	0.87	0.91	1.2	--	0.91	--	1.2	1.5	<1.1	1.4	<1.1	<1.1
Selenium	ug/L	<5.8	0.2	0.22	0.28	0.36	0.25	0.19	0.31	--	<0.086	--	0.3	0.26	<1	--	<1	--
Thallium	ug/L	0.25	<0.5	<0.5	<0.5	<0.5	0.042	<0.036	0.14	--	<0.036	--	--	<0.099	<0.27	--	<0.26	--
Radium-226	pCi/L	0.415	0.985	0.969	0.539	0.514	0.672	1.36	0.619	--	0.776	--	1.23	1.67	--	0.807	0.658	--
Radium-228	pCi/L	1.04	1.15	1.1	1.19	0.978	0.576	1.39	1.06	--	1.18	--	0.858	1.85	--	0.675	0.88	--
Total Radium	pCi/L	1.46	2.14	2.07	1.73	1.49	1.25	2.75	1.68	--	1.96	--	2.09	3.52	--	1.48	1.54	--
Field Oxidation Potential	mV	-150.3	-163.3	-141.5	-171	-154	-172	-189	-181	-179	-152	-179.3	-164	-43.9	-159	-160	-161.5	-173
Field Specific Conductance	umhos/cm	918	875	891	1004	1036	971	1017	1053	1045	1098	1068	1095	1039	1089	1049	1070	1039
Field Temperature	deg C	12.7	7.8	14.2	15.6	9.3	7.6	11.4	15.7	16.2	6	10.8	15.3	16.99	7.1	15.9	8.7	16.2
Groundwater Elevation	feet	627.88	626.93	628.6	628.35	627.32	628.98	627.75	627.28	628.75	628.98	628.27	627.62	628.59	629.99	630.04	627.68	627.53
Oxygen, Dissolved	mg/L	0.08	0.1	0.03	0	0.2	0	0	0	0	0.8	0.12	0.1	0.48	0.2	0.11	0.19	0.05
Turbidity	NTU	--	4.98	2.6	11.14	93.1	3.36	4.61	4.28	3.96	5.25	1.46	11.23	5.92	18.39	4.71	4.16	4
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	530
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	530
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<7.6
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	33
Magnesium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43
Manganese, total	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.8
Potassium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.7
Sodium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17

Single Location

Name: IPL - Lansing

Location ID: MW-302A
Number of Sampling Dates: 3

Parameter Name	Units	5/20/2020	7/6/2020	8/19/2020
Boron	ug/L	190	250	--
Calcium	mg/L	79	78	81
Chloride	mg/L	7.8	6.9	7.1
Fluoride	mg/L	<0.23	<0.23	--
pH at 25 Degrees C	Std. Units	7.4	7.6	--
Field pH	Std. Units	7.27	7.22	7.41
Sulfate	mg/L	53	47	49
Total Dissolved Solids	mg/L	520	350	--
Antimony	ug/L	<0.58	<0.51	--
Arsenic	ug/L	<0.88	<0.88	--
Barium	ug/L	51	47	--
Beryllium	ug/L	<0.27	<0.27	--
Cadmium	ug/L	<0.039	<0.049	--
Chromium	ug/L	<1.1	<1.1	--
Cobalt	ug/L	0.41	0.098	--
Lead	ug/L	0.48	0.14	--
Lithium	ug/L	<2.3	<2.5	--
Mercury	ug/L	<0.1	<0.1	--

Location ID: MW-302A
Number of Sampling Dates: 3

Parameter Name	Units	5/20/2020	7/6/2020	8/19/2020
Molybdenum	ug/L	<1.1	<1.1	<1.1
Selenium	ug/L	1.3	1.1	--
Thallium	ug/L	<0.26	<0.26	--
Radium-226	pCi/L	0.0441	0.0963	--
Radium-228	pCi/L	0.196	-0.00723	--
Total Radium	pCi/L	0.24	0.0963	--
Field Oxidation Potential	mV	126.9	47	74.1
Field Specific Conductance	umhos/cm	644	641	638
Field Temperature	deg C	11.7	11.7	11.8
Groundwater Elevation	feet	623.19	624.2	623.52
Oxygen, Dissolved	mg/L	6.55	6.6	6.23
Turbidity	NTU	11.9	4.68	0.19
Total Alkalinity as CaCO3	mg/L	--	--	290
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	290
Carbonate Alkalinity as CaCO3	mg/L	--	--	<3.8
Iron	mg/L	--	--	0.23
Magnesium	mg/L	--	--	39
Manganese, total	mg/L	--	--	0.019
Potassium	mg/L	--	--	1.2
Sodium	mg/L	--	--	7.5

Single Location

Name: IPL - Lansing

Location ID: MW-303
Number of Sampling Dates: 17

Parameter Name	Units	12/10/2015	4/29/2016	7/20/2016	10/26/2016	1/17/2017	4/19/2017	6/20/2017	8/15/2017	10/16/2017	4/16/2018	6/4/2018	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/18/2020
Boron	ug/L	178	178	405	235	133	177	390	386	592	144	--	675	474	150	520	150	--
Calcium	mg/L	38.2	48.6	64.5	67.1	72.5	60.1	62.2	42	84.7	54.6	--	46	35.3	49	46	54	58
Chloride	mg/L	18.7	16.8	18.1	17.7	21.9	16.1	17.3	18.4	17.2	24.1	--	14.6	16.3	18	16	15	16
Fluoride	mg/L	0.43	0.32	0.37	0.31	0.22	0.24	0.36	0.48	0.25	0.32	--	0.47	0.72	1	0.42	0.38	--
pH at 25 Degrees C	Std. Units	8	8	7.6	7.8	7.7	8.1	7.7	7.9	7.4	8	--	8	7.9	8	8	7.9	--
Field pH	Std. Units	8.03	8.07	7.12	7.93	8.16	8.19	7.93	7.78	7.2	8	7.59	7.66	7.91	7.95	7.83	7.67	7.65
Sulfate	mg/L	30.8	35.8	56	62.2	67.9	43.7	71.9	43.4	69.9	43.5	--	52.5	29.1	35	39	42	33
Total Dissolved Solids	mg/L	240	200	317	340	350	317	346	219	379	--	256	262	181	280	210	450	--
Antimony	ug/L	0.22	0.27	0.55	0.25	0.19	0.26	0.34	0.26	--	0.16	--	0.34	0.19	<0.53	--	<0.58	--
Arsenic	ug/L	<4.5	1.4	1.4	1.8	1.8	2.4	2.5	2.5	--	1.2	--	2.3	2.3	1.4	2.5	1.4	--
Barium	ug/L	102	122	178	169	174	159	214	147	--	173	--	194	121	160	220	210	--
Beryllium	ug/L	<0.17	<0.08	<0.08	<0.08	<0.08	<0.012	<0.012	<0.012	--	0.046	--	<0.12	<0.089	<0.27	--	<0.27	--
Cadmium	ug/L	<0.56	<0.029	<0.029	<0.029	0.042	0.018	<0.018	<0.018	--	<0.018	--	--	<0.033	<0.077	--	<0.039	--
Chromium	ug/L	<0.96	0.52	<0.34	<0.34	0.81	0.71	0.36	0.36	--	0.51	--	0.44	0.089	<0.98	<0.98	<1.1	--
Cobalt	ug/L	0.14	<0.5	<0.5	<0.5	<0.5	0.09	0.22	0.14	--	0.14	--	0.36	0.21	<0.091	0.12	<0.091	--
Lead	ug/L	<1.9	<0.19	0.2	<0.19	0.24	0.078	0.085	<0.033	--	<0.033	--	0.24	<0.13	<0.27	<0.27	<0.27	--
Lithium	ug/L	5.1	6.2	13.9	10.4	5.9	4.7	10.4	16.1	--	<4.6	--	--	8.1	3.3	9.1	4.2	--
Mercury	ug/L	<0.012	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	<0.09	--	<0.09	<0.09	<0.1	--	<0.1	--
Molybdenum	ug/L	<1.5	5	16.8	16.1	10.7	7.6	15.9	11.8	--	7.3	--	21.6	12	6.2	9.8	3.1	23
Selenium	ug/L	<5.8	1.2	0.9	0.6	1.9	0.63	0.67	0.59	--	3.3	--	0.38	0.39	<1	--	1.4	--
Thallium	ug/L	0.14	<0.5	<0.5	<0.5	<0.5	<0.036	<0.036	0.17	--	<0.036	--	--	<0.099	<0.27	--	<0.26	--
Radium-226	pCi/L	-0.132	0.18	0.372	0.653	-0.077	0.339	0.217	0.155	--	0.359	--	0.929	0.664	--	0.444	0.0369	--
Radium-228	pCi/L	0.926	0.555	0.396	0.582	0.416	-0.167	0.422	0.322	--	0.428	--	-0.073	1.21	--	0.0185	0.0937	--
Total Radium	pCi/L	0.926	0.73	0.768	1.24	0.416	0.339	0.639	0.477	--	0.787	--	0.929	1.87	--	0.463	0.131	--
Field Oxidation Potential	mV	84.2	133.2	-27.2	10	221	81	9	-75	49	53	68	-71	139	-76	156	28.9	25.8
Field Specific Conductance	umhos/cm	375.2	409	535	776	614	520	567	423	687	552	431	425	328	448	409	464	468
Field Temperature	deg C	8.5	6.7	30.4	22.1	6.3	10.5	24.8	31.7	25.2	4.1	17	31.5	28.5	4.2	25.2	6.3	30.4
Groundwater Elevation	feet	638.79	638.07	639.33	638.65	638.1	639.2	638.77	637.86	638.79	638.62	638.81	637.85	637.32	638.22	638.03	637.98	638.22
Oxygen, Dissolved	mg/L	2.38	2.63	0.15	8.1	3	1.4	0	0	1.9	3.5	0.36	0.4	0.4	1.4	0.27	1.29	0.15
Turbidity	NTU	--	2.13	0.39	3.02	2.53	0	0	0	0	0.4	1.08	4.51	2.62	6.6	0.58	0	1.62
Total Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	190
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	190
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<3.8
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.05
Magnesium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19
Manganese, total	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.12
Potassium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.6
Sodium	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13

Single Location

Name: IPL - Lansing

Location ID: MW-304
Number of Sampling Dates: 4

Parameter Name	Units	6/20/2019	10/2/2019	5/20/2020	8/19/2020
Boron	ug/L	<110	<110	<73	--
Calcium	mg/L	82	72	70	77
Chloride	mg/L	5.9	7	6.2	7.7
Fluoride	mg/L	<0.23	<0.23	<0.23	--
pH at 25 Degrees C	Std. Units	7.4	7	7.3	--
Field pH	Std. Units	7.01	7.16	7.32	7.55
Sulfate	mg/L	20	17	17	15
Total Dissolved Solids	mg/L	350	300	470	--
Antimony	ug/L	<0.53	--	<0.58	--
Arsenic	ug/L	<0.75	<0.75	<0.88	--
Barium	ug/L	54	47	42	--
Beryllium	ug/L	<0.27	--	<0.27	--
Cadmium	ug/L	<0.077	--	<0.039	--
Chromium	ug/L	1.6	1	8.2	--
Cobalt	ug/L	1.1	0.19	0.22	--
Lead	ug/L	1.2	0.35	<0.27	--
Lithium	ug/L	<2.7	<2.7	<2.3	--
Mercury	ug/L	<0.1	--	<0.1	--
Molybdenum	ug/L	<1.1	<1.1	<1.1	1.2
Selenium	ug/L	<1	--	<1	--
Thallium	ug/L	<0.27	--	<0.26	--

Location ID: MW-304
Number of Sampling Dates: 4

Parameter Name	Units	6/20/2019	10/2/2019	5/20/2020	8/19/2020
Radium-226	pCi/L	0.217	0.246	0.0689	--
Radium-228	pCi/L	0.139	0.653	-0.057	--
Total Radium	pCi/L	0.356	0.9	0.0689	--
Field Oxidation Potential	mV	41	107.3	104.9	109.6
Field Specific Conductance	umhos/cm	593	578.4	574	583
Field Temperature	deg C	10.6	12.4	9	11.8
Groundwater Elevation	feet	0	623.79	621.57	621.75
Oxygen, Dissolved	mg/L	6.2	7.51	7.78	6.76
Turbidity	NTU	104	3.51	3.72	1.06
Total Alkalinity as CaCO3	mg/L	280	--	--	300
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	300
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	<3.8
Iron	mg/L	--	--	--	0.051
Magnesium	mg/L	--	--	--	36
Manganese, total	mg/L	--	--	--	0.011
Potassium	mg/L	--	--	--	1.5
Sodium	mg/L	--	--	--	5.6

Single Location

Name: IPL - Lansing

Location ID: MW-304A
Number of Sampling Dates: 3

Parameter Name	Units	5/20/2020	7/6/2020	8/19/2020
Boron	ug/L	1800	1700	--
Calcium	mg/L	54	41	50
Chloride	mg/L	15	13	13
Fluoride	mg/L	0.57	0.42	--
pH at 25 Degrees C	Std. Units	8	8	--
Field pH	Std. Units	8.04	7.9	8.48
Sulfate	mg/L	83	77	76
Total Dissolved Solids	mg/L	680	330	--
Antimony	ug/L	<0.58	<0.51	--
Arsenic	ug/L	1.3	<0.88	--
Barium	ug/L	67	34	--
Beryllium	ug/L	<0.27	<0.27	--
Cadmium	ug/L	0.19	0.098	--
Chromium	ug/L	2.2	1.1	--
Cobalt	ug/L	3.2	0.83	--
Lead	ug/L	4.3	1.2	--
Lithium	ug/L	2.7	<2.5	--
Mercury	ug/L	<0.1	<0.1	--

Location ID: MW-304A
Number of Sampling Dates: 3

Parameter Name	Units	5/20/2020	7/6/2020	8/19/2020
Molybdenum	ug/L	110	140	140
Selenium	ug/L	<1	<1	--
Thallium	ug/L	<0.26	<0.26	--
Radium-226	pCi/L	0.63	0.221	--
Radium-228	pCi/L	-2.44	0.352	--
Total Radium	pCi/L	0.63	0.573	--
Field Oxidation Potential	mV	61.8	-15.8	50.5
Field Specific Conductance	umhos/cm	529	541	533
Field Temperature	deg C	12.6	19.1	14
Groundwater Elevation	feet	624.88	625.76	0
Oxygen, Dissolved	mg/L	0.48	0.3	0.27
Turbidity	NTU	585.9	181.9	236.2
Total Alkalinity as CaCO3	mg/L	--	--	190
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	190
Carbonate Alkalinity as CaCO3	mg/L	--	--	<7.6
Iron	mg/L	--	--	0.94
Magnesium	mg/L	--	--	21
Manganese, total	mg/L	--	--	0.099
Potassium	mg/L	--	--	0.83
Sodium	mg/L	--	--	69

Single Location

Name: IPL - Lansing

Location ID: MW-305
Number of Sampling Dates: 4

Parameter Name	Units	6/20/2019	10/2/2019	5/19/2020	8/18/2020
Boron	ug/L	180	190	210	--
Calcium	mg/L	92	97	82	90
Chloride	mg/L	6.8	3.2	7.5	6.9
Fluoride	mg/L	<0.23	<0.23	0.23	--
pH at 25 Degrees C	Std. Units	7.2	7.2	7.2	--
Field pH	Std. Units	7.19	7.03	6.9	7.23
Sulfate	mg/L	24	26	<3.6	<3.6
Total Dissolved Solids	mg/L	440	380	540	--
Antimony	ug/L	<0.53	--	<0.58	--
Arsenic	ug/L	2.2	3.4	3.6	--
Barium	ug/L	170	190	220	--
Beryllium	ug/L	<0.27	--	<0.27	--
Cadmium	ug/L	<0.077	--	<0.039	--
Chromium	ug/L	<0.98	<0.98	<1.1	--
Cobalt	ug/L	0.52	0.27	0.32	--
Lead	ug/L	<0.27	<0.27	<0.27	--
Lithium	ug/L	3.4	4.6	<2.3	--
Mercury	ug/L	<0.1	--	<0.1	--
Molybdenum	ug/L	1.7	1.6	<1.1	1.8
Selenium	ug/L	<1	--	<1	--
Thallium	ug/L	<0.27	--	<0.26	--

Location ID: MW-305
Number of Sampling Dates: 4

Parameter Name	Units	6/20/2019	10/2/2019	5/19/2020	8/18/2020
Radium-226	pCi/L	0.181	0.38	0.304	--
Radium-228	pCi/L	0.372	0.178	0.533	--
Total Radium	pCi/L	0.553	0.557	0.837	--
Field Oxidation Potential	mV	27	-105.6	-138	-162.9
Field Specific Conductance	umhos/cm	638	635	684	654
Field Temperature	deg C	15.5	19	9.8	19
Groundwater Elevation	feet	0	629.77	627.24	626.98
Oxygen, Dissolved	mg/L	0.2	0.21	0.48	0.07
Turbidity	NTU	9.6	8.87	20.44	27.27
Total Alkalinity as CaCO3	mg/L	290	--	--	340
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	340
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	<7.6
Iron	mg/L	--	--	--	13
Magnesium	mg/L	--	--	--	32
Manganese, total	mg/L	--	--	--	2
Potassium	mg/L	--	--	--	2.2
Sodium	mg/L	--	--	--	8.9

Single Location

Name: IPL - Lansing

Location ID: MW-306
Number of Sampling Dates: 6

Parameter Name	Units	6/20/2019	10/2/2019	12/5/2019	2/5/2020	5/19/2020	8/18/2020
Boron	ug/L	860	660	--	--	720	--
Calcium	mg/L	240	260	--	--	340	290
Chloride	mg/L	24	40	--	--	32	28
Fluoride	mg/L	<0.23	<0.23	--	--	<0.23	--
pH at 25 Degrees C	Std. Units	6.9	7.2	--	--	6.9	--
Field pH	Std. Units	6.87	9	6.76	6.95	6.66	7.12
Sulfate	mg/L	280	140	--	--	430	260
Total Dissolved Solids	mg/L	1200	1300	--	--	3400	--
Antimony	ug/L	<0.53	--	--	--	<0.58	--
Arsenic	ug/L	8.6	12	9.3	9.4	8.5	--
Barium	ug/L	280	540	--	--	260	--
Beryllium	ug/L	<0.27	--	--	--	<0.27	--
Cadmium	ug/L	<0.077	--	--	--	<0.039	--
Chromium	ug/L	<0.98	<0.98	--	--	<1.1	--
Cobalt	ug/L	1	0.98	--	--	0.53	--
Lead	ug/L	0.52	<0.27	--	--	<0.27	--
Lithium	ug/L	19	25	--	--	25	--
Mercury	ug/L	<0.1	--	--	--	<0.1	--
Molybdenum	ug/L	<1.1	<1.1	--	--	<1.1	<1.1
Selenium	ug/L	<1	--	--	--	<1	--
Thallium	ug/L	<0.27	--	--	--	<0.26	--
Radium-226	pCi/L	0.432	0.902	--	--	0.479	--
Radium-228	pCi/L	0.465	0.889	--	--	0.572	--
Total Radium	pCi/L	0.897	1.79	--	--	1.05	--
Field Oxidation Potential	mV	22	-1205	-127	-127.7	-137	-139.1
Field Specific Conductance	umhos/cm	1632	1998	2196	2477	2332	1911
Field Temperature	deg C	13.8	16.33	16.3	13.7	12.7	15
Groundwater Elevation	feet	0	622.47	620.6	620.83	620.43	620.37

Location ID: MW-306

Number of Sampling Dates: 6

Parameter Name	Units	6/20/2019	10/2/2019	12/5/2019	2/5/2020	5/19/2020	8/18/2020
Oxygen, Dissolved	mg/L	1	0.27	0.9	0.23	0.3	0.1
Turbidity	NTU	25.9	3.67	10.26	4.43	2.63	0.16
Total Alkalinity as CaCO3	mg/L	620	--	--	--	--	850
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	850
Carbonate Alkalinity as CaCO3	mg/L	--	--	--	--	--	<7.6
Iron	mg/L	--	--	--	--	--	43
Magnesium	mg/L	--	--	--	--	--	54
Manganese, total	mg/L	--	--	--	--	--	5.2
Potassium	mg/L	--	--	--	--	--	8.2
Sodium	mg/L	--	--	--	--	--	110

Single Location

Name: IPL - Lansing

Location ID: MW-306A
Number of Sampling Dates: 3

Parameter Name	Units	5/19/2020	7/6/2020	8/18/2020
Boron	ug/L	290	340	--
Calcium	mg/L	83	82	86
Chloride	mg/L	7.8	7.1	7.4
Fluoride	mg/L	<0.23	<0.23	--
pH at 25 Degrees C	Std. Units	7.4	7.5	--
Field pH	Std. Units	6.99	7.04	7.38
Sulfate	mg/L	44	40	41
Total Dissolved Solids	mg/L	610	360	--
Antimony	ug/L	<0.58	<0.51	--
Arsenic	ug/L	<0.88	<0.88	--
Barium	ug/L	61	58	--
Beryllium	ug/L	<0.27	<0.27	--
Cadmium	ug/L	<0.039	<0.049	--
Chromium	ug/L	<1.1	<1.1	--
Cobalt	ug/L	0.33	0.18	--
Lead	ug/L	<0.27	<0.11	--
Lithium	ug/L	<2.3	<2.5	--
Mercury	ug/L	<0.1	<0.1	--

Location ID: MW-306A
Number of Sampling Dates: 3

Parameter Name	Units	5/19/2020	7/6/2020	8/18/2020
Molybdenum	ug/L	<1.1	<1.1	<1.1
Selenium	ug/L	<1	<1	--
Thallium	ug/L	<0.26	<0.26	--
Radium-226	pCi/L	0.887	0.0377	--
Radium-228	pCi/L	0.233	0.487	--
Total Radium	pCi/L	1.12	0.525	--
Field Oxidation Potential	mV	-21.7	-55.8	21.2
Field Specific Conductance	umhos/cm	697	683	654
Field Temperature	deg C	14.6	15.3	15.5
Groundwater Elevation	feet	620.4	621.66	620.63
Oxygen, Dissolved	mg/L	1.18	1.24	1.16
Turbidity	NTU	4.15	1.4	2.71
Total Alkalinity as CaCO3	mg/L	--	--	330
Bicarbonate Alkalinity as CaCO3	mg/L	--	--	330
Carbonate Alkalinity as CaCO3	mg/L	--	--	<7.6
Iron	mg/L	--	--	2.1
Magnesium	mg/L	--	--	38
Manganese, total	mg/L	--	--	1.2
Potassium	mg/L	--	--	1.4
Sodium	mg/L	--	--	12

B3 Most Recent Annual Groundwater Quality Report

2019 Annual Groundwater Monitoring and Corrective Action Report

Lansing Generating Station
Lansing, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25219070.00 | January 31, 2020

2830 Dairy Drive
Madison, WI 53718-6751
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1.0 INTRODUCTION

This 2019 Annual Groundwater Monitoring and Corrective Action Report was prepared to support compliance with the groundwater monitoring requirements of the Coal Combustion Residuals (CCR) Rule [40 CFR 257.50-107]. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.90(e). The applicable sections of the Rule are provided below in *italics*, followed by applicable information relative to the 2019 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units.

This report covers the period of groundwater monitoring from January 1, 2019, through December 31, 2019.

The groundwater monitoring system at the Lansing Generating Station (LAN) is a multiunit system that includes the following two existing CCR units:

- LAN Landfill
- LAN Upper Ash Pond

The groundwater system is designed to detect monitored constituents at the waste boundary of the facility as required by 40 CFR 257.91(d). The groundwater monitoring system currently consists of 1 upgradient monitoring well, 3 downgradient monitoring wells at the waste boundary, and 6 additional downgradient wells.

2.0 § 257.90(E) ANNUAL REPORT REQUIREMENTS

Annual groundwater monitoring and corrective action report. *For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:*

2.1 §257.90(E)(1) SITE MAP

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

A map of the site location is provided on **Figure 1.** A map with an aerial image showing the CCR units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the groundwater monitoring program is provided as **Figure 2.**

2.2 §257.90(E)(2) MONITORING SYSTEM CHANGES

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

Six new monitoring wells were installed in 2019 to characterize site conditions in accordance with § 257.95(g)(1). MW-304, MW-305, and MW-306, were installed on May 15 and 16, 2019. The monitoring well boring logs and well construction forms were completed for the operating record on September 20, 2019. MW-302A, MW-304A, and MW-306A were installed on December 16 through December 19, 2019. Well documentation for the December well installations is in preparation and will be placed in the operating record in 2020.

2.3 §257.90(E)(3) SUMMARY OF SAMPLING EVENTS

In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

Three groundwater sampling events were completed in 2019. The first round of semiannual assessment monitoring was completed in April 2019, and the second round was completed in October 2019. The initial samples from the three new wells installed in May 2019 were collected in June 2019.

Groundwater samples collected during the April, June, and October 2019 sampling events were analyzed for both Appendix III and Appendix IV constituents. A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well and the dates the samples were collected is included in **Table 1**. The results of the field and laboratory analyses are provided in the laboratory reports in **Appendix A**.

2.4 § 257.90(E)(4) MONITORING TRANSITION NARRATIVE

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels);

An Assessment of Corrective Measures (ACM) was initiated for the LAN CCR units in April 2019 and completed in September 2019. The selection of remedy is in progress. The ACM was initiated in response to the detection of cobalt at a statistically significant level exceeding the Groundwater Protection Standard (GPS). Assessment monitoring continued during the ACM and will continue during the selection of remedy.

2.5 § 257.90(E)(5) OTHER REQUIREMENTS

Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

Additional potentially applicable requirements for the annual report, and the location of the requirement within the Rule, are provided in the following sections. For each cited section of the Rule, the portion referencing the annual report requirement is provided below in italics, followed by applicable information relative to the 2019 Annual Groundwater Monitoring and Corrective Action Report for the CCR units.

2.5.1 § 257.90(e) General Requirements

For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year.

Status of Groundwater Monitoring and Corrective Action Program. The groundwater monitoring and corrective action program is currently in the selection of remedy process, with assessment monitoring continuing.

Summary of Key Actions Completed.

- Statistical evaluation for the initial Assessment Monitoring samples collected in April, August, and October 2018, completed January 14, 2019.
- Statistical evaluation for the April 2019 monitoring event completed July 15, 2019.
- Initiation of the ACM on April 15, 2019.
- Two semiannual assessment monitoring events (April and October 2019).
- Installation of six additional groundwater monitoring wells in May and December 2019 to characterize site conditions in accordance with § 257.95(g)(1).
- Initial monitoring of wells installed in May, completed June 20, 2019.
- Preparation of the ACM report, completed September 12, 2019.

Description of Any Problems Encountered.

- No problems were encountered during 2019.

Discussion of Actions to Resolve the Problems. Not applicable.

Projection of Key Activities for the Upcoming Year (2020):

- Statistical evaluation and determination of any statistically significant levels exceeding the GPS for the October 2019 monitoring event (January 2020).
- Statistical evaluation and determination of any statistically significant levels exceeding the GPS for the April 2020 monitoring event (July 2020).
- Continued work on the selection of remedy in accordance with § 257.97.
- Two semiannual assessment monitoring events (April and October 2020).
- Semiannual progress reports for the Selection of Remedy process (March and September 2020).

2.5.2 § 257.94(d) Alternative Detection Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. The LAN CCR units are no longer in the detection monitoring program.

2.5.3 § 257.94(e)(2) Alternative Source Demonstration for Detection Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. The LAN CCR units are no longer in the detection monitoring program.

2.5.4 § 257.95(c) Alternative Assessment Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has been initiated at the site, but no alternative assessment monitoring frequency is proposed at this time.

2.5.5 § 257.95(d)(3) Assessment Monitoring Results and Standards

Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

The recorded concentrations for the assessment monitoring events are in the laboratory reports in Appendix A. The background concentrations established under §257.94(b) were provided in Appendix A of the 2017 Annual Groundwater Monitoring and Corrective Action Report for the LAN CCR Units. The groundwater protection standards established for the CCR units are provided in Table 2.

2.5.6 § 257.95(g)(3)(ii) Alternative Source Demonstration for Assessment Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. No alternative source demonstration evaluation for assessment monitoring was completed in 2019.

2.5.7 § 257.96(a) Extension of Time for Corrective Measures Assessment

The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measure due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

The ACM was initiated on April 15, 2019. The July 10, 2019 certification demonstrating the need for a 90-day deadline extension is included in **Appendix B.**

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Tables

Table 1. CCR Rule Groundwater Samples Summary
Lansing Generating Station / SCS Engineers Project #25219070.00

Sample Dates	Background Well	Downgradient Wells					
	MW-6	MW-301	MW-302	MW-303	MW-304	MW-305	MW-306
4/15/2019	A	A	A	A	NI	NI	NI
6/20/2019	--	--	--	--	A	A	A
10/2/2019	A	A	A	A	A	A	A
Total Samples	2	2	2	2	2	2	2

Abbreviations:
A = Assessment Monitoring Sample
NI = Not Installed
-- = Not Sampled

Created by:	NDK	Date:	1/8/2018
Last revision by:	LWJ	Date:	1/7/2020
Checked by:	NDK	Date:	1/7/2020

I:\25219070.00\Deliverables\2019 Annual Groundwater Monitoring and Corrective Action Report\Tables\[Table 1. GW_Samples_Summary_Table_2019.xlsx]GW Summary

Table 2. Groundwater Protection Standards - CCR Program - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25219070

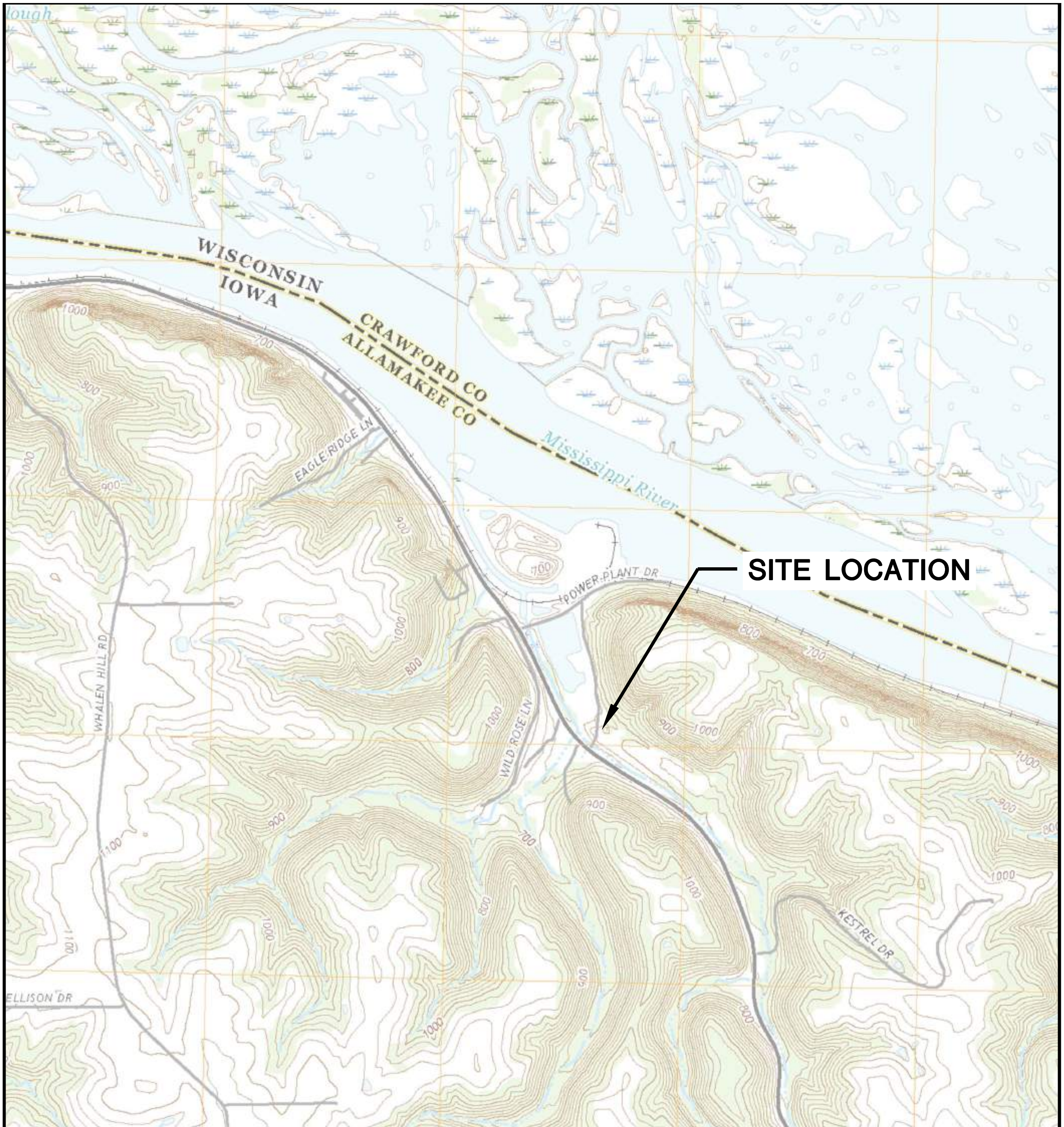
Parameter Name	GPS	Source
Antimony, ug/L	6	MCL
Arsenic, ug/L	10	MCL
Barium, ug/L	2000	MCL
Beryllium, ug/L	4	MCL
Cadmium, ug/L	5	MCL
Chromium, ug/L	100	MCL
Cobalt, ug/L	6	40 CFR 257.95(h)(2)
Fluoride, mg/L	4	MCL
Lead, ug/L	15	40 CFR 257.95(h)(2)
Lithium, ug/L	40	40 CFR 257.95(h)(2)
Mercury, ug/L	2	MCL
Molybdenum, ug/L	100	40 CFR 257.95(h)(2)
Selenium, ug/L	50	MCL
Thallium, ug/L	2	MCL
Radium 226/228 Combined, pCI/L	5	MCL

Abbreviations:
GPS = Groundwater Protection Standard
MCL = Maximum Contaminant Level established under 40 CFR 141.62 and 141.66

Created by: NDK, 9/24/2018
Checked by: SCC, 10/14/2018

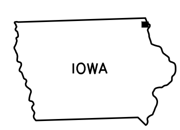
I:\25219070.00\Deliverables\2019 Annual Groundwater Monitoring and Corrective Action Report\Tables\[Table 2. Groundwater Protection Standards.xlsx]Table

Figures



N

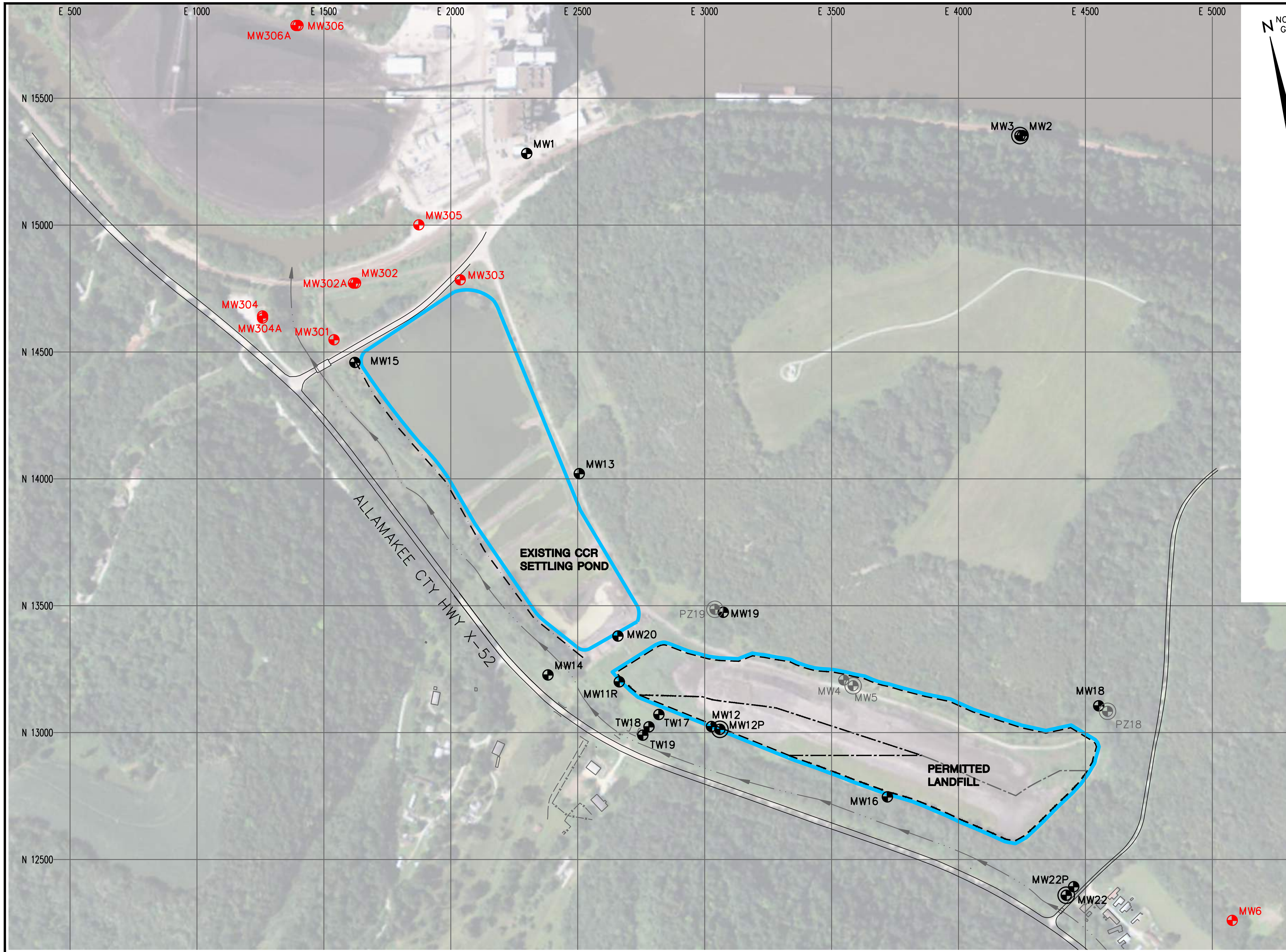
LANSING QUADRANGLE
IOWA–ALLAMAKEE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



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

				ENGINEER	FIGURE
PROJECT NO.	25219070.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718–6751 PHONE: (608) 224–2830	1
DRAWN:	11/27/2019	CHECKED BY:	MDB		
REVISED:	11/27/2019	APPROVED BY:	TK 01/30/2020		

I:\2521□070.00\Drawings\□□□ 201□ Ann□al □eport\Site Location Map.dwg, 1/30/2020 3:31:□0 PM



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
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
———	CCR UNITS

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.

PROJECT NO.	25219070.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	01/20/2020	APPROVED BY:	TK 01/30/2020

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:\2521 070.00\Drawings\ 201 Annual Report\Site Plan and Monitoring Well Locations.dwg, 1/30/2020 3:32:52 PM

Appendix A

Analytical Laboratory Reports

A1 Assessment Monitoring, April 2019

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-153579-1
Client Project/Site: IPL-Lansing, 25219070
Revision: 1

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
7/2/2019 10:35:38 AM
Therese Hargraves, Project Manager I
(708)793-3461
therese.hargraves@testamericainc.com

Designee for

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 310-153579-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-153579-1

Comments
No additional comments.

Receipt
The samples were received on 4/18/2019 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.0º C.

Receipt Exceptions

Revised Report - At client request, mercury units updated to ug/L

HPLC/IC
Method(s) 300.0, 9056A: The following sample was diluted due to the nature of the sample matrix: MW-302 (310-153579-2). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-153579-1	MW-301	Water	04/15/19 12:25	04/18/19 09:05	
310-153579-2	MW-302	Water	04/15/19 13:25	04/18/19 09:05	
310-153579-3	MW-303	Water	04/15/19 14:05	04/18/19 09:05	
310-153579-4	MW-6	Water	04/15/19 15:00	04/18/19 09:05	
310-153579-5	Field Blank	Water	04/15/19 14:10	04/18/19 09:05	

Detection Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Client Sample ID: MW-301 — Lab Sample ID: 310-153579-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	17		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.90		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	51		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	5.4		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	160		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	250		200	110	ug/L	1		6020A	Total/NA
Calcium	73		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.11	J	0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	8.7	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	11		2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	350		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.9	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Groundwater Elevation (ft MSL)	629.19				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-171				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.2				mg/L	1		Field Sampling	Total/NA
pH, Field	8.47				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	539				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	11.3				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	9.33				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-302 — Lab Sample ID: 310-153579-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	13		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.79		0.50	0.23	mg/L	5		9056A	Total/NA
Arsenic	37		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	690		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	530		200	110	ug/L	1		6020A	Total/NA
Calcium	130		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	1.5		0.50	0.091	ug/L	1		6020A	Total/NA
Total Dissolved Solids	450		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Groundwater Elevation (ft MSL)	629.99				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-159				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.2				mg/L	1		Field Sampling	Total/NA
pH, Field	7.66				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1089				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	7.1				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	18.39				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-303 — Lab Sample ID: 310-153579-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	18		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	1.0		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	35		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	1.4	J	2.0	0.75	ug/L	1		6020A	Total/NA
Barium	160		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	150	J	200	110	ug/L	1		6020A	Total/NA
Calcium	49		0.50	0.10	mg/L	1		6020A	Total/NA
Lithium	3.3	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	6.2		2.0	1.1	ug/L	1		6020A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Client Sample ID: MW-303 (Continued)

Lab Sample ID: 310-153579-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Total Dissolved Solids	280		30	24	mg/L	1		SM 2540C	Total/NA
pH	8.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Groundwater Elevation (ft MSL)	638.22				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-76				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	1.4				mg/L	1		Field Sampling	Total/NA
pH, Field	7.95				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	448				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	4.2				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	6.60				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-6

Lab Sample ID: 310-153579-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.7		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.63		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	26		5.0	1.8	mg/L	5		9056A	Total/NA
Barium	43		2.0	0.84	ug/L	1		6020A	Total/NA
Calcium	67		0.50	0.10	mg/L	1		6020A	Total/NA
Total Dissolved Solids	340		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.5	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Groundwater Elevation (ft MSL)	672.78				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	274				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	8.7				mg/L	1		Field Sampling	Total/NA
pH, Field	7.59				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	618				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	10.0				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	0.75				NTU	1		Field Sampling	Total/NA

Client Sample ID: Field Blank

Lab Sample ID: 310-153579-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	27		1.0	0.29	mg/L	1		9056A	Total/NA
Fluoride	0.59		0.10	0.045	mg/L	1		9056A	Total/NA
Sulfate	48		1.0	0.35	mg/L	1		9056A	Total/NA
Calcium	0.32	J	0.50	0.10	mg/L	1		6020A	Total/NA
Total Dissolved Solids	380		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.8	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Client Sample ID: MW-301
Date Collected: 04/15/19 12:25
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-1
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**17**		5.0	1.5	mg/L			04/25/19 18:00	5
Fluoride	**0.90**		0.50	0.23	mg/L			04/25/19 18:00	5
Sulfate	**51**		5.0	1.8	mg/L			04/25/19 18:00	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 14:19	1
Arsenic	**5.4**		2.0	0.75	ug/L		04/19/19 08:00	05/03/19 14:19	1
Barium	**160**		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 14:19	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:19	1
Boron	**250**		200	110	ug/L		04/19/19 08:00	05/03/19 14:19	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 14:19	1
Calcium	**73**		0.50	0.10	mg/L		04/19/19 08:00	05/03/19 14:19	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 14:19	1
Cobalt	**0.11**	**J**	0.50	0.091	ug/L		04/19/19 08:00	05/03/19 14:19	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 14:19	1
Lithium	**8.7**	**J**	10	2.7	ug/L		04/19/19 08:00	05/03/19 14:19	1
Molybdenum	**11**		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 14:19	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 14:19	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:19	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**350**		30	24	mg/L			04/19/19 08:35	1
pH	**7.9**	**HF**	0.1	0.1	SU			04/18/19 15:36	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation (ft MSL)	**629.19**				ft			04/15/19 12:25	1
Oxidation Reduction Potential	**-171**				millivolts			04/15/19 12:25	1
Oxygen, Dissolved, Client Supplied	**0.2**				mg/L			04/15/19 12:25	1
pH, Field	**8.47**				SU			04/15/19 12:25	1
Specific Conductance, Field	**539**				umhos/cm			04/15/19 12:25	1
Temperature, Field	**11.3**				Degrees C			04/15/19 12:25	1
Turbidity, Field	**9.33**				NTU			04/15/19 12:25	1

Client Sample Results

Client: SCS Engineers
Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-302
Lab Sample ID: 310-153579-2
Date Collected: 04/15/19 13:25
Matrix: Water
Date Received: 04/18/19 09:05

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**13**		5.0	1.5	mg/L			04/25/19 18:13	5
Fluoride	**0.79**		0.50	0.23	mg/L			04/25/19 18:13	5
Sulfate	<1.8		5.0	1.8	mg/L			04/25/19 18:13	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 14:22	1
Arsenic	**37**		2.0	0.75	ug/L		04/19/19 08:00	05/03/19 14:22	1
Barium	**690**		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 14:22	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:22	1
Boron	**530**		200	110	ug/L		04/19/19 08:00	05/03/19 14:22	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 14:22	1
Calcium	**130**		0.50	0.10	mg/L		04/19/19 08:00	05/03/19 14:22	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 14:22	1
Cobalt	**1.5**		0.50	0.091	ug/L		04/19/19 08:00	05/03/19 14:22	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 14:22	1
Lithium	<2.7		10	2.7	ug/L		04/19/19 08:00	05/03/19 14:22	1
Molybdenum	<1.1		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 14:22	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 14:22	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:22	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**450**		30	24	mg/L			04/19/19 08:35	1
pH	**7.0**	**HF**	0.1	0.1	SU			04/18/19 15:31	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation (ft MSL)	**629.99**				ft			04/15/19 13:25	1
Oxidation Reduction Potential	**-159**				millivolts			04/15/19 13:25	1
Oxygen, Dissolved, Client Supplied	**0.2**				mg/L			04/15/19 13:25	1
pH, Field	**7.66**				SU			04/15/19 13:25	1
Specific Conductance, Field	**1089**				umhos/cm			04/15/19 13:25	1
Temperature, Field	**7.1**				Degrees C			04/15/19 13:25	1
Turbidity, Field	**18.39**				NTU			04/15/19 13:25	1

Client Sample Results

Client: SCS Engineers　　　　Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-303　　　　Lab Sample ID: 310-153579-3

Date Collected: 04/15/19 14:05　　　　**Matrix: Water**
Date Received: 04/18/19 09:05

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**18**		5.0	1.5	mg/L			04/25/19 18:38	5
Fluoride	**1.0**		0.50	0.23	mg/L			04/25/19 18:38	5
Sulfate	**35**		5.0	1.8	mg/L			04/25/19 18:38	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 14:25	1
Arsenic	**1.4**	**J**	2.0	0.75	ug/L		04/19/19 08:00	05/03/19 14:25	1
Barium	**160**		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 14:25	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:25	1
Boron	**150**	**J**	200	110	ug/L		04/19/19 08:00	05/03/19 14:25	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 14:25	1
Calcium	**49**		0.50	0.10	mg/L		04/19/19 08:00	05/03/19 14:25	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 14:25	1
Cobalt	<0.091		0.50	0.091	ug/L		04/19/19 08:00	05/03/19 14:25	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 14:25	1
Lithium	**3.3**	**J**	10	2.7	ug/L		04/19/19 08:00	05/03/19 14:25	1
Molybdenum	**6.2**		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 14:25	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 14:25	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:25	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**280**		30	24	mg/L			04/19/19 08:35	1
pH	**8.0**	**HF**	0.1	0.1	SU			04/18/19 15:25	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation (ft MSL)	**638.22**				ft			04/15/19 14:05	1
Oxidation Reduction Potential	**-76**				millivolts			04/15/19 14:05	1
Oxygen, Dissolved, Client Supplied	**1.4**				mg/L			04/15/19 14:05	1
pH, Field	**7.95**				SU			04/15/19 14:05	1
Specific Conductance, Field	**448**				umhos/cm			04/15/19 14:05	1
Temperature, Field	**4.2**				Degrees C			04/15/19 14:05	1
Turbidity, Field	**6.60**				NTU			04/15/19 14:05	1

Client Sample Results

Client: SCS Engineers
Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-6
Lab Sample ID: 310-153579-4

Date Collected: 04/15/19 15:00
Matrix: Water
Date Received: 04/18/19 09:05

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**6.7**		5.0	1.5	mg/L			04/25/19 18:51	5
Fluoride	**0.63**		0.50	0.23	mg/L			04/25/19 18:51	5
Sulfate	**26**		5.0	1.8	mg/L			04/25/19 18:51	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 14:29	1
Arsenic	<0.75		2.0	0.75	ug/L		04/19/19 08:00	05/03/19 14:29	1
Barium	**43**		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 14:29	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:29	1
Boron	<110		200	110	ug/L		04/19/19 08:00	05/03/19 14:29	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 14:29	1
Calcium	**67**		0.50	0.10	mg/L		04/19/19 08:00	05/03/19 14:29	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 14:29	1
Cobalt	<0.091		0.50	0.091	ug/L		04/19/19 08:00	05/03/19 14:29	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 14:29	1
Lithium	<2.7		10	2.7	ug/L		04/19/19 08:00	05/03/19 14:29	1
Molybdenum	<1.1		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 14:29	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 14:29	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:29	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**340**		30	24	mg/L			04/19/19 08:35	1
pH	**7.5**	**HF**	0.1	0.1	SU			04/18/19 15:23	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation (ft MSL)	**672.78**				ft			04/15/19 15:00	1
Oxidation Reduction Potential	**274**				millivolts			04/15/19 15:00	1
Oxygen, Dissolved, Client Supplied	**8.7**				mg/L			04/15/19 15:00	1
pH, Field	**7.59**				SU			04/15/19 15:00	1
Specific Conductance, Field	**618**				umhos/cm			04/15/19 15:00	1
Temperature, Field	**10.0**				Degrees C			04/15/19 15:00	1
Turbidity, Field	**0.75**				NTU			04/15/19 15:00	1

Client Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Client Sample ID: Field Blank
Date Collected: 04/15/19 14:10
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-5
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**27**		1.0	0.29	mg/L			04/25/19 19:04	1
Fluoride	**0.59**		0.10	0.045	mg/L			04/25/19 19:04	1
Sulfate	**48**		1.0	0.35	mg/L			04/25/19 19:04	1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 14:32	1
Arsenic	<0.75		2.0	0.75	ug/L		04/19/19 08:00	05/03/19 14:32	1
Barium	<0.84		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 14:32	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:32	1
Boron	<110		200	110	ug/L		04/19/19 08:00	05/03/19 14:32	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 14:32	1
Calcium	**0.32**	**J**	0.50	0.10	mg/L		04/19/19 08:00	05/03/19 14:32	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 14:32	1
Cobalt	<0.091		0.50	0.091	ug/L		04/19/19 08:00	05/03/19 14:32	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 14:32	1
Lithium	<2.7		10	2.7	ug/L		04/19/19 08:00	05/03/19 14:32	1
Molybdenum	<1.1		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 14:32	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 14:32	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 14:32	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:59	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**380**		30	24	mg/L			04/19/19 08:35	1
pH	**7.8**	**HF**	0.1	0.1	SU			04/18/19 15:38	1

Definitions/Glossary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-237732/3
Matrix: Water
Analysis Batch: 237732

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.29		1.0	0.29	mg/L			04/25/19 11:36	1
Fluoride	<0.045		0.10	0.045	mg/L			04/25/19 11:36	1
Sulfate	<0.35		1.0	0.35	mg/L			04/25/19 11:36	1

Lab Sample ID: LCS 310-237732/4
Matrix: Water
Analysis Batch: 237732

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.96		mg/L		100	90 - 110
Fluoride	2.00	2.02		mg/L		101	90 - 110
Sulfate	10.0	10.4		mg/L		104	90 - 110

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-236347/1-A
Matrix: Water
Analysis Batch: 238214

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 236347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		04/19/19 08:00	05/03/19 12:59	1
Arsenic	<0.75		2.0	0.75	ug/L		04/19/19 08:00	05/03/19 12:59	1
Barium	<0.84		2.0	0.84	ug/L		04/19/19 08:00	05/03/19 12:59	1
Beryllium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 12:59	1
Boron	<110		200	110	ug/L		04/19/19 08:00	05/03/19 12:59	1
Cadmium	<0.077		0.50	0.077	ug/L		04/19/19 08:00	05/03/19 12:59	1
Calcium	<0.10		0.50	0.10	mg/L		04/19/19 08:00	05/03/19 12:59	1
Chromium	<0.98		5.0	0.98	ug/L		04/19/19 08:00	05/03/19 12:59	1
Cobalt	<0.091		0.50	0.091	ug/L		04/19/19 08:00	05/03/19 12:59	1
Lead	<0.27		0.50	0.27	ug/L		04/19/19 08:00	05/03/19 12:59	1
Lithium	<2.7		10	2.7	ug/L		04/19/19 08:00	05/03/19 12:59	1
Molybdenum	<1.1		2.0	1.1	ug/L		04/19/19 08:00	05/03/19 12:59	1
Selenium	<1.0		5.0	1.0	ug/L		04/19/19 08:00	05/03/19 12:59	1
Thallium	<0.27		1.0	0.27	ug/L		04/19/19 08:00	05/03/19 12:59	1

Lab Sample ID: LCS 310-236347/2-A
Matrix: Water
Analysis Batch: 238214

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 236347

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	20.0	19.1		ug/L		96	80 - 120
Arsenic	40.0	40.0		ug/L		100	80 - 120
Barium	40.0	37.5		ug/L		94	80 - 120
Beryllium	20.0	20.7		ug/L		103	80 - 120
Boron	880	884		ug/L		100	80 - 120
Cadmium	20.0	19.9		ug/L		99	80 - 120
Calcium	2.00	1.98		mg/L		99	80 - 120
Chromium	40.0	38.8		ug/L		97	80 - 120
Cobalt	20.0	19.4		ug/L		97	80 - 120

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 310-236347/2-A
Matrix: Water
Analysis Batch: 238214

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 236347

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	20.0	18.6		ug/L		93	80 - 120
Lithium	100	100		ug/L		100	80 - 120
Molybdenum	40.0	38.0		ug/L		95	80 - 120
Selenium	40.0	37.5		ug/L		94	80 - 120
Thallium	16.0	15.6		ug/L		98	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 310-236427/1-A
Matrix: Water
Analysis Batch: 236547

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 236427

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		04/19/19 10:19	04/19/19 15:34	1

Lab Sample ID: LCS 310-236427/2-A
Matrix: Water
Analysis Batch: 236547

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 236427

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	1.67	1.45		ug/L		87	80 - 120

Lab Sample ID: 310-153579-1 MS
Matrix: Water
Analysis Batch: 236547

Client Sample ID: MW-301
Prep Type: Total/NA
Prep Batch: 236427

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	<0.10		1.67	1.63		ug/L		98	80 - 120

Lab Sample ID: 310-153579-1 MSD
Matrix: Water
Analysis Batch: 236547

Client Sample ID: MW-301
Prep Type: Total/NA
Prep Batch: 236427

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	<0.10		1.67	1.69		ug/L		101	80 - 120	4	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-236400/1
Matrix: Water
Analysis Batch: 236400

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<30.0		30.0		mg/L			04/19/19 08:35	1

Lab Sample ID: LCS 310-236400/2
Matrix: Water
Analysis Batch: 236400

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	1000		mg/L		100	90 - 110

QC Sample Results

Client: SCS Engineers | Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: 310-153579-4 DU | **Client Sample ID: MW-6**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 236400

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	340		340.0		mg/L		0.6	24

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-236326/1 | **Client Sample ID: Lab Control Sample**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 236326

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

Lab Sample ID: LCS 310-236326/27 | **Client Sample ID: Lab Control Sample**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 236326

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

Lab Sample ID: 310-153579-2 DU | **Client Sample ID: MW-302**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 236326

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	7.0	HF	7.0		SU		0.6	20

QC Association Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

HPLC/IC

Analysis Batch: 237732

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	9056A	
310-153579-2	MW-302	Total/NA	Water	9056A	
310-153579-3	MW-303	Total/NA	Water	9056A	
310-153579-4	MW-6	Total/NA	Water	9056A	
310-153579-5	Field Blank	Total/NA	Water	9056A	
MB 310-237732/3	Method Blank	Total/NA	Water	9056A	
LCS 310-237732/4	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 236347

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	3010A	
310-153579-2	MW-302	Total/NA	Water	3010A	
310-153579-3	MW-303	Total/NA	Water	3010A	
310-153579-4	MW-6	Total/NA	Water	3010A	
310-153579-5	Field Blank	Total/NA	Water	3010A	
MB 310-236347/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-236347/2-A	Lab Control Sample	Total/NA	Water	3010A	

Prep Batch: 236427

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	7470A	
310-153579-2	MW-302	Total/NA	Water	7470A	
310-153579-3	MW-303	Total/NA	Water	7470A	
310-153579-4	MW-6	Total/NA	Water	7470A	
310-153579-5	Field Blank	Total/NA	Water	7470A	
MB 310-236427/1-A	Method Blank	Total/NA	Water	7470A	
LCS 310-236427/2-A	Lab Control Sample	Total/NA	Water	7470A	
310-153579-1 MS	MW-301	Total/NA	Water	7470A	
310-153579-1 MSD	MW-301	Total/NA	Water	7470A	

Analysis Batch: 236547

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	7470A	236427
310-153579-2	MW-302	Total/NA	Water	7470A	236427
310-153579-3	MW-303	Total/NA	Water	7470A	236427
310-153579-4	MW-6	Total/NA	Water	7470A	236427
310-153579-5	Field Blank	Total/NA	Water	7470A	236427
MB 310-236427/1-A	Method Blank	Total/NA	Water	7470A	236427
LCS 310-236427/2-A	Lab Control Sample	Total/NA	Water	7470A	236427
310-153579-1 MS	MW-301	Total/NA	Water	7470A	236427
310-153579-1 MSD	MW-301	Total/NA	Water	7470A	236427

Analysis Batch: 238214

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	6020A	236347
310-153579-2	MW-302	Total/NA	Water	6020A	236347
310-153579-3	MW-303	Total/NA	Water	6020A	236347
310-153579-4	MW-6	Total/NA	Water	6020A	236347
310-153579-5	Field Blank	Total/NA	Water	6020A	236347

Metals (Continued)

Analysis Batch: 238214 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 310-236347/1-A	Method Blank	Total/NA	Water	6020A	236347
LCS 310-236347/2-A	Lab Control Sample	Total/NA	Water	6020A	236347

General Chemistry

Analysis Batch: 236326

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	SM 4500 H+ B	
310-153579-2	MW-302	Total/NA	Water	SM 4500 H+ B	
310-153579-3	MW-303	Total/NA	Water	SM 4500 H+ B	
310-153579-4	MW-6	Total/NA	Water	SM 4500 H+ B	
310-153579-5	Field Blank	Total/NA	Water	SM 4500 H+ B	
LCS 310-236326/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
LCS 310-236326/27	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
310-153579-2 DU	MW-302	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 236400

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	SM 2540C	
310-153579-2	MW-302	Total/NA	Water	SM 2540C	
310-153579-3	MW-303	Total/NA	Water	SM 2540C	
310-153579-4	MW-6	Total/NA	Water	SM 2540C	
310-153579-5	Field Blank	Total/NA	Water	SM 2540C	
MB 310-236400/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-236400/2	Lab Control Sample	Total/NA	Water	SM 2540C	
310-153579-4 DU	MW-6	Total/NA	Water	SM 2540C	

Field Service / Mobile Lab

Analysis Batch: 238763

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	Field Sampling	
310-153579-2	MW-302	Total/NA	Water	Field Sampling	
310-153579-3	MW-303	Total/NA	Water	Field Sampling	
310-153579-4	MW-6	Total/NA	Water	Field Sampling	

Lab Chronicle

Client: SCS Engineers Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-301 Lab Sample ID: 310-153579-1
Date Collected: 04/15/19 12:25 **Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	237732	04/25/19 18:00	MLU	TAL CF
Total/NA	Prep	3010A			236347	04/19/19 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	238214	05/03/19 14:19	SAD	TAL CF
Total/NA	Prep	7470A			236427	04/19/19 10:19	JNR	TAL CF
Total/NA	Analysis	7470A		1	236547	04/19/19 15:47	JNR	TAL CF
Total/NA	Analysis	SM 2540C		1	236400	04/19/19 08:35	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	236326	04/18/19 15:36	BER	TAL CF
Total/NA	Analysis	Field Sampling		1	238763	04/15/19 12:25	EAR	TAL CF

Client Sample ID: MW-302 Lab Sample ID: 310-153579-2
Date Collected: 04/15/19 13:25 **Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	237732	04/25/19 18:13	MLU	TAL CF
Total/NA	Prep	3010A			236347	04/19/19 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	238214	05/03/19 14:22	SAD	TAL CF
Total/NA	Prep	7470A			236427	04/19/19 10:19	JNR	TAL CF
Total/NA	Analysis	7470A		1	236547	04/19/19 15:53	JNR	TAL CF
Total/NA	Analysis	SM 2540C		1	236400	04/19/19 08:35	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	236326	04/18/19 15:31	BER	TAL CF
Total/NA	Analysis	Field Sampling		1	238763	04/15/19 13:25	EAR	TAL CF

Client Sample ID: MW-303 Lab Sample ID: 310-153579-3
Date Collected: 04/15/19 14:05 **Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	237732	04/25/19 18:38	MLU	TAL CF
Total/NA	Prep	3010A			236347	04/19/19 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	238214	05/03/19 14:25	SAD	TAL CF
Total/NA	Prep	7470A			236427	04/19/19 10:19	JNR	TAL CF
Total/NA	Analysis	7470A		1	236547	04/19/19 15:55	JNR	TAL CF
Total/NA	Analysis	SM 2540C		1	236400	04/19/19 08:35	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	236326	04/18/19 15:25	BER	TAL CF
Total/NA	Analysis	Field Sampling		1	238763	04/15/19 14:05	EAR	TAL CF

Client Sample ID: MW-6 Lab Sample ID: 310-153579-4
Date Collected: 04/15/19 15:00 **Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	237732	04/25/19 18:51	MLU	TAL CF

Lab Chronicle

Client: SCS Engineers	Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

## Client Sample ID: MW-6	Lab Sample ID: 310-153579-4

Date Collected: 04/15/19 15:00	**Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			236347	04/19/19 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	238214	05/03/19 14:29	SAD	TAL CF
Total/NA	Prep	7470A			236427	04/19/19 10:19	JNR	TAL CF
Total/NA	Analysis	7470A		1	236547	04/19/19 15:57	JNR	TAL CF
Total/NA	Analysis	SM 2540C		1	236400	04/19/19 08:35	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	236326	04/18/19 15:23	BER	TAL CF
Total/NA	Analysis	Field Sampling		1	238763	04/15/19 15:00	EAR	TAL CF

## Client Sample ID: Field Blank	Lab Sample ID: 310-153579-5

Date Collected: 04/15/19 14:10	**Matrix: Water**
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	237732	04/25/19 19:04	MLU	TAL CF
Total/NA	Prep	3010A			236347	04/19/19 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	238214	05/03/19 14:32	SAD	TAL CF
Total/NA	Prep	7470A			236427	04/19/19 10:19	JNR	TAL CF
Total/NA	Analysis	7470A		1	236547	04/19/19 15:59	JNR	TAL CF
Total/NA	Analysis	SM 2540C		1	236400	04/19/19 08:35	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	236326	04/18/19 15:38	BER	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers   Job ID: 310-153579-1
Project/Site: IPL-Lansing, 25219070

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Iowa	State Program	7	007	12-01-19

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Method Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
7470A	Mercury (CVAA)	SW846	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF
7470A	Preparation, Mercury	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

310-153579 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information

Client: SCS Engineers

City/State: CITY Menomonee Falls STATE WI | Project: IPL-Lansing

Receipt Information

Date/Time Received: DATE 4-18-19 TIME 905 | Received By: LAB

Delivery Type: ☐ UPS ☒ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☐ Lab Courier ☐ TA Field Services ☐ Client Drop-off ☐ Other:________

Condition of Cooler/Containers

Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☐ Yes ☒ No	*If yes:* Cooler # ____ of ____	
Cooler Custody Seals Present?	☒ Yes ☐ No	*If yes:* Cooler custody seals intact?	☒ Yes ☐ No
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact?	☐ Yes ☐ No
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	

Temperature Record

Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:________ ☐ NONE

Thermometer ID: N | Correction Factor (°C): +0.0

• **Temp Blank Temperature** – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature

Uncorrected Temp (°C): 3.0 | Corrected Temp (°C): 3.0

• **Sample Container Temperature**

Container type(s) used: CONTAINER 1 | CONTAINER 2

Uncorrected Temp (°C): TEMP 1 | TEMP 2 | Corrected Temp (°C): TEMP 1 | TEMP 2

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
 a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

Document: CF-LG-WI-002
Revision: 24
Date: 03/07/2019

TestAmerica Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

#38998

Eurofins TestAmerica, Cedar Falls
704 Enterprise Drive
Cedar Falls, IA 50613
Phone (319) 277-2401 Fax (319) 277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins | Environment Testing TestAmerica

Client Information	Sampler: Gary Sterkel	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-38998-12748.1
Client Contact: Gary Sterkel	Phone: 262-518-4081	E-Mail: sandie.fredrick@testamericainc.com		Page: Page 1 of 1
Company: SCS Engineers		Analysis Requested		Job #:
Address: N84 W13540 Leon Road	Due Date Requested:			
City: Menomonee Falls	TAT Requested (days): Standard			
State, Zip: WI, 53051				
Phone:	PO #: 25219070			
Email: gsterkel@scsengineers.com	WO #:			
Project Name: IPL-Lansing, 25219070	Project #: 31011020			
Site:	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	N	D	D		
MW-301	4/15/19	1225	G	Water	N	N	1	1	1	1		
MW-302	4/15/19	1325	G	Water	N	N	1	1	1	1		
MW-303	4/15/19	1405	G	Water	N	N	1	1	1	1		
MW-6	4/15/19	1500	G	Water	N	N	1	1	1	1		
Field Blank	4/15/19	1410	G	Water	N	N	1	1	1	1		
				Water								

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by: | Date: | Time: | Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Gary Sterkel	4/17/19 1700	SCS	DW	4/18/19 0905	TACF
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Container Summary Report

Temperature readings: ____________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-301	310-153579-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-301	310-153579-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-301	310-153579-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-153579-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-302	310-153579-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-153579-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-153579-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-303	310-153579-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-153579-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-153579-A-4	Plastic 250ml - with Nitric Acid	<2		
MW-6	310-153579-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-153579-D-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-153579-A-5	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-153579-C-5	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-153579-D-5	Plastic 1 liter - Nitric Acid	<2		

Table 2. Sampling Points and Parameters - CCR Rule Sampling Program
Groundwater Monitoring - Lansing Generating Station / SCS Engineers Project #25219070.00

	Parameter	MW-301	MW-302	MW-303	MW-20	MW-6	Field Blank	TOTAL
Appendix III Parameters	Boron	x	x	x		x	x	5
	Calcium	x	x	x		x	x	5
	Chloride	x	x	x		x	x	5
	Fluoride	x	x	x		x	x	5
	pH	x	x	x		x	x	5
	Sulfate	x	x	x		x	x	5
	TDS	x	x	x		x	x	5
Appendix IV Parameters	Antimony	x	x	x		x	x	5
	Arsenic	x	x	x		x	x	5
	Barium	x	x	x		x	x	5
	Beryllium	x	x	x		x	x	5
	Cadmium	x	x	x		x	x	5
	Chromium	x	x	x		x	x	5
	Cobalt	x	x	x		x	x	5
	Fluoride	x	x	x		x	x	5
	Lead	x	x	x		x	x	5
	Lithium	x	x	x		x	x	5
	Mercury	x	x	x		x	x	5
	Molybdenum	x	x	x		x	x	5
	Selenium	x	x	x		x	x	5
	Thallium	x	x	x		x	x	5
	Radium	x	x	x		x	x	5
Field Parameters	Groundwater Elevation	x	x	x	x	x		5
	Well Depth	x	x	x		x		4
	pH (field)	x	x	x		x		4
	Specific Conductance	x	x	x		x		4
	Dissolved Oxygen	x	x	x		x		4
	ORP	x	x	x		x		4
	Temperature	x	x	x		x		4
	Turbidity	x	x	x		x		4
	Color	x	x	x		x		4
	Odor	x	x	x		x		4

Notes: All samples are unfiltered (total analysis)

C:\Users\fredricks\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\3TD90TJJ\[L

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-153579-1

Login Number: 153579
List Number: 1
Creator: Homolar, Dana J

List Source: Eurofins TestAmerica, Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing
TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-153579-2
Client Project/Site: IPL-Lansing, 25219070

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
6/24/2019 12:59:55 PM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Job ID: 310-153579-2

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-153579-2

Comments
No additional comments.

Receipt
The samples were received on 4/18/2019 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.0º C.

RAD
Method(s) 903.0, 9315: Ra-226; The Ra-226 matrix spike (MS) is recovering (73%) outside of the control limits of 75-138%. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery is within acceptance limits. The data have been reported with this narrative. MW-301 (310-153579-1), MW-302 (310-153579-2), MW-303 (310-153579-3), MW-6 (310-153579-4), Field Blank (310-153579-5), (LCS 160-429215/1-A), (MB 160-429215/24-A), (310-153734-D-7-A), (310-153734-C-7-A MS) and (310-153734-C-7-B MSD)

Method(s) 903.0, 9315: Ra-226; Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-301 (310-153579-1), MW-302 (310-153579-2), MW-303 (310-153579-3), MW-6 (310-153579-4), Field Blank (310-153579-5), (LCS 160-429215/1-A), (MB 160-429215/24-A), (310-153734-D-7-A), (310-153734-C-7-A MS) and (310-153734-C-7-B MSD)

Method(s) 904.0, 9320: Radium-228; Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-301 (310-153579-1), MW-302 (310-153579-2), MW-303 (310-153579-3), MW-6 (310-153579-4), Field Blank (310-153579-5), (LCS 160-429223/1-A), (MB 160-429223/24-A), (310-153734-D-7-B), (310-153734-C-7-C MS) and (310-153734-C-7-D MSD)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-429223. The following samples had yellow discoloration: MW-302 (310-153579-2).

Method(s) PrecSep-21: Radium 226 Prep Batch 160-429215. The following samples had yellow discoloration: MW-302 (310-153579-2)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-153579-1	MW-301	Water	04/15/19 12:25	04/18/19 09:05	
310-153579-2	MW-302	Water	04/15/19 13:25	04/18/19 09:05	
310-153579-3	MW-303	Water	04/15/19 14:05	04/18/19 09:05	
310-153579-4	MW-6	Water	04/15/19 15:00	04/18/19 09:05	
310-153579-5	Field Blank	Water	04/15/19 14:10	04/18/19 09:05	

Detection Summary

Client: SCS Engineers
Job ID: 310-153579-2
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-301 — Lab Sample ID: 310-153579-1

No Detections.

Client Sample ID: MW-302 — Lab Sample ID: 310-153579-2

No Detections.

Client Sample ID: MW-303 — Lab Sample ID: 310-153579-3

No Detections.

Client Sample ID: MW-6 — Lab Sample ID: 310-153579-4

No Detections.

Client Sample ID: Field Blank — Lab Sample ID: 310-153579-5

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Client Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Client Sample ID: MW-301

Lab Sample ID: 310-153579-1

Date Collected: 04/15/19 12:25
Date Received: 04/18/19 09:05

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.232**		0.141	0.143	1.00	0.184	pCi/L	05/21/19 09:05	06/20/19 09:56	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*05/21/19 09:05*	*06/20/19 09:56*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0628	U	0.243	0.243	1.00	0.448	pCi/L	05/21/19 10:02	06/17/19 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*
Y Carrier	*81.9*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.232	U	0.281	0.282	5.00	0.448	pCi/L		06/24/19 09:02	1

Client Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Client Sample ID: MW-302
Date Collected: 04/15/19 13:25
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-2
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.119	U	0.105	0.106	1.00	0.156	pCi/L	05/21/19 09:05	06/20/19 09:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*05/21/19 09:05*	*06/20/19 09:57*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0267	U	0.237	0.237	1.00	0.422	pCi/L	05/21/19 10:02	06/17/19 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*
Y Carrier	*83.0*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.146	U	0.259	0.260	5.00	0.422	pCi/L		06/24/19 09:02	1

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Client Sample ID: MW-303
Date Collected: 04/15/19 14:05
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-3
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.543**		0.186	0.192	1.00	0.198	pCi/L	05/21/19 09:05	06/20/19 09:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.5*		*40 - 110*	*05/21/19 09:05*	*06/20/19 09:57*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0763	U	0.248	0.248	1.00	0.455	pCi/L	05/21/19 10:02	06/17/19 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.5*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*
Y Carrier	*82.2*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.543**		0.310	0.314	5.00	0.455	pCi/L		06/24/19 09:02	1

Client Sample ID: MW-6

Date Collected: 04/15/19 15:00
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-4

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0888	U	0.103	0.104	1.00	0.169	pCi/L	05/21/19 09:05	06/20/19 13:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*05/21/19 09:05*	*06/20/19 13:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.166	U	0.237	0.237	1.00	0.396	pCi/L	05/21/19 10:02	06/17/19 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*
Y Carrier	*84.5*		*40 - 110*	*05/21/19 10:02*	*06/17/19 15:59*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.255	U	0.258	0.259	5.00	0.396	pCi/L		06/24/19 09:02	1

Client Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Client Sample ID: Field Blank

Date Collected: 04/15/19 14:10
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-5
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0670	U	0.102	0.102	1.00	0.174	pCi/L	05/21/19 09:05	06/20/19 13:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.5*		*40 - 110*	*05/21/19 09:05*	*06/20/19 13:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.122	U	0.281	0.281	1.00	0.480	pCi/L	05/21/19 10:02	06/17/19 16:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.5*		*40 - 110*	*05/21/19 10:02*	*06/17/19 16:03*	*1*
Y Carrier	*84.5*		*40 - 110*	*05/21/19 10:02*	*06/17/19 16:03*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.189	U	0.299	0.299	5.00	0.480	pCi/L		06/24/19 09:02	1

Definitions/Glossary

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-429215/24-A
Matrix: Water
Analysis Batch: 432306

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 429215

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.05470	U	0.0932	0.0933	1.00	0.164	pCi/L	05/21/19 09:05	06/20/19 13:22	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*105*		*40 - 110*	*05/21/19 09:05*	*06/20/19 13:22*	*1*

Lab Sample ID: LCS 160-429215/1-A
Matrix: Water
Analysis Batch: 432305

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 429215

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.497		1.06	1.00	0.168	pCi/L	84	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*105*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-429223/24-A
Matrix: Water
Analysis Batch: 431881

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 429223

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1432	U	0.212	0.212	1.00	0.356	pCi/L	05/21/19 10:02	06/17/19 16:07	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*105*		*40 - 110*	*05/21/19 10:02*	*06/17/19 16:07*	*1*
Y Carrier	*82.6*		*40 - 110*	*05/21/19 10:02*	*06/17/19 16:07*	*1*

Lab Sample ID: LCS 160-429223/1-A
Matrix: Water
Analysis Batch: 431911

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 429223

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-228	9.11	8.016		1.07	1.00	0.646	pCi/L	88	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*105*		*40 - 110*
Y Carrier	*83.7*		*40 - 110*

QC Association Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Rad

Prep Batch: 429215

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	PrecSep-21	
310-153579-2	MW-302	Total/NA	Water	PrecSep-21	
310-153579-3	MW-303	Total/NA	Water	PrecSep-21	
310-153579-4	MW-6	Total/NA	Water	PrecSep-21	
310-153579-5	Field Blank	Total/NA	Water	PrecSep-21	
MB 160-429215/24-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-429215/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 429223

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-153579-1	MW-301	Total/NA	Water	PrecSep_0	
310-153579-2	MW-302	Total/NA	Water	PrecSep_0	
310-153579-3	MW-303	Total/NA	Water	PrecSep_0	
310-153579-4	MW-6	Total/NA	Water	PrecSep_0	
310-153579-5	Field Blank	Total/NA	Water	PrecSep_0	
MB 160-429223/24-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-429223/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: SCS Engineers | Job ID: 310-153579-2
Project/Site: IPL-Lansing, 25219070

Client Sample ID: MW-301
Lab Sample ID: 310-153579-1
Date Collected: 04/15/19 12:25
Matrix: Water
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			429215	05/21/19 09:05	ORM	TAL SL
Total/NA	Analysis	903.0		1	432306	06/20/19 09:56	CDR	TAL SL
Total/NA	Prep	PrecSep_0			429223	05/21/19 10:02	ORM	TAL SL
Total/NA	Analysis	904.0		1	431911	06/17/19 15:59	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	432478	06/24/19 09:02	SMP	TAL SL

Client Sample ID: MW-302
Lab Sample ID: 310-153579-2
Date Collected: 04/15/19 13:25
Matrix: Water
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			429215	05/21/19 09:05	ORM	TAL SL
Total/NA	Analysis	903.0		1	432306	06/20/19 09:57	CDR	TAL SL
Total/NA	Prep	PrecSep_0			429223	05/21/19 10:02	ORM	TAL SL
Total/NA	Analysis	904.0		1	431911	06/17/19 15:59	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	432478	06/24/19 09:02	SMP	TAL SL

Client Sample ID: MW-303
Lab Sample ID: 310-153579-3
Date Collected: 04/15/19 14:05
Matrix: Water
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			429215	05/21/19 09:05	ORM	TAL SL
Total/NA	Analysis	903.0		1	432306	06/20/19 09:57	CDR	TAL SL
Total/NA	Prep	PrecSep_0			429223	05/21/19 10:02	ORM	TAL SL
Total/NA	Analysis	904.0		1	431911	06/17/19 15:59	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	432478	06/24/19 09:02	SMP	TAL SL

Client Sample ID: MW-6
Lab Sample ID: 310-153579-4
Date Collected: 04/15/19 15:00
Matrix: Water
Date Received: 04/18/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			429215	05/21/19 09:05	ORM	TAL SL
Total/NA	Analysis	903.0		1	432305	06/20/19 13:16	CDR	TAL SL
Total/NA	Prep	PrecSep_0			429223	05/21/19 10:02	ORM	TAL SL
Total/NA	Analysis	904.0		1	431911	06/17/19 15:59	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	432478	06/24/19 09:02	SMP	TAL SL

Lab Chronicle

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Client Sample ID: Field Blank

Date Collected: 04/15/19 14:10
Date Received: 04/18/19 09:05

Lab Sample ID: 310-153579-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			429215	05/21/19 09:05	ORM	TAL SL
Total/NA	Analysis	903.0		1	432305	06/20/19 13:16	CDR	TAL SL
Total/NA	Prep	PrecSep_0			429223	05/21/19 10:02	ORM	TAL SL
Total/NA	Analysis	904.0		1	431881	06/17/19 16:03	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	432478	06/24/19 09:02	SMP	TAL SL

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: SCS Engineers　　Job ID: 310-153579-2
Project/Site: IPL-Lansing, 25219070

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Iowa	State Program	7	007	12-01-19

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	Dept. of Defense ELAP		L2305	04-06-22
ANAB	DoD		L2305	04-06-22
Arizona	State Program	9	AZ0813	12-08-19
California	State Program	9	2886	06-30-19 *
Connecticut	State Program	1	PH-0241	03-31-21
Florida	NELAP	4	E87689	06-30-19 *
Hawaii	State Program	9	NA	06-30-19
Illinois	NELAP	5	200023	11-30-19
Iowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA011	12-31-19
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-19
Missouri	State Program	7	780	06-30-19
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19 *
New York	NELAP	2	11616	03-31-20
North Dakota	State Program	8	R207	06-30-19 *
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State		9997	08-31-19
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-20
Pennsylvania	NELAP		68-00540	02-28-20
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-13	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542018-10	07-31-19
Virginia	NELAP	3	460230	06-14-20
Washington	State Program	10	C592	08-30-19
West Virginia DEP	State Program	3	381	08-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

310-153579 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information	
Client: SCS Engineers	
City/State: CITY Menomonee Falls STATE WI	Project: IPL-Lansing
Receipt Information	
Date/Time Received: DATE 4-18-19 TIME 905	Received By: LAB
Delivery Type: ☐ UPS ☒ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☐ Lab Courier ☐ TA Field Services ☐ Client Drop-off ☐ Other:________	
Condition of Cooler/Containers	
Sample(s) received in Cooler? ☒ Yes ☐ No	*If yes:* Cooler ID:
Multiple Coolers? ☐ Yes ☒ No	*If yes:* Cooler # ____ of ____
Cooler Custody Seals Present? ☒ Yes ☐ No	*If yes:* Cooler custody seals intact? ☒ Yes ☐ No
Sample Custody Seals Present? ☐ Yes ☒ No	*If yes:* Sample custody seals intact? ☐ Yes ☐ No
Trip Blank Present? ☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓
Temperature Record	
Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:________ ☐ NONE	
Thermometer ID: N	Correction Factor (°C): +0.0
• **Temp Blank Temperature** – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature	
Uncorrected Temp (°C): 3.0	Corrected Temp (°C): 3.0
• **Sample Container Temperature**	
Container type(s) used: CONTAINER 1	CONTAINER 2
Uncorrected Temp (°C): TEMP 1 TEMP 2	Corrected Temp (°C): TEMP 1 TEMP 2
Exceptions Noted	
1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No	
a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No	
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No	
NOTE: If yes, contact PM before proceeding. If no, proceed with login	
Additional Comments	

Document: CF-LG-WI-002
Revision: 24
Date: 03/07/2019

TestAmerica-Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

#38998

Eurofins TestAmerica, Cedar Falls
704 Enterprise Drive
Cedar Falls, IA 50613
Phone (319) 277-2401 Fax (319) 277-2425

Chain of Custody Record

TestAmerica Des Moines SC 214

eurofins | Environment Testing TestAmerica

Client Information	Sampler: Gary Sterkel	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-38998-12748.1
Client Contact: Gary Sterkel	Phone: 262-518-4081	E-Mail: sandie.fredrick@testamericainc.com		Page: Page 1 of 1
Company: SCS Engineers				Job #:
Address: N84 W13540 Leon Road	Due Date Requested:			
City: Menomonee Falls	TAT Requested (days): Standard			
State, Zip: WI, 53051				
Phone:	PO #: 25219070			
Email: gsterkel@scsengineers.com	WO #:			
Project Name: IPL-Lansing, 25219070	Project #: 31011020			
Site:	SSOW#:			

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
			Preservation Code:		X	X	D	N	D	D	X	
MW-301	4/15/19	1225	G	Water	N	N	1	1	1	1		
MW-302	4/15/19	1325	G	Water	N	N	1	1	1	1		
MW-303	4/15/19	1405	G	Water	N	N	1	1	1	1		
MW-6	4/15/19	1500	G	Water	N	N	1	1	1	1		
Field Blank	4/15/19	1410	G	Water	N	N	1	1	1	1		
				Water								

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ______ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:		Time:	Method of Shipment:	
Relinquished by: Gary Sterkel	Date/Time: 4/17/19 1700	Company: SCS	Received by: [signature]	Date/Time: 4/18/19 0905	Company: TACK
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Login Container Summary Report

Temperature readings: ______________________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-301	310-153579-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-301	310-153579-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-301	310-153579-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-153579-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-302	310-153579-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-153579-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-153579-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-303	310-153579-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-153579-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-153579-A-4	Plastic 250ml - with Nitric Acid	<2		
MW-6	310-153579-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-153579-D-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-153579-A-5	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-153579-C-5	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-153579-D-5	Plastic 1 liter - Nitric Acid	<2		

Table 2. Sampling Points and Parameters - CCR Rule Sampling Program
Groundwater Monitoring - Lansing Generating Station / SCS Engineers Project #25219070.00

	Parameter	MW-301	MW-302	MW-303	MW-20	MW-6	Field Blank	TOTAL
Appendix III Parameters	Boron	x	x	x		x	x	5
	Calcium	x	x	x		x	x	5
	Chloride	x	x	x		x	x	5
	Fluoride	x	x	x		x	x	5
	pH	x	x	x		x	x	5
	Sulfate	x	x	x		x	x	5
	TDS	x	x	x		x	x	5
Appendix IV Parameters	Antimony	x	x	x		x	x	5
	Arsenic	x	x	x		x	x	5
	Barium	x	x	x		x	x	5
	Beryllium	x	x	x		x	x	5
	Cadmium	x	x	x		x	x	5
	Chromium	x	x	x		x	x	5
	Cobalt	x	x	x		x	x	5
	Fluoride	x	x	x		x	x	5
	Lead	x	x	x		x	x	5
	Lithium	x	x	x		x	x	5
	Mercury	x	x	x		x	x	5
	Molybdenum	x	x	x		x	x	5
	Selenium	x	x	x		x	x	5
	Thallium	x	x	x		x	x	5
	Radium	x	x	x		x	x	5
Field Parameters	Groundwater Elevation	x	x	x	x	x		5
	Well Depth	x	x	x		x		4
	pH (field)	x	x	x		x		4
	Specific Conductance	x	x	x		x		4
	Dissolved Oxygen	x	x	x		x		4
	ORP	x	x	x		x		4
	Temperature	x	x	x		x		4
	Turbidity	x	x	x		x		4
	Color	x	x	x		x		4
	Odor	x	x	x		x		4

Notes: All samples are unfiltered (total analysis)

C:\Users\fredricks\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\3TD90TJJ\[L/

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Login Sample Receipt Checklist

Client: SCS Engineers | Job Number: 310-153579-2

Login Number: 153579
List Number: 1
Creator: Homolar, Dana J

List Source: Eurofins TestAmerica, Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: SCS Engineers | Job Number: 310-153579-2

Login Number: 153579
List Number: 2
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 04/22/19 02:00 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	18.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: SCS Engineers
Project/Site: IPL-Lansing, 25219070

Job ID: 310-153579-2

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**Ba Carrier (40-110)**
310-153579-1	MW-301	92.9
310-153579-2	MW-302	94.4
310-153579-3	MW-303	97.5
310-153579-4	MW-6	101
310-153579-5	Field Blank	97.5
LCS 160-429215/1-A	Lab Control Sample	105
MB 160-429215/24-A	Method Blank	105

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**Ba Carrier (40-110)**	**Y Carrier (40-110)**
310-153579-1	MW-301	92.9	81.9
310-153579-2	MW-302	94.4	83.0
310-153579-3	MW-303	97.5	82.2
310-153579-4	MW-6	101	84.5
310-153579-5	Field Blank	97.5	84.5
LCS 160-429223/1-A	Lab Control Sample	105	83.7
MB 160-429223/24-A	Method Blank	105	82.6

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

A2 Initial Sampling Event – Newly Installed Monitoring wells, June 2019

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ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-158624-1
Client Project/Site: Alliant Lansing, 25218221

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
7/12/2019 3:45:04 PM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Table of Contents

Case Narrative

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Job ID: 310-158624-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-158624-1

Comments
FIELD BLANK WATER DATA REVIEW: After review by the lab, the field blank water supplied for this analysis had notable concentrations of chloride, fluoride, sulfate, TDS, Barium, Calcium and Molydenum present. Reanalysis of the remaining service center field blank water confirms the higher levels of analytes present.

Receipt
The samples were received on 6/25/2019 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.8º C.

HPLC/IC
Method(s) 9056A: The following samples were diluted due to the nature of the sample matrix: MW-304 (310-158624-1), MW-305 (310-158624-2) and MW-306 (310-158624-3). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-158624-1	MW-304	Water	06/20/19 12:20	06/25/19 09:05	
310-158624-2	MW-305	Water	06/20/19 14:30	06/25/19 09:05	
310-158624-3	MW-306	Water	06/20/19 13:45	06/25/19 09:05	
310-158624-4	Field Blank	Water	06/20/19 14:15	06/25/19 09:05	

Detection Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Client Sample ID: MW-304 — Lab Sample ID: 310-158624-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	5.9		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	20		5.0	1.8	mg/L	5		9056A	Total/NA
Barium	54		2.0	0.84	ug/L	1		6020A	Total/NA
Calcium	82		0.50	0.10	mg/L	1		6020A	Total/NA
Chromium	1.6	J F2 F1	5.0	0.98	ug/L	1		6020A	Total/NA
Cobalt	1.1		0.50	0.091	ug/L	1		6020A	Total/NA
Lead	1.2		0.50	0.27	ug/L	1		6020A	Total/NA
Total Alkalinity as CaCO3 to pH 4.5	280		5.0	1.9	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	350		60	48	mg/L	1		SM 2540C	Total/NA
pH	7.4	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	N/A				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	41				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	6.2				mg/L	1		Field Sampling	Total/NA
pH, Field	7.01				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	593				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	10.6				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	104				NTU	1		Field Sampling	Total/NA
Well Depth	N/A				ft	1		Field Sampling	Total/NA

Client Sample ID: MW-305 — Lab Sample ID: 310-158624-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.8		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	24		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	2.2		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	170		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	180	J	200	110	ug/L	1		6020A	Total/NA
Calcium	92		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.52		0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	3.4	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	1.7	J	2.0	1.1	ug/L	1		6020A	Total/NA
Total Alkalinity as CaCO3 to pH 4.5	290		5.0	1.9	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	440		60	48	mg/L	1		SM 2540C	Total/NA
pH	7.2	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	N/A				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	27				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.2				mg/L	1		Field Sampling	Total/NA
pH, Field	7.19				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	638				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	15.5				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	9.60				NTU	1		Field Sampling	Total/NA
Well Depth	N/A				ft	1		Field Sampling	Total/NA

Client Sample ID: MW-306 — Lab Sample ID: 310-158624-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	24		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	280		20	7.0	mg/L	20		9056A	Total/NA
Arsenic	8.6		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	280		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	860		200	110	ug/L	1		6020A	Total/NA
Calcium	240		0.50	0.10	mg/L	1		6020A	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

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Client Sample ID: MW-306 (Continued)

Lab Sample ID: 310-158624-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	1.0		0.50	0.091	ug/L	1		6020A	Total/NA
Lead	0.52		0.50	0.27	ug/L	1		6020A	Total/NA
Lithium	19		10	2.7	ug/L	1		6020A	Total/NA
Total Alkalinity as CaCO3 to pH 4.5	620		5.0	1.9	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	1200		60	48	mg/L	1		SM 2540C	Total/NA
pH	6.9	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	N/A				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	22				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	1.0				mg/L	1		Field Sampling	Total/NA
pH, Field	6.87				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1632				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.8				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	25.90				NTU	1		Field Sampling	Total/NA
Well Depth	N/A				ft	1		Field Sampling	Total/NA

Client Sample ID: Field Blank

Lab Sample ID: 310-158624-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	21		1.0	0.29	mg/L	1		9056A	Total/NA
Fluoride	0.82		0.10	0.045	mg/L	1		9056A	Total/NA
Sulfate	37		1.0	0.35	mg/L	1		9056A	Total/NA
Barium	3.5		2.0	0.84	ug/L	1		6020A	Total/NA
Calcium	0.37	J	0.50	0.10	mg/L	1		6020A	Total/NA
Molybdenum	1.1	J	2.0	1.1	ug/L	1		6020A	Total/NA
Total Alkalinity as CaCO3	220		5.0	1.9	mg/L	1		2320B	Total/NA
Total Dissolved Solids	360		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.7	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Client Sample ID: MW-304
Date Collected: 06/20/19 12:20
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-1
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**5.9**		5.0	1.5	mg/L			06/28/19 21:21	5
Fluoride	<0.23		0.50	0.23	mg/L			06/28/19 21:21	5
Sulfate	**20**		5.0	1.8	mg/L			06/28/19 21:21	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		06/26/19 08:26	07/03/19 13:10	1
Arsenic	<0.75		2.0	0.75	ug/L		06/26/19 08:26	07/01/19 21:26	1
Barium	**54**		2.0	0.84	ug/L		06/26/19 08:26	07/03/19 13:10	1
Beryllium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:26	1
Boron	<110		200	110	ug/L		06/26/19 08:26	07/01/19 21:26	1
Cadmium	<0.077		0.50	0.077	ug/L		06/26/19 08:26	07/03/19 13:10	1
Calcium	**82**		0.50	0.10	mg/L		06/26/19 08:26	07/01/19 21:26	1
Chromium	**1.6**	**J F2 F1**	5.0	0.98	ug/L		06/26/19 08:26	07/01/19 21:26	1
Cobalt	**1.1**		0.50	0.091	ug/L		06/26/19 08:26	07/01/19 21:26	1
Lead	**1.2**		0.50	0.27	ug/L		06/26/19 08:26	07/03/19 13:10	1
Lithium	<2.7		10	2.7	ug/L		06/26/19 08:26	07/01/19 21:26	1
Molybdenum	<1.1		2.0	1.1	ug/L		06/26/19 08:26	07/01/19 21:26	1
Selenium	<1.0		5.0	1.0	ug/L		06/26/19 08:26	07/01/19 21:26	1
Thallium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:26	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		06/26/19 10:28	06/27/19 15:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3 to pH 4.!	**280**		5.0	1.9	mg/L			06/28/19 11:33	1
Total Dissolved Solids	**350**		60	48	mg/L			06/25/19 15:39	1
pH	**7.4**	**HF**	0.1	0.1	SU			06/25/19 16:59	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**N/A**				ft			06/20/19 12:20	1
Oxidation Reduction Potential	**41**				millivolts			06/20/19 12:20	1
Oxygen, Dissolved, Client Supplied	**6.2**				mg/L			06/20/19 12:20	1
pH, Field	**7.01**				SU			06/20/19 12:20	1
Specific Conductance, Field	**593**				umhos/cm			06/20/19 12:20	1
Temperature, Field	**10.6**				Degrees C			06/20/19 12:20	1
Turbidity, Field	**104**				NTU			06/20/19 12:20	1
Well Depth	**N/A**				ft			06/20/19 12:20	1

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Client Sample ID: MW-305
Date Collected: 06/20/19 14:30
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-2
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**6.8**		5.0	1.5	mg/L			06/28/19 21:35	5
Fluoride	<0.23		0.50	0.23	mg/L			06/28/19 21:35	5
Sulfate	**24**		5.0	1.8	mg/L			06/28/19 21:35	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		06/26/19 08:26	07/03/19 13:20	1
Arsenic	**2.2**		2.0	0.75	ug/L		06/26/19 08:26	07/01/19 21:36	1
Barium	**170**		2.0	0.84	ug/L		06/26/19 08:26	07/03/19 13:20	1
Beryllium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:36	1
Boron	**180**	**J**	200	110	ug/L		06/26/19 08:26	07/01/19 21:36	1
Cadmium	<0.077		0.50	0.077	ug/L		06/26/19 08:26	07/03/19 13:20	1
Calcium	**92**		0.50	0.10	mg/L		06/26/19 08:26	07/01/19 21:36	1
Chromium	<0.98		5.0	0.98	ug/L		06/26/19 08:26	07/01/19 21:36	1
Cobalt	**0.52**		0.50	0.091	ug/L		06/26/19 08:26	07/01/19 21:36	1
Lead	<0.27		0.50	0.27	ug/L		06/26/19 08:26	07/03/19 13:20	1
Lithium	**3.4**	**J**	10	2.7	ug/L		06/26/19 08:26	07/01/19 21:36	1
Molybdenum	**1.7**	**J**	2.0	1.1	ug/L		06/26/19 08:26	07/01/19 21:36	1
Selenium	<1.0		5.0	1.0	ug/L		06/26/19 08:26	07/01/19 21:36	1
Thallium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:36	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		06/26/19 10:28	06/27/19 15:28	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3 to pH 4.!	**290**		5.0	1.9	mg/L			06/28/19 11:33	1
Total Dissolved Solids	**440**		60	48	mg/L			06/25/19 15:39	1
pH	**7.2**	**HF**	0.1	0.1	SU			06/25/19 17:00	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**N/A**				ft			06/20/19 14:30	1
Oxidation Reduction Potential	**27**				millivolts			06/20/19 14:30	1
Oxygen, Dissolved, Client Supplied	**0.2**				mg/L			06/20/19 14:30	1
pH, Field	**7.19**				SU			06/20/19 14:30	1
Specific Conductance, Field	**638**				umhos/cm			06/20/19 14:30	1
Temperature, Field	**15.5**				Degrees C			06/20/19 14:30	1
Turbidity, Field	**9.60**				NTU			06/20/19 14:30	1
Well Depth	**N/A**				ft			06/20/19 14:30	1

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Client Sample ID: MW-306
Date Collected: 06/20/19 13:45
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-3
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**24**		5.0	1.5	mg/L			06/28/19 22:04	5
Fluoride	<0.23		0.50	0.23	mg/L			06/28/19 22:04	5
Sulfate	**280**		20	7.0	mg/L			06/28/19 22:48	20

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		06/26/19 08:26	07/03/19 13:23	1
Arsenic	**8.6**		2.0	0.75	ug/L		06/26/19 08:26	07/01/19 21:39	1
Barium	**280**		2.0	0.84	ug/L		06/26/19 08:26	07/03/19 13:23	1
Beryllium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:39	1
Boron	**860**		200	110	ug/L		06/26/19 08:26	07/01/19 21:39	1
Cadmium	<0.077		0.50	0.077	ug/L		06/26/19 08:26	07/03/19 13:23	1
Calcium	**240**		0.50	0.10	mg/L		06/26/19 08:26	07/01/19 21:39	1
Chromium	<0.98		5.0	0.98	ug/L		06/26/19 08:26	07/01/19 21:39	1
Cobalt	**1.0**		0.50	0.091	ug/L		06/26/19 08:26	07/01/19 21:39	1
Lead	**0.52**		0.50	0.27	ug/L		06/26/19 08:26	07/03/19 13:23	1
Lithium	**19**		10	2.7	ug/L		06/26/19 08:26	07/01/19 21:39	1
Molybdenum	<1.1		2.0	1.1	ug/L		06/26/19 08:26	07/01/19 21:39	1
Selenium	<1.0		5.0	1.0	ug/L		06/26/19 08:26	07/01/19 21:39	1
Thallium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:39	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		06/26/19 10:28	06/27/19 15:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3 to pH 4.!	**620**		5.0	1.9	mg/L			06/28/19 11:33	1
Total Dissolved Solids	**1200**		60	48	mg/L			06/25/19 15:39	1
pH	**6.9**	**HF**	0.1	0.1	SU			06/25/19 17:01	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**N/A**				ft			06/20/19 13:45	1
Oxidation Reduction Potential	**22**				millivolts			06/20/19 13:45	1
Oxygen, Dissolved, Client Supplied	**1.0**				mg/L			06/20/19 13:45	1
pH, Field	**6.87**				SU			06/20/19 13:45	1
Specific Conductance, Field	**1632**				umhos/cm			06/20/19 13:45	1
Temperature, Field	**13.8**				Degrees C			06/20/19 13:45	1
Turbidity, Field	**25.90**				NTU			06/20/19 13:45	1
Well Depth	**N/A**				ft			06/20/19 13:45	1

Client Sample ID: Field Blank

Lab Sample ID: 310-158624-4
Date Collected: 06/20/19 14:15
Matrix: Water
Date Received: 06/25/19 09:05

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**21**		1.0	0.29	mg/L			06/28/19 23:03	1
Fluoride	**0.82**		0.10	0.045	mg/L			06/28/19 23:03	1
Sulfate	**37**		1.0	0.35	mg/L			06/28/19 23:03	1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		06/26/19 08:26	07/03/19 13:27	1
Arsenic	<0.75		2.0	0.75	ug/L		06/26/19 08:26	07/03/19 13:27	1
Barium	**3.5**		2.0	0.84	ug/L		06/26/19 08:26	07/03/19 13:27	1
Beryllium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:53	1
Boron	<110		200	110	ug/L		06/26/19 08:26	07/01/19 21:53	1
Cadmium	<0.077		0.50	0.077	ug/L		06/26/19 08:26	07/03/19 13:27	1
Calcium	**0.37**	**J**	0.50	0.10	mg/L		06/26/19 08:26	07/03/19 13:27	1
Chromium	<0.98		5.0	0.98	ug/L		06/26/19 08:26	07/01/19 21:53	1
Cobalt	<0.091		0.50	0.091	ug/L		06/26/19 08:26	07/01/19 21:53	1
Lead	<0.27		0.50	0.27	ug/L		06/26/19 08:26	07/01/19 21:53	1
Lithium	<2.7		10	2.7	ug/L		06/26/19 08:26	07/03/19 13:27	1
Molybdenum	**1.1**	**J**	2.0	1.1	ug/L		06/26/19 08:26	07/01/19 21:53	1
Selenium	<1.0		5.0	1.0	ug/L		06/26/19 08:26	07/03/19 13:27	1
Thallium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:53	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		06/26/19 10:28	06/27/19 15:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3	**220**		5.0	1.9	mg/L			06/28/19 16:15	1
Total Dissolved Solids	**360**		30	24	mg/L			06/25/19 15:39	1
pH	**7.7**	**HF**	0.1	0.1	SU			06/25/19 17:02	1

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Definitions/Glossary

Client: SCS Engineers | Job ID: 310-158624-1
Project/Site: Alliant Lansing, 25218221

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F1	MS and/or MSD Recovery is outside acceptance limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-244437/34
Matrix: Water
Analysis Batch: 244437

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.29		1.0	0.29	mg/L			07/01/19 10:15	1
Fluoride	<0.045		0.10	0.045	mg/L			07/01/19 10:15	1
Sulfate	<0.35		1.0	0.35	mg/L			07/01/19 10:15	1

Lab Sample ID: LCS 310-244437/35
Matrix: Water
Analysis Batch: 244437

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	10.2		mg/L		102	90 - 110
Fluoride	2.00	2.08		mg/L		104	90 - 110
Sulfate	10.0	10.5		mg/L		105	90 - 110

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-243799/1-A
Matrix: Water
Analysis Batch: 244559

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 243799

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.75		2.0	0.75	ug/L		06/26/19 08:26	07/01/19 21:19	1
Beryllium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:19	1
Boron	<110		200	110	ug/L		06/26/19 08:26	07/01/19 21:19	1
Calcium	<0.10		0.50	0.10	mg/L		06/26/19 08:26	07/01/19 21:19	1
Chromium	<0.98		5.0	0.98	ug/L		06/26/19 08:26	07/01/19 21:19	1
Cobalt	<0.091		0.50	0.091	ug/L		06/26/19 08:26	07/01/19 21:19	1
Lithium	<2.7		10	2.7	ug/L		06/26/19 08:26	07/01/19 21:19	1
Molybdenum	<1.1		2.0	1.1	ug/L		06/26/19 08:26	07/01/19 21:19	1
Selenium	<1.0		5.0	1.0	ug/L		06/26/19 08:26	07/01/19 21:19	1
Thallium	<0.27		1.0	0.27	ug/L		06/26/19 08:26	07/01/19 21:19	1

Lab Sample ID: MB 310-243799/1-A
Matrix: Water
Analysis Batch: 245078

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 243799

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	<0.53		1.0	0.53	ug/L		06/26/19 08:26	07/03/19 12:53	1
Barium	<0.84		2.0	0.84	ug/L		06/26/19 08:26	07/03/19 12:53	1
Cadmium	<0.077		0.50	0.077	ug/L		06/26/19 08:26	07/03/19 12:53	1
Lead	<0.27		0.50	0.27	ug/L		06/26/19 08:26	07/03/19 12:53	1

Lab Sample ID: LCS 310-243799/2-A
Matrix: Water
Analysis Batch: 244559

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	40.0	44.0		ug/L		110	80 - 120
Beryllium	20.0	22.1		ug/L		110	80 - 120
Boron	880	972		ug/L		110	80 - 120
Calcium	2.00	2.30		mg/L		115	80 - 120

QC Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 310-243799/2-A
Matrix: Water
Analysis Batch: 244559

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	40.0	44.6		ug/L		112	80 - 120
Cobalt	20.0	22.7		ug/L		114	80 - 120
Lithium	100	105		ug/L		105	80 - 120
Molybdenum	40.0	45.0		ug/L		113	80 - 120
Selenium	40.0	43.6		ug/L		109	80 - 120
Thallium	16.0	18.0		ug/L		113	80 - 120

Lab Sample ID: LCS 310-243799/2-A
Matrix: Water
Analysis Batch: 245078

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	20.0	20.4		ug/L		102	80 - 120
Barium	40.0	43.8		ug/L		109	80 - 120
Cadmium	20.0	22.2		ug/L		111	80 - 120
Lead	20.0	22.4		ug/L		112	80 - 120

Lab Sample ID: 310-158624-1 MS
Matrix: Water
Analysis Batch: 244559

Client Sample ID: MW-304
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	<0.75		40.0	45.2		ug/L		113	75 - 125
Beryllium	<0.27		20.0	22.8		ug/L		114	75 - 125
Boron	<110		880	1040		ug/L		118	75 - 125
Calcium	82		2.00	82.7	4	mg/L		37	75 - 125
Chromium	1.6	J F2 F1	40.0	46.1		ug/L		111	75 - 125
Cobalt	1.1		20.0	23.0		ug/L		110	75 - 125
Lithium	<2.7		100	108		ug/L		108	75 - 125
Molybdenum	<1.1		40.0	46.2		ug/L		116	75 - 125
Selenium	<1.0		40.0	44.0		ug/L		110	75 - 125
Thallium	<0.27		16.0	18.0		ug/L		112	75 - 125

Lab Sample ID: 310-158624-1 MS
Matrix: Water
Analysis Batch: 245078

Client Sample ID: MW-304
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	<0.53		20.0	20.5		ug/L		102	75 - 125
Barium	54		40.0	100		ug/L		114	75 - 125
Cadmium	<0.077		20.0	22.3		ug/L		112	75 - 125
Lead	1.2		20.0	23.8		ug/L		113	75 - 125

Lab Sample ID: 310-158624-1 MSD
Matrix: Water
Analysis Batch: 244559

Client Sample ID: MW-304
Prep Type: Total/NA
Prep Batch: 243799

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	<0.75		40.0	43.9		ug/L		110	75 - 125	3	20
Beryllium	<0.27		20.0	22.2		ug/L		111	75 - 125	2	20

QC Sample Results

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 310-158624-1 MSD — **Client Sample ID: MW-304**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 244559 — **Prep Batch: 243799**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Boron	<110		880	1070		ug/L		122	75 - 125	3	20
Calcium	82		2.00	84.8	4	mg/L		142	75 - 125	2	20
Chromium	1.6	J F2 F1	40.0	70.9	F1 F2	ug/L		173	75 - 125	42	20
Cobalt	1.1		20.0	23.2		ug/L		111	75 - 125	1	20
Lithium	<2.7		100	106		ug/L		106	75 - 125	2	20
Molybdenum	<1.1		40.0	47.0		ug/L		117	75 - 125	2	20
Selenium	<1.0		40.0	43.3		ug/L		108	75 - 125	2	20
Thallium	<0.27		16.0	17.6		ug/L		110	75 - 125	2	20

Lab Sample ID: 310-158624-1 MSD — **Client Sample ID: MW-304**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 245078 — **Prep Batch: 243799**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	<0.53		20.0	20.4		ug/L		102	75 - 125	0	20
Barium	54		40.0	100		ug/L		115	75 - 125	0	20
Cadmium	<0.077		20.0	22.2		ug/L		111	75 - 125	1	20
Lead	1.2		20.0	23.6		ug/L		112	75 - 125	1	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 310-243832/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 244121 — **Prep Batch: 243832**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.20	0.10	ug/L		06/26/19 10:28	06/27/19 14:38	1

Lab Sample ID: LCS 310-243832/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 244121 — **Prep Batch: 243832**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	1.67	1.60		ug/L		96	80 - 120

Method: 2320B - Alkalinity (Low Level)

Lab Sample ID: MB 310-244274/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 244274

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3	<1.9		5.0	1.9	mg/L			06/28/19 16:15	1

Lab Sample ID: LCS 310-244274/2 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 244274

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Alkalinity as CaCO3	1060	963		mg/L		91	90 - 110

Method: 2320B - Alkalinity (Low Level) (Continued)

Lab Sample ID: 310-158624-4 MS
Matrix: Water
Analysis Batch: 244274

Client Sample ID: Field Blank
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Alkalinity as CaCO3	220		265	472		mg/L		96	74 - 122

Lab Sample ID: 310-158624-4 MSD
Matrix: Water
Analysis Batch: 244274

Client Sample ID: Field Blank
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Alkalinity as CaCO3	220		265	472		mg/L		96	74 - 122	0	14

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 310-244216/1
Matrix: Water
Analysis Batch: 244216

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Alkalinity as CaCO3 to pH 4.5	<1.9		5.0	1.9	mg/L			06/28/19 11:33	1

Lab Sample ID: LCS 310-244216/2
Matrix: Water
Analysis Batch: 244216

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Alkalinity as CaCO3 to pH 4.5	1060	965		mg/L		91	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-243733/1
Matrix: Water
Analysis Batch: 243733

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<24		30	24	mg/L			06/25/19 15:39	1

Lab Sample ID: LCS 310-243733/2
Matrix: Water
Analysis Batch: 243733

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	982		mg/L		98	90 - 110

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-243744/1
Matrix: Water
Analysis Batch: 243744

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	6.9		SU		99	98 - 102

QC Association Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

HPLC/IC

Analysis Batch: 244437

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	9056A	
310-158624-2	MW-305	Total/NA	Water	9056A	
310-158624-3	MW-306	Total/NA	Water	9056A	
310-158624-3	MW-306	Total/NA	Water	9056A	
310-158624-4	Field Blank	Total/NA	Water	9056A	
MB 310-244437/34	Method Blank	Total/NA	Water	9056A	
LCS 310-244437/35	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 243799

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	3010A	
310-158624-2	MW-305	Total/NA	Water	3010A	
310-158624-3	MW-306	Total/NA	Water	3010A	
310-158624-4	Field Blank	Total/NA	Water	3010A	
MB 310-243799/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-243799/2-A	Lab Control Sample	Total/NA	Water	3010A	
310-158624-1 MS	MW-304	Total/NA	Water	3010A	
310-158624-1 MSD	MW-304	Total/NA	Water	3010A	

Prep Batch: 243832

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	7470A	
310-158624-2	MW-305	Total/NA	Water	7470A	
310-158624-3	MW-306	Total/NA	Water	7470A	
310-158624-4	Field Blank	Total/NA	Water	7470A	
MB 310-243832/1-A	Method Blank	Total/NA	Water	7470A	
LCS 310-243832/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 244121

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	7470A	243832
310-158624-2	MW-305	Total/NA	Water	7470A	243832
310-158624-3	MW-306	Total/NA	Water	7470A	243832
310-158624-4	Field Blank	Total/NA	Water	7470A	243832
MB 310-243832/1-A	Method Blank	Total/NA	Water	7470A	243832
LCS 310-243832/2-A	Lab Control Sample	Total/NA	Water	7470A	243832

Analysis Batch: 244559

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	6020A	243799
310-158624-2	MW-305	Total/NA	Water	6020A	243799
310-158624-3	MW-306	Total/NA	Water	6020A	243799
310-158624-4	Field Blank	Total/NA	Water	6020A	243799
MB 310-243799/1-A	Method Blank	Total/NA	Water	6020A	243799
LCS 310-243799/2-A	Lab Control Sample	Total/NA	Water	6020A	243799
310-158624-1 MS	MW-304	Total/NA	Water	6020A	243799
310-158624-1 MSD	MW-304	Total/NA	Water	6020A	243799

QC Association Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Metals

Analysis Batch: 245078

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	6020A	243799
310-158624-2	MW-305	Total/NA	Water	6020A	243799
310-158624-3	MW-306	Total/NA	Water	6020A	243799
310-158624-4	Field Blank	Total/NA	Water	6020A	243799
MB 310-243799/1-A	Method Blank	Total/NA	Water	6020A	243799
LCS 310-243799/2-A	Lab Control Sample	Total/NA	Water	6020A	243799
310-158624-1 MS	MW-304	Total/NA	Water	6020A	243799
310-158624-1 MSD	MW-304	Total/NA	Water	6020A	243799

General Chemistry

Analysis Batch: 243733

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	SM 2540C	
310-158624-2	MW-305	Total/NA	Water	SM 2540C	
310-158624-3	MW-306	Total/NA	Water	SM 2540C	
310-158624-4	Field Blank	Total/NA	Water	SM 2540C	
MB 310-243733/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-243733/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 243744

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	SM 4500 H+ B	
310-158624-2	MW-305	Total/NA	Water	SM 4500 H+ B	
310-158624-3	MW-306	Total/NA	Water	SM 4500 H+ B	
310-158624-4	Field Blank	Total/NA	Water	SM 4500 H+ B	
LCS 310-243744/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 244216

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	SM 2320B	
310-158624-2	MW-305	Total/NA	Water	SM 2320B	
310-158624-3	MW-306	Total/NA	Water	SM 2320B	
MB 310-244216/1	Method Blank	Total/NA	Water	SM 2320B	
LCS 310-244216/2	Lab Control Sample	Total/NA	Water	SM 2320B	

Analysis Batch: 244274

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-4	Field Blank	Total/NA	Water	2320B	
MB 310-244274/1	Method Blank	Total/NA	Water	2320B	
LCS 310-244274/2	Lab Control Sample	Total/NA	Water	2320B	
310-158624-4 MS	Field Blank	Total/NA	Water	2320B	
310-158624-4 MSD	Field Blank	Total/NA	Water	2320B	

Field Service / Mobile Lab

Analysis Batch: 245591

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	Field Sampling	
310-158624-2	MW-305	Total/NA	Water	Field Sampling	
310-158624-3	MW-306	Total/NA	Water	Field Sampling	

Eurofins TestAmerica, Cedar Falls

Lab Chronicle

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Client Sample ID: MW-304

Lab Sample ID: 310-158624-1

Date Collected: 06/20/19 12:20
Date Received: 06/25/19 09:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	244437	06/28/19 21:21	MLU	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	244559	07/01/19 21:26	SAD	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	245078	07/03/19 13:10	SAD	TAL CF
Total/NA	Prep	7470A			243832	06/26/19 10:28	SAD	TAL CF
Total/NA	Analysis	7470A		1	244121	06/27/19 15:25	MLU	TAL CF
Total/NA	Analysis	SM 2320B		1	244216	06/28/19 11:33	MDK	TAL CF
Total/NA	Analysis	SM 2540C		1	243733	06/25/19 15:39	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	243744	06/25/19 16:59	ARG	TAL CF
Total/NA	Analysis	Field Sampling		1	245591	06/20/19 12:20	ANO	TAL CF

Client Sample ID: MW-305

Lab Sample ID: 310-158624-2

Date Collected: 06/20/19 14:30
Date Received: 06/25/19 09:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	244437	06/28/19 21:35	MLU	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	244559	07/01/19 21:36	SAD	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	245078	07/03/19 13:20	SAD	TAL CF
Total/NA	Prep	7470A			243832	06/26/19 10:28	SAD	TAL CF
Total/NA	Analysis	7470A		1	244121	06/27/19 15:28	MLU	TAL CF
Total/NA	Analysis	SM 2320B		1	244216	06/28/19 11:33	MDK	TAL CF
Total/NA	Analysis	SM 2540C		1	243733	06/25/19 15:39	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	243744	06/25/19 17:00	ARG	TAL CF
Total/NA	Analysis	Field Sampling		1	245591	06/20/19 14:30	ANO	TAL CF

Client Sample ID: MW-306

Lab Sample ID: 310-158624-3

Date Collected: 06/20/19 13:45
Date Received: 06/25/19 09:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	244437	06/28/19 22:04	MLU	TAL CF
Total/NA	Analysis	9056A		20	244437	06/28/19 22:48	MLU	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	244559	07/01/19 21:39	SAD	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	245078	07/03/19 13:23	SAD	TAL CF
Total/NA	Prep	7470A			243832	06/26/19 10:28	SAD	TAL CF
Total/NA	Analysis	7470A		1	244121	06/27/19 15:30	MLU	TAL CF
Total/NA	Analysis	SM 2320B		1	244216	06/28/19 11:33	MDK	TAL CF

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Client Sample ID: MW-306

Lab Sample ID: 310-158624-3

Date Collected: 06/20/19 13:45

Matrix: Water

Date Received: 06/25/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 2540C		1	243733	06/25/19 15:39	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	243744	06/25/19 17:01	ARG	TAL CF
Total/NA	Analysis	Field Sampling		1	245591	06/20/19 13:45	ANO	TAL CF

Client Sample ID: Field Blank

Lab Sample ID: 310-158624-4

Date Collected: 06/20/19 14:15

Matrix: Water

Date Received: 06/25/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	244437	06/28/19 23:03	MLU	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	244559	07/01/19 21:53	SAD	TAL CF
Total/NA	Prep	3010A			243799	06/26/19 08:26	HED	TAL CF
Total/NA	Analysis	6020A		1	245078	07/03/19 13:27	SAD	TAL CF
Total/NA	Prep	7470A			243832	06/26/19 10:28	SAD	TAL CF
Total/NA	Analysis	7470A		1	244121	06/27/19 15:32	MLU	TAL CF
Total/NA	Analysis	2320B		1	244274	06/28/19 16:15	MDK	TAL CF
Total/NA	Analysis	SM 2540C		1	243733	06/25/19 15:39	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	243744	06/25/19 17:02	ARG	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers Job ID: 310-158624-1
Project/Site: Alliant Lansing, 25218221

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Iowa	State Program	7	007	12-01-19

Method Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
7470A	Mercury (CVAA)	SW846	TAL CF
2320B	Alkalinity (Low Level)	SM	TAL CF
SM 2320B	Alkalinity	SM	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF
7470A	Preparation, Mercury	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Table 3. Parameters for Groundwater Monitoring to meet Federal Requirements

Appendix III	Boron
	Calcium
	Chloride
	Fluoride
	pH
	Sulfate
	TDS
Appendix IV	Antimony
	Arsenic
	Barium
	Beryllium
	Cadmium
	Chromium
	Cobalt
	Fluoride
	Lead
	Lithium
	Mercury
	Molybdenum
	Selenium
	Thallium
	Radium

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310-158624 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information

Client: SCS

City/State: CITY Menomonee Falls STATE WI	Project:

Receipt Information

Date/Time Received: DATE 6-25-19 TIME 905	Received By: LAB

Delivery Type: ☐ UPS ☒ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee
☐ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:________

Condition of Cooler/Containers

Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☐ Yes ☒ No	*If yes:* Cooler # ____ of ____	
Cooler Custody Seals Present?	☒ Yes ☐ No	*If yes:* Cooler custody seals intact?	☒ Yes ☐ No
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact?	☐ Yes ☐ No
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	

Temperature Record

Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:________ ☐ NONE

Thermometer ID: M	Correction Factor (°C): -0.1

• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature

Uncorrected Temp (°C): 0.9	Corrected Temp (°C): 0.8

• Sample Container Temperature

Container(s) used:	CONTAINER 1	CONTAINER 2
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

#404059

Eurofins TestAmerica, Cedar Falls
704 Enterprise Drive
Cedar Falls, IA 50613
Phone: 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins | Environment Testing TestAmerica

Client Information	Sampler: Gary Sterkel	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-40459-13154.1
Client Contact: Gary Sterkel	Phone: 262 518 4081	E-Mail: sandie.fredrick@testamericainc.com		Page: Page 1 of 1
Company: SCS Engineers		Analysis Requested		Job #:
Address: N84 W13540 Leon Road	Due Date Requested:			
City: Menomonee Falls	TAT Requested (days): Standard			
State, Zip: WI, 53051				
Phone:	PO #: 25218221			
Email: gsterkel@scsengineers.com	WO #:			
Project Name: Alliant Lansing, 25218221	Project #: 31011020			
Site:	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
				Preservation Code:			D	N	D	D		
~~MW-301~~ MW-304	6/20/19	1220	G	Water	N	N	1	1	1	1		
~~MW-302~~ MW-305	6/20/19	1430	G	Water	N	N	1	1	1	1		
~~MW-303~~ MW-306	6/20/19	1345	G	Water	N	N	1	1	1	1		
~~MW-6~~ FIELD BLANK	6/20/19	1415	G	Water	N	N	1	1	1	1		

Possible Hazard Identification
[X] Non-Hazard [ ] Flammable [ ] Skin Irritant [ ] Poison B [ ] Unknown [ ] Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
[ ] Return To Client [X] Disposal By Lab [ ] Archive For ______ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:		Time:	Method of Shipment:	
Relinquished by: Gary Sterkel	Date/Time: 6/21/19 1200	Company: SCS	Received by: [signature]	Date/Time: 6-21-19 12:00	Company: TA
Relinquished by: [signature]	Date/Time: 6-21-19 1700	Company: TA	Received by: [signature]	Date/Time: 6/25/19 0905	Company: TA
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 15735

Ver: 01/16/2019

Temperature readings: ______________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-304	310-158624-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-304	310-158624-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-158624-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-158624-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-305	310-158624-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-158624-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-158624-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-306	310-158624-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-158624-D-3	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-158624-A-4	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-158624-C-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-158624-D-4	Plastic 1 liter - Nitric Acid	<2		

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-158624-1

Login Number: 158624
List Number: 1
Creator: Bovy, Lorrainna L

List Source: Eurofins TestAmerica, Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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TestAmerica

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-158624-2
Client Project/Site: Alliant Lansing, 25218221

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
8/15/2019 9:31:16 AM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Job ID: 310-158624-2

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-158624-2

Comments
No additional comments.

Receipt
The samples were received on 6/25/2019 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.8º C.

RAD
Method(s) 903.0, 9315: Ra-226 Prep Batch 160-433168 & Method(s) 904.0, 9320: Ra-228 Prep Batch 160-433172: Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-304 (310-158624-1), MW-305 (310-158624-2), MW-306 (310-158624-3), Field Blank (310-158624-4), (LCS 160-433168/1-A), (LCSD 160-433168/2-A) and (MB 160-433168/18-A

Method(s) PrecSep-21: Radium 226 Prep Batch 160-433168 & Method(s) PrecSep_0: Radium 228 Prep Batch 160-433172: Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-304 (310-158624-1), MW-305 (310-158624-2), MW-306 (310-158624-3) and Field Blank (310-158624-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-433168 & Method(s) PrecSep_0: Radium 228 Prep Batch 160-433172: The following samples were prepared at a reduced aliquot due to yellow discoloration: MW-304 (310-158624-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-158624-1	MW-304	Water	06/20/19 12:20	06/25/19 09:05	
310-158624-2	MW-305	Water	06/20/19 14:30	06/25/19 09:05	
310-158624-3	MW-306	Water	06/20/19 13:45	06/25/19 09:05	
310-158624-4	Field Blank	Water	06/20/19 14:15	06/25/19 09:05	

Detection Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: MW-304 — Lab Sample ID: 310-158624-1

No Detections.

Client Sample ID: MW-305 — Lab Sample ID: 310-158624-2

No Detections.

Client Sample ID: MW-306 — Lab Sample ID: 310-158624-3

No Detections.

Client Sample ID: Field Blank — Lab Sample ID: 310-158624-4

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: MW-304
Date Collected: 06/20/19 12:20
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-1
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.217**		0.0991	0.101	1.00	0.111	pCi/L	06/28/19 13:59	08/14/19 13:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.5*		*40 - 110*	*06/28/19 13:59*	*08/14/19 13:11*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.139	U	0.274	0.275	1.00	0.468	pCi/L	06/28/19 14:44	07/18/19 08:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.5*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*
Y Carrier	*87.9*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.356	U	0.291	0.293	5.00	0.468	pCi/L		08/15/19 09:03	1

Client Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: MW-305

Date Collected: 06/20/19 14:30
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-2
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.181**		0.0801	0.0817	1.00	0.0872	pCi/L	06/28/19 13:59	08/14/19 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.9*		*40 - 110*	*06/28/19 13:59*	*08/14/19 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.372**		0.235	0.237	1.00	0.361	pCi/L	06/28/19 14:44	07/18/19 08:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.9*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*
Y Carrier	*88.6*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.553**		0.248	0.251	5.00	0.361	pCi/L		08/15/19 09:03	1

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: MW-306
Date Collected: 06/20/19 13:45
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-3
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.432		0.112	0.118	1.00	0.0964	pCi/L	06/28/19 13:59	08/14/19 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*40 - 110*	*06/28/19 13:59*	*08/14/19 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.465		0.241	0.245	1.00	0.360	pCi/L	06/28/19 14:44	07/18/19 08:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*
Y Carrier	*96.4*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:53*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.897		0.266	0.272	5.00	0.360	pCi/L		08/15/19 09:03	1

Client Sample Results

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: Field Blank

Date Collected: 06/20/19 14:15
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-4

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0236	U	0.0359	0.0359	1.00	0.0884	pCi/L	06/28/19 13:59	08/14/19 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*106*		*40 - 110*	*06/28/19 13:59*	*08/14/19 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.500**		0.224	0.229	1.00	0.326	pCi/L	06/28/19 14:44	07/18/19 08:54	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*106*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:54*	*1*
Y Carrier	*93.5*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:54*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.500**		0.227	0.232	5.00	0.326	pCi/L		08/15/19 09:03	1

Definitions/Glossary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-433168/18-A
Matrix: Water
Analysis Batch: 439520

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 433168

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0000	U	0.0431	0.0431	1.00	0.0895	pCi/L	06/28/19 13:59	08/14/19 14:58	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*40 - 110*	*06/28/19 13:59*	*08/14/19 14:58*	*1*

Lab Sample ID: LCS 160-433168/1-A
Matrix: Water
Analysis Batch: 439522

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 433168

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.887		1.02	1.00	0.106	pCi/L	87	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.6*		*40 - 110*

Lab Sample ID: LCSD 160-433168/2-A
Matrix: Water
Analysis Batch: 439522

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 433168

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226	11.4	9.320		0.955	1.00	0.0949	pCi/L	82	75 - 125	0.29	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*102*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-433172/18-A
Matrix: Water
Analysis Batch: 435292

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 433172

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.005494	U	0.175	0.175	1.00	0.316	pCi/L	06/28/19 14:44	07/18/19 08:55	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:55*	*1*
Y Carrier	*98.3*		*40 - 110*	*06/28/19 14:44*	*07/18/19 08:55*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-433172/1-A | **Client Sample ID: Lab Control Sample**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 435292 | **Prep Batch: 433172**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.01	8.856		1.04	1.00	0.376	pCi/L	98	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.6*		*40 - 110*
Y Carrier	*84.9*		*40 - 110*

Lab Sample ID: LCSD 160-433172/2-A | **Client Sample ID: Lab Control Sample Dup**
Matrix: Water | **Prep Type: Total/NA**
Analysis Batch: 435292 | **Prep Batch: 433172**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			9.01	8.392		0.974	1.00	0.314	pCi/L	93	75 - 125	0.23	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*102*		*40 - 110*
Y Carrier	*86.7*		*40 - 110*

QC Association Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Rad

Prep Batch: 433168

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	PrecSep-21	
310-158624-2	MW-305	Total/NA	Water	PrecSep-21	
310-158624-3	MW-306	Total/NA	Water	PrecSep-21	
310-158624-4	Field Blank	Total/NA	Water	PrecSep-21	
MB 160-433168/18-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-433168/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-433168/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 433172

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-158624-1	MW-304	Total/NA	Water	PrecSep_0	
310-158624-2	MW-305	Total/NA	Water	PrecSep_0	
310-158624-3	MW-306	Total/NA	Water	PrecSep_0	
310-158624-4	Field Blank	Total/NA	Water	PrecSep_0	
MB 160-433172/18-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-433172/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-433172/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Client Sample ID: MW-304

Date Collected: 06/20/19 12:20
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			433168	06/28/19 13:59	ORM	TAL SL
Total/NA	Analysis	903.0		1	439521	08/14/19 13:11	KLS	TAL SL
Total/NA	Prep	PrecSep_0			433172	06/28/19 14:44	ORM	TAL SL
Total/NA	Analysis	904.0		1	435292	07/18/19 08:53	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	439613	08/15/19 09:03	SMP	TAL SL

Client Sample ID: MW-305

Date Collected: 06/20/19 14:30
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			433168	06/28/19 13:59	ORM	TAL SL
Total/NA	Analysis	903.0		1	439521	08/14/19 13:12	KLS	TAL SL
Total/NA	Prep	PrecSep_0			433172	06/28/19 14:44	ORM	TAL SL
Total/NA	Analysis	904.0		1	435292	07/18/19 08:53	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	439613	08/15/19 09:03	SMP	TAL SL

Client Sample ID: MW-306

Date Collected: 06/20/19 13:45
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			433168	06/28/19 13:59	ORM	TAL SL
Total/NA	Analysis	903.0		1	439521	08/14/19 13:12	KLS	TAL SL
Total/NA	Prep	PrecSep_0			433172	06/28/19 14:44	ORM	TAL SL
Total/NA	Analysis	904.0		1	435292	07/18/19 08:53	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	439613	08/15/19 09:03	SMP	TAL SL

Client Sample ID: Field Blank

Date Collected: 06/20/19 14:15
Date Received: 06/25/19 09:05

Lab Sample ID: 310-158624-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			433168	06/28/19 13:59	ORM	TAL SL
Total/NA	Analysis	903.0		1	439521	08/14/19 13:12	KLS	TAL SL
Total/NA	Prep	PrecSep_0			433172	06/28/19 14:44	ORM	TAL SL
Total/NA	Analysis	904.0		1	435292	07/18/19 08:54	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	439613	08/15/19 09:03	SMP	TAL SL

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: SCS Engineers
Job ID: 310-158624-2
Project/Site: Alliant Lansing, 25218221

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Iowa	State Program	7	007	12-01-19

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP		L2305	04-06-22
ANAB	DoD		L2305	04-06-22
ANAB	DOE		L2305.01	04-06-22
Arizona	State		AZ0813	12-08-19
Arizona	State Program	9	AZ0813	12-08-19
California	State		2886	06-30-20
California	State Program	9	2886	06-30-20
Connecticut	State Program	1	PH-0241	03-31-21
Florida	NELAP	4	E87689	06-30-20
Florida	NELAP		E87689	06-30-20
Hawaii	State Program	9	NA	06-30-20
Illinois	NELAP	5	200023	11-30-19
Illinois	NELAP		004553	11-30-19
Iowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State		KY90125	12-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-20
Louisiana (DW)	NELAP	6	LA011	12-31-19
Louisiana (DW)	State		LA011	12-31-19
Maryland	State		310	09-30-20
Maryland	State Program	3	310	09-30-20
Michigan	State Program	5	9005	06-30-20
Missouri	State		780	06-30-22
Missouri	State Program	7	780	06-30-20
New Jersey	NELAP	2	MO002	06-30-20
New Jersey	NELAP		MO002	06-30-20
New York	NELAP	2	11616	03-31-20
New York	NELAP		11616	04-01-20
North Dakota	State Program	8	R207	06-30-20
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State		9997	08-31-19
Oklahoma	State Program	6	9997	08-31-19 *
Pennsylvania	NELAP	3	68-00540	02-28-20
Pennsylvania	NELAP		68-00540	02-28-20
South Carolina	State Program	4	85002001	06-30-20
Texas	NELAP	6	T104704193-19-14	07-31-20
Texas	NELAP		T104704193-19-13	07-31-20
US Fish & Wildlife	Federal		058448	07-31-20
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542019-11	07-31-20
Virginia	NELAP	3	460230	06-14-20
Virginia	NELAP		10310	06-14-20
Washington	State Program	10	C592	08-30-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
West Virginia DEP	State Program	3	381	08-31-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: SCS Engineers
Project/Site: Alliant Lansing, 25218221

Job ID: 310-158624-2

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Table 3. Parameters for Groundwater Monitoring to meet Federal Requirements

Appendix III	Boron
	Calcium
	Chloride
	Fluoride
	pH
	Sulfate
	TDS
Appendix IV	Antimony
	Arsenic
	Barium
	Beryllium
	Cadmium
	Chromium
	Cobalt
	Fluoride
	Lead
	Lithium
	Mercury
	Molybdenum
	Selenium
	Thallium
	Radium

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310-158624 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: SCS			
City/State: CITY Menomonee Falls	STATE WI	Project:	

Receipt Information	
Date/Time Received: DATE 6-25-19 TIME 905	Received By: LAB
Delivery Type: ☐ UPS ☒ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☐ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:________	

Condition of Cooler/Containers			
Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☐ Yes ☒ No	*If yes:* Cooler # ____ of ____	
Cooler Custody Seals Present?	☒ Yes ☐ No	*If yes:* Cooler custody seals intact?	☒ Yes ☐ No
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact?	☐ Yes ☐ No
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	

Temperature Record	
Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:________ ☐ NONE	
Thermometer ID: M	Correction Factor (°C): -0.1
• **Temp Blank Temperature** – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature	
Uncorrected Temp (°C): 0.9	Corrected Temp (°C): 0.8

• Sample Container Temperature		
Container(s) used:	CONTAINER 1	CONTAINER 2
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

#40/60/59

Eurofins TestAmerica, Cedar Falls
704 Enterprise Drive
Cedar Falls, IA 50613
Phone: 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins Environment Testing TestAmerica

Client Information	Sampler: Gary Sterkel	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-40459-13154.1
Client Contact: Gary Sterkel	Phone: 262 518 · 4081	E-Mail: sandie.fredrick@testamericainc.com		Page: Page 1 of 1
Company: SCS Engineers				Job #:
Address: N84 W13540 Leon Road	Due Date Requested:			
City: Menomonee Falls	TAT Requested (days): Standard			
State, Zip: WI, 53051				
Phone:	PO #: 25218221			
Email: gsterkel@scsengineers.com	WO #:			
Project Name: Alliant Lansing, 25218221	Project #: 31011020			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
			Preservation Code:		X	X	D	N	D	D	X	
~~MW-301~~ MW-304	6/20/19	1220	G	Water	N	N	1	1	1	1		
~~MW-302~~ MW-305	6/20/19	1430	G	Water	N	N	1	1	1	1		
~~MW-303~~ MW-306	6/20/19	1345	G	Water	N	N	1	1	1	1		
~~MW-6~~ FIELD BLANK	6/20/19	1415	G	Water	N	N	1	1	1	1		

Possible Hazard Identification
[X] Non-Hazard [ ] Flammable [ ] Skin Irritant [ ] Poison B [ ] Unknown [ ] Radiological

Deliverable Requested: I, II, III, IV, Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
[ ] Return To Client [X] Disposal By Lab [ ] Archive For ______ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Gary Sterkel	6/21/19 1200	SCS	[signature]	6-21-19 13:00	TA
[signature]	6-21-19 1700	TA	[signature]	6/25/19 0905	TA

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: 15735

Ver: 01/16/2019

Login Container Summary Report

Temperature readings: ____________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-304	310-158624-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-304	310-158624-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-158624-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-158624-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-305	310-158624-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-158624-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-158624-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-306	310-158624-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-158624-D-3	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-158624-A-4	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-158624-C-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-158624-D-4	Plastic 1 liter - Nitric Acid	<2		

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Eurofins TestAmerica, Cedar Falls
[illegible] Venture Way
Cedar Falls, IA 50613
Phone 319-277-2401 Fax 319-[illegible]

Chain of Custody Record

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-17503.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: sandie.fredrick@testamericainc.com	State of Origin: Iowa	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc		Accreditations Required (See note): State Program - Iowa		Job #: 310-158624-2
Address: 13715 Rider Trail North,	Due Date Requested: 7/24/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Alliant Lansing, 25218221	Project #: 31011020			
Site:	SSOW#:			

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226_228GFPC_P	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-304 (310-158624-1)	6/20/19	12:20 Central		Water			X	X	X	2	
MW-305 (310-158624-2)	6/20/19	14:30 Central		Water			X	X	X	2	
MW-306 (310-158624-3)	6/20/19	13:45 Central		Water			X	X	X	2	
Field Blank (310-158624-4)	6/20/19	14:15 Central		Water			X	X	X	2	

310-158624 Chain of Custody

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - other (specify)
Other:

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) — Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: T [signature]	Date/Time: 6-25-19 1440	Company:	Received by: Michael Heum — Date/Time: 6-26-19 09:45 — Company: TASTR
Relinquished by:	Date/Time:	Company:	Received by: — Date/Time: — Company:
Relinquished by:	Date/Time:	Company:	Received by: — Date/Time: — Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-158624-2

Login Number: 158624
List Number: 1
Creator: Bovy, Lorrainna L

List Source: Eurofins TestAmerica, Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: SCS Engineers | Job Number: 310-158624-2

Login Number: 158624
List Number: 2
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 06/26/19 12:02 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	17.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: SCS Engineers Job ID: 310-158624-2
Project/Site: Alliant Lansing, 25218221

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**Ba Carrier (40-110)**
310-158624-1	MW-304	95.5
310-158624-2	MW-305	96.9
310-158624-3	MW-306	95.2
310-158624-4	Field Blank	106
LCS 160-433168/1-A	Lab Control Sample	94.6
LCSD 160-433168/2-A	Lab Control Sample Dup	102
MB 160-433168/18-A	Method Blank	95.2

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**Ba Carrier (40-110)**	**Y Carrier (40-110)**
310-158624-1	MW-304	95.5	87.9
310-158624-2	MW-305	96.9	88.6
310-158624-3	MW-306	95.2	96.4
310-158624-4	Field Blank	106	93.5
LCS 160-433172/1-A	Lab Control Sample	94.6	84.9
LCSD 160-433172/2-A	Lab Control Sample Dup	102	86.7
MB 160-433172/18-A	Method Blank	95.2	98.3

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

A3 Assessment Monitoring, October 2019

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TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-166665-1
Client Project/Site: Lansing Gen Station, 25219070
Revision: 2

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
11/8/2019 11:42:45 AM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Table of Contents

Case Narrative

Job ID: 310-166665-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-166665-1

Comments
No additional comments.

Receipt
The samples were received on 10/4/2019 6:20 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were -0.1º C and 1.0º C.

Receipt Exceptions
REVISION: Field data updated by client.

REVISION2: Field data GWE updated for MW-20 and Hg removed.

HPLC/IC
Method 9056A: The following samples were diluted due to the nature of the sample matrix: MW-301 (310-166665-1), MW-302 (310-166665-2), MW-303 (310-166665-3), MW-6 (310-166665-4), Field Blank (310-166665-5), MW-304 (310-166665-6), MW-305 (310-166665-7), MW-306 (310-166665-8) and MW-20 (310-166665-9). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-166665-1	MW-301	Water	10/02/19 13:35	10/04/19 18:20	
310-166665-2	MW-302	Water	10/02/19 12:40	10/04/19 18:20	
310-166665-3	MW-303	Water	10/02/19 14:13	10/04/19 18:20	
310-166665-4	MW-6	Water	10/02/19 11:45	10/04/19 18:20	
310-166665-5	Field Blank	Water	10/02/19 23:59	10/04/19 18:20	
310-166665-6	MW-304	Water	10/02/19 15:50	10/04/19 18:20	
310-166665-7	MW-305	Water	10/02/19 09:15	10/04/19 18:20	
310-166665-8	MW-306	Water	10/02/19 09:10	10/04/19 18:20	
310-166665-9	MW-20	Water	10/02/19 10:35	10/04/19 18:20	

Detection Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-301 — Lab Sample ID: 310-166665-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	14		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.23	J	0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	56		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	5.6		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	180		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	360		200	110	ug/L	1		6020A	Total/NA
Calcium	68		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.11	J	0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	8.0	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	10		2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	310		30	24	mg/L	1		SM 2540C	Total/NA
pH	8.1	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	626.54				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-156.8				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.13				mg/L	1		Field Sampling	Total/NA
pH, Field	8.11				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	501.8				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	15.6				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	1.36				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-302 — Lab Sample ID: 310-166665-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	12		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.24	J	0.50	0.23	mg/L	5		9056A	Total/NA
Arsenic	53		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	740		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	690		200	110	ug/L	1		6020A	Total/NA
Calcium	130		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	1.3		0.50	0.091	ug/L	1		6020A	Total/NA
Molybdenum	1.4	J	2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	480		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	630.04				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-160				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.11				mg/L	1		Field Sampling	Total/NA
pH, Field	7.15				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1049				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	15.9				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	4.71				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-303 — Lab Sample ID: 310-166665-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	16		5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.42	J	0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	39		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	2.5		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	220		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	520		200	110	ug/L	1		6020A	Total/NA
Calcium	46		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.12	J	0.50	0.091	ug/L	1		6020A	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-303 (Continued) — Lab Sample ID: 310-166665-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	9.1	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	9.8		2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	210		30	24	mg/L	1		SM 2540C	Total/NA
pH	8.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	638.03				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	156				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.27				mg/L	1		Field Sampling	Total/NA
pH, Field	7.83				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	409				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	25.2				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	0.58				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-6 — Lab Sample ID: 310-166665-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.9		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	24		5.0	1.8	mg/L	5		9056A	Total/NA
Barium	46		2.0	0.84	ug/L	1		6020A	Total/NA
Calcium	70		0.50	0.10	mg/L	1		6020A	Total/NA
Total Dissolved Solids	280		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.5	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	675.54				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	88.9				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	10.29				mg/L	1		Field Sampling	Total/NA
pH, Field	7.46				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	590				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	10.0				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	0.70				NTU	1		Field Sampling	Total/NA

Client Sample ID: Field Blank — Lab Sample ID: 310-166665-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
pH	6.2	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA

Client Sample ID: MW-304 — Lab Sample ID: 310-166665-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	7.0		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	17		5.0	1.8	mg/L	5		9056A	Total/NA
Barium	47		2.0	0.84	ug/L	1		6020A	Total/NA
Calcium	72		0.50	0.10	mg/L	1		6020A	Total/NA
Chromium	1.0	J	5.0	0.98	ug/L	1		6020A	Total/NA
Cobalt	0.19	J	0.50	0.091	ug/L	1		6020A	Total/NA
Lead	0.35	J	0.50	0.27	ug/L	1		6020A	Total/NA
Total Dissolved Solids	300		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	623.79				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	107.3				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	7.51				mg/L	1		Field Sampling	Total/NA
pH, Field	7.16				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	578.4				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	12.4				Degrees C	1		Field Sampling	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: SCS Engineers
Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: MW-304 (Continued) — Lab Sample ID: 310-166665-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Turbidity, Field	3.51				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-305 — Lab Sample ID: 310-166665-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	3.2	J	5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	26		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	3.4		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	190		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	190	J	200	110	ug/L	1		6020A	Total/NA
Calcium	97		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.27	J	0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	4.6	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	1.6	J	2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	380		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.2	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	629.77				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-105.6				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.21				mg/L	1		Field Sampling	Total/NA
pH, Field	7.03				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	635				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	19.0				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	8.87				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-306 — Lab Sample ID: 310-166665-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	40		5.0	1.5	mg/L	5		9056A	Total/NA
Sulfate	140		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	12		2.0	0.75	ug/L	1		6020A	Total/NA
Barium	540		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	660		200	110	ug/L	1		6020A	Total/NA
Calcium	260		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.98		0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	25		10	2.7	ug/L	1		6020A	Total/NA
Total Dissolved Solids	1300		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.2	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	622.47				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-1205				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.27				mg/L	1		Field Sampling	Total/NA
pH, Field	9.00				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1998				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	16.33				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	3.67				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-20 — Lab Sample ID: 310-166665-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	2.0	J	5.0	1.5	mg/L	5		9056A	Total/NA
Fluoride	0.37	J	0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	240		5.0	1.8	mg/L	5		9056A	Total/NA
Arsenic	3.4		2.0	0.75	ug/L	1		6020A	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Client Sample ID: MW-20 (Continued)
Lab Sample ID: 310-166665-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	160		2.0	0.84	ug/L	1		6020A	Total/NA
Boron	3100		200	110	ug/L	1		6020A	Total/NA
Calcium	150		0.50	0.10	mg/L	1		6020A	Total/NA
Cobalt	0.90		0.50	0.091	ug/L	1		6020A	Total/NA
Lithium	2.8	J	10	2.7	ug/L	1		6020A	Total/NA
Molybdenum	41		2.0	1.1	ug/L	1		6020A	Total/NA
Total Dissolved Solids	690		30	24	mg/L	1		SM 2540C	Total/NA
pH	7.7	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	652.64				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-49.1				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.27				mg/L	1		Field Sampling	Total/NA
pH, Field	7.79				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1026				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.2				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	0.99				NTU	1		Field Sampling	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: MW-301
Lab Sample ID: 310-166665-1
Date Collected: 10/02/19 13:35
Matrix: Water
Date Received: 10/04/19 18:20

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**14**		5.0	1.5	mg/L			10/09/19 00:14	5
Fluoride	**0.23**	**J**	0.50	0.23	mg/L			10/09/19 00:14	5
Sulfate	**56**		5.0	1.8	mg/L			10/09/19 00:14	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.6**		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 21:55	1
Barium	**180**		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 21:55	1
Boron	**360**		200	110	ug/L		10/08/19 07:59	10/08/19 21:55	1
Calcium	**68**		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 21:55	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 21:55	1
Cobalt	**0.11**	**J**	0.50	0.091	ug/L		10/08/19 07:59	10/08/19 21:55	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 21:55	1
Lithium	**8.0**	**J**	10	2.7	ug/L		10/08/19 07:59	10/08/19 21:55	1
Molybdenum	**10**		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 21:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**310**		30	24	mg/L			10/08/19 12:27	1
pH	**8.1**	**HF**	0.1	0.1	SU			10/04/19 21:12	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**626.54**				ft			10/02/19 13:35	1
Oxidation Reduction Potential	**-156.8**				millivolts			10/02/19 13:35	1
Oxygen, Dissolved, Client Supplied	**0.13**				mg/L			10/02/19 13:35	1
pH, Field	**8.11**				SU			10/02/19 13:35	1
Specific Conductance, Field	**501.8**				umhos/cm			10/02/19 13:35	1
Temperature, Field	**15.6**				Degrees C			10/02/19 13:35	1
Turbidity, Field	**1.36**				NTU			10/02/19 13:35	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-302
Date Collected: 10/02/19 12:40
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-2
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**12**		5.0	1.5	mg/L			10/09/19 00:47	5
Fluoride	**0.24**	**J**	0.50	0.23	mg/L			10/09/19 00:47	5
Sulfate	<1.8		5.0	1.8	mg/L			10/09/19 00:47	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**53**		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 21:57	1
Barium	**740**		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 21:57	1
Boron	**690**		200	110	ug/L		10/08/19 07:59	10/08/19 21:57	1
Calcium	**130**		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 21:57	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 21:57	1
Cobalt	**1.3**		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 21:57	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 21:57	1
Lithium	<2.7		10	2.7	ug/L		10/08/19 07:59	10/08/19 21:57	1
Molybdenum	**1.4**	**J**	2.0	1.1	ug/L		10/08/19 07:59	10/08/19 21:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**480**		30	24	mg/L			10/08/19 12:27	1
pH	**7.0**	**HF**	0.1	0.1	SU			10/04/19 21:13	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**630.04**				ft			10/02/19 12:40	1
Oxidation Reduction Potential	**-160**				millivolts			10/02/19 12:40	1
Oxygen, Dissolved, Client Supplied	**0.11**				mg/L			10/02/19 12:40	1
pH, Field	**7.15**				SU			10/02/19 12:40	1
Specific Conductance, Field	**1049**				umhos/cm			10/02/19 12:40	1
Temperature, Field	**15.9**				Degrees C			10/02/19 12:40	1
Turbidity, Field	**4.71**				NTU			10/02/19 12:40	1

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-303
Date Collected: 10/02/19 14:13
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-3
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	16		5.0	1.5	mg/L			10/09/19 01:19	5
Fluoride	0.42	J	0.50	0.23	mg/L			10/09/19 01:19	5
Sulfate	39		5.0	1.8	mg/L			10/09/19 01:19	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.5		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:00	1
Barium	220		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:00	1
Boron	520		200	110	ug/L		10/08/19 07:59	10/08/19 22:00	1
Calcium	46		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:00	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:00	1
Cobalt	0.12	J	0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:00	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:00	1
Lithium	9.1	J	10	2.7	ug/L		10/08/19 07:59	10/08/19 22:00	1
Molybdenum	9.8		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:00	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	210		30	24	mg/L			10/08/19 12:27	1
pH	8.0	HF	0.1	0.1	SU			10/04/19 21:16	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	638.03				ft			10/02/19 14:13	1
Oxidation Reduction Potential	156				millivolts			10/02/19 14:13	1
Oxygen, Dissolved, Client Supplied	0.27				mg/L			10/02/19 14:13	1
pH, Field	7.83				SU			10/02/19 14:13	1
Specific Conductance, Field	409				umhos/cm			10/02/19 14:13	1
Temperature, Field	25.2				Degrees C			10/02/19 14:13	1
Turbidity, Field	0.58				NTU			10/02/19 14:13	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-6
Date Collected: 10/02/19 11:45
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-4
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**6.9**		5.0	1.5	mg/L			10/09/19 01:36	5
Fluoride	<0.23		0.50	0.23	mg/L			10/09/19 01:36	5
Sulfate	**24**		5.0	1.8	mg/L			10/09/19 01:36	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.75		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:13	1
Barium	**46**		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:13	1
Boron	<110		200	110	ug/L		10/08/19 07:59	10/08/19 22:13	1
Calcium	**70**		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:13	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:13	1
Cobalt	<0.091		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:13	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:13	1
Lithium	<2.7		10	2.7	ug/L		10/08/19 07:59	10/08/19 22:13	1
Molybdenum	<1.1		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**280**		30	24	mg/L			10/08/19 12:27	1
pH	**7.5**	**HF**	0.1	0.1	SU			10/04/19 22:34	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**675.54**				ft			10/02/19 11:45	1
Oxidation Reduction Potential	**88.9**				millivolts			10/02/19 11:45	1
Oxygen, Dissolved, Client Supplied	**10.29**				mg/L			10/02/19 11:45	1
pH, Field	**7.46**				SU			10/02/19 11:45	1
Specific Conductance, Field	**590**				umhos/cm			10/02/19 11:45	1
Temperature, Field	**10.0**				Degrees C			10/02/19 11:45	1
Turbidity, Field	**0.70**				NTU			10/02/19 11:45	1

Client Sample Results

Client: SCS Engineers
Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: Field Blank
Lab Sample ID: 310-166665-5

Date Collected: 10/02/19 23:59
Matrix: Water
Date Received: 10/04/19 18:20

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.29		1.0	0.29	mg/L			10/09/19 01:52	1
Fluoride	<0.045		0.10	0.045	mg/L			10/09/19 01:52	1
Sulfate	<0.35		1.0	0.35	mg/L			10/09/19 01:52	1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.75		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:16	1
Barium	<0.84		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:16	1
Boron	<110		200	110	ug/L		10/08/19 07:59	10/08/19 22:16	1
Calcium	<0.10		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:16	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:16	1
Cobalt	<0.091		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:16	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:16	1
Lithium	<2.7		10	2.7	ug/L		10/08/19 07:59	10/08/19 22:16	1
Molybdenum	<1.1		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<24		30	24	mg/L			10/08/19 12:27	1
pH	**6.2**	**HF**	0.1	0.1	SU			10/04/19 22:38	1

Client Sample Results

Client: SCS Engineers — Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: MW-304 — **Lab Sample ID: 310-166665-6**
Date Collected: 10/02/19 15:50 — **Matrix: Water**
Date Received: 10/04/19 18:20

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**7.0**		5.0	1.5	mg/L			10/09/19 02:08	5
Fluoride	<0.23		0.50	0.23	mg/L			10/09/19 02:08	5
Sulfate	**17**		5.0	1.8	mg/L			10/09/19 02:08	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.75		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:18	1
Barium	**47**		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:18	1
Boron	<110		200	110	ug/L		10/08/19 07:59	10/08/19 22:18	1
Calcium	**72**		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:18	1
Chromium	**1.0**	**J**	5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:18	1
Cobalt	**0.19**	**J**	0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:18	1
Lead	**0.35**	**J**	0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:18	1
Lithium	<2.7		10	2.7	ug/L		10/08/19 07:59	10/08/19 22:18	1
Molybdenum	<1.1		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**300**		30	24	mg/L			10/08/19 12:27	1
pH	**7.0**	**HF**	0.1	0.1	SU			10/04/19 22:39	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	**623.79**				ft			10/02/19 15:50	1
Oxidation Reduction Potential	**107.3**				millivolts			10/02/19 15:50	1
Oxygen, Dissolved, Client Supplied	**7.51**				mg/L			10/02/19 15:50	1
pH, Field	**7.16**				SU			10/02/19 15:50	1
Specific Conductance, Field	**578.4**				umhos/cm			10/02/19 15:50	1
Temperature, Field	**12.4**				Degrees C			10/02/19 15:50	1
Turbidity, Field	**3.51**				NTU			10/02/19 15:50	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-305
Date Collected: 10/02/19 09:15
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-7
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	3.2	J	5.0	1.5	mg/L			10/09/19 02:25	5
Fluoride	<0.23		0.50	0.23	mg/L			10/09/19 02:25	5
Sulfate	26		5.0	1.8	mg/L			10/09/19 02:25	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.4		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:21	1
Barium	190		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:21	1
Boron	190	J	200	110	ug/L		10/08/19 07:59	10/08/19 22:21	1
Calcium	97		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:21	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:21	1
Cobalt	0.27	J	0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:21	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:21	1
Lithium	4.6	J	10	2.7	ug/L		10/08/19 07:59	10/08/19 22:21	1
Molybdenum	1.6	J	2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	380		30	24	mg/L			10/08/19 12:27	1
pH	7.2	HF	0.1	0.1	SU			10/04/19 22:40	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	629.77				ft			10/02/19 09:15	1
Oxidation Reduction Potential	-105.6				millivolts			10/02/19 09:15	1
Oxygen, Dissolved, Client Supplied	0.21				mg/L			10/02/19 09:15	1
pH, Field	7.03				SU			10/02/19 09:15	1
Specific Conductance, Field	635				umhos/cm			10/02/19 09:15	1
Temperature, Field	19.0				Degrees C			10/02/19 09:15	1
Turbidity, Field	8.87				NTU			10/02/19 09:15	1

Client Sample Results

Client: SCS Engineers
Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: MW-306
Lab Sample ID: 310-166665-8
Date Collected: 10/02/19 09:10
Matrix: Water
Date Received: 10/04/19 18:20

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	40		5.0	1.5	mg/L			10/09/19 03:14	5
Fluoride	<0.23		0.50	0.23	mg/L			10/09/19 03:14	5
Sulfate	140		5.0	1.8	mg/L			10/09/19 03:14	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	12		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:23	1
Barium	540		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:23	1
Boron	660		200	110	ug/L		10/08/19 07:59	10/08/19 22:23	1
Calcium	260		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:23	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:23	1
Cobalt	0.98		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:23	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:23	1
Lithium	25		10	2.7	ug/L		10/08/19 07:59	10/08/19 22:23	1
Molybdenum	<1.1		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1300		30	24	mg/L			10/08/19 12:27	1
pH	7.2	HF	0.1	0.1	SU			10/04/19 22:41	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	622.47				ft			10/02/19 09:10	1
Oxidation Reduction Potential	-1205				millivolts			10/02/19 09:10	1
Oxygen, Dissolved, Client Supplied	0.27				mg/L			10/02/19 09:10	1
pH, Field	9.00				SU			10/02/19 09:10	1
Specific Conductance, Field	1998				umhos/cm			10/02/19 09:10	1
Temperature, Field	16.33				Degrees C			10/02/19 09:10	1
Turbidity, Field	3.67				NTU			10/02/19 09:10	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-20
Date Collected: 10/02/19 10:35
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-9
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2.0	J	5.0	1.5	mg/L			10/09/19 03:47	5
Fluoride	0.37	J	0.50	0.23	mg/L			10/09/19 03:47	5
Sulfate	240		5.0	1.8	mg/L			10/09/19 03:47	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.4		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 22:26	1
Barium	160		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 22:26	1
Boron	3100		200	110	ug/L		10/08/19 07:59	10/08/19 22:26	1
Calcium	150		0.50	0.10	mg/L		10/08/19 07:59	10/08/19 22:26	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 22:26	1
Cobalt	0.90		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 22:26	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 22:26	1
Lithium	2.8	J	10	2.7	ug/L		10/08/19 07:59	10/08/19 22:26	1
Molybdenum	41		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 22:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	690		30	24	mg/L			10/08/19 12:27	1
pH	7.7	HF	0.1	0.1	SU			10/04/19 22:42	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	652.64				ft			10/02/19 10:35	1
Oxidation Reduction Potential	-49.1				millivolts			10/02/19 10:35	1
Oxygen, Dissolved, Client Supplied	0.27				mg/L			10/02/19 10:35	1
pH, Field	7.79				SU			10/02/19 10:35	1
Specific Conductance, Field	1026				umhos/cm			10/02/19 10:35	1
Temperature, Field	13.2				Degrees C			10/02/19 10:35	1
Turbidity, Field	0.99				NTU			10/02/19 10:35	1

Definitions/Glossary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-256330/3
Matrix: Water
Analysis Batch: 256330

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.29		1.0	0.29	mg/L			10/08/19 19:08	1
Fluoride	<0.045		0.10	0.045	mg/L			10/08/19 19:08	1
Sulfate	<0.35		1.0	0.35	mg/L			10/08/19 19:08	1

Lab Sample ID: LCS 310-256330/4
Matrix: Water
Analysis Batch: 256330

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.65		mg/L		97	90 - 110
Fluoride	2.00	1.88		mg/L		94	90 - 110
Sulfate	10.0	9.29		mg/L		93	90 - 110

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-255858/1-A
Matrix: Water
Analysis Batch: 256010

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 255858

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.75		2.0	0.75	ug/L		10/08/19 07:59	10/08/19 21:11	1
Barium	<0.84		2.0	0.84	ug/L		10/08/19 07:59	10/08/19 21:11	1
Boron	<110		200	110	ug/L		10/08/19 07:59	10/08/19 21:11	1
Calcium	0.115	J	0.50	0.10	mg/L		10/08/19 07:59	10/08/19 21:11	1
Chromium	<0.98		5.0	0.98	ug/L		10/08/19 07:59	10/08/19 21:11	1
Cobalt	<0.091		0.50	0.091	ug/L		10/08/19 07:59	10/08/19 21:11	1
Lead	<0.27		0.50	0.27	ug/L		10/08/19 07:59	10/08/19 21:11	1
Lithium	<2.7		10	2.7	ug/L		10/08/19 07:59	10/08/19 21:11	1
Molybdenum	<1.1		2.0	1.1	ug/L		10/08/19 07:59	10/08/19 21:11	1

Lab Sample ID: LCS 310-255858/2-A
Matrix: Water
Analysis Batch: 256010

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 255858

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	20.0	19.8		ug/L		99	80 - 120
Arsenic	40.0	38.5		ug/L		96	80 - 120
Barium	40.0	43.2		ug/L		108	80 - 120
Beryllium	20.0	21.0		ug/L		105	80 - 120
Boron	880	911		ug/L		104	80 - 120
Cadmium	20.0	21.3		ug/L		106	80 - 120
Calcium	2.00	2.22		mg/L		111	80 - 120
Chromium	40.0	41.5		ug/L		104	80 - 120
Cobalt	20.0	21.7		ug/L		109	80 - 120
Lead	20.0	21.0		ug/L		105	80 - 120
Lithium	100	98.0		ug/L		98	80 - 120
Molybdenum	40.0	41.7		ug/L		104	80 - 120
Selenium	40.0	40.4		ug/L		101	80 - 120
Thallium	16.0	16.8		ug/L		105	80 - 120

Eurofins TestAmerica, Cedar Falls

QC Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 310-166665-3 DU
Matrix: Water
Analysis Batch: 256010

Client Sample ID: MW-303
Prep Type: Total/NA
Prep Batch: 255858

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	2.5		2.52		ug/L		1	20
Barium	220		212		ug/L		2	20
Boron	520		533		ug/L		2	20
Calcium	46		47.2		mg/L		3	20
Chromium	<0.98		<0.98		ug/L		NC	20
Cobalt	0.12	J	0.124	J	ug/L		6	20
Lead	<0.27		<0.27		ug/L		NC	20
Lithium	9.1	J	9.35	J	ug/L		3	20
Molybdenum	9.8		9.78		ug/L		0.6	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-255908/1
Matrix: Water
Analysis Batch: 255908

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<24		30	24	mg/L			10/08/19 12:27	1

Lab Sample ID: LCS 310-255908/2
Matrix: Water
Analysis Batch: 255908

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	1000		mg/L		100	90 - 110

Lab Sample ID: 310-166665-8 DU
Matrix: Water
Analysis Batch: 255908

Client Sample ID: MW-306
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1300		1300		mg/L		0.5	24

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-255573/1
Matrix: Water
Analysis Batch: 255573

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

Lab Sample ID: LCS 310-255573/15
Matrix: Water
Analysis Batch: 255573

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

QC Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Method: SM 4500 H+ B - pH (Continued)

Lab Sample ID: 310-166665-4 DU
Matrix: Water
Analysis Batch: 255573

Client Sample ID: MW-6
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	7.5	HF		7.4		SU				0.8	20

QC Association Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

HPLC/IC

Analysis Batch: 256330

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	9056A	
310-166665-2	MW-302	Total/NA	Water	9056A	
310-166665-3	MW-303	Total/NA	Water	9056A	
310-166665-4	MW-6	Total/NA	Water	9056A	
310-166665-5	Field Blank	Total/NA	Water	9056A	
310-166665-6	MW-304	Total/NA	Water	9056A	
310-166665-7	MW-305	Total/NA	Water	9056A	
310-166665-8	MW-306	Total/NA	Water	9056A	
310-166665-9	MW-20	Total/NA	Water	9056A	
MB 310-256330/3	Method Blank	Total/NA	Water	9056A	
LCS 310-256330/4	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 255858

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	3010A	
310-166665-2	MW-302	Total/NA	Water	3010A	
310-166665-3	MW-303	Total/NA	Water	3010A	
310-166665-4	MW-6	Total/NA	Water	3010A	
310-166665-5	Field Blank	Total/NA	Water	3010A	
310-166665-6	MW-304	Total/NA	Water	3010A	
310-166665-7	MW-305	Total/NA	Water	3010A	
310-166665-8	MW-306	Total/NA	Water	3010A	
310-166665-9	MW-20	Total/NA	Water	3010A	
MB 310-255858/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-255858/2-A	Lab Control Sample	Total/NA	Water	3010A	
310-166665-3 DU	MW-303	Total/NA	Water	3010A	

Analysis Batch: 256010

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	6020A	255858
310-166665-2	MW-302	Total/NA	Water	6020A	255858
310-166665-3	MW-303	Total/NA	Water	6020A	255858
310-166665-4	MW-6	Total/NA	Water	6020A	255858
310-166665-5	Field Blank	Total/NA	Water	6020A	255858
310-166665-6	MW-304	Total/NA	Water	6020A	255858
310-166665-7	MW-305	Total/NA	Water	6020A	255858
310-166665-8	MW-306	Total/NA	Water	6020A	255858
310-166665-9	MW-20	Total/NA	Water	6020A	255858
MB 310-255858/1-A	Method Blank	Total/NA	Water	6020A	255858
LCS 310-255858/2-A	Lab Control Sample	Total/NA	Water	6020A	255858
310-166665-3 DU	MW-303	Total/NA	Water	6020A	255858

General Chemistry

Analysis Batch: 255573

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	SM 4500 H+ B	
310-166665-2	MW-302	Total/NA	Water	SM 4500 H+ B	
310-166665-3	MW-303	Total/NA	Water	SM 4500 H+ B	
310-166665-4	MW-6	Total/NA	Water	SM 4500 H+ B	

QC Association Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

General Chemistry (Continued)

Analysis Batch: 255573 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-5	Field Blank	Total/NA	Water	SM 4500 H+ B	
310-166665-6	MW-304	Total/NA	Water	SM 4500 H+ B	
310-166665-7	MW-305	Total/NA	Water	SM 4500 H+ B	
310-166665-8	MW-306	Total/NA	Water	SM 4500 H+ B	
310-166665-9	MW-20	Total/NA	Water	SM 4500 H+ B	
LCS 310-255573/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
LCS 310-255573/15	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
310-166665-4 DU	MW-6	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 255908

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	SM 2540C	
310-166665-2	MW-302	Total/NA	Water	SM 2540C	
310-166665-3	MW-303	Total/NA	Water	SM 2540C	
310-166665-4	MW-6	Total/NA	Water	SM 2540C	
310-166665-5	Field Blank	Total/NA	Water	SM 2540C	
310-166665-6	MW-304	Total/NA	Water	SM 2540C	
310-166665-7	MW-305	Total/NA	Water	SM 2540C	
310-166665-8	MW-306	Total/NA	Water	SM 2540C	
310-166665-9	MW-20	Total/NA	Water	SM 2540C	
MB 310-255908/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-255908/2	Lab Control Sample	Total/NA	Water	SM 2540C	
310-166665-8 DU	MW-306	Total/NA	Water	SM 2540C	

Field Service / Mobile Lab

Analysis Batch: 257065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	Field Sampling	
310-166665-2	MW-302	Total/NA	Water	Field Sampling	
310-166665-3	MW-303	Total/NA	Water	Field Sampling	
310-166665-4	MW-6	Total/NA	Water	Field Sampling	
310-166665-6	MW-304	Total/NA	Water	Field Sampling	
310-166665-7	MW-305	Total/NA	Water	Field Sampling	
310-166665-8	MW-306	Total/NA	Water	Field Sampling	
310-166665-9	MW-20	Total/NA	Water	Field Sampling	

Lab Chronicle

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-301

Lab Sample ID: 310-166665-1

Date Collected: 10/02/19 13:35
Matrix: Water
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 00:14	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 21:55	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 21:12	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 13:35	EAR	TAL CF

Client Sample ID: MW-302

Lab Sample ID: 310-166665-2

Date Collected: 10/02/19 12:40
Matrix: Water
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 00:47	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 21:57	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 21:13	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 12:40	EAR	TAL CF

Client Sample ID: MW-303

Lab Sample ID: 310-166665-3

Date Collected: 10/02/19 14:13
Matrix: Water
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 01:19	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:00	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 21:16	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 14:13	EAR	TAL CF

Client Sample ID: MW-6

Lab Sample ID: 310-166665-4

Date Collected: 10/02/19 11:45
Matrix: Water
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 01:36	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:13	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:34	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 11:45	EAR	TAL CF

Lab Chronicle

Client: SCS Engineers | Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Client Sample ID: Field Blank — Lab Sample ID: 310-166665-5
Date Collected: 10/02/19 23:59 — **Matrix: Water**
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	256330	10/09/19 01:52	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:16	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:38	JMH	TAL CF

Client Sample ID: MW-304 — Lab Sample ID: 310-166665-6
Date Collected: 10/02/19 15:50 — **Matrix: Water**
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 02:08	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:18	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:39	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 15:50	EAR	TAL CF

Client Sample ID: MW-305 — Lab Sample ID: 310-166665-7
Date Collected: 10/02/19 09:15 — **Matrix: Water**
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 02:25	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:21	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:40	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 09:15	EAR	TAL CF

Client Sample ID: MW-306 — Lab Sample ID: 310-166665-8
Date Collected: 10/02/19 09:10 — **Matrix: Water**
Date Received: 10/04/19 18:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 03:14	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:23	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:41	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 09:10	EAR	TAL CF

Lab Chronicle

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Client Sample ID: MW-20
Date Collected: 10/02/19 10:35
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	256330	10/09/19 03:47	CJT	TAL CF
Total/NA	Prep	3010A			255858	10/08/19 07:59	HED	TAL CF
Total/NA	Analysis	6020A		1	256010	10/08/19 22:26	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	255908	10/08/19 12:27	MDK	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	255573	10/04/19 22:42	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	257065	10/02/19 10:35	EAR	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers | Job ID: 310-166665-1
Project/Site: Lansing Gen Station, 25219070

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State Program	007	12-01-19

Method Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

eurofins | Environment Testing TestAmerica

310-166665 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information

Client: SCS Engineers			
City/State: CITY Menomonee Falls	STATE WI	Project: Lansing Gen Station	

Receipt Information

Date/Time Received:	DATE 10/4/19	TIME 1820	Received By: LAB

Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee
☒ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:

Condition of Cooler/Containers

Sample(s) received in Cooler?	☒ Yes	☐ No	*If yes:* Cooler ID:
Multiple Coolers?	☒ Yes	☐ No	*If yes:* Cooler # 1 of 2
Cooler Custody Seals Present?	☐ Yes	☒ No	*If yes:* Cooler custody seals intact? ☐ Yes ☐ No
Sample Custody Seals Present?	☐ Yes	☒ No	*If yes:* Sample custody seals intact? ☐ Yes ☐ No
Trip Blank Present?	☐ Yes	☒ No	*If yes:* Which VOA samples are in cooler? ↓

Temperature Record

Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other: ☐ NONE

Thermometer ID: M	Correction Factor (°C): -0.1

• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature

Uncorrected Temp (°C): 0.0	Corrected Temp (°C): -0.1

• Sample Container Temperature

	CONTAINER 1	CONTAINER 2
Container(s) used:		
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

two MW-6's one with time 11:45 or 1550

NO MW 304 sample labeled

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

eurofins | Environment Testing TestAmerica

Place COC scanning label here

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Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: SCS Engineers			
City/State: CITY Menomonee Falls STATE WI		Project: Lansing Gen. Station	
Receipt Information			
Date/Time Received: DATE 10/4/19 TIME 1820		Received By: LAB	
Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☒ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:			
Condition of Cooler/Containers			
Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☒ Yes ☐ No	*If yes:* Cooler # 2 of 2	
Cooler Custody Seals Present?	☐ Yes ☒ No	*If yes:* Cooler custody seals intact? ☐ Yes ☐ No	
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact? ☐ Yes ☐ No	
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	
Temperature Record			
Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other: ☐ NONE			
Thermometer ID: M		Correction Factor (°C): -0.1	
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C): 1.1		Corrected Temp (°C): 1.0	
• Sample Container Temperature			
Container(s) used:	CONTAINER 1	CONTAINER 2	
Uncorrected Temp (°C):			
Corrected Temp (°C):			

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

eurofins Environment Testing TestAmerica

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Phone: 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

Client Information	Sampler: Louise Jennings	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-43540-12748.1
Client Contact: Gary Sterkel	Phone: 608 509 8245	E-Mail: sandie.fredrick@testamericainc.com		Page: Page 1 of 1
Company: SCS Engineers		Analysis Requested		Job #:
Address: N84 W13540 Leon Road	Due Date Requested:			Preservation Codes:
City: Menomonee Falls	TAT Requested (days): Standard			
State, Zip: WI, 53051				
Phone:	PO #: 25219070			
Email: gsterkel@scsengineers.com	WO #:			
Project Name: Lansing Gen Station, 25219070	Project #: 31011020			
Site:	SSOW#:			Other:

Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
				Preservation Code:			D	N	D	D		
MW-301	10.2.19	1335	G	Water			X	X	X	X		
MW-302	10.2.19	1240	G	Water								
MW-303	10.2.19	1413	G	Water								
MW-6	10.2.19	1145	G	Water								
Field Blank	10.2.19	2359	—	Water								There are 2 coolers for this COC.
MW-304	10.2.19	1550	G	Water								
MW-305	10.2.19	0915	G	Water								
MW-306	10.2.19	0910	G	Water								
MW-20	10.2.19	1035	G	Water								
				Water								

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by: | Date: | Time: | Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
L. Jennings	10.3.19 1610		Lindsay Binder	10/4/19 1820	

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Container Summary Report

Temperature readings: ______________________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-301	310-166665-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-301	310-166665-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-301	310-166665-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-166665-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-302	310-166665-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-166665-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-166665-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-303	310-166665-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-166665-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-166665-A-4	Plastic 250ml - with Nitric Acid	<2		
MW-6	310-166665-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-166665-D-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-166665-A-5	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-166665-C-5	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-166665-D-5	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-166665-A-6	Plastic 250ml - with Nitric Acid	<2		
MW-304	310-166665-C-6	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-166665-D-6	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-166665-A-7	Plastic 250ml - with Nitric Acid	<2		
MW-305	310-166665-C-7	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-166665-D-7	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-166665-A-8	Plastic 250ml - with Nitric Acid	<2		
MW-306	310-166665-C-8	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-166665-D-8	Plastic 1 liter - Nitric Acid	<2		
MW-20	310-166665-A-9	Plastic 250ml - with Nitric Acid	<2		
MW-20	310-166665-C-9	Plastic 1 liter - Nitric Acid	<2		
MW-20	310-166665-D-9	Plastic 1 liter - Nitric Acid	<2		

Fredrick, Sandie

From:	Blodgett, Meghan <mblodgett@scsengineers.com>
Sent:	Thursday, October 10, 2019 7:50 PM
To:	Fredrick, Sandie
Cc:	Kron, Nicole
Subject:	RE: Eurofins TestAmerica Sample Login Confirmation files from 310-166665 Lansing Gen Station, 25219070

-External Email-

Sandie,

Please remove the following metals from all samples for this sampling round at Lansing. If some have already been initiated and they'll still be on the invoice even if they're not reported, just let me know.

Antimony
Beryllium
Cadmium
Mercury
Selenium
Thallium

Thanks,

Meghan Blodgett
608.216.7362 (o)
608.345.9221 (m)

From: Sandie Fredrick <sandie.fredrick@testamericainc.com>
Sent: Monday, October 7, 2019 4:05 PM
To: Blodgett, Meghan <mblodgett@scsengineers.com>; Kron, Nicole <NKron@scsengineers.com>; Karwoski, Thomas <TKarwoski@scsengineers.com>
Subject: Eurofins TestAmerica Sample Login Confirmation files from 310-166665 Lansing Gen Station, 25219070

============== This message originated outside of SCS Engineers ==============

Hello Everyone,

Attached, please find the Sample Confirmation files for job 310-166665; Lansing Gen Station, 25219070

Please feel free to contact me if you have any questions.

Thank you.

Sandie Fredrick
Project Manager

TestAmerica Laboratories, Inc.
Phone: 920-261-1660

E-mail: sandie.fredrick@testamericainc.com
www.eurofinsus.com | www.testamericainc.com

Reference: [310-388060]
Attachments: 5

Please let us know if we met your expectations by rating the service you received from Eurofins TestAmerica on this project by visiting our website at: Project Feedback

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Groundwater Monitoring Results - Field Parameters
Lansing Generating Station / SCS Engineers Project #25219070
October 2019

Sample	Sample Date/Time	Groundwater Elevation (ft AMSL)	Temperature (Deg. C)	pH (Std. Units)	Dissolved Oxygen (mg/L)	Specific Conductivity (µmhos/cm)	ORP (mV)	Turbidity (NTU)
MW-301	10.02.19/1335	626.54	15.6	8.11	0.13	501.8	-156.8	1.36
MW-302	10.02.19/1240	630.04	15.9	7.15	0.11	1,049	-160	4.71
MW-303	10.02.19/1445	638.03	25.2	7.83	0.27	409	156	0.58
MW-304	10.02.19/1550	623.79	12.4	7.16	7.51	578.4	107.3	3.51
MW-305	10.02.19/0915	629.77	19.0	7.03	0.21	635	-105.6	8.87
MW-306	10.02.19/0910	622.47	16.33	9.00	0.27	1,998	-1,205	3.67
MW-6	10.02.19/1139	675.54	10.0	7.46	10.29	590	88.9	0.70
MW-20	10.02.19/1053	652.64	13.2	7.79	0.27	1,026	-49.1	0.99

Abbreviations:
AMSL = above mean sea level
µmhos/cm = microSiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
ORP = Oxidation Reduction (REDOX)
NTU = Nephelometric Turbidity Units

Created by: MB Date: 4/19/2019
Last revision by: MDB Date: 10/23/2019
Checked by: Date:

I:\25219070.00\Data and Calculations\Tables\Field Data Tables\[October 2019_Lansing_CCR_Field.xlsx]Data

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Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-166665-1

Login Number: 166665
List Number: 1
Creator: Spoerre, Autumn R

List Source: Eurofins TestAmerica, Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-166665-2
Client Project/Site: Lansing Gen Station, 25219070

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett

Authorized for release by:
10/31/2019 2:32:17 PM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Job ID: 310-166665-2

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-166665-2

Comments
No additional comments.

Receipt
The samples were received on 10/4/2019 6:20 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were -0.1° C and 1.0° C.

RAD
Methods 903.0, 9315: Radium-226 prep batch 160-445567-Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-301 (310-166665-1), MW-302 (310-166665-2), MW-303 (310-166665-3), MW-6 (310-166665-4), Field Blank (310-166665-5), MW-304 (310-166665-6), MW-305 (310-166665-7), MW-306 (310-166665-8), MW-20 (310-166665-9), (LCS 160-445567/1-A), (LCSD 160-445567/2-A) and (MB 160-445567/20-A)

Methods 904.0, 9320: Radium-228 prep batch 160-445583- Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-301 (310-166665-1), MW-302 (310-166665-2), MW-303 (310-166665-3), MW-6 (310-166665-4), Field Blank (310-166665-5), MW-304 (310-166665-6), MW-305 (310-166665-7), MW-306 (310-166665-8), MW-20 (310-166665-9), (LCS 160-445583/1-A), (LCSD 160-445583/2-A) and (MB 160-445583/20-A)

Method PrecSep_0: Radium 228 Prep Batch 160-445583: The following samples had light yellow discoloration:MW-302 (310-166665-2) and MW-306 (310-166665-8). Sample 440-251680-F-2 was reduced due to brown discoloration with suspended solids.

Method PrecSep_0: Radium 228 Prep Batch 160-445583: Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-301 (310-166665-1), MW-302 (310-166665-2), MW-303 (310-166665-3), MW-6 (310-166665-4), Field Blank (310-166665-5), MW-304 (310-166665-6), MW-305 (310-166665-7), MW-306 (310-166665-8) and MW-20 (310-166665-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep-21: Radium 226 Prep Batch 160-445567: The following samples had light yellow discoloration:MW-302 (310-166665-2) and MW-306 (310-166665-8). Sample 440-251680-F-2 was reduced due to brown discoloration with suspended solids.

Method PrecSep-21: Radium 226 Prep Batch 160-445567: Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-301 (310-166665-1), MW-302 (310-166665-2), MW-303 (310-166665-3), MW-6 (310-166665-4), Field Blank (310-166665-5), MW-304 (310-166665-6), MW-305 (310-166665-7), MW-306 (310-166665-8) and MW-20 (310-166665-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: SCS Engineers
Job ID: 310-166665-2
Project/Site: Lansing Gen Station, 25219070

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-166665-1	MW-301	Water	10/02/19 13:35	10/04/19 18:20	
310-166665-2	MW-302	Water	10/02/19 12:40	10/04/19 18:20	
310-166665-3	MW-303	Water	10/02/19 14:13	10/04/19 18:20	
310-166665-4	MW-6	Water	10/02/19 11:45	10/04/19 18:20	
310-166665-5	Field Blank	Water	10/02/19 23:59	10/04/19 18:20	
310-166665-6	MW-304	Water	10/02/19 15:50	10/04/19 18:20	
310-166665-7	MW-305	Water	10/02/19 09:15	10/04/19 18:20	
310-166665-8	MW-306	Water	10/02/19 09:10	10/04/19 18:20	
310-166665-9	MW-20	Water	10/02/19 10:35	10/04/19 18:20	

Detection Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-301 | Lab Sample ID: 310-166665-1

No Detections.

Client Sample ID: MW-302 | Lab Sample ID: 310-166665-2

No Detections.

Client Sample ID: MW-303 | Lab Sample ID: 310-166665-3

No Detections.

Client Sample ID: MW-6 | Lab Sample ID: 310-166665-4

No Detections.

Client Sample ID: Field Blank | Lab Sample ID: 310-166665-5

No Detections.

Client Sample ID: MW-304 | Lab Sample ID: 310-166665-6

No Detections.

Client Sample ID: MW-305 | Lab Sample ID: 310-166665-7

No Detections.

Client Sample ID: MW-306 | Lab Sample ID: 310-166665-8

No Detections.

Client Sample ID: MW-20 | Lab Sample ID: 310-166665-9

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-301
Date Collected: 10/02/19 13:35
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-1
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.372**		0.148	0.151	1.00	0.164	pCi/L	10/09/19 12:55	10/31/19 05:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:39*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.116	U	0.327	0.327	1.00	0.566	pCi/L	10/09/19 13:31	10/24/19 12:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*75.1*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:39*	*1*
Y Carrier	*74.4*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:39*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.488	U	0.359	0.360	5.00	0.566	pCi/L		10/31/19 13:31	1

Client Sample ID: MW-302
Date Collected: 10/02/19 12:40
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-2
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.807**		0.193	0.207	1.00	0.156	pCi/L	10/09/19 12:55	10/31/19 05:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.4*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:39*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.675**		0.428	0.433	1.00	0.658	pCi/L	10/09/19 13:31	10/24/19 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.4*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*
Y Carrier	*62.4*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.48**		0.470	0.480	5.00	0.658	pCi/L		10/31/19 13:31	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-303

Date Collected: 10/02/19 14:13
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-3
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.444**		0.140	0.146	1.00	0.141	pCi/L	10/09/19 12:55	10/31/19 05:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:40*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0185	U	0.233	0.233	1.00	0.420	pCi/L	10/09/19 13:31	10/24/19 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*
Y Carrier	*77.8*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.463**		0.272	0.275	5.00	0.420	pCi/L		10/31/19 13:31	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-6

Date Collected: 10/02/19 11:45
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-4
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.237**		0.127	0.129	1.00	0.171	pCi/L	10/09/19 12:55	10/31/19 05:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.9*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:40*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.259	U	0.268	0.270	1.00	0.437	pCi/L	10/09/19 13:31	10/24/19 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.9*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*
Y Carrier	*81.5*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:40*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.495**		0.297	0.299	5.00	0.437	pCi/L		10/31/19 13:31	1

Client Sample ID: Field Blank
Lab Sample ID: 310-166665-5

Date Collected: 10/02/19 23:59
Matrix: Water
Date Received: 10/04/19 18:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.128	U	0.103	0.103	1.00	0.154	pCi/L	10/09/19 12:55	10/31/19 05:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:40*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.194	U	0.258	0.259	1.00	0.490	pCi/L	10/09/19 13:31	10/24/19 12:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*
Y Carrier	*82.2*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.128	U	0.278	0.279	5.00	0.490	pCi/L		10/31/19 13:31	1

Client Sample ID: MW-304

Lab Sample ID: 310-166665-6

Date Collected: 10/02/19 15:50

Matrix: Water

Date Received: 10/04/19 18:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.246**		0.127	0.129	1.00	0.163	pCi/L	10/09/19 12:55	10/31/19 05:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.8*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:40*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.653**		0.382	0.386	1.00	0.587	pCi/L	10/09/19 13:31	10/24/19 12:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.8*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:35*	*1*
Y Carrier	*80.7*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:35*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.900**		0.403	0.407	5.00	0.587	pCi/L		10/31/19 13:31	1

Client Sample ID: MW-305
Lab Sample ID: 310-166665-7
Date Collected: 10/02/19 09:15
Matrix: Water
Date Received: 10/04/19 18:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.380**		0.138	0.143	1.00	0.156	pCi/L	10/09/19 12:55	10/31/19 05:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.5*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:41*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.178	U	0.295	0.295	1.00	0.496	pCi/L	10/09/19 13:31	10/24/19 12:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.5*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*
Y Carrier	*87.5*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.557**		0.326	0.328	5.00	0.496	pCi/L		10/31/19 13:31	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-306

Date Collected: 10/02/19 09:10
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-8
Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.902		0.198	0.214	1.00	0.152	pCi/L	10/09/19 12:55	10/31/19 05:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.8*		*40 - 110*	*10/09/19 12:55*	*10/31/19 05:41*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.889		0.381	0.390	1.00	0.555	pCi/L	10/09/19 13:31	10/24/19 12:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.8*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*
Y Carrier	*85.6*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.79		0.429	0.445	5.00	0.555	pCi/L		10/31/19 13:31	1

Client Sample Results

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-20

Lab Sample ID: 310-166665-9

Date Collected: 10/02/19 10:35
Date Received: 10/04/19 18:20

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.521**		0.149	0.157	1.00	0.142	pCi/L	10/09/19 12:55	10/31/19 08:08	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*10/09/19 12:55*	*10/31/19 08:08*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.530	U	0.376	0.379	1.00	0.594	pCi/L	10/09/19 13:31	10/24/19 12:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*
Y Carrier	*76.3*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.05**		0.404	0.410	5.00	0.594	pCi/L		10/31/19 13:31	1

Definitions/Glossary

Client: SCS Engineers　　Job ID: 310-166665-2
Project/Site: Lansing Gen Station, 25219070

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Job ID: 310-166665-2
Project/Site: Lansing Gen Station, 25219070

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-445567/20-A
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 448412
Prep Batch: 445567

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2099		0.117	0.119	1.00	0.160	pCi/L	10/09/19 12:55	10/31/19 08:08	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*10/09/19 12:55*	*10/31/19 08:08*	*1*

Lab Sample ID: LCS 160-445567/1-A
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 448412
Prep Batch: 445567

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.922		1.09	1.00	0.168	pCi/L	87	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*71.5*		*40 - 110*

Lab Sample ID: LCSD 160-445567/2-A
Client Sample ID: Lab Control Sample Dup
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 448412
Prep Batch: 445567

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226	11.4	9.379		1.03	1.00	0.171	pCi/L	83	75 - 125	0.26	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-445583/20-A
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 447584
Prep Batch: 445583

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.02149	U	0.261	0.261	1.00	0.468	pCi/L	10/09/19 13:31	10/24/19 12:36	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*
Y Carrier	*83.7*		*40 - 110*	*10/09/19 13:31*	*10/24/19 12:36*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-445583/1-A
Matrix: Water
Analysis Batch: 447518

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 445583

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.46	10.73		1.47	1.00	0.873	pCi/L	113	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*71.5*		*40 - 110*
Y Carrier	*54.2*		*40 - 110*

Lab Sample ID: LCSD 160-445583/2-A
Matrix: Water
Analysis Batch: 447518

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 445583

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			9.46	10.09		1.23	1.00	0.532	pCi/L	107	75 - 125	0.24	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.4*		*40 - 110*
Y Carrier	*77.0*		*40 - 110*

QC Association Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Rad

Prep Batch: 445567

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	PrecSep-21	
310-166665-2	MW-302	Total/NA	Water	PrecSep-21	
310-166665-3	MW-303	Total/NA	Water	PrecSep-21	
310-166665-4	MW-6	Total/NA	Water	PrecSep-21	
310-166665-5	Field Blank	Total/NA	Water	PrecSep-21	
310-166665-6	MW-304	Total/NA	Water	PrecSep-21	
310-166665-7	MW-305	Total/NA	Water	PrecSep-21	
310-166665-8	MW-306	Total/NA	Water	PrecSep-21	
310-166665-9	MW-20	Total/NA	Water	PrecSep-21	
MB 160-445567/20-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-445567/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-445567/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 445583

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-166665-1	MW-301	Total/NA	Water	PrecSep_0	
310-166665-2	MW-302	Total/NA	Water	PrecSep_0	
310-166665-3	MW-303	Total/NA	Water	PrecSep_0	
310-166665-4	MW-6	Total/NA	Water	PrecSep_0	
310-166665-5	Field Blank	Total/NA	Water	PrecSep_0	
310-166665-6	MW-304	Total/NA	Water	PrecSep_0	
310-166665-7	MW-305	Total/NA	Water	PrecSep_0	
310-166665-8	MW-306	Total/NA	Water	PrecSep_0	
310-166665-9	MW-20	Total/NA	Water	PrecSep_0	
MB 160-445583/20-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-445583/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-445583/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-301

Lab Sample ID: 310-166665-1

Date Collected: 10/02/19 13:35
Date Received: 10/04/19 18:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:39	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447518	10/24/19 12:39	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-302

Lab Sample ID: 310-166665-2

Date Collected: 10/02/19 12:40
Date Received: 10/04/19 18:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:39	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447518	10/24/19 12:40	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-303

Lab Sample ID: 310-166665-3

Date Collected: 10/02/19 14:13
Date Received: 10/04/19 18:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:40	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447518	10/24/19 12:40	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-6

Lab Sample ID: 310-166665-4

Date Collected: 10/02/19 11:45
Date Received: 10/04/19 18:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:40	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447518	10/24/19 12:40	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Lab Chronicle

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: Field Blank

Date Collected: 10/02/19 23:59
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:40	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447584	10/24/19 12:36	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-304

Date Collected: 10/02/19 15:50
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 05:40	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447584	10/24/19 12:35	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-305

Date Collected: 10/02/19 09:15
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448459	10/31/19 05:41	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447584	10/24/19 12:36	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Client Sample ID: MW-306

Date Collected: 10/02/19 09:10
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448459	10/31/19 05:41	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447584	10/24/19 12:36	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Lab Chronicle

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Client Sample ID: MW-20
Date Collected: 10/02/19 10:35
Date Received: 10/04/19 18:20

Lab Sample ID: 310-166665-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			445567	10/09/19 12:55	ORM	TAL SL
Total/NA	Analysis	903.0		1	448412	10/31/19 08:08	SCB	TAL SL
Total/NA	Prep	PrecSep_0			445583	10/09/19 13:31	ORM	TAL SL
Total/NA	Analysis	904.0		1	447584	10/24/19 12:36	JCB	TAL SL
Total/NA	Analysis	Ra226_Ra228 Pos		1	448473	10/31/19 13:31	SMP	TAL SL

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: SCS Engineers
Job ID: 310-166665-2
Project/Site: Lansing Gen Station, 25219070

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State Program	007	12-01-19

Laboratory: Eurofins TestAmerica, St. Louis

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State Program	373	12-01-20

Method Summary

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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310-166665 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: SCS Engineers			
City/State: CITY Menomonee Falls	STATE WI	Project: Lansing Gen Station	
Receipt Information			
Date/Time Received: DATE 10/4/19	TIME 1820	Received By: LAB	

Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee
☒ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:________

Condition of Cooler/Containers

Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☒ Yes ☐ No	*If yes:* Cooler # 1 of 2	
Cooler Custody Seals Present?	☐ Yes ☒ No	*If yes:* Cooler custody seals intact?	☐ Yes ☐ No
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact?	☐ Yes ☐ No
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	

Temperature Record

Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:________ ☐ NONE

Thermometer ID: M	Correction Factor (°C): -0.1
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature	
Uncorrected Temp (°C): 0.0	Corrected Temp (°C): -0.1

• Sample Container Temperature

Container(s) used:	CONTAINER 1	CONTAINER 2
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

two MW-6's one with time 11:45 or 1550
NO MW 304 sample labeled

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

eurofins | Environment Testing TestAmerica

Place COC scanning label here

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Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: SCS Engineers			
City/State: CITY Menomonee Falls STATE WI		Project: Lansing Gen. Station	
Receipt Information			
Date/Time Received: DATE 10/4/19 TIME 1820		Received By: LAB	
Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☒ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:_____			
Condition of Cooler/Containers			
Sample(s) received in Cooler?	☒ Yes ☐ No	*If yes:* Cooler ID:	
Multiple Coolers?	☒ Yes ☐ No	*If yes:* Cooler # 2 of 2	
Cooler Custody Seals Present?	☐ Yes ☒ No	*If yes:* Cooler custody seals intact?	☐ Yes ☐ No
Sample Custody Seals Present?	☐ Yes ☒ No	*If yes:* Sample custody seals intact?	☐ Yes ☐ No
Trip Blank Present?	☐ Yes ☒ No	*If yes:* Which VOA samples are in cooler? ↓	
Temperature Record			
Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:_____ ☐ NONE			
Thermometer ID: M		Correction Factor (°C): -0.1	
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C): 1.1		Corrected Temp (°C): 1.0	
• Sample Container Temperature			
Container(s) used:	CONTAINER 1	CONTAINER 2	
Uncorrected Temp (°C):			
Corrected Temp (°C):			
Exceptions Noted			
1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No			
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No			
NOTE: If yes, contact PM before proceeding. If no, proceed with login			
Additional Comments			

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

43540

Chain of Custody Record

ofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Phone: 319-277-2401 Fax: 319-277-2425

TestAmerica Des Moines SC
214

eurofins | Environment Testing TestAmerica

Client Information	Sampler: Louise Jennings	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):
Client Contact: Gary Sterkel	Phone: 414 608 509 8245	E-Mail: sandie.fredrick@testamericainc.com	COC No: 310-43540-12748.1
Company: SCS Engineers			Page: Page 1 of 1
Address: N84 W13540 Leon Road	Due Date Requested:		Job #:
City: Menomonee Falls	TAT Requested (days): Standard		
State, Zip: WI, 53051			
Phone:	PO #: 25219070		
Email: gsterkel@scsengineers.com	WO #:		
Project Name: Lansing Gen Station, 25219070	Project #: 31011020		
Site:	SSOW#:		

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A, 7470A	2540C_Calcd, 9056A_ORGFM_28D, SM4500_H+	903.0 - Radium 226	904.0 - Radium 228	Total Number of containers	Special Instructions/Note:
				Preservation Code:			D	N	D	D		
MW-301	10.2.19	1335	G	Water			X	X	X	X		
MW-302	10.2.19	1240	G	Water								
MW-303	10.2.19	1413	G	Water								
MW-6	10.2.19	1145	G	Water								
Field Blank	10.2.19	2359	—	Water								There are 2 coolers for this COC.
MW-304	10.2.19	1550	G	Water								
MW-305	10.2.19	0915	G	Water								
MW-306	10.2.19	0910	G	Water								
MW-20	10.2.19	1035	G	Water								
				Water								

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[signature]	10.3.19 1610		Lindsay Binder	10/4/19 1820	

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Container Summary Report

Temperature readings: ______________________

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-301	310-166665-A-1	Plastic 250ml - with Nitric Acid	<2		
MW-301	310-166665-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-301	310-166665-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-166665-A-2	Plastic 250ml - with Nitric Acid	<2		
MW-302	310-166665-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-302	310-166665-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-166665-A-3	Plastic 250ml - with Nitric Acid	<2		
MW-303	310-166665-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-303	310-166665-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-166665-A-4	Plastic 250ml - with Nitric Acid	<2		
MW-6	310-166665-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-6	310-166665-D-4	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-166665-A-5	Plastic 250ml - with Nitric Acid	<2		
Field Blank	310-166665-C-5	Plastic 1 liter - Nitric Acid	<2		
Field Blank	310-166665-D-5	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-166665-A-6	Plastic 250ml - with Nitric Acid	<2		
MW-304	310-166665-C-6	Plastic 1 liter - Nitric Acid	<2		
MW-304	310-166665-D-6	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-166665-A-7	Plastic 250ml - with Nitric Acid	<2		
MW-305	310-166665-C-7	Plastic 1 liter - Nitric Acid	<2		
MW-305	310-166665-D-7	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-166665-A-8	Plastic 250ml - with Nitric Acid	<2		
MW-306	310-166665-C-8	Plastic 1 liter - Nitric Acid	<2		
MW-306	310-166665-D-8	Plastic 1 liter - Nitric Acid	<2		
MW-20	310-166665-A-9	Plastic 250ml - with Nitric Acid	<2		
MW-20	310-166665-C-9	Plastic 1 liter - Nitric Acid	<2		
MW-20	310-166665-D-9	Plastic 1 liter - Nitric Acid	<2		

Login Sample Receipt Checklist

Client: SCS Engineers | Job Number: 310-166665-2

Login Number: 166665 | **List Source: Eurofins TestAmerica, Cedar Falls**
List Number: 1
Creator: Spoerre, Autumn R

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: SCS Engineers | Job Number: 310-166665-2

Login Number: 166665
List Number: 2
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 10/08/19 03:08 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	18.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Client: SCS Engineers
Project/Site: Lansing Gen Station, 25219070

Job ID: 310-166665-2

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
310-166665-1	MW-301	75.1
310-166665-2	MW-302	77.4
310-166665-3	MW-303	88.7
310-166665-4	MW-6	83.9
310-166665-5	Field Blank	87.6
310-166665-6	MW-304	80.8
310-166665-7	MW-305	84.5
310-166665-8	MW-306	76.8
310-166665-9	MW-20	87.0
LCS 160-445567/1-A	Lab Control Sample	71.5
LCSD 160-445567/2-A	Lab Control Sample Dup	81.4
MB 160-445567/20-A	Method Blank	87.6

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
310-166665-1	MW-301	75.1	74.4
310-166665-2	MW-302	77.4	62.4
310-166665-3	MW-303	88.7	77.8
310-166665-4	MW-6	83.9	81.5
310-166665-5	Field Blank	87.6	82.2
310-166665-6	MW-304	80.8	80.7
310-166665-7	MW-305	84.5	87.5
310-166665-8	MW-306	76.8	85.6
310-166665-9	MW-20	87.0	76.3
LCS 160-445583/1-A	Lab Control Sample	71.5	54.2
LCSD 160-445583/2-A	Lab Control Sample Dup	81.4	77.0
MB 160-445583/20-A	Method Blank	87.6	83.7

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

Appendix B

Demonstration of Need for ACM Deadline Extension

July 10, 2019
File No. 25218201.00

Mr. Jon Jackson
Interstate Power and Light Company
1031 Iowa Street, Suite 5007
Dubuque, IA 52001

Subject: Demonstration of Need for Deadline Extension
Assessment of Corrective Measures
Lansing Generating Station, Lansing, Iowa

Dear Mr. Jackson:

In accordance with 40 CFR 257.96(a), Interstate Power and Light Company (IPL) has initiated an Assessment of Corrective Measures (ACM) for the Lansing Generating Station. The ACM was initiated on April 15, 2019, in response to detections of constituents in Appendix IV to 40 CFR Part 257 at statistically significant levels above the groundwater protection standards (GPS) established under 40 CFR 257.95(h). As allowed under 40 CFR 257.96(a), this letter provides a demonstration that additional time beyond the 90-day deadline is needed to complete the ACM, and that the deadline may be extended by 60 days. Therefore, the ACM must be completed by September 13, 2019.

Demonstration of Need for Additional Time

Additional time is needed to complete the ACM in order to investigate the nature and extent of downgradient groundwater impacts and consider that information in preparing the ACM. The additional information obtained through further investigation of site conditions is important to the selection of suitable corrective measures and the evaluation of those corrective measures in meeting the requirements and objectives outlined in 40 CFR 257.96(c). Specifically, additional data about the nature and extent of groundwater impacts is needed to determine the current level of risk, evaluate the reduction of risk provided, and evaluate the implementation of potential corrective measures.

In January 2019, prior to initiating an ACM in April 2019, IPL began the process of designing, permitting, installing, and sampling additional groundwater monitoring wells to investigate the nature and extent of these constituents in groundwater, in accordance with 40 CFR 257.95(g)(1).

The following factors contributed to delays in the installation and sampling of the new wells, which in turn created the need for the extension of the ACM deadline by up to 60 days as allowed under 40 CFR 257.96(a):

- Selection of well locations, arrangement for access to the well locations, and local permit reviews delayed well installation.
- Drilling subcontractor schedules caused additional delays due to limited subcontractor availability and Iowa drilling licensing requirements.

Additional information regarding the nature and extent of groundwater impacts will provide further understanding of existing risks associated with the groundwater impacts identified at the Lansing Generating Station, which provides the basis for evaluating potential corrective measures as required under 40 CFR 257.96. While evaluation of the nature and extent of impacts may continue in parallel with the ACM and selection of remedy, extending the ACM deadline as allowed under the coal combustion residuals (CCR) rule will allow for the consideration of additional information and provide for a more complete ACM. Thus, the 60-day extension is needed.

As required by 40 CFR 257.96(a), a professional engineer's certification of the accuracy of this demonstration is enclosed.

PE Certification

As required by 40 CFR 257.96, I, Eric J. Nelson, hereby certify that this demonstration of need for the 60-day extension of the deadline for completing an Assessment of Corrective Measures is accurate. I am a duly licensed Professional Engineer under the laws of the State of Iowa.

7/10/2019

(signature) (date)

Eric J. Nelson

(printed or typed name)

License number 23136

My license renewal date is December 31, 2020.

Pages or sheets covered by this seal:

ACM - Demonstration of Need for Deadline Extension

Lansing Generating Station

Sincerely,

Eric J. Nelson, PE
Project Director
SCS Engineers

Thomas J. Karwoski
Senior Project Manager
SCS Engineers

EJN/AJR/SC

cc: Matt Cole, Interstate Power and Light Company
Jeff Maxted, Alliant Energy

I:\25218201.00\Correspondence\Client\ACM Extension\190710_Jackson_LAN_ACM Ext_PE_Certification_Letter.docx

B4 Groundwater Sampling and Analysis Plan

SCS ENGINEERS

Groundwater Sampling and Analysis Plan

Lansing Generating Station
Lansing, Iowa

Prepared for:

Interstate Power and Light Company

4902 N Biltmore Lane
Madison, Wisconsin 53707

Prepared by:

SCS ENGINEERS
2830 Dairy Drive
Madison, Wisconsin 53718-6751
(608) 224-2830

October 2017
File No. 25216070.17

Offices Nationwide
www.scsengineers.com

Groundwater Sampling and Analysis Plan
Lansing Generating Station
Lansing, Iowa

Prepared for:

Interstate Power and Light Company
4902 N Biltmore Lane
Madison, Wisconsin 53707

Prepared by:

SCS ENGINEERS
2830 Dairy Drive
Madison, Wisconsin 53718-6751
(608) 224-2830

October 2017
File No. 25216070.17

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SIGNATURES PAGE

Meghan Blodgett
Hydrogeologist
SCS ENGINEERS

Thomas J. Karwoski
Project Manager
SCS ENGINEERS

1.0 INTRODUCTION

This Groundwater Sampling Plan (plan) summarizes groundwater sampling and analysis procedures for the Lansing Generating Station, a generating station with a coal combustion residuals (CCR) landfill and settling pond located in Lansing, Iowa (**Figure 1**). Groundwater sampling at this site is performed to satisfy sampling requirements under United States Environmental Protection Agency (USEPA) Rule 40 CFR Part 257.50-107 (CCR rule sampling). This plan was prepared in accordance with the requirements of 40 CFR Part 257.93(a).

2.0 SAMPLING EVENTS AND PARAMETERS

Groundwater monitoring under the federal program includes semiannual sampling events beginning in October 2017. All samples collected under the CCR rule sampling program are to be unfiltered (total analysis).

A list of the locations at which water level measurements and samples will be collected is included in **Table 1**. This table includes the parameters that may be analyzed at each sampling location. Sampling point locations are shown on **Figure 2**.

3.0 FIELD METHODS

3.1 WATER LEVEL MEASUREMENTS

Depth to water and total well depth will be recorded at each monitoring well immediately prior to purging. These measurements should be taken from the top of the polyvinyl chloride (PVC) well casing. During each sampling event, depths to groundwater at all wells must be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

3.2 WELL PURGING – LOW-FLOW METHOD

Wells will be sampled using low-flow sampling techniques, as documented in USEPA publication EPA/540/S-95/504. All site wells have dedicated WellWizard ™ sampling systems for this purpose. These dedicated pump systems will be used for well purging and for sample collection.

After the initial water level measurement, the well will be purged with a consistent flow of 1 liter per minute (L/min) or less. The water level should remain stable or stabilize during the purging. If the level does not stabilize and continues to drop, the flow rate will be reduced. If the level does not stabilize with a flow rate of 50 milliliters per minute (mL/min), the well will be purged according to the procedure in **Section 3.3**. The purge rate will be measured using a calibrated device and timer, and recorded.

Purge water should be monitored until three consecutive readings, taken approximately 2 minutes or 0.5 well volumes apart, are stabilized within the provided ranges for the following parameters:

Parameter	Range
pH[1,2]	+/- 0.1 unit
Specific Conductance[1,2]	+/- 3%
Dissolved Oxygen[1,2]	+/- 10%
Oxidation/Reduction Potential[1,2]	+/- 10 millivolts
Temperature[2]	+/- 3%
Turbidity[1,2] (Required if collecting non-filtered metals samples. Recommended otherwise.)	+/- 10% for values greater than 5 NTU. If three turbidity values are less than 5 NTU, consider the values as stabilized.

References: (1): USEPA Publication EPA/540/S-95/504 and (2): USEPA Region 1 Low-Stress (Low-Flow) SOP, Revision Number 3, Revised January 19, 2010.

Measurements will be collected using a portable meter and recorded on a Groundwater Sampling Log (**Appendix A**). All parameters except turbidity must be obtained using a flow-through cell. Samples for turbidity measurements will be obtained before water enters the flow-through cell.

Meter calibration will be performed according to the manufacturer's instructions and will be documented in the field book. Observations of sample odor and color will be recorded. Visual observations of turbidity may be recorded in addition to instrument readings.

Once the readings have stabilized, which indicates that stagnant water in the well has been replaced with formation water, the well will be ready for groundwater sampling from the discharge.

3.3 WELL PURGING – IF STABLE WATER LEVEL CANNOT BE ACHIEVED

If a stable water level cannot be achieved in a well with low-flow purging methods, in a well where low-flow sampling is the intended sampling method, the well will be purged using the dedicated pump. The well will then be allowed to recover sufficiently so that the required sample volume may be collected. The sample will be collected using the dedicated low-flow pump. The pumping rate should be set as slow as practical in order to minimize sample turbidity.

If this method is used, the indicator field parameters listed in **Section 3.2** will be recorded but stability is not required. The depth to water before sample collection will be recorded.

3.4 SAMPLING PROTOCOL

3.4.1 Monitoring Wells – Low-Flow Method

After each well is determined to have stabilized (see **Section 3.2**), samples will be collected using the dedicated bladder pump. Disposable chemical-resistant (e.g., nitrile) gloves will be worn during sampling and will be changed between sampling points.

All samples will be labeled with the sample ID (monitoring well number), site name, project number, time and date of collection, analytical parameters, preservative, and the initials of the sampler. The laboratory will provide instructions regarding the preservation techniques required for each analysis. The laboratory will provide any required temperature and/or trip blanks, and will provide water and sample containers for field blanks.

3.4.2 Monitoring Wells – Low-Flow Method in Slow-Recovering Wells

At wells purged using the procedure described in **Section 3.2**, samples will be collected using the dedicated bladder pump after the well has recovered sufficiently for the required sample volume to be collected. The pumping rate during sampling will be set as low as practical in order to minimize sample turbidity. Disposable chemical-resistant (e.g., nitrile) gloves will be worn during sampling and will be changed between sampling points.

All samples will be labeled with the sample ID (monitoring well number), site name, project number, time and date of collection, analytical parameters, preservative, and the initials of the sampler. The laboratory will provide instructions regarding the preservation techniques required for each analysis. The laboratory will provide any required temperature and/or trip blanks, and will provide water and sample containers for field blanks.

3.4.3 Quality Assurance and Quality Control

A Field Blank sample will be collected during each sampling event using distilled or deionized water and sample containers provided by the laboratory. If applicable, the Field Blank bottles will be filled in an area of the site where the risk of sample contamination from CCR handling activities appears to be the greatest (e.g., next to a monitoring well, adjacent to or downwind of an active CCR handling area). The location where the Field Blank bottles were filled will be recorded in the field notes.

3.4.4 Sample Containers

Sample containers will be provided by the laboratory contractor for the sample analysis. Containers for samples that require preservation will be pre-preserved by the laboratory. The laboratory will provide sample containers for the collection of quality control samples.

3.4.5 Sample Preservation

Samples will be preserved as required for the analytical methods being used. The laboratory will provide instructions and sample containers pre-filled with preservative chemicals, if required. All samples will be kept on ice from the time of collection until they are submitted to the laboratory.

3.4.6 Sample Shipment

Samples for all parameters except radium will be packed in coolers with ice and will be shipped to the laboratory using a method that ensures delivery within required temperature limits. Radium samples do not require ice for shipping. Typically, samples will be shipped for next-day delivery using a courier service or a shipping company (e.g., FedEx or UPS).

3.5 EQUIPMENT DECONTAMINATION

Equipment that is not dedicated to a single well (e.g., water level measurement tape or non-dedicated pump) will be decontaminated between monitoring points. Decontamination will consist of cleaning with water and nonphosphate detergent (i.e., Alconox™ or equivalent), followed by a double-rinse with distilled water.

4.0 ANALYTICAL METHODS

Laboratory sample analysis will be performed using the following methods. Other methods may be substituted provided the Limit of Detection of the new method is lower than the regulatory standard(s) to which the results will be compared.

- Total Metals (except mercury) – EPA 6010 or 6020
- Mercury – EPA 7470
- Anions – EPA 9056 or EPA 300.0
- Total Dissolved Solids – SM 2540C
- Radium 226 – EPA 903.1
- Radium 228 – EPA 904.0

4.1 ANALYTICAL QUALITY ASSURANCE/QUALITY CONTROL

Samples for laboratory analysis will be submitted only to a laboratory that is certified for the methods listed in **Section 4.0**. The laboratory will have established Quality Assurance/Quality Control (QA/QC) procedures that conform to industry standards.

5.0 DOCUMENTATION

5.1 FIELD DOCUMENTATION

Water levels, purge volumes, sample times, field parameters, and general well condition information will be recorded on Groundwater Sampling Log forms (**Appendix A**).

5.2 CHAIN OF CUSTODY

Chain of Custody forms will be supplied by the laboratory and completed in the field by the sampler. An example Chain of Custody form is included in **Appendix B**. At a minimum, Chain of Custody forms will include:

- Sample IDs, date and time of sample collection, required analyses for each sample, and sample preservative (if applicable)
- Site name and project number
- Sampler's name and company
- Laboratory name and address
- Signature of person relinquishing samples for shipping

6.0 STATISTICAL ANALYSIS

Groundwater monitoring data for the Lansing Generating Station CCR units will be evaluated in accordance with 40 CFR 257.93(f)(3). The procedures to be followed for statistical analysis of groundwater monitoring data are included in **Appendix C**.

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TABLE 1

Sampling Points and Parameters – CCR Rule Sampling Program

Table 1. Sampling Points and Parameters - CCR Rule Sampling Program
Groundwater Monitoring - Lansing Generating Station / SCS Engineers Project #25216070.17

	Parameter	MW-301	MW-302	MW-303	MW-20*	MW-6	Field Blank
Appendix III Parameters (Detection Monitoring)	Boron	X	X	X	X	X	X
	Calcium	X	X	X	X	X	X
	Chloride	X	X	X	X	X	X
	Fluoride	X	X	X	X	X	X
	pH	X	X	X	X	X	X
	Sulfate	X	X	X	X	X	X
	TDS	X	X	X	X	X	X
Appendix IV Parameters (Assessment Monitoring)	Antimony	X	X	X	X	X	X
	Arsenic	X	X	X	X	X	X
	Barium	X	X	X	X	X	X
	Beryllium	X	X	X	X	X	X
	Cadmium	X	X	X	X	X	X
	Chromium	X	X	X	X	X	X
	Cobalt	X	X	X	X	X	X
	Fluoride	X	X	X	X	X	X
	Lead	X	X	X	X	X	X
	Lithium	X	X	X	X	X	X
	Mercury	X	X	X	X	X	X
	Molybdenum	X	X	X	X	X	X
	Selenium	X	X	X	X	X	X
	Thallium	X	X	X	X	X	X
	Radium	X	X	X	X	X	X
CCR Rule Field Parameters	Groundwater Elevation	X	X	X	X	X	
	pH	X	X	X	X	X	
Low-Flow Sampling Field Parameters	Well Depth	X	X	X	X	X	
	Specific Conductance	X	X	X	X	X	
	Dissolved Oxygen	X	X	X	X	X	
	ORP	X	X	X	X	X	
	Temperature	X	X	X	X	X	
	Turbidity	X	X	X	X	X	
	Color	X	X	X	X	X	
	Odor	X	X	X	X	X	

Notes: All samples are unfiltered (total).
*: MW-20 is included in the sampling program but is not a CCR Rule compliance well.

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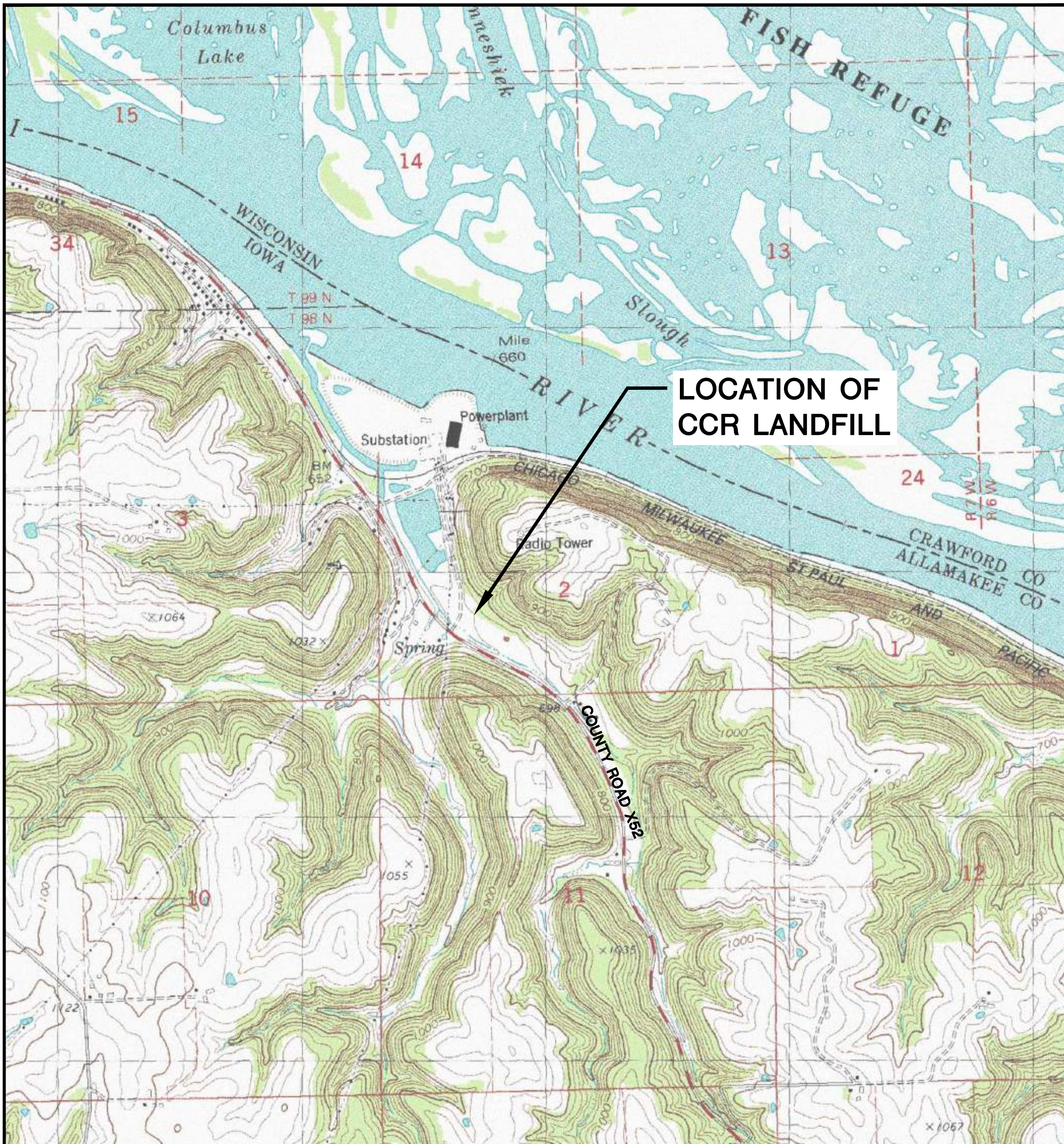
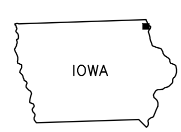
FIGURES



N

LANSING QUADRANGLE
IOWA–ALLAMAKEE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 LANSING 15' QUADRANGLE
1997
SCALE: 1" = 2,000'



CLIENT	ALLIANT ENERGY. INTERSTATE POWER AND LIGHT 2320 POWER PLANT DRIVE LANSING, IA 52151–9733	SITE	INTERSTATE POWER AND LIGHT LANSING GENERATING STATION COAL COMBUSTION RESIDUE LANDFILL LANSING, IOWA	SITE LOCATION MAP

PROJECT NO.	25215135.70	DRAWN BY:	AHB	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718–6751 PHONE: (608) 224–2830	FIGURE
DRAWN:	08/09/12	CHECKED BY:	MDB		1
REVISED:	02/02/16	APPROVED BY:			

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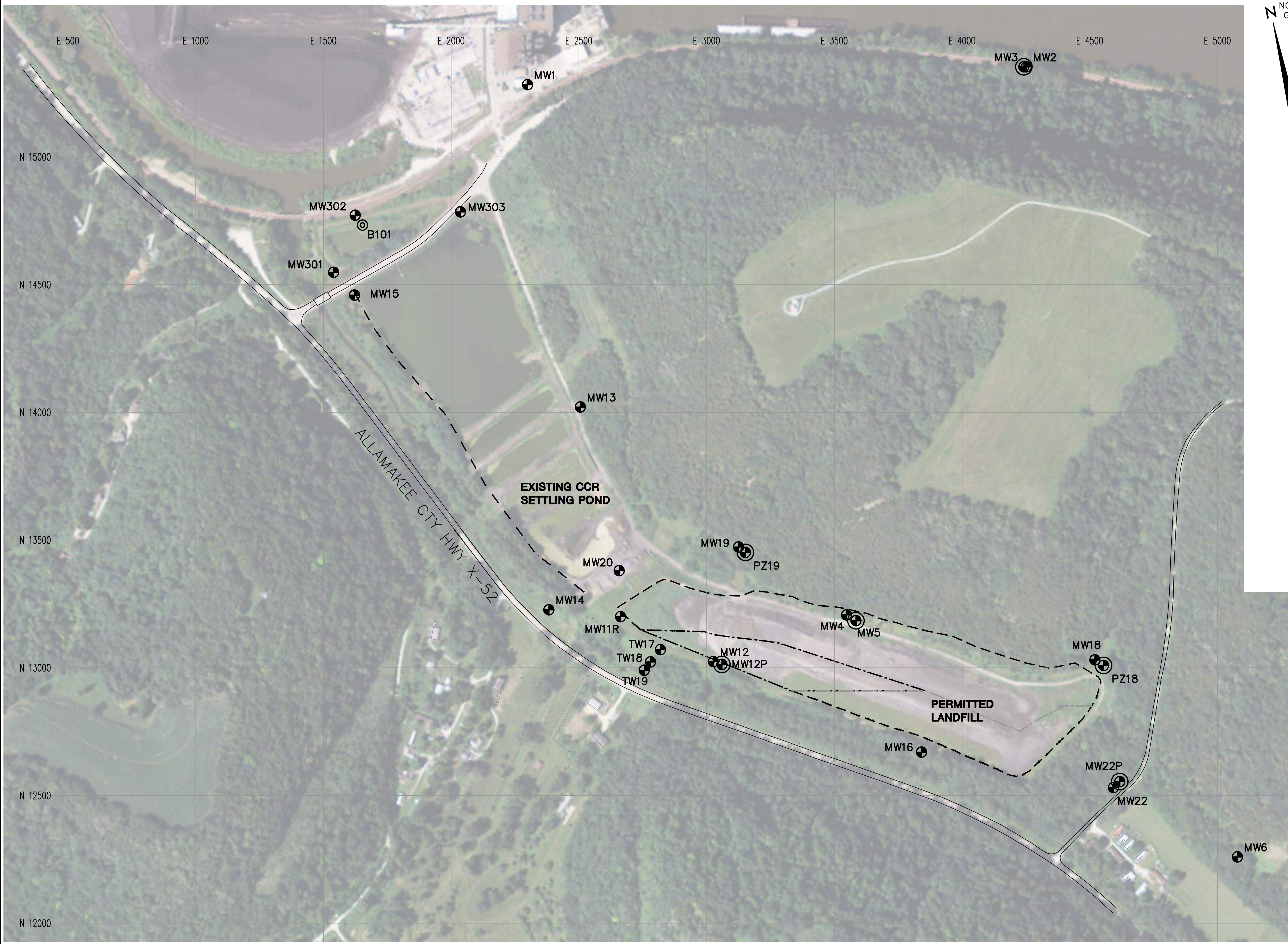

LEGEND

- APPROVED LIMITS OF WASTE
- LIMITS OF PHASE 1 FINAL COVER
- LIMITS OF PHASE 2 FINAL COVER
- MW17 EXISTING MONITORING WELL
- MW12P EXISTING PIEZOMETER
- B101 SOIL & BEDROCK BORING
- SLURRY WALL

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.

PROJECT NO.	25216070.00	DRAWN BY:	AHB
DRAWN:	10/24/16	CHECKED BY:	MDB
REVISED:	11/28/16	APPROVED BY:	

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

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

SITE: INTERSTATE POWER AND LIGHT
LANSING POWER STATION
COAL COMBUSTION RESIDUE LANDFILL
LANSING, IOWA

SITE PLAN

FIGURE 2

I:\2521□070.00\Drawings\Site Plan.dwg, 11/28/201□ 3:20:2□ PM

APPENDIX A

Low-Flow Groundwater Sampling Log

Environmental Consultants
and Contractors
2830 Dairy Drive
Madison, WI 53718-6751
608 224-2830
FAX 608 224-2839
www.scsengineers.com

SCS ENGINEERS

Groundwater Sampling Log

Project No. ______________________ **Site** ______________________

Well No. ______________________ **Date** ______________________

Well Depth ______________ **Sampling Device** ______________________

Water Level ______________ **Other Info.** ______________________

Purge Volume ______________ **Pumping Rate** ______________________

Sampling Personnel ______________________________________

Color/Odor ______________________________________

Time	Water Level	Temp.	pH	DO (mg/L)	Conductivity (µs/cm)	ORP	Turbidity	Notes
Stability Requirements:		+/- 3%	+/- 0.1 unit	±/- 10%	+/- 3%	+/- 10mV	+/- 10% or 3 readings <5 NTU	

Type of Samples Collected: ______________________________________

Additional Notes: ______________________________________

Information: 2 in = 617 ml/ft, 4 in = 2,470 ml/ft: $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi\ r^3$

APPENDIX B

Example Chain of Custody

(Please Print Clearly)

Company Name:	SCS Engineers
Branch/Location:	Madison, WI
Project Contact:	Tom Karwoski
Phone:	(608) 224-2830
Project Number:	25216070.17
Project Name:	IPL-LAN GW Monitoring
Project State:	Iowa
Sampled By (Print):	
Sampled By (Sign):	
PO #:	
Regulatory Program:	

Pace Analytical®
www.pacelabs.com

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Quote #:	
Mail To Contact:	Tom Karwoski
Mail To Company:	SCS Engineers
Mail To Address:	2830 Dairy Drive Madison, WI 53718
Invoice To Contact:	Tom Karwoski
Invoice To Company:	SCS Engineers
Invoice To Address:	2830 Dairy Drive Madison, WI 53718
Invoice To Phone:	(608) 224-2830

Data Package Options (billable)
- ☐ EPA Level III
- ☐ EPA Level IV

MS/MSD
- ☐ On your sample (billable)
- ☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge
W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

FILTERED? (YES/NO): Y / N
PRESERVATION (CODE)*: Pick Letter
Analyses Requested

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX									CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
	MW-301			GW											
	MW-302			GW											
	MW-303			GW											
	MW-6			GW											
	MW-20			GW											
	Field Blank			W											

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:

PACE Project No.

Receipt Temp = °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

APPENDIX C

Statistical Methodology for Groundwater Monitoring

APPENDIX C
Statistical Methodology for Groundwater Monitoring
Lansing Generating Station (LAN) – Interstate Power and Light Company (IPL)
October 2017

Groundwater monitoring data for the LAN CCR units will be evaluated in accordance with 40 CFR 257.93(f)(3), using a prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper prediction limit.

Statistical evaluation will be performed using commercially available software (*Chemstat*, *Sanitas for Groundwater*© or similar) in general accordance with the USEPA's *Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* dated March 2009 (Unified Guidance) (USEPA, 2009) and generally accepted procedures.

The general procedures to be followed for statistical analysis of groundwater monitoring data are outlined below.

BACKGROUND MONITORING

A minimum of eight background samples will be collected prior to October 2017 for each Appendix III and Appendix IV constituent for each well in the monitoring system to develop the initial background data set for prediction limit analysis.

DETECTION MONITORING

The following data analysis will be performed for Appendix III parameters during detection monitoring to determinate whether a statistically significant increase (SSI) has occurred:

- Data Evaluation and Validation/Censoring
- Statistical Analysis using Prediction Limits

For the prediction limit calculation, the selection of interwell or intrawell testing will be based on the considerations outlined in Chapter 6 of the Unified Guidance, including natural background spatial variability, historical contamination associated with the sources other than the CCR unit(s), indications of contamination associated with the CCR unit(s), and background sample data set sizes.

For the initial detection monitoring event, interwell testing will be performed to compare compliance well concentrations to background well concentrations. If compliance well results do not significantly exceed background results and/or an alternative source demonstration indicates that higher concentrations in a compliance well are not associated with a release from the CCR unit(s), then intrawell testing may be implemented for future monitoring.

Data Evaluation and Validation/Censoring

In preparation for statistical analysis, data evaluation and validation/censoring steps will include:

- Averaging duplicate samples
- Validation and censoring
- Outlier analysis

Averaging Duplicate Samples

Field and laboratory quality assurance/quality control may involve the collection of one field duplicate per monitoring event. For data evaluation purposes, duplicates will be averaged with the original sample to form an independent data point before statistical analysis is performed.

Validation and Censoring

To filter analytical data that may not represent valid results, data from the monitoring events will be validated. Data flagged with a "J" qualifier indicates the quantitation of the parameter is less than the laboratory's LOQ but greater than the laboratory's LOD. Data flagged with a "B" qualifier indicated that the parameter was also detected in a trip blank, field blank, and/or method blank detection.

For compliance wells, non-detect data and data flagged with a "J" or "B" qualifier will not be subjected to statistical analysis for compliance purposes. Background data flagged with a "B" qualifier may not be included in the statistical analysis to preserve the power of the test to detect a potential release from the facility.

Outlier Analysis

Outlier analysis will be performed for background data to identify potential extreme values that may be due to sampling, laboratory, transportation, or transcription errors. Outlier analysis will be performed on background data for parameters for which statistical analysis will be performed. Background observations identified as outliers may not be included in the statistical analysis to preserve the power of the test to evaluate if the parameter detections are potentially due to the CCR unit.

Outlier analysis will include visual data review as well as statistical analysis as discussed in Chapter 12 of the Unified Guidance. The formal tests for outliers involve comparing the individual data points for each parameter within the same well against the remaining data from other sampling events. Dixon's test is recommended for small data sets (i.e., $n \leq 25$). Rosner's test is recommended for large data sets (i.e., $n > 25$). Probability plots and/or box plots may also be used for visual identification of outliers.

Statistical Analysis using Prediction Limits

Statistical analysis will be conducted for Appendix III parameters validated and quantified at a concentration equal to or above the laboratory's limit of quantitation (LOQ) in the compliance wells to evaluate if the parameter detections are potentially due to the CCR unit. The statistical analysis process involves:

- Evaluating Background Data
- Assessing Data Distribution
- Calculating Upper Prediction Limits (UPLs)
- Verification Retesting (as appropriate)

Evaluating Background Data

Background data for interwell analysis will be pooled from upgradient monitoring well MW-6. The dates utilized for interwell analysis for the 1st semi-annual detection monitoring event, scheduled for October 2017, will include sampling events between April 1, 2016, and October 31, 2017. Background data for intrawell analysis will include compliance well results from sampling events between April 1, 2016, and August 31, 2017.

As described above, background data will be reviewed for outliers that should be removed prior to further statistical analysis.

The background data set will be updated for future monitoring events in accordance with the Unified Guidance.

Assessing Data Distribution

The assessment of the data distribution is critical for prediction limit calculations, as the selected formula is dependent on the data distribution. The Shapiro-Wilks test of normality is used to assess the distribution of background data for datasets with fewer than 50 data points. The Shapiro-Francia test of normality is used to assess the distribution of background data for datasets with 50 data points or more. Background data that are not determined to be normally distributed will also be evaluated to determine if the distribution can be transformed to a normal distribution by transforming the data (e.g., log or square root) and applying the same tests for normality. Data sets with greater than 50% non-detects will not be subjected to a data distribution evaluation, and the UPL will set using the non-parametric method.

Calculating Upper Prediction Limits

A prediction limit or interval is used to make a statement about one or more future "like" measurements. The Unified Guidance recommends using prediction limits with retesting as a means to lower facility-wide false positive rates while maintaining adequate statistical power to detect an SSI. Prior to constructing prediction limits with retesting following the Unified Guidance, a retesting plan must be specified based on the number of statistical evaluation periods per year, number of constituents, number of monitoring wells, and number of background results. The calculated UPL is then based on the retesting plan.

For initial detection monitoring at LAN, a 1-of-2 retesting plan will provide adequate statistical power to detect an SSI, while maintaining the annual target facility-wide false positive rate at no greater than 10% (cumulative throughout the year). The retesting plan can be modified in the future provided that the statistical power and site-wide false positive criteria are met. Any changes to the retesting plan should be documented before the sampling event begins.

The first number in the "_-of-_" retesting plan indicates the number of resamples that must not exceed the prediction limit in order to determine that an SSI has not occurred. The second number indicates the total number of samples required (i.e., the initial sample plus the resample). Therefore, in a 1-of-2 retesting approach, an SSI has occurred only if both the initial sample and the resample exceed the UPL.

The amount of background data that are below the limit of detection (LOD) plays an important role in selecting the appropriate statistical evaluation method and the resulting statistical calculation. If less than 15% of the background data observations are less than the reporting limit (non-detects), these will be replaced with one half of the reporting limit prior to running the analysis. If more than 15% but less than 50% of the background data are less than the reporting limit, the data's sample mean and sample standard deviation will be adjusted according to the method of Cohen or Aitchison. A non-parametric prediction limit will be calculated for data not transformed normal or containing greater than 50% non-detect results. As a general guideline, if 15% or fewer of the values are "not detected", the non-detect results will be replaced with the LOQ divided by two. If more than 15% but less than 50% of the values were reported as "not detected", the non-detect results will be adjusted using the Aitchison's Method or the Kaplan-Meier technique. The Aitchison's Method assumes that non-detects are actually free of the parameter being measured, so that the non-detect value can be regarded as a zero concentration. The Kaplan-Meier technique creates an estimate of the population mean and standard deviation adjusted for data censoring, based on the fitted distributional model. If 50% or greater of the data were reported as "not detected", a non-parametric statistical method will be utilized.

For any parameter with 100% non-detects in the background data, the Double Quantification rule will be used to evaluate the data for an SSI, as described in Chapter 6 of the Unified Guidance, which states:

> *A confirmed exceedance is registered if any well-constituent pair in the '100% non-detect' group exhibits quantified measurements (i.e., at or above the reporting limit [RL]) in two consecutive sample and resample events.*

When the background data are transformed to a normal distribution (e.g., data are lognormally distributed), the UPL is calculated using the transformed data and then the result is transformed back to its original scale.

When the background data or transformed data are not normally distributed or the percent of non-detects is greater than 50, a non-parametric UPL will be calculated.

Verification Retesting

For each semiannual sampling event, if an initial sample result exceeds the UPL, verification retesting may be performed. Retesting will generally be performed within 60 days of the initial sampling, to allow time to complete the sample analysis and data evaluation prior to the next semiannual event. As described above, in a 1-of-2 retesting approach, an SSI has occurred only if both the initial sample and the resample exceed the UPL.

IPL may choose not to retest one or more well/constituent pairs if the likelihood of the retest result being below the UPL appears low. If an initial sample result exceeds the UPL and the retest sample is not collected and analyzed in accordance with the retesting plan, then an SSI will be determined to have occurred.

ASSESSMENT MONITORING

If assessment monitoring is implemented, data analysis will be performed for Appendix IV parameters to determine whether an SSI over background has occurred for any required constituent. The assessment monitoring statistical evaluation process for comparison to background is the same as for detection monitoring.

Site-specific groundwater protection standard (GPS) values will be established for Appendix IV parameters in accordance with 40 CFR 257.95(h) as outlined below:

1. If an EPA maximum contaminant level (MCL) exists for a given parameter, and the UPL of the background data does not exceed the MCL, the GPS is set to the MCL.

2. If the UPL of the background data for a given parameter is greater than the EPA-MCL, the GPS is set to the background UPL.

3. If the MCL does not exist (not promulgated), the GPS is set to the background UPL.

Assessment monitoring results will be compared to the site-specific GPS values.

REVISIONS

This methodology for statistical evaluation of groundwater monitoring data may be revised as additional data are collected and/or in response to regulatory requirement or guidance changes. For example, the retesting approach may be modified as additional background results are obtained. Revisions will apply to future monitoring events performed after the change is made to the plan.

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Appendix C

Assessment of Corrective Measures

C1 Assessment of Corrective Measures
C2 Addendum No. 1 – Assessment of Corrective Measures

C1 Assessment of Corrective Measures

Assessment of Corrective Measures Landfill and Surface Impoundment

Lansing Generating Station
Lansing, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25218201.00 | September 12, 2019

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Tables

Figures

Appendices

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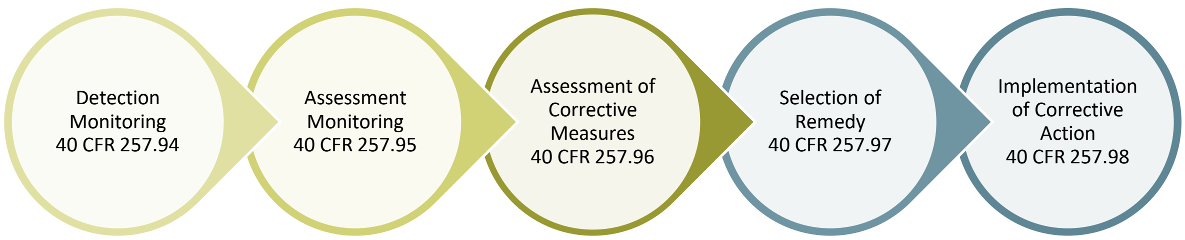
EXECUTIVE SUMMARY

Interstate Power and Light Company (IPL), an Alliant Energy company, operates a dry ash landfill and ash ponds at the Lansing Generating Station (LAN). The landfill and ponds are used to manage coal combustion residuals (CCR) and wastewater from the power plant, which burns coal to generate electricity.

IPL samples and tests the groundwater in the area of the landfill and pond to comply with U.S. Environmental Protection Agency (USEPA) standards for the Disposal of CCR from Electric Utilities, or the “CCR Rule” (Rule). Groundwater monitoring is also conducted under an Iowa Department of Natural Resources (IDNR) sanitary disposal project permit for the landfill.

Groundwater samples from one of the wells installed under the Rule to monitor the landfill and pond contain arsenic at levels higher than the Groundwater Protection Standards (GPS) defined in the Rule. Arsenic occurs naturally and can be present in coal and CCR.

IPL has prepared this Assessment of Corrective Measures (ACM) Report in response to the groundwater sampling results obtained to comply with the Rule at the LAN facility. The ACM process is one step in a series of steps defined in the Rule and shown below.



To prepare the ACM, IPL has worked to understand the following:

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

IPL has installed new wells to help identify where arsenic levels are higher than the USEPA standards. Because the time allowed by the Rule to prepare the ACM is limited, work to improve the understanding of the items listed above is still ongoing.

IPL has identified appropriate options, or Corrective Measures, to bring the levels of arsenic in groundwater below USEPA standards. In addition to stopping landfill disposal of CCR and the discharge of CCR and LAN wastewater to the pond, these corrective measures include:

- Cap CCR in Place with Monitored Natural Attenuation (MNA)
- Consolidate CCR and Cap with MNA

- Excavate and Dispose CCR on Site with MNA
- Excavate and Dispose CCR in Off-site Landfill with MNA

IPL has also included a “No Action” alternative for comparison purposes only.

The ACM includes a preliminary evaluation of all five options using factors identified in the Rule.

Based on what is currently known, the groundwater impacts at LAN are limited, but are not completely understood. IPL will continue to work on understanding groundwater impacts at LAN, and will use this information to select one of the Corrective Measures identified above.

IPL will provide semiannual updates on its progress in evaluating Corrective Measures to address the groundwater impacts at LAN.

Before a remedy is selected, IPL will hold a public meeting with interested and affected parties to discuss the ACM.

For more information on Alliant Energy, view our 2019 Corporate Sustainability Report at http://www.alliantenergy.com/sustainability.

1.0 INTRODUCTION AND PURPOSE

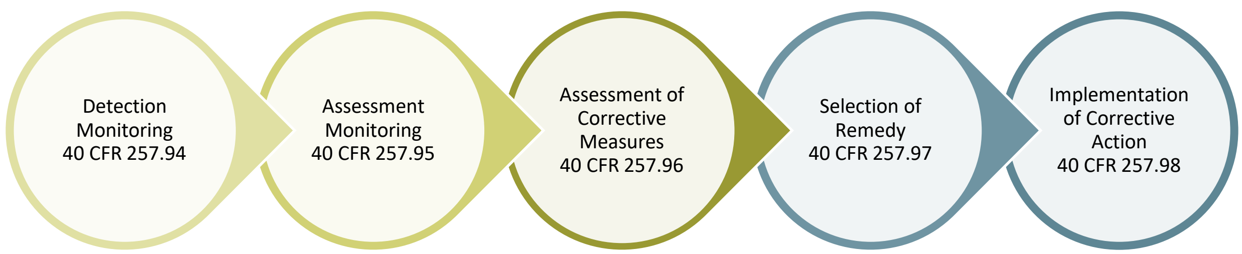
The Assessment of Corrective Measures (ACM) at the Interstate Power and Light Company (IPL) Lansing Generating Station (LAN) was prepared to comply with U.S. Environmental Protection Agency (USEPA) regulations regarding the Disposal of Coal Combustion Residuals from Electric Utilities [40 CFR 257.50-107], or the "CCR Rule" (Rule). Specifically, the ACM was initiated and this report was prepared to fulfill the requirements of 40 CFR 257.96, including:

- Prevention of further releases
- Remediation of release
- Restoration of affected areas

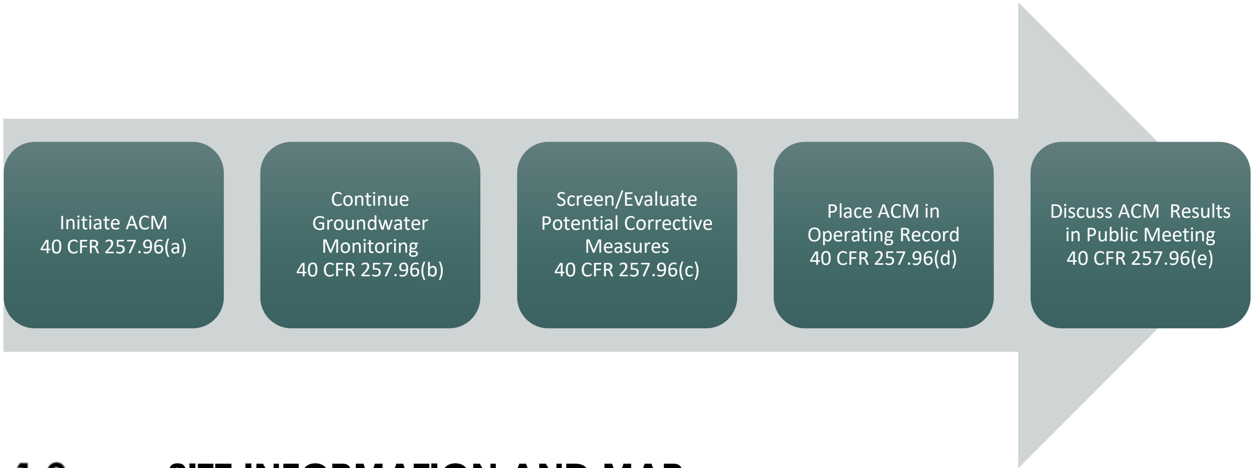
This ACM Report summarizes the remedial alternatives for addressing the Groundwater Protection Standard (GPS) exceedances observed in the 2018 sampling events and identified in the Notification of Groundwater Protection Standard Exceedance dated February 13, 2019.

1.1 ASSESSMENT OF CORRECTIVE MEASURES PROCESS

As discussed above, this ACM Report has been prepared in response to GPS exceedances observed in groundwater samples collected at the LAN facility. The ACM process is one step in a series of steps defined in the CCR Rule and depicted in the graphic below. To date, IPL has implemented a detection monitoring program per 40 CFR 257.94 and completed assessment monitoring at LAN per 40 CFR 257.95. An ACM is now required based on the groundwater monitoring results obtained through October 2018. With the ACM completed, IPL is required to select a corrective measure (remedy) according to 40 CFR 257.97. The remedy selection process must be completed as soon as feasible, and, once selected, IPL is required to start the corrective action process within 90 days.



The process for developing the ACM is defined in 40 CFR 257.96 and is shown in the graphic below. IPL is required to discuss the ACM results in a public meeting at least 30 days before selecting a remedy. To facilitate the selection of a remedy for the GPS exceedances at LAN, IPL continues to investigate and assess the nature and extent of the groundwater impacts. Information about the site, the groundwater monitoring completed, the groundwater impacts as they are currently understood, and the ongoing assessment activities are discussed in the sections that follow.



1.2 SITE INFORMATION AND MAP

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 plant is 2320 Power Plant Drive in Lansing, Iowa (**Figure 1**). The facility includes a coal-fired generating plant, a coal combustion residuals (CCR) landfill, and a CCR settling pond. The LAN was originally constructed in 1948, with additional units added in 1957 and 1976.

The groundwater monitoring system at LAN is a multi-unit system monitoring two existing CCR Units that are contiguous:

- LAN Landfill (existing landfill)
- LAN Upper Ash Pond (existing surface impoundment)

The LAN Landfill is operated under a sanitary disposal project permit (Permit #03-SDP-05-01P) administered by the Iowa Department of Natural Resources (IDNR). A separate groundwater monitoring system has been established to monitor the landfill for the state permit. The permitted landfill airspace may, at the earliest, be fully utilized by the end of 2021. Once fully utilized, the landfill will close by installing a state-permitted final cover design that meets the CCR Rule minimum design requirements in 40 CFR 257.102(d)(3).

The LAN Upper Ash Pond is operated with discharges regulated under individual National Pollutant Discharge Elimination System (NPDES) Permit Number IA0300100. The LAN Upper Ash Pond will close to comply with the requirements of 40 CFR 257.101(b)(1) and 103(a). The pond is expected to close by November 1, 2023.

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.** Monitoring wells installed for the state monitoring program for the CCR landfill are also shown on **Figure 2.**

2.0 BACKGROUND

2.1 REGIONAL GEOLOGIC INFORMATION

The uppermost geologic formation beneath LAN that meets the definition of the "uppermost aquifer," as defined under 40 CFR 257.53, is the shallow alluvial aquifer in combination with the hydraulically connected lower Cambrian-Ordovician sandstone unit (Jordan sandstone).

The uppermost bedrock unit in the site area is the Jordan aquifer, which is the lower Cambrian-Ordovician sandstone interbedded with dolostone. The thickness of the Jordan aquifer varies from 50 to more than 120 feet thick in most areas of Allamakee County. Underlying the Cambrian-Ordovician sandstone are the Cambrian confining beds comprised of dolostone, siltstone, and shale. The Cambrian confining beds overly the Dresbach Aquifer, comprised of shaly sandstone. A summary of the regional hydrogeologic stratigraphy is presented in **Appendix A**. A regional bedrock surface hydrogeologic map, hydrogeologic cross sections, and a contour map of the top of the Cambrian-Ordovician sandstone in northeastern Iowa are also included in **Appendix A**. The bedrock surface elevation is highly variable due to erosion.

The Mississippi River and associated alluvial aquifers are a major source of surface water and shallow groundwater in the area. The alluvial aquifer is up to 60 feet thick within the deeply incised valley where LAN is located, but is thin to absent on the surrounding bluffs and hilltops. The lower Cambrian-Ordovician sandstone unit (Jordan sandstone) is the shallowest regional bedrock aquifer. The October 1989 IDNR Water Atlas No. 8 states that the Jordan aquifer is commonly the source of municipal and industrial high-capacity wells in the region. A summary of the regional groundwater units is included in **Appendix A**.

A map showing the regional potentiometric surface in the Jordan sandstone is presented in **Appendix A**. This map shows the potentiometric surface near the site area as sloping to the east-northeast. The flow direction in the shallow unconsolidated aquifer at LAN is generally to the north-northwest (**Figure 3**). The flow in the Jordan sandstone immediately beneath the landfill and ponds is also likely to the north-northwest due to the influence of incoming groundwater from the bluffs flanking the valley with ultimate discharge to the Mississippi River.

2.2 SITE GEOLOGIC INFORMATION

Monitoring wells MW-301 through MW-306 were installed to intersect the surficial alluvium aquifer at the site. The unconsolidated material found at these well locations is generally sand and silt. The total boring depths were between 16 and 27 feet below ground surface (bgs) and bedrock was not encountered in these borings. Upgradient well MW-6 was previously installed for a state groundwater monitoring program, which is required as part of the solid waste permit for the CCR landfill. MW-6 was installed to a total depth of 93.5 feet bgs and intersects the water table, which is in the Jordan sandstone aquifer at this well location. Boring logs for MW-6 and MW-301 through MW-306 are included in **Appendix B**.

Shallow groundwater at the site generally flows to the north-northwest. The groundwater flow pattern based on water levels measured in April 2019 is shown on **Figure 3**. The groundwater elevation data for the CCR rule monitoring wells and the state program monitoring wells are provided in **Table 1**.

A geologic cross-section was prepared along a line through the CCR units and in alignment with the direction of groundwater flow. The cross-section location is provided on **Figure 2** and the geologic cross-section is provided on **Figure 4**. The cross-section line runs through the landfill, the Upper Ash Pond, and the coal pile, and also shows upgradient monitoring well MW-6, several borings or monitoring wells near the landfill and pond, and downgradient assessment monitoring well MW-306. Sandstone bedrock, unconsolidated geologic material, and estimated water table levels are identified on the cross section.

2.3 CCR RULE MONITORING SYSTEM

The original groundwater monitoring system established in accordance with the CCR Rule consists of one upgradient (background) monitoring well and three downgradient (compliance) monitoring wells. The background monitoring well is MW-6. The three initial downgradient monitoring wells are MW-301, MW-302, and MW-303, which were installed in November 2015. Three additional downgradient monitoring wells, MW-304, MW-305, and MW-306, were installed in May 2019 in accordance with the requirements of 40 CFR 257.95(g)(1). The CCR Rule wells were installed in the upper portion of the uppermost aquifer at LAN. Well depths range from approximately 14.5 to 91 feet bgs.

3.0 NATURE AND EXTENT OF GROUNDWATER IMPACTS

3.1 POTENTIAL SOURCES

The potential sources of groundwater impacts are currently under evaluation. Based on a review of existing site documents, potential sources of groundwater impacts from the monitored CCR units include the following:

CCR Unit	Potential Sources	Description	Quantity
Landfill	CCR	Bottom ash, economizer ash, fly ash, dry flue gas desulfurization (FGD) byproduct, and pyrites	485,000 CY (permitted maximum volume)
Upper Ash Pond	CCR	Bottom ash, economizer ash, and fly ash	357,000 CY
	Low volume waste waters from plant	Includes Unit 4 hydroveyor water, air heater washes, RO reject water, demineralizer regeneration wastewater, and Unit 4 boiler sump discharge	4.83 million gallons per day (MGD)
	Storm water	Annual precipitation, runoff from landfill and surrounding areas	99 AC-FT (Watershed of 87 acres)

Note: Storm water volume is calculated based on the watershed area for the pond (17 acres) and landfill and surrounding areas (70 acres), and the annual average precipitation for Lansing, Iowa, of 35 inches per year. Runoff from the landfill and surrounding areas (8.5 inches) is estimated using **Figure 1**. Average Annual Runoff, 1951-1980 from USGS publication Average Annual Runoff in the United States, 1951-1980 (Gebert 1987).

3.2 GROUNDWATER ASSESSMENT

3.2.1 Groundwater Depth and Flow Direction

Depth to groundwater as measured in the site monitoring wells varies from 8 to 75 feet bgs due to topographic variations across the facility. Groundwater flow at the site is generally to the north-northwest. The flow in the Jordan sandstone immediately beneath the landfill and ponds is also likely to the north-northwest due to the influence of incoming groundwater from the bluffs flanking the valley with ultimate discharge to the Mississippi River.

3.2.2 Groundwater Protection Standard Exceedances Identified

The ACM process was triggered by the detection of arsenic at statistically significant levels exceeding the GPS in samples from MW-302.

This statistical evaluation of the assessment monitoring results was based on the first three sampling events for the Appendix IV assessment monitoring parameters, including sampling events in April, August, and October 2018. The complete results for these sampling events are summarized in **Table 3.**

GPS exceedances were identified from the April 2019 sampling events for the following well and parameter:

Assessment Monitoring Appendix IV Parameters	Location of GPS Exceedance(s)	Historic Range of Detections at Wells Exceeding GPS	Groundwater Protection Standard (GPS)
Arsenic (µg/L)	MW-302	30.8 to 50.4	10

Note: Historic range includes results from assessment monitoring from April 2018 through April 2019.

3.2.3 Expanding the Groundwater Monitoring Network

Monitoring wells MW-304, MW-305, and MW-306 were installed in May 2019 downgradient of the CCR units to expand the groundwater monitoring network at LAN beyond the edge of the CCR unit boundaries and to fulfill the requirements of 40 CFR 257.95(g)(1), which requires additional characterization to support a complete and accurate assessment of corrective measures. Groundwater samples were collected following installation of the three new monitoring wells.

The initial sampling results from MW-304, MW-305, and MW-306, shown in **Table 3**, indicate that arsenic did not exceed the GPS in the samples from these wells. The extent of GPS exceedances may be limited to the immediate vicinity of the landfill and impoundment if future sampling results confirm there are no GPS exceedances in wells MW-304, MW-305, and MW-306.

3.2.4 State Monitoring Program Arsenic Results

Arsenic is included in the parameter list for the state monitoring program for the CCR landfill. Monitoring results from the state program, provided in **Table 4**, provide additional information on the nature and extent of arsenic concentrations at the site.

Arsenic GPS exceedances in the state program results are limited to two monitoring well locations (MW-11/11R and MW12). The arsenic levels at these two locations adjacent to the landfill are lower than the concentrations in downgradient CCR well MW-302. Per IDNR requirements, metals sampling was changed from filtered to unfiltered in 2016. Arsenic concentrations appear to be stable since that time. Metals like arsenic tend to adsorb to suspended solids that can be introduced into the sample during collection, which are not removed from unfiltered samples. Arsenic results from other wells in the vicinity of or downgradient from these two wells (including MW-12P, MW-14, TW-17, TW-18, TW-19, and MW-20) were below the GPS defining the horizontal and vertical extent of arsenic impacts in this area.

Groundwater assessments were performed in accordance with the state monitoring program during 2013 and 2014 to evaluate the elevated arsenic concentrations. The assessment reports concluded that elevated arsenic concentrations were due in part to localized geochemical conditions in the immediate vicinity of the landfill. IDNR required no further investigation of the arsenic concentrations.

3.3 CONCEPTUAL SITE MODEL

The following conceptual site model describes the arsenic levels above the GPS, discusses potential exposure pathways affecting human health and the environment, and presents a cursory review of the potential impacts. The conceptual site model for LAN has been prepared in general conformance with the Standard Guide for Developing Conceptual Site Models for Contaminated Sites (ASTM E1689-95). This conceptual site model is the basis for assessing the efficacy of likely corrective measures to address the source, release mechanisms, and exposure routes.

3.3.1 Nature of Constituent above GPS

To describe the nature of the constituents in groundwater at LAN, we have reviewed a number of sources for information regarding arsenic in groundwater, and how that groundwater may impact potential receptors through the exposure pathways discussed in **Section 3.3.2**.

Arsenic

Arsenic (As) is a metalloid that is naturally present in rocks, soil, and water. Arsenic is naturally present in coal and is present in CCR after the coal is combusted.

Arsenic has historically had numerous industrial and commercial uses, including as copper chromated arsenate (CCA), a wood preservative. Arsenic is also used in pesticides, semiconductors, and light-emitting diodes; and it is added to other metals to form alloys for industrial use, including in lead-acid batteries.

Primary food sources of arsenic include seafood; however, much of the arsenic in food sources is in the form of relatively nontoxic organic arsenic compounds. In some areas, drinking water also contains arsenic. Human intake varies depending on location and diet.

A summary of the properties, occurrences, and potential health effects of arsenic is provided in the Public Health Statement and ToxFAQs factsheet prepared by the Agency for Toxic Substances and Disease Registry (ATSDR), which is an agency of the U.S. Department of Health and Human Services. Copies of the ATSDR Public Health Statement and ToxFAQs factsheet are provided in **Appendix C.**

Arsenic Exposure

A summary of the potential exposures and health effects of arsenic is provided in the Public Health Statement and ToxFAQs factsheet prepared by ATSDR. Copies of the ATSDR Public Health Statement and ToxFAQs factsheet are provided in **Appendix C.**

For comparison, the concentrations of arsenic detected to date in groundwater samples from the CCR Rule monitoring system wells range from below the detection limit to 50.4 ug/L (Note: 1 ug/L in water is equivalent to 1 ppb). The GPS for arsenic is 10 ug/L. The GPS for arsenic is equivalent to the USEPA maximum contaminant level (MCL) for arsenic.

3.3.2 Potential Receptors and Pathways

As described in **Section 3.3**, ASTM E1689-95 provides a framework for identifying potential receptors (people or other organisms potentially affected by the groundwater impacts at LAN) and pathways (the ways groundwater impacts might reach receptors). In accordance with ASTM E1689-95, we have considered both potential human and ecological exposures to groundwater impacted by arsenic, as identified in **Section 3.2.2**.

Human Health

In general, human health exposure routes to contaminants in the environment include ingestion, inhalation, and dermal contact with the following environmental media:

- Groundwater
- Surface Water and Sediments
- Air
- Soil
- Biota/Food

If people might be exposed to the impacts described in **Section 3.0** via one of the environmental media listed above, a potential exposure route exists and is evaluated further. For the groundwater impacts at LAN, the following potential exposure pathways have been identified with respect to human health:

- **Groundwater – Ingestion and Dermal Contact.** The potential for ingestion of, or dermal contact with, impacted groundwater from LAN exists if water supply wells are present in the area of impacted groundwater and are used as a potable water supply. Based on a review of the IDNR GeoSam well database. and information provided by LAN:
  - No off-site water supply wells have been identified downgradient of the CCR Units.
  - A private supply well located across County Highway X52 from the landfill was sampled by Allamakee County in 2014 at the homeowner's request, and the sample was analyzed for arsenic. Arsenic was not detected in the sample. The Allamakee County Sanitarian stated that the well was 400 feet deep and under artesian pressure.
  - Two on-site water supply wells, Well #2 and Well #4, are currently used as sources of potable water.
    - Well #2 is 235 feet deep and is cased to 78 feet. Well #4 is 240 feet deep and is cased to 143 feet. Both wells are open to the sandstone aquifer.
    - The water supply operation permit for these wells (IDNR public water supply ID 0345181) requires sampling for inorganic constituents every 9 years. Arsenic was not detected in the most recent samples, collected on April 21, 2014.

- **Surface Water and Sediments – Ingestion and Dermal Contact.** The potential for ingestion of or dermal contact with impacted surface water and sediments exists if impacted groundwater from the LAN facility has interacted with adjacent surface water and sediments, to the extent that arsenic is present in these media at concentrations that represents a risk to human health. There is no current evidence indicating that impacted groundwater has interacted with adjacent surface water and created an exposure pathway, but the exposure pathway assessment is incomplete and ongoing.

- **Biota/Food – Ingestion.** The potential for ingestion of impacted food exists if impacted groundwater from the facility has interacted with elements of the human food chain. Based on discussions with facility staff, no hunting or farming occurs within the current area of known groundwater impacts. Elements of the food chain may also be exposed indirectly through groundwater-to-surface water interactions, which are subject to additional assessment.

Based on the lack of groundwater exposure, only the surface water, sediment, and biota/food exposure pathways were retained for further consideration. However, the implementation of potential corrective measures may introduce secondary exposure pathways that are discussed in **Section 6.0** and will be evaluated further as a corrective measure is selected for LAN.

Ecological Health

In addition to human exposures to impacted groundwater, potential ecological exposures are also considered. If ecological receptors might be exposed to impacted groundwater, the potential exposure routes are evaluated further. Ecological receptors include living organisms, other than humans, the habitat supporting those organisms, or natural resources potentially adversely affected by CCR impacts. This includes:

- Transfer from an environmental media to animal and plant life. This can occur by bioaccumulation, bioconcentration, and biomagnification:
  - Bioaccumulation is the general term describing a process by which chemicals are taken up by a plant or animal either directly from exposure to impacted media (soil, sediment, water) or by eating food containing the chemical.
  - Bioconcentration is a process in which chemicals are absorbed by an animal or plant to levels higher than the surrounding environment.
  - Biomagnification is a process in which chemical levels in plants or animals increase from transfer through the food web (e.g., predators have greater concentrations of a particular chemical than their prey).
- Benthic invertebrates within adjacent waters.

Based on the information presented in **Section 3.2.3** and the location of the Mississippi River downgradient from the current area of known groundwater impacts, both of these ecological exposure routes need to be evaluated further. Both potential ecological exposure pathways require groundwater-to-surface water interactions for the exposure pathway to be complete. The groundwater-to-surface water interactions at LAN are the subject of ongoing assessment.

The surface water/sediment, biota/food, and ecological exposure assessment is presently incomplete as the extent of groundwater impacts is still being evaluated. If groundwater impacts extend to the river, then these exposure pathways will be evaluated further. Evaluation of constituent concentrations in sediment and surface water may be estimated through calculations and/or additional sampling.

4.0 POTENTIAL CORRECTIVE MEASURES

In this section, we identify potential corrective measures to meet the ACM goals identified in 40 CFR 257.96(a), which are to:

- Prevent further releases
- Remediate releases
- Restore affected areas to original conditions

The development of corrective measure alternatives is described further in the following sections. Corrective measure alternatives developed to address the groundwater impacts at LAN are described in **Section 5.0**. The alternatives selected are qualitatively evaluated in **Section 6.0**.

As required under 40 CFR 257.96(c), the following sections provide an analysis of the effectiveness of potential corrective measures. This evaluation includes the requirements and objectives identified in 40 CFR 257.97, which includes:

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to residual contamination;

- The time required to begin and complete the remedy; and

- The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy.

4.1 IDENTIFICATION OF CORRECTIVE MEASURES

As described in the USEPA Solid Waste Disposal Facility Criteria Technical Manual (USEPA 1998), corrective measures generally include up to three components, including:

- Source Control
- Containment
- Restoration

Within each component, there are alternative measures that may be used to accomplish the component objectives. The measures from one or more components are then combined to form corrective measure alternatives (discussed in **Section 5.0**) intended to address the observed groundwater impacts. Potential corrective measures were identified based on site information available during development of the ACM for the purpose of meeting the goals described in **Section 4.0**.

Each component and associated corrective measures are further identified in subsequent paragraphs. The corrective measures are evaluated for feasibility and combined to create the corrective action alternatives identified in this section, and further evaluated in **Section 5.0**. We continue to evaluate site conditions and may identify additional corrective measures based on new information regarding the nature and extent of the impacts.

4.1.1 Source Control

The source control component of a corrective measure is intended to identify and locate the source of impacts and provide a mechanism to prevent further releases from the source. For this site, the sources to be controlled are the CCR materials in the landfill and impoundment, along with plant process water. Each of the source control measures below require closure of the landfill and impoundment, and for waste water to be re-directed from the CCR units to eliminate the flows that may mobilize constituents from the CCR and transport them to groundwater. We have identified the following potential source control measures:

- **Cap in place.** Cap the CCR in uncovered areas of the existing landfill and the CCR surface impoundment in place to reduce the infiltration of rain water into the impoundments, and prevent transport of CCR constituents from unsaturated CCR materials into the groundwater and reduce the potential for CCR to interface with groundwater. The landfill closure will be conducted according to the disposal permit issued by the IDNR.

- **Consolidate and cap.** Consolidate CCR from the surface impoundment into a smaller area adjacent to the landfill to reduce the potential source footprint. Install a cap over uncovered areas of the existing landfill, and the consolidated CCR from the surface impoundment to prevent transport of CCR constituents from unsaturated CCR materials into the groundwater and minimize the potential for CCR to interface with groundwater. The landfill closure will be conducted according to the disposal permit issued by the IDNR.

- **Excavate CCR and create on-site disposal area.** Excavate CCR from the landfill and surface impoundment and place CCR in a new lined disposal area on site to prevent further releases from the CCR and isolate the CCR from potential groundwater interactions. Cap the new disposal area with final cover to prevent the transport of CCR constituents from unsaturated CCR.

- **Excavate impounded CCR and dispose at a licensed off-site disposal area.** Remove all CCR from the site and haul to a licensed landfill to prevent further releases from the CCR areas.

Water movement through the CCR materials is the mechanism for CCR impacts to groundwater. Surface water can move vertically through the CCR materials via infiltration of rainwater and surface water runoff. Groundwater can move horizontally through the CCR material in areas where CCR material is at an elevation that is below the water table. The source control measures have been considered to prevent “vertical” migration of water through the CCR via cap and cover systems.

Based on the available information for this site, all the source control measures have potential to prevent further releases, thus are retained for incorporation into alternatives for further evaluation. However, IPL continues to investigate the source of groundwater impacts and, with new information, source control measures may be added or removed from consideration.

4.1.2 Containment

The objective of containment is to limit the spread of the groundwater impacts beyond the source. The need for containment depends on the nature and extent of impacts, exposure pathways, and risks to receptors. Containment may also be implemented in combination with restoration as described in **Section 4.1.3**. Containment may be a recommended element of a corrective measure if needed to:

- Prevent off-site migration of groundwater impacts
- Cease completion of an exposure pathway (e.g., water supply well).

Containment may also be used in lieu of active restoration if an active approach is needed but treatment is not warranted by the aquifer characteristics including:

- Water in the affected aquifer is naturally unsuited for human consumption
- Contaminants present in low concentration with low mobility
- Low potential for exposure to contaminants and low risk associated with exposure
- Low transmissivity and low future user demand

The following measures have potential to limit the spread of the existing groundwater impacts:

- **Gradient Control with Pumping.** Gradient control includes a measure to alter the groundwater velocity and direction to slow or isolate impacts. This can be accomplished with pumping wells and/or a trench/sump collection system. If groundwater pumping is considered for capturing an impacted groundwater plume, the impacted groundwater must be managed in conformance with all applicable Federal and State requirements.

- **Gradient Control with Phytotechnology.** Gradient control with phytotechnology relies on the ability of vegetation to evapotranspire sources of surface water and groundwater. Water interception capacity by the aboveground canopy and subsequent evapotranspiration through the root system can limit vertical migration of water from the surface downward. The horizontal migration of groundwater can be controlled or contained using deep-rooted species, such as prairie plants and trees, to intercept, take up, and transpire the water. Trees classified as phreatophytes are deep-rooted, high-transpiring, water-loving organisms that send their roots into regions of high moisture and can survive in conditions of temporary saturation.

- **Chemical Stabilization.** Stabilization refers to processes that involve chemical reactions that reduce the leachability of arsenic. Stabilization chemically immobilizes impacts or reduces their solubility through a chemical reaction. The desired results of stabilization methods include converting metals into a less soluble, mobile, or toxic form.

Based on the currently available information for this site, active containment (other than source control) is not currently required for this site and is not included in the proposed alternatives. IPL will continue to investigate the nature and extent of the groundwater impacts at LAN and may add containment measures as warranted by data.

4.1.3 Restoration

Restoration is the process through which groundwater quality is restored to meet GPSs. This can be accomplished by way of Monitored Natural Attention (MNA) or intensively addressed by groundwater treatment with or without extraction.

MNA can be a viable remedy or component of a remedial alternative for groundwater impacted with metals. MNA requires ongoing involvement and potentially intense characterization of the geochemical environment to understand the attenuation processes involved, and to justify reliance on them and regular, long-term monitoring to ensure the attenuation processes are meeting remedial goals.

MNA is not a “do-nothing” alternative; rather it is an effective knowledge-based remedy where a thorough engineering analysis provides the basis for understanding, monitoring, predicting, and documenting natural processes. To properly employ this remedy, there needs to be a strong scientific basis supported by appropriate research and site-specific monitoring implemented in accordance with quality controls. The compelling evidence needed to support proper evaluation of the remedy requires that the processes that lower metal concentrations in groundwater be well understood.

If active treatment is implemented, water may be treated in situ, on site, or off site. The need for active treatment depends on the nature and extent of impacts, potential exposure pathways, and current and anticipated future risks to receptors. If there are no receptors or if the risks are acceptably low, then MNA is an appropriate option. If existing or future risks require a more rapid restoration of groundwater quality, then active restoration may be needed.

Treated groundwater may be re-injected, sent to a local publicly owned treatment works (POTW), or discharged to a local body of surface water, depending on local, State, and Federal requirements. Typical on-site treatment practices for metals include coagulation and precipitation, ion exchange, or reverse osmosis. Off-site wastewater treatment may include sending the impacted groundwater that is extracted to a local POTW or to a facility designed to treat the contaminants of concern.

The removal rate of groundwater constituents such as arsenic will depend on the rate of groundwater extraction, the cation exchange capacity of the soil, and partition coefficients of the constituents sorbed to the soil. As the concentration of metals in groundwater is reduced, the rate at which constituents become partitioned from the soil to the aqueous phase may also be reduced. The amount of flushing of the aquifer material required to remove the metals and reduce their concentration in groundwater below the GPS will generally determine the time frame required for restoration. This time frame is site-specific.

In-situ methods may be appropriate, particularly where pump and treat technologies may present adverse effects. In-situ methods may include biological restoration requiring pH control, addition of specific micro-organisms, and/or addition of nutrients and substrate to augment and encourage degradation by indigenous microbial populations. Bioremediation requires laboratory treatability studies and pilot field studies to determine the feasibility and the reliability of full-scale treatment.

At this time, based on current information, Monitored Natural Attenuation is retained for incorporation into alternatives for further evaluation. Other restoration measures may be retained or additional ones added from the results of our continued investigation of the nature and extent of groundwater impacts.

5.0 CORRECTIVE MEASURE ALTERNATIVES

We have preliminarily identified the following corrective measure alternatives for the groundwater impacts at LAN:

- 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 with MNA

These alternatives were developed by selecting components from the reasonable and appropriate corrective measures components discussed above. Capping areas of the landfill that are currently open is included with all potential source control measures. With the exception of the No Action alternative, each of the corrective measure alternatives meet the requirements in 40 CFR 257.97(b)(1) through (5) based on the information available at the current time. We may identify additional alternatives based on the continued evaluation of site conditions.

5.1 ALTERNATIVE 1 – NO ACTION

IPL is committed to implementing corrective measures as required under the Rule, and the No-Action alternative is only included as a baseline condition and a point of comparison for the other alternatives. The consideration of this alternative assumes the monitoring of groundwater continues under this action.

5.2 ALTERNATIVE 2 – CLOSE AND CAP IN PLACE WITH MNA

Alternative 2 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit and closing the CCR impoundment with no further discharge. CCR materials will be capped and vegetation established on the final cover in accordance with the requirements for closure in place in 40 CFR 257.102(d). This measure is consistent with landfill cover systems to prevent infiltration of surface water into the CCR as described in **Section 4.1.1**. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

5.3 ALTERNATIVE 3 – CONSOLIDATE AND CAP WITH MNA

Alternative 3 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit, and closing the CCR impoundment (no further discharge). The impounded CCR will be closed by relocating a portion of the impounded CCR and consolidating it into a smaller footprint within the CCR surface impoundment and/or landfill. The impounded CCR materials and currently open areas of the landfill will be capped in accordance with the requirements for closure in place in 40 CFR 257.102(d). This measure is consistent with landfill cover systems to prevent infiltration of surface water into the CCR as described in **Section 4.1.1**. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

5.4 ALTERNATIVE 4 – EXCAVATE CCR AND DISPOSE ON SITE WITH MNA

Alternative 4 includes closing the landfill and impoundment (no further disposal or discharge), excavation of CCR from the landfill and surface impoundment, and creation of a new on-site disposal area with a liner and cap system. This alternative will serve to entomb the CCR at the site and allow for the collection and management of liquids generated from the new disposal area. Further releases from the CCR will be prevented by the use of engineering controls constructed/installed to meet the design criteria for new CCR landfills required under 40 CFR 257.70. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a new on-site disposal area liner and cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

If the ongoing assessment of potential sources discussed in **Section 3.1** eliminates either the landfill or surface impoundment as the source of the arsenic impacts, Alternative 4 may be refined to focus on the remaining source. For example, if the landfill can be eliminated as a source of arsenic in groundwater through further evaluation, the landfill may be closed according to the disposal permit issued by the IDNR as described under Alternatives 2 and 3.

5.5 ALTERNATIVE 5 – EXCAVATE CCR AND DISPOSE OFF SITE WITH MNA

Alternative 5 includes closing the landfill and impoundment (no further disposal or discharge), excavation of all CCR, and transport to an approved off-site landfill. Further on site releases from the CCR sources will be prevented by relocating the source material to another site, which eliminates the potential for ongoing leaching of constituents in impounded CCR into groundwater at LAN.

This alternative eliminates CCR sluicing/plant process water discharges and, with the removal of CCR from the site, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

If the ongoing assessment of potential sources discussed in **Section 3.1** eliminates either the landfill or surface impoundment as the source of the arsenic impacts, Alternative 5 may be refined to focus on the remaining source. For example, if the landfill can be eliminated as a source of arsenic in groundwater through further evaluation, the landfill may be closed according to the disposal permit issued by the IDNR as described under Alternatives 2 and 3.

6.0 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

As required by 40 CFR 257.96(c), the following sections provide an evaluation of the effectiveness of corrective measure alternatives in meeting the requirements and objectives outlines in 40 CFR

257.97. The evaluation addresses the requirements and objectives identified in 40 CFR 257.96(c)(1) through (3), which include:

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to residual contamination;
- The time required to begin and complete the remedy; and
- The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy.

In addition to the discussion of the items listed above, **Table 5** provides a summary of the initial evaluation of the alternatives including each of the criteria listed in 40 CFR 257.97.

6.1 ALTERNATIVE 1 – NO ACTION

As described in **Section 5.1**, the No Action alternative is only included as a baseline condition and a point of comparison for the other alternatives. This alternative does 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. For comparison only, Alternative 1 is evaluated with regard to the criteria in 40 FR 257.96(c) below:

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – The ability to attain the GPS for arsenic without any additional action is unlikely.
  - Reliability – Alternative 1 does not provide any reduction in existing risk.
  - Implementation – Nothing is required to implement Alternative 1.
  - Impacts – No additional safety or cross-media impacts are expected with Alternative 1. This alternative does not control current suspected routes of exposure to residual contamination.

- **Timing.** No time is required to begin. However, the time required to attain the GPS for arsenic under Alternative 1 is unknown.

- **Institutional Requirements.** No institutional requirements beyond maintaining current regulatory approvals exist for Alternative 1.

6.2 ALTERNATIVE 2 – CLOSE AND CAP IN PLACE WITH MNA

As described in **Section 5.2**, Alternative 2 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit and closing the CCR impoundment with no further discharge. CCR materials will be capped and vegetation established on the final cover in accordance with the requirements for closure in place in 40 CFR 257.102(d).

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundments by capping is expected to address infiltration, which is a key contributor to groundwater impacts. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 2 is capable of and expected to attain the GPS for arsenic.

- Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method.

- Implementation – The construction of Alternative 2 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent a suitable subgrade is established in the impoundment for cap construction, which can likely be achieved through standard dewatering methods. Additional subgrade stabilization may be required to support the cap. The cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 2 are not specialized and are generally readily available with the exception of potential stabilization of impounded CCR with thixotropic characteristics.

- Impacts – Safety impacts associated with the implementation of Alternative 2 are not significantly different than other heavy civil construction projects. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of off-site transportation of CCR. The potential for exposure to residual contamination is low since CCR will be capped.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be completed by the end of 2021. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. Alternative 2 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 2:
  - IDNR Closure Permit
  - State and local erosion control/construction stormwater management permits

6.3 ALTERNATIVE 3 – CONSOLIDATE ON-SITE AND CAP WITH MNA

As described in **Section 5.3**, Alternative 3 includes closing the landfill, closing the impoundment with no further discharge, relocating and consolidating impounded CCR into a smaller footprint within the CCR surface impoundment and/or landfill, covering the CCR materials with a cap, and establishing vegetation in accordance with the existing State of Iowa sanitary disposal project permit and requirements for closure in place in 40 CFR 257.102(d).

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by capping is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of impounded CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass,

toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 3 is capable of and expected to attain the GPS for arsenic.

– Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method. A consolidated cap footprint may enhance reliability by reducing the scale of post-closure maintenance.

– Implementation – The construction of Alternative 3 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent required to excavate and relocate CCR within the CCR impoundments and provide a suitable subgrade for cap construction. Additional subgrade stabilization may be required to support the cap. Conditioning (e.g., drying) of relocated CCR is expected during on-site re-disposal. Alternative 3 can likely be achieved through standard dewatering and conditioning methods. Although the cap footprint will be minimized, cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 3 are not specialized and are generally readily available with the exception of potential stabilization of impounded CCR with thixotropic characteristics.

– Impacts – Safety impacts associated with the implementation of Alternative 3 are not significantly different than other heavy civil construction projects. The level of disturbance required to consolidate CCR before capping may represent some increase in safety risk due to site conditions and on-site construction traffic. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of off-site transportation of CCR. The potential for exposure to residual contamination is low since CCR will be capped and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be completed by the end of 2021. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The consolidation of CCR into a smaller cap area may decrease the time to reach GPS. Alternative 3 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 3:
  – IDNR Closure Permit
  – State and local erosion control/construction stormwater management permits

6.4 ALTERNATIVE 4 – EXCAVATE AND DISPOSE ON SITE WITH MNA

As described in **Section 5.4**, Alternative 4 includes closing the landfill and impoundment, excavation of impounded CCR from the source area, and creation of a new on-site disposal that meets the design criteria for new CCR landfills required under 40 CFR 257.70.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by removing and re-disposing CCR in a new lined/capped disposal area in combination with capping open areas of the landfill is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The separation from groundwater and other location criteria for the new on-site disposal facility may enhance the performance of this alternative. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 4 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of on-site re-disposal with a composite liner and cap is good. Disposal facilities that meet the requirements in 40 CFR 257.70 or other similar requirements have been used for solid waste disposal including municipal and industrial waste for numerous years. There is significant industry experience with the design and construction of similar disposal facilities. The composite liner and cover combined with a consolidated disposal footprint may enhance reliability by reducing infiltration and the scale of post-closure maintenance. At the same time, post-closure maintenance is likely more complex due to maintenance of a leachate collection system and geosynthetic repairs requiring specialized personnel, material, and equipment.

  - Implementation – The complexity of constructing the new liner and cap is moderate due to the composite design and the management of CCR with thixotropic characteristics. The limited area available at the facility for developing an on-site disposal facility makes this alternative logistically complex. Significant volumes of CCR will be excavated and stored on site while the disposal facility is constructed. Significant dewatering will be required to excavate and relocate CCR to a temporary storage area. Conditioning (e.g., drying) of relocated CCR is expected to facilitate temporary storage and on-site re-disposal. Alternative 4 can likely be achieved through standard dewatering and conditioning methods, but may be impacted by the space available for these activities and the thixotropic character of some CCR. Although the post-closure CCR footprint will be minimized, composite liner and cap construction may put a high demand on the local supply of suitable cap materials. The local availability of liner and cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 4 are not specialized and are generally readily available with the exception of the resources needed to install the geosynthetic portions of the composite liner and cover, which are not locally available.

  - Impacts – Safety impacts associated with the implementation of Alternative 4 are not significantly different than other heavy civil construction projects. However, the level of disturbance required to excavate, store, and re-dispose CCR on site and the traffic required to import composite liner and cap material are not typical and likely represent an increase in safety risk due to site conditions, on-site construction traffic, and incoming/outgoing off-site construction traffic. A risk of cross-media impacts is possible due to the large volume of CCR to be excavated, stored, and relocated on site. The potential for exposure to residual contamination is low since CCR will be capped and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be completed by the end of 2021. However, the time required to permit and develop the on-site disposal facility may extend this schedule. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The consolidation of CCR into a new on-site disposal facility with a composite liner and cap may decrease the time to reach GPS. Alternative 4 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 4:
  - IDNR Closure Permit
  - IDNR Disposal Facility (Landfill) Permit
  - State and local erosion control/construction stormwater management permits

6.5 ALTERNATIVE 5 – EXCAVATE AND DISPOSE OFF SITE WITH MNA

As described in **Section 5.5**, Alternative 5 includes closing the landfill and impoundment, excavation of CCR from the source area, and transporting the impounded CCR off site for disposal.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by removing and re-disposing CCR off site will eliminate the source material exposed to infiltration, which is a key contributor to groundwater impacts. The off-site disposal of CCR prevents further releases at LAN, but introduces the possibility of releases at the receiving facility. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 5 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of excavation and off-site disposal of impounded CCR is good. Off-site disposal facilities are required to meet the requirements in 40 CFR 257.70 or other similar requirements, which have been used for solid waste disposal including municipal and industrial waste for numerous years. There is significant industry experience with the design and construction of these disposal facilities.

  - Implementation –The complexity of excavating CCR for off-site disposal is moderate due to the thixotropic characteristics of some of the CCR. The scale of CCR excavation (expected to exceed 840K cy), off-site transportation, and the permitting/development of off-site disposal facility airspace makes this alternative logistically complex. Significant dewatering will be required to excavate CCR. Conditioning (e.g., drying) of relocated CCR is expected to facilitate off site re-disposal. Alternative 5 can likely be achieved through standard dewatering and conditioning methods, but may be impacted by the space available for these activities and the thixotropic character of some CCR. Although the source area at LAN will be eliminated, the development of off-site disposal airspace will put a high demand on the receiving disposal facility, which may not have the current physical or logistical capacity to receive large volumes of CCR in a short period of time. The equipment and personnel required to implement on-site and off-site aspects of Alternative 5 are not specialized and are generally readily available with the exception of the resources needed to install the geosynthetic portions of the off-site composite liner and cover, which are not locally available.

- Impacts – Safety impacts associated with the implementation of Alternative 5 are not significantly different than other heavy civil construction projects. However, the level of disturbance required to excavate, transport, and re-dispose CCR and the traffic required to import composite liner and cap material at the receiving disposal facility are not typical and likely represent an increase in safety risk due to large volumes of incoming/outgoing off-site construction traffic at both sites. A risk of cross-media impacts is possible due to the large volume of CCR to be excavated and transported from the site. The potential for exposure to residual contamination on site is very low since CCR will be capped or removed; however, the off-site potential for exposure to CCR is increased due to the relocation of the source material.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be completed by the end of 2021. However, the time required to secure the off-site disposal airspace required to complete this alternative, including potential procurement, permitting, and construction, may extend this schedule significantly. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The removal of impounded CCR from LAN may decrease the time to reach GPS. Alternative 5 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 5:
  - IDNR Closure Permit
  - Approval of off-site disposal facility owner or landfill permit for new off-site facility
  - State and local erosion control/construction stormwater management permits
  - Transportation agreements and permits (local roads and railroads)

  State solid waste comprehensive planning approvals may also be required.

7.0 SUMMARY OF ASSESSMENT

Each of the identified corrective measure alternatives exhibits both favorable and unfavorable outcomes with respect to the assessment factors that must be evaluated in accordance with 40 CFR 257.97(c). At the present time, limited impacts have been identified as described in **Section 3.0**. The nature and extent of those impacts are the subject of ongoing assessment and IPL continues to assess remedies to meet the requirements and objectives described in 40 CFR 257.97.

8.0 REFERENCES

W.A. Gebert, David J. Graczyk, and William R. Krug (1987), Average Annual Runoff in the United States, 1951-80, USGS Hydrologic Atlas 710.

U.S. EPA. (1998) “Solid Waste Disposal Facility Criteria Technical Manual (EPA530-R-93-017), Revised April 13, 1998.” Solid Waste and Emergency Response.

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Tables

Table 1. Water Level Summary

Interstate Power & Light - Lansing, Iowa / SCS Engineers Project #25219070

Well Number	MW1 (4)	MW2	MW3 (3)	MW4	MW5	MW6	MW11	MW11R	MW12	MW12P	MW13	MW14	MW15
Top of Casing Elevation (feet amsl)	636.67	657.36	656.78	698.17	698.46	741.33	686.19	686.42	691.40	691.58	658.38	646.06	656.82
Screen Length (ft)	20	10	10	10	10	10	10	10	15	5	15	15	15
Top of Well Screen Elevation (ft)	626.50	620.50	600.00	650.00	630.00	656.00	657.96	646.94	657.70	627.98	649.48	636.96	640.82
December 10, 2015	NM	NM	NM	NM	NM	662.28	AB	NM	NM	NM	NM	NM	NM
April 28, 2016	627.50	620.26	620.83	651.55	652.79	662.80	AB	645.96	650.05	650.00	643.56	641.56	634.71
July 20, 2016	NM	NM	NM	NM	NM	663.21	AB	NM	NM	NM	NM	NM	NM
October 27, 2016	NM	NM	NM	NM	NM	670.82	AB	NM	NM	NM	NM	NM	NM
January 18, 2017	NM	NM	NM	NM	NM	666.28	AB	NM	NM	NM	NM	NM	NM
April 19-21, 2017	629.39	622.04	622.02	658.84	660.00	669.82	AB	648.24	653.68	653.40	647.61	643.01	634.50
June 19-20, 2017	NM	NM	NM	NM	NM	670.65	AB	NM	NM	NM	NM	NM	NM
August 15, 2017	NM	NM	NM	NM	NM	670.61	AB	NM	NM	NM	NM	NM	NM
October 16, 2017	NM	NM	NM	NM	NM	669.58	AB	NM	NM	NM	NM	NM	NM
April 16-17, 2018	628.63	620.82	617.50	AB	AB	667.64	AB	647.07	652.25	651.90	646.36	642.61	634.07
April 26, 2018	628.67	620.86	617.63	AB	AB	667.96	AB	647.47	651.75	652.54	646.38	645.46	634.14
June 4, 2018	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM
October 8, 2018	NM	NM	NM	AB	AB	664.71	AB	NM	NM	NM	NM	NM	NM
April 15-16, 2019	630.95	632.16	628.40	AB	AB	672.78	AB	648.69	654.35	653.99	649.45	643.08	633.71
June 20, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Bottom of Well Elevation (ft)	606.50	610.50	590.00	640.47	620.36	646.03	647.59	636.94	642.70	622.98	634.48	621.96	625.82

Well Number	TW17	TW18	TW19	MW-16	MW-18	MW-19	MW-22	MW-22P	MW20	MW301	MW302	MW303	MW304	MW305	MW306
Top of Casing Elevation (feet amsl)	659.59	659.15	659.05	700.26	771.09	713.07	702.55	702.17	662.29	641.61	638.40	656.27	636.43	633.87	637.48
Screen Length (ft)	15	15	15	15	15	15	15	5	10	10	10	10	10	10	10
Top of Well Screen Elevation (ft)	649.39	650.55	648.95	662.18	669.23	651.69	665.27	625.14	648.79	624.01	626.90	637.97	630.43	627.87	621.48
December 10, 2015	NM	NM	NM	NI	NI	NI	NI	NI	648.27	623.54	627.88	638.79	NI	NI	NI
April 28, 2016	647.78	NM (5)	646.80	NI	NI	NI	NI	NI	648.61	623.45	627.24	638.15	NI	NI	NI
July 20, 2016	NM	NM	NM	NM	NM	NM	NM	NM	649.86	624.76	628.60	639.33	NI	NI	NI
October 27, 2016	NM	NM	NM	NM	NM	NM	NM	NM	651.32	624.97	628.35	638.65	NI	NI	NI
January 18, 2017	NM	NM	NM	NM	NM	NM	NM	NM	650.18	624.09	627.32	638.10	NI	NI	NI
April 19-21, 2017	649.87	649.03	649.01	660.45	669.88	649.12	668.38	667.45	651.71	624.70	628.98	639.20	NI	NI	NI
June 19-20, 2017	NM	NM	NM	NM	NM	NM	NM	NM	650.22	624.89	627.75	638.77	NI	NI	NI
August 15, 2017	NM	NM	NM	NM	NM	NM	NM	NM	649.58	624.09	627.28	637.86	NI	NI	NI
October 16, 2017	NM	NM	NM	NM	NM	NM	NM	NM	650.81	625.70	628.75	638.79	NI	NI	NI
April 16-17, 2018	648.77	648.49	648.23	NM	NM	NM	NM	NM	650.77	624.29	628.98	638.62	NI	NI	NI
April 26, 2018	648.99	648.35	648.00	656.61	667.79	647.19	666.28	665.17	651.18	624.56	628.75	638.57	NI	NI	NI
June 4, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	624.62	628.27	638.81	NI	NI	NI
October 8, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	625.73	628.59	637.32	NI	NI	NI
April 15-16, 2019	649.73	648.47	648.10	NM	672.64	651.55	671.05	669.22	652.57	629.19	629.99	638.22	NI	NI	NI
June 20, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	623.61	629.12	623.05
Bottom of Well Elevation (ft)	634.39	635.55	633.95	647.18	654.23	636.69	650.27	620.14	638.79	614.01	616.90	627.97	620.43	617.87	611.48

Notes: NM = not measured NI = not installed AB = abandoned

1. MW3 could not be located during this sampling event.
2. Repairs were completed at MW3 in July 2013. Elevations calculated for February, April, and July 2013 are estimates based on the old top of casing elevation (657.36 feet amsl). MW3 was re-surveyed on June 3, 2014.
3. MW1 was repaired in April 2013. Groundwater elevations measured before this date are calculated using the old top of casing elevation (637.60 ft amsl).
4. TW18 was damaged and could not be accessed for a water level measurement in April 2016. The well was repaired in July 2016.

Created by: MDB Date: 8/9/2013
Last revision by: JR Date: 6/28/2019
Checked by: ACW Date: 7/15/2019

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

Sample Dates	Downgradient Wells						Background Well
	MW-301	MW-302	MW-303	MW-304	MW-305	MW-306	MW-6
12/10/2015	B	B	B	--	--	--	B
4/29/2016	B	B	B	--	--	--	B
7/20/2016	B	B	B	--	--	--	B
10/26-27/2016	B	B	B	--	--	--	B
1/17-18/2017	B	B	B	--	--	--	B
4/19/2017	B	B	B	--	--	--	B
6/19-20/2017	B	B	B	--	--	--	B
8/15/2017	B	B	B	--	--	--	B
10/16/2017	D	D	D	--	--	--	D
4/16/2018	A	A	A	--	--	--	A
4/26/2018	--	--	--	--	--	--	A-R
6/4/2018	A-R	A-R	A-R	--	--	--	--
8/7/2018	A	A	A	--	--	--	A
10/8/2018	A	A	A	--	--	--	A
4/15/2019	A	A	A	--	--	--	A
6/20/2019	--	--	--	A	A	A	--

Abbreviations:
B = Background Sample Event
D = Detection Monitoring Program Event
-- = Not Applicable
A = Assessment Monitoring Sample Event
A-R = Assessment Monitoring Resample Event

Created by: NDK Date: 1/8/2018
Last revision by: NDK Date: 8/7/2019
Checked by: MDB Date: 8/7/2019
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Table 3. Groundwater Analytical Results Summary - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25218201.00

				Background Well					Compliance Wells																	
				MW-6					MW-301					MW-302					MW-303					MW-304	MW-305	MW-306
Parameter Name	**UPL Method**	**UPL**	**GPS**	10/16/2017	4/16/2018, 4/26/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/16/2017	4/16/2018, 6/4/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/16/2017	4/16/2018, 6/4/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/16/2017	4/16/2018, 6/4/2018 ^	8/7/2018	10/8/2018	4/15/2019	6/20/2019	6/20/2019	6/20/2019
Appendix III																										
Boron, ug/L	P*	100		41.2 J	29.8 J	42.9 J	40.2 J	<110	436	198.0	279	357	250	708	489	648	694	690	592	144	675	474	150 J	<110	180 J	860
Calcium, mg/L	P	73.9		66.9	72.7	66.5	69.6	67	65.9	64.5	65.1	72.5	73	116	120	116	122	130	84.7	54.6	46.0	35.3	49	82	92	240
Chloride, mg/L	P	8.52		6.5	6.5	7.3	6.6	6.7	17.3	20.2	17.7	15.9	17	13.9	13.0	13.9	13.5	13	17.2	24.1	14.6	16.3	18	5.9	6.8	24
Fluoride, mg/L	P*	0.2		0.14 J	0.084 J	0.12 J	<0.19	0.63	0.24	0.24	0.23	0.27	0.9	0.28	0.24	0.23	0.27	0.79	0.25	0.32	0.47	0.72	1.0	<0.23	<0.23	<0.23
Field pH, Std. Units	P	7.9		7.03	7.34	7.18	7.06	7.59	7.66	8.4	8.08	8.16	8.47	7.1	7.26	6.92	6.93	7.66	7.20	8.00	7.66	7.91	7.95	7.01	7.19	6.87
Sulfate, mg/L	P	29.4		25.8	26.4	24.8	25.5	26	52.7	49.3	53.2	64.4	51	<0.5	<0.24	<0.24	<0.24	<1.8	69.9	43.5	52.5	29.1	35	20	24	280
Total Dissolved Solids, mg/L	P	386.7		318	343	351	319	340	289	300.0	326	320	350	507	543	562	518	450	379	296	262	181	280	350	440	1,200
Appendix IV		**UPL**	**GPS**																							
Antimony, ug/L	NP*	0.037	6	NA	<0.026	<0.15	<0.078	<0.53	NA	0.071 J	0.16 J	0.085 J	<0.53	NA	0.035 J	<0.15	<0.078	<0.53	NA	0.16 J	0.34 J	0.19 J	<0.53	<0.53	<0.53	<0.53
Arsenic, ug/L	P*	0.37	10	NA	0.23 J	0.26 J	0.24 J	<0.75	NA	3.9	4.4	5.4	5.4	NA	**30.8**	**47.6**	**50.4**	**37**	NA	1.2	2.3	2.3	1.4 J	<0.75	2.2	8.6
Barium, ug/L	P	48.5	2,000	NA	44.1	43.1	43	43	NA	163	156	155	160	NA	789	661	603	690	NA	173	194	121	160	54	170	280
Beryllium, ug/L	DQ	DQ	4	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.012	<0.12	<0.089	<0.27	NA	0.046 J	<0.12	<0.089	<0.27	<0.27	<0.27	<0.27
Cadmium, ug/L	DQ	DQ	5	NA	<0.018	NA	<0.033	<0.077	NA	<0.018	NA	<0.033	<0.077	NA	<0.018	NA	<0.033	<0.077	NA	<0.018	NA	<0.033	<0.077	<0.077	<0.077	<0.077
Chromium, ug/L	P	1.20	100	NA	0.66 J	0.97 J	0.73 J	<0.98	NA	1.1	<0.19	0.09 J	<0.98	NA	0.35 J	0.49 J	0.39 J	<0.98	NA	0.51 J	0.44 J	0.089 J	<0.98	1.6 J	<0.98	<0.98
Cobalt, ug/L	NP*	0.34	6	NA	<0.014	<0.15	<0.062	<0.091	NA	0.086 J	0.16 J	0.11 J	0.11 J	NA	1.1	1.1	1.1	1.5	NA	0.14 J	0.36 J	0.21 J	<0.091	1.1	0.52	1.0
Fluoride, mg/L	P*	0.2	4	NA	0.084 J	0.12 J	<0.19	0.63	NA	0.24	0.23	0.27	0.90	NA	0.24	0.23	0.27	0.79	NA	0.32	0.47	0.72	1.0	<0.23	<0.23	<0.23
Lead, ug/L	NP*	0.13	15	NA	<0.033	<0.12	<0.13	<0.27	NA	0.037 J	<0.12	<0.13	<0.27	NA	0.084 J	0.23 J	<0.13	<0.27	NA	<0.033	0.24 J	<0.13	<0.27	1.2	<0.27	0.52
Lithium, ug/L	NP*	3	40	NA	<4.6	NA	<4.6	<2.7	NA	<4.6	NA	9.1 J	8.7 J	NA	<4.6	NA	<4.6	<2.7	NA	<4.6	NA	8.1 J	3.3 J	<2.7	3.4 J	19
Mercury, ug/L	DQ	DQ	2	NA	<0.090	<0.090	<0.090	<0.10	NA	0.31	<0.090	<0.090	<0.10	NA	0.35	<0.090	<0.090	<0.10	NA	<0.090	<0.090	<0.090	<0.10	<0.10	<0.10	<0.10
Molybdenum, ug/L	P*	0.37	100	NA	0.26 J	0.28 J	<0.57	<1.1	NA	4.4	5.6	10.3	11	NA	0.91 J	1.2	1.5	<1.1	NA	7.3	21.6	12	6.2	<1.1	1.7 J	<1.1
Selenium, ug/L	P*	0.72	50	NA	0.47 J	0.5 J	0.46 J	<1.0	NA	<0.086	0.22 J	0.18 J	<1.0	NA	<0.086	0.3 J	0.26 J	<1.0	NA	3.3	0.38 J	0.39 J	<1.0	<1.0	<1.0	<1.0
Thallium, ug/L	NP*	0.29	2	NA	<0.036	NA	<0.099	<0.27	NA	<0.036	NA	<0.099	<0.27	NA	<0.036	NA	<0.099	<0.27	NA	<0.036	NA	<0.099	<0.27	<0.27	<0.27	<0.27
Radium 226/228 Combined, pCI/L	P	1.88	5	NA	1.35	0.974	1.37	0.255	NA	0.689	1.66	0.556	0.232	NA	1.96	2.09	3.52	0.146	NA	0.787	0.929	1.87	0.543	0.0356	0.553	0.897

4.4 Italics and blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

30.8 Bold and yellow highlighted cell indicates the compliance well result exceeds the GPS.

Abbreviations:

UPL = Upper Prediction Limit
NA = Not Analyzed
P = Parametric UPL with 1-of-2 retesting
U = Result is less than the sample detection limit.

GPS = Groundwater Protection Standard
J = Estimated concentration at or above the LOD and below the LOQ.
DQ = Double Quantification rule applies (not detected in background samples)

LOD = Limit of Detection
LOQ = Limit of Quantitation
NP = Nonparametric UPL (highest background value)

* = UPL is below the LOQ for background sampling. For compliance wells, only results confirmed above the LOQ are evaluated as potential SSIs above background.
^ = During the April 2018 sampling event, all non-radium sample containers for MW-6 were damaged during shipment. MW-6 was resampled for non-radium parameters on 4/26/2018. Total Dissolved Solids samples for MW-301, MW-302, and MW-303 were analyzed out of hold time. Those wells were resampled for TDS only on 6/5/2018.

Notes:
1. An individual result above the UPL or GPS does not constitute a statistically significant increase (SSI) above background or statistically significant increase above the GPS.
   See the accompanying letter text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (US EPA) Maximum Contamination Level (MCL), if established; otherwise, the value from 40 CFR 257.95(h)(2) is used.
3. Interwell UPLs calculated based on results from background well MW-6.

Created by: NDK Date: 5/1/2018
Last revision by: LMH Date: 8/15/2019
Checked by: NDK Date: 8/15/2019

I:\25218201.00\Deliverables\LAN ACM\Tables\[3_CCR GW Screening Summary_LAN.xlsx]Table

Table 4. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW3	5/11/2001	<1.8
MW4	5/11/2001	<1.8
	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	3.3
	8/23/2004	<0.79
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	2.9
	5/30/2007	<1
	4/16/2008	<0.43
	4/3/2009	0.27 J
	4/21/2010	<1.0
	5/4/2011	<1.0
	5/4/2011(Dup)	<2.0 RL
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.62 J
	5/29/2014	<0.18
	4/21/2015	<0.25
	4/28/2016	0.30 J
	4/20/2017	0.33 J
MW5	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	4.7
	8/23/2004	0.92
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	<0.79
	5/30/2007	<1
	4/16/2008	<0.43
	04/16/08 Dup	<0.43
	4/3/2009	0.22 J
	4/21/2010	<1.0
	4/21/2010 (Dup)	<1.0
	5/4/2011	<1.0
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.65 J
	5/29/2014	1.3
	4/21/2015	<0.25
	4/28/2016	0.26 J
	4/20/2017	0.26 J

Table 4. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW6	5/11/2001	<1.8
	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	3.9
	8/23/2004	<0.79
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	0.93 J
	5/30/2007	<1.0
	4/16/2008	<0.43
	4/3/2009 Dup	0.29 J
	4/3/2009	0.29 J
	4/21/2010	<1.0
	5/4/2011	<1.0
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.55 J
	4/20/2015	<0.25
	4/29/2016	0.26 J
	4/19/2017	0.27 J
	4/16/2018	0.19 J
	4/15/2019	<0.75
MW11	3/8/2002	**23**
	5/26/2004	**16**
	8/23/2004	3.8
MW11R	4/21/2010	2.44
	5/4/2011	**11.6**
	4/25/2012	**13.6**
	4/25/2012 (Dup)	**15.7**
	4/2/2013	**25**
	7/2/2013	**23**
	4/30/2014	**27**
	5/29/2014	**27**
	4/21/2015	**23**
	4/28/2016	**33.4**
	4/20/2017	**30.4**
	4/17/2018	**28.5**
	4/16/2019	**28**
MW12	4/2/2013	**16**
	7/2/2013	**17**
	4/30/2014	**16**
	5/29/2014	**14**
	4/21/2015	**13**
	4/28/2016	**24.2**
	4/20/2017	**19.4**
	4/17/2018	**20.6**
	4/16/2019	**20**
MW12P	4/30/2014	1.0
	5/29/2014	0.45 J
	4/21/2015	0.34 J
	4/28/2016	0.44 J
	4/20/2017	0.88 J
	4/17/2018	0.51 J
	4/16/2019	<0.75

Table 4. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW13	4/2/2013	1.1
	7/2/2013	<1.0
	7/2/2013 Dup	<1.0
	4/30/2014	1.6
	5/29/2014	0.65 J
	4/20/2015	1.1
	4/28/2016	3.5
	4/20/2017	1.5
	4/17/2018	0.89 J
	4/16/2019	<0.75
MW14	4/2/2013	<1.0
	7/2/2013	<1.0
	4/30/2014	0.54 J
	5/29/2014	<0.18
	4/20/2015	<0.25
	4/29/2016	0.16 J
	4/20/2017	0.68 J
	4/17/2018	0.16 J
	4/15/2019	<0.75
MW15	4/30/2014	0.95 J
	5/29/2014	0.82 J
	4/20/2015	0.79 J
	4/29/2016	0.39 J
	4/20/2017	0.42 J
	4/17/2018	0.14 J
	4/16/2019	<0.75
TW17	4/30/2014	0.87 J
	5/29/2014	0.25 J
TW18	4/30/2014	1.40
	5/29/2014	<0.18
	4/20/2015	0.47 J
	4/20/2017	1.2
	4/17/2018	2.1
	4/16/2019	<0.75
TW19	4/30/2014	4.6
	5/29/2014	0.59 J
Groundwater Protection Standard (GPS)		10

Abbreviations:
µg/L = micrograms per liter

Notes:
Bold+underlined values meet or exceed GPS.

Laboratory Notes/Qualifiers:
J = Estimated value. Analyte detected at a level less than the reporting limit and greater than or equal to the Method Detection Limit. The user of this data should be aware that this data is of unknown quality.
RL = Reporting limit raised due to sample matrix effects.

Created by:	TLC	Date:	8/20/2013
Last revision by:	SCC	Date:	8/7/2019
Checked by:	NDK	Date:	8/8/2019

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Table 5. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25218201.00

	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
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
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Potentially	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
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
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
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
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
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

Table 5. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25218201.00

	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
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
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)
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
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
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
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
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
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
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

Table 5. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25218201.00

	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
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
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
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
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
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
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)	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed

Created by: LAB/SK Date: 6/20/2019
Last revision by: EJN Date: 9/10/2019
Checked by: TK Date: 9/12/2019

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Figures

N

LANSING QUADRANGLE

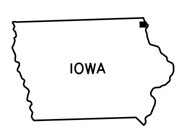
IOWA–ALLAMAKEE CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)

NW/4 LANSING 15' QUADRANGLE

1997

SCALE: 1" = 2,000'



CLIENT	ALLIANT ENERGY. INTERSTATE POWER AND LIGHT 2320 POWER PLANT DRIVE LANSING, IA 52151-9733	SITE	INTERSTATE POWER AND LIGHT LANSING GENERATING STATION COAL COMBUSTION RESIDUE LANDFILL LANSING, IOWA	SITE LOCATION MAP

PROJECT NO.	25218201	DRAWN BY:	AHB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	08/09/12	CHECKED BY:	MDB			1
REVISED:	08/27/19	APPROVED BY:	TJK 09/10/19			

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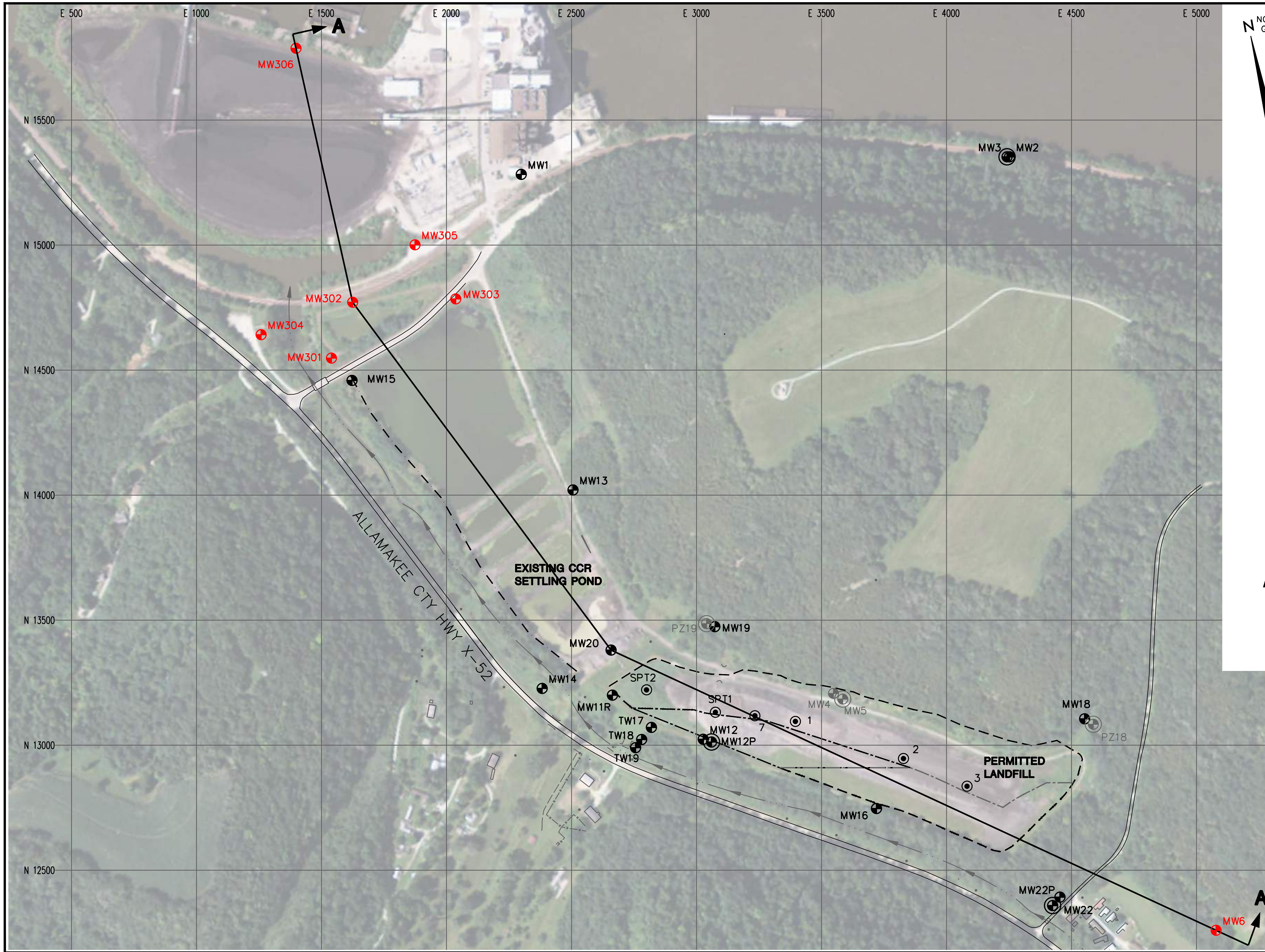

NORTH GRID
N

400 0 400

SCALE: 1" = 400'

LEGEND

(line)	APPROVED LIMITS OF WASTE
(line)	LIMITS OF PHASE 1 FINAL COVER
(line)	LIMITS OF PHASE 2 FINAL COVER
MW17	EXISTING STATE PROGRAM MONITORING WELL
MW12P	EXISTING STATE PROGRAM PIEZOMETER
MW17	EXISTING CCR RULE MONITORING WELL
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
	SOIL BORING
(line)	SLURRY WALL
(line)	EXISTING STREAM
(line)	CROSS SECTION LOCATION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. ONLY BORINGS USED FOR GEOLOGIC CROSS SECTION A-A' ARE SHOWN.
3. MW6 IS SAMPLED UNDER BOTH TH STATE AND CCR RULE MONITORING PROGRAMS.

PROJECT NO.	25218201	DRAWN BY:	AHB/RJG
DRAWN:	07/03/19	CHECKED BY:	MDB
REVISED:	08/07/19	APPROVED BY:	TJK 09/10/19

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

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

SITE: INTERSTATE POWER AND LIGHT
LANSING GENERATING STATION
COAL COMBUSTION RESIDUE LANDFILL
LANSING, IOWA

SITE PLAN AND MONITORING WELL LOCATION MAP

FIGURE 2

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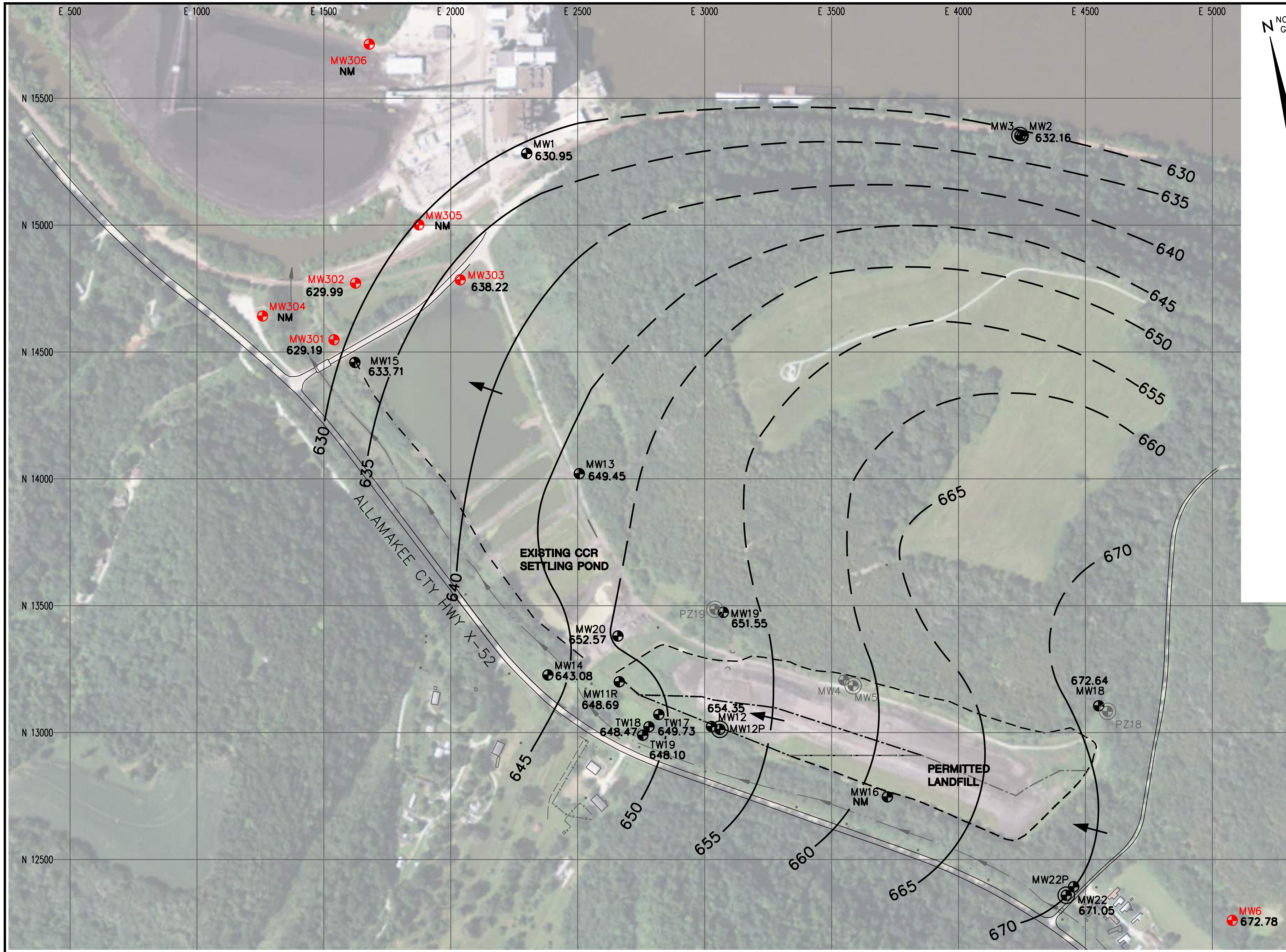
11/25/2020 - Classification: Internal - ECRM7804115



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
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW17	EXISTING CCR MONITORING WELL
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
— · — · —	SLURRY WALL
···→···→	EXISTING STREAM
629.99	WATER TABLE ELEVATION
NM	NOT MEASURED
———	WATER TABLE CONTOUR (DASHED WHERE INFERRED)
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. MONITORING WELLS MW304, MW305, AND MW306 WERE INSTALLED IN MAY 2019.

PROJECT NO.	25219070.00	DRAWN BY:	BSS
DRAWN:	07/03/19	CHECKED BY:	NK
REVISED:	07/08/19	APPROVED BY:	TJK 09/10/19

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

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

SITE: INTERSTATE POWER AND LIGHT
LANSING POWER STATION
COAL COMBUSTION RESIDUE LANDFILL
LANSING, IOWA

WATER TABLE MAP – APRIL 15-16, 2019

FIGURE 3

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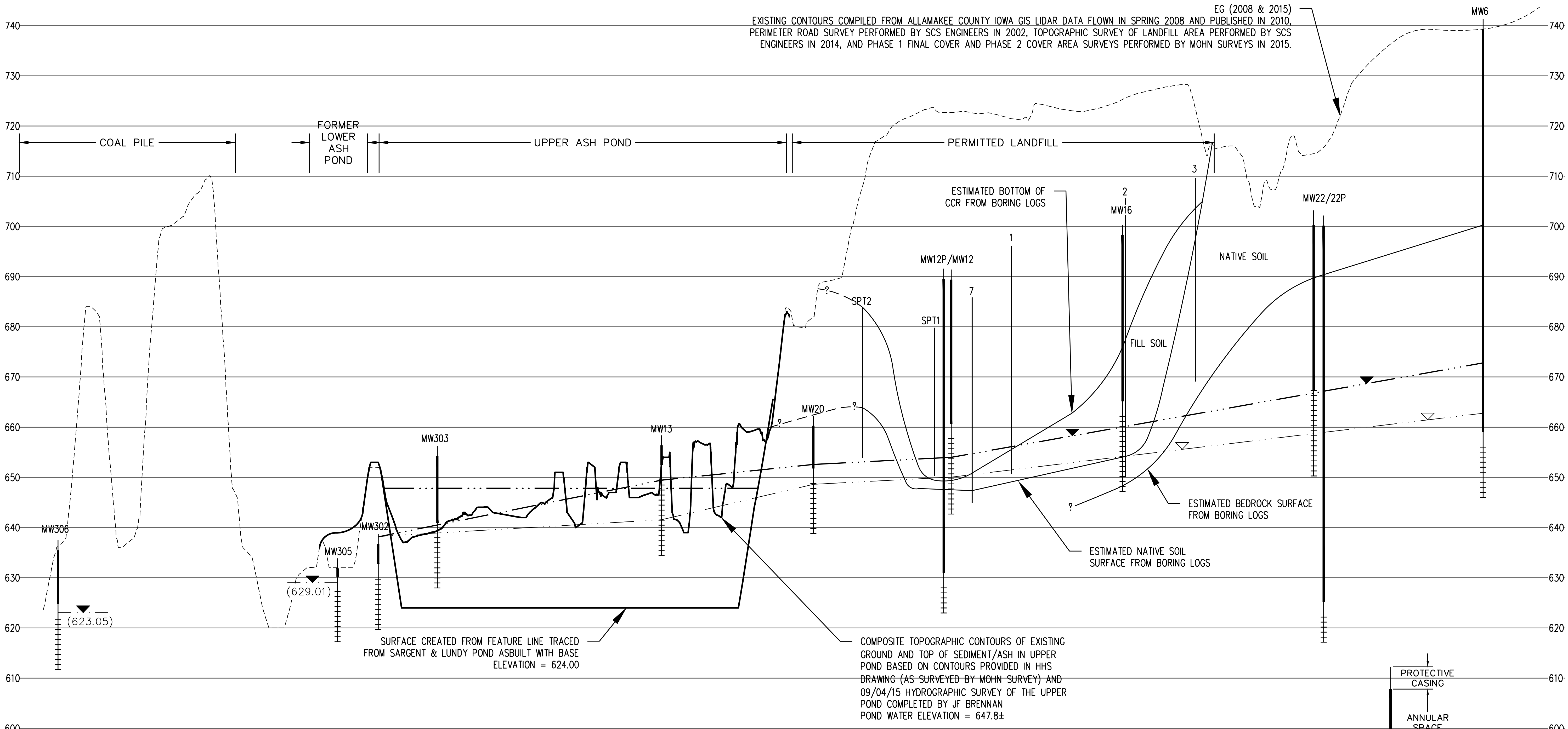


NOTES:

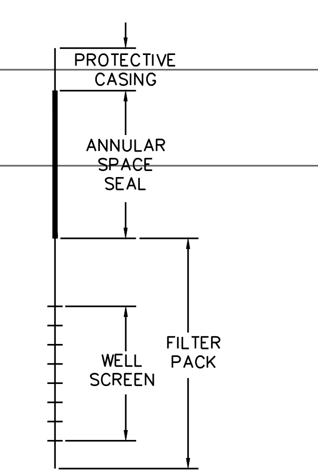
1. THE FOLLOWING MONITORING WELL AND BORING LOCATIONS ARE PROJECTED ALONG THE CROSS SECTION; MW22P/MW22, MW16, MW12/MW12P, MW13, MW303, MW305, 1, 2, 3, 7, SPT1, AND SPT2. SEE FIGURE 1 FOR CROSS SECTION LOCATION.
2. MONITORING WELLS MW305 AND MW306 WERE INSTALLED IN MAY 2019 AND FIRST SAMPLED ON JUNE 20, 2019. WATER TABLE ELEVATIONS FOR JUNE 20, 2019 ARE SHOWN AT THESE WELLS.

0 400

HORIZONTAL SCALE: 1" = 300'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 20X

LEGEND

- HIGH WATER TABLE MEASURED APRIL 15-16, 2019
- LOW WATER TABLE MEASURED APRIL 28, 2016
- (623.05) JUNE 20, 2019 WATER TABLE ELEVATION
- UPPER ASH POND SURFACE WATER ELEVATION



WELL DETAIL

PROJECT NO.	25219070.00	DRAWN BY:	AHB/RJG
DRAWN:	07/03/19	CHECKED BY:	MDB
REVISED:	08/07/19	APPROVED BY:	TJK 09/10/19

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

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

SITE: INTERSTATE POWER AND LIGHT
LANSING POWER STATION
COAL COMBUSTION RESIDUE LANDFILL
LANSING, IOWA

CROSS SECTION A-A'

FIGURE 4

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Appendix A

Regional Geological and Hydrogeological Information

Table LAN-3 Regional Hydrogeologic Stratigraphy
Lansing Generating Station / SCS Engineers Project #25215053

Strategic Unit			Hydrogeologic Units	Type of Rock	Hydrologic Conditions	Thickness Range (ft)	Age of Rocks*
Quaternary		Recent and Pleistocene deposits	Surficial aquifers-Alluvium, Drift, Buried-channel	Sand and gravel interbedded with silt and clay	Mostly unconfined local aquifers, some artesian, small-to-large yields	0 – 305	0 – 2.8 million years (m.y.)
Devonian	Yellow Spring Group (Gp)	Lime Creek Formation (Fm)	Confining layers	Shale, some dolostone	Non-aquifer	0 – 50	365 – 405 m.y.
	Cedar Valley Gp	Lithograph City Fm Coralville Fm Little Cedar Fm	Silurian-Devonian aquifer	Limestone and dolostone, thin shales	Major aquifer, mostly artesian, moderate-to-large yields	0 – 400	
	Wapsipinicon Gp	Pinicon Ridge Fm Spillville Fm		Dolostone and limestone			
Silurian		Scotch Grove Fm Hopkinton Fm Blanding Fm Tete des Morts Fm		Dolostone, locally with much chert, local shale as cavern fillings			405 – 425 m.y.
Ordovician	Maquoketa Fm	Brainard Member Fort Atkinson Member Clermont Member Elgin Member	Maquoketa Fm, confining beds Fort Atkinson – Elgin aquifer	Shale and dolostone, some chert	Non-aquifer to local aquifer, small-to-moderate yields	0 – 300	425 – 455 m.y.
	Galena Gp	Dubuque Fm Wise Lake Fm Dunleith Fm Decorah Fm	Galena aquifer	Limestone and dolostone, minor chert, shale at base and locally in upper part	Local aquifer, confined and unconfined, small-to-moderate yields	0 – 240	455 – 460 m.y.
		Platteville Fm Glenwood Fm	Decorah-Platteville-Glenwood confining beds	Limestone and shale	Non-aquifer	0 – 50	
		St. Peter Sandstone	Cambrian-Ordovician aquifer	Sandstone	Major aquifer, mostly artesian, large yields	0 – 580	460 – 500 m.y.
		Prairie du Chien Gr		Dolostone, minor sandstone and chert			500 – 503 m.y.
Cambrian		Jordan Sandstone		Sandstone, dolomitic			
		St. Lawrence Fm	Cambrian confining beds	Dolostone, silty	Non-aquifer	0 – 400	503 – 508 m.y.
		Lone Rock (Franconia) Fm		Fine, sandstone, siltstone, shale, and minor dolostone			
		Wenowoc (incl Ironton-Galesville sandstone) Fm	Dresbach aquifer	Sandstone	Artesian aquifer, large yields	0 – 1,950	508 – 515 m.y.
		Eau Claire Fm		Fine sandstone, siltstone, and shale			
		Mt. Simon Sandstone		Sandstone			
Pre-C		Undifferentiated crystalline rocks	Unknown	Igneous and metamorphic rocks	Unknown	Unknown	570 m.y. – > 2 billion years

*Age determinations as used on COSUNA charts published by AAPG-USGS
Source: "Water Resources of Southeast Iowa," Iowa Geologic Survey Water Atlas No. 4.

I:\25215053\Data\Tables\Table 2_Regional Hydrogeologic Stratigraphy.doc

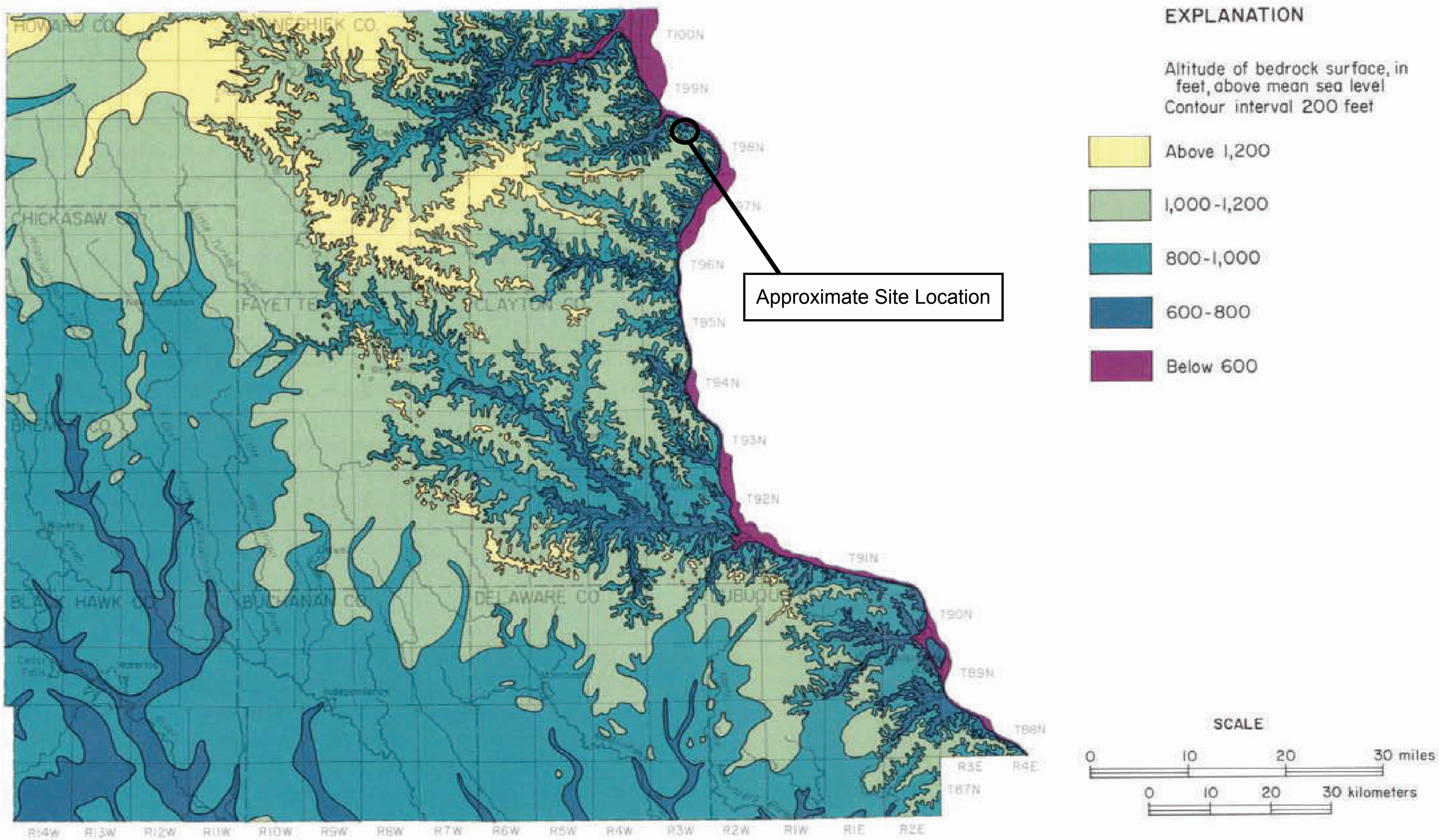

Figure 30. Altitude and configuration of the bedrock surface

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

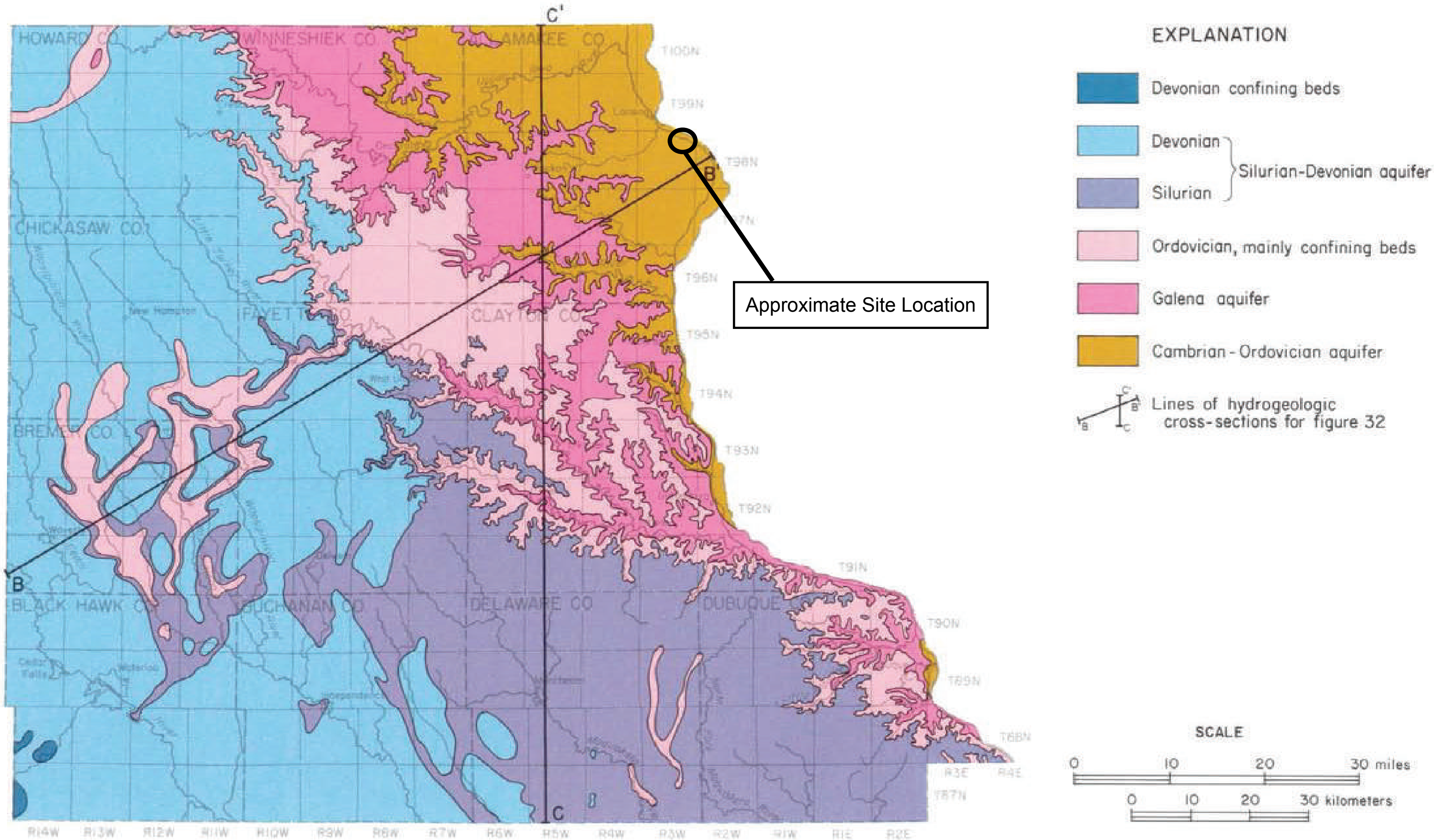

Figure 31. Bedrock hydrogeologic map

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

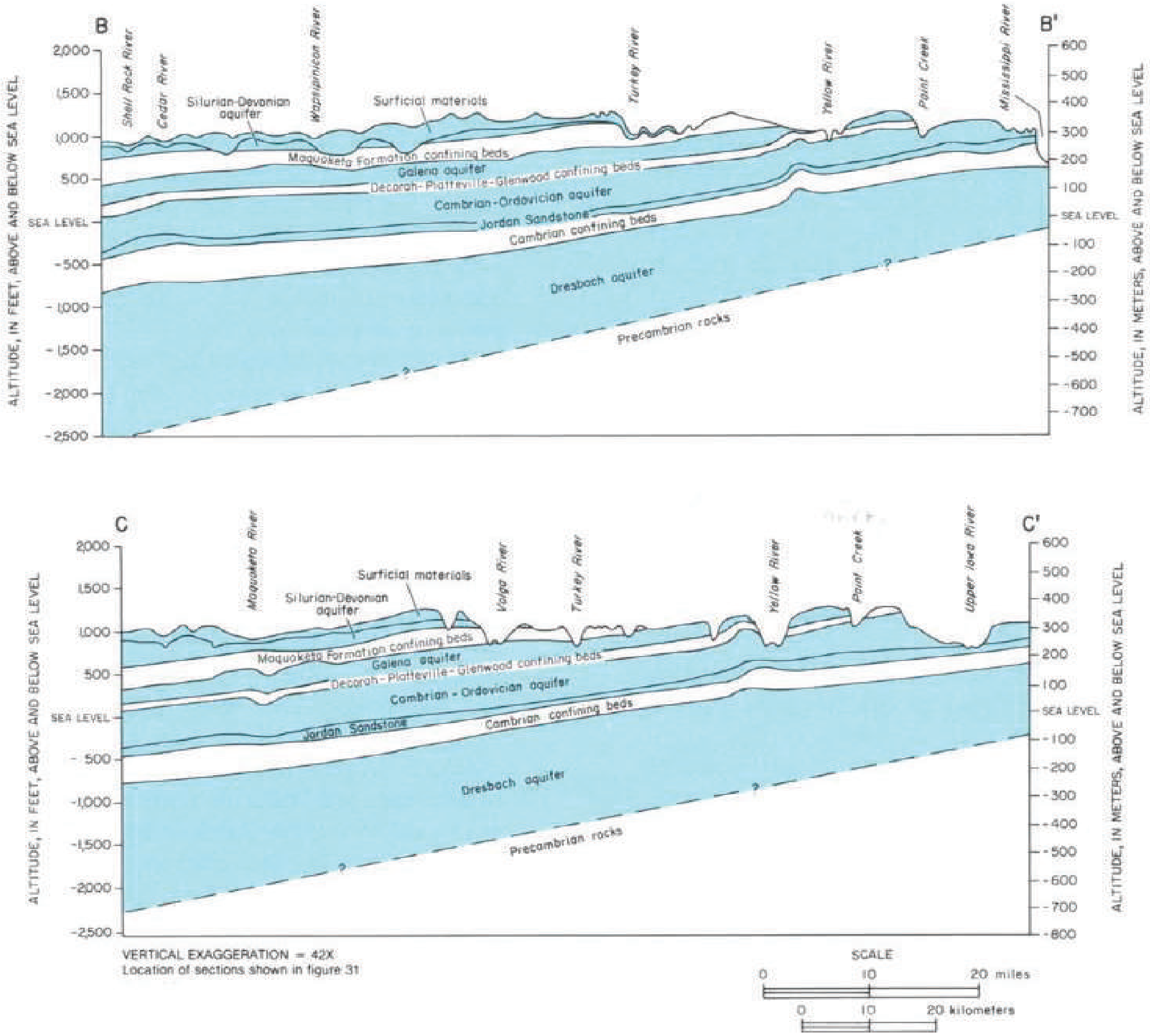

Figure 32. Hydrogeologic cross-sections

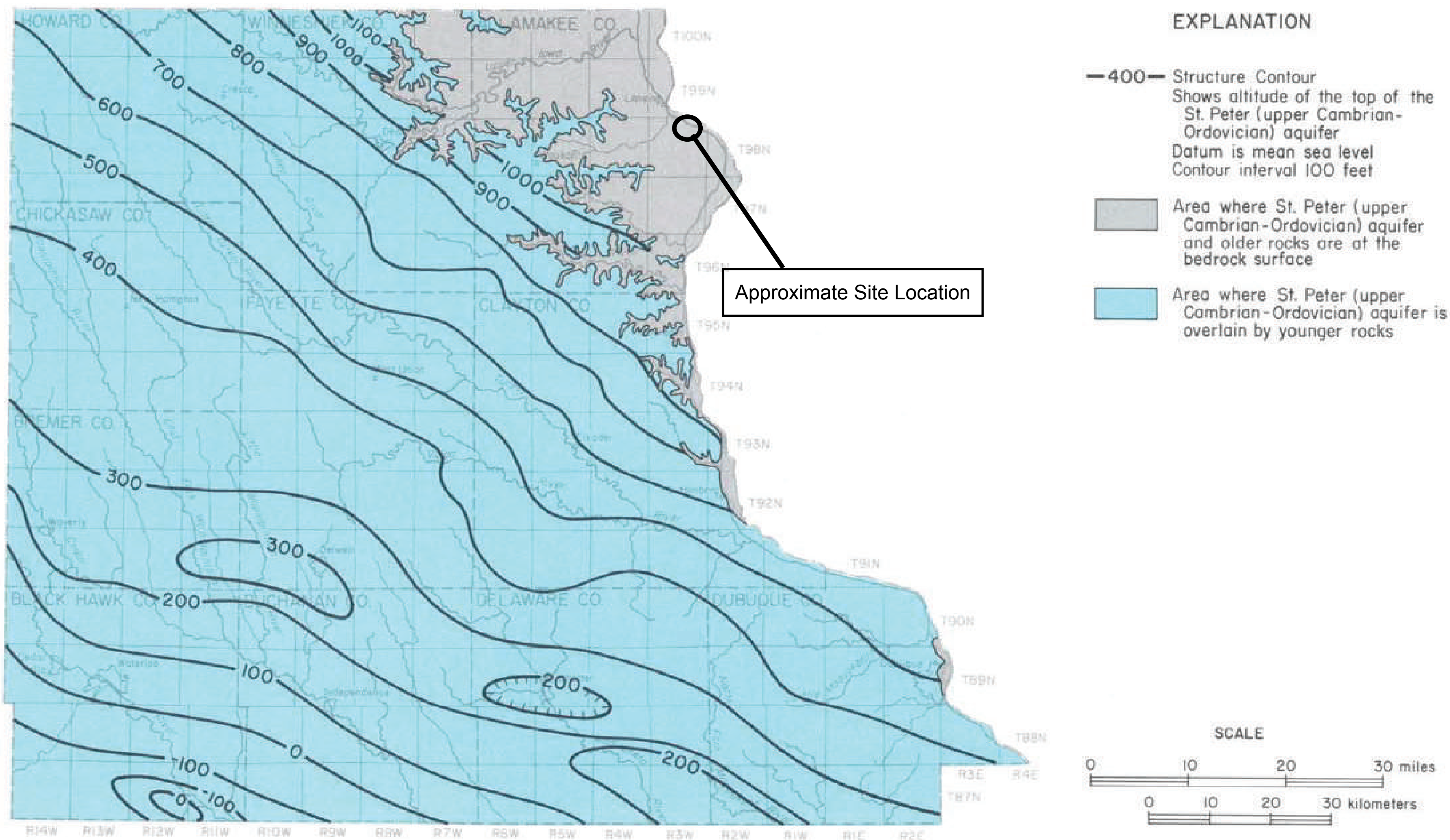

Figure 38. Altitude of the top of the St. Peter (upper Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

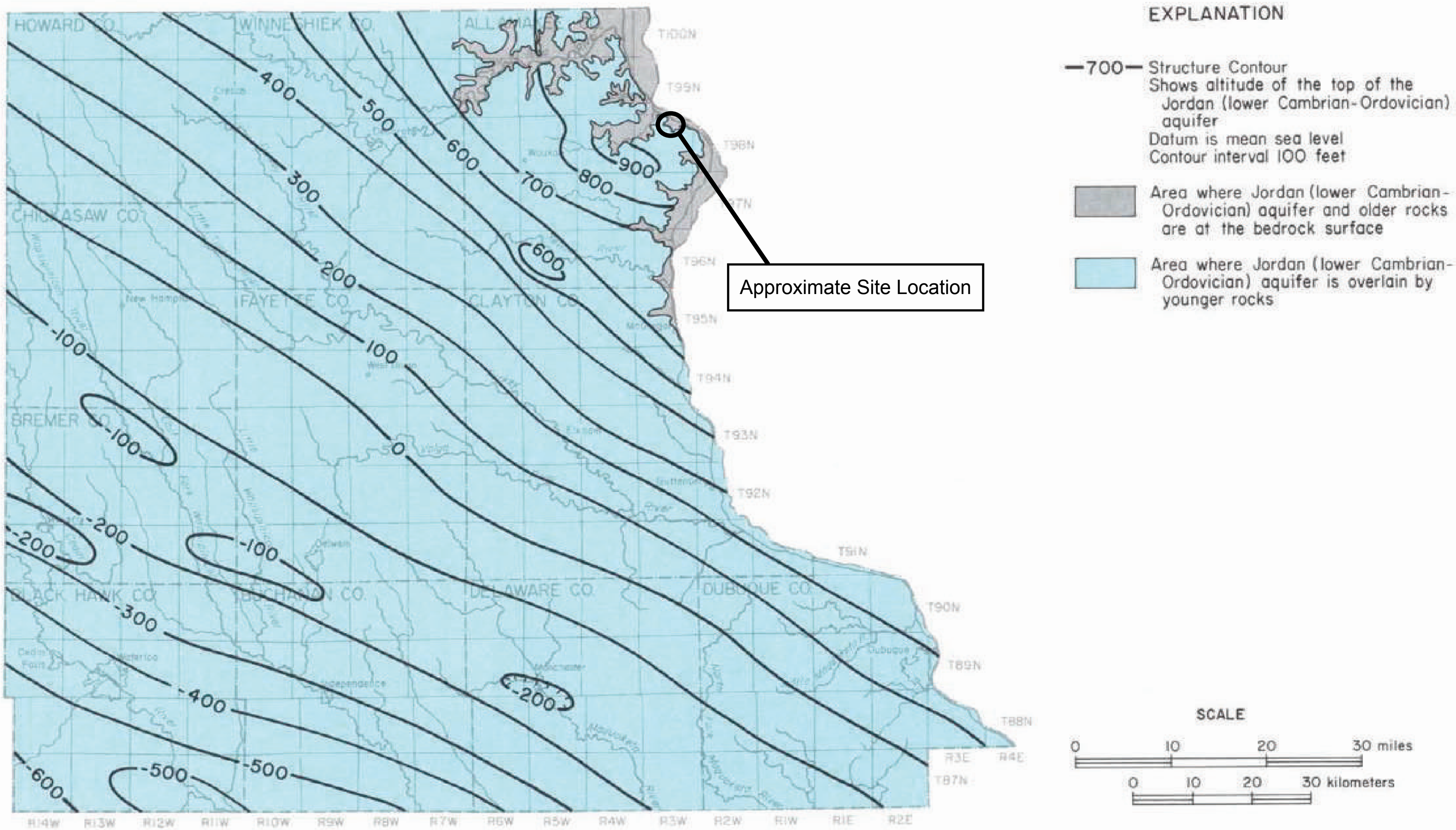

Figure 39. Altitude of the top of the Jordan (lower Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

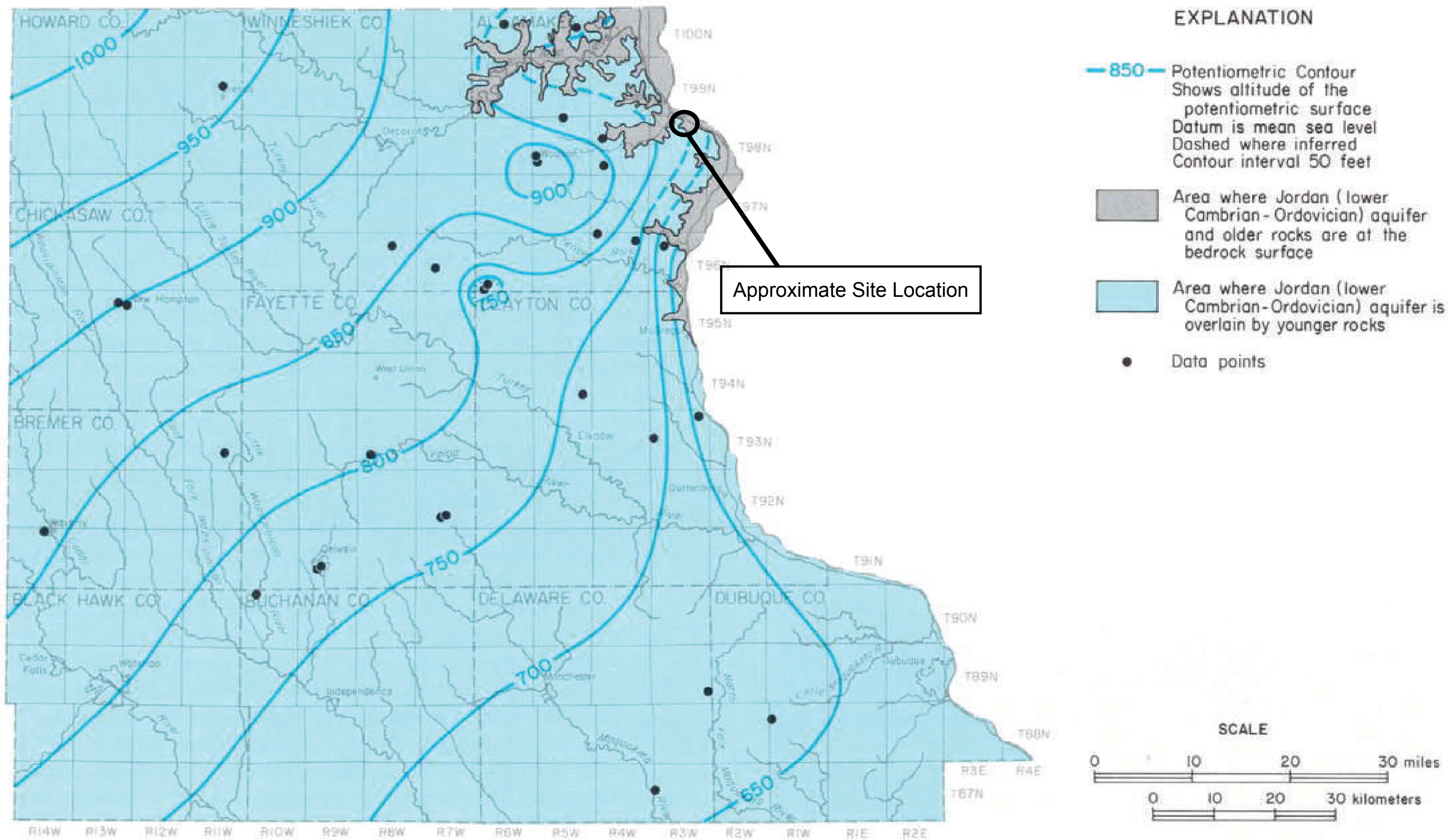

Figure 56. Potentiometric surface of the Jordan (lower Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

Appendix B

Boring Logs

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					734.0	5		**0.0 to 6.0 SILT** Topsoil developed in silt from 0.0 to 1.5. Topsoil is dark brown. Clayey silt, trace sand is loess or colluvium (slopewash) derived from loess. Medium brown, changing gradually to yellow brown below 5.0.
					729.0	10		**6.0 to 37.0 TALUS** Light brown sandy silt with dolomite chunks.
					724.0	15		
					719.0	20		
					714.0	25		
					709.0	30		
					704.0	35		
					699.0	40		**37.0 to 93.5 INTERBEDDED SANDSTONE AND SILTSTONE** Sandstone is fine-grained, with quartz silt matrix, glauconitic. Siltstone contains minor amount of very fine quartz sand and glauconite. Sandstone is laminated light greenish gray with creamy color. Siltstone is light greenish gray. Sandstone from 37.0 to 58.0.
					694.0	45		
					689.0	50		

Howard R Green Company
CONSULTING ENGINEERS

PROJECT: Interstate Power Company
PROJECT NUMBER: 717880-J
SURFACE ELEVATION: 739.3 Feet MSL
TOTAL DEPTH OF HOLE: 93.5 Feet

LOG OF MW-6
LOCATION: Lansing, Iowa
GEOLOGIST: Barbara Torney

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					684.0	55		
								Siltstone from 58.0 to 68.0.
					679.0	60		
					674.0	65		
								Interbedded sandstone and siltstone from 68.0 to 78.0.
					669.0	70		
					664.0	75		
								Siltstone from 78.0 to 83.0
					659.0	80		
								No sample from 83.0 to 93.5. Likely interbedded sandstone and siltstone by comparison to same interval on log of MW-4 and MW-5. Lower few feet may be primarily siltstone.
					654.0	85		
					649.0	90		
					644.0	95		
					639.0	100		

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT Interstate Power Company
PROJECT NUMBER 717880-J
SURFACE ELEVATION 739.3 Feet MSL
TOTAL DEPTH OF HOLE 93.5 Feet

LOG OF MW-6

LOCATION Lansing, Iowa
GEOLOGIST Barbara Torney

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name: IPL- Lansing Generating Station SCS#: 25215135.70	License/Permit/Monitoring Number	Boring Number: B-301	
Boring Drilled By: Name of crew chief (first, last) and Firm: Mike Mueller, Cascade Drilling	Date Drilling Started: 11/2/2015	Date Drilling Completed: 11/2/2015	Drilling Method: hollow stem auger
Unique Well No. / DNR Well ID No. / Common Well Name: MW-301	Final Static Water Level: Feet	Surface Elevation: 639.4 Feet	Borehole Diameter: 8.0 in
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ State Plane 3,957,744 N, 5,541,108 E S/C/N; NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W	Lat ° ' " Long ° ' "	Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W	
Facility ID	County: Allamakee	Civil Town/City/ or Village: Lansing	

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–4.5	POORLY GRADED SAND, medium grained, very dark gray brown (10YR 3/2).	SP									
S1	23	10 31 38 48	2–4							M				
S2	24	32 47 50	4.5–7	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/4).	SP-SM					M				
S3	22	18 33 47 43	7–9.5	POORLY GRADED SAND WITH SILT AND GRAVEL, medium grained sand, large grained gravel, dark yellowish brown (10YR 3/6).	SP-SM					M				
S4	24	36 46 50	9.5–	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/6).	SP-SM					S				Water @ 10 ft bgs
S5	22	13 9 7 10	12–14							S				

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

Signature: [signature]

Firm: SCS Engineers, 2830 Dairy Drive Madison, WI 53718 Tel: 608-224-2830 Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B-301

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	20	3 2 4	16, 17	SILT, black (10YR 3/1).	ML					S				
S7	24	2 2 2 2	18, 19	SILT WITH SAND, black (10YR 3/1).	ML					S				
S8	24	2 2 4	20, 21, 22	POORLY GRADED SAND WITH SILT, black (10YR 3/1).	SP-SM					S				
S9	24	2 9 12 14	23, 24, 25, 26	SILT, dark olive gray (5Y 3/2).	ML					S				
				End of Boring at 26 ft bgs.										

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Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-302

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/4/2015	11/4/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-302	Feet	635.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,929 N, 5,541,179 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	POORLY GRADED SAND, medium grained, dark grayish brown (10YR 4/2).										
S1	24	6 14 17 19	3		SP					M				
S2	24	26 45 50	5.5	SANDY SILT, trace small gravel, black (10YR 3/1).						M				
S3	24	12 13 10 8	8							M				
S4	11	9 11 13 12	10.5		ML					S				Saturation @ 11 ft bgs
			11	Large gravel										
S5	8	32 23 30 36	13							S				
			13.5	Large gravel										
			15											

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

Signature	Firm	
[signature]	SCS Engineers 2830 Dairy Drive Madison, WI 53718	Tel: 608-224-2830 Fax:

Boring Number B-302

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	24	5 5 6 8	16, 17	SANDY SILT, trace small gravel, black (10YR 3/1). *(continued)*	ML					S				
S7	18		18, 19, 20	Silt, Black (10YR 3/1).	ML					S				
				End of Boring at 20 ft bgs.										

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Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-303

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2015	11/2/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-303	Feet	653.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,857 N, 5,541,622 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–2.5	SILTY SAND, very dark gray (5Y 3/1).	SM									
			2.5–7	POORLY GRADED SAND, medium grained, dark grayish brown (10 YR 4/2).	SP									
S1	24	5 16 17 24	3							M				
S2	24	11 8 10	5.5							M				
			7–15	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2).	SP									
S3	24	11 38 50	8							M				
S4	18	16 35 50	10.5							M				
S5	16	27 50 50	13							M				

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

Signature [signature] Firm SCS Engineers
2830 Dairy Drive Madison, WI 53718
Tel: 608-224-2830
Fax:

Boring Number B-303

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	0	38 50	16	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2). *(continued)*	SP					M				Rock in Spoon
			17											
S7	18	17 25 40 47	18							S				Saturation @17 ft bgs.
			19											
			20	POORLY GRADED SAND, medium grained, very dark gray (5Y 3/1).	SP									
S8	17	37 48 44	21							S				
			22											
S9	18	11 24 26 27	23							S				
			24											
			25											
S10	24	37 50	26							S				
			27	End of Boring at 27 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW304

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/15/2019	5/15/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW304	623.61 Feet MSL	635.5 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,893 N, 5,540,876 E S/C/N
SE 1/4 of NE 1/4 of Section 3, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–3	SILT, mottled, (10YR 3/2), some black coal looking material.	ML									
	12	3 6 3 3	2							M				
	18	1 2 2 1	3–5	LEAN CLAY, (10YR 4/3), soft, some organic material.	CL					W				
	12	2 2 3 2	5–9	SILT, (10YR 2/2), uniform, trace fine sand and clay.	ML					M				
	18	1 1 3 2	8							W				
	18	1 2 1 1	9–15	POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial).	SP					W				
	12	0 0 1 1	12							W				
	12	0 0 1 1	14							W				

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

Signature: [signature] for Zach Watson
Firm: SCS Engineers
2830 Dairy Drive, Madison, WI 53718
Tel:
Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW304

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
		0 0 1 1	16	POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial). *(continued)*						W				
		2 5 6 6	17 18 19	Same as above but more coarse, (2.5YR 5/4), trace silt.	SP					W				
			20	End of Boring at 20 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW305

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/16/2019	5/16/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW305	629.12 Feet MSL	631.8 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,958,109 N, 5,541,533 E S/C/N
SE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9.5	Hydrovaced to 9.5 feet.										
			9.5	FAT CLAY, dark greenish gray, (GLEY 13/10Y), soft, trace red sand, wood pieces and roots.	CH									
	24	1 1 1 1	11							W				
	24	0 0 0 2	13							W				
			14	Sand seams at 13.5 and 14.5 feet.										

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

Signature	Firm	
[signature] For Zach Watson	SCS Engineers 2830 Dairy Drive, Madison, WI 53718	Tel: Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW305

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			16	FAT CLAY, dark greenish gray, (GLEY 1 3/10Y), soft, trace red sand, wood pieces and roots. *(continued)*	CH					W				
				End of Boring at 16 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW306

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/16/2019	5/16/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW306	623.05 Feet MSL	636.7 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,958,977 N, 5,541,203 E S/C/N
NE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–12	Hydrovaced to 12 feet.										
	12	1 2 4 3	12–15	POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt.	SP					W				

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

Signature	Firm	
[signature] for Zach Watson	SCS Engineers 2830 Dairy Drive, Madison, WI 53718	Tel: Fax:

Boring Number MW306

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
	18	1 2 2 4		POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt. *(continued)*						W				
			16	Same as above but gray, (10YR 4/2).										
	18	1 1 2 2	17							W				
			18											
	18		19							W				
			20		SP									
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Appendix C

Information on Arsenic

Arsenic - ToxFAQs™

CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic

CS265956-A

compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This Public Health Statement is the summary chapter from the Toxicological Profile for Arsenic. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-800-232-4636.

This public health statement tells you about arsenic and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Arsenic has been found in at least 1,149 of the 1,684 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which arsenic is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to this substance may harm you.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to arsenic, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS ARSENIC?

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Arsenic is classified chemically as a metalloid, having both properties of a metal and a nonmetal; however, it is frequently referred to as a metal. Elemental arsenic (sometimes referred to as metallic arsenic) is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic.

Most inorganic and organic arsenic compounds are white or colorless powders that do not evaporate. They have no smell, and most have no special taste. Thus, you usually cannot tell if arsenic is present in your food, water, or air.

Inorganic arsenic occurs naturally in soil and in many kinds of rock, especially in minerals and ores that contain copper or lead. When these ores are heated in smelters, most of the arsenic goes up the stack and enters the air as a fine dust. Smelters may collect this dust and take out the arsenic as a compound called arsenic trioxide (As_2O_3).

However, arsenic is no longer produced in the United States; all of the arsenic used in the United States is imported.

Presently, about 90% of all arsenic produced is used as a preservative for wood to make it resistant to rotting and decay. The preservative is copper chromated arsenate (CCA) and the treated wood is referred to as "pressure-treated." In 2003, U.S. manufacturers of wood preservatives containing arsenic began a voluntary transition from CCA to other wood preservatives that do not contain arsenic in wood products for certain residential uses, such as play structures, picnic tables, decks, fencing, and boardwalks. This phase out was completed on December 31, 2003; however, wood treated prior to this date could still be used and existing structures made with CCA-treated wood would not be affected. CCA-treated wood products continue to be used in industrial applications. It is not known whether, or to what extent, CCA-treated wood products may contribute to exposure of people to arsenic.

In the past, inorganic arsenic compounds were predominantly used as pesticides, primarily on cotton fields and in orchards. Inorganic arsenic compounds can no longer be used in agriculture. However, organic arsenic compounds, namely cacodylic acid, disodium methylarsenate (DSMA), and monosodium methylarsenate (MSMA), are still used as pesticides, principally on cotton. Some organic arsenic compounds are used as additives in animal feed. Small quantities of elemental arsenic are added to other metals to form metal mixtures or alloys with improved properties. The greatest use of arsenic in alloys is in lead-acid batteries for automobiles. Another important use of arsenic compounds is in semiconductors and light-emitting diodes.

1.2 WHAT HAPPENS TO ARSENIC WHEN IT ENTERS THE ENVIRONMENT?

Arsenic occurs naturally in soil and minerals and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Volcanic eruptions are another source of arsenic. Arsenic is associated with ores containing metals, such as copper and lead. Arsenic may enter the environment during the mining and smelting of these ores. Small amounts of arsenic also may be released into the atmosphere from coal-fired power plants and incinerators because coal and waste products often contain some arsenic.

Arsenic cannot be destroyed in the environment. It can only change its form, or become attached to or separated from particles. It may change its form by reacting with oxygen or other molecules present in air, water, or soil, or by the action of bacteria that live in soil or sediment. Arsenic released from power plants and other combustion processes is usually attached to very small particles. Arsenic contained in wind-borne soil is generally found in larger particles. These particles settle to the ground or are washed out of the air by rain. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water. Ultimately, most arsenic ends up in the soil or sediment. Although some fish and shellfish take in arsenic, which may build up in tissues, most of this arsenic is in an organic form called arsenobetaine (commonly called "fish arsenic") that is much less harmful.

1.3 HOW MIGHT I BE EXPOSED TO ARSENIC?

Since arsenic is found naturally in the environment, you will be exposed to some arsenic by eating food, drinking water, or breathing air. Children may also be exposed to arsenic by eating soil. Analytical methods used by scientists to determine the levels of arsenic in the environment generally do not determine the specific form of arsenic present. Therefore, we do not always know the form of arsenic a person may be exposed to. Similarly, we often do not know what forms of arsenic are present at hazardous waste sites. Some forms of arsenic may be so tightly attached to particles or embedded in minerals that they are not taken up by plants and animals.

The concentration of arsenic in soil varies widely, generally ranging from about 1 to 40 parts of arsenic to a million parts of soil (ppm) with an average level of 3–4 ppm. However, soils in the vicinity of arsenic-rich geological deposits, some mining and smelting sites, or agricultural areas where arsenic pesticides had been applied in the past may contain much higher levels of arsenic. The concentration of arsenic in natural surface and groundwater is generally about 1 part in a billion parts of water (1 ppb), but may exceed 1,000 ppb in contaminated areas or where arsenic levels in soil are high. Groundwater is far more likely to contain high levels of arsenic than surface water. Surveys of U.S. drinking water indicate that about 80% of water supplies have less than 2 ppb of arsenic, but 2% of supplies exceed 20 ppb of arsenic. Levels of arsenic in food range from about 20 to 140 ppb. However, levels of inorganic arsenic, the form of most concern, are far lower. Levels of arsenic in the air generally range from less than 1 to about 2,000 nanograms (1 nanogram equals a billionth of a gram) of arsenic per cubic meter of air (less than 1–2,000 ng/m^3), depending on location, weather conditions, and the level of industrial activity in the area. However, urban areas generally have mean arsenic levels in air ranging from 20 to 30 ng/m^3.

You normally take in small amounts of arsenic in the air you breathe, the water you drink, and the food you eat. Of these, food is usually the largest source of arsenic. The predominant dietary source of arsenic is seafood, followed by rice/rice cereal, mushrooms, and poultry. While seafood contains the greatest amounts of arsenic, for fish and shellfish, this is mostly in an organic form of arsenic called arsenobetaine that is much less harmful. Some seaweeds may contain arsenic in inorganic forms that may be more harmful. Children are likely to eat small amounts of dust or soil each day, so this is another way they may be exposed to arsenic. The total amount of arsenic you take in from these sources is generally about 50 micrograms (1 microgram equals one-millionth of a gram) each day. The level of inorganic arsenic (the form of most concern) you take in from these sources is generally about 3.5 microgram/day. Children may be exposed to small amounts of arsenic from hand-to-mouth activities from playing on play structures or decks constructed out of CCA-treated wood. The potential exposure that children may receive from playing in play structures constructed from CCA-treated wood is generally smaller than that they would receive from food and water.

In addition to the normal levels of arsenic in air, water, soil, and food, you could be exposed to higher levels in several ways, such as the following:

- Some areas of the United States contain unusually high natural levels of arsenic in rock, and this can lead to unusually high levels of arsenic in soil or water. If you live in an area like this, you could take in elevated amounts of arsenic in drinking water. Children may be taking in higher amounts of arsenic because of hand-to-mouth contact or eating soil in areas with higher than usual arsenic concentrations.

- Some hazardous waste sites contain large quantities of arsenic. If the material is not properly disposed of, it can get into surrounding water, air, or soil. If you live near such a site, you could be exposed to elevated levels of arsenic from these media.

- If you work in an occupation that involves arsenic production or use (for example, copper or lead smelting, wood treating, or pesticide application), you could be exposed to elevated levels of arsenic during your work.

- If you saw or sand arsenic-treated wood, you could inhale some of the sawdust into your nose or throat. Similarly, if you burn arsenic-treated wood, you could inhale arsenic in the smoke.

- If you live in a former agricultural area where arsenic was used on crops, the soil could contain high levels of arsenic.

- In the past, several kinds of products used in the home (rat poison, ant poison, weed killer, some types of medicines) had arsenic in them. However, most of these uses of arsenic have ended, so you are not likely to be exposed from home products any longer.

1.4 HOW CAN ARSENIC ENTER AND LEAVE MY BODY?

If you swallow arsenic in water, soil, or food, most of the arsenic may quickly enter into your body. The amount that enters your body will depend on how much you swallow and the kind of arsenic that you swallow. This is the most likely way for you to be exposed near a waste site. If you breathe air that contains arsenic dusts, many of the dust particles settle onto the lining of the lungs. Most of the arsenic in these particles is then taken up from the lungs into the body. You might be exposed in this way near waste sites where arsenic-contaminated soils are allowed to blow into the air, or if you work with arsenic-containing soil or products. If you get arsenic-contaminated soil or water on your skin, only a small amount will go through your skin into your body, so this is usually not of concern.

Both inorganic and organic forms leave your body in your urine. Most of the inorganic arsenic will be gone within several days, although some will remain in your body for several months or even longer. If you are exposed to organic arsenic, most of it will leave your body within several days.

1.5 HOW CAN ARSENIC AFFECT MY HEALTH?

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing may also help identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect public health. Scientists have the responsibility to treat research animals with care and compassion. Scientists must comply with strict animal care guidelines because laws today protect the welfare of research animals.

Inorganic arsenic has been recognized as a human poison since ancient times, and large oral doses (above 60,000 ppb in water which is 10,000 times higher than 80% of U.S. drinking water arsenic levels) can result in death. If you swallow lower levels of inorganic arsenic (ranging from about 300 to 30,000 ppb in water; 100–10,000 times higher than most U.S. drinking water levels), you may experience irritation of your stomach and intestines, with symptoms such as stomachache, nausea, vomiting, and diarrhea. Other effects you might experience from swallowing inorganic arsenic include decreased production of red and white blood cells, which may cause fatigue, abnormal heart rhythm, blood-vessel damage resulting in bruising, and impaired nerve function causing a "pins and needles" sensation in your hands and feet.

Perhaps the single-most characteristic effect of long-term oral exposure to inorganic arsenic is a pattern of skin changes. These include patches of darkened skin and the appearance of small "corns" or "warts" on the palms, soles, and torso, and are often associated with changes in the blood vessels of the skin. Skin cancer may also develop. Swallowing arsenic has also been reported to increase the risk of cancer in the liver, bladder, and lungs. The Department of Health and Human Services (DHHS) has determined that inorganic arsenic is known to be a human carcinogen (a chemical that causes cancer). The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans. EPA also has classified inorganic arsenic as a known human carcinogen.

If you breathe high levels of inorganic arsenic, then you are likely to experience a sore throat and irritated lungs. You may also develop some of the skin effects mentioned above. The exposure level that produces these effects is uncertain, but it is probably above 100 micrograms of arsenic per cubic meter ($\mu g/m^3$) for a brief exposure. Longer exposure at lower concentrations can lead to skin effects, and also to circulatory and peripheral nervous disorders. There are some data suggesting that inhalation of inorganic arsenic may also interfere with normal fetal development, although this is not certain. An important concern is the ability of inhaled inorganic arsenic to increase the risk of lung cancer. This has been seen mostly in workers exposed to arsenic at smelters, mines, and chemical factories, but also in residents living near smelters and arsenical chemical factories. People who live near waste sites with arsenic may have an increased risk of lung cancer as well.

If you have direct skin contact with high concentrations of inorganic arsenic compounds, your skin may become irritated, with some redness and swelling. However, it does not appear that skin contact is likely to lead to any serious internal effects.

Almost no information is available on the effects of organic arsenic compounds in humans. Studies in animals show that most simple organic arsenic compounds (such as methyl and dimethyl compounds) are less toxic than the inorganic forms. In animals, ingestion of methyl compounds can result in diarrhea, and lifetime exposure can damage the kidneys. Lifetime exposure to dimethyl compounds can damage the urinary bladder and the kidneys.

1.6 HOW CAN ARSENIC AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Children are exposed to arsenic in many of the same ways that adults are. Since arsenic is found in the soil, water, food, and air, children may take in arsenic in the air they breathe, the water they drink, and the food they eat. Since children tend to eat or drink less of a variety of foods and beverages than do adults, ingestion of contaminated food or juice or infant formula made with arsenic-contaminated water may represent a significant source of exposure. In addition, since children often play in the soil and put their hands in their mouths and sometimes intentionally eat soil, ingestion of contaminated soil may be a more important source of arsenic exposure for children than for adults. In areas of the United States where natural levels of arsenic in the soil and water are high, or in areas in and around contaminated waste sites, exposure of children to arsenic through ingestion of soil and water may be significant. In addition, contact with adults who are wearing clothes contaminated with arsenic (e.g., with dust from copper- or lead-smelting factories, from wood-treating or pesticide application, or from arsenic-treated wood) could be a source of exposure. Because of the tendency of children to taste things that they find, accidental poisoning from ingestion of pesticides is also a possibility. Thus, although most of the exposure pathways for children are the same as those for adults, children may be at a higher risk of exposure because of normal hand-to-mouth activity.

Children who are exposed to inorganic arsenic may have many of the same effects as adults, including irritation of the stomach and intestines, blood vessel damage, skin changes, and reduced nerve function. Thus, all health effects observed in adults are of potential concern in children. There is also some evidence that suggests that long-term exposure to inorganic arsenic in children may result in lower IQ scores. We do not know if absorption of inorganic arsenic from the gut in children differs from adults.

There is some evidence that exposure to arsenic in early life (including gestation and early childhood) may increase mortality in young adults.

There is some evidence that inhaled or ingested inorganic arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of inorganic arsenic that cause illness in pregnant females can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

In animals, exposure to organic arsenic compounds can cause low birth weight, fetal malformations, and fetal deaths. The dose levels that cause these effects also result in effects in the mothers.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO ARSENIC?

If your doctor finds that you have been exposed to substantial amounts of arsenic, ask whether your children might also have been exposed. Your doctor might need to ask your state health department to investigate.

Many communities may have high levels of arsenic in their drinking water, particularly from private wells, because of contamination or as a result of the geology of the area. The north central region and the western region of the United States have the highest arsenic levels in surface water and groundwater sources, respectively. Wells used to provide water for drinking and cooking should be tested for arsenic. As of January 2006, EPA's Maximum Contaminant Level (MCL) for arsenic in drinking water is 10 ppb. If you have arsenic in your drinking water at levels higher that the EPA's MCL, an alternative source of water should be used for drinking and cooking should be considered.

If you use arsenic-treated wood in home projects, personal protection from exposure to arsenic-containing sawdust may be helpful in limiting exposure of family members. These measures may include dust masks, gloves, and protective clothing. Arsenic-treated wood should never be burned in open fires, or in stoves, residential boilers, or fire places, and should not be composted or used as mulch. EPA's Consumer Awareness Program (CAP) for CCA is a voluntary program established by the manufacturers of CCA products to inform consumers about the proper handling, use, and disposal of CCA-treated wood. You can find more information about this program in Section 6.5. Hand washing can reduce the potential exposure of children to arsenic after playing on play structures constructed with CCA-treated wood, since most of the arsenic on the children's hands was removed with water.

If you live in an area with a high level of arsenic in the water or soil, substituting cleaner sources of water and limiting contact with soil (for example, through use of a dense groundcover or thick lawn) would reduce family exposure to arsenic. By paying careful attention to dust and soil control in the home (air filters, frequent cleaning), you can reduce family exposure to contaminated soil. Some children eat a lot of soil. You should prevent your children from eating soil. You should discourage your children from putting objects in their mouths. Make sure they wash their hands frequently and before eating. Discourage your children from putting their hands in their mouths or engaging in other hand-to-mouth activities. Since arsenic may be found in the home as a pesticide, household chemicals containing arsenic should be stored out of reach of young children to prevent accidental poisonings. Always store household chemicals in their original labeled containers; never store household chemicals in containers that children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number by the phone.

It is sometimes possible to carry arsenic from work on your clothing, skin, hair, tools, or other objects removed from the workplace. This is particularly likely if you work in the fertilizer, pesticide, glass, or copper/lead smelting industries. You may contaminate your car, home, or other locations outside work where children might be exposed to arsenic. You should know about this possibility if you work with arsenic.

Your occupational health and safety officer at work can and should tell you whether chemicals you work with are dangerous and likely to be carried home on your clothes, body, or tools and whether you should be showering and changing clothes before you leave work, storing your street clothes in a separate area of the workplace, or laundering your work clothes at home separately from other clothes. Material safety data sheets (MSDS) for many chemicals used should be found at your place of work, as required by the Occupational Safety and Health Administration (OSHA) in the U.S. Department of Labor. MSDS information should include chemical names and hazardous ingredients, and important properties, such as fire and explosion data, potential health effects, how you get the chemical(s) in your body, how to properly handle the materials, and what to do in the case of emergencies. Your employer is legally responsible for providing a safe workplace and should freely answer your questions about hazardous chemicals. Your state OSHA-approved occupational safety and health program or OSHA can answer any further questions and help your employer identify and correct problems with hazardous substances. Your state OSHA-approved occupational safety and health program or OSHA will listen to your formal complaints about workplace health hazards and inspect your workplace when necessary. Employees have a right to seek safety and health on the job without fear of punishment.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ARSENIC?

Several sensitive and specific tests can measure arsenic in your blood, urine, hair, or fingernails, and these tests are often helpful in determining if you have been exposed to above-average levels of arsenic in the past. These tests are not usually performed in a doctor's office. They require sending the sample to a testing laboratory.

Measurement of arsenic in your urine is the most reliable means of detecting arsenic exposures that you experienced within the last several days. Most tests measure the total amount of arsenic present in your urine. This can sometimes be misleading, because the nonharmful forms of arsenic in fish and shellfish can give a high reading even if you have not been exposed to a toxic form of arsenic. For this reason, laboratories sometimes use a more complicated test to separate "fish arsenic" from other forms. Because most arsenic leaves your body within a few days, analysis of your urine cannot detect if you were exposed to arsenic in the past. Tests of your hair or fingernails can tell if you were exposed to high levels over the past 6–12 months, but these tests are not very useful in detecting low-level exposures. If high levels of arsenic are detected, this shows that you have been exposed, but unless more is known about when you were exposed and for how long, it is usually not possible to predict whether you will have any harmful health effects.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as "not-to-exceed" levels, that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value that is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for ARSENIC include the following:

The federal government has taken several steps to protect humans from arsenic. First, EPA has set limits on the amount of arsenic that industrial sources can release into the environment. Second, EPA has restricted or canceled many of the uses of arsenic in pesticides and is considering further restrictions. Third, in January 2001, the EPA lowered the limit for arsenic in drinking water from 50 to 10 ppb. Finally, OSHA has established a permissible exposure limit (PEL), 8-hour time-weighted average, of 10 $\mu g/m^3$ for airborne arsenic in various workplaces that use inorganic arsenic.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE
Mailstop F-32
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: http://www.ntis.gov/

C2 Addendum No. 1 – Assessment of Corrective Measures

Addendum No. 1
Assessment of Corrective Measures
Landfill and Surface Impoundment

Lansing Generating Station
Lansing, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220100.00 | November 25, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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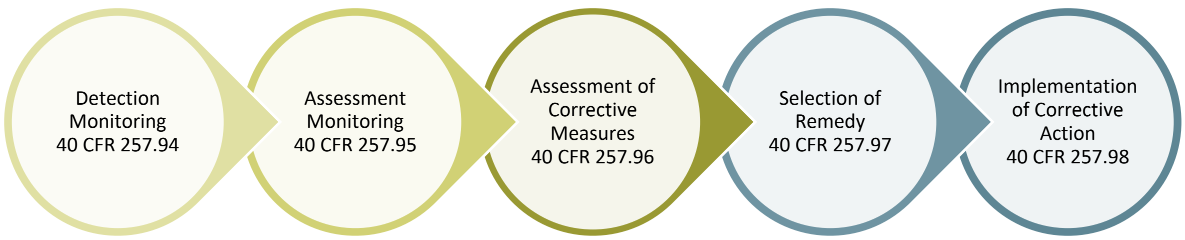
EXECUTIVE SUMMARY

Interstate Power and Light Company (IPL), an Alliant Energy company, operates a dry ash landfill and ash ponds at the Lansing Generating Station (LAN). The landfill and ponds are used to manage coal combustion residuals (CCR) and wastewater from the power plant, which burns coal to generate electricity.

IPL samples and tests the groundwater in the area of the landfill and pond to comply with U.S. Environmental Protection Agency (USEPA) standards for the Disposal of CCR from Electric Utilities, or the "CCR Rule" (Rule). Groundwater monitoring is also conducted under an Iowa Department of Natural Resources (IDNR) sanitary disposal project permit for the landfill.

Groundwater samples from one of the wells installed under the Rule to monitor the landfill and pond contain arsenic at levels higher than the Groundwater Protection Standards (GPS) defined in the Rule. Arsenic occurs naturally and can be present in coal and CCR.

IPL prepared an Assessment of Corrective Measures (ACM) Report in September 2019 in response to the groundwater sampling results obtained to comply with the Rule at the LAN facility. The ACM process is one step in a series of steps defined in the Rule and shown below.



To prepare the ACM, IPL worked to understand the following:

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

Because the time allowed by the Rule to prepare the ACM was limited, IPL has continued work to improve the understanding of the items listed above. Addendum No. 1 has been prepared to update the ACM for LAN based on the information now available.

IPL has identified appropriate options, or Corrective Measures, to bring the levels of arsenic in groundwater below USEPA standards. In addition to stopping landfill disposal of CCR and the discharge of CCR and LAN wastewater to the pond, these corrective measures include:

- Cap CCR in Place with Monitored Natural Attenuation (MNA)
- Consolidate CCR and Cap with MNA
- Excavate and Dispose CCR on Site with MNA

- Excavate and Dispose CCR in Off-site Landfill with MNA
- Consolidate and Cap with Chemical Amendment
- Consolidate and Cap with Groundwater Collection
- Consolidate and Cap with Barrier Wall

IPL has also included a "No Action" alternative for comparison purposes only. This alternative will not be selected as a remedy.

Addendum No. 1 includes an updated evaluation of all eight options using factors identified in the Rule.

IPL will provide semiannual updates on its progress in evaluating Corrective Measures to address the groundwater impacts at LAN.

IPL held a public meeting on October 12, 2020, to discuss the contents of the September 2019 ACM. Before a remedy is selected, IPL will hold a public meeting with interested and affected parties to discuss this addendum.

For more information on Alliant Energy, view our Corporate Responsibility Report at https://poweringwhatsnext.alliantenergy.com/crr/.

1.0 INTRODUCTION AND PURPOSE

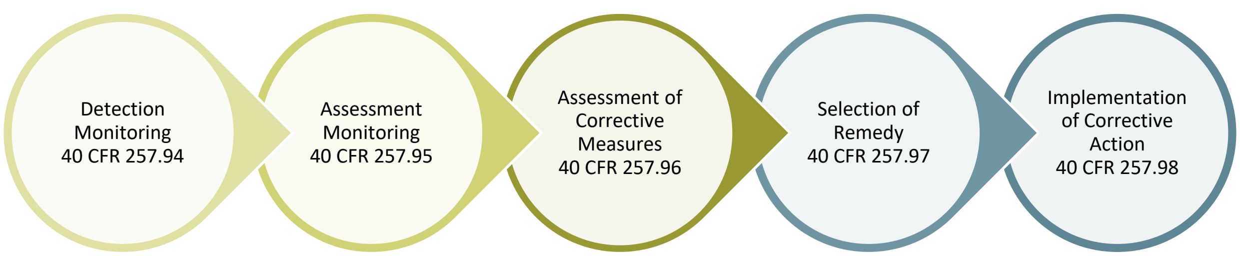
An Assessment of Corrective Measures (ACM) at the Interstate Power and Light Company (IPL) Lansing Generating Station (LAN) was prepared to comply with U.S. Environmental Protection Agency (USEPA) regulations regarding the Disposal of Coal Combustion Residuals from Electric Utilities [40 CFR 257.50-107], or the "CCR Rule" (Rule). Specifically, the ACM was initiated and this report was prepared to fulfill the requirements of 40 CFR 257.96, including:

- Prevention of further releases
- Remediation of release
- Restoration of affected areas

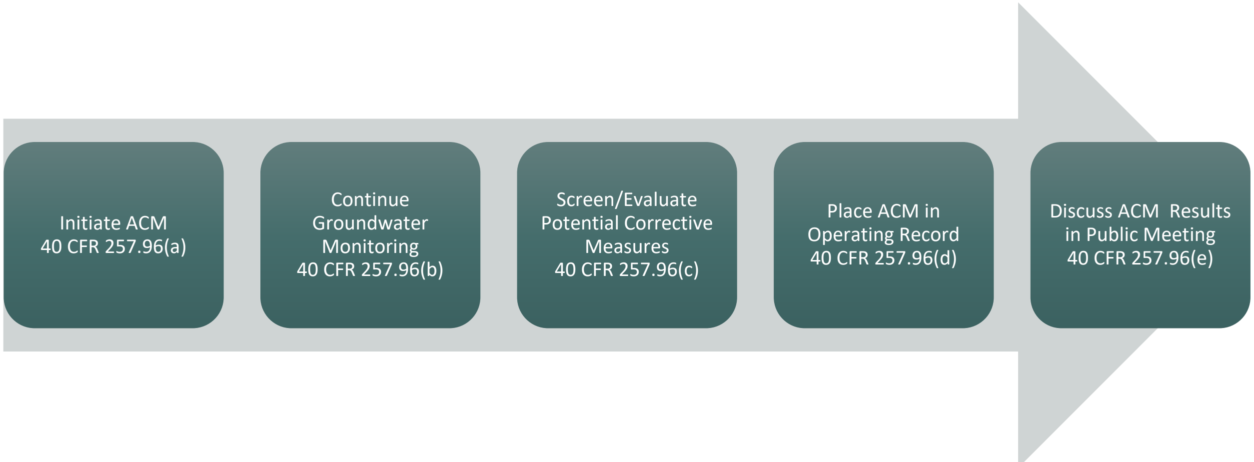
An ACM Report was issued in September 2019 to summarize the remedial alternatives for addressing the Groundwater Protection Standard (GPS) exceedances observed in the 2018 sampling events and identified in the Notification of Groundwater Protection Standard Exceedance dated February 13, 2019. The September 2019 ACM identified additional information needed to inform the selection of a corrective measure (remedy) for LAN according to 40 CFR 257.97. Since the ACM was issued, IPL has worked to obtain the needed information and prepared Addendum No. 1 to update the ACM for LAN and discuss additional remedy alternatives.

1.1 ASSESSMENT OF CORRECTIVE MEASURES PROCESS

As discussed above, Addendum No. 1 was prepared to update the ACM Report developed in response to GPS exceedances observed in groundwater samples collected at the LAN facility. The ACM process is one step in a series of steps defined in the CCR Rule and depicted in the graphic below. To date, IPL has implemented a detection monitoring program per 40 CFR 257.94 and completed assessment monitoring at LAN per 40 CFR 257.95. The September 2019 ACM was required based on the groundwater monitoring results obtained through October 2018. With the ACM completed and now updated with new information, IPL is required to select a remedy according to 40 CFR 257.97. The remedy selection process must be completed as soon as feasible, and, once selected, IPL is required to start the corrective action process within 90 days.



The process for developing the ACM is defined in 40 CFR 257.96 and is shown in the graphic below. IPL held a public meeting on October 12, 2020, to discuss the September 2019 ACM with interested and affected parties. Additional corrective measure alternatives are identified in Addendum No. 1 that were not discussed at the October 12 meeting. Since IPL is required to discuss the ACM results in a public meeting at least 30 days before selecting a remedy, a second public meeting will be held to discuss the new alternatives. To facilitate the selection of a remedy for the GPS exceedances at LAN, IPL continues to investigate and assess the nature and extent of the groundwater impacts. Information about the site, the groundwater monitoring completed, the groundwater impacts as they are currently understood, and the ongoing assessment activities are discussed in the sections that follow.



1.2 SITE INFORMATION AND MAP

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 plant is 2320 Power Plant Drive in Lansing, Iowa (**Figure 1**). The facility includes a coal-fired generating plant, a coal combustion residuals (CCR) landfill, and a CCR settling pond. The LAN was originally constructed in 1948, with additional units added in 1957 and 1976.

The groundwater monitoring system at LAN is a multi-unit system monitoring two existing CCR Units that are contiguous:

- LAN Landfill (existing landfill)
- LAN Upper Ash Pond (existing surface impoundment)

The LAN Landfill is operated under a sanitary disposal project permit (Permit #03-SDP-05-01P) administered by the Iowa Department of Natural Resources (IDNR). A separate groundwater monitoring system has been established to monitor the landfill for the state permit. The permitted landfill airspace may, at the earliest, be fully utilized by the end of 2021. Once fully utilized, the landfill will close by installing a state-permitted final cover design that meets the CCR Rule minimum design requirements in 40 CFR 257.102(d)(3).

The LAN Upper Ash Pond is operated with discharges regulated under individual National Pollutant Discharge Elimination System (NPDES) Permit Number IA0300100. The LAN Upper Ash Pond will close to comply with the requirements of 40 CFR 257.101(b)(1) and 103(a). The pond is expected to close by November 1, 2023.

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.** Monitoring wells installed for the state monitoring program for the CCR landfill are also shown on **Figure 2.**

2.0 BACKGROUND

2.1 REGIONAL GEOLOGIC INFORMATION

The uppermost geologic formation beneath LAN that meets the definition of the "uppermost aquifer," as defined under 40 CFR 257.53, is the shallow alluvial aquifer in combination with the hydraulically connected lower Cambrian-Ordovician sandstone unit (Jordan sandstone).

The uppermost bedrock unit in the site area is the Jordan aquifer, which is the lower Cambrian-Ordovician sandstone interbedded with dolostone. The thickness of the Jordan aquifer varies from 50 to more than 120 feet thick in most areas of Allamakee County. Underlying the Cambrian-Ordovician sandstone are the Cambrian confining beds comprised of dolostone, siltstone, and shale. The Cambrian confining beds overly the Dresbach Aquifer, comprised of shaly sandstone. A summary of the regional hydrogeologic stratigraphy is presented in **Appendix A**. A regional bedrock surface hydrogeologic map, hydrogeologic cross sections, and a contour map of the top of the Cambrian-Ordovician sandstone in northeastern Iowa are also included in **Appendix A.** The bedrock surface elevation is highly variable due to erosion.

The Mississippi River and associated alluvial aquifers are a major source of surface water and shallow groundwater in the area. The alluvial aquifer is up to 60 feet thick within the deeply incised valley where LAN is located, but is thin to absent on the surrounding bluffs and hilltops. The lower Cambrian-Ordovician sandstone unit (Jordan sandstone) is the shallowest regional bedrock aquifer. The October 1989 IDNR Water Atlas No. 8 states that the Jordan aquifer is commonly the source of municipal and industrial high-capacity wells in the region. A summary of the regional groundwater units is included in **Appendix A.**

A map showing the regional potentiometric surface in the Jordan sandstone is presented in **Appendix A**. This map shows the potentiometric surface near the site area as sloping to the east-northeast. The flow direction in the shallow unconsolidated aquifer at LAN is generally to the north-northwest (**Figures 3** through **5**). The flow in the Jordan sandstone immediately beneath the landfill and ponds is also likely to the north-northwest due to the influence of incoming groundwater from the bluffs flanking the valley with ultimate discharge to the Mississippi River.

2.2 SITE GEOLOGIC INFORMATION

Monitoring wells MW-301 through MW-306, and MW302A, MW-304A, and MW-306A were installed to intersect the surficial alluvium aquifer at the site. The unconsolidated material found at these well locations is generally sand and silt. The total boring depths were between 16 and 56 feet below ground surface (bgs) and bedrock was not encountered in these borings. Upgradient well MW-6 was previously installed for a state groundwater monitoring program, which is required as part of the solid waste permit for the CCR landfill. MW-6 was installed to a total depth of 93.5 feet bgs and intersects the water table, which is in the Jordan sandstone aquifer at this well location. Boring logs for MW-6 and MW-301 through MW-306A are included in **Appendix B.**

Shallow groundwater at the site generally flows to the north-northwest. The groundwater flow pattern based on water levels measured in 2019 and 2020 is shown on **Figures 3** through **5.** The deeper groundwater within the alluvium flows to the north-northeast as shown on **Figures 6** and **7.** The groundwater elevation data for the CCR rule monitoring wells and the state program monitoring wells are provided in **Table 1.**

A geologic cross-section was prepared along a line through the CCR units and in alignment with the direction of groundwater flow. The cross-section location is provided on **Figure 2** and the geologic cross-section is provided on Figure 8. The cross-section line runs through the landfill, the Upper Ash Pond, and the coal pile, and also shows upgradient monitoring well MW-6, several borings or monitoring wells near the landfill and pond, and downgradient assessment monitoring well nest MW-306/306A. Sandstone bedrock, unconsolidated geologic material, and estimated water table levels are identified on the cross section.

2.3 CCR RULE MONITORING SYSTEM

The original groundwater monitoring system established in accordance with the CCR Rule consists of one upgradient (background) monitoring well and three downgradient (compliance) monitoring wells. The background monitoring well is MW-6. The three initial downgradient monitoring wells are MW-301, MW-302, and MW-303, which were installed in November 2015. Three additional downgradient monitoring wells, MW-304, MW-305, and MW-306, were installed in May 2019, and three deeper piezometers MW-302A, MW-304A, and MW-306A were installed in December 2019 in accordance with the requirements of 40 CFR 257.95(g)(1). The CCR Rule wells were installed in the upper portion of the uppermost aquifer at LAN. Well depths range from approximately 14.5 to 91 feet bgs.

3.0 NATURE AND EXTENT OF GROUNDWATER IMPACTS

3.1 POTENTIAL SOURCES

The potential sources of groundwater impacts are currently under evaluation. Based on a review of existing site documents, potential sources of groundwater impacts from the monitored CCR units include the following:

CCR Unit	Potential Sources	Description	Quantity
Landfill	CCR	Bottom ash, economizer ash, fly ash, dry flue gas desulfurization (FGD) byproduct, and pyrites	485,000 CY (permitted maximum volume)
Upper Ash Pond	CCR	Bottom ash, economizer ash, and fly ash	490,000 CY
	Low volume waste waters from plant	Includes Unit 4 hydroveyor water, air heater washes, RO reject water, demineralizer regeneration wastewater, and Unit 4 boiler sump discharge	4.83 million gallons per day (MGD)
	Storm water	Annual precipitation, runoff from landfill and surrounding areas	99 AC-FT (Watershed of 87 acres)

Note: Storm water volume is calculated based on the watershed area for the pond (17 acres) and landfill and surrounding areas (70 acres), and the annual average precipitation for Lansing, Iowa, of 35 inches per year. Runoff from the landfill and surrounding areas (8.5 inches) is estimated using Figure 1. Average Annual Runoff, 1951-1980 from USGS publication Average Annual Runoff in the United States, 1951-1980 (Gebert, 1987).

Estimated CCR quantities have been updated with preliminary estimates developed following a recent geotechnical field investigation of the CCR materials in the Upper Ash Pond conducted in June 2020. The volume estimate was prepared using data from soil borings installed in and around the CCR surface impoundments in September 2014, May 2015, and June 2020. IPL initiated the June 2020 fieldwork to investigate the quantity and properties of the CCR present in the open areas of the Upper Ash Pond for the purpose of supporting the selection, design, and construction of the Upper Ash Pond closure. Previous geotechnical drilling in the area of the impoundment identified a very high water content CCR material with very little residual shear strength after disturbance. The latest geotechnical investigation effort helped identify the nature and extent of this CCR.

The volume of CCR in contact with groundwater will need to be considered as the remedy selection process is completed. Groundwater elevation data provided in **Table 1** and information available in the operating record for the Upper Ash Pond including the September 2016 History of Construction report (HHS, 2016) and periodic inspection reports such as the December 2019 CCR Surface Impoundment Annual Inspection Report (HHS, 2019) show that some portion of the CCR in the Upper Ash Pond is likely to be in contact with groundwater at times. This is also depicted on the cross section provided as **Figure 8**.

The high water table depicted on the cross section also shows that CCR in the LAN Landfill may also be in contact with groundwater. This condition was investigated in 2015 when a boring was installed through the CCR in an effort to install a potential monitoring point within the waste limits. The water table was not encountered in this boring and a well was not installed (SCS, 2015). The water table depicted on **Figure 8** is based on groundwater elevations measured at wells located on either side of the landfill and likely does not represent the conditions within the landfill based on the findings of the 2015 boring.

3.2 GROUNDWATER ASSESSMENT

3.2.1 Groundwater Depth and Flow Direction

Depth to groundwater as measured in the site CCR monitoring wells varies from 4 to 75 feet bgs due to topographic variations across the facility. Groundwater flow at the site is generally to the north-northwest. The flow in the Jordan sandstone immediately beneath the landfill and ponds is also likely to the north-northwest due to the influence of incoming groundwater from the bluffs flanking the valley with ultimate discharge to the Mississippi River.

3.2.2 Groundwater Protection Standard Exceedances Identified

The ACM process was triggered by the detection of arsenic at statistically significant levels exceeding the GPS in samples from MW-302.

This statistical evaluation of the assessment monitoring results was based on the first three sampling events for the Appendix IV assessment monitoring parameters, including sampling events in April, August, and October 2018. The complete results for these sampling events are summarized in **Table 3.**

GPS exceedances for arsenic at MW-302 have continued to be identified in monitoring since the initiation of the ACM. Arsenic has not been detected at statistically significant levels above the GPS in any other wells. Therefore, the ACM and Addendum No. 1 address the following GPS exceedance:

Assessment Monitoring Appendix IV Parameters	Location of GPS Exceedance(s)	Historic Range of Detections at Wells With SSL Above GPS	Groundwater Protection Standard (GPS)
Arsenic (µg/L)	MW-302	30.8 to 53	10

µg/L = micrograms per liter
Note: Historic range includes results from assessment monitoring from April 2018 through October 2020.

3.2.3 Expanding the Groundwater Monitoring Network

Monitoring wells MW-304, MW-305, and MW-306 were installed in May 2019 downgradient of the CCR units to expand the groundwater monitoring network at LAN beyond the edge of the CCR unit boundaries and to fulfill the requirements of 40 CFR 257.95(g)(1), which requires additional characterization to support a complete and accurate assessment of corrective measures. Three deeper piezometers MW-302A, MW-304A, and MW-306A were installed in December 2019, also in accordance with the requirements of 40 CFR 257.95(g)(1). Groundwater samples were collected following installation of the new monitoring wells.

The initial sampling results from MW-302A, MW-304/304A, MW-305, and MW-306/306A, shown in **Table 3**, indicate that there was not a statistically significant exceedance of arsenic in any of these wells. The extent of GPS exceedances may be limited to the immediate vicinity of the landfill and impoundment if future sampling results confirm there are no GPS exceedances in wells other than MW-302.

3.2.4 State Monitoring Program Arsenic Results

Arsenic is included in the parameter list for the state monitoring program for the CCR landfill. Monitoring results from the state program, provided in **Table 4**, provide additional information on the nature and extent of arsenic concentrations at the site.

Arsenic GPS exceedances in the state program results are limited to two monitoring well locations (MW-11/11R and MW12). The arsenic levels at these two locations adjacent to the landfill are lower than the concentrations in downgradient CCR well MW-302. Per IDNR requirements, metals sampling was changed from filtered to unfiltered in 2016. Arsenic concentrations appear to be stable since that time. Metals like arsenic tend to adsorb to suspended solids that can be introduced into the sample during collection, which are not removed from unfiltered samples. Arsenic results from other wells in the vicinity of or downgradient from these two wells (including MW-12P, MW-14, TW-17, TW-18, TW-19, and MW-20) were below the GPS defining the horizontal and vertical extent of arsenic impacts in this area.

Groundwater assessments were performed in accordance with the state monitoring program during 2013 and 2014 to evaluate the elevated arsenic concentrations. The assessment reports concluded that elevated arsenic concentrations were due in part to localized geochemical conditions in the immediate vicinity of the landfill. IDNR required no further investigation of the arsenic concentrations.

3.2.5 MNA Data Collection and Evaluation

An evaluation of the potential for LAN to utilize monitored natural attenuation (MNA) as a corrective action alternative began with the initiation of an ACM at LAN. The tiered analysis approach in the USEPA guidance, "Monitored Natural Attenuation of Inorganic Contaminants in Groundwater, Volume 1 – Technical Basis for Assessment" (USEPA, 2007), is being used as a guide for evaluating MNA as a potential corrective action alternative at LAN.

There are four tiers of analysis to be addressed in evaluating the site for MNA:

1. Demonstrate active contaminant removal from groundwater
2. Determine mechanism and rate of attenuation
3. Determine system capacity and stability of attenuation
4. Design a performance monitoring program and identify an alternative remedy

Data collection activities during the assessment monitoring and ACM process that begins to address the objectives of tiers 1 and 2 include:

- Installation of downgradient assessment wells MW-304, MW-305 and MW-306 and deeper downgradient piezometers MW-302A, MW-304A, and MW306A to evaluate groundwater flow direction and horizontal and vertical hydraulic gradients.
- Additional groundwater sampling events and analysis of data from all site wells to evaluate contaminant distribution in groundwater and stability of groundwater concentrations over time.
- Analysis of general groundwater chemistry and field parameters in addition to the App III and IV constituents to provide further characterization of groundwater chemistry.
- Analysis of both total and dissolved constituents for selected parameters.

A hydrogeochemical conceptual model and summary of preliminary evaluation of arsenic attenuation in the aquifer at LAN is included in **Appendix C**. Preliminary findings include:

- One of the seven monitoring wells on the downgradient perimeter of the Lansing Generating Station Ash Pond (MW-302) consistently exceeds the arsenic GPS of 10 µg/L.
- One well (MW-304A) consistently exceeded the molybdenum groundwater protection standard of 100 µg/L. However, this well appears to sample groundwater that cannot be affected by potential releases from the Upper Ash Pond and additional evaluations are ongoing to identify the alternative source.
- Immediate downgradient of MW-302 is Unnamed Creek 2 (see **Figure 2**) that receives the discharge from LAN's NPDES Permit Outfall 001with a water elevation of ~621 feet. MW-305 and MW-1 to the north of the ditch had water levels of 627.24 and 629.38 feet. This shows that the Unnamed Creek 2 is a gaining stream and that Unnamed Creek 2 is likely a drainage divide, with shallow groundwater from beneath the Coal Pile flowing to the southwest toward the Unnamed Creek 2 and to the northwest to MW-306. The hydraulic head at MW-302A is 623.19 feet indicating that groundwater is likely flowing upward toward Unnamed Creek 2 from depths on the order of 50 feet bgs.

- MW-304 and -304A are separated from the Upper Ash Pond and the other monitoring wells by an unnamed creek that flows along the southwest side of the Upper Ash Pond. The vertical gradient at this well cluster is upwards, suggesting that the creek may be a divide.

- The pH and redox are the master variables that significantly control the chemistry and environmental fate of arsenic. The groundwater is near neutral in pH with most wells reflecting high ORP oxic conditions.

- Soil colors (see boring logs in **Appendix B**) suggest reducing conditions and the potential for organic carbon to drive the low ORP reducing conditions. The concentrations of dissolved iron and manganese are negatively correlated with ORP as anoxic conditions favor the dissolution of iron and manganese oxyhydroxides.

- Arsenic is not present in background groundwater and there is no correlation with ORP or DO. When arsenic is present, the concentration increases as the groundwater becomes more reducing. This could be due to the reduction of arsenate (As5+) to arsenite (As3+), or due to the dissolution of iron oxyhydroxides that may release absorbed arsenic

- As the anoxic groundwater with dissolved iron and arsenic moves toward a more aerobic environment, it will be exposed to the atmosphere and the dissolved oxygen content and ORP will increase. This will result in the precipitation of iron oxyhydroxides, which will remove arsenic from solution by adsorption.

- Given the uncertainties in groundwater-surface interactions it is not feasible to estimate the mass of arsenic dissolved in the groundwater until additional data is collected.

A preliminary evaluation of whether the arsenic plume is stable, growing, or decreasing has been completed using a Mann-Kendall trend test. The results of the trend test are provided in **Appendix D.** No statistically significant increasing or decreasing trends were identified in the results obtained since assessment monitoring was initiated. Additional groundwater sampling rounds that include the deep piezometers are required before a complete evaluation is possible.

Based on the investigations completed to date, Arsenic GPS exceedances are limited to the area around monitoring well MW-302 and the elevated concentrations of arsenic appear to be the result of localized reducing conditions. Natural attenuation of arsenic may be a viable alternative for site remediation. Additional investigation is warranted to further characterize the specific natural attenuation processes within the aquifer and to provide the basis for a long-term corrective action monitoring program. Recommendations for additional investigation are provided below:

- The hydrogeological and geochemical conceptual models need to be better defined at a very small scale to better understand the potential arsenic migration pathways. The following are recommendations that will provide the necessary data:

  - Installation of surveyed staff gages:
    - in the Upper and Lower Ash Pond,
    - in Unnamed Creek 2 downstream of Outfall 001 near MW-302, -305 and MW-1, and
    - in Unnamed Creek 1 southwest of the site near MW-304, MW-14 and north of the railroad bridge.

– Installation of an additional water table monitoring well(s) between the coal pile and Unnamed Creek 2 could help in confirming if groundwater is flowing from the coal pile area toward the creek.

– Concurrent seasonal measurements of groundwater and surface water levels to determine discharge relationships.

– Surface water at the suggested staff gage locations should also be sampled concurrently with groundwater for analyses of field parameters; filtered and total major cations, arsenic, iron and manganese; and major anions to assess geochemical changes that may result as groundwater moves from an anaerobic to an aerobic environment.

– Continue to include the measurement of oxidation-reduction potential with groundwater field analyses.

3.3 CONCEPTUAL SITE MODEL

The following conceptual site model describes the arsenic levels above the GPS, discusses potential exposure pathways affecting human health and the environment, and presents a cursory review of the potential impacts. The conceptual site model for LAN has been prepared in general conformance with the Standard Guide for Developing Conceptual Site Models for Contaminated Sites (ASTM E1689-95). This conceptual site model is the basis for assessing the efficacy of likely corrective measures to address the source, release mechanisms, and exposure routes.

3.3.1 Nature of Constituent above GPS

The nature of the constituents in groundwater at LAN that are present at concentrations greater than the GPS (arsenic) were described in the September 2019 ACM. No additional constituents have been identified at statistically significant levels above a GPS. Molybdenum has been detected above a GPS at MW-304A, and is subject to ongoing evaluation. Please refer to the detailed discussion of arsenic previously provided in Section 3.3.1 of the 2019 ACM.

3.3.2 Potential Receptors and Pathways

As described in **Section 3.3**, ASTM E1689-95 provides a framework for identifying potential receptors (people or other organisms potentially affected by the groundwater impacts at LAN) and pathways (the ways groundwater impacts might reach receptors). In accordance with ASTM E1689-95, we have considered both potential human and ecological exposures to groundwater impacted by arsenic, as identified in **Section 3.2.2**.

Human Health

In general, human health exposure routes to contaminants in the environment include ingestion, inhalation, and dermal contact with the following environmental media:

- Groundwater
- Surface Water and Sediments
- Air
- Soil
- Biota/Food

If people might be exposed to the impacts described in **Section 3.0** via one of the environmental media listed above, a potential exposure route exists and is evaluated further. For the groundwater impacts at LAN, the following potential exposure pathways have been identified with respect to human health:

- **Groundwater – Ingestion and Dermal Contact.** The potential for ingestion of, or dermal contact with, impacted groundwater from LAN exists if water supply wells are present in the area of impacted groundwater and are used as a potable water supply. Based on a review of the IDNR GeoSam well database. and information provided by LAN:
  - No off-site water supply wells have been identified downgradient of the CCR Units.
  - A private supply well located across County Highway X52 from the landfill was sampled by Allamakee County in 2014 at the homeowner's request, and the sample was analyzed for arsenic. Arsenic was not detected in the sample. The Allamakee County Sanitarian stated that the well was 400 feet deep and under artesian pressure.
  - Two on-site water supply wells, Well #2 and Well #4, are currently used as sources of potable water.
    - Well #2 is 235 feet deep and is cased to 78 feet. Well #4 is 240 feet deep and is cased to 143 feet. Both wells are open to the sandstone aquifer.
    - The water supply operation permit for these wells (IDNR public water supply ID 0345181) requires sampling for inorganic constituents every 9 years. Arsenic was not detected in the most recent samples, collected on April 21, 2014.
- **Surface Water and Sediments – Ingestion and Dermal Contact.** The potential for ingestion of or dermal contact with impacted surface water and sediments exists if impacted groundwater from the LAN facility has interacted with adjacent surface water and sediments, to the extent that arsenic is present in these media at concentrations that represents a risk to human health.
- **Biota/Food – Ingestion.** The potential for ingestion of impacted food exists if impacted groundwater from the facility has interacted with elements of the human food chain. Based on discussions with facility staff, no hunting or farming occurs within the current area of known groundwater impacts. Elements of the food chain may also be exposed indirectly through groundwater-to-surface water interactions, which are subject to additional assessment.

Based on the lack of groundwater exposure, only the surface water, sediment, and biota/food exposure pathways were retained for further consideration in the September 2019 ACM. However, the implementation of potential corrective measures may introduce secondary exposure pathways that are discussed in **Section 6.0** and will be evaluated further as a corrective measure is selected for LAN.

Ecological Health

In addition to human exposures to impacted groundwater, potential ecological exposures are also considered. If ecological receptors might be exposed to impacted groundwater, the potential exposure routes are evaluated further. Ecological receptors include living organisms, other than humans, the habitat supporting those organisms, or natural resources potentially adversely affected by CCR impacts. This includes:

- Transfer from an environmental media to animal and plant life. This can occur by bioaccumulation, bioconcentration, and biomagnification:
  - Bioaccumulation is the general term describing a process by which chemicals are taken up by a plant or animal either directly from exposure to impacted media (soil, sediment, water) or by eating food containing the chemical.
  - Bioconcentration is a process in which chemicals are absorbed by an animal or plant to levels higher than the surrounding environment.
  - Biomagnification is a process in which chemical levels in plants or animals increase from transfer through the food web (e.g., predators have greater concentrations of a particular chemical than their prey).
- Benthic invertebrates within adjacent waters.

Based on the information available and presented in September 2019 ACM, both of the ecological exposure routes required additional evaluation at the time.

Since the September 2019 ACM was completed, exposure pathways subject to groundwater to surface water interactions have been evaluated further through the following:

- Review of state surface water standards for arsenic.
- Review of application materials and studies conducted by IPL for the renewal of the NPDES permit for LAN.
- Developing a hydrogeochemical conceptual model and a preliminary evaluation of arsenic attenuation (see Section 3.2.5).

Based on our evaluation to date, the arsenic impacts to groundwater at LAN are unlikely to impact the river. This preliminary conclusion is based on the following:

- Surface water standards identified in our review are higher than the GPS for arsenic (see 567 Iowa Administrative Code Chapter 61 Water Quality Standards).
- Groundwater near the surface water interface is likely to transition from anaerobic to aerobic, which is expected to precipitate iron oxyhydroxides removing arsenic from solution by adsorption.
- Mussel communities in the channel adjacent to MW-302 and the Mississippi River we observed in support of the NPDES Permit renewal for LAN. Mussels, one of the most sensitive animal groups, present at the likely point of groundwater to surface water interaction showed mussel populations that were “characterized as balanced and indigenous,” which is not indicative of chronic or acute impacts (Alliant, 2020).

Although an initial assessment indicates that arsenic in groundwater at LAN is unlikely having a negative impact on the Mississippi River or people and biota utilizing the river, the groundwater-to-surface-water interactions at LAN are the subject of ongoing assessment.

The surface water/sediment, biota/food, and ecological exposure assessment is incomplete as the extent of groundwater impacts is still being evaluated. If groundwater impacts extend to the river, then these exposure pathways will be evaluated further. Evaluation of constituent concentrations in sediment and surface water may be estimated through calculations and/or additional sampling.

4.0 POTENTIAL CORRECTIVE MEASURES

In this section, we identify potential corrective measures to meet the ACM goals identified in 40 CFR 257.96(a), which are to:

- Prevent further releases
- Remediate releases
- Restore affected areas to original conditions

The development of corrective measure alternatives is described further in the following sections. Corrective measure alternatives developed to address the groundwater impacts at LAN are described in Section 5.0. The alternatives selected are qualitatively evaluated in Section 6.0.

As required under 40 CFR 257.96(c), the following sections provide an analysis of the effectiveness of potential corrective measures. This evaluation includes the requirements and objectives identified in 40 CFR 257.97, which includes:

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to residual contamination;

- The time required to begin and complete the remedy; and

- The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy.

4.1 IDENTIFICATION OF CORRECTIVE MEASURES

As described in the USEPA Solid Waste Disposal Facility Criteria Technical Manual (USEPA, 1998), corrective measures generally include up to three components, including:

- Source Control
- Containment
- Restoration

Within each component, there are alternative measures that may be used to accomplish the component objectives. The measures from one or more components are then combined to form corrective measure alternatives (discussed in Section 5.0) intended to address the observed groundwater impacts. Potential corrective measures were identified based on site information available during development of the ACM for the purpose of meeting the goals described in Section 4.0.

Each component and associated corrective measures are further identified in subsequent paragraphs. The corrective measures are evaluated for feasibility and combined to create the corrective action alternatives identified in this section, and further evaluated in **Section 5.0**. We continue to evaluate site conditions and may identify additional corrective measures based on new information regarding the nature and extent of the impacts.

4.1.1 Source Control

The source control component of a corrective measure is intended to identify and locate the source of impacts and provide a mechanism to prevent further releases from the source. For this site, the sources to be controlled are the CCR materials in the landfill and impoundment, along with plant process water. Each of the source control measures below require closure of the landfill and impoundment, and for waste water to be re-directed from the CCR units to eliminate the flows that may mobilize constituents from the CCR and transport them to groundwater. We have identified the following potential source control measures:

- **Cap in place.** Cap the CCR in uncovered areas of the existing landfill and the CCR surface impoundment in place to reduce the infiltration of rain water into the impoundments, and prevent transport of CCR constituents from unsaturated CCR materials into the groundwater and reduce the potential for CCR to interface with groundwater. The landfill closure will be conducted according to the disposal permit issued by the IDNR.

- **Consolidate and cap.** Consolidate CCR from the surface impoundment into a smaller area adjacent to the landfill to reduce the cap area exposed to infiltration and reduce the potential source footprint. Install a cap over uncovered areas of the existing landfill, and the consolidated CCR from the surface impoundment to prevent transport of CCR constituents from unsaturated CCR materials into the groundwater and minimize the potential for CCR to interface with groundwater. The landfill closure will be conducted according to the disposal permit issued by the IDNR.

- **Consolidate and cap with chemical stabilization.** Consolidate CCR from the surface impoundment into a smaller area adjacent to the landfill to reduce the cap area exposed to infiltration, reduce the potential source footprint, prevent transport of CCR constituents from unsaturated CCR materials into the groundwater, and minimize the potential for CCR to interface with groundwater. Mix a chemical amendment into CCR in-situ prior to placing additional CCR for consolidation and mix the amendment into CCR as it is excavated and placed for consolidation to reduce the mobility of select CCR constituents in the environment. Chemical stabilization may include the use of one or multiple admixtures that serve to physically and/or chemically stabilize the constituents of concern within the CCR. Physically, this may include solidification with cementitious or polymeric materials. Chemically, this may include precipitation or alteration to render arsenic less mobile in the environment. Evaluation of an appropriate commodity amendment, that may include Calcium Polysulfide, Portland Cement, Calcium Oxide, and/or proprietary chemicals such as FerroBlack-H, MAECTITE, 3Dme, and/or MRC, will occur during the remedy selection process.

- **Excavate CCR and create on-site disposal area.** Excavate CCR from the landfill and surface impoundment and place CCR in a new lined disposal area on site to prevent further releases from the CCR and isolate the CCR from potential groundwater interactions. Cap the new disposal area with final cover to prevent the transport of CCR constituents from unsaturated CCR.

- **Excavate impounded CCR and dispose at a licensed off-site disposal area.** Remove all CCR from the site and haul to a licensed landfill to prevent further releases from the CCR areas.

Water movement through the CCR materials is the mechanism for CCR impacts to groundwater. Surface water can move vertically through the CCR materials via infiltration of rainwater and surface water runoff. Groundwater can move horizontally through the CCR material in areas where CCR material is at an elevation that is below the water table. Source control measures have been considered to prevent "vertical" migration of water through the CCR via cap and cover systems and potential contact with groundwater.

Based on the available information for this site, all the source control measures have potential to prevent further releases, thus are retained for incorporation into alternatives for further evaluation.

In conjunction with the ongoing evaluation of MNA mechanisms and site attenuation capacity, chemical stabilization has been added as a source control alternative. Additional source control may be needed to address CCR that could be in contact with groundwater after closure in place, or if MNA mechanisms are not active at LAN or the site does not have the attenuation capacity to reduce groundwater concentrations of arsenic below the GPS.

4.1.2 Containment

The objective of containment is to limit the spread of the groundwater impacts beyond the source. The need for containment depends on the nature and extent of impacts, exposure pathways, and risks to receptors. Containment may also be implemented in combination with restoration as described in **Section 4.1.3**. Containment may be a recommended element of a corrective measure if needed to:

- Prevent off-site migration of groundwater impacts
- Cease completion of an exposure pathway (e.g., water supply well).

Containment may also be used in lieu of active restoration if an active approach is needed but treatment is not warranted by the aquifer characteristics including:

- Water in the affected aquifer is naturally unsuited for human consumption
- Contaminants present in low concentration with low mobility
- Low potential for exposure to contaminants and low risk associated with exposure
- Low transmissivity and low future user demand

The following measures have potential to limit the spread of the existing groundwater impacts:

- **Gradient Control with Pumping.** Gradient control includes a measure to alter the groundwater velocity and direction to slow or isolate impacts. This can be accomplished with pumping wells and/or a trench/sump collection system. If groundwater pumping is considered for capturing an impacted groundwater plume, the impacted groundwater must be managed in conformance with all applicable Federal and State requirements.

- **Gradient Control with Phytotechnology.** Gradient control with phytotechnology relies on the ability of vegetation to evapotranspire sources of surface water and groundwater. Water interception capacity by the aboveground canopy and subsequent evapotranspiration through the root system can limit vertical migration of water from the surface downward. The horizontal migration of groundwater can be controlled or contained using deep-rooted species, such as prairie plants and trees, to intercept, take up, and transpire the water. Trees classified as phreatophytes are deep-rooted, high-transpiring, water-loving organisms that send their roots into regions of high moisture and can survive in conditions of temporary saturation.

- **Chemical Stabilization.** Stabilization refers to processes that involve chemical reactions that reduce the leachability of arsenic. Stabilization chemically immobilizes impacts or reduces their solubility through a chemical reaction. The desired results of stabilization methods include converting metals into a less soluble, mobile, or toxic form.

- **Containment Walls.** Containment walls can be applied in two ways. First, a wall that creates a physical barrier to the flow of groundwater to limit the movement of constituents of concern in groundwater. Second, a passive barrier installed to intercept the flow of groundwater and constructed with a reactive media designed to adsorb, precipitate, or degrade groundwater constituents to limit their movement in the environment (FRTR, 2020).

Based on the currently available information for this site an active MNA mechanism has been identified at LAN, but requires additional assessment. The site capacity to attenuate the arsenic impacts to groundwater is also ongoing. Thus, active containment may be required for this site due to the potential for CCR to remain in contact with groundwater following closure in place.

4.1.3 Restoration

Restoration is the process through which groundwater quality is restored to meet GPSs. This can be accomplished by way of Monitored Natural Attention (MNA) or intensively addressed by groundwater treatment with or without extraction.

MNA can be a viable remedy or component of a remedial alternative for groundwater impacted with metals. MNA requires ongoing involvement and potentially intense characterization of the geochemical environment to understand the attenuation processes involved, and to justify reliance on them and regular, long-term monitoring to ensure the attenuation processes are meeting remedial goals.

MNA is not a “do-nothing” alternative; rather it is an effective knowledge-based remedy where a thorough engineering analysis provides the basis for understanding, monitoring, predicting, and documenting natural processes. To properly employ this remedy, there needs to be a strong scientific basis supported by appropriate research and site-specific monitoring implemented in accordance with quality controls. The compelling evidence needed to support proper evaluation of the remedy requires that the processes that lower metal concentrations in groundwater be well understood.

If active treatment is implemented, water may be treated in situ, on site, or off site. The need for active treatment depends on the nature and extent of impacts, potential exposure pathways, and current and anticipated future risks to receptors. If there are no receptors or if the risks are acceptably low, then MNA is an appropriate option. If existing or future risks require a more rapid restoration of groundwater quality, then active restoration may be needed.

Treated groundwater may be re-injected, sent to a local publicly owned treatment works (POTW), or discharged to a local body of surface water, depending on local, State, and Federal requirements. Typical on-site treatment practices for metals include coagulation and precipitation, ion exchange, or reverse osmosis. Off-site wastewater treatment may include sending the impacted groundwater that is extracted to a local POTW or to a facility designed to treat the contaminants of concern.

The removal rate of groundwater constituents such as arsenic will depend on the rate of groundwater extraction, the cation exchange capacity of the soil, and partition coefficients of the constituents sorbed to the soil. As the concentration of metals in groundwater is reduced, the rate at which constituents become partitioned from the soil to the aqueous phase may also be reduced. The amount of flushing of the aquifer material required to remove the metals and reduce their concentration in groundwater below the GPS will generally determine the time frame required for restoration. This time frame is site-specific.

In-situ methods may be appropriate, particularly where pump and treat technologies may present adverse effects. In-situ methods may include the introduction of a chemical amendment to adsorb, precipitate, or degrade a contaminant or biological restoration requiring pH control, addition of specific micro-organisms, and/or addition of nutrients and substrate to augment and encourage degradation by indigenous microbial populations. Bioremediation requires laboratory treatability studies and pilot field studies to determine the feasibility and the reliability of full-scale treatment.

Based on current available information, an active MNA mechanism at LAN has been identified, but is still being evaluated along with the capacity of the site to attenuate the arsenic impacts to groundwater. Other restoration measures have been included in this addendum to increase the breadth of alternatives evaluated and available for consideration during the remedy selection process. These additional alternatives are discussed in Section 5.0.

5.0 CORRECTIVE MEASURE ALTERNATIVES

We have preliminarily identified the following corrective measure alternatives for the groundwater impacts at LAN:

- 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 with MNA
- Alternative 6 – Consolidate and Cap with Chemical Amendment
- Alternative 7 – Consolidate and Cap with Groundwater Collection
- Alternative 8 – Consolidate and Cap with Barrier Wall

These alternatives were developed by selecting components from the reasonable and appropriate corrective measures components discussed above. Capping areas of the landfill that are currently open is included with all potential source control measures. With the exception of the No Action alternative, each of the corrective measure alternatives meet the requirements in 40 CFR 257.97(b)(1) through (5) based on the information available at the current time. We may identify additional alternatives based on the continued evaluation of site conditions.

5.1 ALTERNATIVE 1 – NO ACTION

IPL is committed to implementing corrective measures as required under the Rule, and the No-Action alternative is only included as a baseline condition and a point of comparison for the other alternatives. The consideration of this alternative assumes the monitoring of groundwater continues under this action.

5.2 ALTERNATIVE 2 – CLOSE AND CAP IN PLACE WITH MNA

Alternative 2 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit and closing the CCR impoundment with no further discharge. CCR materials will be capped and vegetation established on the final cover in accordance with the requirements for closure in place in 40 CFR 257.102(d). This measure is consistent with landfill cover systems to prevent infiltration of surface water into the CCR as described in **Section 4.1.1**. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

5.3 ALTERNATIVE 3 – CONSOLIDATE AND CAP WITH MNA

Alternative 3 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit, and closing the CCR impoundment (no further discharge). The impounded CCR will be closed by relocating a portion of the impounded CCR and consolidating it into a smaller footprint within the CCR surface impoundment and/or landfill. The impounded CCR materials and currently open areas of the landfill will be capped in accordance with the requirements for closure in place in 40 CFR 257.102(d). This measure is consistent with landfill cover systems to prevent infiltration of surface water into the CCR as described in **Section 4.1.1**. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Consolidation of CCR into a smaller footprint during closure also reduces the volume of potential source materials that may be in contact with groundwater after closure. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

5.4 ALTERNATIVE 4 – EXCAVATE CCR AND DISPOSE ON SITE WITH MNA

Alternative 4 includes closing the landfill and impoundment (no further disposal or discharge), excavation of CCR from the landfill and surface impoundment, and creation of a new on-site disposal area with a liner and cap system. This alternative will serve to entomb the CCR at the site and allow for the collection and management of liquids generated from the new disposal area. Further releases from the CCR will be prevented by the use of engineering controls constructed/installed to meet the design criteria for new CCR landfills required under 40 CFR 257.70. The capped areas will be subject to enhanced groundwater monitoring via MNA.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a new on-site disposal area liner and cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

If the ongoing assessment of potential sources discussed in **Section 3.1** eliminates either the landfill or surface impoundment as the source of the arsenic impacts, Alternative 4 may be refined to focus on the remaining source. For example, if the landfill can be eliminated as a source of arsenic in groundwater through further evaluation, the landfill may be closed according to the disposal permit issued by the IDNR as described under Alternatives 2 and 3.

5.5 ALTERNATIVE 5 – EXCAVATE CCR AND DISPOSE OFF SITE WITH MNA

Alternative 5 includes closing the landfill and impoundment (no further disposal or discharge), excavation of all CCR, and transport to an approved off-site landfill. Further on site releases from the CCR sources will be prevented by relocating the source material to another site, which eliminates the potential for ongoing leaching of constituents in impounded CCR into groundwater at LAN.

This alternative eliminates CCR sluicing/plant process water discharges and, with the removal of CCR from the site, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. MNA is included with this alternative to monitor changes in groundwater impacts and the effectiveness of degradation mechanisms on groundwater concentrations over time.

If the ongoing assessment of potential sources discussed in **Section 3.1** eliminates either the landfill or surface impoundment as the source of the arsenic impacts, Alternative 5 may be refined to focus on the remaining source. For example, if the landfill can be eliminated as a source of arsenic in groundwater through further evaluation, the landfill may be closed according to the disposal permit issued by the IDNR as described under Alternatives 2 and 3.

5.6 ALTERNATIVE 6 – CONSOLIDATE AND CAP WITH CHEMICAL AMENDMENT

Alternative 6 includes closing the landfill and impoundment (no further discharge), adding a chemical amendment to in-place CCR and relocated CCR to reduce the mobilization of arsenic prior to relocating and consolidating CCR into a smaller footprint within the CCR units, 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 prevent infiltration of surface water into the CCR and the reduced contaminant mobilization achieved by chemical amendment as described in **Section 4.1.1**.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Consolidation of CCR into a smaller footprint during closure also reduces the volume of potential source materials that may be in contact with groundwater after closure. Further leaching of metals and migration within groundwater will be reduced by minimizing the footprint of CCR in contact with groundwater and by fixation using a chemical amendment.

5.7 ALTERNATIVE 7 – CONSOLIDATE AND CAP WITH GROUNDWATER COLLECTION

Alternative 7 includes closing the landfill and impoundment (no further discharge), relocating and consolidating CCR into a smaller footprint within the 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 prevent infiltration of surface water into the CCR as described in Section 4.1.1. Impacted groundwater will be collected using pumps and treated prior to discharge according to state and federal requirements as described in Section 4.1.2.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Consolidation of CCR into a smaller footprint during closure also reduces the volume of potential source materials that may be in contact with groundwater after closure. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time as impacted groundwater is collected to contain and restore arsenic concentrations in groundwater to levels below the GPS.

5.8 ALTERNATIVE 8 – CONSOLIDATE AND CAP WITH BARRIER WALL

Alternative 8 includes closing the landfill and impoundment (no further discharge), relocating and consolidating CCR into a smaller footprint within the 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 prevent infiltration of surface water into the CCR as described in Section 4.1.1. Impacted groundwater will be intercepted with a barrier wall to minimize the migration of arsenic as described in Section 4.1.2.

This alternative eliminates CCR sluicing/plant process water discharges and, with the consolidation of the CCR footprint and the installation of a cap, will reduce infiltration through the CCR. This is expected to address the major contributor to the observed GPS exceedances, which is exposure of CCR material to precipitation/surface water infiltration. Consolidation of CCR into a smaller footprint during closure also reduces the volume of potential source materials that may be in contact with groundwater after closure. Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time as impacted groundwater is intercepted with a barrier wall to minimize the spread of arsenic in groundwater.

6.0 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

As required by 40 CFR 257.96(c), the following sections provide an evaluation of the effectiveness of corrective measure alternatives in meeting the requirements and objectives outlines in 40 CFR 257.97. The evaluation addresses the requirements and objectives identified in 40 CFR 257.96(c)(1) through (3), which include:

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to residual contamination;
- The time required to begin and complete the remedy; and
- The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy.

In addition to the discussion of the items listed above, **Table 6** provides a summary of the initial evaluation of the alternatives including each of the criteria listed in 40 CFR 257.97.

6.1 ALTERNATIVE 1 – NO ACTION

As described in **Section 5.1**, the No Action alternative is only included as a baseline condition and a point of comparison for the other alternatives. This alternative does 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. For comparison only, Alternative 1 is evaluated with regard to the criteria in 40 FR 257.96(c) below:

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – The ability to attain the GPS for arsenic without any additional action is unlikely.
  - Reliability – Alternative 1 does not provide any reduction in existing risk.
  - Implementation – Nothing is required to implement Alternative 1.
  - Impacts – No additional safety or cross-media impacts are expected with Alternative 1. This alternative does not control current suspected routes of exposure to residual contamination.
- **Timing.** No time is required to begin. However, the time required to attain the GPS for arsenic under Alternative 1 is unknown.
- **Institutional Requirements.** No institutional requirements beyond maintaining current regulatory approvals exist for Alternative 1.

6.2 ALTERNATIVE 2 – CLOSE AND CAP IN PLACE WITH MNA

As described in **Section 5.2**, Alternative 2 includes closing the landfill in accordance with the CCR Rule and existing State of Iowa sanitary disposal project permit and closing the CCR impoundment with no further discharge. CCR materials will be capped and vegetation established on the final cover in accordance with the requirements for closure in place in 40 CFR 257.102(d).

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundments by capping is expected to address infiltration, which is a key contributor to groundwater impacts. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 2 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method.

  - Implementation – The construction of Alternative 2 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent a suitable subgrade is established in the impoundment for cap construction, which can likely be achieved through standard dewatering methods. Additional subgrade stabilization may be required to support the cap. The cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 2 are not specialized and are generally readily available with the exception of potential stabilization of impounded CCR with thixotropic characteristics.

  - Impacts – Safety impacts associated with the implementation of Alternative 2 are not significantly different than other heavy civil construction projects. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of off-site transportation of CCR. Although the risk to surface water receptors is already low and ending wastewater discharges and capping the landfill and impoundment minimizes infiltration (a significant source of water and CCR interaction), some interaction between CCR in the impoundment and groundwater may remain after closure. The ease of implementation and low-impact nature of MNA as a groundwater restoration method must be evaluated against the effectiveness of passive groundwater restoration, which is the subject of ongoing evaluations. An insufficient MNA mechanism, insufficient site attenuation capacity, or changes in groundwater conditions may require additional action to restore groundwater or prevent cross-media impacts between groundwater and surface water. The potential for exposure to residual contamination is low since CCR will be capped.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. Alternative 2 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 2:
  – IDNR Closure Permit
  – State and local erosion control/construction stormwater management permits

6.3 ALTERNATIVE 3 – CONSOLIDATE ON SITE AND CAP WITH MNA

As described in **Section 5.3**, Alternative 3 includes closing the landfill, closing the impoundment with no further discharge, relocating and consolidating impounded CCR into a smaller footprint within the CCR surface impoundment and/or landfill, covering the CCR materials with a cap, and establishing vegetation in accordance with the existing State of Iowa sanitary disposal project permit and requirements for closure in place in 40 CFR 257.102(d).

- **Performance, Reliability, Implementation, and Impacts.**
  – <u>Performance</u> – Ceasing wastewater discharges and closing the landfill and impoundment by capping is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of impounded CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The smaller closure footprint also reduces the potential for ongoing CCR contact with groundwater. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 3 is capable of and expected to attain the GPS for arsenic.

  – <u>Reliability</u> – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method. A consolidated cap footprint may enhance reliability by reducing the scale of post-closure maintenance.

  – <u>Implementation</u> – The construction of Alternative 3 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent required to excavate and relocate CCR within the CCR impoundments and provide a suitable subgrade for cap construction. Additional subgrade stabilization may be required to support the cap. Conditioning (e.g., drying) of relocated CCR is expected during on-site re-disposal. Alternative 3 can likely be achieved through standard dewatering and conditioning methods. Although the cap footprint will be minimized, cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 3 are not specialized and are generally readily available with the exception of potential stabilization of impounded CCR with thixotropic characteristics.

  – <u>Impacts</u> – Safety impacts associated with the implementation of Alternative 3 are not significantly different than other heavy civil construction projects. The level of disturbance required to consolidate CCR before capping may represent some increase in safety risk due to site conditions and on-site construction traffic. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of off-site transportation of CCR. Although the risk to surface water receptors is already low and ending wastewater discharges and capping the landfill and impoundment minimizes infiltration (a significant source of water and CCR interaction), some interaction between CCR in the impoundment and groundwater may remain after closure. The consolidation of CCR prior to capping under Alternative 3 reduces the potential for CCR and groundwater interaction after closure. The ease of implementation and low-impact nature of MNA as a groundwater restoration method must be evaluated against the effectiveness of passive groundwater restoration, which is the subject of ongoing evaluations. An insufficient MNA mechanism, insufficient site attenuation capacity, or changes in groundwater conditions may require additional action to restore groundwater or prevent cross-media impacts between groundwater and surface water. The potential for exposure to residual contamination is low since CCR will be capped and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The consolidation of CCR into a smaller cap area may decrease the time to reach GPS. Alternative 3 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 3:
  - IDNR Closure Permit
  - State and local erosion control/construction stormwater management permits

6.4 ALTERNATIVE 4 – EXCAVATE AND DISPOSE ON SITE WITH MNA

As described in **Section 5.4**, Alternative 4 includes closing the landfill and impoundment, excavation of impounded CCR from the source area, and creation of a new on-site disposal that meets the design criteria for new CCR landfills required under 40 CFR 257.70.

- **Performance, Reliability, Implementation, and Impacts.**
  - <u>Performance</u> – Ceasing wastewater discharges and closing the landfill and impoundment by removing and re-disposing CCR in a new lined/capped disposal area in combination with capping open areas of the landfill is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The separation from groundwater and other location criteria for the new on-site disposal facility may enhance the performance of this alternative. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 4 is capable of and expected to attain the GPS for arsenic.

  - <u>Reliability</u> – The expected reliability of on-site re-disposal with a composite liner and cap is good. Disposal facilities that meet the requirements in 40 CFR 257.70 or other similar requirements have been used for solid waste disposal including municipal and industrial waste for numerous years. There is significant industry experience with the design and construction of similar disposal facilities. The composite liner and cover combined with a consolidated disposal footprint may enhance reliability by reducing infiltration and the scale of post-closure maintenance. At the same time, post-closure maintenance is likely more complex due to maintenance of a leachate collection system and geosynthetic repairs requiring specialized personnel, material, and equipment.

- Implementation – The complexity of constructing the new liner and cap is moderate due to the composite design and the management of CCR with thixotropic characteristics. The limited area available at the facility for developing an on-site disposal facility makes this alternative logistically complex. Significant volumes of CCR will be excavated and stored on site while the disposal facility is constructed. Significant dewatering will be required to excavate and relocate CCR to a temporary storage area. Conditioning (e.g., drying) of relocated CCR is expected to facilitate temporary storage and on-site re-disposal. Alternative 4 can likely be achieved through standard dewatering and conditioning methods, but may be impacted by the space available for these activities and the thixotropic character of some CCR. Although the post-closure CCR footprint will be minimized, composite liner and cap construction may put a high demand on the local supply of suitable cap materials. The local availability of liner and cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 4 are not specialized and are generally readily available with the exception of the resources needed to install the geosynthetic portions of the composite liner and cover, which are not locally available.

- Impacts – Safety impacts associated with the implementation of Alternative 4 are not significantly different than other heavy civil construction projects. However, the level of disturbance required to excavate, store, and re-dispose CCR on site and the traffic required to import composite liner and cap material are not typical and likely represent an increase in safety risk due to site conditions, on-site construction traffic, and incoming/outgoing off-site construction traffic. A risk of cross-media impacts is possible due to the large volume of CCR to be excavated, stored, and relocated on site. Although the risk to surface water receptors is already low, Alternative 4 significantly reduces the potential interaction between CCR and water after closure. The ease of implementation and low-impact nature of MNA as a groundwater restoration method must be evaluated against the effectiveness of passive groundwater restoration, which is the subject of ongoing evaluations. An insufficient MNA mechanism, insufficient site attenuation capacity, or changes in groundwater conditions may require additional action to restore groundwater or prevent cross-media impacts between groundwater and surface water. The potential for exposure to residual contamination is low since CCR will be capped and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. However, the time required to permit and develop the on-site disposal facility may extend this schedule. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The consolidation of CCR into a new on-site disposal facility with a composite liner and cap may decrease the time to reach GPS. Alternative 4 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 4:
  - IDNR Closure Permit
  - IDNR Disposal Facility (Landfill) Permit
  - State and local erosion control/construction stormwater management permits

6.5 ALTERNATIVE 5 – EXCAVATE AND DISPOSE OFF SITE WITH MNA

As described in **Section 5.5**, Alternative 5 includes closing the landfill and impoundment, excavation of CCR from the source area, and transporting the impounded CCR off site for disposal.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by removing and re-disposing CCR off site will eliminate the source material exposed to infiltration, which is a key contributor to groundwater impacts. The off-site disposal of CCR prevents further releases at LAN, but introduces the possibility of releases at the receiving facility. Although the risk to surface water receptors is already low, Alternative 5 nearly eliminates the potential interaction between CCR and water after closure. The ease of implementation and low-impact nature of MNA as a groundwater restoration method must be evaluated against the effectiveness of passive groundwater restoration, which is the subject of ongoing evaluations. A lack of active MNA mechanism, insufficient site attenuation capacity, or changes in groundwater conditions may require additional action to restore groundwater or prevent cross-media impacts between groundwater and surface water. MNA monitoring will identify, if active, the natural attenuation processes that reduce mass, toxicity, mobility, volume, or concentrations of the constituents of concern in groundwater. Alternative 5 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of excavation and off-site disposal of impounded CCR is good. Off-site disposal facilities are required to meet the requirements in 40 CFR 257.70 or other similar requirements, which have been used for solid waste disposal including municipal and industrial waste for numerous years. There is significant industry experience with the design and construction of these disposal facilities.

  - Implementation –The complexity of excavating CCR for off-site disposal is moderate due to the thixotropic characteristics of some of the CCR. The scale of CCR excavation (expected to exceed 840K cy), off-site transportation, and the permitting/development of off-site disposal facility airspace makes this alternative logistically complex. Significant dewatering will be required to excavate CCR. Conditioning (e.g., drying) of relocated CCR is expected to facilitate off site re-disposal. Alternative 5 can likely be achieved through standard dewatering and conditioning methods, but may be impacted by the space available for these activities and the thixotropic character of some CCR. Although the source area at LAN will be eliminated, the development of off-site disposal airspace will put a high demand on the receiving disposal facility, which may not have the current physical or logistical capacity to receive large volumes of CCR in a short period of time. The equipment and personnel required to implement on-site and off-site aspects of Alternative 5 are not specialized and are generally readily available with the exception of the resources needed to install the geosynthetic portions of the off-site composite liner and cover, which are not locally available.

  - Impacts – Safety impacts associated with the implementation of Alternative 5 are not significantly different than other heavy civil construction projects. However, the level of disturbance required to excavate, transport, and re-dispose CCR and the traffic required to import composite liner and cap material at the receiving disposal facility are not typical and likely represent an increase in safety risk due to large volumes of incoming/outgoing off-site construction traffic at both sites. A risk of cross-media impacts is possible due to the large volume of CCR to be excavated and transported from the site. The potential for exposure to residual contamination on site is very low since CCR will be capped or removed; however, the off-site potential for exposure to CCR is increased due to the relocation of the source material.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. However, the time required to secure the off-site disposal airspace required to complete this alternative, including potential procurement, permitting, and construction, may extend this schedule significantly. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach GPS. The removal of impounded CCR from LAN may decrease the time to reach GPS. Alternative 5 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 5:
  - IDNR Closure Permit
  - Approval of off-site disposal facility owner or landfill permit for new off-site facility
  - State and local erosion control/construction stormwater management permits
  - Transportation agreements and permits (local roads and railroads)

  State solid waste comprehensive planning approvals may also be required.

6.6 ALTERNATIVE 6 – CONSOLIDATE AND CAP WITH CHEMICAL AMENDMENT

As described in **Section 5.6**, Alternative 6 includes closing the landfill and impoundment, relocating and consolidating CCR into a smaller footprint within the CCR surface impoundment, adding a chemical amendment to the CCR to reduce the mobilization of arsenic 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).

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by capping is expected to address infiltration, which is a key

contributor to groundwater impacts. The consolidation of CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The smaller closure footprint also reduces the potential for ongoing CCR contact with groundwater. The application of a chemical amendment to the CCR that will remain on site may further reduce the potential for ongoing groundwater impacts after closure. Although the risk to surface water receptors is already low, the potential for CCR in the impoundment to interact with groundwater may remain after closure. Alternative 6 further reduces the potential for ongoing groundwater impacts from that interaction between CCR and water. If needed to address changes in groundwater conditions or prevent cross-media impacts between groundwater and surface water, the initial application of a chemical amendment during closure can be supplemented with additional applications in the future outside of capped area. Alternative 6 is capable of and expected to attain the GPS for arsenic.

– Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method. A consolidated cap footprint may enhance reliability by reducing the scale of post-closure maintenance. Based on a review of information in the Federal Remediation Technologies Roundtable (FRTR) Technology Screening Matrix, amending source material using site-specific chemistries can be an effective means of sequestering metals to limit the future release to groundwater from residual source material. The technology can be applied to source material and groundwater plumes. The approach has been used at full scale to remediate inorganics (FRTR 2020).

– Implementation – The construction of Alternative 6 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent required to excavate and relocate CCR within the CCR impoundments and provide a suitable subgrade for cap construction. Additional subgrade stabilization may be required to support the cap. Conditioning (e.g., drying) of relocated CCR is expected during on-site re-disposal. Alternative 6 can likely be achieved through standard dewatering and conditioning methods. Although the cap footprint will be minimized, cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 6 are not specialized and are generally readily available with the exception of potential stabilization of impounded CCR with thixotropic characteristics. However, the equipment for the in-situ chemical amendment application is more specialized and may be in high demand.

– Impacts – Safety impacts associated with the implementation of Alternative 6 are not significantly different than other heavy civil construction projects. The level of disturbance required to consolidate CCR before capping may represent some increase in safety risk due to site conditions and on-site construction traffic. Some elevated risk may exist due to the use of and application of amendment chemistry, but can likely be addressed with additional worker protective measures. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of offsite transportation of CCR. Although the risk to surface water receptors is already low based on available data, the additional source control provided by Alternative 6 may offer further reduction of risks if groundwater conditions change. The potential for exposure to residual contamination is low since the CCR will be chemically stabilized, capped, and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach the GPS. The consolidation of CCR into a smaller cap area may decrease the time to reach the GPS. The chemical amendment of source material may also reduce the time to reach the GPS. Alternative 6 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 6:
  - IDNR Closure Permit
  - Federal, state, and local floodplain permits
  - Injection permits
  - State and local erosion control/construction stormwater management permits
  - Federal and state wetland permitting may also be required.

6.7 ALTERNATIVE 7 – CONSOLIDATE AND CAP WITH GROUNDWATER COLLECTION

As described in **Section 5.7**, Alternative 7 includes closing the landfill and impoundments relocating and consolidating CCR into a smaller footprint within the CCR surface impoundment, covering the CCR materials with a cap, establishing vegetation in accordance with the requirements for closure in place in 40 CFR 257.102(d), and installing a groundwater pump and treat system to prevent the migration of and/or recover groundwater with arsenic concentrations greater than the GPS.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by capping is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The groundwater pump and treat system may further reduce the potential for down-gradient migration of groundwater impacts after closure. Although the risk to surface water receptors is already low, the potential for CCR in the impoundment to interact with groundwater may remain after closure. Alternative 7 further reduces the risk of potential ongoing groundwater impacts from that interaction between CCR and water. The groundwater pump and treat system offers additional flexibility to address changes in groundwater conditions or prevent cross-media impacts between groundwater and surface water. Alternative 7 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method. A consolidated cap footprint may enhance reliability by reducing the scale of post-closure maintenance. Similar to capping, groundwater pump and treat is a common method used to limit the migration of impacted groundwater or remove impacted groundwater to restore groundwater concentrations to levels below the GPS.

- Implementation – The construction of Alternative 7 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent required to excavate and relocate CCR within the CCR impoundments and provide a suitable subgrade for cap construction. Additional subgrade stabilization may be required to support the cap. Conditioning (e.g., drying) of relocated CCR is expected during on-site re-disposal. The complexity of the groundwater pump and treat system is also low. Alternative 7 can likely be achieved through standard dewatering and conditioning methods. Although the cap footprint will be minimized, cap construction may put a high demand on the local supply of suitable cap materials. The local availability of cap materials will be evaluated further during remedy selection. The equipment and personnel required to implement Alternative 7 are not specialized and are generally readily available. The development, operation, maintenance and monitoring of adequate treatment for large volumes of groundwater with relatively low concentrations of arsenic likely increases the complexity of implementing this alternative.

- Impacts – Safety impacts associated with the implementation of Alternative 7 are not significantly different than other heavy civil construction projects. The level of disturbance required to consolidate CCR before capping may represent some increase in safety risk due to site conditions and on-site construction traffic. Some elevated risk may exist due to the additional construction involved with the groundwater pump and treat system and the higher complexity of the long term maintenance required. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of offsite transportation of CCR. Although the risk to surface water receptors is already low based on available data, the active nature of the groundwater plume containment provided by Alternative 7 may offer further reduction of risks if groundwater conditions change. The potential for exposure to residual contaminated source material is low since CCR will be capped and the footprint of the cap minimized. The potential exposure to contaminated groundwater is increased due to the ex-situ groundwater treatment required and the potential for worker exposure and spills.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach the GPS. The additional time required to design and install the groundwater pump and treat system is unlikely to have a significant impact on the implementation timing but may reduce the time required to attain the GPS. The consolidation of CCR into a smaller cap area may decrease the time to reach the GPS. Alternative 7 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 7:
  - IDNR Closure Permit
  - Federal, state, and local floodplain permits
  - State and local well installation permits
  - NPDES permitting for post-treatment groundwater discharges
  - State and local erosion control/construction stormwater management permits
  - Federal and state wetland permitting may also be required.

6.8 ALTERNATIVE 8 – CONSOLIDATE AND CAP WITH BARRIER WALL

As described in **Section 5.8**, Alternative 8 includes closing the landfill and impoundment, relocating and consolidating CCR into a smaller footprint within the CCR surface impoundments, covering the CCR materials with a cap, establishing vegetation in accordance with the requirements for closure in place in 40 CFR 257.102(d), and installing a downgradient barrier wall to prevent the migration of groundwater with arsenic concentrations greater than the GPS.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the landfill and impoundment by capping is expected to address infiltration, which is a key contributor to groundwater impacts. The consolidation of CCR into a smaller footprint may enhance the performance of the cap by further reducing the area exposed to limited post-construction infiltration through the cap. The barrier wall may further reduce the potential for ongoing groundwater impacts after closure. Although the risk to surface water receptors is already low, the potential for CCR in the impoundment to interact with groundwater may remain after closure. Alternative 8 further reduces the risk of potential ongoing groundwater impacts from that interaction between CCR and water. Although it acts passively, the barrier wall reduces the risk from a more passive groundwater restoration approach such as MNA if MNA mechanisms are not active, the site has insufficient site attenuation capacity, or groundwater conditions change in a way that increases the potential for cross-media impacts between groundwater and surface water. Alternative 8 is capable of and expected to attain the GPS for arsenic.

  - Reliability – The expected reliability of capping is good. Capping is a common practice and standard remedial method for closure in place in remediation and solid waste management. There is significant industry experience with the design and construction of this method. A consolidated cap footprint may enhance reliability by reducing the scale of post-closure maintenance. A barrier wall at LAN will likely have to consist of a permeable reactive barrier (PRB) due to the lack of an impermeable layer to key a low permeability barrier wall into. In general the reliability of PRBs for containment of inorganics is favorable based on information available in the FRTR Technology Screening Matrix (FRTR 2020). The reliability of a PRB requires the identification of a suitable reactive media for the conditions at LAN and the ability to effectively locate the barrier, which are both likely but require additional evaluations. PRB performance can diminish over time as consumptive media is exhausted or hydraulic conditions change due to chemical precipitation or biofouling. Long-term monitoring and maintenance is required to ensure continued performance.

- Implementation – The construction of Alternative 8 is moderately complex due to the thixotropic characteristics of the impounded CCR. Dewatering will be required to the extent required to excavate and relocate CCR within the CCR impoundments and provide a suitable subgrade for cap construction. Additional subgrade stabilization may be required to support the cap. Conditioning (e.g., drying) of relocated CCR is expected during on-site re-disposal. The complexity of the PRB wall significantly increases the level of complexity for implementing this alternative. PRB installation contractors and equipment have lengthy procurement timelines. Alternative 8 can likely be achieved through standard dewatering and conditioning methods. Although the cap footprint will be minimized, cap construction may put a high demand on the local supply of suitable cap materials. The equipment and personnel required to implement the consolidation and capping portion of Alternative 8 are not specialized and are generally readily available. However, the equipment for the barrier wall is more specialized and may be in high demand.

- Impacts – Safety impacts associated with the implementation of Alternative 8 are not significantly different than other heavy civil construction projects. The level of disturbance required to consolidate CCR before capping may represent some increase in safety risk due to site conditions and on-site construction traffic. Some elevated risk may exist due to the additional construction involved with the barrier wall construction and the higher complexity of the long term barrier wall performance monitoring. Cross-media impacts are expected to be limited due to the small volume of CCR expected to be relocated on site, the short duration of cap construction, the effectiveness of standard engineering controls during construction (e.g., dust control), and the lack of offsite transportation of CCR. Although the risk to surface water receptors is already low based on available data, the enhanced nature of the passive groundwater plume containment provided by Alternative 8 may offer further reduction of risks if groundwater conditions change. The potential for exposure to residual contaminated source material is low since CCR will be capped and the footprint of the cap minimized.

- **Timing.** Closure of the landfill and impoundment can be completed within 1 to 2 years of remedy selection. At LAN, the closure of the landfill and impoundment is expected to be complete by October 17, 2023. The time required to attain the GPS for arsenic will be evaluated further during the remedy selection process, but is expected to take between 2 and 10 years after closure construction is complete. The level of source disturbance during construction may increase the time required to reach the GPS. The additional time required to design and install the barrier wall is unlikely to have a significant impact on the implementation timing but may reduce the time required to attain the GPS. The consolidation of CCR into a smaller cap area may decrease the time to reach GPS. Alternative 8 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** The following permits and approvals are expected to be required to implement Alternative 8:
  - IDNR Closure Permit
  - Federal, state, and local floodplain permits
  - State and local well installation permits
  - State and local erosion control/construction stormwater management permits
  - Federal and state wetland permitting may also be required.

7.0 SUMMARY OF ASSESSMENT

Each of the identified corrective measure alternatives exhibits both favorable and unfavorable outcomes with respect to the assessment factors that must be evaluated in accordance with 40 CFR 257.97(c). At the present time, limited impacts have been identified as described in **Section 3.0**. The nature and extent of those impacts are the subject of ongoing assessment and IPL continues to assess remedies to meet the requirements and objectives described in 40 CFR 257.97.

8.0 REFERENCES

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Tables

Table 1. Water Level Summary
Interstate Power & Light - Lansing, Iowa / SCS Engineers Project #25220100.00

Raw Data	MW1(4)	MW2	MW3(3)	MW4	MW5	MW6	MW11	MW11R	MW12	MW12P	MW13	MW14	MW15	TW17	TW18	TW19	MW-16	MW-18	MW-19	MW-22	MW-22P	MW20	MW301	MW302	MW302A	MW303	MW304	MW304A	MW305	MW306	MW306A
Measurement Date																															
May 11, 2001	3.9	28.83	28.07	44.56	43.64	78.21	NM	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
March 8, 2002	8.72	37.15	36.42	47.60	46.66	79.62	32.59	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
February 19, 2004	NM	NM	NM	49.37	48.41	88.06	38.16	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
May 26, 2004	NM	NM	NM	45.28	44.31	77.04	34.10	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
August 23, 2004	NM	NM	NM	46.02	45.08	78.68	36.15	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
November 18, 2004	NM	NM	NM	47.36	46.42	77.45	38.01	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
May 5, 2005	NM	NM	NM	47.75	46.79	79.53	38.42	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
May 19, 2006	NM	NM	NM	47.74	46.80	79.55	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
May 30, 2007	NM	NM	NM	47.96	47.03	79.64	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
April 16, 2008	NM	NM	NM	44.18	43.22	76.78	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
April 3, 2009	NM	NM	NM	42.45	41.51	75.17	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		NI	NI		NI	NI	
April 21, 2010	NM	NM	NM	45.90	44.95	78.25	AB	40.01	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 4, 2011	NM	NM	NM	44.66	43.71	77.49	AB	39.84	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 25, 2012	NM	NM	NM	46.40	45.43	78.50	AB	39.89	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
October 17, 2012	9.34	37.33	NM(2)	47.44	46.49	79.23	AB	40.26	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
February 19-20, 2013	9.64	37.33	36.10	47.45	46.50	79.20	AB	41.00	41.09	NI	14.66	4.13	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 1, 2013	8.87	36.68	35.57	45.93	45.00	77.17	AB	40.21	39.69	NI	13.77	4.70	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
July 1, 2013	5.10	31.48	30.68	37.04	36.15	68.21	AB	37.69	37.74	NI	9.95	3.63	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 29, 2014	6.83	NM	NM	44.00	43.03	76.47	AB	39.46	39.78	40.25	12.41	4.11	22.99	10.85	11.89	10.97	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 29, 2014	6.92	32.99	32.28	44.64	44.65	77.03	AB	39.89	40.35	40.85	12.99	4.63	23.21	11.45	12.60	12.09	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 20, 2015	8.51	37.27	36.00	46.17	45.22	78.03	AB	40.49	41.08	41.53	14.65	4.04	22.97	11.80	12.80	12.08	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
December 10, 2015	NM	NM	NM	NM	NM	79.05	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	14.02	18.07	10.52	NI	17.48	NI	NI	NI	NI	NI
April 28, 2016	9.17	37.10	35.95	46.62	45.67	78.53	AB	40.46	41.35	41.58	14.82	4.50	22.11	11.81	--	12.25	NI	NI	NI	NI	NI	13.68	18.16	11.16	NI	18.12	NI	NI	NI	NI	NI
July 20, 2016	NM	NM	NM	NM	NM	78.12	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	12.43	16.85	9.80	NI	16.94	NI	NI	NI	NI	NI
October 27, 2016	NM	NM	NM	NM	NM	70.51	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	10.97	16.64	10.05	NI	17.62	NI	NI	NI	NI	NI
January 18, 2017	NM	NM	NM	NM	NM	75.05	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	12.11	17.52	11.08	NI	18.17	NI	NI	NI	NI	NI
April 19-21, 2017	7.28	35.32	34.76	39.33	38.46	71.51	AB	38.18	37.72	38.18	10.77	3.05	22.32	9.72	10.12	10.04	39.81	101.21	63.95	34.17	34.72	10.58	16.91	9.42	NI	17.07	NI	NI	NI	NI	NI
June 19-20, 2017	NM	NM	NM	NM	NM	70.68	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	12.07	16.72	10.65	NI	17.5	NI	NI	NI	NI	NI
August 15, 2017	NM	NM	NM	NM	NM	70.72	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	12.71	17.52	11.12	NI	18.41	NI	NI	NI	NI	NI
October 16, 2017	NM	NM	NM	NM	NM	71.75	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	11.48	15.91	9.65	NI	17.48	NI	NI	NI	NI	NI
April 16-17, 2018	8.04	36.54	39.28	AB	AB	73.69	AB	39.35	39.15	39.68	12.02	3.45	22.75	10.82	10.66	10.82	NM	NM	NM	NM	NM	11.52	17.32	9.42	NI	17.65	NI	NI	NI	NI	NI
April 26, 2018	8	36.5	39.15	AB	AB	73.37	AB	38.95	39.65	39.04	12	0.6	22.68	10.6	10.8	11.05	43.65	103.3	65.88	36.27	37	11.11	17.05	9.65	NI	17.7	NI	NI	NI	NI	NI
June 4, 2018	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	16.99	10.13	NI	17.46	NI	NI	NI	NI	NI
August 7, 2018	NM	NM	NM	AB	AB	73.20	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	17.10	10.78	NI	18.42	NI	NI	NI	NI	NI
October 8, 2018	NM	NM	NM	AB	AB	76.62	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	15.88	9.81	NI	18.95	NI	NI	NI	NI	NI
April 15-16, 2019	5.72	25.2	28.38	AB	AB	68.55	AB	37.73	37.05	37.59	8.93	2.98	23.11	9.86	10.68	10.95	NM	98.45	61.52	31.50	32.95	9.72	12.42	8.41	NI	18.05	NI	NI	NI	NI	NI
June 20, 2019	NM	NM	NM	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	12.82	NI	4.75	14.43	NI
October 2, 2019	NM	NM	NM	NM	AB	65.79	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	9.65	15.07	8.36	NI	18.24	12.64	NI	4.1	15.01	NI
December 5, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	NM	NI	NM	16.88	NI
February 5, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	NM	NI	NM	16.65	NI
May 20-21, 2020	7.29	36.75	35.4	NM	NM	66.86	NM	38.25	36.95	37.54	10.44	2.83	23.02	10.77	10.29	9.65	39.18	96.73	60.01	30.39	31.71	12.09	17.15	10.72	15.74	18.29	14.86	13.72	6.63	17.05	19.16
July 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	14.73	NM	NM	12.84	NM	NM	17.90
August 19-21, 2020	NM	NM	NM	NM	NM	66.69	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	11.41	16.59	10.87	15.41	18.05	14.68	NM	6.89	17.11	18.93
October 19-20, 2020	7.98	36.98	35.56	AB	AB	67.96	AB	38.71	37.46	38.01	10.88	3.10	23.38	9.92	10.39	10.91	39.84	97.74	61.12	31.34	32.62	12.79	17.19	11.26	15.90	19.31	15.03	14.19	7.33	17.56	19.39

Table 1. Water Level Summary
Interstate Power & Light - Lansing, Iowa / SCS Engineers Project #25220100.00

Well Number	MW1[4]	MW2	MW3[3]	MW4	MW5	MW6	MW11	MW11R	MW12	MW12P	MW13	MW14	MW15	TW17	TW18	TW19	MW-16	MW-18	MW-19	MW-22	MW-22P	MW20	MW301	MW302	MW302A	MW303	MW304	MW304A	MW305	MW306	MW306A
Top of Casing Elevation (feet amsl)	636.67	657.36	656.78	698.17	698.46	741.33	686.19	686.42	691.40	691.58	658.38	646.06	656.82	659.59	659.15	659.05	700.26	771.09	716.07	702.55	702.17	662.29	641.61	638.40	638.93	656.27	636.43	638.60	633.87	637.48	639.56
Screen Length (ft)	20	10	10	10	10	10	10	10	15	5	15	15	15	15	15	15	15	15	15	15	5	10	10	10	5	10	10	5	10	10	5
Top of Well Screen Elevation (ft)	626.50	620.50	600.00	650.00	630.00	656.00	657.96	646.94	657.70	627.98	649.48	636.96	640.82	649.39	650.55	648.95	662.18	669.23	651.69	665.27	625.14	648.79	624.01	626.90	594.93	637.97	630.43	593.60	627.87	621.48	589.56
Measurement Date																															
May 11, 2001	632.77	628.53	629.29	653.61	654.82	663.12	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
March 8, 2002	627.95	620.21	620.94	650.57	651.80	661.71	653.60	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
February 19, 2004	NM	NM	NM	648.80	650.05	653.27	648.03	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 26, 2004	NM	NM	NM	652.89	654.15	664.29	652.09	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
August 23, 2004	NM	NM	NM	652.15	653.38	662.65	650.04	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
November 18, 2004	NM	NM	NM	650.81	652.04	663.88	648.18	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 5, 2005	NM	NM	NM	650.42	651.67	661.80	647.77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 19, 2006	NM	NM	NM	650.43	651.66	661.78	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 30, 2007	NM	NM	NM	650.21	651.43	661.69	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 16, 2008	NM	NM	NM	653.99	655.24	664.55	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 3, 2009	NM	NM	NM	655.72	656.95	666.16	DRY	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 21, 2010	NM	NM	NM	652.27	653.51	663.08	DRY	646.41	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 4, 2011	NM	NM	NM	653.51	654.75	663.84	DRY	646.58	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 25, 2012	NM	NM	NM	651.77	653.03	662.83	DRY	646.53	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
October 17, 2012	627.33	620.03	NM[2]	650.73	651.97	662.10	AB	646.16	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
February 19-20, 2013	627.03	620.03	621.26	650.72	651.96	662.13	AB	645.42	650.31	NI	643.72	641.93	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 1, 2013	627.80	620.68	621.79	652.24	653.46	664.16	AB	646.21	651.71	NI	644.61	641.36	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
July 1, 2013	631.57	625.88	626.68	661.13	662.31	673.12	AB	648.73	653.66	NI	648.43	642.43	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 29, 2014	629.84	NM	NM	654.17	655.43	664.86	AB	646.96	651.62	651.33	645.97	641.95	633.83	648.74	647.26	648.08	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
May 29, 2014	629.75	624.37	624.50	653.53	653.81	664.30	AB	646.53	651.05	650.73	645.39	641.43	633.61	648.14	646.55	646.96	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
April 20, 2015	628.16	620.09	620.78	652.00	653.24	663.30	AB	645.93	650.32	650.05	643.73	642.02	633.85	647.79	646.35	646.97	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
December 10, 2015	NM	NM	NM	NM	NM	662.28	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	648.27	623.54	627.88	NI	638.79	NI	NI	NI	NI	NI
April 28, 2016	627.50	620.26	620.83	651.55	652.79	662.80	AB	645.96	650.05	650.00	643.56	641.56	634.71	647.78	NM[5]	646.80	NI	NI	NI	NI	NI	648.61	623.45	627.24	NI	638.15	NI	NI	NI	NI	NI
July 20, 2016	NM	NM	NM	NM	NM	663.21	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	649.86	624.76	628.60	NI	639.33	NI	NI	NI	NI	NI
October 27, 2016	NM	NM	NM	NM	NM	670.82	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	651.32	624.97	628.35	NI	638.65	NI	NI	NI	NI	NI
January 18, 2017	NM	NM	NM	NM	NM	666.28	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	650.18	624.09	627.32	NI	638.10	NI	NI	NI	NI	NI
April 19-21, 2017	629.39	622.04	622.02	658.84	660.00	669.82	AB	648.24	653.68	653.40	647.61	643.01	634.50	649.87	649.03	649.01	660.45	669.88	652.12	668.38	667.45	651.71	624.70	628.98	NI	639.20	NI	NI	NI	NI	NI
June 19-20, 2017	NM	NM	NM	NM	NM	670.65	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	650.22	624.89	627.75	NI	638.77	NI	NI	NI	NI	NI
August 15, 2017	NM	NM	NM	NM	NM	670.61	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	649.58	624.09	627.28	NI	637.86	NI	NI	NI	NI	NI
October 16, 2017	NM	NM	NM	NM	NM	669.58	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	650.81	625.70	628.75	NI	638.79	NI	NI	NI	NI	NI
April 16-17, 2018	628.63	620.82	617.50	AB	AB	667.64	AB	647.07	652.25	651.90	646.36	642.61	634.07	648.77	648.49	648.23	NM	NM	NM	NM	NM	650.77	624.29	628.98	NI	638.62	NI	NI	NI	NI	NI
April 26, 2018	628.67	620.86	617.63	AB	AB	667.96	AB	647.47	651.75	652.54	646.38	645.46	634.14	648.99	648.35	648.00	656.61	667.79	650.19	666.28	665.17	651.18	624.56	628.75	NI	638.57	NI	NI	NI	NI	NI
June 4, 2018	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	624.62	628.27	NI	638.81	NI	NI	NI	NI	NI
October 8, 2018	NM	NM	NM	AB	AB	664.71	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	625.73	628.59	NI	637.32	NI	NI	NI	NI	NI
April 15-16, 2019	630.95	632.16	628.40	AB	AB	672.78	AB	648.69	654.35	653.99	649.45	643.08	633.71	649.73	648.47	648.10	NM	672.64	654.55	671.05	669.22	652.57	629.19	629.99	NI	638.22	NI	NI	NI	NI	NI
June 20, 2019	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	623.61	NI	629.12	623.05	NI
October 2, 2019	NM	NM	NM	AB	AB	675.54	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	652.64	626.54	630.04	NI	638.03	623.79	NI	629.77	622.47	NI
December 5, 2019	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	NM	NI	NM	620.60	NI
February 5, 2020	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NM	NM	NI	NM	620.83	NI
May 20-21, 2020	629.38	620.61	621.38	AB	AB	674.47	AB	648.17	654.45	654.04	647.94	643.23	633.80	648.82	648.86	649.40	661.08	674.36	656.06	672.16	670.46	650.20	624.46	627.68	623.19	637.98	621.57	624.88	627.24	620.43	620.40
July 6, 2020	NM	NM	NM	AB	AB	NM	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	624.20	NM	NM	625.76	NM	NM	621.66
August 19-21, 2020	NM	NM	NM	AB	AB	674.64	AB	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	650.88	625.02	627.53	623.52	638.22	621.75	NM	626.98	620.37	620.63
October 19-20, 2020	628.69	620.38	621.22	AB	AB	673.37	AB	647.71	653.94	653.57	647.50	642.96	633.44	649.67	648.76	648.14	660.42	673.35	654.95	671.21	669.55	649.50	624.42	627.14	623.03	636.96	621.40	624.41	626.54	619.92	620.17
Bottom of Well Elevation (ft)	606.50	610.50	590.00	640.47	620.36	646.03	647.59	636.94	642.70	622.98	634.48	621.96	625.82	634.39	635.55	633.95	647.18	654.23	636.69	650.27	620.14	638.79	614.01	616.90	589.93	627.97	620.43	588.60	617.87	611.48	584.56

Notes: NM = not measured NI = not installed AB = abandoned

1. The groundwater elevations recorded for MW11 on 2/19/04, 11/18/04, and 5/05/05 are not considered reliable due to a minimal quantity of water observed in the well. The actual water table elevation could be lower than the reported value.
2. MW3 could not be located during this sampling event.
3. Repairs were completed at MW3 in July 2013. Elevations calculated for February, April, and July 2013 are estimates based on the old top of casing elevation (657.36 feet amsl). MW3 was re-surveyed on June 3, 2014.
4. MW1 was repaired in April 2013. Groundwater elevations measured before this date are calculated using the old top of casing elevation (637.60 ft amsl).
5. TW18 was damaged and could not be accessed for a water level measurement in April 2016. The well was repaired in July 2016.

Created by: MDB Date: 8/9/2013
Last revision by: ACW Date: 10/22/2020
Checked by: RM Date: 10/22/2020

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

Sample Dates	Downgradient Wells									Background Well
	MW-301	MW-302	MW-302A	MW-303	MW-304	MW-304A	MW-305	MW-306	MW-306A	MW-6
12/10/2015	B	B	NI	B	NI	NI	NI	NI	NI	B
4/29/2016	B	B	NI	B	NI	NI	NI	NI	NI	B
7/20/2016	B	B	NI	B	NI	NI	NI	NI	NI	B
10/26-27/2016	B	B	NI	B	NI	NI	NI	NI	NI	B
1/17-18/2017	B	B	NI	B	NI	NI	NI	NI	NI	B
4/19/2017	B	B	NI	B	NI	NI	NI	NI	NI	B
6/19-20/2017	B	B	NI	B	NI	NI	NI	NI	NI	B
8/15/2017	B	B	NI	B	NI	NI	NI	NI	NI	B
10/16/2017	D	D	NI	D	NI	NI	NI	NI	NI	D
4/16/2018	A	A	NI	A	NI	NI	NI	NI	NI	A
4/26/2018	--	--	NI	--	NI	NI	NI	NI	NI	A-R
6/4/2018	A-R	A-R	NI	A-R	NI	NI	NI	NI	NI	--
8/7/2018	A	A	NI	A	NI	NI	NI	NI	NI	A
10/8/2018	A	A	NI	A	NI	NI	NI	NI	NI	A
4/15/2019	A	A	NI	A	NI	NI	NI	NI	NI	A
6/20/2019	--	--	NI	--	A	NI	A	A	NI	--
10/2/2019	A	A	NI	A	A	NI	A	A	NI	A
12/5/2019	--	--	NI	--	--	NI	--	A-R	NI	--
2/5/2020	--	--	NI	--	--	NI	--	A-R	NI	A
5/19-20/2020	A	A	A	A	A	A	A	A	A	A
7/6/2020	--	--	A	A	--	A	--	--	A	--
8/18-19/2020	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R	A-R
10/19/2020	A	A	A	A	A	A	A	A	A	A

Abbreviations:
B = Background Sample Event
D = Detection Monitoring Program Event
-- = Not Applicable
A = Assessment Monitoring Sample Event
A-R = Assessment Monitoring Resample Event
NI = Not Installed

Created by: NDK Date: 1/8/2018
Last revision by: TK Date: 11/23/2020
Checked by: NDK Date: 11/23/2020

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Table 3. Groundwater Analytical Results Summary - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Parameter Name	UPL Method	UPL	GPS	Background Well MW-6									Compliance Wells MW-301								
				10/16/2017	4/16/2018, 4/26/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/19/2020	10/20/2020	10/16/2017	4/16/2018, 6/4/2018 ^	8/7/2018	10/8/2018	4/15/2019	10/2/2019	5/19/2020	8/18/2020	10/19/2020
Appendix III																					
Boron, ug/L	P*	100		41.2 J	29.8 J	42.9 J	40.2 J	<110	<110	<73	NA	<80	436	198.0	279	357	250	360	150	NA	260
Calcium, mg/L	P	73.9		66.9	72.7	66.5	69.6	67	70	72	76	69	65.9	64.5	65.1	72.5	73	68	56	65	57
Chloride, mg/L	P	8.52		6.5	6.5	7.3	6.6	6.7	6.9	7.7	6.8	5.6	17.3	20.2	17.7	15.9	17	14	17	15	15
Fluoride, mg/L	P*	0.2		0.14 J	0.084 J	0.12 J	<0.19	0.63	<0.23	<0.23	NA	<0.23	0.24	0.24	0.23	0.27	0.9	0.23 J	0.56	NA	<0.23
Field pH, Std. Units	P	7.9		7.03	7.34	7.18	7.06	7.59	7.46	7.34	7.98	7.42	7.66	8.4	8.08	8.16	8.47	8.11	7.85	8.33	8.06
Sulfate, mg/L	P	29.4		25.8	26.4	24.8	25.5	26	24	27	25	25	52.7	49.3	53.2	64.4	51	56	34	44	48
Total Dissolved Solids, mg/L	P	386.7		318	343	351	319	340	280	580	NA	300	289	300.0	326	320	350	310	480	NA	280
Appendix IV		**UPL**	**GPS**																		
Antimony, ug/L	NP*	0.037	6	NA	<0.026	<0.15	<0.078	<0.53	NA	<0.58	NA	NA	NA	0.071 J	0.16 J	0.085 J	<0.53	NA	<0.58	NA	NA
Arsenic, ug/L	P*	0.37	10	NA	0.23 J	0.26 J	0.24 J	<0.75	<0.75	<0.88	NA	<0.88	NA	3.9	4.4	5.4	5.4	5.6	3.8	NA	6
Barium, ug/L	P	48.5	2,000	NA	44.1	43.1	43	43	46	46	NA	45	NA	163	156	155	160	180	140	NA	150
Beryllium, ug/L	DQ	DQ	4	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA	NA	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA	NA
Cadmium, ug/L	DQ	DQ	5	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.049	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.049
Chromium, ug/L	P	1.20	100	NA	0.66 J	0.97 J	0.73 J	<0.98	<0.98	<1.1	NA	<1.1	NA	1.1	<0.19	0.09 J	<0.98	<0.98	<1.1	NA	<1.1
Cobalt, ug/L	NP*	0.34	6	NA	<0.014	<0.15	<0.062	<0.091	<0.091	<0.091	NA	<0.091	NA	0.086 J	0.16 J	0.11 J	0.11 J	0.11 J	0.11 J	NA	0.11 J
Fluoride, mg/L	P*	0.2	4	NA	0.084 J	0.12 J	<0.19	0.63	<0.23	<0.23	NA	<0.23	NA	0.24	0.23	0.27	0.90	0.23 J	0.56	NA	<0.23
Lead, ug/L	NP*	0.13	15	NA	<0.033	<0.12	<0.13	<0.27	<0.27	<0.27	NA	<0.11	NA	0.037 J	<0.12	<0.13	<0.27	<0.27	<0.27	NA	<0.11
Lithium, ug/L	NP*	3	40	NA	<4.6	NA	<4.6	<2.7	<2.7	<2.3	NA	<2.5	NA	<4.6	NA	9.1 J	8.7 J	8.0 J	7.0 J	NA	7.9 J
Mercury, ug/L	DQ	DQ	2	NA	<0.090	<0.090	<0.090	<0.10	NA	<0.10	NA	NA	NA	0.31	<0.090	<0.090	<0.10	NA	<0.10	NA	NA
Molybdenum, ug/L	P*	0.37	100	NA	0.26 J	0.28 J	<0.57	<1.1	<1.1	<1.1	<1.1	<1.1	NA	4.4	5.6	10.3	11	10	8.1	5.8	7.5
Selenium, ug/L	P*	0.72	50	NA	0.47 J	0.5 J	0.46 J	<1.0	NA	<1.0	NA	<1.0	NA	<0.086	0.22 J	0.18 J	<1.0	NA	<1.0	NA	<1.0
Thallium, ug/L	NP*	0.29	2	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	NA	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	NA
Radium 226/228 Combined,	P	1.88	5	NA	1.35	0.974	1.37	0.255	0.495	0.504	NA	pending	NA	0.689	1.66	0.556	0.232	0.488	0.200	NA	pending
Additonal Parameters - Selection of Remedy																					
Arsenic, dissolved#, ug/L	UPL or GPS not applicable			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L				NA	NA	NA	NA	NA	NA	NA	NA	74,000	NA	NA	NA	NA	NA	NA	NA	NA	62,000
Iron, dissolved,# ug/L				NA	NA	NA	NA	NA	NA	NA	<50.0	<50.0	NA	NA	NA	NA	NA	NA	NA	330	110
Iron, ug/L				NA	NA	NA	NA	NA	NA	NA	<50.0	<50.0	NA	NA	NA	NA	NA	NA	NA	680	500
Magnesium, ug/L				NA	NA	NA	NA	NA	NA	NA	38,000	37,000	NA	NA	NA	NA	NA	NA	NA	19,000	18,000
Manganese, dissolved, ug/L#				NA	NA	NA	NA	NA	NA	NA	6.6 J	25	NA	NA	NA	NA	NA	NA	NA	810	530
Manganese, ug/L				NA	NA	NA	NA	NA	NA	NA	4	<4.0	NA	NA	NA	NA	NA	NA	NA	800	560
Molybdenum, dissolved,ug/L#				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L				NA	NA	NA	NA	NA	NA	NA	1.2	1,100	NA	NA	NA	NA	NA	NA	NA	3,200	3,600
Sodium, ug/L				NA	NA	NA	NA	NA	NA	NA	5,000	4,500	NA	NA	NA	NA	NA	NA	NA	13,000	11,000
Total Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	290	300	NA	NA	NA	NA	NA	NA	NA	200	160
Cabonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	<3.8	<3.8	NA	NA	NA	NA	NA	NA	NA	<3.8	<3.8
Bicarbonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	290	300	NA	NA	NA	NA	NA	NA	NA	200	160

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance well result exceeds the GPS.
17	Yellow highlighted cell with bold text indicates the compliance well result exceeds the GPS and the result was determined to be statistically significant (1).
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of MNA.

See Page 4 for abbreviations and notes.

Table 3. Groundwater Analytical Results Summary - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Compliance Wells

Parameter Name	UPL Method	UPL	GPS	MW-302 10/16/2017	MW-302 4/16/2018, 6/4/2018 ^	MW-302 8/7/2018	MW-302 10/8/2018	MW-302 4/15/2019	MW-302 10/2/2019	MW-302 5/20/2020	MW-302 8/19/2020	MW-302 10/19/2020
Appendix III												
Boron, ug/L	P*	100		708	489	648	694	690	690	480	NA	640
Calcium, mg/L	P	73.9		116	120	116	122	130	130	120	130	110
Chloride, mg/L	P	8.52		13.9	13.0	13.9	13.5	13	12	14	12	11
Fluoride, mg/L	P*	0.2		0.28	0.24	0.23	0.27	0.79	0.24 J	0.25 J	0.27 J	<0.23
Field pH, Std. Units	P	7.9		7.1	7.26	6.92	6.93	7.66	7.15	6.93	7.18	7.06
Sulfate, mg/L	P	29.4		<0.5	<0.24	<0.24	<0.24	<1.8	<1.8	<3.6	<3.6	<3.6
Total Dissolved Solids, mg/L	P	386.7		507	543	562	518	450	480	710	NA	490
Appendix IV		**UPL**	**GPS**									
Antimony, ug/L	NP*	0.037	6	NA	0.035 J	<0.15	<0.078	<0.53	NA	<0.58	NA	NA
Arsenic, ug/L	P*	0.37	10	NA	30.8	47.6	50.4	37	**53**	**33**	NA	**48**
Barium, ug/L	P	48.5	2,000	NA	789	661	603	690	740	610	NA	630
Beryllium, ug/L	DQ	DQ	4	NA	<0.012	<0.12	<0.089	<0.27	NA	<0.27	NA	NA
Cadmium, ug/L	DQ	DQ	5	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.049
Chromium, ug/L	P	1.20	100	NA	0.35 J	0.49 J	0.39 J	<0.98	<0.98	<1.1	NA	<1.1
Cobalt, ug/L	NP*	0.34	6	NA	1.1	1.1	1.1	1.5	1.3	1.0	NA	0.86
Fluoride, mg/L	P*	0.2	4	NA	0.24	0.23	0.27	0.79	0.24 J	0.25 J	NA	<0.23
Lead, ug/L	NP*	0.13	15	NA	0.084 J	0.23 J	<0.13	<0.27	<0.27	<0.27	NA	<0.11
Lithium, ug/L	NP*	3	40	NA	<4.6	NA	<4.6	<2.7	<2.7	<2.3	NA	<2.5
Mercury, ug/L	DQ	DQ	2	NA	0.35	<0.090	<0.090	<0.10	NA	<0.10	NA	NA
Molybdenum, ug/L	P*	0.37	100	NA	0.91 J	1.2	1.5	<1.1	1.4 J	<1.1	<1.1	<1.1
Selenium, ug/L	P*	0.72	50	NA	<0.086	0.3 J	0.26 J	<1.0	NA	<1.0	NA	<1.0
Thallium, ug/L	NP*	0.29	2	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	NA
Radium 226/228 Combined,	P	1.88	5	NA	1.96	2.09	3.52	0.146	1.48	1.54	NA	pending
Additonal Parameters - Selection of Remedy												
Arsenic, dissolved#, ug/L	UPL or GPS not applicable			NA	NA	NA	NA	NA	NA	NA	46	44
Calcium, ug/L				NA	NA	NA	NA	NA	NA	NA	NA	130,000
Iron, dissolved,# ug/L				NA	NA	NA	NA	NA	NA	NA	32,000	30,000
Iron, ug/L				NA	NA	NA	NA	NA	NA	NA	33,000	33,000
Magnesium, ug/L				NA	NA	NA	NA	NA	NA	NA	43,000	42,000
Manganese, dissolved, ug/L#				NA	NA	NA	NA	NA	NA	NA	2,800	2,500
Manganese, ug/L				NA	NA	NA	NA	NA	NA	NA	2,800	2,700
Molybdenum, dissolved,ug/L#				NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L				NA	NA	NA	NA	NA	NA	NA	4,700	4,300
Sodium, ug/L				NA	NA	NA	NA	NA	NA	NA	17,000	17,000
Total Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	530	540
Cabonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	<7.6	<3.8
Bicarbonate Alkalinity, mg/L				NA	NA	NA	NA	NA	NA	NA	530	540

Parameter Name	MW-302A 5/20/2020	MW-302A 7/6/2020	MW-302A 8/19/2020	MW-302A 10/19/2020	MW-303 10/16/2017	MW-303 4/16/2018, 6/4/2018 ^	MW-303 8/7/2018	MW-303 10/8/2018	MW-303 4/15/2019	MW-303 10/2/2019	MW-303 5/19/2020	MW-303 8/18/2020	MW-303 10/19/2020
Appendix III													
Boron, ug/L	190	250	NA	160	592	144	675	474	150 J	520	150	NA	370
Calcium, mg/L	79	78	81	72	84.7	54.6	46.0	35.3	49	46	54	58	34
Chloride, mg/L	7.8	6.9	7.1	6	17.2	24.1	14.6	16.3	18	16	15	16	15
Fluoride, mg/L	<0.23	<0.23	NA	<0.23	0.25	0.32	0.47	0.72	1.0	0.42 J	0.38 J	NA	<0.23
Field pH, Std. Units	7.27	7.22	7.41	7.33	7.20	8.00	7.66	7.91	7.95	7.83	7.67	7.65	7.77
Sulfate, mg/L	53	47	49	47	69.9	43.5	52.5	29.1	35	39	42	33	20
Total Dissolved Solids, mg/L	520	350	NA	350	379	296	262	181	280	210	450	NA	180
Appendix IV													
Antimony, ug/L	<0.58	<0.51	NA	NA	NA	0.16 J	0.34 J	0.19 J	<0.53	NA	<0.58	NA	NA
Arsenic, ug/L	<0.88	<0.88	NA	<0.88	NA	1.2	2.3	2.3	1.4 J	2.5	1.4 J	NA	3.2
Barium, ug/L	51	47	NA	46	NA	173	194	121	160	220	210	NA	190.0
Beryllium, ug/L	<0.27	<0.27	NA	NA	NA	0.046 J	<0.12	<0.089	<0.27	NA	<0.27	NA	NA
Cadmium, ug/L	<0.039	<0.049	NA	<0.049	NA	<0.018	NA	<0.033	<0.077	NA	<0.039	NA	<0.049
Chromium, ug/L	<1.1	<1.1	NA	1.2 J	NA	0.51 J	0.44 J	0.089 J	<0.98	<0.98	<1.1	NA	<1.1
Cobalt, ug/L	0.41 J	0.098 J	NA	<0.091	NA	0.14 J	0.36 J	0.21 J	<0.091	0.12 J	<0.091	NA	0.098 J
Fluoride, mg/L	<0.23	<0.23	NA	<0.23	NA	0.32	0.47	0.72	1.0	0.42 J	0.38 J	NA	<0.23
Lead, ug/L	0.48 J	0.14 J	NA	<0.11	NA	<0.033	0.24 J	<0.13	<0.27	<0.27	<0.27	NA	<0.11
Lithium, ug/L	<2.3	<2.5	NA	<2.5	NA	<4.6	NA	8.1 J	3.3 J	9.1 J	4.2 J	NA	9.5 J
Mercury, ug/L	<0.10	<0.10	NA	NA	NA	<0.090	<0.090	<0.090	<0.10	NA	<0.10	NA	NA
Molybdenum, ug/L	<1.1	<1.1	<1.1	<1.1	NA	7.3	21.6	12	6.2	9.8	3.1	23	10
Selenium, ug/L	1.3 J	1.1 J	NA	<1.0	NA	3.3	0.38 J	0.39 J	<1.0	NA	1.4 J	NA	<1.0
Thallium, ug/L	<0.62	<0.26	NA	NA	NA	<0.036	NA	<0.099	<0.27	NA	<0.26	NA	NA
Radium 226/228 Combined,	0.24	0.0963	NA	pending	NA	0.787	0.929	1.87	0.543	0.463	0.131	NA	pending
Additonal Parameters - Selection of Remedy													
Arsenic, dissolved#, ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	81,000	NA	NA	NA	NA	NA	NA	NA	NA	35,000
Iron, dissolved,# ug/L	NA	NA	330	56 J	NA	NA	NA	NA	NA	NA	NA	<50	<50
Iron, ug/L	NA	NA	230	<50	NA	NA	NA	NA	NA	NA	NA	<50	<50
Magnesium, ug/L	NA	NA	39, 000	38,000	NA	NA	NA	NA	NA	NA	NA	19,000	13,000
Manganese, dissolved, ug/L#	NA	NA	38	10	NA	NA	NA	NA	NA	NA	NA	120	160
Manganese, ug/L	NA	NA	19	<4.0	NA	NA	NA	NA	NA	NA	NA	120	180
Molybdenum, dissolved,ug/L#	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	1,200	1,000	NA	NA	NA	NA	NA	NA	NA	5,600	2,200
Sodium, ug/L	NA	NA	7,500	6,700	NA	NA	NA	NA	NA	NA	NA	13,000	12,000
Total Alkalinity, mg/L	NA	NA	290	300	NA	NA	NA	NA	NA	NA	NA	190	120
Cabonate Alkalinity, mg/L	NA	NA	<3.8	<3.8	NA	NA	NA	NA	NA	NA	NA	<3.8	<3.8
Bicarbonate Alkalinity, mg/L	NA	NA	290	300	NA	NA	NA	NA	NA	NA	NA	190	120

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance well result exceeds the GPS.
17	Yellow highlighted cell with bold text indicates the compliance well result exceeds the GPS and the result was determined to be statistically significant [(1)].
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of MNA.

See Page 4 for abbreviations and notes.

Table 3. Groundwater Analytical Results Summary - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Compliance Wells

Parameter Name	UPL Method	UPL	GPS	MW-304 6/20/2019	MW-304 10/2/2019	MW-304 5/20/2020	MW-304 8/19/2020	MW-304 10/19/2020	MW-304A 5/20/2020	MW-304A 7/6/2020	MW-304A 8/19/2020	MW-304A 10/19/2020
Appendix III												
Boron, ug/L	P*	100		<110	<110	<73	NA	<80	1,800	1,700	NA	1700
Calcium, mg/L	P	73.9		82	72	70	77	66	54	41	50	35
Chloride, mg/L	P	8.52		5.9	7.0	6.2	7.7	6.2	15	13	13	12
Fluoride, mg/L	P*	0.2		<0.23	<0.23	<0.23	NA	<0.23	0.57	0.42 J	NA	<0.23
Field pH, Std. Units	P	7.9		7.01	7.16	7.32	7.55	7.16	8.04	7.90	8.48	7.89
Sulfate, mg/L	P	29.4		20	17	17	15	16	83	77	76	76
Total Dissolved Solids, mg/L	P	386.7		350	300	470	NA	270	680	330	NA	310
Appendix IV		**UPL**	**GPS**									
Antimony, ug/L	NP*	0.037	6	<0.53	NA	<0.58	NA	NA	<0.58	<0.51	NA	NA
Arsenic, ug/L	P*	0.37	10	<0.75	<0.75	<0.88	NA	<0.88	1.3 J	<0.88	NA	<0.88
Barium, ug/L	P	48.5	2,000	54	47	42.0	NA	42.0	67.0	34.0	NA	28.0
Beryllium, ug/L	DQ	DQ	4	<0.27	NA	<0.27	NA	NA	<0.27	<0.27	NA	NA
Cadmium, ug/L	DQ	DQ	5	<0.077	NA	<0.039	NA	<0.049	0.19	0.098 J	NA	0.07 J
Chromium, ug/L	P	1.20	100	1.6 J	1.0 J	8.2	NA	<1.1	2.2 J	1.1 J	NA	<1.1
Cobalt, ug/L	NP*	0.34	6	1.1	0.19 J	0.22 J	NA	<0.091	3.2	0.83	NA	0.43 J
Fluoride, mg/L	P*	0.2	4	<0.23	<0.23	<0.23	NA	<0.23	0.57	0.42 J	NA	<0.23
Lead, ug/L	NP*	0.13	15	1.2	0.35 J	<0.27	NA	<0.11	4.3	1.2	NA	0.48 J
Lithium, ug/L	NP*	3	40	<2.7	<2.7	<2.3	NA	<2.5	2.7 J	<2.5	NA	<2.5
Mercury, ug/L	DQ	DQ	2	<0.10	NA	<0.10	NA	NA	<0.10	<0.10	NA	NA
Molybdenum, ug/L	P*	0.37	100	<1.1	<1.1	<1.1	1.2 J	<1.1	110	140	140	**130**
Selenium, ug/L	P*	0.72	50	<1.0	NA	<1.0	NA	<1.0	<1.0	<1.0	NA	<1.0
Thallium, ug/L	NP*	0.29	2	<0.27	NA	<0.26	NA	NA	<0.26	<0.26	NA	NA
Radium 226/228 Combined,	P	1.88	5	0.0356	0.900	0.0689	NA	pending	0.630	0.573	NA	pending
Additonal Parameters - Selection of Remedy												
Arsenic, dissolved[#], ug/L	UPL or GPS not applicable			NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L				NA	NA	NA	NA	75,000	NA	NA	NA	35,000
Iron, dissolved,[#] ug/L				NA	NA	NA	<50.0	<50.0	NA	NA	<50	55 J
Iron, ug/L				NA	NA	NA	51 J	<50.0	NA	NA	940	270
Magnesium, ug/L				NA	NA	NA	36,000	35,000	NA	NA	21,000	16,000
Manganese, dissolved, ug/L[#]				NA	NA	NA	6.9 J	4.1 J	NA	NA	16	7.3 J
Manganese, ug/L				NA	NA	NA	11	6.0 J	NA	NA	99	26
Molybdenum, dissolved,ug/L[#]				NA	NA	NA	NA	NA	NA	NA	NA	140
Potassium, ug/L				NA	NA	NA	1,500	1,300	NA	NA	830	680
Sodium, ug/L				NA	NA	NA	5,600	6,100	NA	NA	69,000	63,000
Total Alkalinity, mg/L				NA	NA	NA	300	310	NA	NA	190	190
Cabonate Alkalinity, mg/L				NA	NA	NA	<3.8	<3.8	NA	NA	<7.6	<3.8
Bicarbonate Alkalinity, mg/L				NA	NA	NA	300	310	NA	NA	190	190

Parameter Name	MW-305 6/20/2019	MW-305 10/2/2019	MW-305 5/19/2020	MW-305 8/18/2020	MW-305 10/20/2020	MW-306 6/20/2019	MW-306 10/2/2019	MW-306 12/5/2019	MW-306 2/5/2020	MW-306 5/19/2020	MW-306 8/18/2020	MW-306 10/20/2020	MW-306A 5/19/2020	MW-306A 7/6/2020	MW-306A 8/18/2020	MW-306A 10/20/2020
Appendix III																
Boron, ug/L	180 J	190 J	210	NA	220	860	660	NA	NA	720	NA	720	290	340	NA	280
Calcium, mg/L	92	97	82	90	76	240	260	NA	NA	340	290	260	83	82	86	76
Chloride, mg/L	6.8	3.2 J	7.5	6.9	6	24	40	NA	NA	32	28	27	7.8	7.1	7.4	7.2
Fluoride, mg/L	<0.23	<0.23	0.23 J	NA	<0.23	<0.23	<0.23	NA	NA	<0.23	NA	<0.23	<0.23	<0.23	NA	<0.23
Field pH, Std. Units	7.19	7.03	6.90	7.23	7.24	6.87	9.00	6.76	6.95	6.66	7.12	6.88	6.99	7.04	7.38	7.18
Sulfate, mg/L	24	26	<3.6	<3.6	<3.6	280	140	NA	NA	430	260	220	44	40	41	41
Total Dissolved Solids, mg/L	440	380	540	NA	320	1,200	1,300	NA	NA	3,400	NA	1,100	610	360	NA	350
Appendix IV																
Antimony, ug/L	<0.53	NA	<0.58	NA	NA	<0.53	NA	NA	NA	<0.58	NA	NA	<0.58	<0.51	NA	NA
Arsenic, ug/L	2.2	3.4	3.6	NA	5.6	8.6	12	9.3	9.4	8.5	NA	10	<0.88	<0.88	NA	<0.88
Barium, ug/L	170	190	220	NA	200.0	280	540	NA	NA	260	NA	250	61.0	58.0	NA	58.0
Beryllium, ug/L	<0.27	NA	<0.27	NA	NA	<0.27	NA	NA	NA	<0.27	NA	NA	<0.27	<0.27	NA	NA
Cadmium, ug/L	<0.077	NA	<0.039	NA	<0.049	<0.077	NA	NA	NA	<0.039	NA	<0.049	<0.039	<0.049	NA	<0.049
Chromium, ug/L	<0.98	<0.98	<1.1	NA	<1.1	<0.98	<0.98	NA	NA	<1.1	NA	<1.1	<1.1	<1.1	NA	<1.1
Cobalt, ug/L	0.52	0.27 J	0.32 J	NA	0.12 J	1.0	0.98	NA	NA	0.53	NA	0.2 J	0.33 J	0.18 J	NA	0.22 J
Fluoride, mg/L	<0.23	<0.23	0.23 J	NA	<0.23	<0.23	<0.23	NA	NA	<0.23	NA	<0.23	<0.23	<0.23	NA	<0.23
Lead, ug/L	<0.27	<0.27	<0.27	NA	<0.11	0.52	<0.27	NA	NA	<0.27	NA	<0.11	<0.27	<0.11	NA	<0.11
Lithium, ug/L	3.4 J	4.6 J	<2.3	NA	<2.5	19	25	NA	NA	25	NA	26	<2.3	<2.5	NA	<2.5
Mercury, ug/L	<0.10	NA	<0.10	NA	NA	<0.10	NA	NA	NA	<0.10	NA	NA	<0.10	<0.10	NA	NA
Molybdenum, ug/L	1.7 J	1.6 J	<1.1	1.8 J	<1.1	<1.1	<1.1	NA	NA	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Selenium, ug/L	<1.0	NA	<1.0	NA	<1.0	<1.0	NA	NA	NA	<1.0	NA	<1.0	<1.0	<1.0	NA	<1.0
Thallium, ug/L	<0.27	NA	<0.26	NA	NA	<0.27	NA	NA	NA	<0.26	NA	NA	<0.26	<0.26	NA	NA
Radium 226/228 Combined,	0.553	0.557	0.837	NA	pending	0.897	1.79	NA	NA	1.05	NA	pending	1.12	0.525	NA	pending
Additonal Parameters - Selection of Remedy																
Arsenic, dissolved[#], ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	NA	87,000	NA	NA	NA	NA	NA	NA	280,000	NA	NA	NA	85,000
Iron, dissolved,[#] ug/L	NA	NA	NA	11,000	10,000	NA	NA	NA	NA	NA	44,000	39,000	NA	NA	1,900	1,600
Iron, ug/L	NA	NA	NA	13,000	12,000	NA	NA	NA	NA	NA	43,000	40,000	NA	NA	2,100	1,900
Magnesium, ug/L	NA	NA	NA	32,000	32,000	NA	NA	NA	NA	NA	54,000	46,000	NA	NA	38,000	37,000
Manganese, dissolved, ug/L[#]	NA	NA	NA	2,000	1,800	NA	NA	NA	NA	NA	5,100	4,800	NA	NA	1,200	1,100
Manganese, ug/L	NA	NA	NA	2,000	1,800	NA	NA	NA	NA	NA	5,200	4,800	NA	NA	1,200	1,100
Molybdenum, dissolved,ug/L[#]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	NA	2,200	1,800	NA	NA	NA	NA	NA	8,200	7,100	NA	NA	1,400	1,200
Sodium, ug/L	NA	NA	NA	8,900	7,700	NA	NA	NA	NA	NA	110,000	110,000	NA	NA	12,000	11,000
Total Alkalinity, mg/L	NA	NA	NA	340	340	NA	NA	NA	NA	NA	850	800	NA	NA	330	320
Cabonate Alkalinity, mg/L	NA	NA	NA	<7.6	<3.8	NA	NA	NA	NA	NA	<7.6	<3.8	NA	NA	<7.6	<1.9
Bicarbonate Alkalinity, mg/L	NA	NA	NA	340	340	NA	NA	NA	NA	NA	850	800	NA	NA	330	320

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL (background) and the LOQ.
30.8	Yellow highlighted cell indicates the compliance well result exceeds the GPS.
17	Yellow highlighted cell with bold text indicates the compliance well result exceeds the GPS and the result was determined to be statistically significant [(1)].
17	Grayscale indicates Additional Parameters sampled for selection of remedy and evaluation of MNA.

See Page 4 for abbreviations and notes.

Table 3. Groundwater Analytical Results Summary - Assessment Monitoring
Lansing Generating Station / SCS Engineers Project #25220100.00

Abbreviations:

UPL = Upper Prediction Limit
NA = Not Analyzed
µg/L = micrograms per liter
mg/L = milligrams per liter

LOD = Limit of Detection
LOQ = Limit of Quantitation

DQ = Double Quant
NP = Nonparametric UPL (highest background value)
P = Parametric UPL with 1-of-2 retesting
GPS = Groundwater Protection Standard

J = Estimated concentration at or above the LOD and below the LOQ.
DQ = Double Quantification rule applies (not detected in background samples)
# = Dissolved parameter samples collected for MNA data review

Notes:

1. An individual result above the UPL or GPS does not constitute a statistically significant increase (SSI) above background or statistically significant level above the GPS. The arsenic GPS exceedances at MW-3 have been determined to be statistically significant. The arsenic GPS exceedance at MW-306 has been determined not to be statistically significant. The molybdenum GPS exceedance has either been determined not to be statistically significant or the determination is ongoing. See the accompanying report text for additional information regarding determinations of statistical significance.
2. GPS is the United States Environmental Protection Agency (US EPA) Maximum Contamination Level (MCL), if established; otherwise, the value from 40 CFR 257.95(h)(2) is used.
3. Interwell UPLs calculated based on results from background well MW-6.

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Last revision by: NDK Date: 11/14/2020
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Proj Mgr QA/QC: TK Date: 11/24/2020

Table 4. Field Monitoring Data
Lansing Generating Station
October 2017 - July 2020

Well	Parameter	Field pH (Std. Units)	Field Oxidation Potential (mV)	Field Specific Conductance (umhos/cm)	Field Temperature (deg C)	Groundwater Elevation (feet)	Oxygen, Dissolved (mg/L)	Turbidity (NTU)
MW-6	10/16/2017	7.03	282	591	10.2	669.58	8.8	0
	4/26/2018	7.34	35	569	11.1	667.96	3.46	0.81
	8/7/2018	7.18	233	609	10.5	668.13	7.4	1.77
	10/8/2018	7.06	119	587	11.5	664.71	9.1	0.01
	4/15/2019	7.59	274	618	10.0	672.78	8.7	0.75
	10/2/2019	7.46	89	590	10.0	675.54	10.29	0.7
	5/20/2020	7.34	120	597	10.0	674.47	9.2	0.01
MW-301	10/16/2017	7.66	-221	497	17.0	625.70	0	0.05
	4/16/2018	8.39	-40	505	9.5	624.29	1	8.31
	6/4/2018	8.10	-145.5	507	12.2	624.62	0.9	2.72
	8/7/2018	8.08	-149	524	14.6	624.51	0.2	5.5
	10/8/2018	8.16	-180	545	17.4	625.73	0.3	9.19
	4/15/2019	8.47	-171	539	11.3	629.19	0.2	9.33
	10/2/2019	8.11	-156.8	502	15.6	626.54	0.13	1.36
	5/19/2020	7.85	-77.6	474	11.3	624.46	0.75	1.39
MW-302	10/16/2017	7.10	-179	1045	16.2	628.75	0	3.96
	4/16/2018	7.26	-152	1098	6.0	628.98	0.8	5.25
	6/4/2018	6.97	-179.3	1068	10.8	628.27	0.12	1.46
	8/7/2018	6.92	-164	1095	15.3	627.62	0.1	11.23
	10/8/2018	6.93	-43.9	1039	17.0	628.59	0.48	5.92
	4/15/2019	7.66	-159	1089	7.1	629.99	0.2	18.39
	10/2/2019	7.15	-160	1049	15.9	630.04	0.11	4.71
	5/20/2020	6.93	-161.5	1070	8.7	627.68	0.19	4.16
MW-302A	5/20/2020	7.27	126.9	644	11.7	623.19	6.55	11.9
	7/6/2020	7.22	47	641	11.7	624.20	6.6	4.68

Table 4. Field Monitoring Data
Lansing Generating Station
October 2017 - July 2020

Well	Parameter	Field pH (Std. Units)	Field Oxidation Potential (mV)	Field Specific Conductance (umhos/cm)	Field Temperature (deg C)	Groundwater Elevation (feet)	Oxygen, Dissolved (mg/L)	Turbidity (NTU)
MW-303	10/16/2017	7.20	49	687	25.2	638.79	1.9	0
	4/16/2018	8.00	53	552	4.1	638.62	3.5	0.4
	6/4/2018	7.59	68	431	17.0	638.81	0.36	1.08
	8/7/2018	7.66	-71	425	31.5	637.85	0.4	4.51
	10/8/2018	7.91	139	328	28.5	637.32	0.4	2.62
	4/15/2019	7.95	-76	448	4.2	638.22	1.4	6.6
	10/2/2019	7.83	156	409	25.2	638.03	0.27	0.58
	5/19/2020	7.67	28.9	464	6.3	637.98	1.29	0
MW-304	6/20/2019	7.01	41	593	10.6	0.00	6.2	104
	10/2/2019	7.16	107.3	578	12.4	623.79	7.51	3.51
	5/20/2020	7.32	104.9	574	9.0	621.57	7.78	3.72
MW-304A	5/20/2020	8.04	61.8	529	12.6	624.88	0.48	585.9
	7/6/2020	7.90	-15.8	541	19.1	625.76	0.3	181.9
MW-305	6/20/2019	7.19	27	638	15.5	0.00	0.2	9.6
	10/2/2019	7.03	-105.6	635	19.0	629.77	0.21	8.87
	5/19/2020	6.90	-138	684	9.8	627.24	0.48	20.44
MW-306	6/20/2019	6.87	22	1632	13.8	0.00	1	25.9
	10/2/2019	9.00	-1205	1998	16.3	622.47	0.27	3.67
	12/5/2019	6.76	-127	2196	16.3	620.60	0.9	10.26
	2/5/2020	6.95	-127.7	2477	13.7	620.83	0.23	4.43
	5/19/2020	6.66	-137	2332	12.7	620.43	0.3	2.63
MW-306A	5/19/2020	6.99	-21.7	697	14.6	620.40	1.18	4.15
	7/6/2020	7.04	-55.8	683	15.3	621.66	1.24	1.4

Table 5. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW3	5/11/2001	<1.8
MW4	5/11/2001	<1.8
	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	3.3
	8/23/2004	<0.79
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	2.9
	5/30/2007	<1
	4/16/2008	<0.43
	4/3/2009	0.27 J
	4/21/2010	<1.0
	5/4/2011	<1.0
	5/4/2011 (Dup)	<2.0 RL
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.62 J
	5/29/2014	<0.18
	4/21/2015	<0.25
	4/28/2016	0.30 J
	4/20/2017	0.33 J
MW5	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	4.7
	8/23/2004	0.92
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	<0.79
	5/30/2007	<1
	4/16/2008	<0.43
	04/16/08 (Dup)	<0.43
	4/3/2009	0.22 J
	4/21/2010	<1.0
	4/21/2010 (Dup)	<1.0
	5/4/2011	<1.0
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.65 J
	5/29/2014	1.3
	4/21/2015	<0.25
	4/28/2016	0.26 J
	4/20/2017	0.26 J

Table 5. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW6	5/11/2001	<1.8
	3/8/2002	<0.88
	2/19/2004	<3.5
	5/26/2004	3.9
	8/23/2004	<0.79
	11/18/2004	<0.79
	5/5/2005	<0.79
	5/19/2006	0.93 J
	5/30/2007	<1.0
	4/16/2008	<0.43
	4/3/2009 (Dup)	0.29 J
	4/3/2009	0.29 J
	4/21/2010	<1.0
	5/4/2011	<1.0
	4/25/2012	<1.0
	4/2/2013	<1.0
	7/2/2013	<1.0
	4/29/2014	0.55 J
	4/20/2015	<0.25
	4/29/2016	0.26 J
	4/19/2017	0.27 J
	4/16/2018	0.19 J
	4/15/2019	<0.75
MW11	3/8/2002	**23**
	5/26/2004	**16**
	8/23/2004	3.8
MW11R	4/21/2010	2.44
	5/4/2011	**11.6**
	4/25/2012	**13.6**
	4/25/2012 (Dup)	**15.7**
	4/2/2013	**25**
	7/2/2013	**23**
	4/30/2014	**27**
	5/29/2014	**27**
	4/21/2015	**23**
	4/28/2016	**33.4**
	4/20/2017	**30.4**
	4/17/2018	**28.5**
	4/16/2019	**28**
MW12	4/2/2013	**16**
	7/2/2013	**17**
	4/30/2014	**16**
	5/29/2014	**14**
	4/21/2015	**13**
	4/28/2016	**24.2**
	4/20/2017	**19.4**
	4/17/2018	**20.6**
	4/16/2019	**20**

Table 5. Historical Groundwater Arsenic Results for State Monitoring Wells
Alliant-Lansing CCR Landfill
(Results are in µg/L, unless otherwise noted)

Sample	Date	Arsenic (µg/L)
MW12P	4/30/2014	1.0
	5/29/2014	0.45 J
	4/21/2015	0.34 J
	4/28/2016	0.44 J
	4/20/2017	0.88 J
	4/17/2018	0.51 J
	4/16/2019	<0.75
MW13	4/2/2013	1.1
	7/2/2013	<1.0
	7/2/2013 (Dup)	<1.0
	4/30/2014	1.6
	5/29/2014	0.65 J
	4/20/2015	1.1
	4/28/2016	3.5
	4/20/2017	1.5
	4/17/2018	0.89 J
	4/16/2019	<0.75
MW14	4/2/2013	<1.0
	7/2/2013	<1.0
	4/30/2014	0.54 J
	5/29/2014	<0.18
	4/20/2015	<0.25
	4/29/2016	0.16 J
	4/20/2017	0.68 J
	4/17/2018	0.16 J
	4/15/2019	<0.75
MW15	4/30/2014	0.95 J
	5/29/2014	0.82 J
	4/20/2015	0.79 J
	4/29/2016	0.39 J
	4/20/2017	0.42 J
	4/17/2018	0.14 J
	4/16/2019	<0.75
TW17	4/30/2014	0.87 J
	5/29/2014	0.25 J
TW18	4/30/2014	1.40
	5/29/2014	<0.18
	4/20/2015	0.47 J
	4/20/2017	1.2
	4/17/2018	2.1
	4/16/2019	<0.75
TW19	4/30/2014	4.6
	5/29/2014	0.59 J
Groundwater Protection Standard (GPS)		10

Abbreviations:
µg/L = micrograms per liter

Notes:
Bold+underlined values meet or exceed GPS.

Laboratory Notes/Qualifiers:
J = Estimated value. Analyte detected at a level less than the reporting limit and greater than or equal to the Method Detection Limit. The user of this data should be aware that this data is of unknown quality.
RL = Reporting limit raised due to sample matrix effects.

Created by:	TLC	Date:	8/20/2013
Last revision by:	SCC	Date:	8/7/2019
Checked by:	NDK	Date:	8/8/2019

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Table 6. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25220100.00

	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.

Table 6. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25220100.00

	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
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.

Table 6. Preliminary Evaluation of Corrective Measure Alternatives
Lansing Generating Station / SCS Engineers Project #25220100.00

	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
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	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:

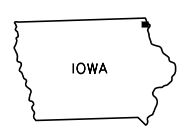
1) Alternatives #1 through #5 were developed and submitted within the Assessment of Corrective Measures Report (ACM), dated September 2019
2) Alternatives #6 through #8 were added in November 2020 as part of Addendum #1 to the September 2020 ACM Report

Created by: LAB/SK Date: 6/20/2019
Last revision by: SKK Date: 11/19/2020
Checked by: EJN Date: 11/23/2020

I:\25220100.00\Deliverables\ACM Amendment\Tables\[6_Evaluation of Assessment of Corrective Measure_LAN.xlsx]LAN_Evaluation Matrix

Figures

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



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

				ENGINEER	FIGURE
PROJECT NO.	25219070.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	1
DRAWN:	11/27/2019	CHECKED BY:	MDB		
REVISED:	03/12/2020	APPROVED BY:	TK 02/12/2020		

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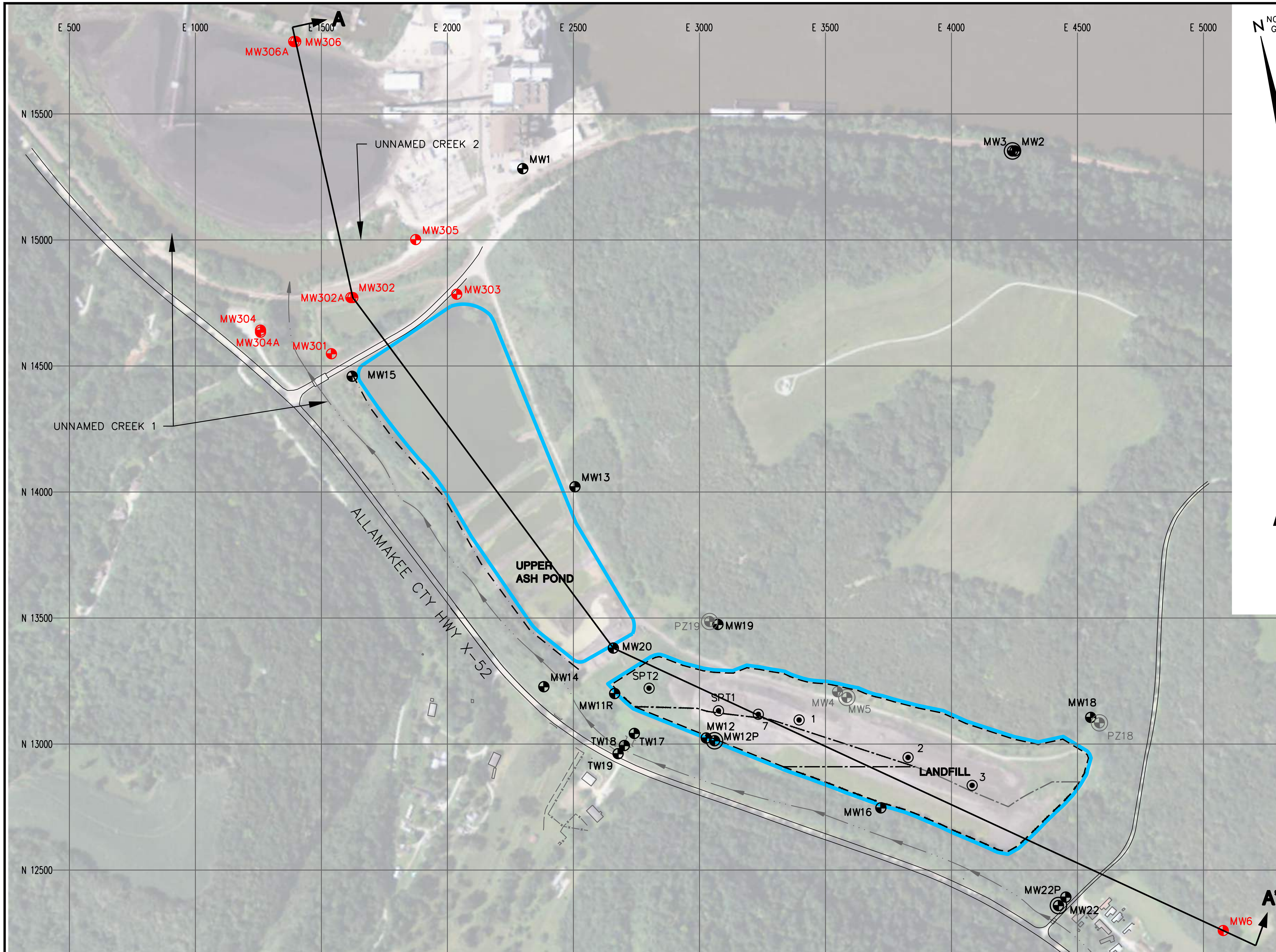

N
NORTH GRID

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SCALE: 1" = 400'

LEGEND

(dashed line)	APPROVED LIMITS OF WASTE
(dash-dot line)	LIMITS OF PHASE 1 FINAL COVER
(dash-dot line)	LIMITS OF PHASE 2 FINAL COVER
(dash line)	SLURRY WALL
(arrow line)	EXISTING STREAM
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
(symbol)	SOIL BORING
(blue line)	CCR UNITS
(arrows)	CROSS SECTION LOCATION

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. ONLY BORINGS USED FOR GEOLOGIC CROSS SECTION A–A' ARE SHOWN.
7. MW6 IS SAMPLED UNDER BOTH THE STATE AND CCR RULE MONITORING PROGRAMS.

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

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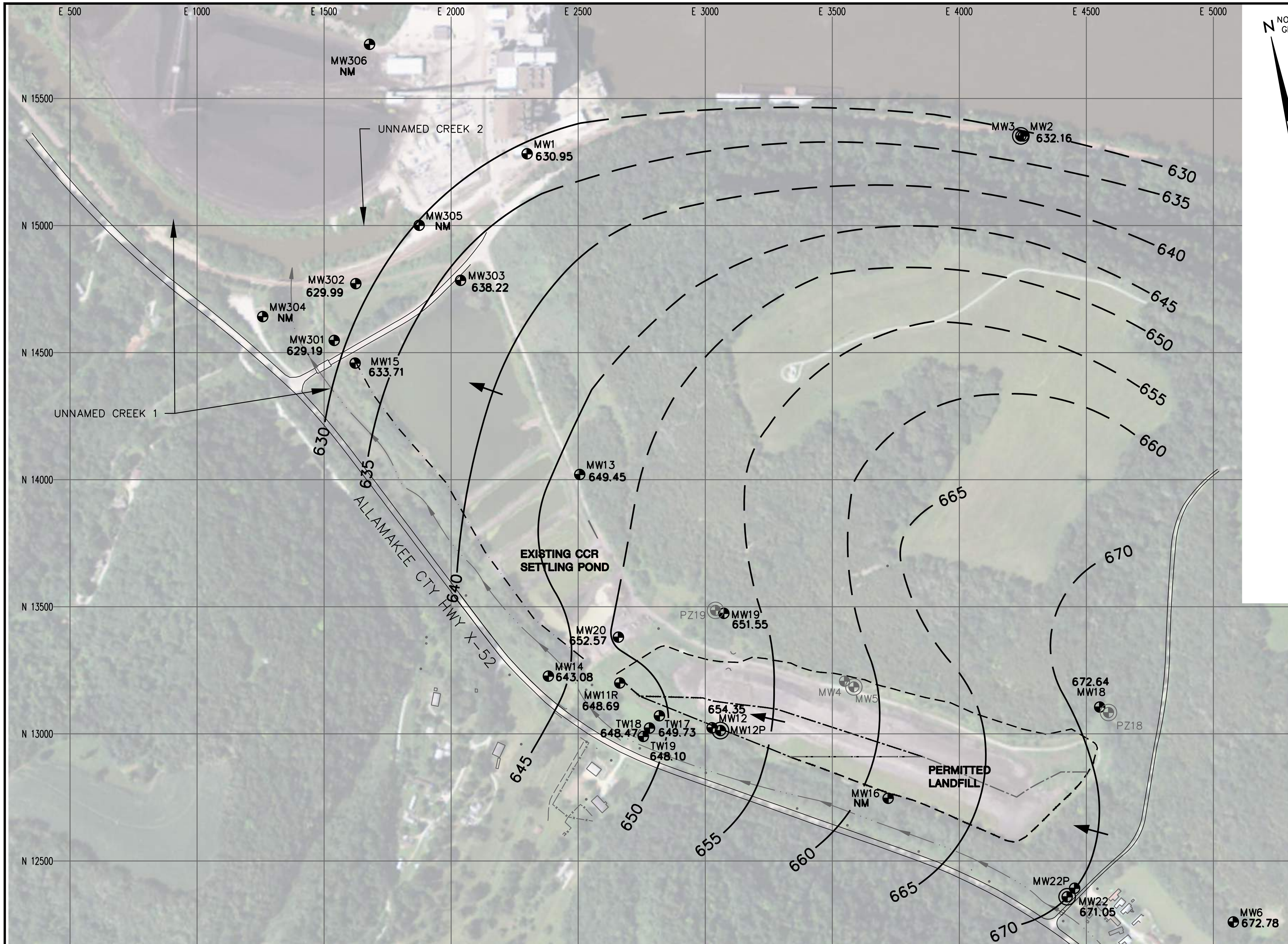
11/25/2020 - Classification: Internal - ECRM7804115



NORTH GRID

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SCALE: 1" = 400'

LEGEND

— — — —	APPROVED LIMITS OF WASTE
— · — · —	LIMITS OF PHASE 1 FINAL COVER
— · — · —	LIMITS OF PHASE 2 FINAL COVER
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
— · — · —	SLURRY WALL
···►···	EXISTING STREAM
629.99	WATER TABLE ELEVATION
NM	NOT MEASURED
———	WATER TABLE CONTOUR (DASHED WHERE INFERRED)
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. MONITORING WELLS MW304, MW305, AND MW306 WERE INSTALLED IN MAY 2019.

PROJECT NO.	25220100.00	DRAWN BY:	BSS	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT: ALLIANT ENERGY. INTERSTATE POWER AND LIGHT 2320 POWER PLANT DRIVE LANSING, IA 52151-9733	SITE: INTERSTATE POWER AND LIGHT LANSING POWER STATION COAL COMBUSTION RESIDUE LANDFILL LANSING, IOWA	WATER TABLE MAP – APRIL 15-16, 2019 — FIGURE 3
DRAWN:	07/03/2019	CHECKED BY:	NK				
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020				

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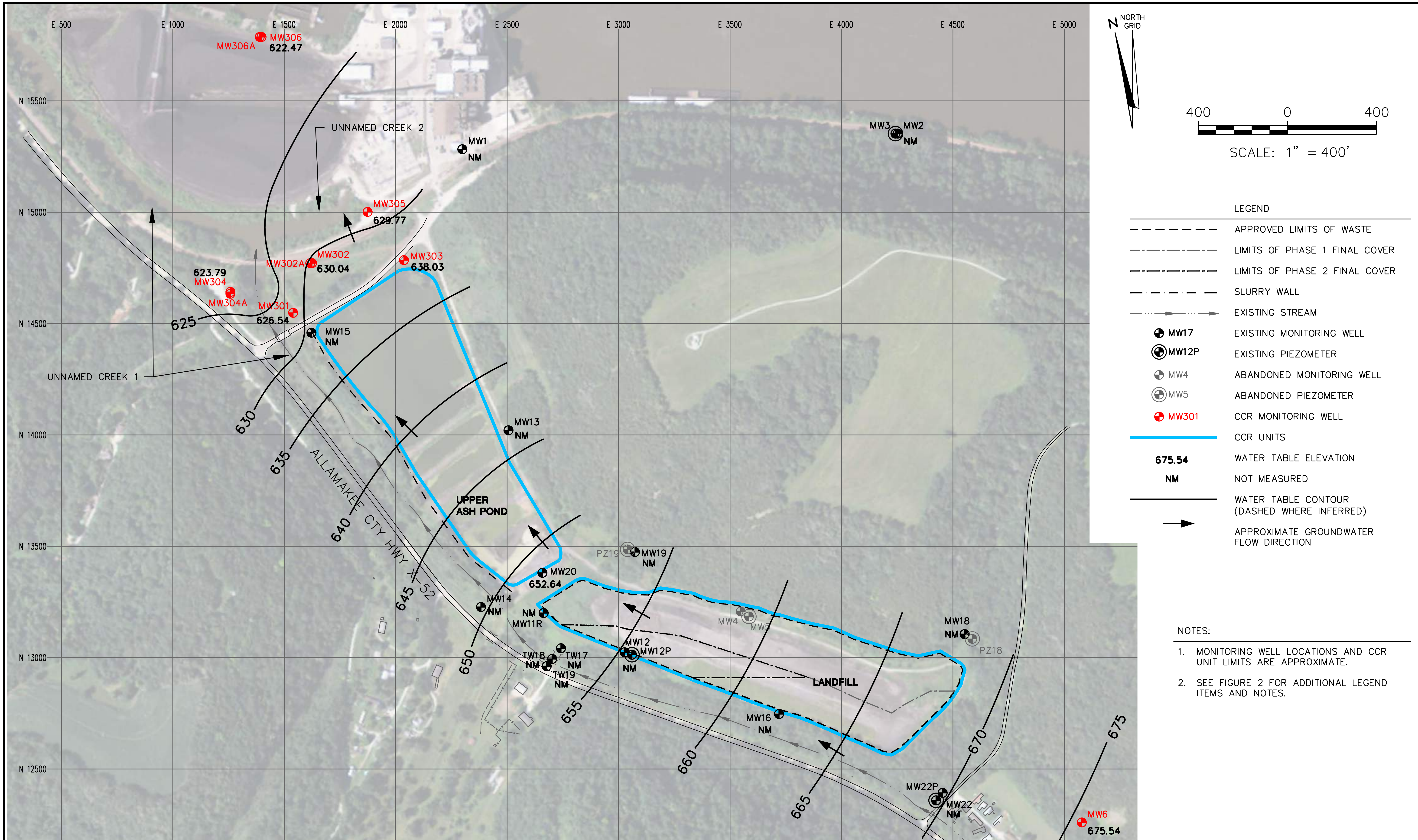

PROJECT NO.	25220100.00	DRAWN BY:	KP
DRAWN:	09/18/2020	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

WATER TABLE MAP
OCTOBER 9, 2019

FIGURE 4

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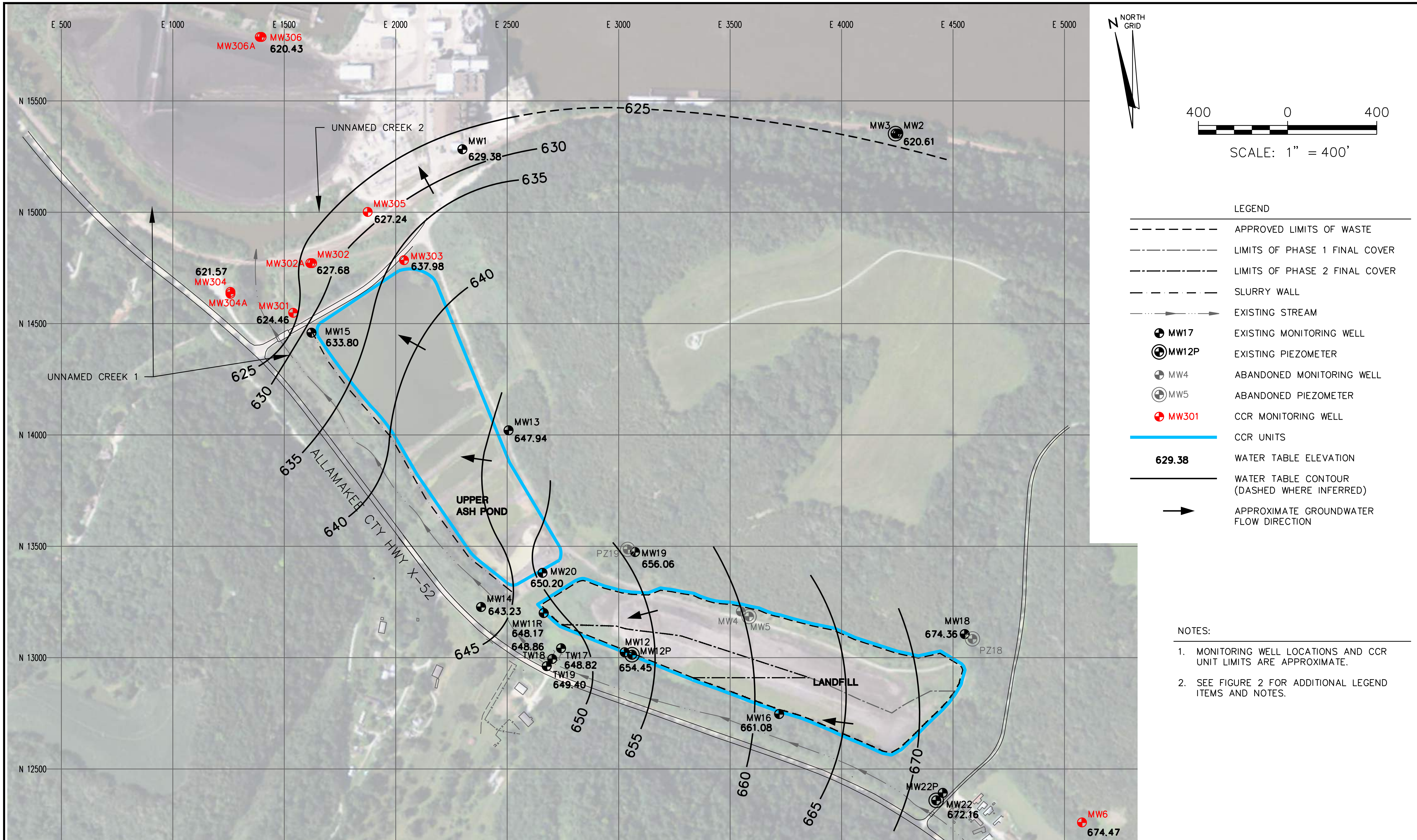
11/25/2020 - Classification: Internal - ECRM7804115



PROJECT NO.	25220100.00	DRAWN BY:	KP
DRAWN:	09/18/2020	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

WATER TABLE MAP
MAY 20-21, 2020

FIGURE
5

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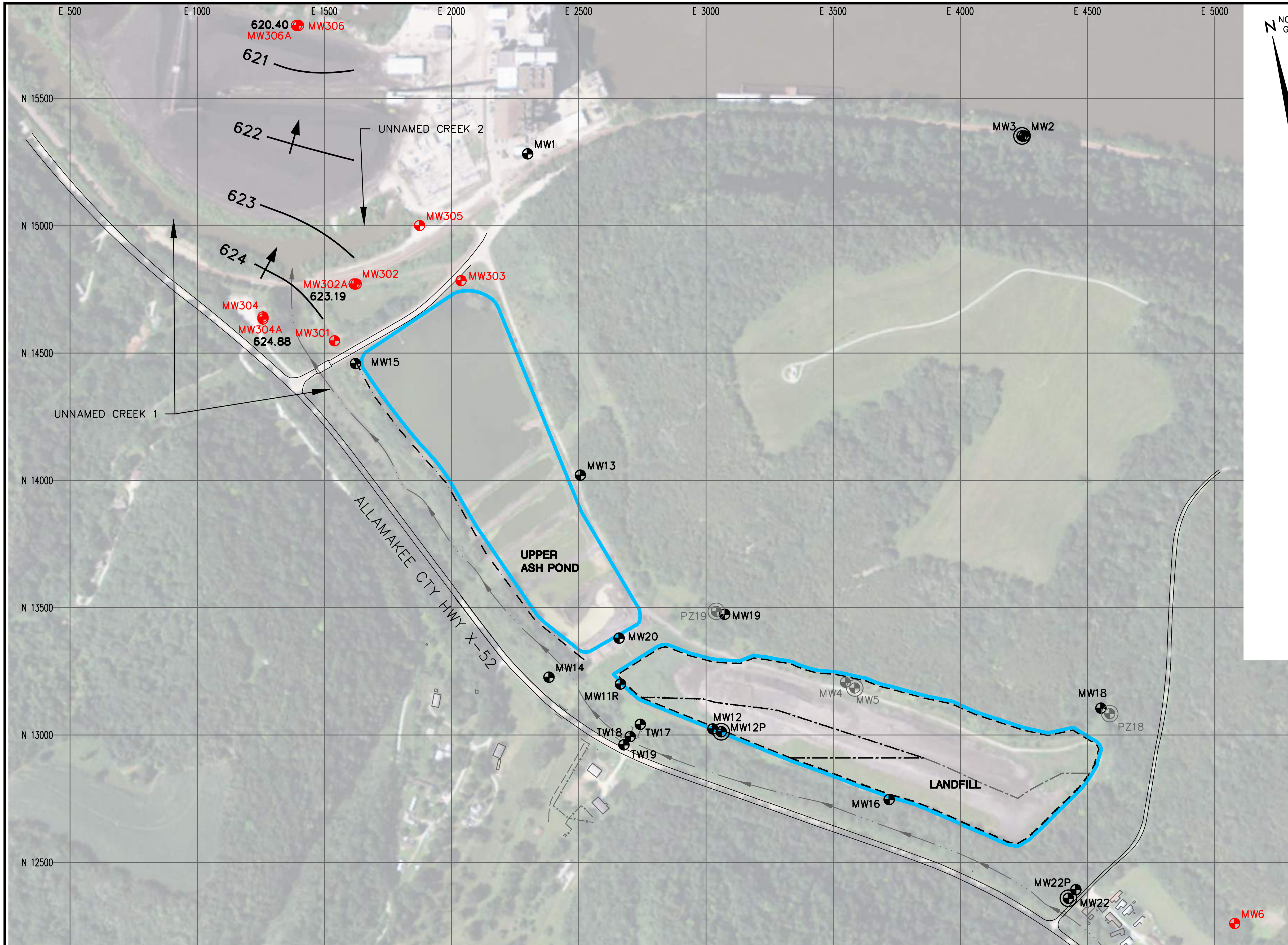

N NORTH GRID

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
- MW17 — EXISTING MONITORING WELL
- MW12P — EXISTING PIEZOMETER
- MW4 — ABANDONED MONITORING WELL
- MW5 — ABANDONED PIEZOMETER
- MW301 — CCR MONITORING WELL
- CCR UNITS
- 623.19 — POTENTIOMETRIC SURFACE ELEVATION MEASURED ON 05/20-21/2020
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
2. SEE FIGURE 2 FOR ADDITIONAL LEGEND ITEMS AND NOTES.

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	07/31/2020	CHECKED BY:	MDB
REVISED:	11/24/2020	APPROVED BY:	TK 11/24/2020

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

POTENTIOMETRIC SURFACE MAP
MAY 20-21, 2020

FIGURE 6

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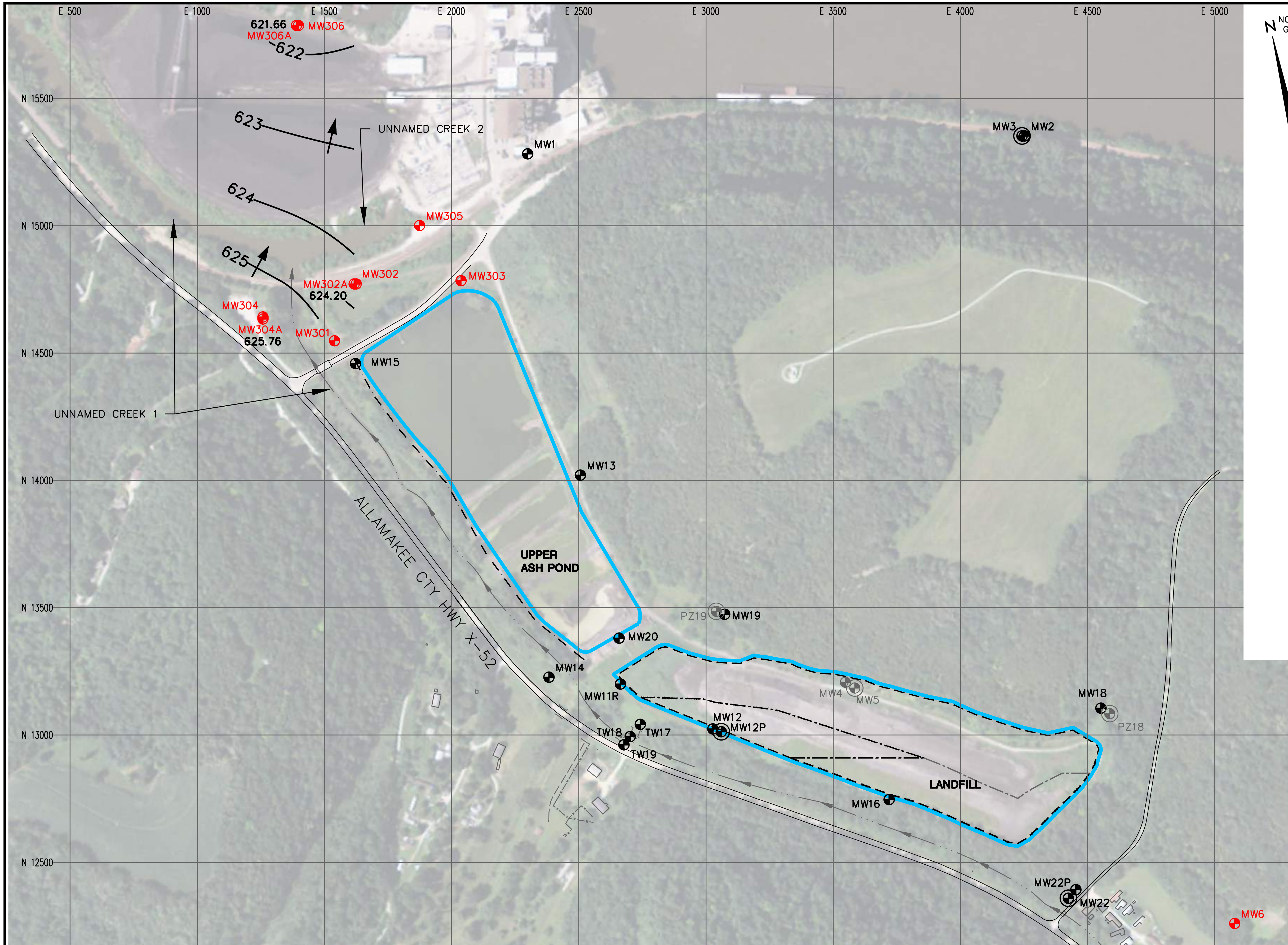

N NORTH GRID

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
- MW17 EXISTING MONITORING WELL
- MW12P EXISTING PIEZOMETER
- MW4 ABANDONED MONITORING WELL
- MW5 ABANDONED PIEZOMETER
- MW301 CCR MONITORING WELL
- CCR UNITS
- 624.20 POTENTIOMETRIC SURFACE ELEVATION MEASURED ON 07/06/2020
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
2. SEE FIGURE 2 FOR ADDITIONAL LEGEND ITEMS AND NOTES.

PROJECT NO.	25220100.00	DRAWN BY:	BSS
DRAWN:	07/31/2020	CHECKED BY:	MDB
REVISED:	09/24/2020	APPROVED BY:	TK 11/24/2020

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

POTENTIOMETRIC SURFACE MAP
JULY 6, 2020

FIGURE 7

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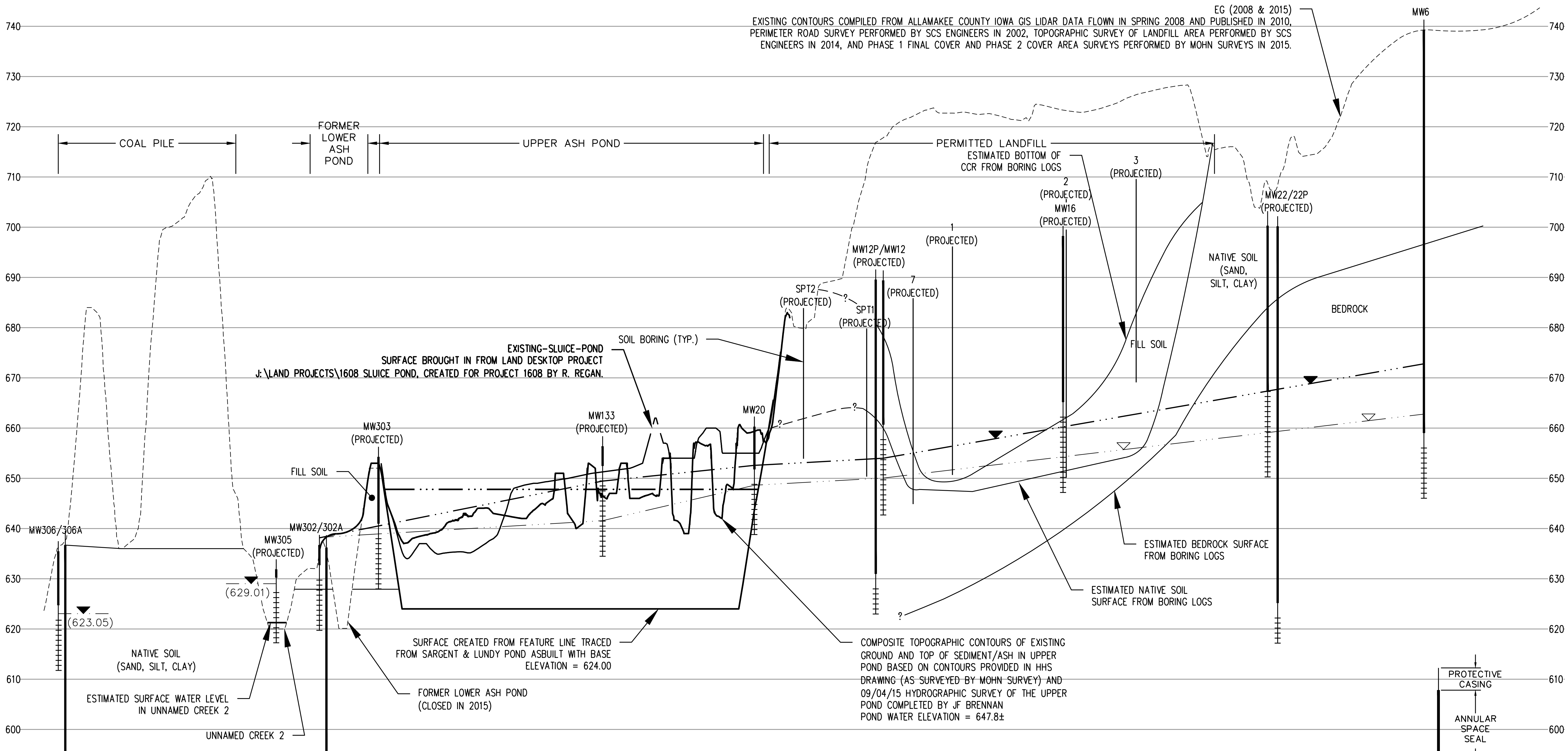


NOTES:

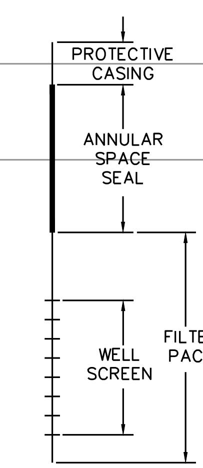
1. THE FOLLOWING MONITORING WELL AND BORING LOCATIONS ARE PROJECTED ALONG THE CROSS SECTION; MW22P/MW22, MW16, MW12/MW12P, MW13, MW303, MW305, 1, 2, 3, 7, SPT1, AND SPT2. SEE FIGURE 2 FOR CROSS SECTION LOCATION.
2. MONITORING WELLS MW305 AND MW306 WERE INSTALLED IN MAY 2019 AND FIRST SAMPLED ON JUNE 20, 2019. WATER TABLE ELEVATIONS FOR JUNE 20, 2019 ARE SHOWN AT THESE WELLS.

0 400

HORIZONTAL SCALE: 1" = 300'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 20X

LEGEND

- HIGH WATER TABLE MEASURED APRIL 15-16, 2019
- LOW WATER TABLE MEASURED APRIL 28, 2016
- (623.05) JUNE 20, 2019 WATER TABLE ELEVATION
- UPPER ASH POND SURFACE WATER ELEVATION



WELL DETAIL

PROJECT NO.	25220100.00	DRAWN BY:	AHB/RJG
DRAWN:	07/03/2019	CHECKED BY:	MDB
REVISED:	09/18/2020	APPROVED BY:	TK 11/24/2020

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

CROSS SECTION A-A'

FIGURE 8

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11/25/2020 - Classification: Internal - ECRM7804115

Appendix A

Regional Geological and Hydrogeological Information

Table LAN-3 Regional Hydrogeologic Stratigraphy
Lansing Generating Station / SCS Engineers Project #25215053

Strategic Unit			Hydrogeologic Units	Type of Rock	Hydrologic Conditions	Thickness Range (ft)	Age of Rocks*
Quaternary		Recent and Pleistocene deposits	Surficial aquifers-Alluvium, Drift, Buried-channel	Sand and gravel interbedded with silt and clay	Mostly unconfined local aquifers, some artesian, small-to-large yields	0 – 305	0 – 2.8 million years (m.y.)
Devonian	Yellow Spring Group (Gp)	Lime Creek Formation (Fm)	Confining layers	Shale, some dolostone	Non-aquifer	0 – 50	365 – 405 m.y.
	Cedar Valley Gp	Lithograph City Fm Coralville Fm Little Cedar Fm	Silurian-Devonian aquifer	Limestone and dolostone, thin shales	Major aquifer, mostly artesian, moderate-to-large yields	0 – 400	
	Wapsipinicon Gp	Pinicon Ridge Fm Spillville Fm		Dolostone and limestone			
Silurian		Scotch Grove Fm Hopkinton Fm Blanding Fm Tete des Morts Fm		Dolostone, locally with much chert, local shale as cavern fillings			405 – 425 m.y.
Ordovician	Maquoketa Fm	Brainard Member Fort Atkinson Member Clermont Member Elgin Member	Maquoketa Fm, confining beds Fort Atkinson – Elgin aquifer	Shale and dolostone, some chert	Non-aquifer to local aquifer, small-to-moderate yields	0 – 300	425 – 455 m.y.
	Galena Gp	Dubuque Fm Wise Lake Fm Dunleith Fm Decorah Fm	Galena aquifer	Limestone and dolostone, minor chert, shale at base and locally in upper part	Local aquifer, confined and unconfined, small-to-moderate yields	0 – 240	455 – 460 m.y.
		Platteville Fm Glenwood Fm	Decorah-Platteville-Glenwood confining beds	Limestone and shale	Non-aquifer	0 – 50	
		St. Peter Sandstone	Cambrian-Ordovician aquifer	Sandstone	Major aquifer, mostly artesian, large yields	0 – 580	460 – 500 m.y.
		Prairie du Chien Gr		Dolostone, minor sandstone and chert			500 – 503 m.y.
Cambrian		Jordan Sandstone		Sandstone, dolomitic			
		St. Lawrence Fm	Cambrian confining beds	Dolostone, silty	Non-aquifer	0 – 400	503 – 508 m.y.
		Lone Rock (Franconia) Fm		Fine, sandstone, siltstone, shale, and minor dolostone			
		Wenowoc (incl Ironton-Galesville sandstone) Fm	Dresbach aquifer	Sandstone	Artesian aquifer, large yields	0 – 1,950	508 – 515 m.y.
		Eau Claire Fm		Fine sandstone, siltstone, and shale			
		Mt. Simon Sandstone		Sandstone			
Pre-C		Undifferentiated crystalline rocks	Unknown	Igneous and metamorphic rocks	Unknown	Unknown	570 m.y. – > 2 billion years

*Age determinations as used on COSUNA charts published by AAPG-USGS
Source: "Water Resources of Southeast Iowa," Iowa Geologic Survey Water Atlas No. 4.

I:\25215053\Data\Tables\Table 2_Regional Hydrogeologic Stratigraphy.doc

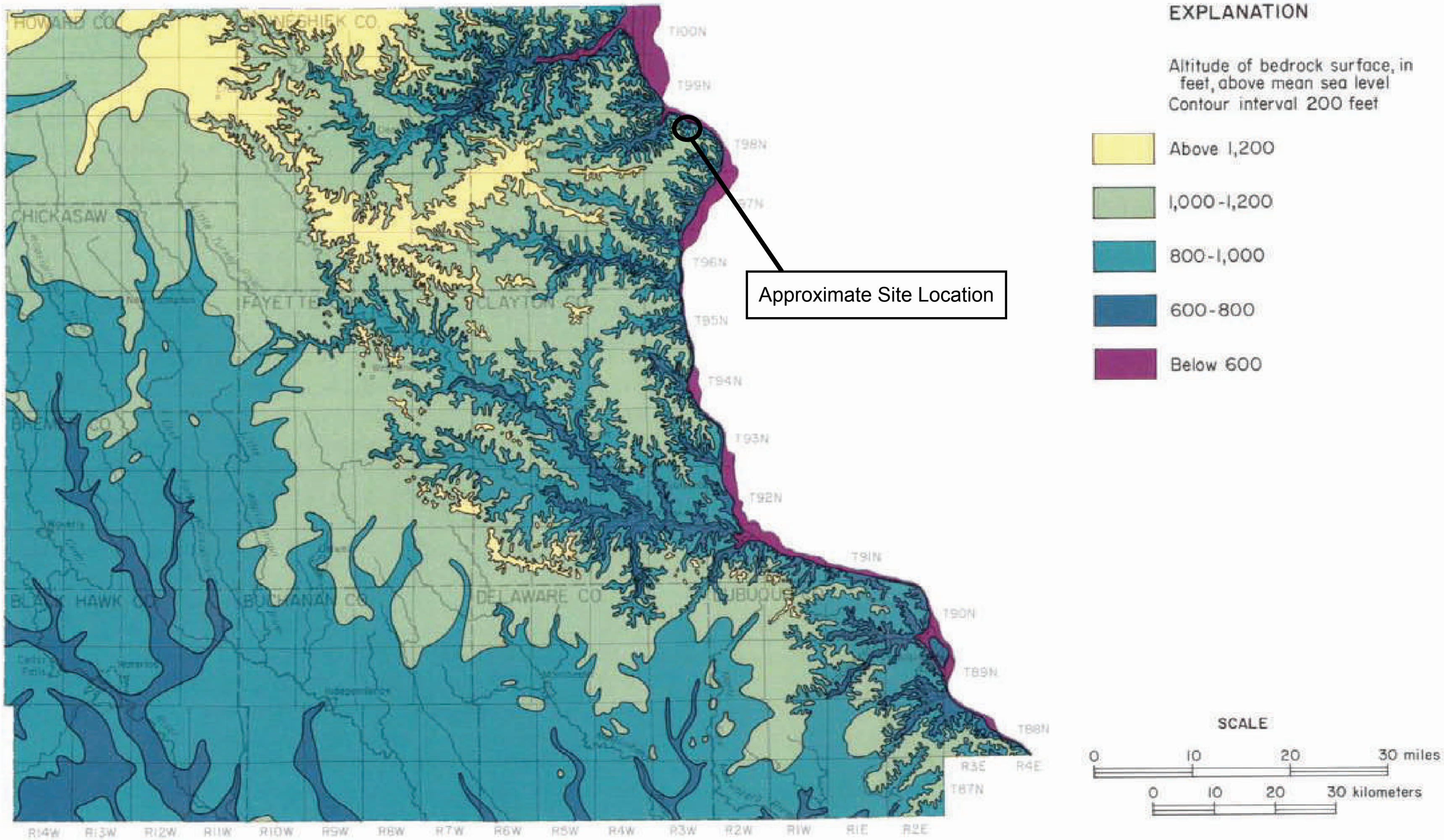

Figure 30. Altitude and configuration of the bedrock surface

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

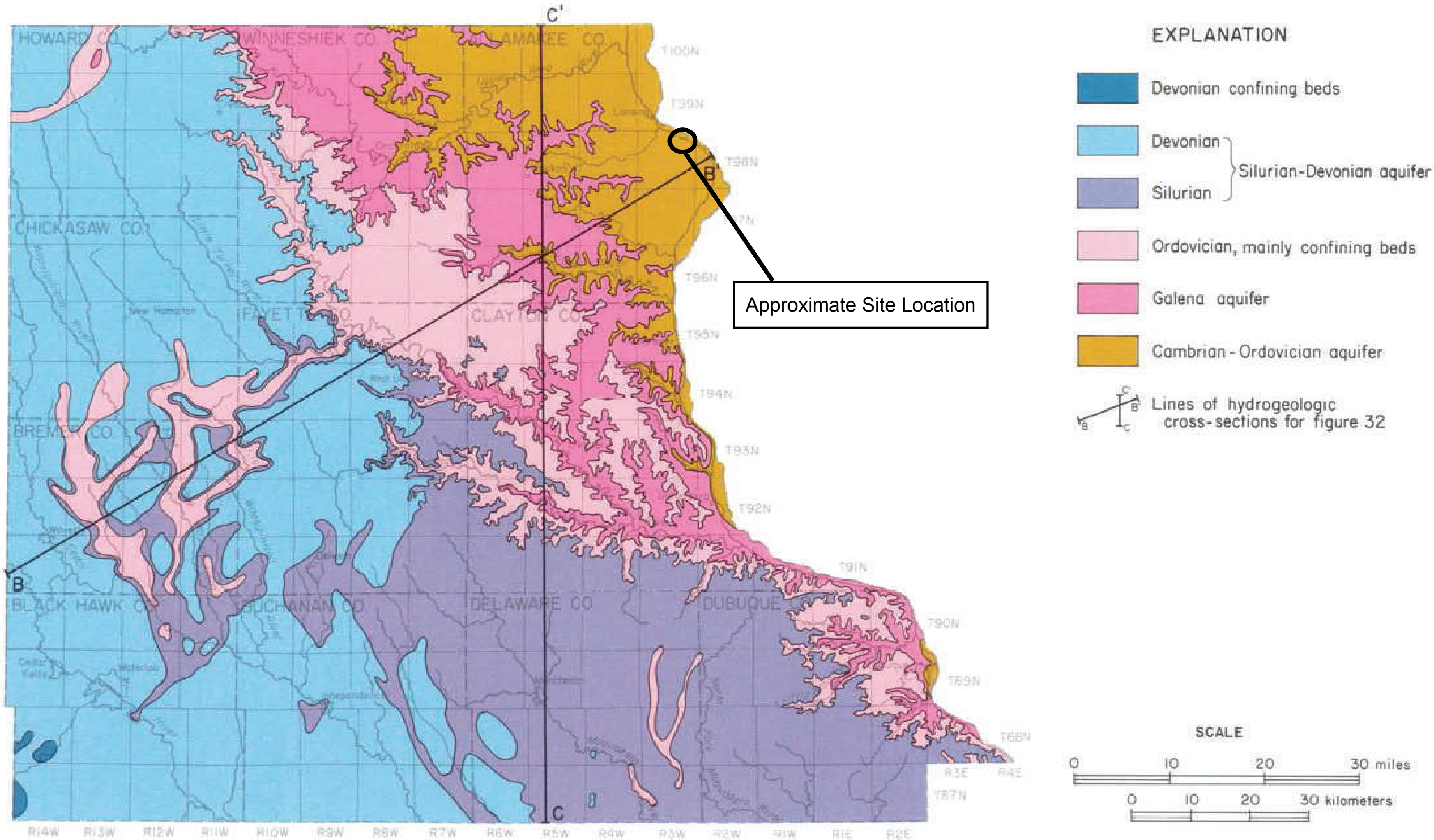

Figure 31. Bedrock hydrogeologic map

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

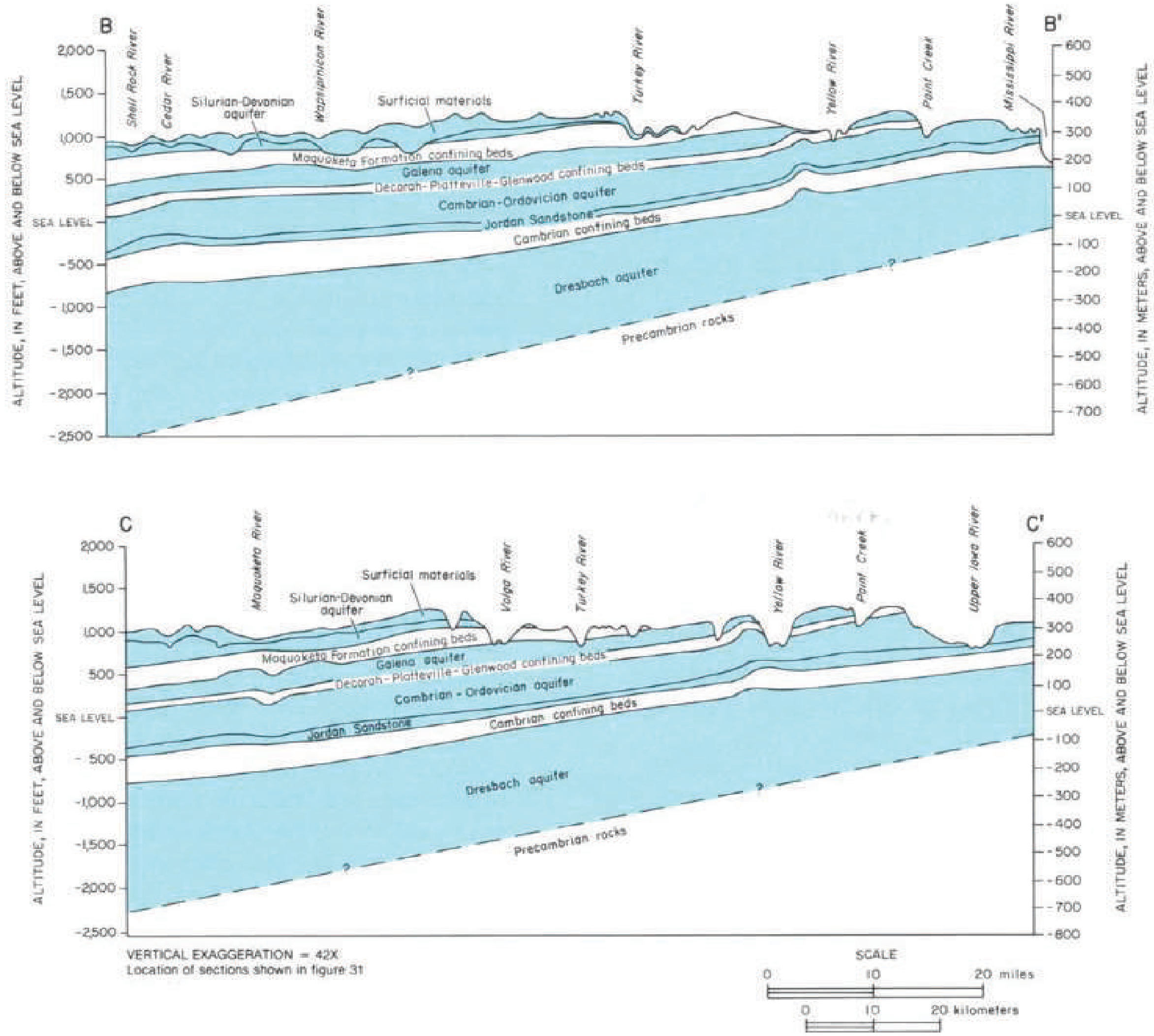

Figure 32. Hydrogeologic cross-sections

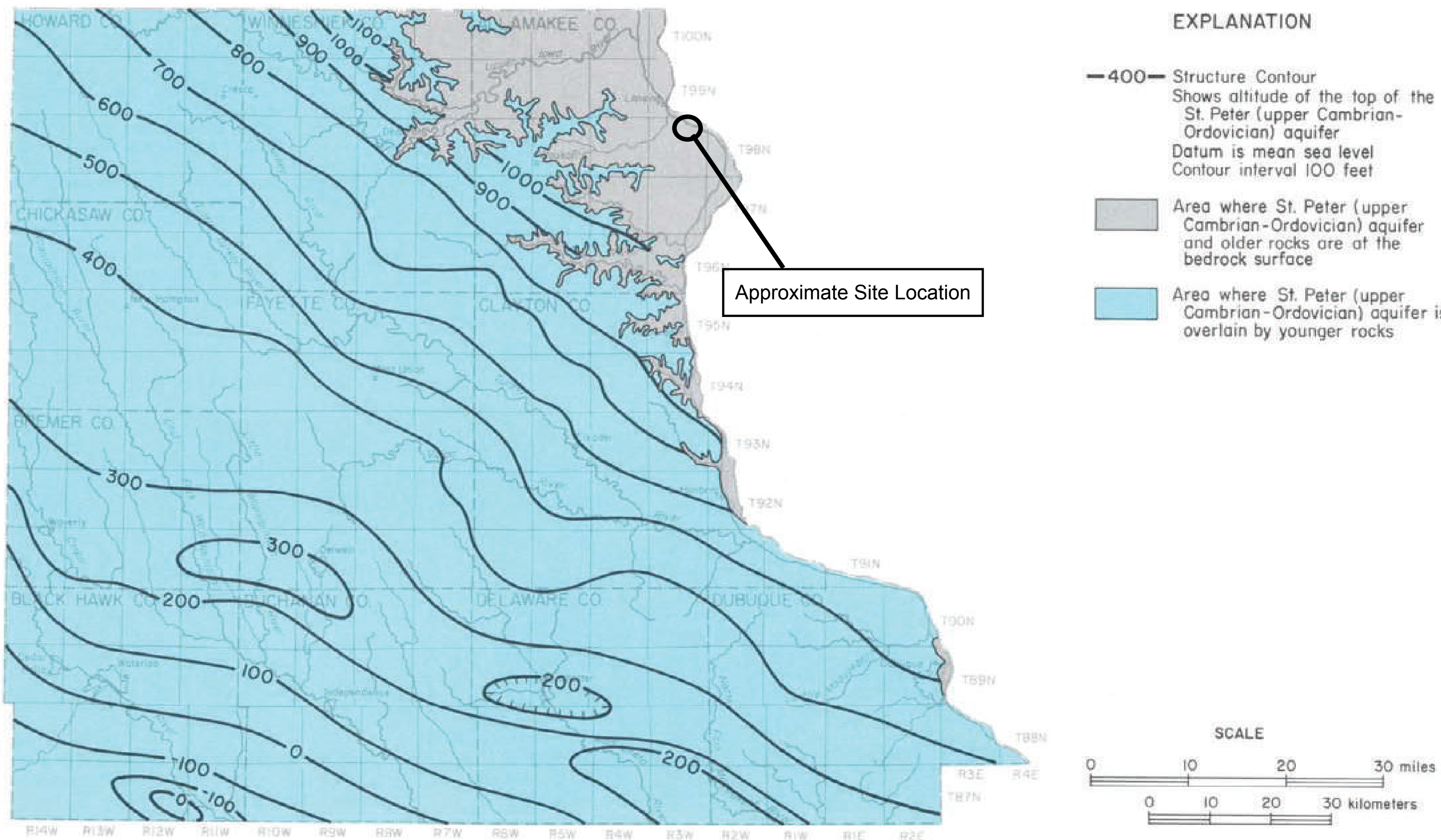

Figure 38. Altitude of the top of the St. Peter (upper Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

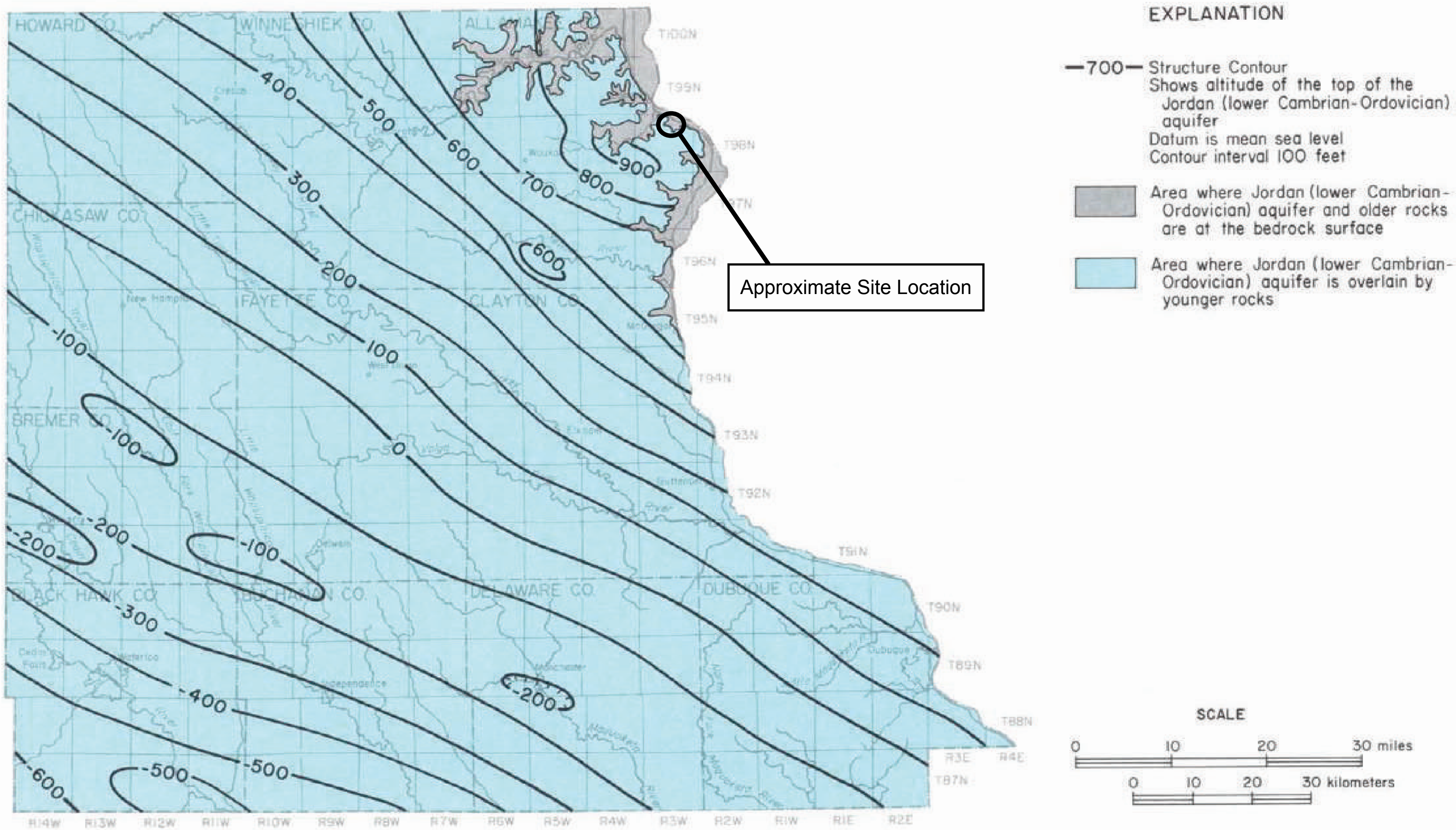

Figure 39. Altitude of the top of the Jordan (lower Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

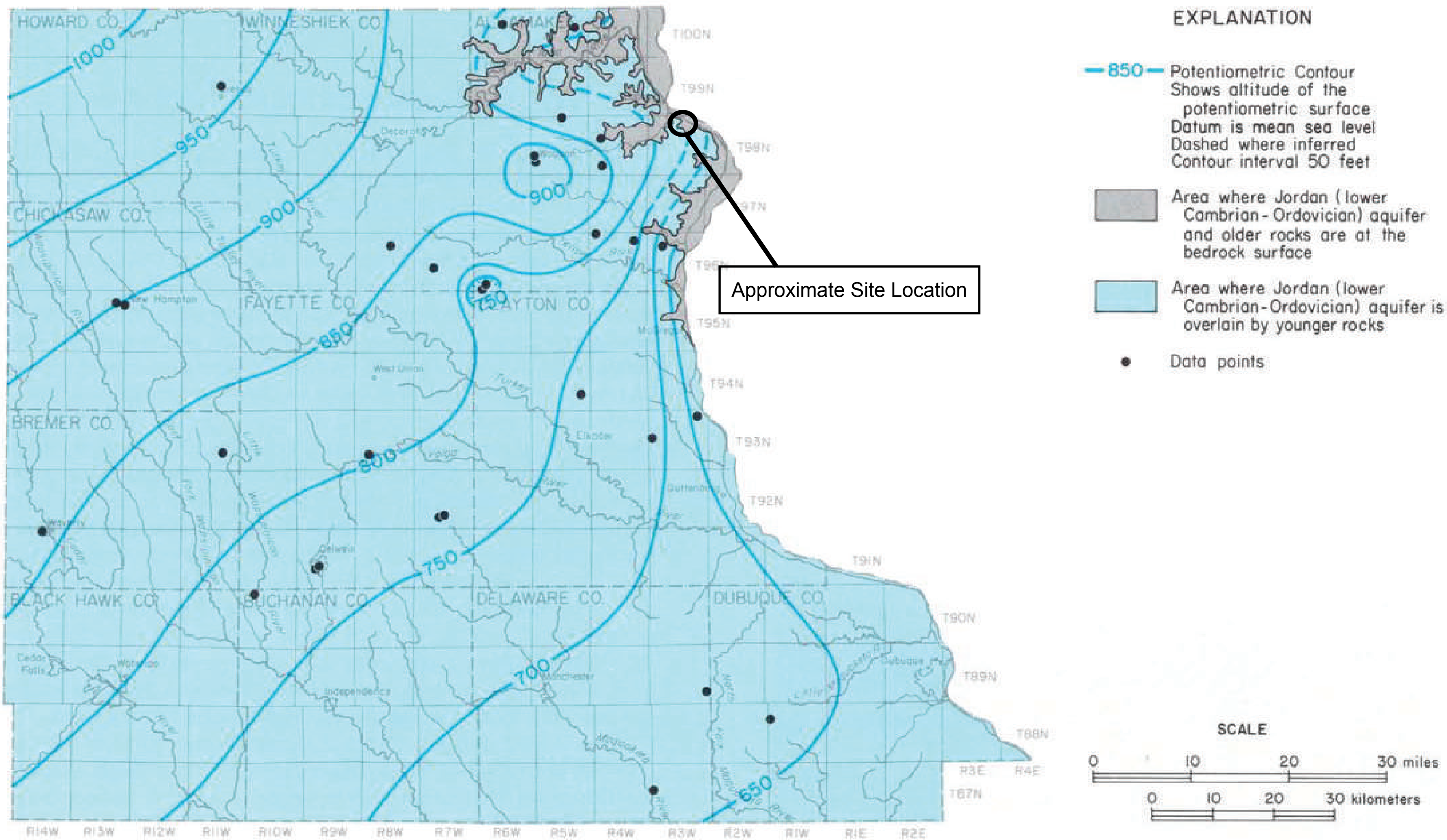

Figure 56. Potentiometric surface of the Jordan (lower Cambrian-Ordovician) aquifer

Source: Horick, Paul J., Water Resources of Northeast Iowa, Iowa Department of Natural Resources Water Atlas Number 8, October

Appendix B

Boring Logs

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					734.0	5		
					729.0	10		
					724.0	15		
					719.0	20		
					714.0	25		
					709.0	30		
					704.0	35		
					699.0	40		
					694.0	45		
					689.0	50		

0.0 to 6.0 SILT
Topsoil developed in silt from 0.0 to 1.5. Topsoil is dark brown. Clayey silt, trace sand is loess or colluvium (slopewash) derived from loess. Medium brown, changing gradually to yellow brown below 5.0.

6.0 to 37.0 TALUS
Light brown sandy silt with dolomite chunks.

37.0 to 93.5 INTERBEDDED SANDSTONE AND SILTSTONE
Sandstone is fine-grained, with quartz silt matrix, glauconitic. Siltstone contains minor amount of very fine quartz sand and glauconite. Sandstone is laminated light greenish gray with creamy color. Siltstone is light greenish gray.

Sandstone from 37.0 to 58.0.

Howard R Green Company
CONSULTING ENGINEERS

PROJECT: Interstate Power Company
PROJECT NUMBER: 717680-J
SURFACE ELEVATION: 739.3 Feet MSL
TOTAL DEPTH OF HOLE: 93.5 Feet

LOG OF MW-6
LOCATION: Lansing, Iowa
GEOLOGIST: Barbara Torney

CaCO3	K (cm/sec)			MW-6	ELEVATION (ft, msl)	DEPTH (feet)	LITHOLOGY	MATERIALS DESCRIPTION
					684.0	55		
					679.0	60		Siltstone from 58.0 to 68.0.
					674.0	65		
					669.0	70		Interbedded sandstone and siltstone from 68.0 to 78.0.
					664.0	75		
					659.0	80		Siltstone from 78.0 to 83.0
					654.0	85		No sample from 83.0 to 93.5. Likely interbedded sandstone and siltstone by comparison to same interval on log of MW-4 and MW-5. Lower few feet may be primarily siltstone.
					649.0	90		
					644.0	95		
					639.0	100		

Howard R. Green Company
CONSULTING ENGINEERS

PROJECT Interstate Power Company
PROJECT NUMBER 717880-J
SURFACE ELEVATION 739.3 Feet MSL
TOTAL DEPTH OF HOLE 93.5 Feet

LOG OF MW-6
LOCATION Lansing, Iowa
GEOLOGIST Barbara Torney

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-301

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2015	11/2/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-301	Feet	639.4 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,744 N, 5,541,108 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ____ ° ____ ' ____ "
Long ____ ° ____ ' ____ "
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–4	POORLY GRADED SAND, medium grained, very dark gray brown (10YR 3/2).	SP									
S1	23	10 31 38 48								M				
S2	24	32 47 50	4.5–7	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/4).	SP-SM					M				
S3	22	18 33 47 43	7–9.5	POORLY GRADED SAND WITH SILT AND GRAVEL, medium grained sand, large grained gravel, dark yellowish brown (10YR 3/6).	SP-SM					M				
S4	24	36 46 50	9.5–15	POORLY GRADED SAND WITH SILT, medium grained, dark yellowish brown (10YR 3/6).						S				Water @ 10 ft bgs
S5	22	13 9 7 10			SP-SM					S				

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

Signature	Firm	
[signature]	SCS Engineers 2830 Dairy Drive Madison, WI 53718	Tel: 608-224-2830 Fax:

Boring Number B-301

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	20	3 2 4	16, 17	SILT, black (10YR 3/1).	ML					S				
S7	24	2 2 2 2	18, 19	SILT WITH SAND, black (10YR 3/1).	ML					S				
S8	24	2 2 4	20, 21, 22	POORLY GRADED SAND WITH SILT, black (10YR 3/1).	SP-SM					S				
S9	24	2 9 12 14	23, 24, 25	SILT, dark olive gray (5Y 3/2).	ML					S				
			26	End of Boring at 26 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name		License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70			B-302

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/4/2015	11/4/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-302	Feet	635.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,929 N, 5,541,179 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	POORLY GRADED SAND, medium grained, dark grayish brown (10YR 4/2).	SP									
S1	24	6 14 17 19	3							M				
S2	24	26 45 50	5.5	SANDY SILT, trace small gravel, black (10YR 3/1).	ML					M				
S3	24	12 13 10 8	8							M				
S4	11	9 11 13 12	10.5							S				Saturation @ 11 ft bgs
			11	Large gravel										
S5	8	32 23 30 36	13							S				
			14	Large gravel										
			15											

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

Signature	Firm	
(signature)	SCS Engineers 2830 Dairy Drive Madison, WI 53718	Tel: 608-224-2830 Fax:

Boring Number B-302

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S6	24	5 5 6 8	16, 17	SANDY SILT, trace small gravel, black (10YR 3/1). *(continued)*	ML					S				
S7	18		18, 19, 20	Silt, Black (10YR 3/1).	ML					S				
				End of Boring at 20 ft bgs.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL- Lansing Generating Station SCS#: 25215135.70		B-303

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2015	11/2/2015	hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-303	Feet	653.9 Feet	8.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,857 N, 5,541,622 E S/C/N
NW 1/4 of SW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___" Long ___° ___' ___"
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–2.5	SILTY SAND, very dark gray (5Y 3/1).	SM									
			2.5–7	POORLY GRADED SAND, medium grained, dark grayish brown (10 YR 4/2).	SP									
S1	24	5 16 17 24	3							M				
S2	24	11 8 10	5.5							M				
			7–15	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2).	SP									
S3	24	11 38 50	8							M				
S4	18	16 35 50	10.5							M				
S5	16	27 50 50	13							M				

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

Signature: [signature] Firm: SCS Engineers, 2830 Dairy Drive Madison, WI 53718 Tel: 608-224-2830 Fax:

Boring Number B-303

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S6	0	38 50	16	POORLY GRADED SAND , medium grained, grayish brown (2.5Y 5/2). *(continued)*	SP					M				Rock in Spoon
S7	18	17 25 40 47	17–19							S				Saturation @17 ft bgs.
S8	17	37 48 44	20–21	POORLY GRADED SAND, medium grained, very dark gray (5Y 3/1).	SP					S				
S9	18	11 24 26 27	22–24							S				
S10	24	37 50	25–27							S				
			27	End of Boring at 27 ft bgs.										

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Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW304

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/15/2019	5/15/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW304	623.61 Feet MSL	635.5 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,957,893 N, 5,540,876 E S/C/N
SE 1/4 of NE 1/4 of Section 3, T 98 N, R 3 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–3	SILT, mottled, (10YR 3/2), some black coal looking material.	ML									
	12	3 6 3 3	2							M				
			3–5	LEAN CLAY, (10YR 4/3), soft, some organic material.	CL									
	18	1 2 2 1	4							W				
			5–9	SILT, (10YR 2/2), uniform, trace fine sand and clay.	ML									
	12	2 2 3 2	6							M				
	18	1 1 3 2	8							W				
			9–15	POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial).	SP									
	18	1 2 1 1	10							W				
	12	0 0 1 1	12							W				
	12	0 0 1 1	14							W				

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

Signature [signature] for Zach Watson

Firm SCS Engineers
2830 Dairy Drive, Madison, WI 53718
Tel:
Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW304

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				POORLY GRADED SAND, fine to coarse, (10YR 3/4), (Alluvial). *(continued)*	SP									
		0 0 1 1	16							W				
			17	Same as above but more coarse, (2.5YR 5/4), trace silt.										
		2 5 6 6	18							W				
			19											
			20	End of Boring at 20 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW305

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/16/2019	5/16/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW305	629.12 Feet MSL	631.8 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,958,109 N, 5,541,533 E S/C/N
SE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9.5	Hydrovaced to 9.5 feet.										
			9.5–15	FAT CLAY, dark greenish gray, (GLEY 1 3/10Y), soft, trace red sand, wood pieces and roots.	CH									
	24	1 1 1 1	11							W				
	24	0 0 0 2	13							W				
			14	Sand seams at 13.5 and 14.5 feet.										

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

Signature	Firm	
[signature] for Zach Watson	SCS Engineers 2830 Dairy Drive, Madison, WI 53718	Tel: Fax:

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW305

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				FAT CLAY, dark greenish gray, (GLEY 13/10Y), soft, trace red sand, wood pieces and roots. *(continued)*	CH					W				
			16	End of Boring at 16 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL Lansing Generating Station SCS#: 25218221.00		MW306

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Eric Wetzel Roberts Environmental Drilling, Inc.	5/16/2019	5/16/2019	4.25" HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW306	623.05 Feet MSL	636.7 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,958,977 N, 5,541,203 E S/C/N
NE 1/4 of NW 1/4 of Section 2, T 98 N, R 3 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–12	Hydrovaced to 12 feet.										
	12	1 2 4 3	12–15	POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt.	SP					W				

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

Signature	Firm	
[signature] for Zach Watson	SCS Engineers 2830 Dairy Drive, Madison, WI 53718	Tel: Fax:

Boring Number MW306

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
	18	1 2 2 4		POORLY GRADED SAND, medium to coarse, rusty in color, (10YR 4/6), trace fine silt. *(continued)*						W				
			16	Same as above but gray, (10YR 4/2).										
	18	1 1 2 2	17							W				
			18											
	18		19							W				
			20		SP									
	18		21							W				
			22											
	18	3 1 2 2	23							W				
			24											
	18	2 1 3 2	25							W				
			26	End of Boring at 26 feet.										

SCS ENGINEERS
Environmental Consultants and Contractors

SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL - Lansing Generating Station SCS#: 25218221.00		MW-302A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Paul Dickinson Cascade Drilling	12/16/2019	12/17/2019	Rotosonic

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			13.01 Feet	636.2 Feet	6 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3957930.08 N, 5541186.04 E S / C / N
SW 1/4 of NW 1/4 of Section 02 , T 98 N, R 03 W

Lat ___° ___' ___"
Long ___° ___' ___"

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

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9	Hydrovac to 9' to check for utilities.										
S1	46"		9–11	POORLY GRADED SAND with silt, clay and trace gravel, dark gray.	SP					W				
			11–13	SILT, gray, trace gravel.	ML									
S2	39"		13–16	SILTY GRAVEL WITH SAND, gray, sand is fine to medium grained, gravel is subangular to angular.	GM					W				

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

Signature	Firm	
[signature]	SCS Engineers	Tel: Fax:

Boring Number MW-302A

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			17	SILTY GRAVEL WITH SAND, gray, sand is fine to medium grained, gravel is subangular to angular. *(continued)*	GM									
			18–22	SILT, dark gray, trace roots.	ML									
S3	48"		21							W				
			22–29	LEAN CLAY, dark gray, roots.	CL									
S4	40"		26	Same but dark brown.						W				
			29–31	SILTY SAND, gray to dark gray, fine to medium grained.	SM									
			31–33	LEAN CLAY, tan with yellow to brown mottling and gray layers, trace silt.	CL									
S5	48"		31.5							W				
			33–36	LEAN CLAY, reddish brown, massive, very dense.	CL									
			36–39	LEAN CLAY, gray.	CL									
S6	48"		36.5							W				
			39–	POORLY GRADED SAND, brown, fine to medium grain, trace gravel.	SP									
S7	48"		42	Same with trace shells						W				

Boring Number MW-302A

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			43	POORLY GRADED SAND, brown, fine to medium grained, trace gravel. *(continued)*	SP									
			44	SILTY GRAVEL, light brown, subangular.	GM									
			45											
			46	LEAN CLAY, mostly light brown, trace gray, trace silt.	CL									
S8	48"		47							W				
			48											
			49	SILTY GRAVEL WITH SAND, light brown, gravel is subangular.	GM									
			50	End of boring at 50 feet.										

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SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL - Lansing Generating Station SCS#: 25218221.00		MW-304A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Paul Dickinson Cascade Drilling	12/18/2019	12/19/2019	Rotosonic

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			10.7 Feet	635.6 Feet	6 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3957884.99 N, 5540876.5 E S / C / N
SE 1/4 of NE 1/4 of Section 03 , T 98 N, R 03 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Allamakee	Lansing

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–10	Hydrovac to 9' to check for utilities.										
			10–11	SILT, grayish brown, toots and sticks.	ML									
S1	49"		11–14	POORLY GRADED SAND WITH SILT AND GRAVEL, fine to medium grained, reddish brown.	SP-SM					W				
			14–16	POORLY GRADED SAND, reddish brown, fine to medium grained.	SP									

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

Signature	Firm	
[signature]	SCS Engineers	Tel: Fax:

Boring Number MW-304A

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			17	POORLY GRADED SAND, reddish brown, fine to medium grained. *(continued)*										
S2	21"		18							W				
			19		SP									
			20	Same but light brown, mostly fine grained.										
			21											
			22											
S3	59"		23	SANDY SILT, brown, fine grained.						W				
			24											
			25											
			26		ML									
			27											
S4	24"		28							W				
			29											
			30	SILTY SAND, light brown, fine grained.										
			31											
			32											
S5	30"		33		SM					W				
			34											
			35											
			36	POORLY GRADED SAND, light brown, fine to medium grained.										
			37											
S6	57"		38		SP					W				
			39											
			40											
			41	POORLY GRADED SAND, orange, fine grained.	SP									
			42	SANDY SILT WITH GRAVEL, sand is fine grained.	ML									

Boring Number MW-304A

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
S7	54"		43–45	SANDY SILT WITH GRAVEL, sand is fine grained. *(continued)*	ML					W				
S8	9"		45–46	POORLY GRADED SAND, light brown, fine grain, trace coarse grained.	SP					W				
S9	48"		46–51	SANDY SILT WITH GRAVEL, light brown with trace yellow, fine grained.	ML					W				
			51	End of boring at 51 feet.										

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SOIL BORING LOG INFORMATION

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name: IPL - Lansing Generating Station SCS#: 25218221.00	License/Permit/Monitoring Number:	Boring Number: MW-306A	
Boring Drilled By: Name of crew chief (first, last) and Firm: Paul Dickinson, Cascade Drilling	Date Drilling Started: 12/17/2019	Date Drilling Completed: 12/18/2019	Drilling Method: Rotosonic
Unique Well No. / DNR Well ID No. / Common Well Name:	Final Static Water Level: 16.3 Feet	Surface Elevation: 636.7 Feet	Borehole Diameter: 6 in
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒ State Plane 3958980.99 N, 5541196.46 E S/C/N; NE 1/4 of NW 1/4 of Section 02, T 98 N, R 03 W	Lat ° ' " Long ° ' "	Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W	
Facility ID:	County: Allamakee	Civil Town/City/ or Village: Lansing	

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0–9	Hydrovac to 9' to check for utilities.										
S1	52"		10–16	POORLY GRADED SAND, reddish brown, trace shells, medium grained.	SP					W				

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

Signature: [signature] | Firm: SCS Engineers | Tel: | Fax:

Boring Number MW-306A

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				POORLY GRADED SAND, reddish brown, trace shells, medium grained. *(continued)*										
			17											
S2	56"									W				
			18		SP									
			19											
			20	POORLY GRADED SAND, gray, fine to medium grained, trace coarse grained and shells.										
			21											
			22											
S3	57"									W				
			23											
			24											
			25	Same, mostly medium grained with fine grained.										
			26											
			27											
S4	54"									W				
			28											
			29											
			30	Same, fine to medium grained with trace coarse grained.	SP									
			31											
			32											
S5	58"									W				
			33											
			34											
			35	Same with shell fragments.										
			36											
			37											
S6	53"									W				
			38											
			39											
			40											
			41	LEAN CLAY, dark gray, massive, very dense with roots and sticks.										
			42		CL									

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SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-306A

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S7	58"		43–44	LEAN CLAY, dark gray, massive, very dense with roots and sticks. *(continued)*	CL					W				
S8	52"		44–50	POORLY GRADED SAND, gray to dark gray, fine grained, trace coarse grain with shell fragments.	SP					W				
			50–52	POORLY GRADED SAND, light gray, fine to medium grained.	SP									
S9	58"		52–56	POORLY GRADED SAND, reddish tan, fine to medium grained with shell fragments.	SP					W				
			56	End of boring at 56 feet.										

Appendix C

Hydrogeochemical Conceptual Model and Preliminary Summary of Groundwater Contaminant Attenuation

ReSolution Partners, LLC

Subject: Arsenic assessment in response to November 2020 information

From: Bernd W. Rehm Date: 24 November 2020

Project: SCS – Alliant Lansing GS CCR Evaluations 158-002a

Introduction.

One of the seven monitoring wells on the downgradient perimeter of the Lansing Generating Station Ash Pond (MW-302) consistently exceed the arsenic groundwater protection standard of 10 µg/L. One well (MW-304A) consistently exceeded the molybdenum groundwater protection standard of 100 µg/L. However, this well appears to sample groundwater that cannot be affected by potential releases from the Ash Pond.

This document focuses on the potential application of monitored natural attenuation with respect to arsenic in the Selection of Remedy for the Ash Pond.

Conceptual Site Model.

Hydrogeology. The monitoring wells except for the background well (MW-6) are completed in surficial sediments consisting of sand, silt and clay layers and lenses. MW-6 is completed in the underlying bedrock consisting of interbedded sandstone and siltstone because the overlying soils are above the water table.

Shallow groundwater generally flows from the south southeast to the north northwest, entering the south side of the Upper Ash Pond and discharging from the north side. The Upper Ash Pond water elevation is assumed to be on the order of 645 to 650 feet. The water table elevation immediately downgradient of the Upper and Former Lower Ash Ponds in May 2020 ranged from 637.98 to 627.68 feet. Immediate downgradient of MW-302 is Unnamed Creek 2 with a water elevation of ~621 feet. MW-305 and MW-1 to the north of the ditch had water levels of 627.24 and 629.38 feet. This shows that the Unnamed Creek 2 is a gaining stream and that Unnamed Creek 2 is likely a drainage divide, with shallow groundwater from beneath the Coal Pile flowing to the southwest toward the Unnamed Creek 2 and to the northwest to MW-306. The hydraulic head at MW-302A is 623.19 feet indicating that groundwater is likely flowing upward toward Unnamed Creek 2 from depths on the order of 50 feet below ground surface.

MW-304 and -304A are separated from the Ash Ponds and the other monitoring wells by an Unnamed Creek 1 that flows along the southwest side of the Upper Ash Pond. The

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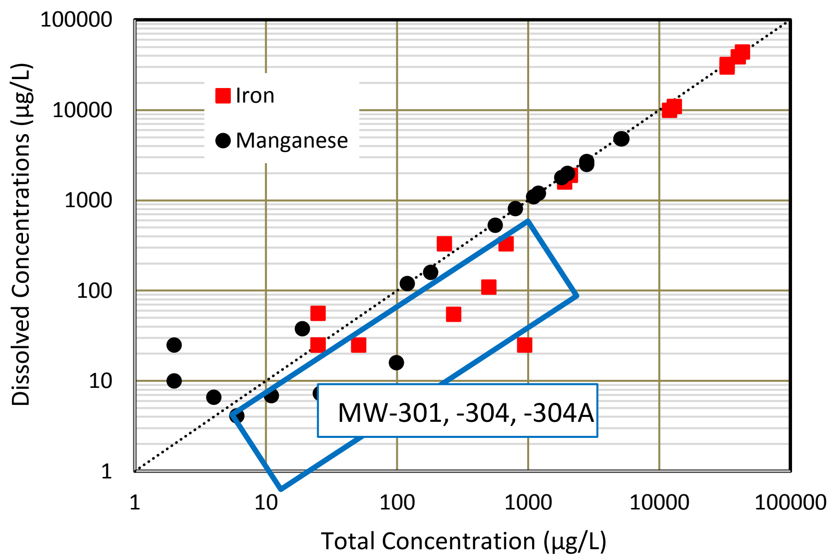
water table at MW-304 is 621.57 feet and the hydraulic head at MW-304A is 624.88. The surface water elevation for Unnamed Creek 1 is not known so it cannot be determined whether the Unnamed Creek 1 is a groundwater divide between MW-304 and the Upper Ash Pond groundwater. The vertical gradient at this well cluster is upwards, suggesting that the Unnamed Creek 1 may be a divide.

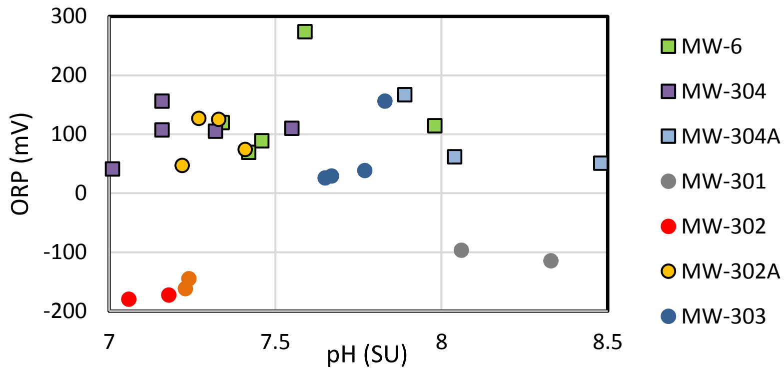
Geochemistry. The geochemistry evaluation focuses on data collected in 2019 and 2020. Selected portions of that data set that are used in this evaluation are summarized in Table 1. In the discussions, it is assumed that groundwater from MW-6, -304 and -304A represents background water quality unaffected by the Ash Pond. MW-306 and -306A are also not included because it appears to be separated from the Ash Pond and the Unnamed Creek 1 and 2 groundwater divide.

Most groundwater samples collected to date have been analyzed for total element contents that represent the sum of dissolved elements and elements associated with suspended sediment. Except for MW-304 and -305 the suspended sediment contents have been low as estimated by turbidity. This is reflected in the correlation between dissolved and total concentrations for iron and manganese.

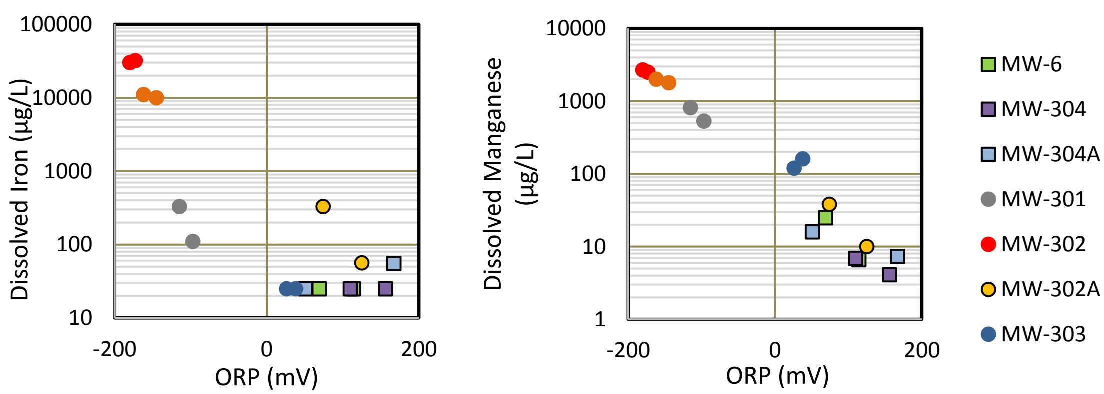


The one pair of measurements of dissolved and total arsenic at MW-302 reflected comparable concentrations of 45 and 48 µg/L.

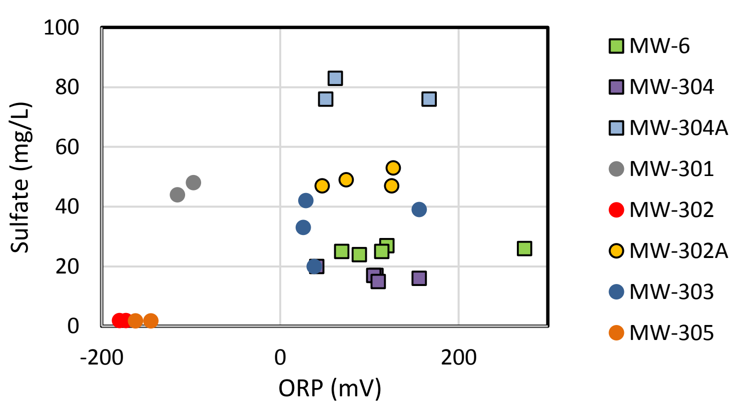
The pH and redox are the master variables that significantly control the chemistry and environmental fate of arsenic. The groundwater is near neutral in pH with most wells reflecting high ORP oxic conditions. The exceptions are MW-301, -302 and -305 with screens in dark olive to black silt or clay.



The soil colors suggest reducing conditions and the potential for organic carbon to drive the low ORP reducing conditions. The concentrations of dissolved iron and manganese are negatively correlated with ORP as anoxic conditions favor the dissolution of iron and manganese oxyhydroxides.



Sulfate would also be expected to reflect the presence of the reducing conditions as the sulfate is reduced to sulfide.



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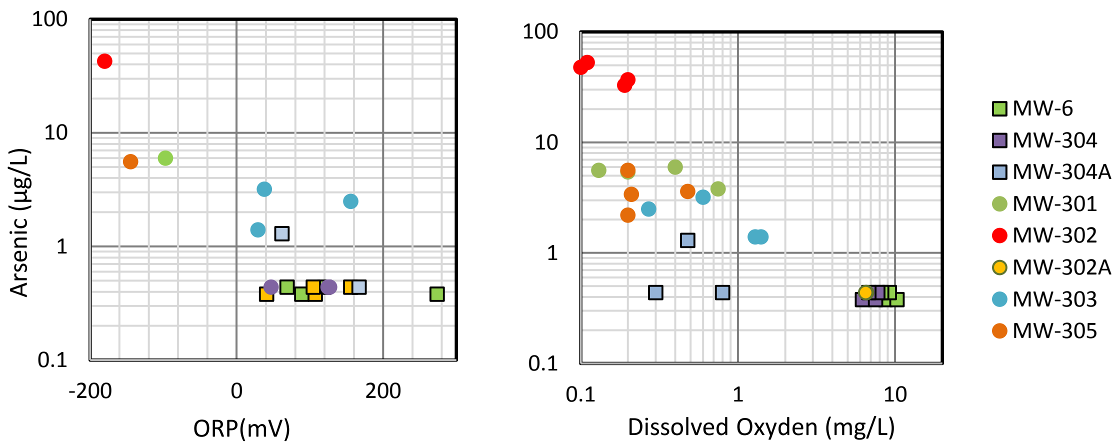
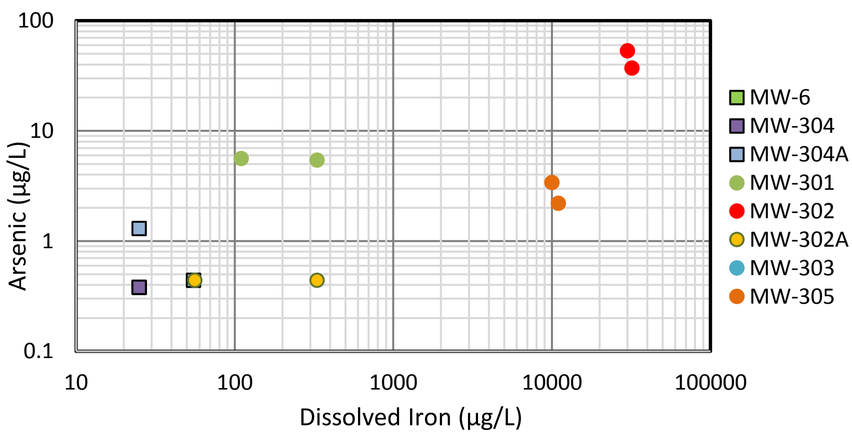
This may be occurring at MW-302 and -305 as the ORP falls below -150 mV assuming that sulfate is flowing into this area.

Note that MW-302A chemistry is similar to other wells unaffected by potential Ash Pond releases. It may reflect background groundwater quality that is flowing upward towards the Unnamed Creek 2.

Arsenic concentrations are a function of ORP or dissolved oxygen as a surrogate to supplement a limited number of ORP observations.



Arsenic is not present in background groundwater and there is no correlation with ORP or DO. When arsenic is present, the concentration increases as the groundwater becomes more reducing. This could be due to the reduction of arsenate (As^{5+}) to arsenite (As^{3+}), or due to the dissolution of iron oxyhydroxides that may release absorbed arsenic as noted in this chart.



As the anoxic groundwater with dissolved iron and arsenic moves toward a more aerobic environment, it will be exposed to the atmosphere and the dissolved oxygen content and

ORP will increase. This will result in the precipitation of iron oxyhydroxides, which will remove arsenic from solution by adsorption.

Given the uncertainties in groundwater-surface interactions it is not feasible to estimate the mass of arsenic dissolved in the groundwater.

Recommendations for Additional Assessment of Site-Specific Monitored Natural Attenuation

The hydrogeological and geochemical conceptual models need to be better defined at a very small scale to better understand the potential arsenic migration pathways:

- Installation of surveyed staff gages:
  - in the Upper and Lower Ash Pond,
  - in Unnamed Creek 2 near MW-302, -305 and MW-1 and
  - in Unnamed Creek 1 southwest of the site near MW-304, MW-14 and north of the railroad bridge.

- Installation of an additional water table monitoring well(s) between the coal pile and the Unnamed Creek 1 could help in confirming if groundwater is flowing from the beneath the coal pile to the Unnamed Creek 1.

- Concurrent seasonal measurements of groundwater and surface water levels to determine discharge relationships.

- Surface water at the suggested staff gage locations should also be sampled concurrently with groundwater for analyses of field parameters; filtered and total major cations, arsenic, iron and manganese; and major anions to assess geochemical changes that may result as groundwater moves from an anaerobic to an aerobic environment.

- Future groundwater sampling no longer needs to include aliquots filtered at 0.45 µm.

- Continue to include the measurement of oxidation-reduction potential with groundwater field analyses.

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Table 1. Geochemical data for Lansing GS.

Location	Collection Date	Field pH	Field SEC	Field Temp.	Oxygen, Dissolved	Tur-bidity	Field ORP	As- T	As- D	Fe- T	Fe- D	Mn-T	Mn-D	Sulfate
		SU	µS	deg C	mg/L	NTU	mV	µg/L						mg/L
MW-301	4/15/2019	8.47	539	11.3	0.2	9		5.4						51
	10/2/2019	8.11	502	15.6	0.1	1		5.6						56
	5/19/2020	7.85	474	11.3	0.8	1		3.8						34
	8/18/2020	8.33	476	15.0	0.2	2	-115			680	330	800	810	44
	10/19/2020	8.06	489	14.7	0.4	1	-97	6.0		500	110	560	530	48
	Average	**8.16**	**496**	**13.6**	**0.3**	**3**	**-106**	**5.2**		**590**	**220**	**680**	**670**	**47**
MW-302	4/15/2019	7.66	1089	7.1	0.2	18		37						0.9
	10/2/2019	7.15	1049	15.9	0.1	5		53						0.9
	5/20/2020	6.93	1070	8.7	0.2	4		33						1.9
	8/19/2020	7.18	1039	16.2	0.1	4	-173		46	33000	32000	2800	2500	1.9
	10/19/2020	7.06	1074	14.4	0.1	3	-180	48	44	33000	30000	2800	2700	1.9
	Average	**7.20**	**1064**	**12.5**	**0.1**	**7**	**-177**	**43**	**45**	**33000**	**31000**	**2800**	**2600**	**1.5**
MW-302A	5/20/2020	7.27	644	11.7	6.6	12	127	0.44						53
	7/6/2020	7.22	641	11.7	6.6	5	47	0.44						47
	8/19/2020	7.41	638	11.8	6.2	0	74			230	330	19	38	49
	10/19/2020	7.33	650	11.4	6.5	1	125	0.44		25	56	2	10	47
	Average	**7.31**	**643**	**11.7**	**6.5**	**4**	**93**	**0.44**		**128**	**193**	**11**	**24**	**49**
MW-303	4/15/2019	7.95	448	4.2	1.4	7		1.4						35
	10/2/2019	7.83	409	25.2	0.3	1	156	2.5						39
	5/19/2020	7.67	464	6.3	1.3	0	29	1.4						42
	8/19/2020	7.65	468	30.4	0.2	2	26			25	25	120	120	33
	10/19/2020	7.77	340	23.5	0.6	0	38	3.2		25	25	180	160	20
	Average	**7.77**	**426**	**17.9**	**0.8**	**2**	**62**	**2.1**		**25**	**25**	**150**	**140**	**34**

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Location	Collection Date	Field pH	Field SEC	Field Temp.	Oxygen, Dissolved	Tur-bidity	Field ORP	As- T	As- D	Fe- T	Fe- D	Mn-T	Mn-D	Sulfate
		SU	µS	deg C	mg/L	NTU	mV	µg/L						mg/L
MW-304	6/20/2019	7.01	593	10.6	6.2	104*	41	0.38						20
	10/2/2019	7.16	578	12.4	7.5	4	107	0.38						17
	5/20/2020	7.32	574	9.0	7.8	4	105	0.44						17
	8/19/2020	7.55	583	11.8	6.8	1	110			51	25	11	6.9	15
	10/19/2020	7.16	602	11.8	6.8	0.4	156	0.44		25	25	6.0	4.1	16
	Average	**7.24**	**586**	**11.1**	**7.0**	**2.2**	**104**	**0.41**		**38**	**25**	**9**	**6**	**17**
MW-304A	5/20/2020	8.04	529	12.6	0.5	586	62	1.3						83
	7/6/2020	7.90	541	19.1	0.3	182		0.44						77
	8/19/2020	8.48	533	14.0	0.3	240	51			940	25	99	16	76
	10/19/2020	7.89	547	10.1	0.8	90	167	0.44		270	55	26	7.3	76
	Average	**8.08**	**538**	**14**	**0.5**	**274**	**93**	**0.73**		**605**	**40**	**63**	**12**	**78**
MW-305	6/20/2019	7.19	638	15.5	0.2	10	27*	2.2						24
	10/2/2019	7.03	635	19.0	0.2	9		3.4						26
	5/19/2020	6.90	684	9.8	0.5	20		3.6						1.8
	8/18/2020	7.23	654	19.0	0.1	27	-162			13000	11000	2000	2000	1.8
	10/20/2020	7.24	634	15.6	0.2	4	-145	5.6		12000	10000	1800	1800	1.8
	Average	**7.12**	**649**	15.8	0.2	**14**	**-154**	**3.7**		**12500**	**10500**	**1900**	**1900**	**11**
MW-306	6/20/2019	6.87	1632	13.8	1.0	26	22*	8.6						280
	10/2/2019	9.00	1998	16.3	0.3	4		12						140
	12/5/2019	6.76	2196	16.3	0.9	10		9.3						
	2/5/2020	6.95	2477	13.7	0.2	4		9.4						
	5/19/2020	6.66	2332	12.7	0.3	3		8.5						430
	8/18/2020	7.12	1911	15.0	0.1	0	-139			43000	44000	5200	4800	260
	10/20/2020	6.88	1832	16.2	0.3	3	-142	10		40000	39000	5100	4800	220
	Average	**7.18**	**2054**	**14.9**	**0.4**	**7**	**-141**	**9.6**		**41500**	**41500**	**5150**	**4800**	**303**
MW-306A	5/19/2020	6.99	697	14.6	1.2	4		0.44						44
	7/6/2020	7.04	683	15.3	1.2	1		0.44						40
	8/18/2020	7.38	654	15.5	1.2	3	21			2100	1900	1200	1200	41
	10/20/2020	7.18	681	14.4	1.3	2	-39	0.44		1900	1600	1100	1100	41
	Average	**7.15**	**679**	**15.0**	**1.2**	**3**	**-9**	**0.44**		**2000**	**1750**	**1150**	**1150**	**42**

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ReSolution Partners, LLC

Location	Collection Date	Field pH	Field SEC	Field Temp.	Oxygen, Dissolved	Tur-bidity	Field ORP	As- T	As- D	Fe- T	Fe- D	Mn-T	Mn-D	Sulfate
		SU	µS	deg C	mg/L	NTU	mV	µg/L						mg/L
MW-6	4/15/2019	7.59	618	10.0	8.7	1	274	0.38						26
	10/2/2019	7.46	590	10.0	10.3	1	89	0.38						24
	5/20/2020	7.34	597	10.0	9.2	0	120	0.44						27
	8/19/2020	7.98	597	9.8	9.5	0	114			25	25	4	6.6	25
	10/20/2020	7.42	578	9.7	8.2	0	69	0.44		25	25	2	25	25
	Average	**7.56**	**596**	**9.9**	**9.2**	**0.3**	**133**	**0.41**		**25**	**25**	**3**	**16**	**25**

Notes: 0.44 Green shading indicates value is 1/2 of the laboratory reporting limit

* Possible outlier, not used in statistical summary.

T - total co0ncentrations

D- dissolved concentrations

967 Jonathon Drive • Madison, WI • 53713

Appendix D

Mann-Kendall Trend Test

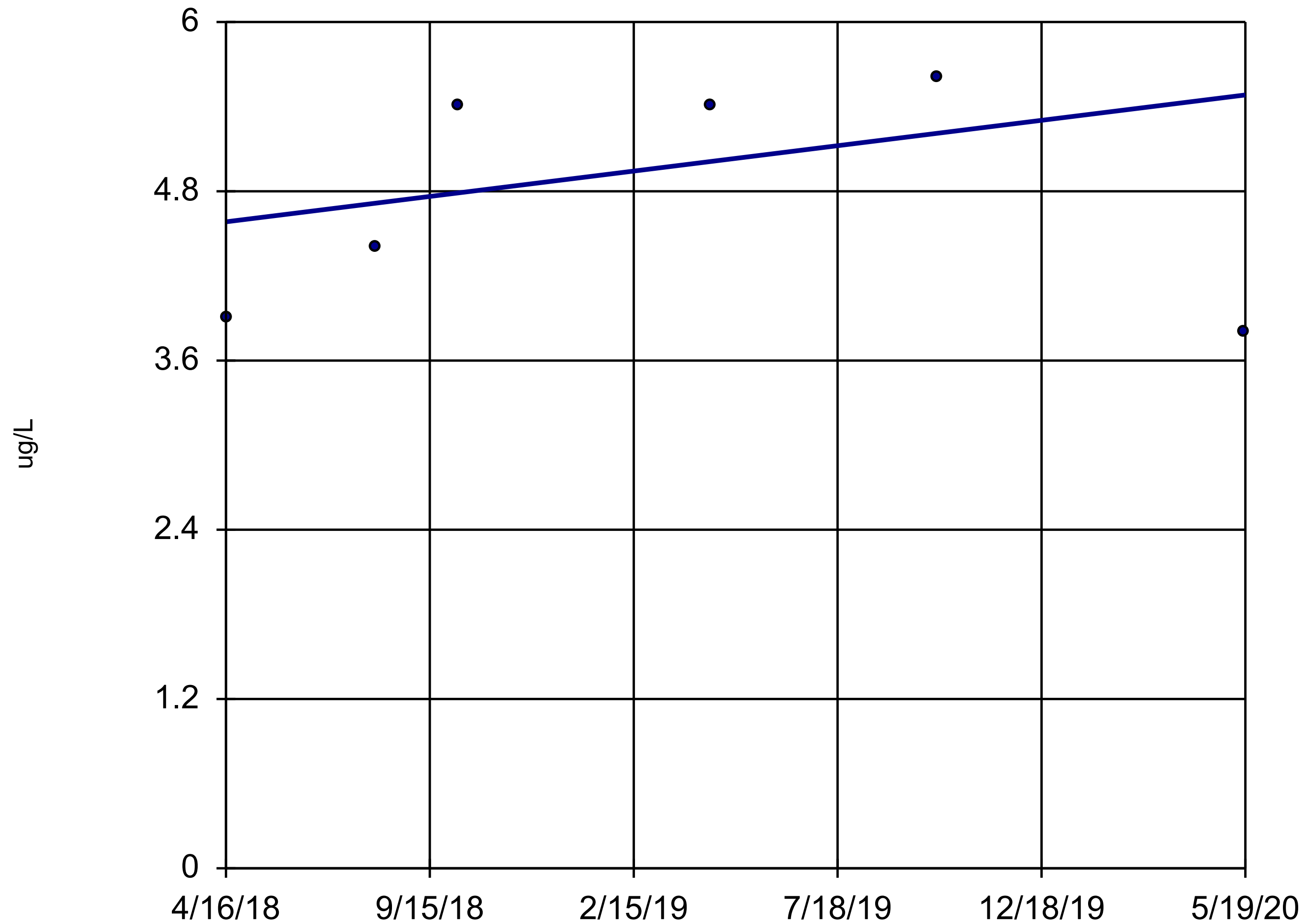
Trend Test

Lansing Generating Station   Client: SCS Engineers   Data: LAN_Export_201121_Rev   Printed 11/21/2020, 6:07 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Arsenic (ug/L)	MW-301	0.4294	4	13	No	6	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-302	2.643	3	13	No	6	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-302A	0	NaN	NaN	No	2	100	n/a	n/a	NaN	NP
Arsenic (ug/L)	MW-303	0.09555	3	13	No	6	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-304	0.1416	NaN	NaN	No	3	100	n/a	n/a	NaN	NP
Arsenic (ug/L)	MW-304A	-3.262	NaN	NaN	No	2	50	n/a	n/a	NaN	NP
Arsenic (ug/L)	MW-305	1.53	NaN	NaN	No	3	0	n/a	n/a	NaN	NP
Arsenic (ug/L)	MW-306	-0.9342	-2	-10	No	5	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-306A	0	NaN	NaN	No	2	100	n/a	n/a	NaN	NP
Arsenic (ug/L)	MW-6 (bg)	0.3471	12	13	No	6	50	n/a	n/a	0.02	NP

Sen's Slope Estimator

MW-301



n = 6

Slope = 0.4294 units per year.

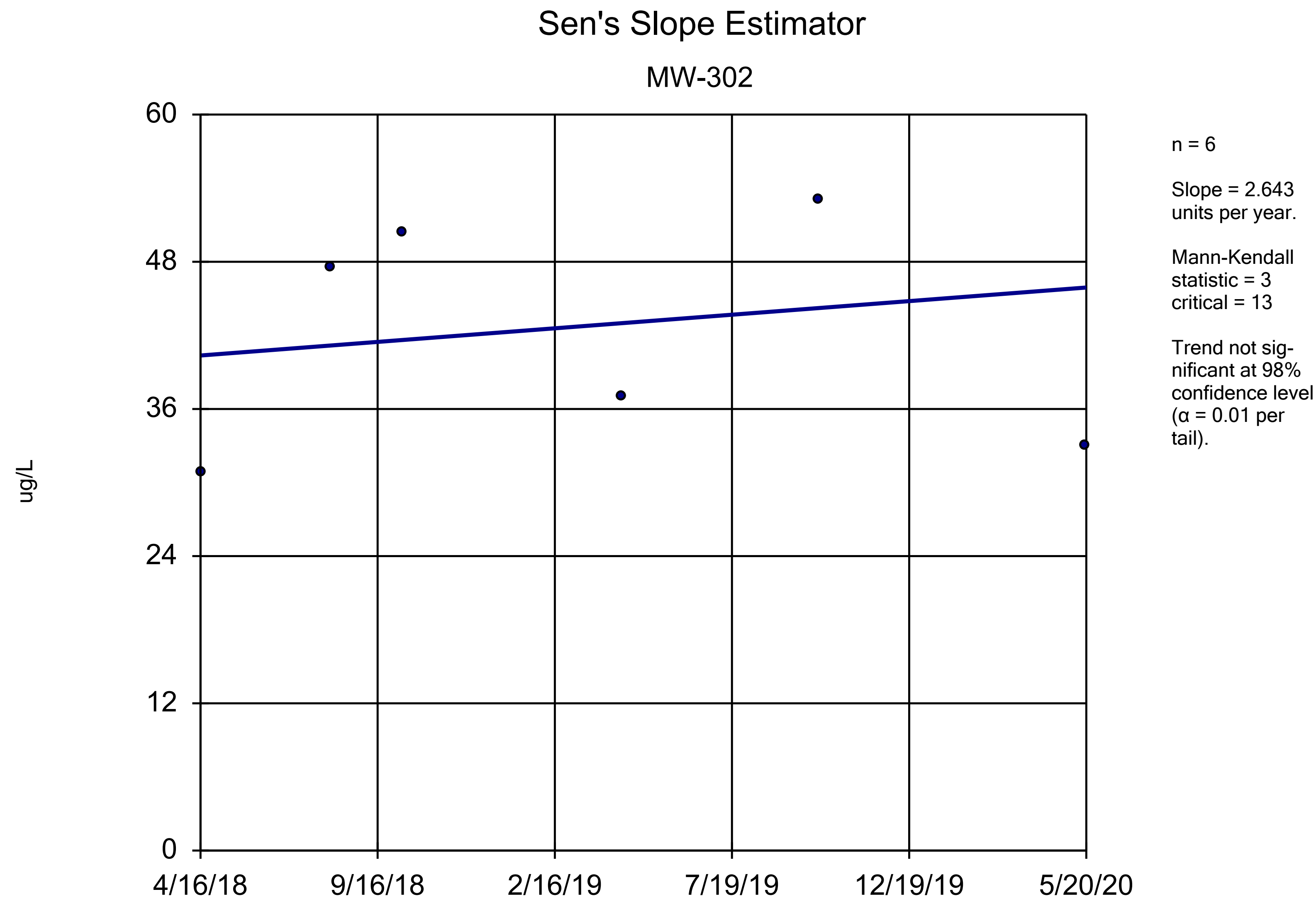
Mann-Kendall statistic = 4 critical = 13

Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 11/21/2020 6:05 PM

Lansing Generating Station Client: SCS Engineers Data: LAN_Export_201121_Rev

Sanitas™ v.9.6.27 Software licensed to SCS Engineers. UG



Constituent: Arsenic   Analysis Run 11/21/2020 6:05 PM

Lansing Generating Station   Client: SCS Engineers   Data: LAN_Export_201121_Rev

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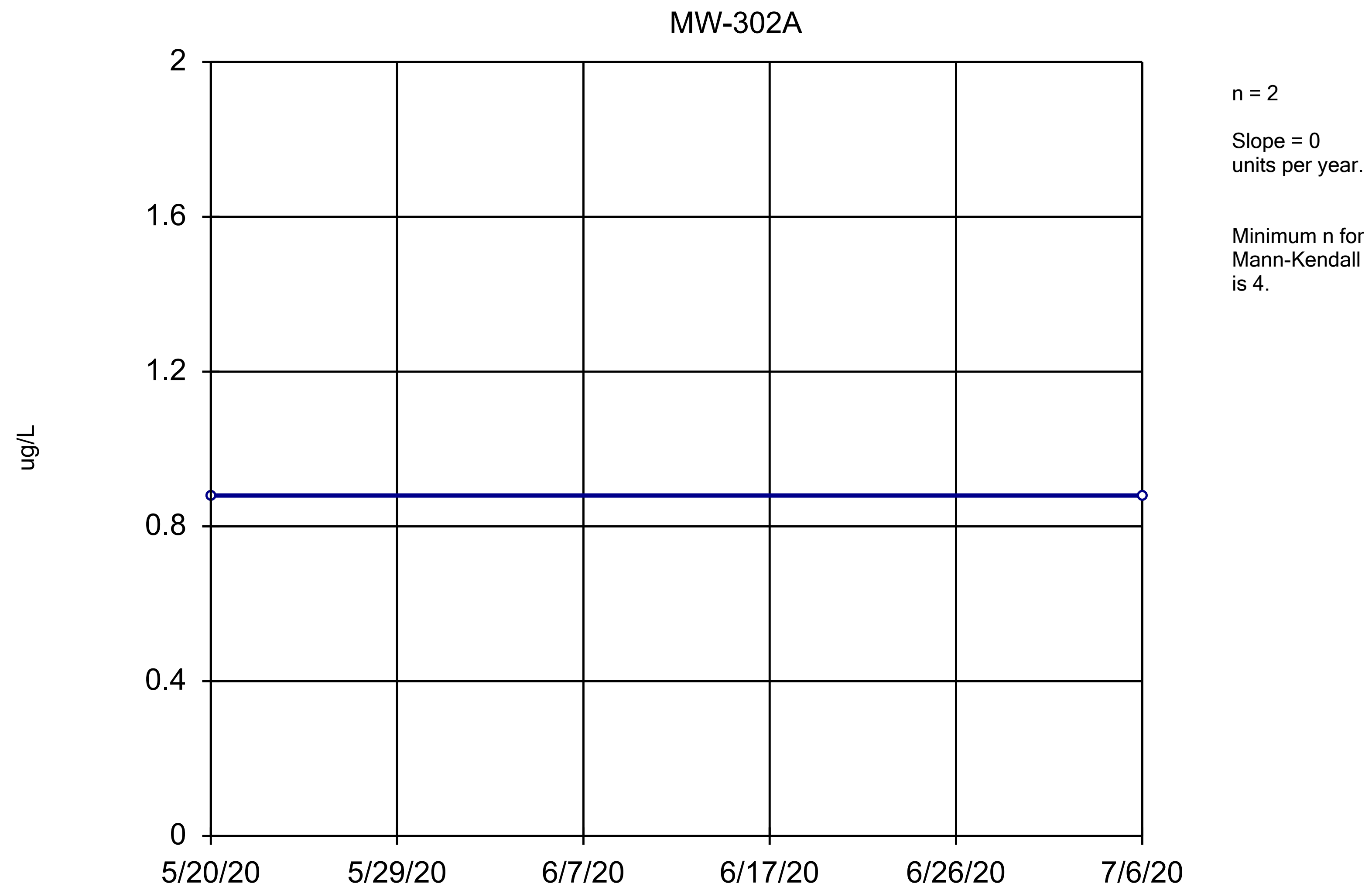
Hollow symbols indicate censored values.

Sen's Slope Estimator



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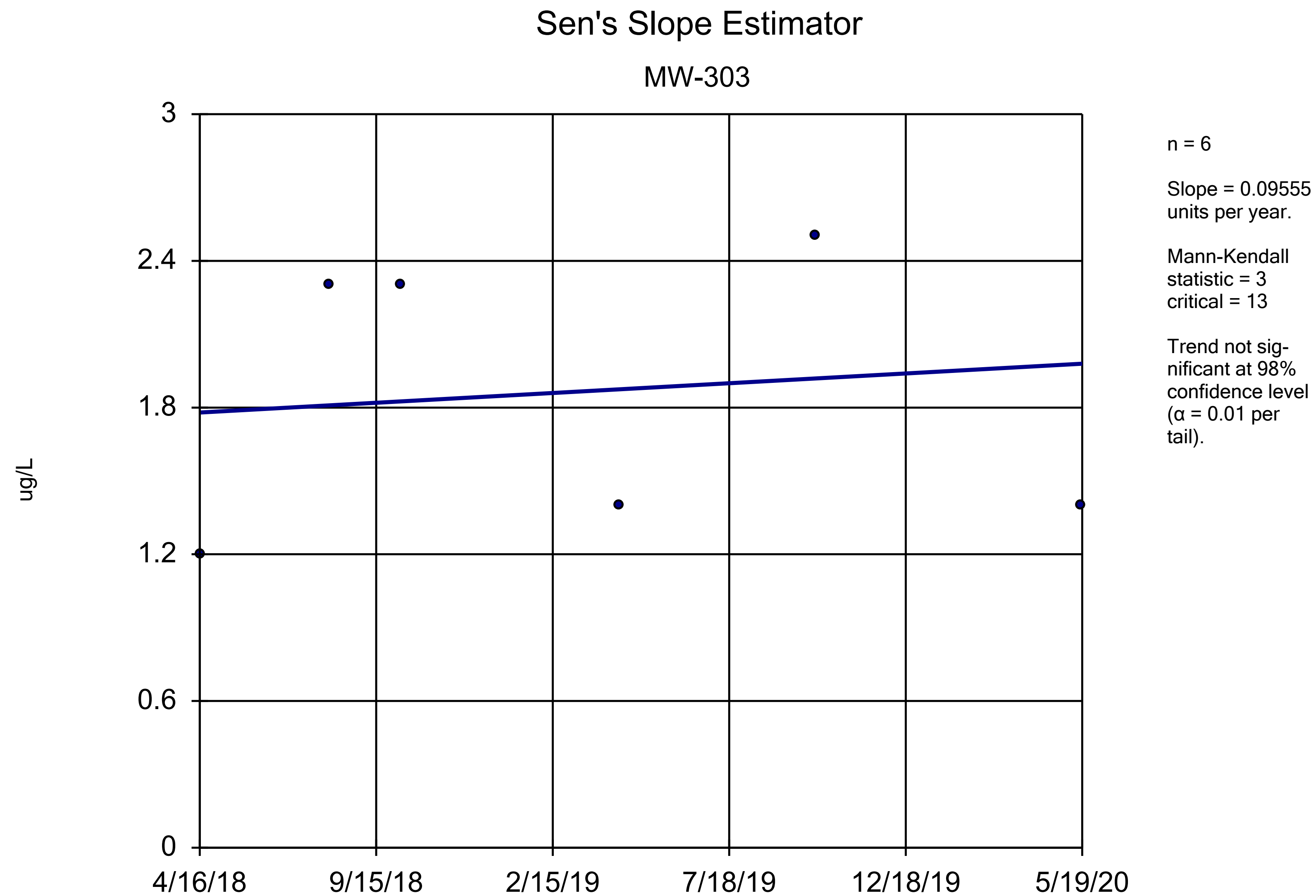

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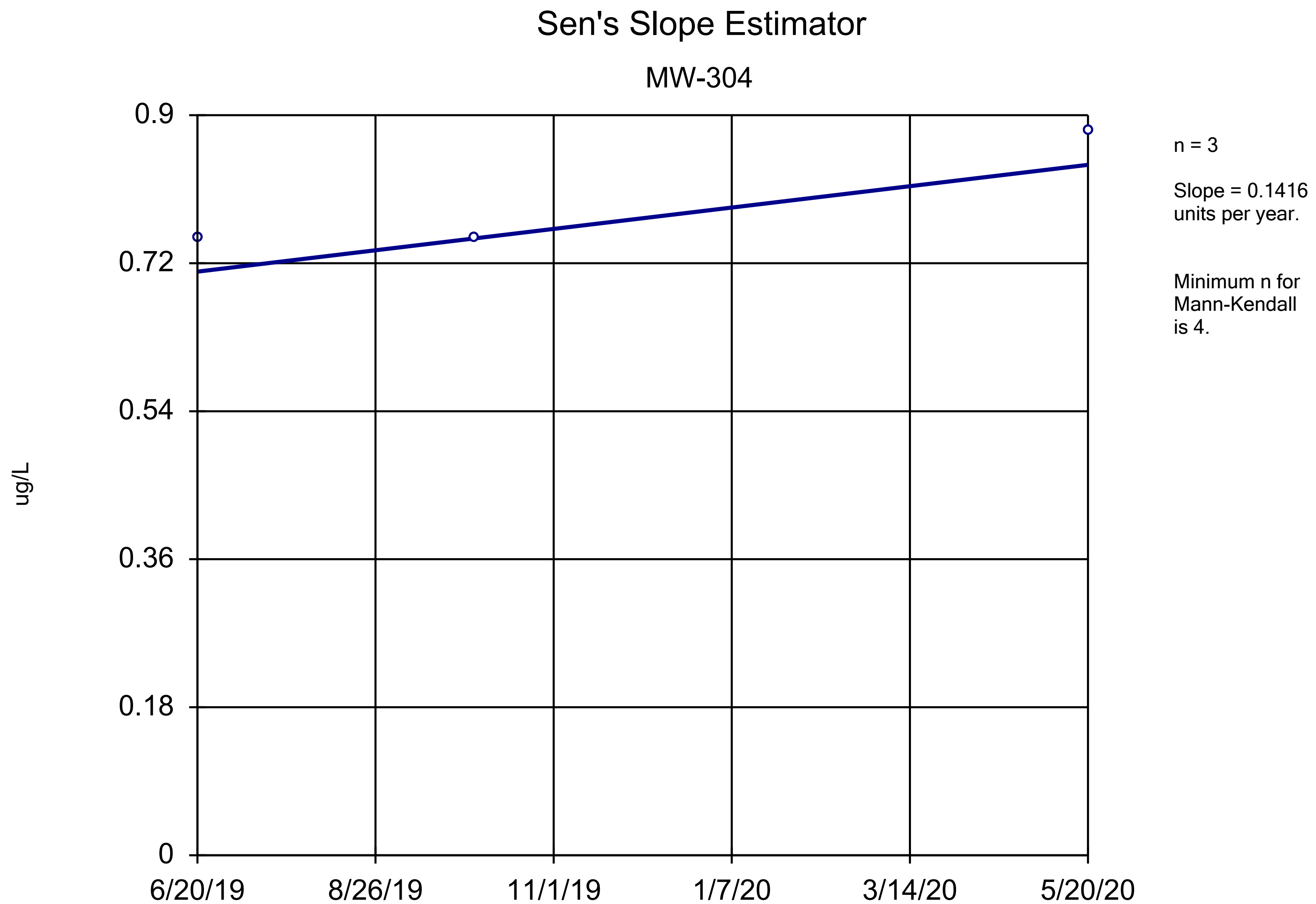

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Lansing Generating Station Client: SCS Engineers Data: LAN_Export_201121_Rev

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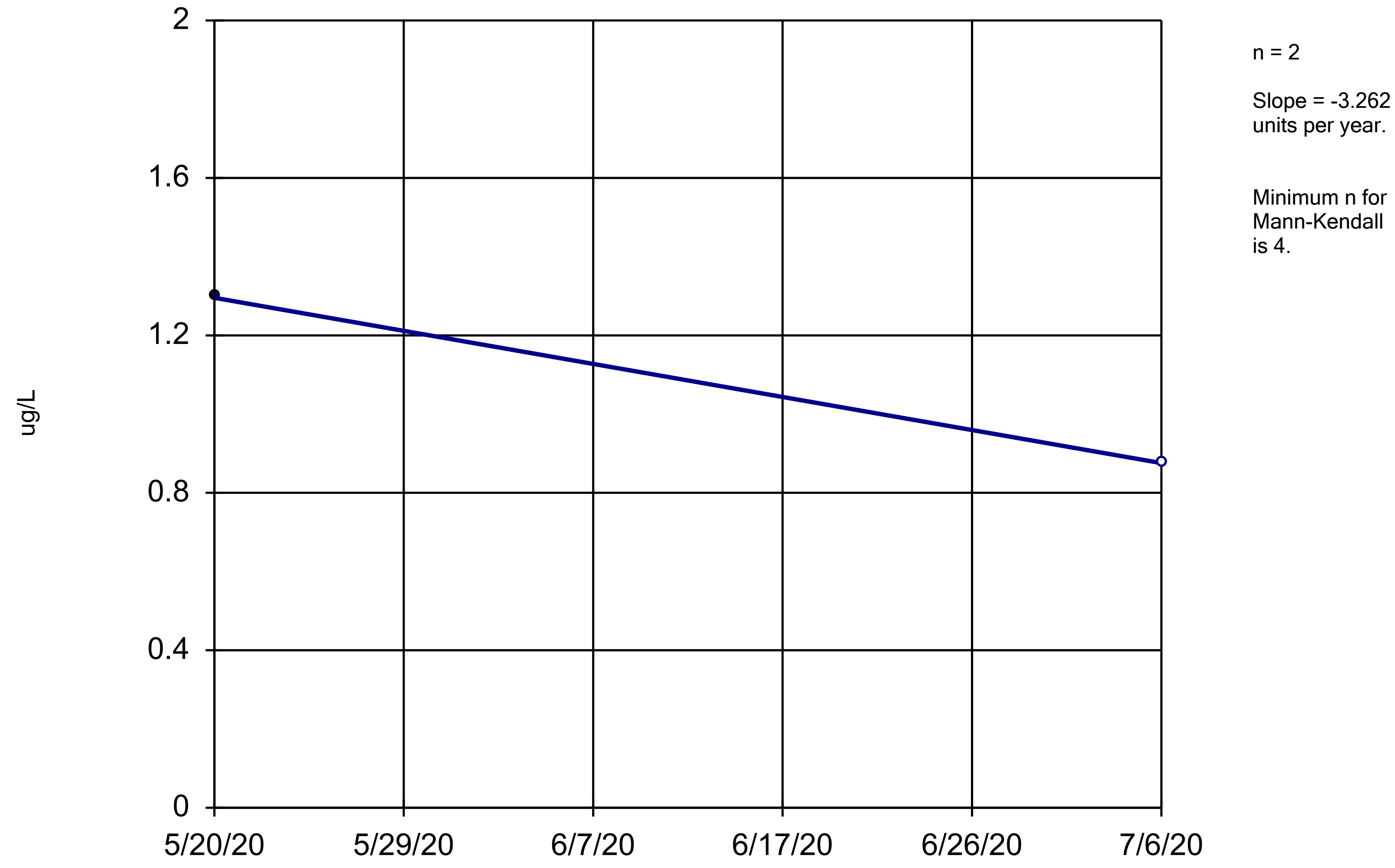
Hollow symbols indicate censored values.

Sen's Slope Estimator

MW-304A



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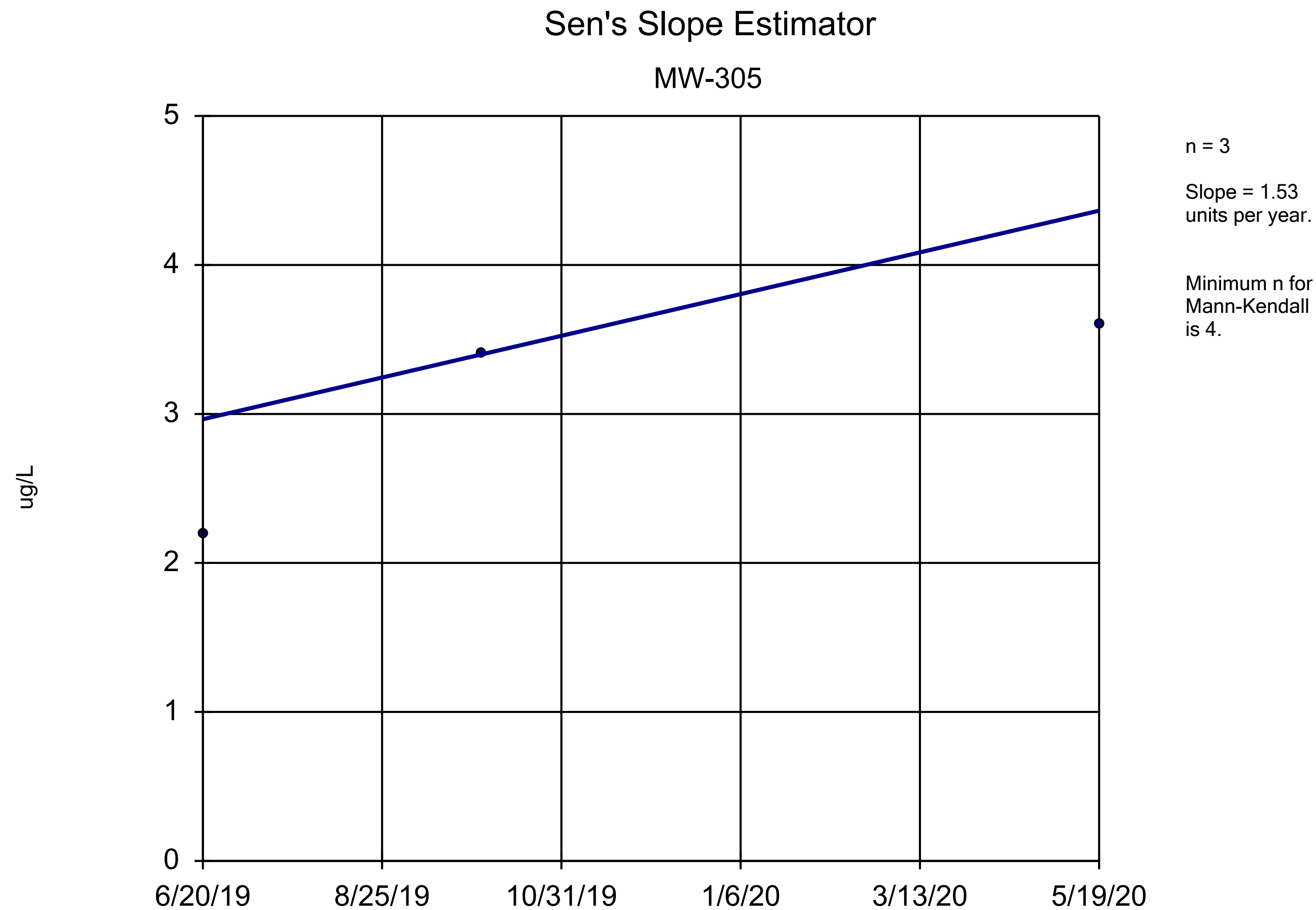

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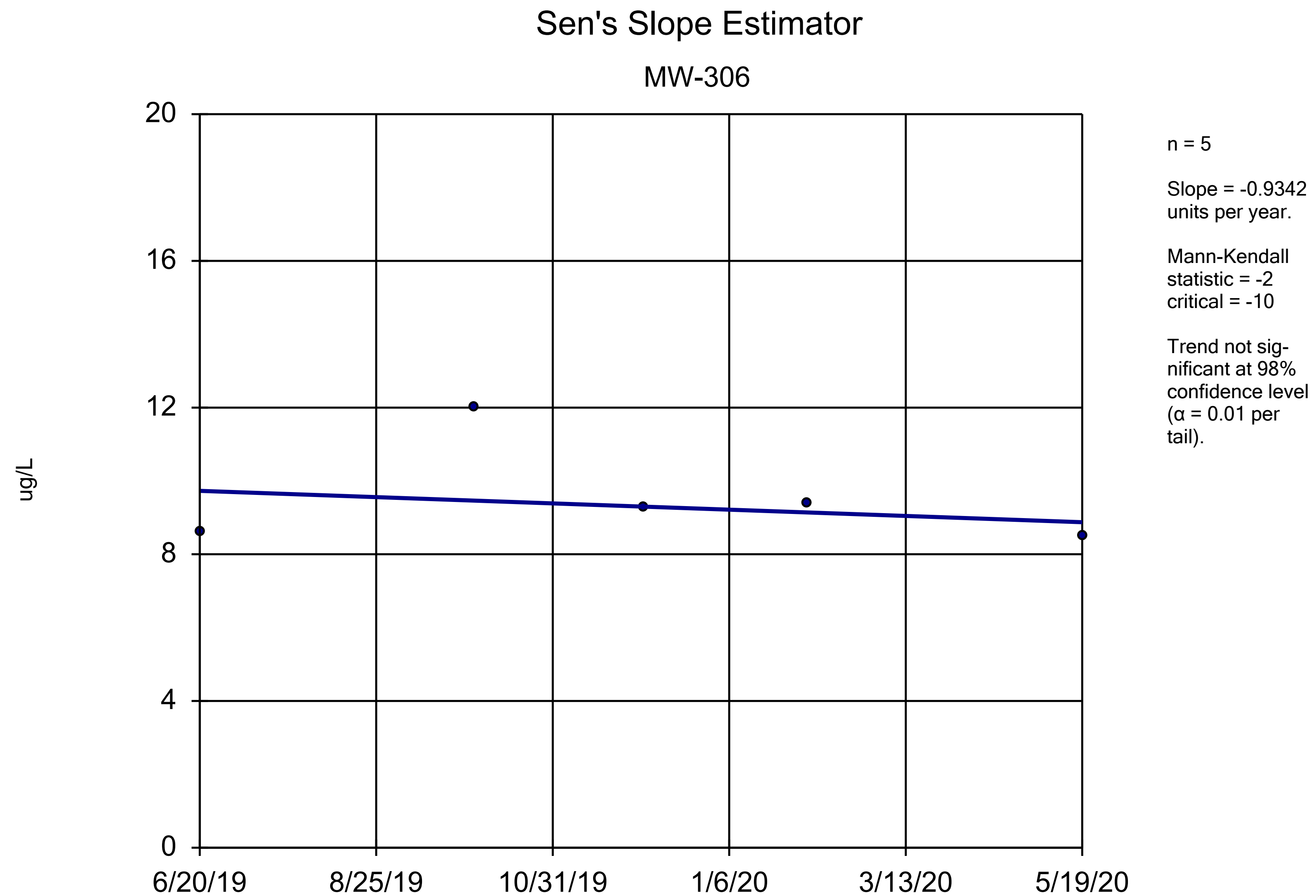

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Lansing Generating Station   Client: SCS Engineers   Data: LAN_Export_201121_Rev

Sanitas™ v.9.6.27 Software licensed to SCS Engineers. UG
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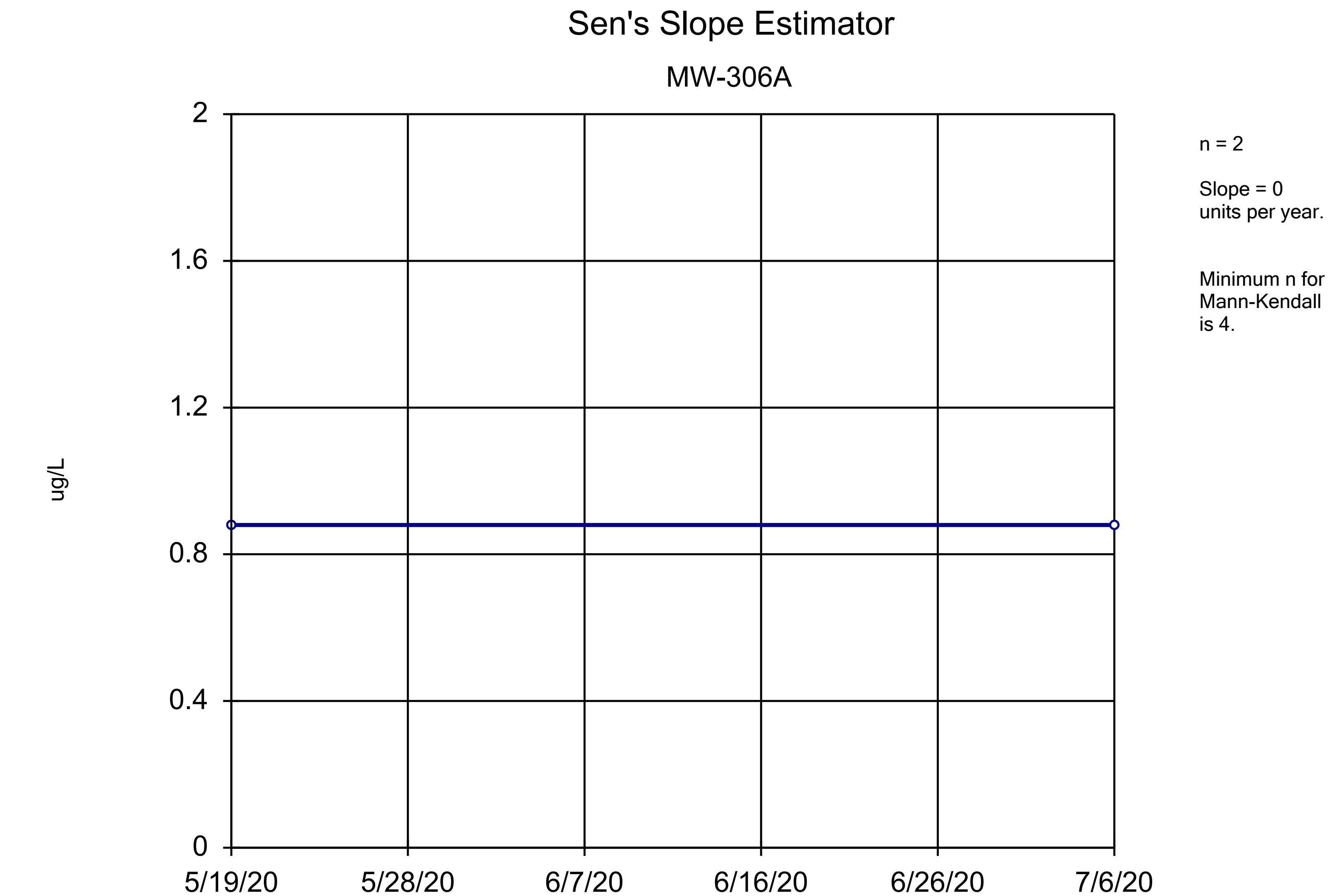

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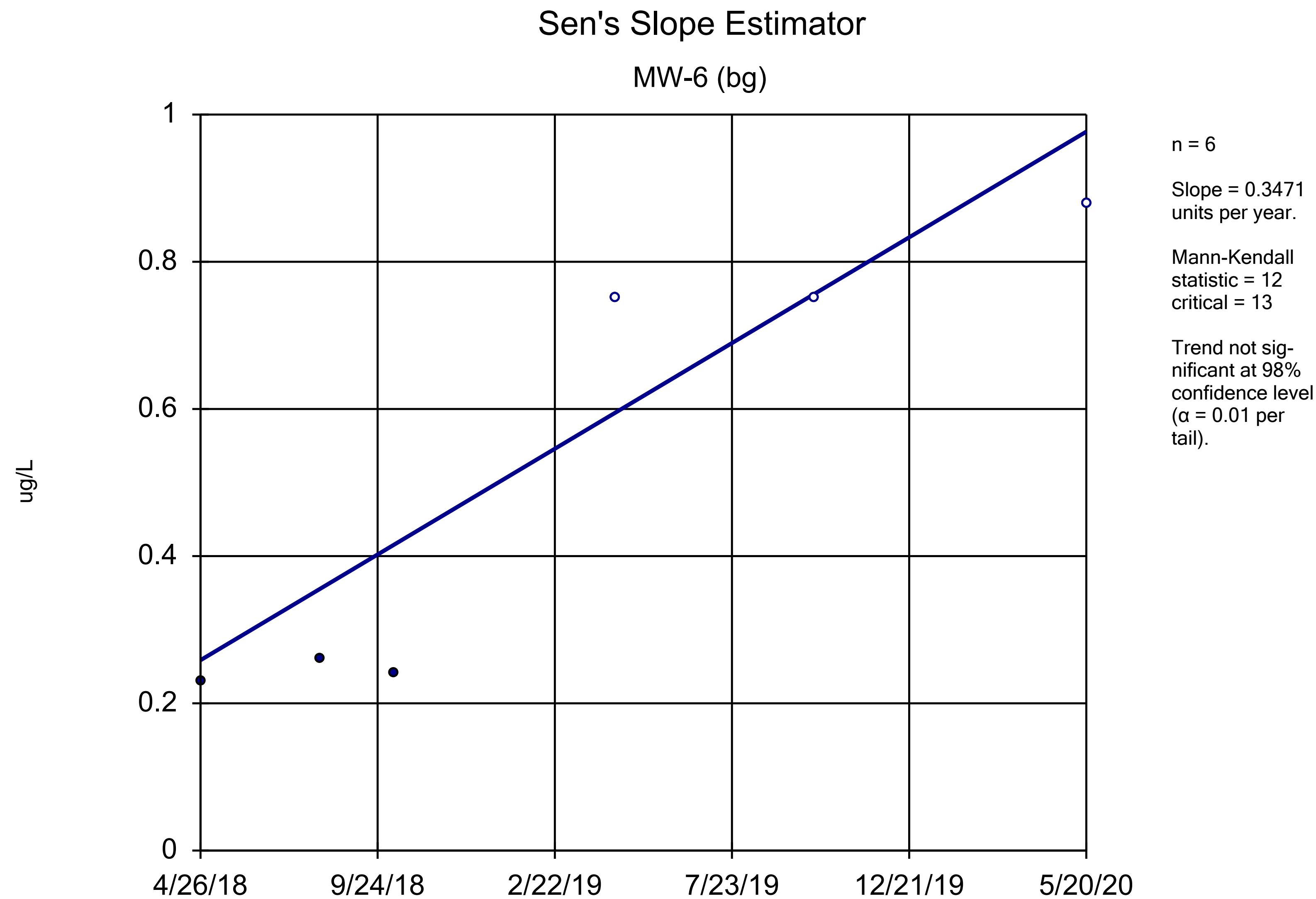
Lansing Generating Station   Client: SCS Engineers   Data: LAN_Export_201121_Rev

Sanitas™ v.9.6.27 Software licensed to SCS Engineers. UG
Hollow symbols indicate censored values.



Constituent: Arsenic Analysis Run 11/21/2020 6:05 PM

Lansing Generating Station Client: SCS Engineers Data: LAN_Export_201121_Rev

Appendix D

Selection of Remedy Semiannual Reports

Semiannual Progress Report Selection of Remedy – Lansing Generating Station

Lansing Generating Station
Lansing, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220082.00 | March 13, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

Table of Contents

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Tables

Figures

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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 above the GPS in groundwater samples from downgradient monitoring well MW-302.

This Semiannual Progress Report summarizes data collected and remedy evaluation progress made since the ACM was completed in September 2019, and outlines planned future activities to complete the selection of remedy process.

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.

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.

The pending closure of the LAN Upper Ash Pond was discussed in the IPL Notification of Intent to Close CCR Surface Impoundment, dated April 3, 2019. 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

Three additional groundwater monitoring wells were installed in December 2019. Monitoring wells MW-302A, MW-304A, and MW-306A are piezometers that were installed to provide vertical groundwater flow data and additional groundwater quality information. The monitoring well locations are shown on **Figure 2**.

2.2 GROUNDWATER MONITORING

Groundwater samples were collected in October 2019, December 2019, and February 2020. The October 2019 monitoring event was part of the routine semiannual assessment monitoring program. The wells sampled included the wells in the original monitoring system (MW-6, MW-301, MW-302, and MW-303) and the three additional wells (MW-304, MW-305, and MW-306) installed in June 2019. Additional samples were collected at MW-306 in December 2019 and February 2020.

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

2.3 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. **Table 3** summarizes the assessment completed for the ACM. No updates or changes to the assessment have been made based on additional information obtained since the issue of the ACM. Additional groundwater data collection and analysis is necessary for the evaluation of the monitored natural attenuation (MNA) option. Updates to the assessment, and development of the quantitative evaluation system discussed in the ACM, will be completed in the future based on updates to the conceptual site model, delineation of the nature and extent of impacts, and collection of additional data relevant to remedy selection.

3.0 PLANNED ACTIVITIES

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

- Collect groundwater samples at piezometers MW-302A, MW-304A, and MW-306A.
- Continue semiannual assessment monitoring for the existing monitoring well network and new monitoring wells.
- Evaluate MNA feasibility, including additional evaluation of groundwater flow and groundwater quality.
- Update conceptual site model based on findings of nature and extent investigation.
- Continue evaluation of remedial options.
- Conduct public meeting (40 CFR 257.96(e)).

Tables

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

Date	Activity
May 2019	Additional monitoring wells installed 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 2019	Conducted semiannual assessment monitoring event
October/November 2019	Planning 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	Additional monitoring wells (piezometers) installed to investigation 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

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

Created by:	NDK	Date:	2/19/2020
Last revision by:	MDB	Date:	2/26/2020
Checked by:	TK	Date:	2/26/2020

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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-303	MW-304	MW-305	MW-306
10/2/2019	A	A	A	A	A	A	A
12/5/2019	--	--	--	--	--	--	Add.
2/5/2020	--	--	--	--	--	--	Add.
Total Samples	1	1	1	1	1	1	1

Abbreviations:
A = Assessment Monitoring Sample
NI = Not Installed
Add. = Additional Sampling Event
-- = Not Sampled

Created by: NDK Date: 2/19/2020
Last revision by: MDB Date: 2/19/2020
Checked by: TK Date: 2/19/2020

I:\25219070.00\Deliverables\2020 Semiannual -Remedy Selection\Tables\[Table 2. GW_Samples_Summary_Table_LAN.xlsx]GW Summary

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
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
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Potentially	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
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
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
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
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
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

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
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
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)
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
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
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
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
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

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
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
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
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
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
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
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
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
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)	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed

Created by: LAB/SK Date: 6/20/2019
Last revision by: EJN Date: 9/10/2019
Checked by: TK Date: 9/12/2019

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Figures

N

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

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

				ENGINEER	FIGURE
PROJECT NO.	25219070.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	1
DRAWN:	11/27/2019	CHECKED BY:	MDB		
REVISED:	03/12/2020	APPROVED BY:	TK 02/12/2020		

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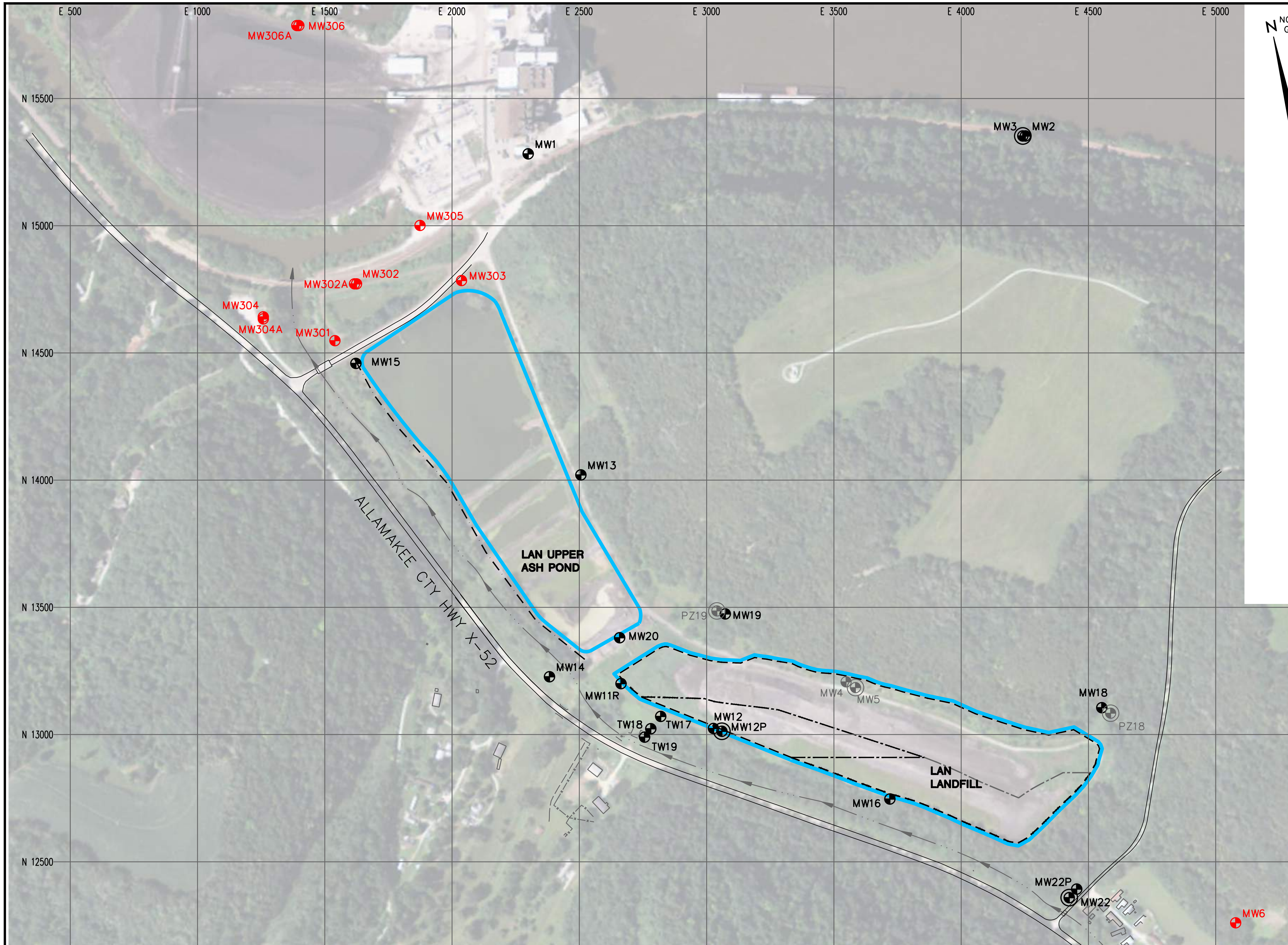

NORTH GRID

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
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
(blue line)	CCR UNITS

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.

PROJECT NO.	25220070.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	03/12/2020	APPROVED BY:	TK 03/12/2020

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
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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

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Semiannual Progress Report Selection of Remedy – Lansing Generating Station

Lansing Generating Station
Lansing, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220082.00 | September 11, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Tables

Figures

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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 above the Groundwater Protection Standard (GPS) in groundwater samples from downgradient monitoring well MW-302.

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

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.

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.

The pending closure of the LAN Upper Ash Pond was discussed in the IPL Notification of Intent to Close CCR Surface Impoundment, dated April 3, 2019. 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 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.

Significant schedule delays occurred due to the COVID-19 pandemic. Temporary travel bans, social distancing restrictions, and pandemic response planning delayed selection of remedy activities for several months. Semiannual assessment monitoring was also delayed due to COVID-19-related restrictions.

2.1 MONITORING NETWORK CHANGES

No changes to the groundwater monitoring network were made in the current reporting period.

2.2 GROUNDWATER MONITORING

Since the March 2020 semiannual update, groundwater samples were collected during three events in May, July, and August 2020. The three events included the following:

- The May 2020 monitoring event was part of the routine semiannual assessment monitoring program. The monitoring event was performed in May instead of April due to the COVID-19 pandemic. The wells sampled included the wells in the original monitoring system (MW-6, MW-301, MW-302, and MW-303); the three additional wells (MW-304, MW-305, and MW-306) installed in June 2019; and three additional wells (MW-302A, MW-304A, and MW-306A) installed in December 2019.

- The July 2020 event only included the most recently installed wells (MW-302A, MW-304A, and MW-306A).

- Additional samples were collected in August 2020 at all the wells for monitored natural attenuation (MNA) parameters and at MW-304A for molybdenum.

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

2.3 GEOTECHNICAL IINVESTIGATION

A geotechnical field investigation, which included a hydrographic survey of the Upper Ash Pond, the advancement of borings in the Upper Ash Pond, and the collection of CCR samples, was performed at LAN in May and June 2020. The start of the survey and geotechnical investigation, originally scheduled to begin in March/April, was delayed until late May/June due to the COVID-19 pandemic. The purpose of the geotechnical investigation work is to supplement existing information and enhance knowledge of:

- CCR depths, elevations, and volumes
- Spatial variation and physical properties of CCR in the Upper Ash Pond

This additional geotechnical data will assist Alliant with:

- Characterization of the site and potential source areas
- Evaluation of corrective measure alternatives
- CCR impoundment closure design and construction

The information obtained from the geotechnical investigation is currently being incorporated into the remedy design and selection process.

2.4 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. **Table 3** summarizes the assessment completed for the ACM. No updates or changes to the assessment have been made based on additional information obtained since the issue of the ACM. Groundwater data collection and analysis is ongoing to evaluate the MNA option. Updates to the assessment, and development of the quantitative evaluation system discussed in the ACM, will be completed in the future based on updates to the conceptual site model, delineation of the nature and extent of impacts, and collection of additional data relevant to remedy selection.

3.0 PLANNED ACTIVITIES

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

- Continue semiannual assessment monitoring for the existing monitoring well network and new monitoring wells.
- Evaluate MNA feasibility, including additional evaluation of groundwater flow and groundwater quality.
- Update conceptual site model based on findings of nature and extent investigation.
- Update and evaluate CCR volume estimates involved with remedial options.
- Continue evaluation of remedial options.
- Conduct public meeting (40 CFR 257.96(e)).

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Tables

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

Date	Activity
May 2019	Additional monitoring wells installed 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 2019	Conducted semiannual assessment monitoring event
October/November 2019	Planning 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	Additional monitoring wells (piezometers) installed to investigate vertical groundwater flow and groundwater quality
December 2019	Sampled assessment well MW-306

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

Date	Activity
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	Conducted semiannual* assessment monitoring event, including new piezometers 302A, 304A, and 306A
May 2020	Completed hydrographic survey of the Upper Ash Pond and landfill topographic survey
June 2020	Completed groundwater monitoring results letter for February 2020 sampling event
June 2020	Completed field phase of a geotechnical study of the CCR surface impoundments
July 2020	Sampled new piezometers 302A, 304A, and 306A

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

Date	Activity
August 2020	Initiated planning for the public ACM meeting
August 2020	Sampled all wells for selected parameters, including monitored natural attenuation (MNA) parameters
August 2020	Completed groundwater monitoring results letter for May and July 2020 sampling events
August 2020	Completed annual landfill Inspection

Notes:
*: Spring semiannual sampling events are typically completed in April; the spring 2020 event was delayed due to the COVID-19 pandemic

Created by: NDK Date: 2/19/2020
Last revision by: EJN Date: 9/1/2020
Checked by: MDB Date: 9/1/2020

I:\25220082.00\Deliverables\2020 Semiannual-Remedy Selection\Sept 2020 Semiannual Update\Tables\[Table 1_Timeline_SOR_LAN.xlsx]Timeline

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
10/2/2019	A	A	A	NI	A	A	NI	A	A	NI
12/5/2019	--	--	--	NI	--	--	NI	--	Add.	NI
2/5/2020	--	--	--	--	--	--	--	--	Add.	--
5/20/2020	A	A	A	A	A	A	A	A	A	A
7/6/2020	--	--	--	A	--	--	A	--	--	A
8/18/2020	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.
Total Samples	3	3	3	3	3	3	3	3	5	3

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

Created by: NDK Date: 2/19/2020
Last revision by: TK Date: 8/27/2020
Checked by: MDB Date: 8/27/2020

I:\25220082.00\Deliverables\2020 Semiannual-Remedy Selection\Sept 2020 Semiannual Update\Tables\[Table 2_GW_Samples_Summary_Table_LAN.xlsx]GW Summary

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
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
257.97(b)(2) Can the remedy attain the groundwater protection standard?	Potentially	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
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
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
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
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
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

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
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
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)
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
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
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
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
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

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
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
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
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
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
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
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
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
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)	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed	To be determined based on input obtained through public meetings/outreach to be completed

Created by: LAB/SK Date: 6/20/2019
Last revision by: EJN Date: 9/10/2019
Checked by: TK Date: 9/12/2019

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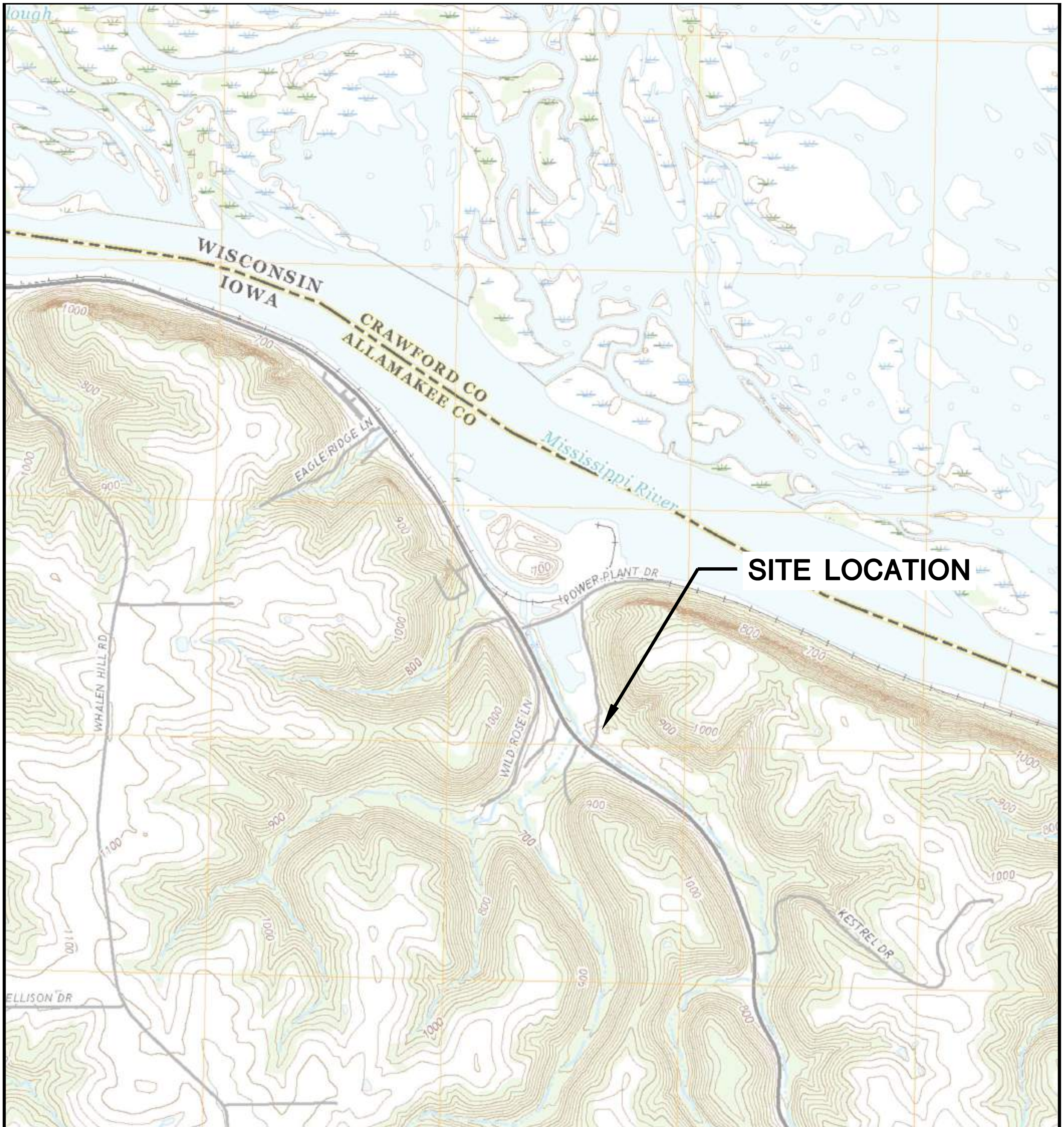
Figures



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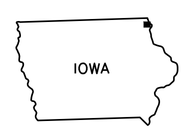
LANSING QUADRANGLE
IOWA–ALLAMAKEE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



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

				ENGINEER	FIGURE
PROJECT NO.	25219070.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718–6751 PHONE: (608) 224–2830	1
DRAWN:	11/27/2019	CHECKED BY:	MDB		
REVISED:	03/12/2020	APPROVED BY:	TK 02/12/2020		

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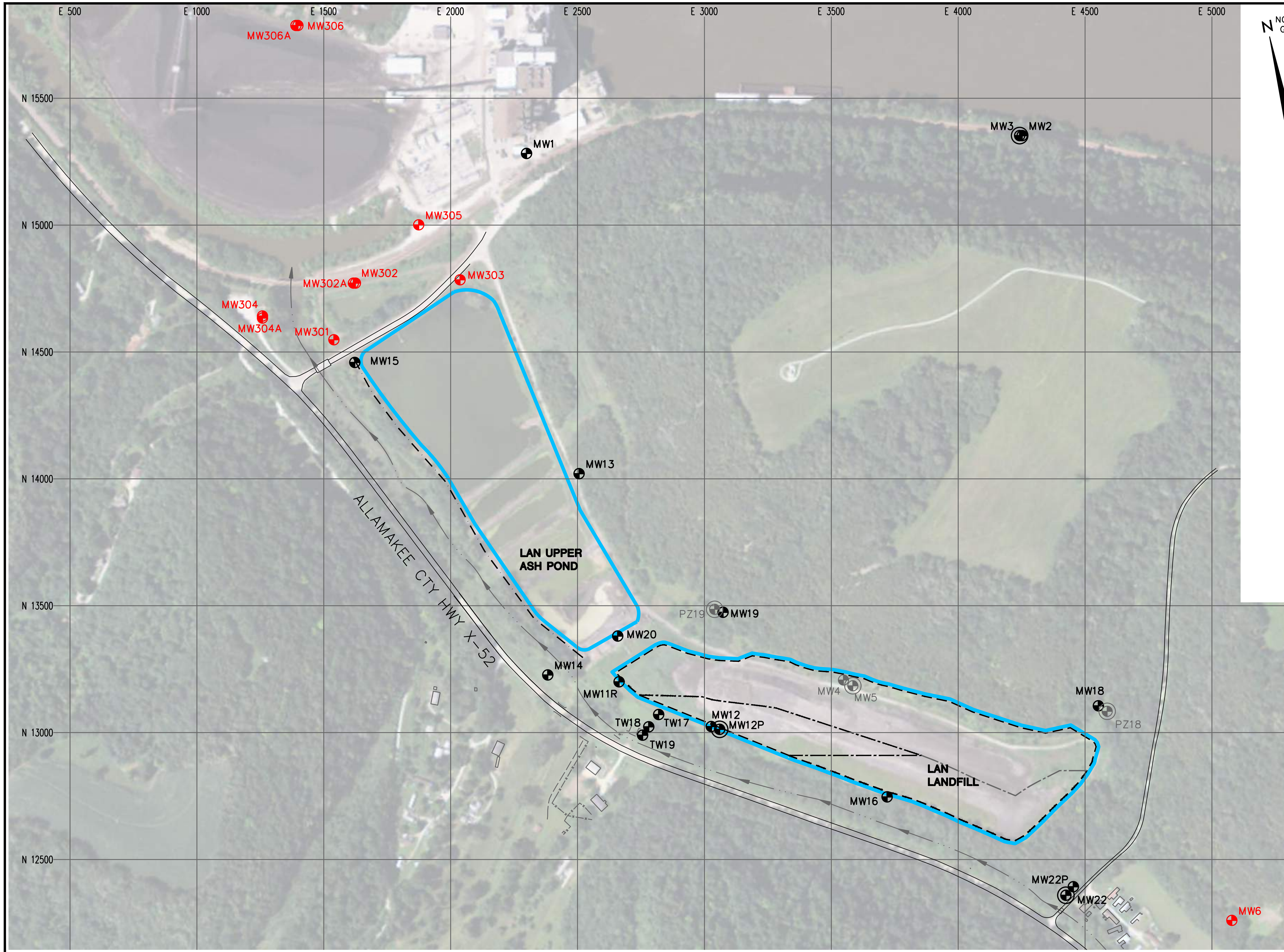

NORTH
GRID
N

400 0 400

SCALE: 1" = 400'

LEGEND

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MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
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2320 POWER PLANT DRIVE
LANSING, IA 52151-9733

SITE: ALLIANT ENERGY
LANSING POWER STATION
LANSING, IOWA

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

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Appendix E

Structural Stability Assessment (October 2017)

ALLIANT ENERGY
Interstate Power and Light Company
Lansing Generating Station

CCR SURFACE IMPOUNDMENT

STRUCTURAL STABILITY ASSESSMENT

Report Issued: October 18, 2017
Revision 1

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

EXECUTIVE SUMMARY

This Structural Stability Assessment (Report) is prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) published Final Rule for Hazardous and Solid Waste Management System – Disposal of Coal Combustion Residual from Electric Utilities (40 CFR Parts 257 and 261, also known as the CCR Rule) published on April 17, 2015 and effective October 19, 2015.

This Report assesses the structural stability of each CCR unit at Lansing Generating Station in Lansing, Iowa in accordance with §257.73(b) and §257.73(d) of the CCR Rule. For purposes of this Report, "CCR unit" refers to an existing CCR surface impoundment.

Primarily, this Report is focused on documenting whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded within each CCR unit.

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Figures

Appendices

1 Introduction

The owner or operator of the Coal Combustion Residual (CCR) unit must conduct an initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. This Report is prepared in accordance with the requirements of §257.73(b) and §257.73(d) of the CCR Rule.

1.1 CCR Rule Applicability

The CCR Rule requires a periodic structural stability assessment by a qualified professional engineer (PE) for existing CCR surface impoundments with a height of 5 feet or more and a storage volume of 20 acre-feet or more; or the existing CCR surface impoundment has a height of 20 feet or more.

1.2 Structural Stability Assessment Applicability

The Lansing Generating Station (LAN) in Lansing, Iowa (Figure 1) has one existing CCR surface impoundment that meets the requirements of §257.73(b)(1) and/or §257.73(b)(2) of the CCR Rule, which is identified as the LAN Upper Ash Pond.

2 FACILITY DESCRIPTION

LAN is located approximately three miles southeast of Lansing, Iowa on the western shore of the Mississippi River in Allamakee County, at 2320 Power Plant Drive, Lansing, Iowa (Figure 1).

LAN is a fossil-fueled electric generating station that has used four steam turbine electric generating units throughout its history. Unit 1, Unit 2, and Unit 3 were retired by 2014 and Unit 4 is the only operating unit. Sub-bituminous coal is the primary fuel for producing steam at LAN. The CCR at LAN is categorized into three types: bottom ash, fly ash, and scrubber byproduct. Fly ash is collected by electrostatic precipitators and pneumatically conveyed to an onsite fly ash silo, which is equipped with a baghouse for dust control. The fly ash is then either transported off-site for beneficial reuse, landfilled (in the case of high loss on ignition), or sluiced to LAN Upper Ash Pond (typically during startup and shutdown). Bottom ash is sluiced to a surface impoundment identified as the LAN Upper Ash Pond, Figure 2, where it is dredged, dewatered, and transported to the onsite landfill. The LAN Upper Ash Pond is located south of the generating plant and is the only existing CCR surface impoundment. Scrubber byproduct consists of fly ash, unreacted lime, and activated carbon. Scrubber byproduct is collected in the byproduct silo prior to being landfilled.

A previous CCR surface impoundment at LAN, identified as the Lower Ash Pond, was located west of the generating plant and north of Power Plant Drive. The Lower Ash Pond was closed in September 2015 by removing the CCR from the surface impoundment via hydraulic dredge and sluicing the CCR to the south end of the LAN Upper Ash Pond. CCR was removed from the Lower Ash Pond prior to backfilling the surface impoundment.

General Facility Information:

Date of Initial Facility Operations:	1946
NPDES Permit Number:	IA0300100

Latitude / Longitude:	41°56’38.43”N 91°38’22.39”W
Nameplate Ratings:	Unit 1 (1948): 16.6 MW (Retired)
	Unit 2 (1949): 11.4 MW (Retired)
	Unit 3 (1957): 35.8 MW (Retired)
	Unit 4 (1977): 270 MW

2.1 LAN Upper Ash Pond

The LAN Upper Ash Pond is located southwest of the generating plant and south of Power Plant Drive. The LAN Upper Ash Pond receives influent flows from the Unit 4 boiler floor sumps, water treatment sumps, fly ash hydroveyor system, storm water runoff from the active dry ash landfill and hillside east of the impoundment, as well as sluiced fly ash and bottom ash. The LAN Upper Ash Pond is the only receiver of sluiced CCR at LAN. The CCR is sluiced from the generating plant to the south east corner of the LAN Upper Ash Pond, Figure 2. The sluiced CCR discharges into the southeast corner of the LAN Upper Ash Pond where the majority of the CCR settles. Ongoing maintenance dredging is conducted in the southern portion of the LAN Upper Ash Pond. The dredged CCR is temporarily stockpiled and dewatered prior to being transported to the on-site active dry ash landfill located south of the LAN Upper Ash Pond.

The sluiced water that is discharged into the LAN Upper Ash Pond flows to the west prior to flowing north through a series of five interconnected settling ponds separated by intermediate dikes. The intermediate dikes have 30-inch diameter corrugated metal pipes (CMPs) on the west and east sides, which hydraulically connect the five settling ponds. The water from each settling pond flows north until it enters the large open settling area of the LAN Upper Ash Pond. The north end of the LAN Upper Ash Pond has a concrete wet well and overflow weir structure that controls the LAN Upper Ash Ponds water level, and is identified as Weir Box #1. The water in the LAN Upper Ash Pond overflows a stop log weir into Weir Box #1, and then through a 146 foot long 24 inch diameter CMP under Power Plant Drive, and into Weir Box #2. The water leaves Weir box 2 through a 225 foot long 24-inch diameter high density polyethylene pipe, which connects Weir Box #2 to Weir Box #3 in the backfilled former Lower Ash Pond. The water flows through Weir Box #3 and discharges to the west through a 77 foot long 24-inch diameter CMP into Unnamed Creek #1. Unnamed Creek #1 flows to the north into Unnamed Creek #2 which then discharges into the Mississippi River. The National Pollutant Discharge Elimination System (NPDES) Outfall 002 monitoring location, which consists of flow monitoring instrumentation, is located at Weir Box #1 and compliance samples are collected from Weir Box #3.

The total surface area of the LAN Upper Ash Pond is approximately 11.5 acres and has an embankment height of approximately 20 feet from the crest to the toe of the downstream slope at its greatest height. The area of the entire CCR Unit inclusive of the impoundment and the dredging and dewatering areas is approximately 17 acres. The interior storage depth of the LAN Upper Ash Pond is approximately 28 feet. The volume of impounded CCR and water within the LAN Upper Ash Pond is approximately 587,000 cubic yards.

3 STRUCTURAL STABILITY ASSESSMENT- §257.73(d)

This Report documents whether the design, construction, operation, and maintenance of each CCR unit is consistent with recognized and generally accepted good engineering practices for maximum volume of CCR and CCR wastewater which can be impounded.

3.1 LAN Upper Ash Pond

The LAN Upper Ash Pond was constructed in 1974 in a valley directly south of the LAN generating station. The construction took place within the valley with the east and south side of the Upper Ash Pond being constructed against naturally occurring ground surface. The north and west sides of the impoundment were constructed of dredge spoil medium to fine sand from Mississippi River maintenance dredging.

To allow construction of the impoundment, the Unnamed Creek #1 was rerouted to run along the west side of the valley between the impoundment and a County Road on the east side slope of the valley, Figure 1. Soil investigations completed at the time of construction indicate the valley is underlain by a medium dense deposit of sand and gravel over the full valley floor with loose to very loose river silt laying on top of the sand and gravel at the north end of the planned Upper Ash Pond. Only organic top soil was removed prior to constructing the two embankment sides of the LAN Upper Ash Pond and the river silt remains in the foundation at the northern end of the LAN Upper Ash Pond. The details of the LAN Upper Ash Pond construction are shown in drawings prepared by Sargent & Lundy in 1974, Appendix A.

The embankment on the north side of the LAN Upper Ash Pond has a 36 foot wide crest to accommodate the Power Plant Drive access road. The western embankment has a 15 foot wide crest. Both embankments were constructed with a 3 horizontal to 1 vertical outside slope. The inside slope of the embankment was lined with a layer of dry bentonite to reduce seepage loss through the permeable embankment soil.

The LAN Upper Ash Pond was constructed with a four foot square concrete riser well, Weir Box #1 for the control of process water and surface water discharge from the Pond. The concrete box is equipped with a wooden stop log system that is used to control the water elevation in the LAN Upper Ash Pond. The normal operation elevation of the stop logs is 648 which maintains the pond water surface at elevation 648.75 feet during normal plant flows of 3,500 gpm. The crest elevation of the embankments is a minimum of elevation 654.

In 2015, a subsurface soil investigation was undertaken to collect soil samples and determine the in-situ density of the north and west embankments and the underlying foundation soil. The soil borings were undertaken with hollow stem augers and sampling was completed with a standard split spoon (ASTM D1556), Figure 2. The density information along with soil test results for water content, grain size, and Atterberg limits, Appendix B, indicate the current conditions of the embankments as constructed in 1974.

In the summer of 2015, the west embankment of the LAN Upper Ash Pond was improved by the installation of a cement-bentonite cutoff wall along the center line of the embankment. The cutoff wall reduced seepage loss through the embankment and eliminated the saturation of the embankment toe and flow of surface water from the toe to the Unnamed Creek #1, Figure 2.

Also in the summer of 2015, the north embankment of the LAN Upper Ash Pond was improved by backfilling the Lower Ash Pond, substantially reducing the total height of the north embankment and improving its overall stability by surcharging the river silt layer in the foundation of the embankment.

3.1.1 CCR Unit Foundation and Abutments - §257.73(d)(1)(i)

The LAN Upper Ash Pond was constructed on foundation soils that are medium dense sand and gravel in the southern part of the Pond and are suitable foundation soils. In the northern end of the pond the sand and gravels have an overlying river silt deposit that is loose to very loose and is saturated due to the Mississippi River. The original construction of the LAN Upper Ash Pond was completed over the top of the river silt which has no clay like properties, Appendix B, and supported the embankment without substantial settlement after construction.

During assessment of embankment stability in 2015, it was determined that the river silt in the foundation resulted in slope stability safety factors less than the CCR Rule standards. As a result of the 2015 finding, the stability was improved within the northern embankment by closing and filling the lower ash pond in order to surcharge the river silt, lessen the northern embankment height, and by stabilizing ground water elevation.

The improvements increased the safety factor for slope stability controlled by the river silt layer to acceptable values as reported in the Safety Factor Assessment Report 40 CFR 257.73 (b) and (e). The effects of the weak foundation soil is corrected and the operation of the LAN Upper Ash Pond is acceptable as designed and modified.

3.1.2 Slope Protection - §257.73(d)(1)(ii)

The impoundment is incised on the east and south sides. The north embankment crest is about 35 feet wide and contains Power Pant Road, which is the plant access road to the LAN. The northern slope is 3:1 and is comprised of shallow rooting vegetation, which is adequate to protect against surface erosion. The west embankment is also 3:1 and is vegetated with shallow rooting grasses, which is adequate to protect against surface erosion. The toe of the downstream west embankment has 10 feet of rip rap material, which protects from erosive forces during flooding of the Unnamed Creek #1. Lastly, backwater elevation from Mississippi River 100 year return elevation is 634, which does not reach toe of the embankment.

Sudden drawdown is addressed in Section 3.1.7.

3.1.3 CCR Embankment Density- §257.73(d)(1)(iii)

The embankments were constructed in 1974 using dredge sand from maintenance dredging of the Mississippi River. The sand is medium to fine grained and very uniform throughout the embankments, Appendix B. The density is medium dense to dense indicating adequate compaction at the time of construction. Observation during installation of a cement-bentonite cutoff wall in 2015 in the west embankment, indicates further grain cementation in the formerly saturated areas of the embankment, likely due to calcium hydroxide from pond water.

The information from this assessment indicates the CCR unit has been designed, constructed, operated, and maintained with sufficient embankment density.

3.1.4 Vegetation Management - §257.73(d)(1)(iv)

Historically vegetation management has been conducted on a periodic basis. At the time of the initial Annual Inspection in October 2015, the areas upstream and downstream slopes of the west embankment could not be properly inspected due to the presence of dense/tall brush and woody vegetation along the entire slope. Since the Annual Inspection, the facility has removed woody deep rooting vegetation from the embankment and has managed the remaining grassy vegetation to facilitate effective inspections. The facility plans to continue managing the grassy vegetation on the embankments at a height that facilitates effective inspections.

3.1.5 Spillway Management - §257.73(d)(1)(v)

The water in the LAN Upper Ash Pond overflows a stop log weir into Weir Box #1, and then through a 146 foot long 24 inch diameter CMP under Power Plant Drive, and into Weir Box #2. The water leaves Weir box 2 through a 225 foot long 24-inch diameter high density polyethylene pipe, which connects Weir Box #2 to Weir Box #3 in the backfilled former Lower Ash Pond. The water flows through Weir Box #3 and discharges to the west through a 77 foot long 24-inch diameter CMP into Unnamed Creek #1. Unnamed Creek #1 flows to the north into Unnamed Creek #2 which then discharges into the Mississippi River. The culverts are constructed of non-erodible material and designed to carry sustained flows.

The Weir Box structures are checked for malfunction (e.g., blockages, deformations) during the weekly inspections by the facility personnel.

This impoundment currently has a hazard potential classification of "Significant," which in turn requires an evaluation of the impacts of a 1,000 year rainfall event. The Inflow Flood Control Plan, which is a separate document developed to comply with 40 CFR 257.82, shows that the precipitation from this event will drain through the culverts without overtopping the embankments of the impoundment. The freeboard at peak flow will be approximately 8 inches.

3.1.6 Hydraulic Structures - §257.73(d)(1)(vi)

The discharge structure from the LAN Upper Ash Pond is controlled by a four foot wide weir box (Weir Box #1), where the flow discharges through a single 24-inch pipe. Prior to the final discharge there are two intermediate structures, Weir Box #2 and Weir Box #3, which were previously used to convey flow through the now closed lower ash pond. During closure of the lower ash pond, a 24-inch HDPE pipe was installed to connect Weir Box #2 to Weir Box #3. The pipes installed between Weir Box #1 to Weir Box #2 and from Weir Box #3 to the outfall are 24-inch CMPs.

On June 22, 2016 all three sections of pipes were inspected using remote camera video inspection system. The inspection showed that there was minimal deterioration, deformation, distortion, sedimentation, debris, and no bedding deficiencies were observed within the pipe from Weir Box #2 to Weir Box #3 and from Weir Box #3 to the outfall.

The pipe from Weir Box #1 could not be inspected because the pipe is lower in elevation than the subsequent downstream pipes. A pump was used to dewater Weir Box #1 and the video camera system was able to collect visuals on the initial section of pipe. The camera observed solids buildup of 8-inches to 10-inches thick. The solids appeared to be organic in nature and could be due to biological growth within the pipe. Additionally, the solids were intermixed with a thin hard layers.

In September 2017, LAN successfully removed the solids that had accumulated within the 146 feet of 24-inch CMP between Weir Box #1 and Weir Box #2. The solids were removed by advancing pipe jetting equipment through the entirety of the 24-inch CMP from Weir Box #1 to Weir Box #2. In order to jet the pipe, the water level within the LAN Upper Ash Pond was lowered to reduce flow into Weir Box #1. During the pipe cleaning activities, the accumulated water within both Weir Box #1 and Weir Box #2 was managed by pumping the water out of the weir boxes and conveying it back into the LAN Upper Ash Pond. The solids that were removed from the pipe jetting activities were collected and pumped back into the LAN Upper Ash Pond for settling.

Following the pipe cleaning activities, the 24-inch CMP was inspected using a remote video camera, similar to the inspection completed in June 2016. The video inspection confirmed the successful removal of solids within the 24-inch CMP. The video inspection observed an approximate two-foot sag within the pipe. The sag in the pipe extended for nearly the entire length. Given the composition of the embankment materials and age of the pipe, this sag is believed to be a product of settling.

Although there are no significant signs of deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure, HHS recommends that LAN monitors for any differences in the performance of the pipe from Weir Box #1 to Weir Box #2. Any significant changes to flows, increases in suspended solids, or observed sediment buildup discovered during subsequent 7-day or 30-day inspections may indicate a deficiency in the structure and would warrant additional investigation.

3.1.7 Sudden Drawdown - §257.73(d)(1)(vii)

The toe of the north embankment is above the 100 year flood elevation of Mississippi River Pool 9, Appendix C. The toe of the west embankment could be flooded by backwater in the Unnamed Creek #1. However, the creek overflows down a drop riffle structure that loses 15 foot of elevation under the bridge for Power Plant drive and is unlikely to have significant flood elevation profile on the west embankment toe.

Information on the CCR unit design, construction, operation, and maintenance indicate sudden drawdown conditions from an adjacent water body do not occur for the LAN Upper Ash Pond.

4 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

To meet the requirements of 40 CFR 257.73(d)(3), I Mark W. Loerop hereby certify that I am a licensed professional engineer in the State of Iowa and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR 257.73(b) and 40 CFR 257.73(d).

The initial Structural Stability Assessment, dated September 02, 2016, was prepared and certified by a qualified professional engineer. The next periodic review of this Structural Stability Assessment is required to be complete by September 2021.

This certification is for Revision 1 of the Structural Stability Assessment, which includes the following amendments:

- Revisions to the text in Section 3.1.6 Hydraulic Structures regarding the cleaning and inspection of the 24-inch diameter CMP between Weir Box #1 and Weir Box #2 that occurred in September 2017.

LICENSED PROFESSIONAL ENGINEER
MARK W. LOEROP
22197
IOWA

By: [signature]

Name: MARK LOEROP

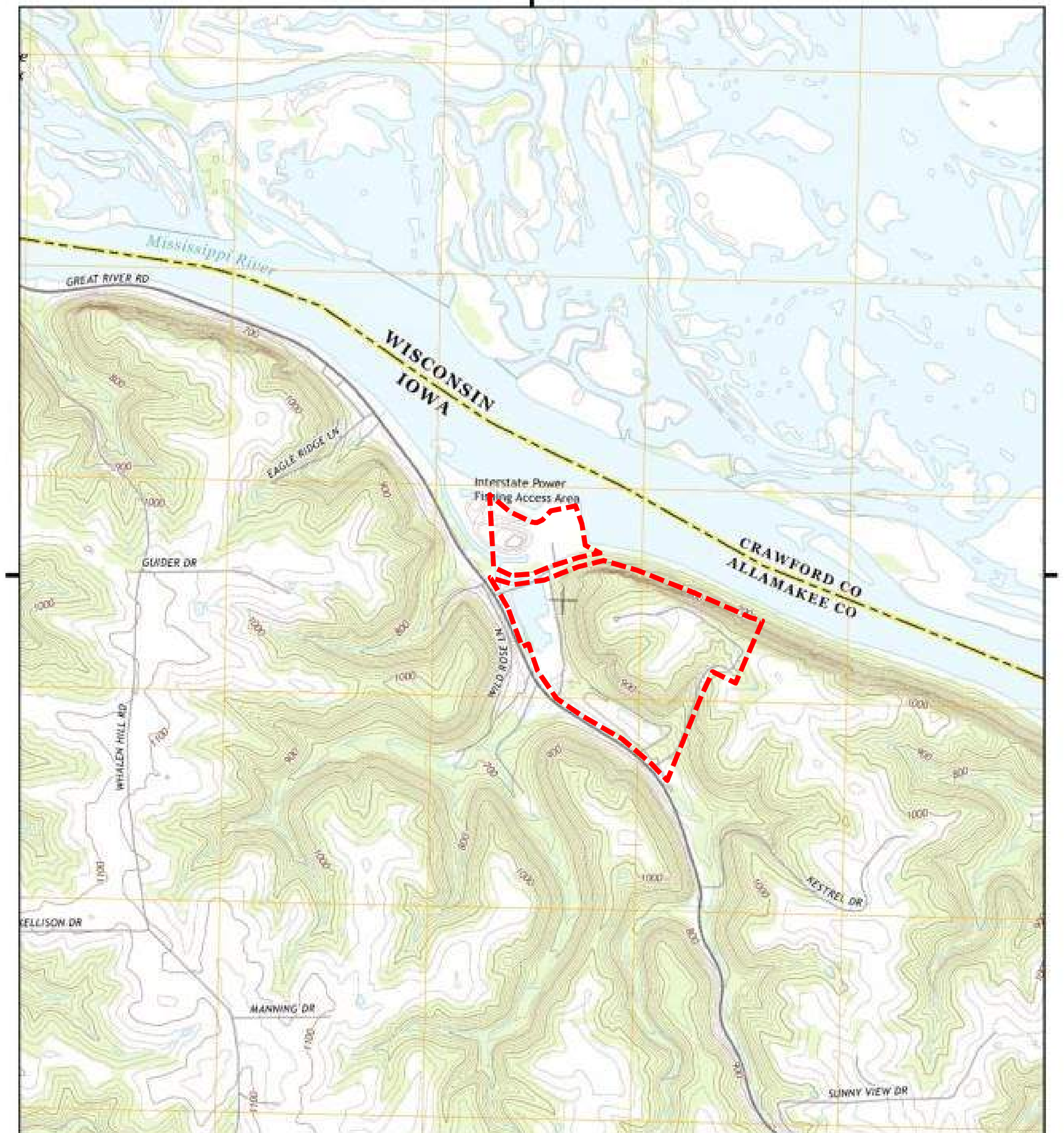
Date: OCT 18, 2017

FIGURES

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Structural Stability Assessment

Historical Topo Map 2013



This report includes information from the following map sheet(s).

Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Lansing, 2013, 7.5-minute

SITE NAME: Lasing Generating Station
ADDRESS: 2364-2366 Power Plant Dr
Lansing, IA 52151
CLIENT: Environmental Site Assessors

N

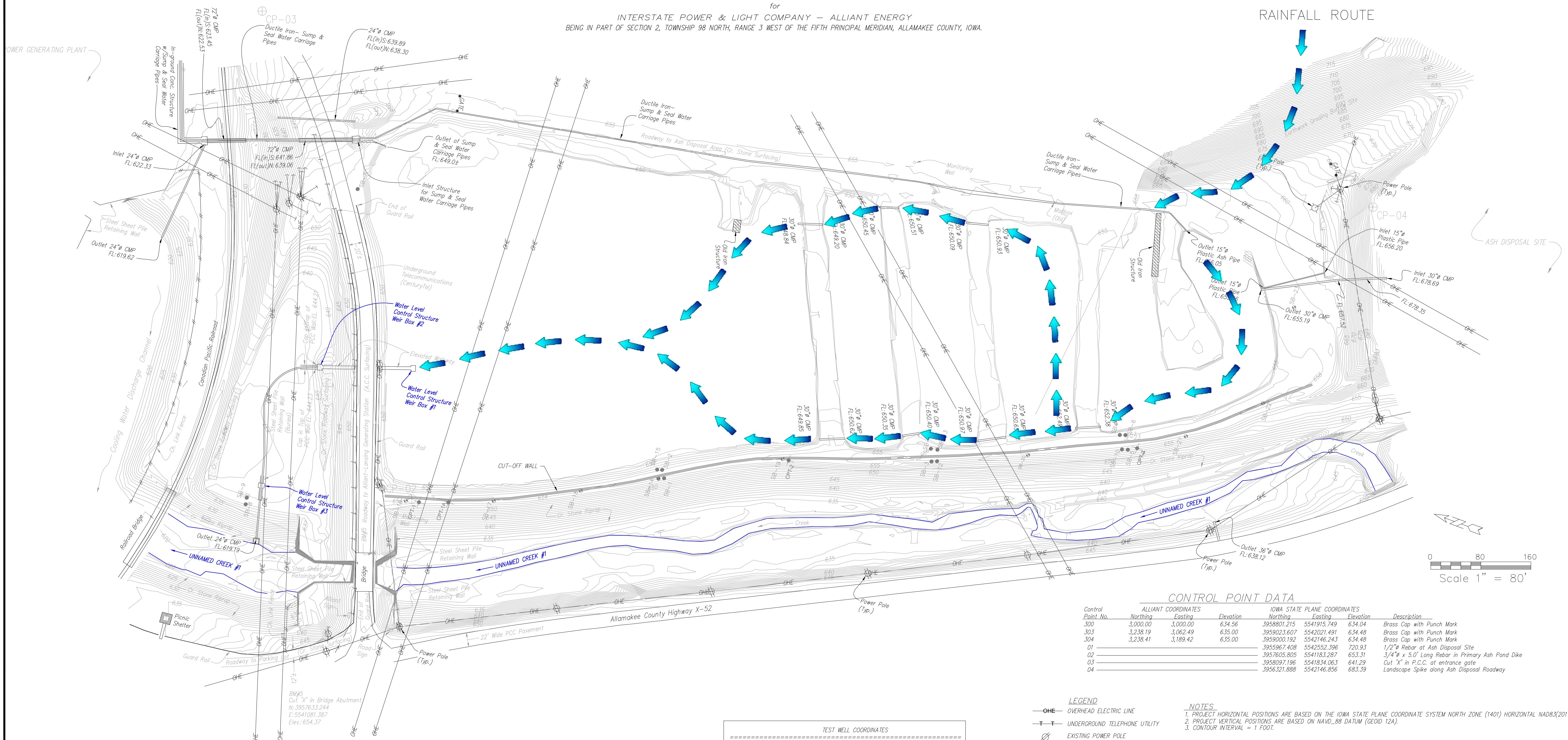
4555570 - 1 page 5

Historical Aerial Photo

Approximate Property Boundary

HARD HAT SERVICES™ Engineering, Construction and Management Solutions	Site Location Lansing Generating Station Intersate Power and Light Company	Drawing Figure 1 Date 6/7/2016

UPPER AND LOWER CCR POND TOPOGRAPHIC SURVEY AND LOWER CCR POND BATHYMETRY
at
ALLIANT LANSING POWER GENERATING STATION
for
INTERSTATE POWER & LIGHT COMPANY – ALLIANT ENERGY
BEING IN PART OF SECTION 2, TOWNSHIP 98 NORTH, RANGE 3 WEST OF THE FIFTH PRINCIPAL MERIDIAN, ALLAMAKEE COUNTY, IOWA.



CONTROL POINT DATA

Control Point No.	ALLIANT COORDINATES Northing	Easting	Elevation	IOWA STATE PLANE COORDINATES Northing	Easting	Elevation	Description
300	3,000.00	3,000.00	634.56	3958801.215	5541915.749	634.04	Brass Cap with Punch Mark
303	3,238.19	3,062.49	635.00	3959023.607	5542021.491	634.48	Brass Cap with Punch Mark
304	3,238.41	3,189.42	635.00	3959000.192	5542146.243	634.48	Brass Cap with Punch Mark
01	—	—	—	3955967.408	5542552.396	720.93	1/2"ø Rebar at Ash Disposal Site
02	—	—	—	3957605.805	5541183.287	653.31	3/4"ø x 5.0' Long Rebar in Primary Ash Pond Dike
03	—	—	—	3958097.196	5541834.063	641.29	Cut 'X' in P.C.C. at entrance gate
04	—	—	—	3956321.888	5542146.856	683.39	Landscape Spike along Ash Disposal Roadway

LEGEND

- OHE — OVERHEAD ELECTRIC LINE
- T T — UNDERGROUND TELEPHONE UTILITY
- EXISTING POWER POLE
- SB — TEMPORARY WELL LOCATION
- SB — SOIL BORING LOCATION
- CPT — CONE PENITROMETER TEST LOCATION
- CP — CONTROL POINT

NOTES

1. PROJECT HORIZONTAL POSITIONS ARE BASED ON THE IOWA STATE PLANE COORDINATE SYSTEM NORTH ZONE (1401) HORIZONTAL NAD83(2011).
2. PROJECT VERTICAL POSITIONS ARE BASED ON NAVD_88 DATUM (GEOID 12A).
3. CONTOUR INTERVAL = 1 FOOT.

TEST WELL COORDINATES

WELL ID	Northing	Easting	TOP Elevation	Ground Elevation
SB-1	3957238.28	5541352.23	653.36	653.26
SB-2	3957245.81	5541363.76	652.66	652.63
SB-3	3956845.82	5541523.57	656.39	655.37
SB-4	3956853.80	5541542.37	655.88	655.34
SB-5	3956557.49	5541648.53	656.70	655.80
SB-6	3956569.09	5541669.35	656.19	655.97
SB-7	3957856.52	5541618.95	653.45	653.33
SB-8	3957852.40	5541084.50	641.74	638.43
SB-9	3957854.40	5541094.88	640.63	638.52
SB-10	NS	NS	656.38	655.85
SB-11	NS	NS	656.38	656.17
SB-12	NS	NS	656.40	655.44
SB-13	NS	NS	656.43	655.27
SB-14	NS	NS	654.37	653.15
SB-15	NS	NS	652.75	652.67

NOTE:
1. SURVEY INFORMATION PROVIDED ABOVE WAS COMPILED BY MOHN SURVEYING, INC. 1890 GREAT RIVER ROAD LANSING, IOWA 52151, APRIL 2015.
2. ALLIANT ENERGY REQUIRES 20 FEET OVERHEAD SEPARATION DISTANCE FOR EQUIPMENT OPERATING UNDER POWERLINES.

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1				

SCALE: AS SHOWN | DATE: 5-19-16
DRAWN BY: JFD | CHECKED BY: CTS | APPROVED BY: MWL

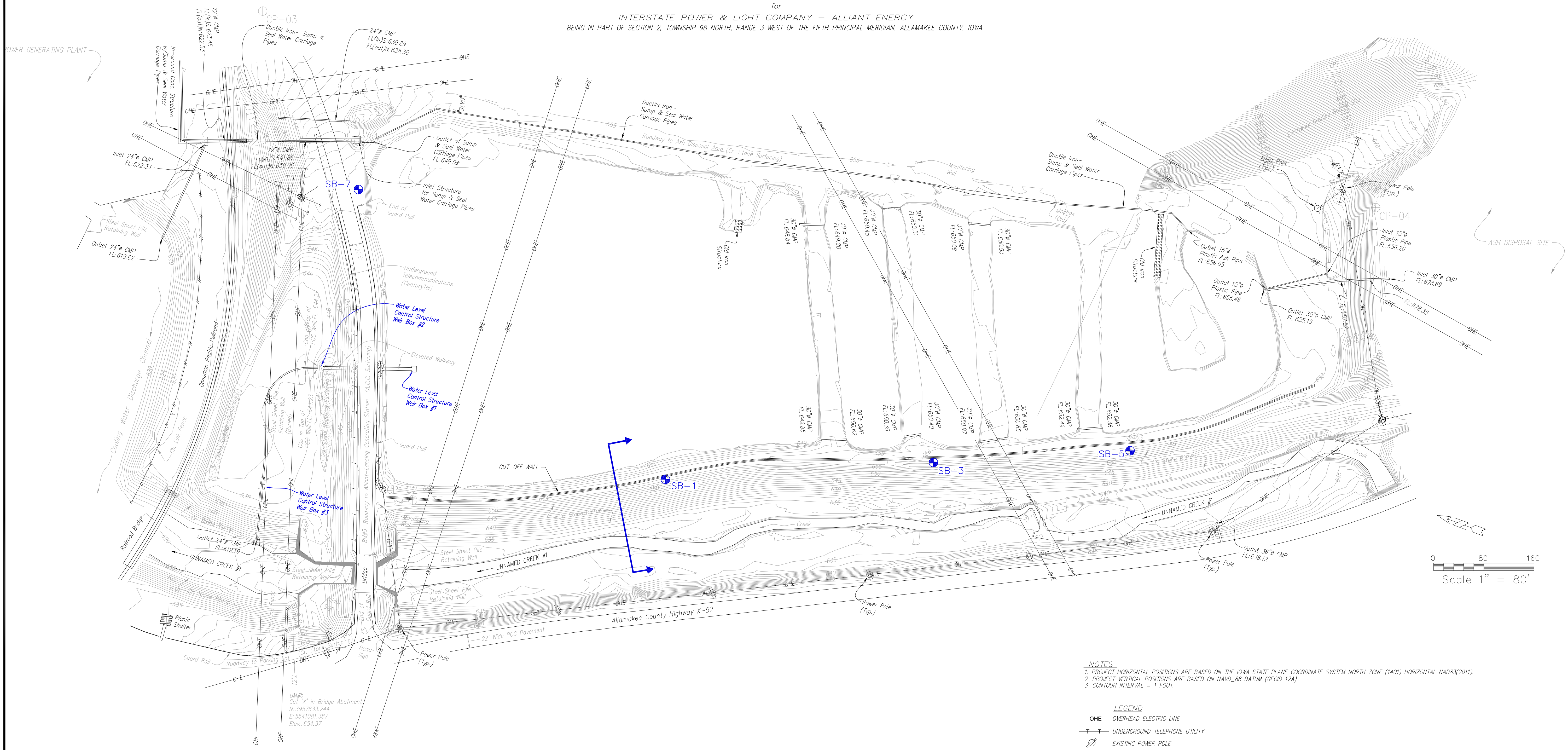
HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
Structural Stability Assessment
SITE PLAN

JOB 154.018.012.002
SHT. FIGURE 2
DWG. 154.018.012.002-D2

UPPER AND LOWER CCR POND TOPOGRAPHIC SURVEY AND LOWER CCR POND BATHYMETRY
at
ALLIANT LANSING POWER GENERATING STATION
for
INTERSTATE POWER & LIGHT COMPANY – ALLIANT ENERGY
BEING IN PART OF SECTION 2, TOWNSHIP 98 NORTH, RANGE 3 WEST OF THE FIFTH PRINCIPAL MERIDIAN, ALLAMAKEE COUNTY, IOWA.



NOTES
1. PROJECT HORIZONTAL POSITIONS ARE BASED ON THE IOWA STATE PLANE COORDINATE SYSTEM NORTH ZONE (1401) HORIZONTAL NAD83(2011).
2. PROJECT VERTICAL POSITIONS ARE BASED ON NAVD_88 DATUM (GEOID 12A).
3. CONTOUR INTERVAL = 1 FOOT.

LEGEND
- OHE — OVERHEAD ELECTRIC LINE
- T T — UNDERGROUND TELEPHONE UTILITY
- EXISTING POWER POLE
- SB — SOIL BORING LOCATION
- ANALYSIS CROSS-SECTION

NOTE:
1. SURVEY INFORMATION PROVIDED ABOVE WAS COMPILED BY MOHN SURVEYING, INC. 1890 GREAT RIVER ROAD LANSING, IOWA 52151, APRIL 2015.
2. ALLIANT ENERGY REQUIRES 20 FEET OVERHEAD SEPARATION DISTANCE FOR EQUIPMENT OPERATING UNDER POWERLINES.

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1				

SCALE: AS SHOWN | DATE: 5-19-16
DRAWN BY: JFD | CHECKED BY: CTS | APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SOIL BORING AND
SLOPE STABILITY CROSS-SECTION LOCATION

JOB 154.018.012.002
SHT. FIGURE 3
DWG. 154.018.012.002-D2

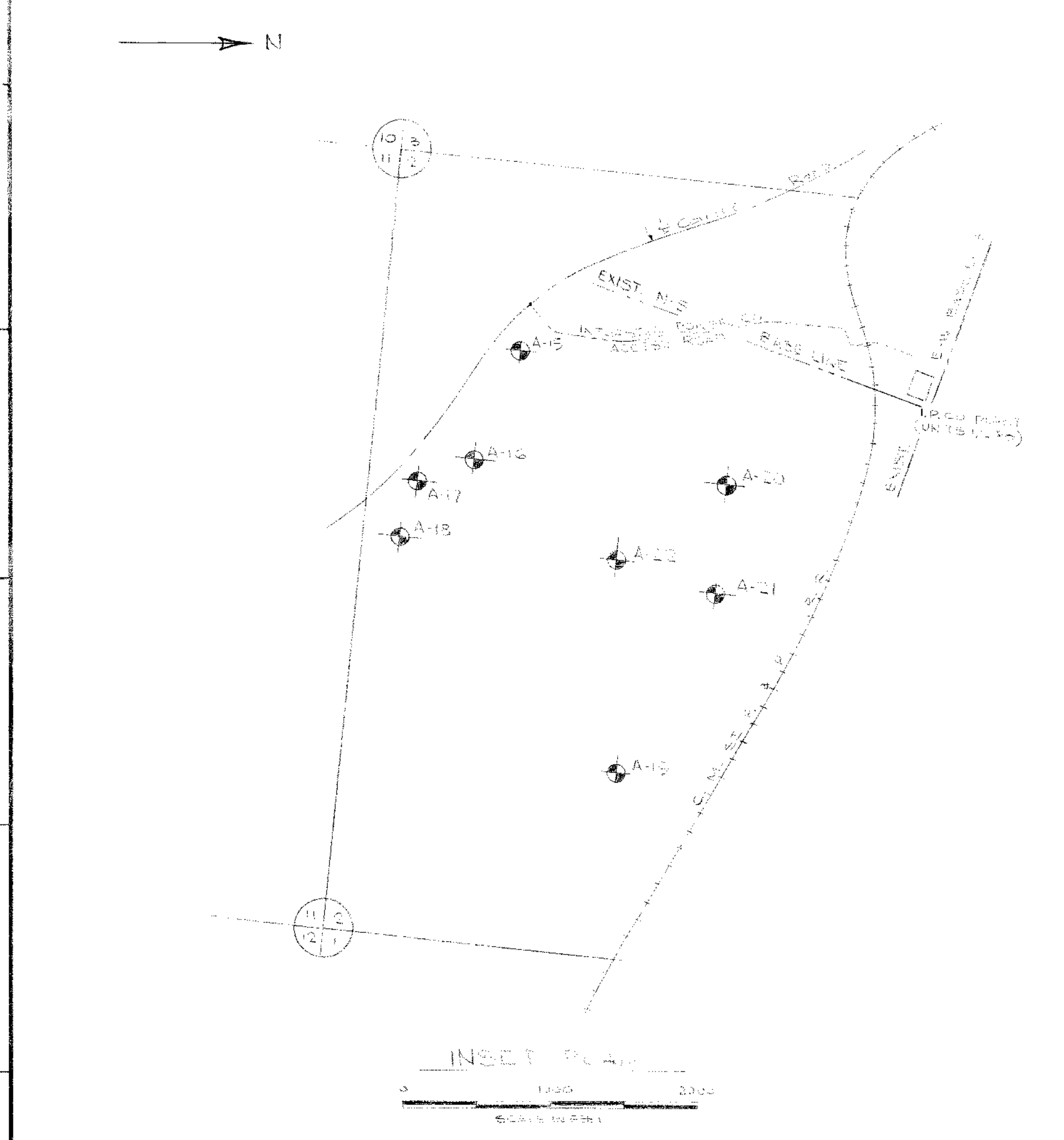
APPENDIX A – 1974 Upper Ash Pond Construction Drawings

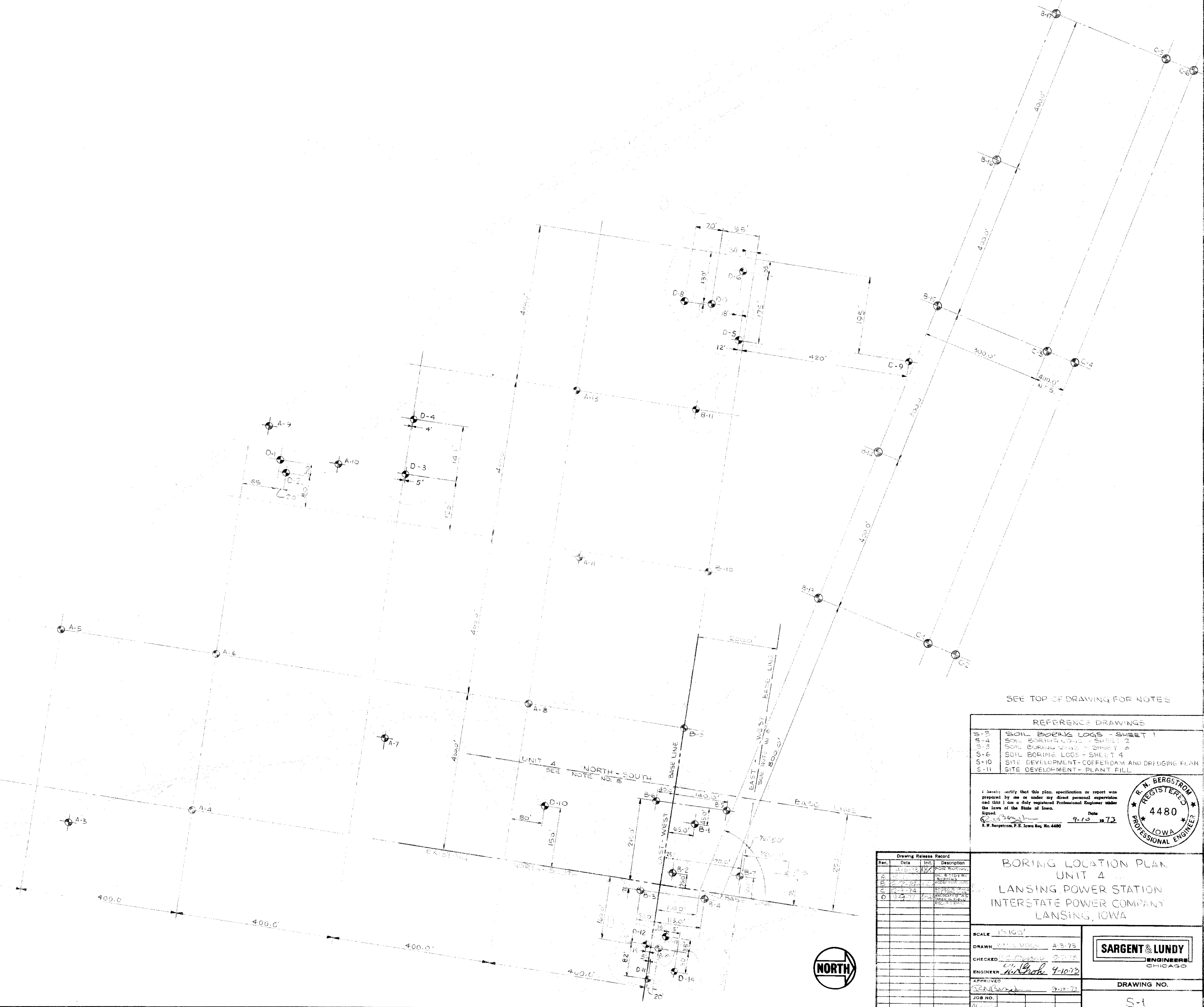
Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Structural Stability Assessment

NOTES

1. A-1 THRU A-22 25' MAXIMUM OR TO ROCK.
2. B-1 AND B-2 CORE 10' INTO SOLID ROCK, B-3 THRU B-19 TO ROCK.
3. C-1 THRU C-6 25' MAXIMUM BELOW WATER LEVEL OR TO ROCK.
4. STANDARD PENETRATION TEST BLOW COUNTS AT 5' INTERVALS OR CHANGE IN STRATA SHALL BE PROVIDED FOR EACH SAMPLE OF GRANULAR SOIL ENCOUNTERED.
5. STANDARD PENETRATION TEST BLOW COUNTS, FIELD POCKET PENETROMETER TESTS, AND WATER CONTENT DETERMINATIONS AT 5' INTERVALS OR CHANGE IN STRATA, SHALL BE PROVIDED FOR EACH SAMPLE OF COHESIVE SOIL ENCOUNTERED.
6. THE TYPE, CONSISTENCY, RECOVERY RATIO, ROCK QUALITY DESIGNATION AND LABORATORY UNCONFINED COMPRESSION TESTS ON REPRESENTATIVE ROCK SAMPLES SHALL BE PROVIDED FOR EACH ROCK CORE.
7. OBTAIN REPRESENTATIVE SOIL SAMPLES FROM THE RIVER BOTTOM, BORINGS NO. C-1 THRU C-6 AND THE EASTERN HALF OF THE SITE, BORINGS NO. A-1 THRU A-11, A-14 A-15 & A-18. PERFORM MODIFIED PROCTOR DENSITY TESTS AND GRAIN SIZE ANALYSIS ON REPRESENTATIVE SAMPLES.
8. FOR THE COMPOSITE UNIT 4 BASE LINE & GRID SYSTEM SEE DWG [illegible]
9. D-1 THRU D-14 TO ROCK.





NOTE: FOR BORINGS NOT SHOWN ON THIS LOCATION PLAN SEE INSET ABOVE.

SEE TOP OF DRAWING FOR NOTES

REFERENCE DRAWINGS

S-3	SOIL BORING LOGS - SHEET 1
S-4	SOIL BORING LOGS - SHEET 2
S-5	SOIL BORING LOGS - SHEET 3
S-6	SOIL BORING LOGS - SHEET 4
S-10	SITE DEVELOPMENT - COFFERDAM AND DREDGING PLAN
S-11	SITE DEVELOPMENT - PLANT FILL

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed [signature] Date 9-10 19 73

R. N. Bergstrom, P.E. Iowa Reg. No. 4480

R. N. BERGSTROM REGISTERED 4480 PROFESSIONAL ENGINEER IOWA

Drawing Release Record

Rev.	Date	Init.	Description
	4-6-73		FOR BORINGS
A			DELETED BORINGS
B	6-7-73		ADDED BASE LINES
C	12-3-74		ADDED BORINGS D-1 THRU D-14
D	9-9-77		RELOCATED D AS TAKEN IN FIELD RECORD DWG

BORING LOCATION PLAN
UNIT 4
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

SCALE 1" = 100'

DRAWN 4-3-73

CHECKED 9-7-73

ENGINEER [signature] 9-10-73

APPROVED [signature] 9-10-73

JOB NO. 4044

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. S-1

Boring A-1

Boring A-2

Boring A-3

Boring A-4

Boring A-5

Boring A-6

Boring A-7

Boring A-8

Boring A-9

Boring A-10

Boring A-11

Boring A-13

Boring A-15

Boring A-16

Boring A-17

Boring A-18

Boring A-19

Boring A-20

Boring A-21

Boring A-22

Boring C-1

Boring C-2

Boring C-3

Boring C-5

Boring C-6

Boring C-4

REFERENCE BID SPEC. G-2105 1-21-74

NOTES

1 LEGEND FOR DRILLING METHODS

REFERENCE DRAWINGS

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed [signature] Date 9-10 1973

R. N. Bergstrom, P. E., Iowa Reg. No. 4480

R. N. BERGSTROM REGISTERED 4480 IOWA PROFESSIONAL ENGINEER

SOIL BORING LOGS
SHEET 1
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

R.C. Odegard 9-7-73

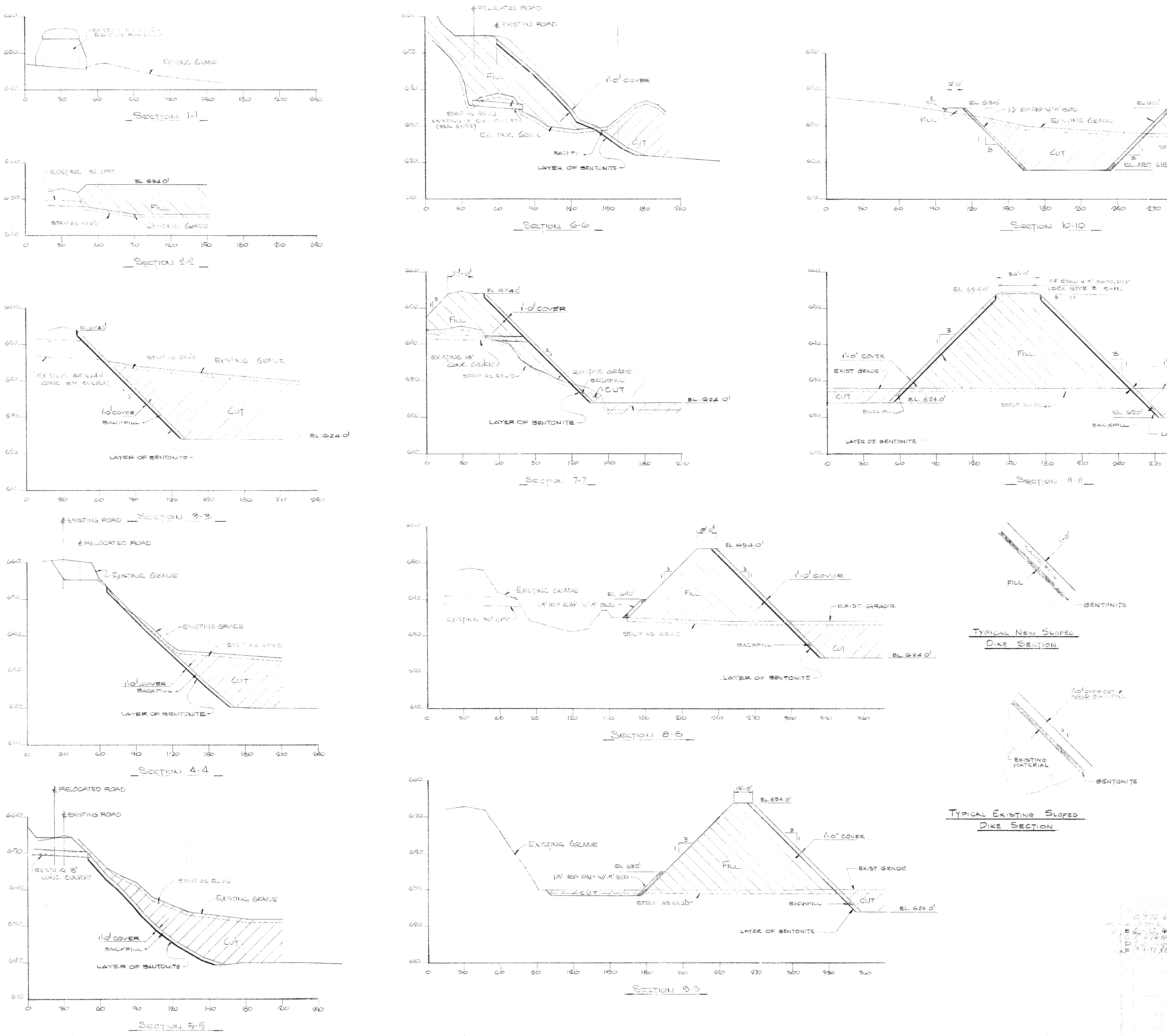
W A Groh 9-7-73

R N Bergstrom 9-10-73

SARGENT & LUNDY

4644-03

DRAWING NO. S-3



1. WORK IN CONJ. WITH DWGS S-10 & S-11
2. ALL FILL SHALL CONFORM TO SPEC G ...
3. ASH DIKE SECTIONS 4, 5 & 6 REVISED AS PER FIELD INFORMATION DATED 7/30/76.

S-10 SITE DEVELOPMENT - COFFERDAM & DREDGING PLAN
S-11 SITE DEVELOPMENT - PLANT FILL - UNIT 4

E 9-9-77 REDRAWN

SITE DEVELOPMENT
ASH DIKE SECTIONS - SHEET 1
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

VERT 1" = 10' HORIZ 1" = 30'
G. R. BOLL 5-20-74
R. C. OBRECHT 5-28-74
6-5-74

4644-63

S-14

APPENDIX B – 2015 Embankment and Foundation Soil Investigation

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Structural Stability Assessment

BORING LOG

CABENO Environmental Field Services, LLC

More Than Just A Probing Company

CLIENT: Hard Hat

PROJECT: Lansing, IA

COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

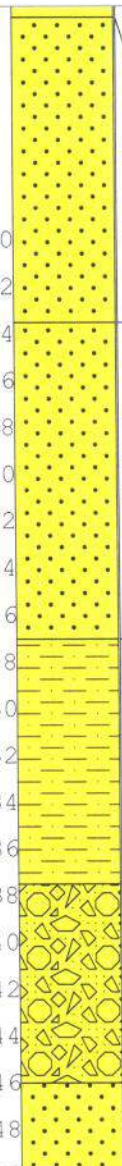
BORING NO.: ***SB1***

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/22/15*
DATE FINISHED: *1/2213/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 5	9.0
	SS2	18"	4 5 10	15.0
	SS3	18"	3 6 9	15.0
	SS4	18"	7 9 11	20.0
	SS5	18"	7 10 13	23.0
▽	SS6	18"	7 11 18	29.0
	SS7	18"	8 11 14	25.0
	SS8	18"	8 11 13	24.0
	SS9	18"	8 11 11	22.0
	SS10	18"	4 7 7	14.0
	SS11	18"	2 3 6	8.0
	SS12	18"	0 0 0	0.0
	SS13	18"	0 0 0	0.0
	SS14	18"	1 1 2	3.0
	SS15	18"	3 4 4	8.0
	SS16	18"	0 9 11	20.0
	SS17	18"	5 11 10	21.0
	SS18	18"	4 5 7	12.0
	SS19	18"	3 4 8	12.0

SOIL CONSISTENCY HISTOGRAM

PROFILE



DEPTH IN FEET	DESCRIPTION
0 – -1	SILT; brown; plastic; moist; trace clay
-1 – -13.5	SAND; brown; fine grained; poorly graded; well sorted; dry to moist 1'-5' sample collected for geotech analysis @ 9'2" black stained with plant matter
-13.5 – -27	SAND; gray; fine to medium grained; moist; graded; trace gravel and snail shells @ 15' grades wet 15'-20' sample collected for geotech analysis @17.5' grades brown @23.5' grades fine to coarse, well graded
-27 – -37.5	SILT; gray; non plastic; wet; trace clay 28'-32' sample collected for geotech analysis @29' grades trace plant matter and snail shells
-37.5 – -46	GRAVEL; brown; coarse; poorly graded; wet; trace cobbles 40'-50' sample collected for geotech analysis
-46 – -50	SAND; light gray; coarse grained; poorly graded; wet
-50	Bottom of boring @ 50' 1" PVC temp well installed @ 50'. 10' screen, natural sand pack

BORING LOG

CABENO Environmental Field Services, LLC
More Than Just A Probing Company

CLIENT: Hard Hat

PROJECT: Lansing, IA

COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

BORING NO.: *SB3*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/22/15*
DATE FINISHED: *1/22/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	6 7 7	14.0
	SS2	18"	4 9 10	19.0
	SS3	18"	5 10 19	29.0
	SS4	18"	7 13 16	29.0
	SS5	18"	6 12 17	29.0
∇	SS6	18"	6 12 16	28.0
	SS7	18"	12 21 21	42.0
	SS8	18"	8 12 15	27.0
	SS9	18"	8 19 21	40.0
	SS10	18"	8 5 6	11.0
	SS11	18"	6 8 15	23.0
	SS12	18"	5 5 10	15.0
	SS13	18"	3 1 1	2.0
	SS14	18"	6 10 10	20.0
	SS15	18"	4 6 12	18.0
	SS16	18"	10 9 7	16.0
	SS17	18"	6 8 10	18.0
	SS18	18"	22 24 21	45.0
	SS19	18"	10 10 12	22.0
	SS20	18"	14 9 12	21.0

DEPTH IN FEET	DESCRIPTION
0 to -2	SILT; gray to black; non plastic; moist; some bottom ash
-2 to -24	SAND; brown; fine grained; poorly graded; moist 2'-5' sample collected for geotech analysis 13'-20' sample collected for geotech analysis @13.5' grades wet and trace snail shells @16' grades fine to medium grained; graded 24'-27' sample collected for geotech analysis
-24 to -27	SILT; gray; non plastic to low plasticity; wet; some clay; trace organic plant matter
-27 to -31	GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand 27'-32' sample collected for geotech analysis
-31 to -33	SILT; gray to black; non plastic; wet; trace to some clay and organic plant matter
-33 to -50	GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand
-50	Bottom of boring @ 50' 1" PVC temp well installed @ 50'. 10' screen, natural sand pack

CABENO Environmental Field Services, LLC

More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

COORDINATES: N NOT SURVEYED E NOT SURVEYED

PROJECT: Lansing, IA

BORING NO.: *SB5*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 3	7.0
	SS2	18"	5 7 12	19.0
	SS3	18"	5 13 19	32.0
	SS4	18"	5 13 15	28.0
▽	SS5	18"	5 11 13	24.0
	SS6	18"	6 12 16	28.0
	SS7	18"	12 14 17	31.0
	SS8	18"	3 2 2	4.0
	SS9	18"	4 4 4	8.0
	SS10	18"	14 9 2	11.0
	SS11	18"	2 2 4	6.0
	SS12	18"	6 7 8	15.0
	SS13	18"	9 10 10	20.0
	SS14	18"	10 36 8	44.0
	SS15	18"	15 12 9	21.0
	SS16	18"	20 14 14	28.0
	SS17	18"	11 12 18	30.0
	SS18	18"	17 14 15	29.0
	SS19	18"	13 14 17	31.0
	SS20	18"	18 19 24	43.0

DEPTH IN FEET	DESCRIPTION
0 to -1	SILT; black; non plastic; dry to moist
-1 to -19	SAND; brown; fine grained; poorly graded; moist; trace to some bottom ash 5' bottom ash grades out 10'-16' sample collected for geotech analysis @12' grades wet and trace snail shells @ 16' grades gray to olive
-19 to -22	Silty CLAY; black to dark gray; low plasticity; moist; trace fine sand and organic plant matter 18.5'-20' sample collected for geotech analysis
-22 to -50	SAND & GRAVEL; black; fine to coarse; well graded; wet; trace to some silt 22'-27.5' sample collected for geotech analysis 40'-45' sample collected for geotech analysis @43.5' grades brown
-50	Bottom of boring @ 50' 1" PVC temp well installed @ 50'. 10' screen, natural sand pack

BORING LOG

CLIENT: Hard Hat

PROJECT: Lansing, IA

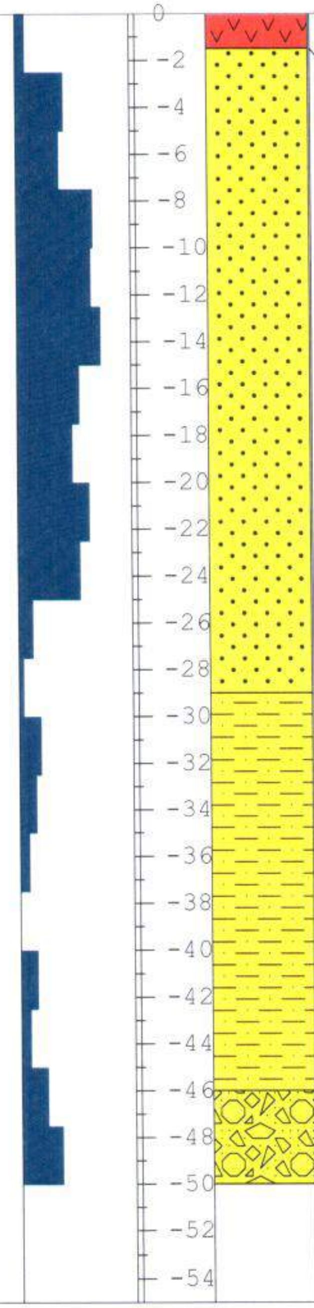
COORDINATES: *N NOT SURVEYED* / *E NOT SURVEYED*

BORING NO.: *SB7*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	3 2 2	4.0
	SS2	18"	9 11 19	20.0
	SS3	18"	4 5 13	18.0
	SS4	18"	7 14 18	32.0
	SS5	18"	5 11 20	31.0
	SS6	18"	8 15 20	35.0
▽	SS7	18"	7 12 14	26.0
	SS8	18"	7 9 14	23.0
	SS9	18"	11 13 17	30.0
	SS10	18"	8 12 14	26.0
	SS11	18"	2 3 3	6.0
	SS12	18"	1 1 1	2.0
	SS13	18"	3 3 6	9.0
	SS14	18"	2 3 4	7.0
	SS15	18"	1 2 2	4.0
	SS16	18"	0 0 0	0.0
	SS17	18"	2 3 4	7.0
	SS18	18"	3 2 2	4.0
	SS19	18"	8 4 7	11.0
	SS20	18"	2 8 9	17.0

SOIL CONSISTENCY HISTOGRAM / DEPTH IN FEET / PROFILE



DESCRIPTION

Bottom ASH; black; fine grained; poorly graded

SAND; brown; fine grained; poorly graded; moist

4'-10' sample collected for geotech analysis

@16' grades wet

19'-25' sample collected for geotech analysis

@ 21' grades gray

SILT; black to gray; no plasticity; moist to wet; trace clay

29'-32.5' sample collected for geotech analysis

36'-40' sample collected for geotech analysis

@ 41' grading trace organic plant matter and trace intermittent 1/16" sand seams

@ 44' is a thin, 1" gravel seam

GRAVEL; brown; coarse; poorly graded; wet; trace to some silt and sand
46'-50' sample collected for geotech analysis
last spoon blocked with large gravel

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

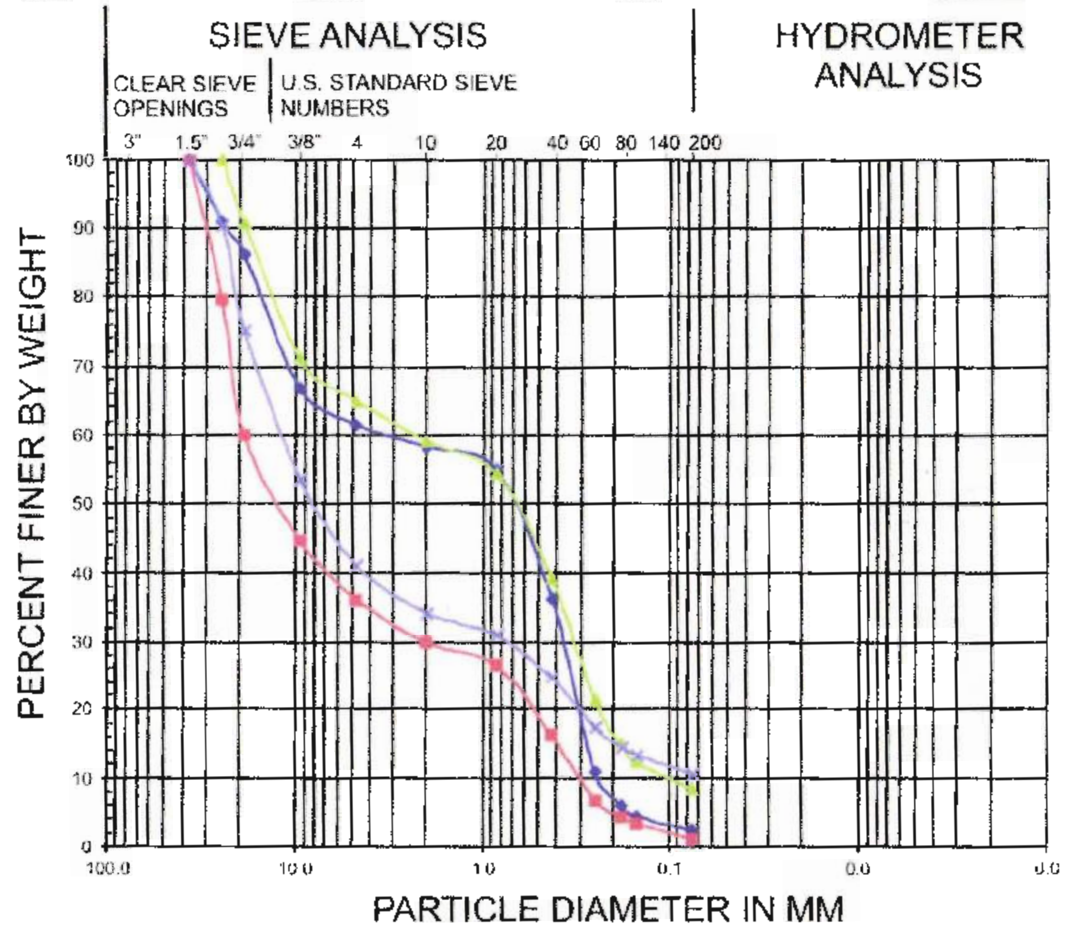
APPENDIX B

UPDATE TO ADD SB-7
· SEPARATE 8½x11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL - Lansing Generating Station — Tested By: Test America — Date: 2/3/2015
Boring No.: SB-1, SB-3 & SB-5 "SAND & GRAVEL"



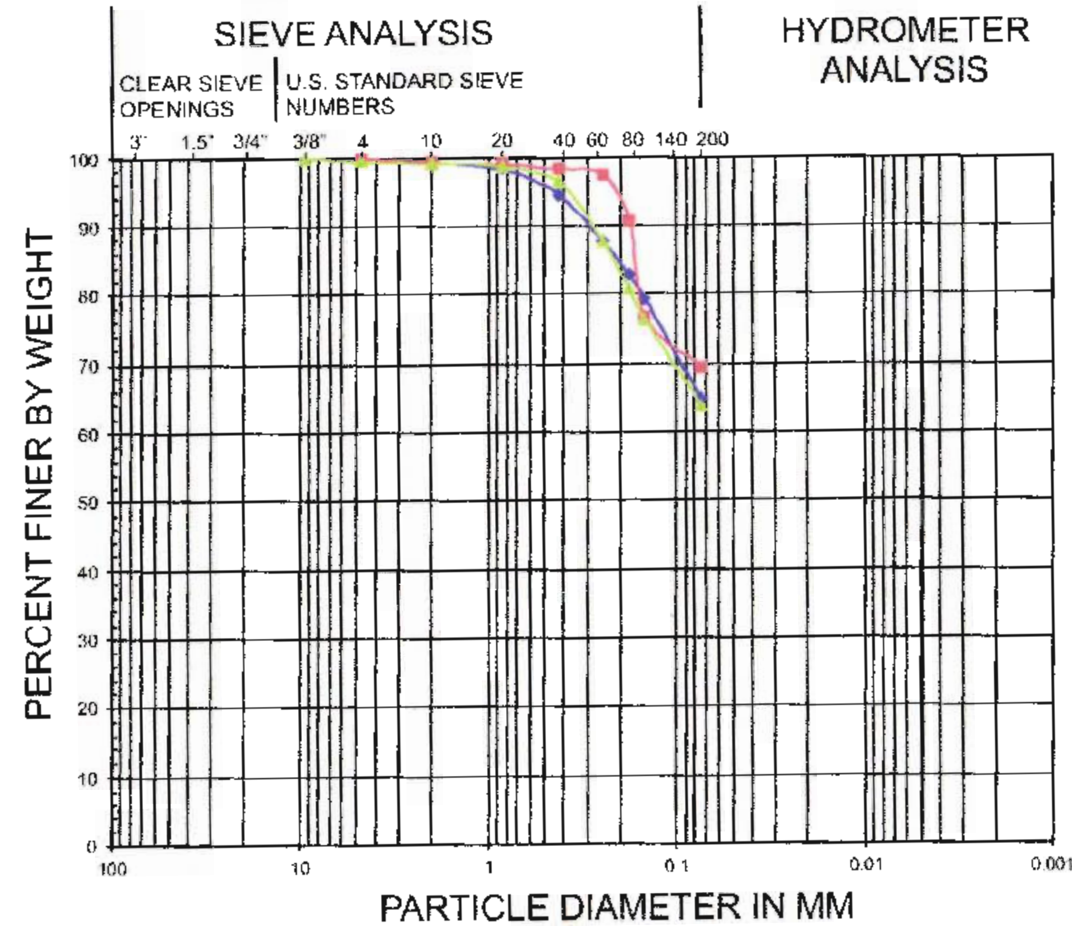
COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W %
	SB-1	40 - 50	SAND & GRAVEL	SW / GW	16.5
	SB-3	27 - 32	SAND & GRAVEL	SW / GW	13.4
	SB-5	22 - 27.5	SAND & GRAVEL	SW / GW	32.1
	SB-5	44 - 45	SAND & GRAVEL	SW / GW	9.8

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL – Lansing Generating Station — Tested By: Test America — Date: 2/3/2015
Boring No.: SB-1, SB-3 & SB-5 "SANDY SILT"



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W %
	SB-1	28 - 32	Sandy Silt	ML	28	26	36.1
	SB-3	24.5 - 27	Sandy Silt	ML	27	23	25.4
	SB-5	18.5 - 20	Sandy Silt	ML	24	20	21.8

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS

SCALE: NONE — DATE: 5-14-15
DRAWN BY: JFD — CHECKED BY: TJH — APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SEEPAGE CONTROL CUT-OFF WALL
PARTICLE SIZE DISTRIBUTION
SB-1 & SB-3

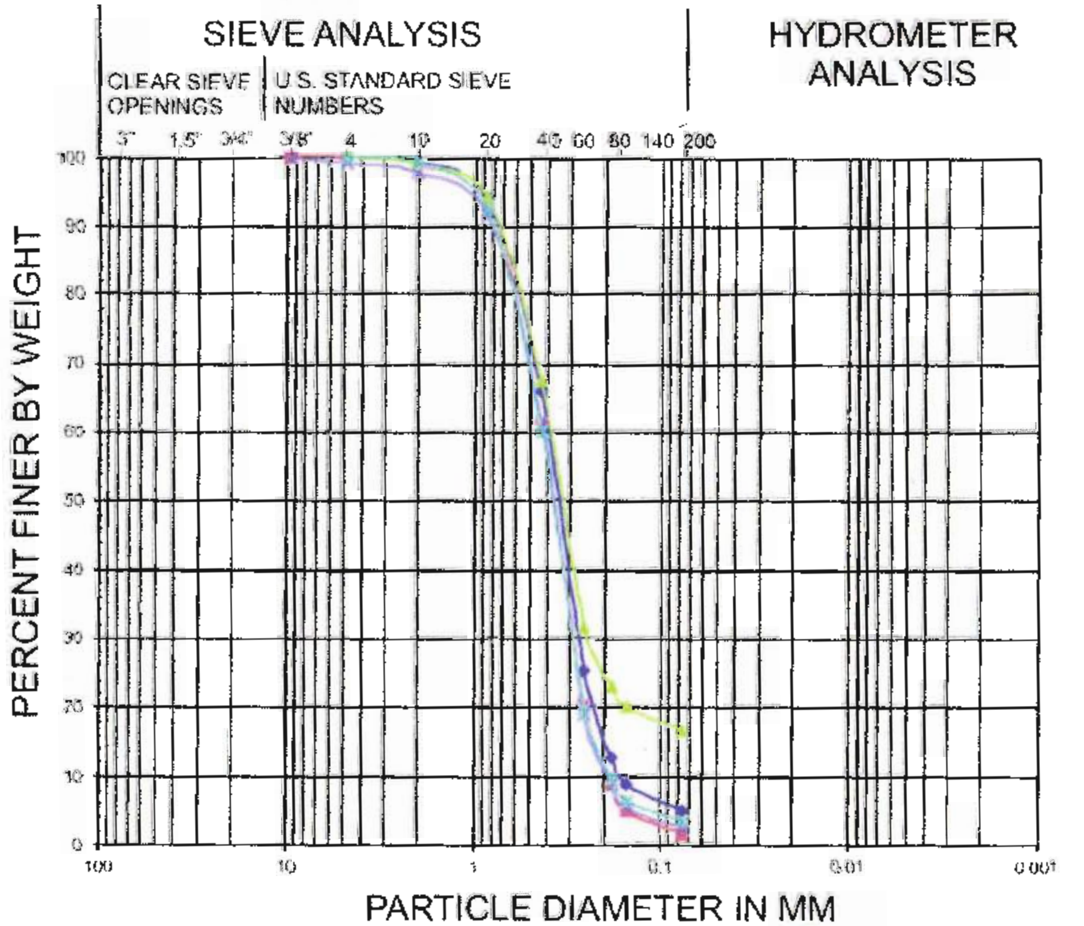
JOB 154.021.003
SHT. 8
DWG. 154021SW-08-12

APPENDIX B
UPDATE TO ADD SB-7
SEPARATE 8½x11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL - Lansing Generating Station
Boring No.: SB-1, SB-3 & SB-5 "UPPER SAND"
Tested By: TestAmerica
Date: 2/3/2015



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W %
	SB-1	1 - 5	Medium - Fine Sand	SP	4.1
	SB-1	15 - 20	Medium - Fine Sand	SP	20.1
	SB-3	2 - 5	Silty Medium - Fine Sand	SM	3.1
	SB-3	13 - 20	Medium - Fine Sand	SP	19.0
	SB-5	10 - 16	Medium - Fine Sand	SP	13.3

REV	DATE	BY	APP	DESCRIPTION
1	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS

SCALE: NONE | DATE: 5-14-15
DRAWN BY: JFD | CHECKED BY: TJH | APPROVED BY: MWL

HARD HAT SERVICES
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SEEPAGE CONTROL CUT-OFF WALL
PARTICLE SIZE DISTRIBUTION
SB-5

JOB 154.021.003
SHT. 9
DWG. 154021SW-08-12

HEC
Harrington Engineering & Construction, Inc.

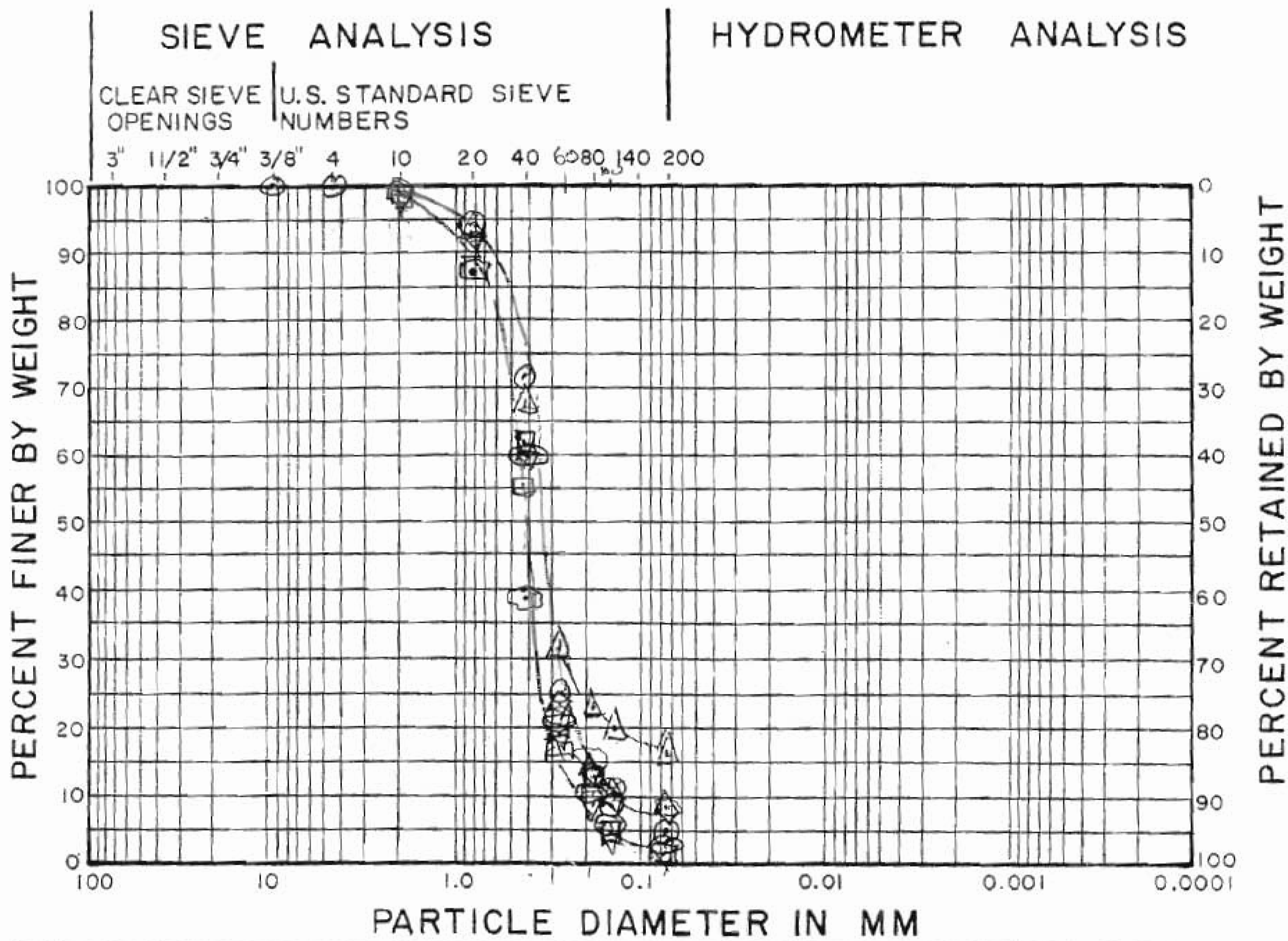
Particle Size Distribution

"UPPER SAND"

PROJECT ______ TESTED BY ______ DATE ______

PROJECT NO. ______ CALC BY ______ DATE ______

BORING NO. ______ CHKD BY ______ DATE ______



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

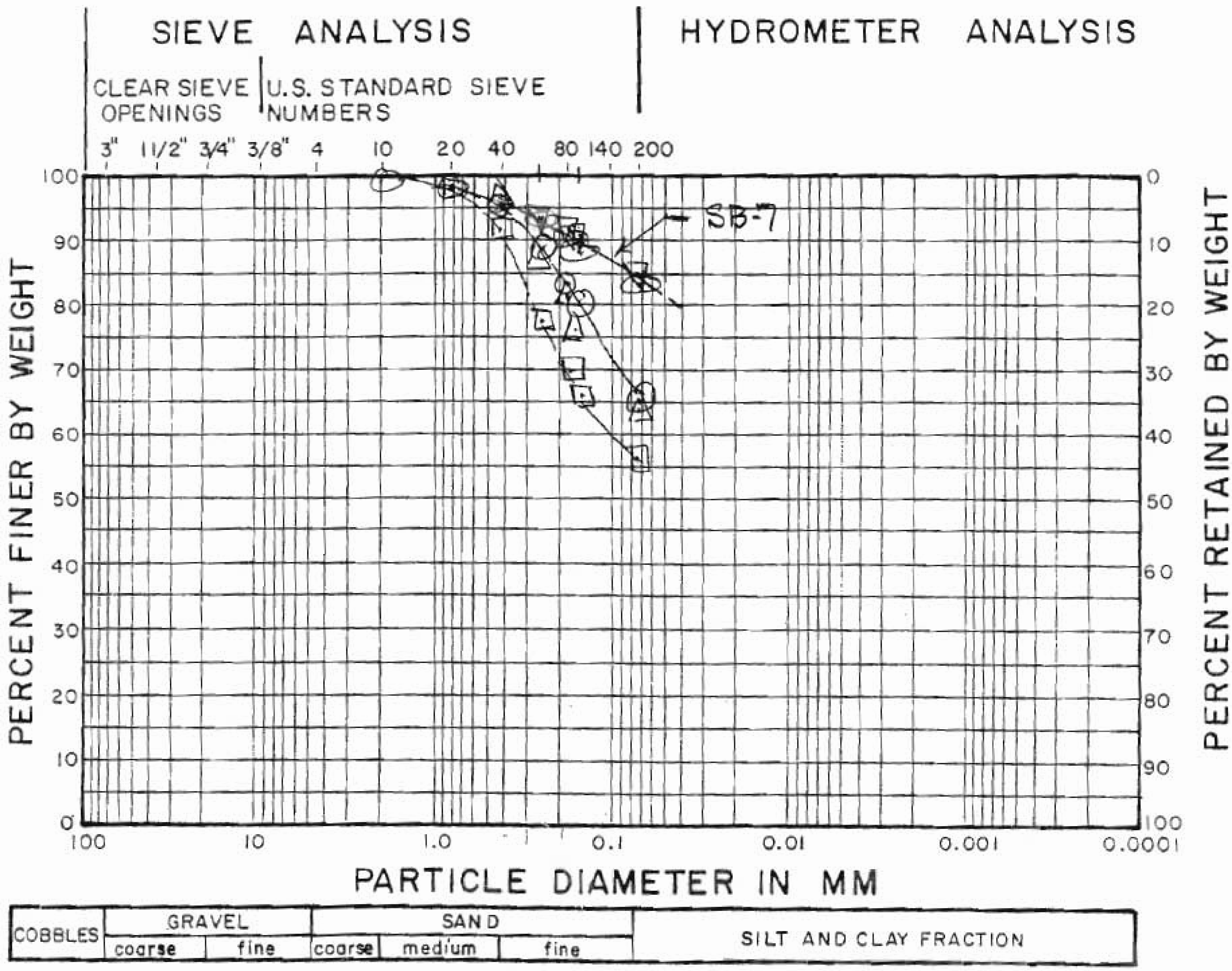
SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
⊙	SB-1		1-5	MED-FINE SAND	SP			4.1
⊡	SB-1		15-20	"	SP			20.1
△	SB-3		2-5	SILTY MED-FINE SAND	SM			3.1
▽	SB-3		13-20	MED-FINE SAND	SP			19.0
⊖	SB-5		10-16	"	SP			13.3
◇	SB-7		4-10	"	SP-SM			3.1
▭	SB-7		19-25	"	SP			17.1

HE&C
Harrington Engineering & Construction, Inc.

Particle Size Distribution

"SANDY SILT"

PROJECT ______________________ TESTED BY ______________ DATE ____________
PROJECT NO. ___________________ CALC BY ________________ DATE ____________
BORING NO. ____________________ CHKD BY ________________ DATE ____________



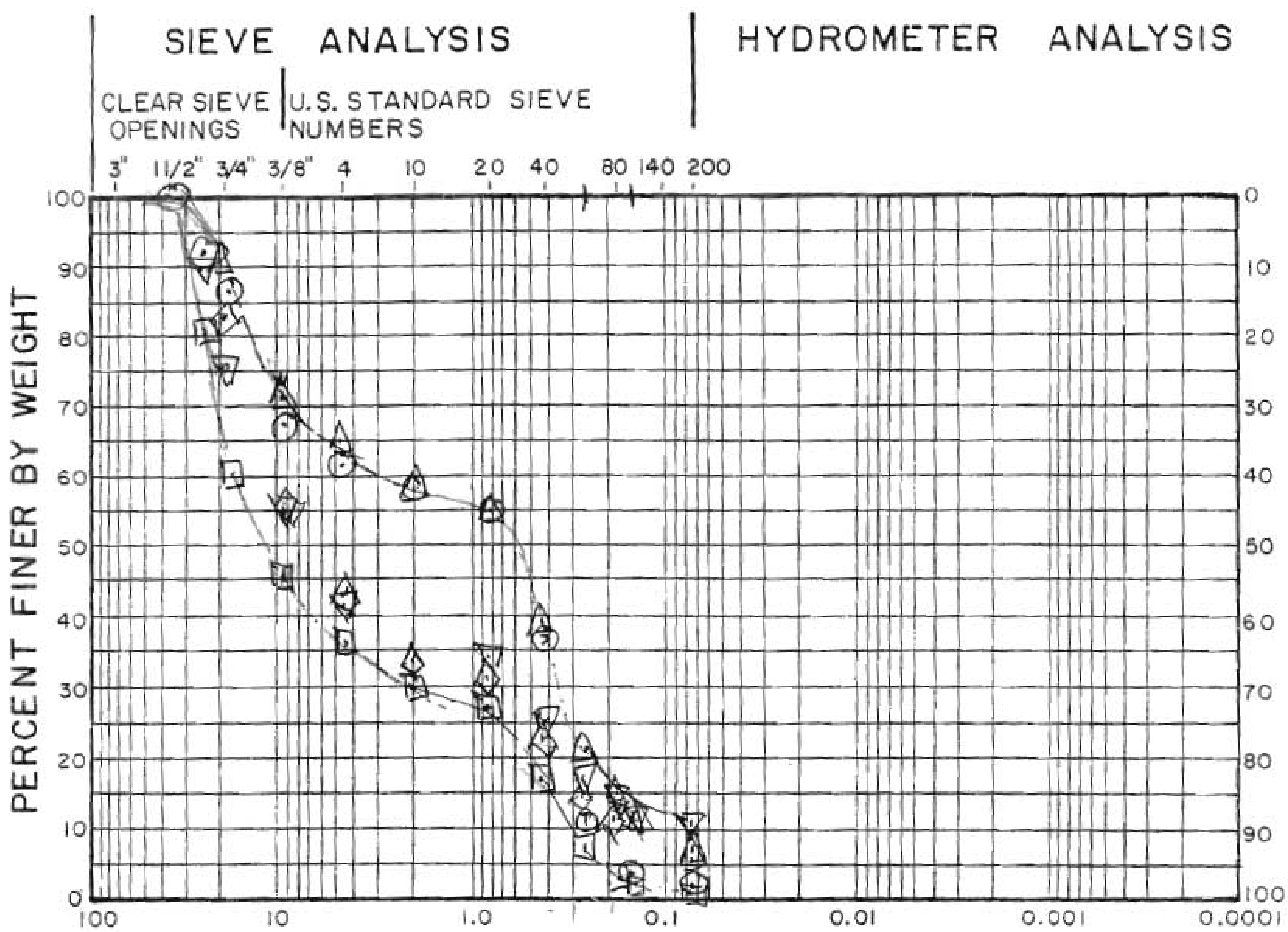
SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
○	SB-1		28-32	SANDY SILT	ML	28	26	36.1
▫	SB-3		24.5-27	SANDY SILT	ML	27	23	23.4
△	SB-5		18.5-20	SANDY SILT	ML	24	20	21.8
▽	SB-7		29-32.5	SANDY SILT	ML	29	25	27.0
⬭	SB-7		36-40	SANDY SILT	ML	31	26	35.7

HE&C
Harrington Engineering & Construction, Inc.

Particle Size Distribution

"SANDY GRAVEL"

PROJECT ____________ TESTED BY ____________ DATE ____________
PROJECT NO. ____________ CALC BY ____________ DATE ____________
BORING NO. ____________ CHKD BY ____________ DATE ____________



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
◯	SB-1		40-50	SAND & GRAVEL	SW/GW			16.5
☐	SB-3		27-32	"	"			13.4
△	SB-5		22-27.5	"	"			32.1
▽	SB-5		44-45	"	"			9.8
◇	SB-7		46-50	"	"			35.7

APPENDIX C – Flood Elevations for Mississippi River Pool #9

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Structural Stability Assessment

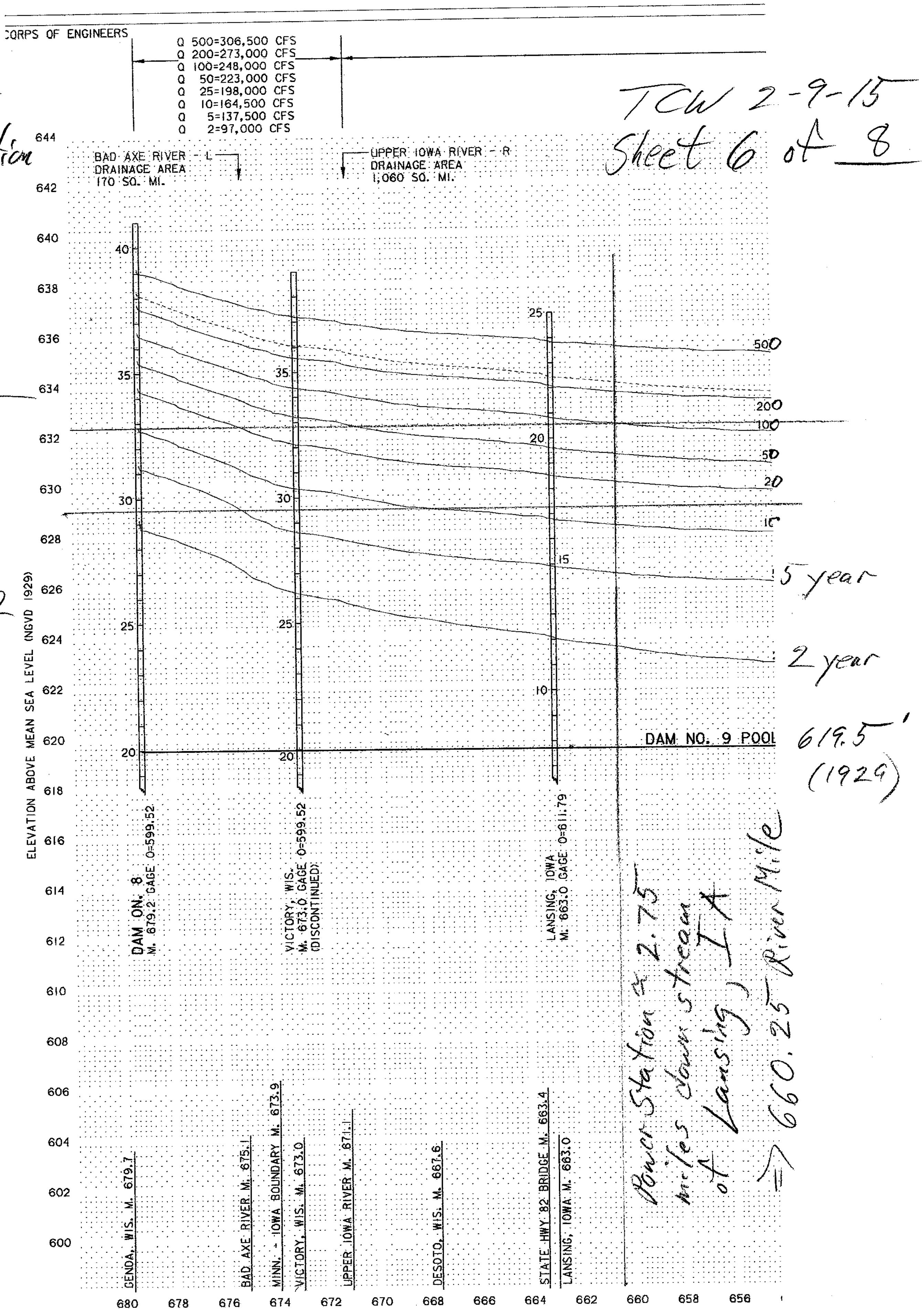
IPL
Lansing IA
Power Station

TCW 2-9-15
Sheet 6 of 8

100 Year Level
632.3
Datum 1929

632.8
Datum 1912

632.15
Datum 1988

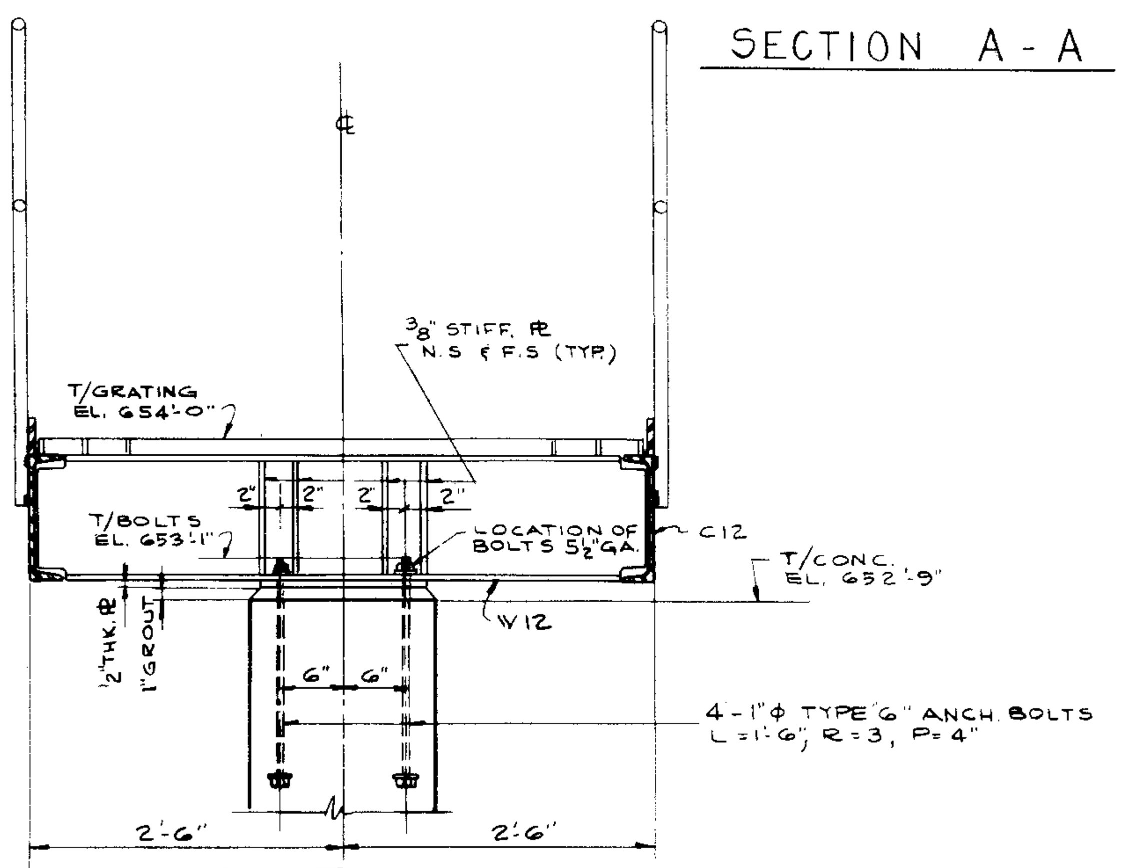


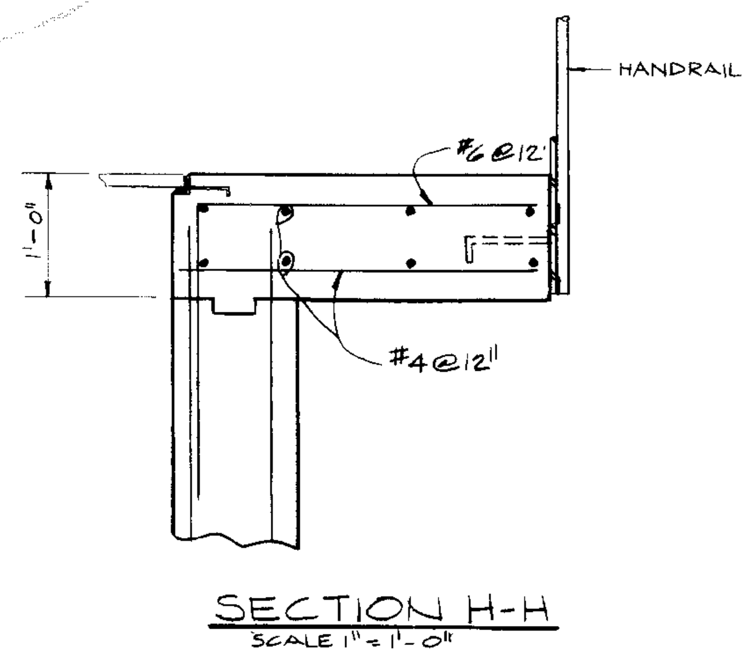
Ref: USACE Upper Mississippi River Flow Frequency Query

APPENDIX D – Construction Details Weir Box #1

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Structural Stability Assessment





NOTES

1. FOR GENERAL NOTES SEE DWG. S-
2. ALL GRATINGS, CURB ANGLES, HANDRAIL & HANDRAIL POSTS SHALL BE GALVANIZED.
3. STOP LOG TIMBER SHALL BE - DENSE SELECTED STRUCTURAL GRADE DOUGLAS-FIR AND BE TREATED WITH CREOSOTE PRESERVATIVE, 1" MIN. PENETRATION & CREOSOTE RETENTION OF 8.0 LBS PER CUBIC FOOT.
4. FURNISH ONE "SECTION" OF STOP LOG WHICH CONSISTS OF 3-5½"x11½" WIDE TIMBERS FASTENED TOGETHER AS A UNIT AS INDICATED IN S.&L. STD. DWG. 1743-6 FOR BOTTOM PART OF EACH "SET". COAT HEAVILY WITH BITUMINOUS PAINT BETWEEN TIMBERS. FURNISH SINGLE 5½"x11½" WIDE STOP LOGS FOR ALL OTHERS.

REFERENCE DRAWINGS

S-215	WEIR BOX Nº1, Nº2 & Nº3 - SECTIONS & DETAILS

Drawing Release Record

Rev.	Date	Init.	Description
	3-28-74	ASC	FOR MATERIAL ONLY
A	5-28-74	ASC	FOR CONSTRUCTION
B	9-5-74	ASC	STOP LOGS CHG'D
C	9-25-74		DIMENSIONS CHANGED
D	7-7-75	ASC	REV. ELEVATIONS REV. PILING
E	2-25-75		COMPACTED GRAVEL FILL ADDED

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.
Signed [signature] Date 8-14-74
R. N. Bergstrom, P.E. Iowa Reg. No. 4480

R. N. BERGSTROM REGISTERED 4480 PROFESSIONAL ENGINEER IOWA

WEIR BOX NO.1 & NO.2 - PLAN SECTIONS & DETAILS ASH SETTLING BASIN

LANSING POWER STATION UNIT 4
INTERSTATE POWER CO.
LANSING, IOWA

SCALE ¼"=1'-0" UNLESS NOTED
DRAWN S.J.C. 12-13-73
CHECKED S. K. JUNG 8/12/74
ENGINEER [signature] 8-12-74
APPROVED [signature] 8-14-74
JOB NO. 4644

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. S-213

Appendix F

Initial Safety Factor Assessment (September 2016)

ALLIANT ENERGY
Interstate Power and Light
Lansing Generating Station

CCR SURFACE IMPOUNDMENT

SAFETY FACTOR ASSESSMENT

Report Issued: September 2, 2016
Revision 0

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

EXECUTIVE SUMMARY

This Safety Factor Assessment (Report) is prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) published Final Rule for Hazardous and Solid Waste Management System – Disposal of Coal Combustion Residual (CCR) from Electric Utilities (40 CFR Parts 257 and 261, also known as the CCR Rule) published on April 17, 2015 and effective October 19, 2015.

This Report assess the safety factors of each CCR unit at Lansing Generating Station in Lansing, Iowa in accordance with §257.73(b) and §257.73(e) of the CCR Rule. For purposes of this Report, "CCR unit" refers to existing CCR surface impoundments.

Primarily, this Report is focused on assessing if each CCR surface impoundment achieves the minimum safety factors, which include:

- Static factor of safety under long-term, maximum storage pool loading condition,
- Static factor of safety under the maximum surcharge pool loading condition,
- Seismic factor of safety; and,
- Post-Liquefaction factor of safety for embankments constructed of soils that have susceptibility to liquefaction.

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Appendices

1 Introduction

The owner or operator of the Coal Combustion Residual (CCR) unit must conduct an initial and periodic safety factor assessments to determine if each CCR surface impoundment achieves the minimum safety factors, which include:

- Static factor of safety under long-term, maximum storage pool loading condition,
- Static factor of safety under the maximum surcharge pool loading condition,
- Seismic factor of safety; and,
- Post-Liquefaction factor of safety for embankments constructed of soils that have susceptibility to liquefaction.

This Report has been prepared in accordance with the requirements of §257.73(b) and §257.73(e) of the CCR Rule.

1.1 CCR Rule Applicability

The CCR Rule requires a periodic safety factor assessment by a qualified professional engineer (PE) for existing CCR surface impoundments with a height of 5 feet or more and a storage volume of 20 acre-feet or more; or the existing CCR surface impoundment has a height of 20 feet or more.

1.2 Safety Factor Assessment Applicability

The Lansing Generating Station (LAN) in Lansing, Iowa (Figure 1) has one existing CCR surface impoundment, identified as LAN Upper Ash Pond

The identified existing CCR surface impoundment meets the requirements of §257.73(b)(1) and/or §257.73(b)(2), therefore is subject to the periodic safety factor assessment requirements of §257.73(e) of the CCR Rule.

2 FACILITY DESCRIPTION

LAN is located approximately three miles southeast of Lansing, Iowa on the western shore of the Mississippi River in Allamakee County, at 2320 Power Plant Drive, Lansing, Iowa (Figure 1).

LAN is a fossil-fueled electric generating station that has used four steam turbine electric generating units throughout its history. Unit 1, Unit 2, and Unit 3 were retired by 2014 and Unit 4 is the only operating unit. Sub-bituminous coal is the primary fuel for producing steam at LAN. The CCR at LAN is categorized into three types: bottom ash, fly ash, and scrubber byproduct. Fly ash is collected by electrostatic precipitators and pneumatically conveyed to an onsite fly ash silo, which is equipped with a baghouse for dust control. The fly ash is then either transported off-site for beneficial reuse, landfilled (in the case of high loss on ignition), or sluiced to LAN Upper Ash Pond (typically during startup and shutdown). Bottom ash is sluiced to a surface impoundment identified as the LAN Upper Ash Pond, Figure 2, where it is dredged, dewatered, and transported to the onsite landfill. The LAN Upper Ash Pond is located south of the generating plant and is the only existing CCR surface impoundment. Scrubber byproduct consists of fly ash, unreacted lime, and activated carbon. Scrubber byproduct is collected in the byproduct silo prior to being landfilled.

A previous CCR surface impoundment at LAN, identified as the Lower Ash Pond, was located west of the generating plant and north of Power Plant Drive. The Lower Ash Pond was closed in September 2015 by removing the CCR from the surface impoundment via hydraulic dredge and sluicing the CCR to the south end of the LAN Upper Ash Pond. CCR was removed from the Lower Ash Pond prior to backfilling the surface impoundment.

General Facility Information:

Date of Initial Facility Operations:	1946
NPDES Permit Number:	IA0300100

Latitude / Longitude:	41°56’38.43”N 91°38’22.39”W
Nameplate Ratings:	Unit 1 (1948): 16.6 MW (Retired)
	Unit 2 (1949): 11.4 MW (Retired)
	Unit 3 (1957): 35.8 MW (Retired)
	Unit 4 (1977): 270 MW

2.1 LAN Upper Ash Pond

The LAN Upper Ash Pond is located southwest of the generating plant and south of Power Plant Drive. The LAN Upper Ash Pond receives influent flows from the Unit 4 boiler floor sumps, water treatment sumps, fly ash hydroveyor system, storm water runoff from the active dry ash landfill and hillside east of the impoundment, as well as sluiced fly ash and bottom ash. The LAN Upper Ash Pond is the only receiver of sluiced CCR at LAN. The CCR is sluiced from the generating plant to the south east corner of the LAN Upper Ash Pond, Figure 2. The sluiced CCR discharges into the southeast corner of the LAN Upper Ash Pond where the majority of the CCR settles. Ongoing maintenance dredging is conducted in the southern portion of the LAN Upper Ash Pond. The dredged CCR is temporarily stockpiled and dewatered prior to being transported to the on-site active dry ash landfill located south of the LAN Upper Ash Pond.

The sluiced water that is discharged into the LAN Upper Ash Pond flows to the west prior to flowing north through a series of five interconnected settling ponds separated by intermediate dikes. The intermediate dikes have 30-inch diameter corrugated metal pipes on the west and east sides, which hydraulically connects the five settling ponds. The water from each settling pond flows north until it enters the fifth large open settling pond area of the LAN Upper Ash Pond. The north end of the LAN Upper Ash Pond has a concrete wet well and overflow weir structure that controls the LAN Upper Ash Ponds water level, and is identified as Weir Box #1. The water in the LAN Upper Ash Pond overflows a stop log weir into Weir Box #1 and then through a 146 foot long 24 inch diameter corrugated metal pipe, under Power Plant Drive, and into Weir Box #2. The water leaves Weir Box #2 through a 225 foot long, 24-inch diameter high density polyethylene pipe, which connects Weir Box #2 to Weir Box #3. The water flows through

Weir Box #3 in the backfilled former Lower Ash Pond. The water flows through Weir Box #3 and discharges to the west through a 77 foot long, 24-inch diameter corrugated metal pipe into Unnamed Creek #1. Unnamed Creek #1 flows to the north into Unnamed Creek #2 which then discharges into the Mississippi River. The National Pollution Discharge Elimination System (NPDES) Outfall 002 monitoring location, which consists of flow monitoring instrumentation, is located at Weir Box #1 and compliance samples are collected from Weir Box #3.

The total surface area of the LAN Upper Ash Pond is approximately 11.5 acres and has an embankment height of approximately 20 feet from the crest to the toe of the downstream slope at its greatest height. The area of the entire CCR Unit inclusive of the impoundment and the dredging and dewatering areas is approximately 17 acres. The interior storage depth of the LAN Upper Ash Pond is approximately 28 feet. The volume of impounded CCR and water within the LAN Upper Ash Pond is approximately 587,000 cubic yards.

3 SAFETY FACTOR ASSESSMENT- §257.73(e)

This Report evaluates whether each CCR surface impoundment achieves the minimum safety factors, which are identified on the table below.

Safety Factor Assessment	Minimum Safety Factor
Static Safety Factor Under Maximum Storage Pool Loading	1.50
Static Safety Factor Under Maximum Surcharge Pool Loading	1.40
Seismic Safety Factor	1.00
Liquefaction Safety Factor	1.20

3.1 Safety Factor Assessment Methods

The safety factor assessment is completed with the two dimensional limit-equilibrium slope stability analyses program STABL5M (1996)[1]. The program analyzes many potential failure circles or block slides by random generation of failure surfaces using the toe and crest search boundaries set for each analysis. The solution occurs by balancing the resisting forces along the failure plane due to the Mohr-Columb failure strength parameters of friction angle and cohesion. The gravity driving forces are divided by the resisting forces to produce a safety factor for the slope. The minimum of hundreds of searches is presented as the applicable safety factor.

There are both total stress and effective stress friction angle and cohesion values for soil. In the case of cohesionless soil (gravel, sand and silt) the values are the same. For clay the total stress value is cohesion only. At the LAN Upper Ash Pond only cohesionless soil is present in and under the embankments.

3.1.1 Soil Conditions In and Under the Impoundment

The LAN Upper Ash Pond is constructed in the valley of Unnamed Creek #1 south of the LAN Generating Station. The Unnamed Creek #1 was rerouted to the west side of the

[1] STABL User Manual by Ronald A. Siegal, Purdue University, June 4, 1975 and STABL5 – The Spencer Method of Slices: Final Report by J. R. Carpenter, Purdue University, August 28, 1985

valley in the northern half of the LAN Upper Ash Pond when the impoundment was constructed in 1974. At the north end of the LAN Upper Ash Pond, Unnamed Creek #1 drops over a manmade riffle structure under the Power Plant road Bridge losing approximately 14 feet of elevation to reach the elevation of Pool #9 of the Mississippi River. The drop structure prevents backwater flooding of the Mississippi River from encroaching on the toe of the LAN Upper Ash Pond embankment.

In early 2015, four soil borings were installed at the locations shown on Figure 2, to determine the types of and density of soil present in the embankments and foundation of the LAN Upper Ash Pond. The soil borings logs SB-1, SB-3, SB-5 and SB-7 including the penetration resistance measured by the Standard Split Spoon (SPT) (ASTM D 1556) are enclosed in Appendix A. The results of laboratory testing on selected soil samples for grain size, water content and Atterberg limits are shown in Appendix B.

The test results indicate that the embankment is constructed of uniform fine to medium sand (SP). The sand was compacted to medium dense to dense consistency as shown by the SPT results. Below the embankment, the two northern borings SB-1 and SB-7, Figure 2, show that a very loose to loose silt is present under the embankment overlying a medium dense gravel. In borings SB-3 and SB-5, Figure 2, the silt is thin and overlies the same gravel. The silt deposit in the two northern borings is from backwater deposition by the Mississippi River prior to the installation of the LAN Upper Ash Pond and the thin silt layer to the south is natural deposition from flooding of the Unnamed Stream #1. The Iowa Bedrock Survey Map available from the Iowa Geology and Water Survey, July 2013 indicates that bedrock is at elevation 564 (depth of 90 feet below top of embankment) in the northern part of the LAN Upper Ash Pond and rises in elevation moving south up the valley of the Unnamed Stream #1.

A cement-bentonite slurry wall was installed in the West embankment of the LAN Upper Ash pond in the summer of 2015. The cement-bentonite wall prevents water from the LAN Upper Ash Pond from flowing through the embankment sand and discharging as surface seepage at the toe of the embankment. During installation of the wall it was observed that the sand below the normal water elevation in the embankment had higher strength than sand above the water table likely due to cementation of the sand particles by calcium hydroxide in the impoundment water. The observation was used along with the SPT values in the boring logs to assign soil properties to the embankment and foundation soils using NAVFACS DM-7[2]. The internal friction angles selected based on the SPT results are:

Soil Type	Internal Friction Angle	Total Unit Weight (lb/ft3)
Embankment Sand above GW	32	110
Embankment Sand below GW	36	108
River Silt	26	100
Valley Gravel	35	120

The ground water elevation in the embankment is monitored by piezometers installed on both sides of the cement-bentonite wall in 2015. The monitoring results show that the water elevation in the embankment drops 17 feet across the cement-bentonite cut off wall at the north end of the west embankment.

3.1.2 Design Water Surface in Impoundment: Maximum Normal Pool and Maximum Pool Under Design Inflow Storm

The LAN Upper Ash Pond water elevation is controlled by stop logs in the overflow structure, Weir Box #1, Figure 2. The normal pool is elevation 648.75 feet that occurs when operating with stop logs installed to elevation 648 feet and with the normal process water flow to the LAN Upper Ash Pond of 8.0 cubic feet per second.

During passage of the 1,000 year return period design storm, the impoundment elevation rises to elevation 652.5 feet according to the Inflow Flood Control Plan (a separate document developed to comply with40 CFR 257.82). The rise in pool elevation during

[2] Naval Facilities Engineering Command Design Manual DM-7, Figure 3-7 "Density versus Angle of Internal Friction for Cohesionless Soils", March 1971

the storm flow is 3.75 feet with a remaining freeboard of 1.5 feet on the minimum crest elevation of 654.

3.1.3 Selection of Seismic Design Parameters and Description of Method

The design earthquake ground acceleration is selected from the United States Geologic Survey (USGS) detailed seismic design maps based on the latitude and longitude of the station. The peak ground acceleration (PGA) value is selected for a 2% probability of exceedance in 50 years (2500 year return period) as required by 40 CFR 257.53. Since the site soils with the exception of the river silt layer are medium dense to dense sand and gravel and extend to bedrock at 90 feet, the site class as defined in the 2009 International Building Code 1613.5.5 is Site Class D. For Site Class D the ground surface PGA for slope stability and liquefaction assessment is 0.044 g, Appendix C.

3.1.4 Liquefaction Assessment Method and Parameters

Certain soils may have zero effective stress (liquefaction) during an earthquake from static shear of a saturated embankment slope. Soils that will liquefy include loose or very loose uniform fine sand or silt, and low plasticity clay (plastic index of less than 12). The liquefaction resistance of a soil is based on its strength and effective confining stress. The strength of the saturated embankment sand, river silt and valley gravel are measured by the SPT results shown on the borings in Appendix A.

The test results for SB-1 located on the west embankment, Figure 1, at the highest embankment height and with the lowest river silt strength measured indicate the silt is very loose (blowcounts weight of rod only).

The simplified assessment of liquefaction procedure as first proposed by Seed and most recently updated and published by Idriss and Boulanger[3] is used to assess the potential for liquefaction of the river silt. The procedure uses the strengths determined by the SPT test, adjusted to normalize for overburden pressure and for fines content, to determine

[3] Idriss I. M. and R. W. Boulanger, "Soil Liquefaction During Earthquakes", EERI MNO-12, 2008.

the cyclic resistance ratio for the soil at earthquake magnitude 7.5 and at 1 atmosphere pressure. The cyclic resistance ratio is then adjusted for the actual earthquake magnitude of the design event which is 7.7 for a New Madrid Fault source earthquake[4]. The cyclic stress ratio caused by the design surface PGA is then used to determine the actual cyclic stress ratio at 65% of maximum strain at depth in the soil profile. The cyclic resistance ratio is divided by the cyclic stress ratio to determine the factor of safety for liquefaction.

The results for the soil profile of SB-1 at the north end of the west embankment of the LAN Upper Ash Pond is shown in Appendix C. The results indicate that the river silt layer will not liquefy during the site design earthquake.

3.2 LAN Upper Ash Pond

The LAN Upper Ash Pond is incised on the east and south sides of the impoundment. The north and west sides the impoundment is created by construction of medium to fine sand embankments reported to be sand from maintenance dredging of the Mississippi River. All of the embankments have the same outer slope of 3 horizontal to 1 vertical. The southern end of the west embankment has lower embankment height and sits on more competent foundation soil and is not the critical section of the embankment.

The northern embankment and the north half of the west embankment sit on a layer of loose to very loose river silt. After closure of the former LAN Lower Ash Pond, the north embankment height was reduced and has more confinement on the river silt layer than the west embankment. In addition, the north embankment has a much wider crest to accommodate Power Plant Road.

For all of the above reasons, the west embankment in the vicinity of boring SB-1 is the critical embankment slope for the LAN Upper Ash Pond, Figure 2.

---

[4] Elnashi et al, "Impact of Earthquakes on the Central USA", FEMA Report 8-02, Mid-American Earthquake Center, 2002

3.2.1 Static Safety Factor Assessment Under Maximum Storage Pool Loading - §257.73(e)(1)(i)

The critical cross-section is analyzed with the maximum storage pool under normal operations at elevation 649 feet (648.75 feet rounded up). Analysis for both a circular and block sliding surface, Appendix D, show a minimum factor of safety of 1.8 for both the circular and block slide surface.

3.2.2 Static Safety Factor Assessment Under Maximum Surcharge Pool Loading - §257.73(e)(1)(ii)

The LAN Upper Ash Pond storm water flow with the design 1,000 year return flow is elevation 653 feet (652.5 feet rounded up). The increase in water elevation is considered with Unnamed Stream #1 flowing at bank full capacity under the assumption that it would be transmitting rainfall from the same storm event. Analysis for both a circular and block slide surface, Appendix D, show a minimum factor of safety of 1.7 for a block slide surface.

3.2.3 Seismic Safety Factor Assessment - §257.73(e)(1)(iii)

The LAN Upper Ash Pond was assigned a pseudo-static earthquake coefficient equal to 0.04 g and a vertical upward component equal to $^2/_3$ of the horizontal component (0.027 g) as recommended by Newmark[5]. Analysis for both circular and block slide surfaces, Appendix D, show a minimum factor of safety of 1.4 for a block slide surface.

3.2.4 Post-Liquefaction Safety Factor Assessment - §257.73(e)(1)(iv)

The embankment and foundation soils of the LAN Upper Ash Pond will not liquefy during the design earthquake. No post-liquefaction slope stability assessment is required.

[5] Newmark, N. M. and W. J. Hall, "Earthquake Spectra and Design", EERI Monograph, Earthquake Engineering Research Institute, Berkeley, California, 1982

4 Results Summary

The results of the safety factor assessment indicate that the embankment of the LAN Upper Ash Pond meets the requirements of 40 CFR 257.73(e). The results are summarized as:

	Static Stability Normal Water Elevation	Static Stability Flood Water Elevation	Pseudo Static Earthquake with Normal Water Elevation	Liquefaction Potential	Post-Earthquake Static Stability Normal Water Elevation
Required Safety Factor	1.5	1.4	1.0		1.2
LAN Upper Ash Pond	1.8	1.7	1.4	no	Not applicable

5 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

To meet the requirements of 40 CFR 257.73(e)(2), I Mark W. Loerop hereby certify that I am a licensed professional engineer in the State of Iowa; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR 257.73(b) and 40 CFR 257.73(e).

LICENSED PROFESSIONAL ENGINEER
MARK W. LOEROP
22197
IOWA

By:

Name: MARK LOEROP

Date: 09-02-2016

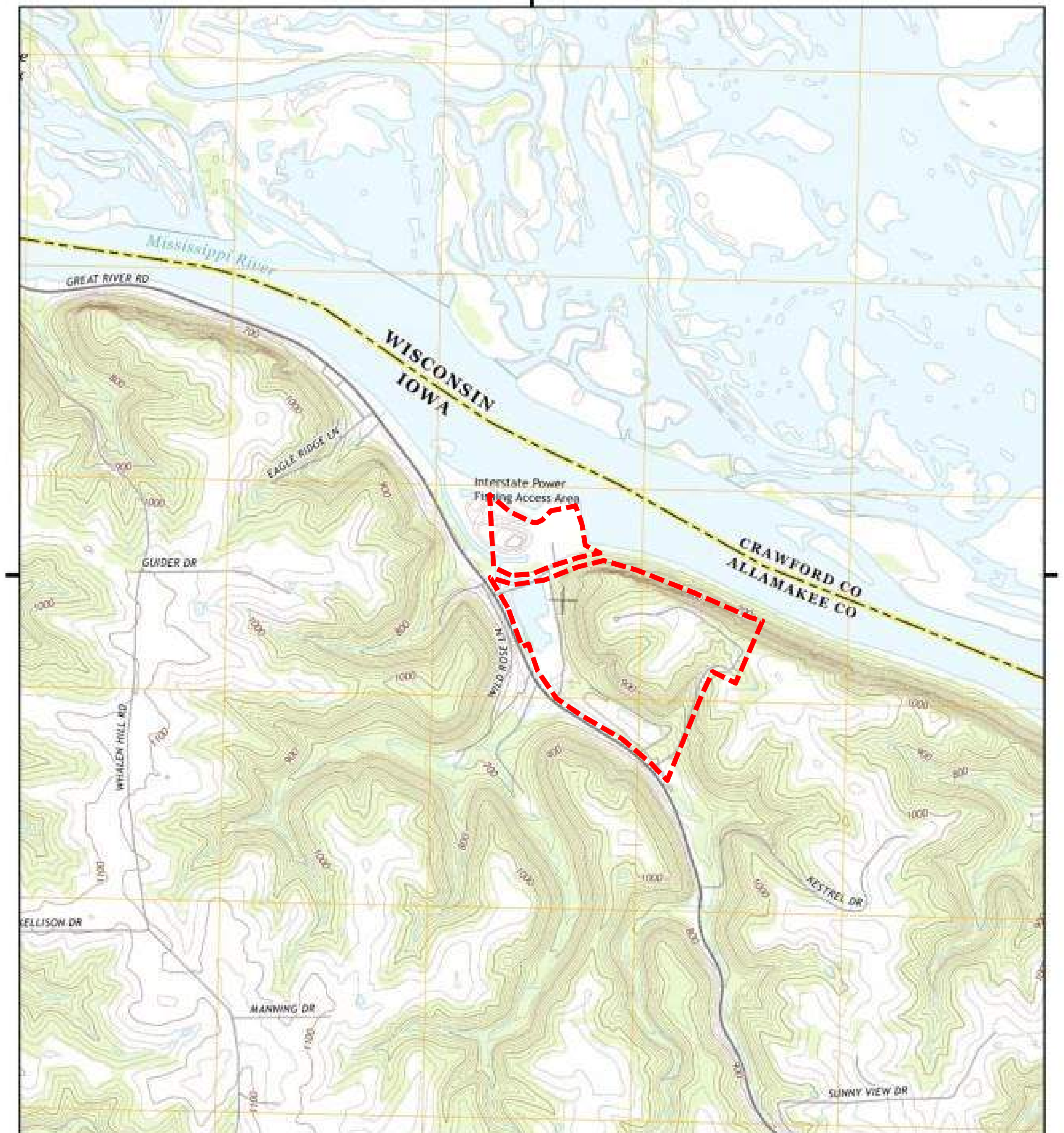
FIGURES

Alliant Energy
Interstate Power and Light
Lansing Generating Station
Lansing, Iowa

Safety Factor Assessment

Historical Topo Map

2013



This report includes information from the following map sheet(s).

Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Lansing, 2013, 7.5-minute

SITE NAME: Lasing Generating Station
ADDRESS: 2364-2366 Power Plant Dr
Lansing, IA 52151
CLIENT: Environmental Site Assessors

N

4555570 - 1 page 5

Historical Aerial Photo

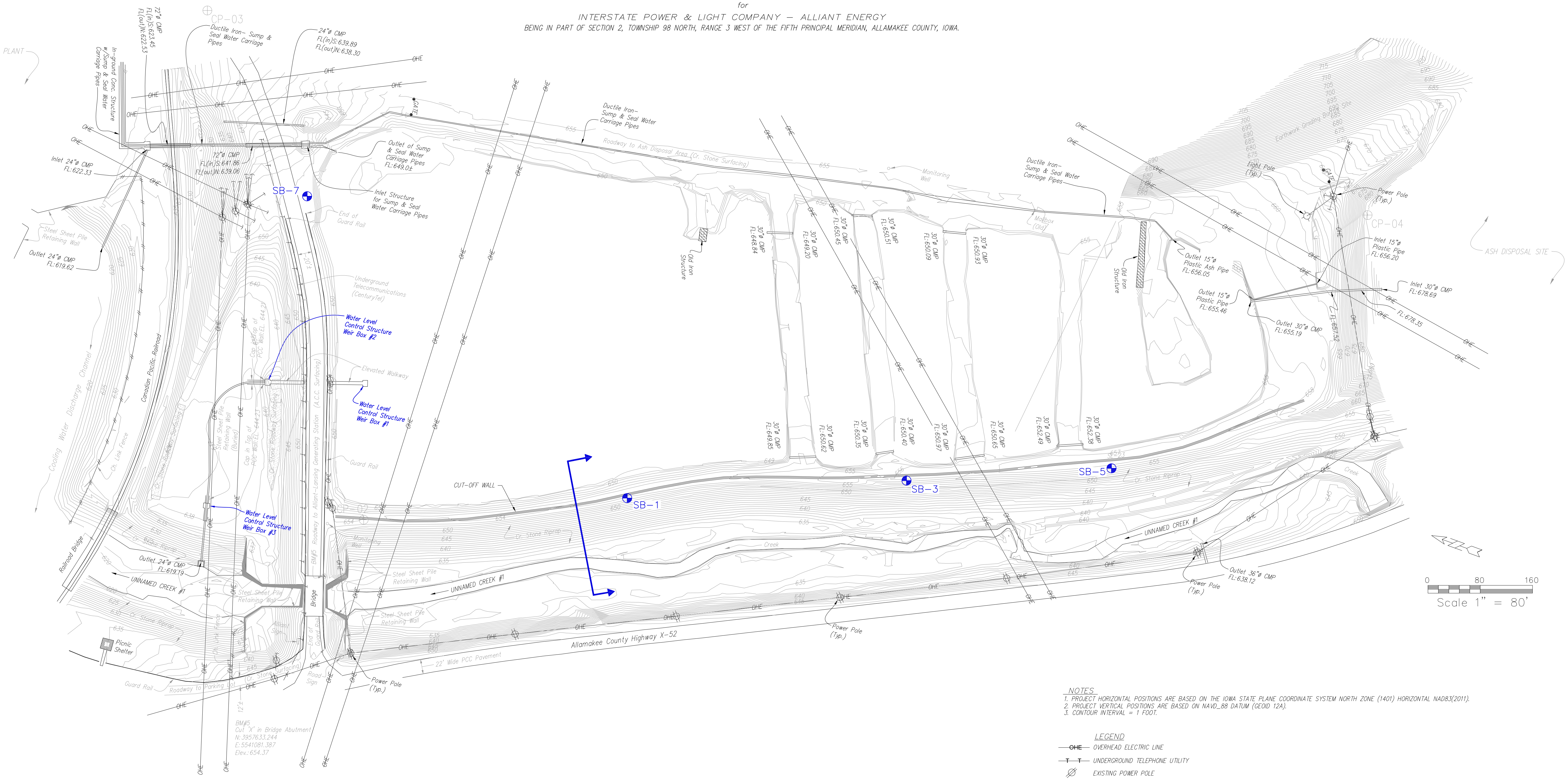
Approximate Property Boundary

HARD HAT SERVICES ™
Engineering, Construction and Management Solutions

Site Location
Lansing Generating Station
Intersate Power and Light Company

Drawing	Figure 1
Date	6/7/2016

UPPER AND LOWER CCR POND TOPOGRAPHIC SURVEY AND LOWER CCR POND BATHYMETRY
at
ALLIANT LANSING POWER GENERATING STATION
for
INTERSTATE POWER & LIGHT COMPANY – ALLIANT ENERGY
BEING IN PART OF SECTION 2, TOWNSHIP 98 NORTH, RANGE 3 WEST OF THE FIFTH PRINCIPAL MERIDIAN, ALLAMAKEE COUNTY, IOWA.



NOTES
1. PROJECT HORIZONTAL POSITIONS ARE BASED ON THE IOWA STATE PLANE COORDINATE SYSTEM NORTH ZONE (1401) HORIZONTAL NAD83(2011).
2. PROJECT VERTICAL POSITIONS ARE BASED ON NAVD_88 DATUM (GEOID 12A).
3. CONTOUR INTERVAL = 1 FOOT.

LEGEND
- OHE — OVERHEAD ELECTRIC LINE
- T — UNDERGROUND TELEPHONE UTILITY
- EXISTING POWER POLE
- SB — SOIL BORING LOCATION
- ANALYSIS CROSS-SECTION

NOTE:
1. SURVEY INFORMATION PROVIDED ABOVE WAS COMPILED BY MOHN SURVEYING, INC. 1890 GREAT RIVER ROAD LANSING, IOWA 52151, APRIL 2015.
2. ALLIANT ENERGY REQUIRES 20 FEET OVERHEAD SEPARATION DISTANCE FOR EQUIPMENT OPERATING UNDER POWERLINES.

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1				

SCALE: AS SHOWN | DATE: 5-19-16
DRAWN BY: JFD | CHECKED BY: CTS | APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SOIL BORING AND SLOPE STABILITY CROSS-SECTION LOCATION

JOB 154.018.012.002
SHT. FIGURE 2
DWG. 154.018.012.002-D2

APPENDIX A – Soil Borings

Alliant Energy
Interstate Power and Light
Lansing Generating Station
Lansing, Iowa

Safety Factor Assessment

BORING LOG

CABENO Environmental Field Services, LLC
More Than Just A Probing Company

CLIENT: Hard Hat

PROJECT: Lansing, IA

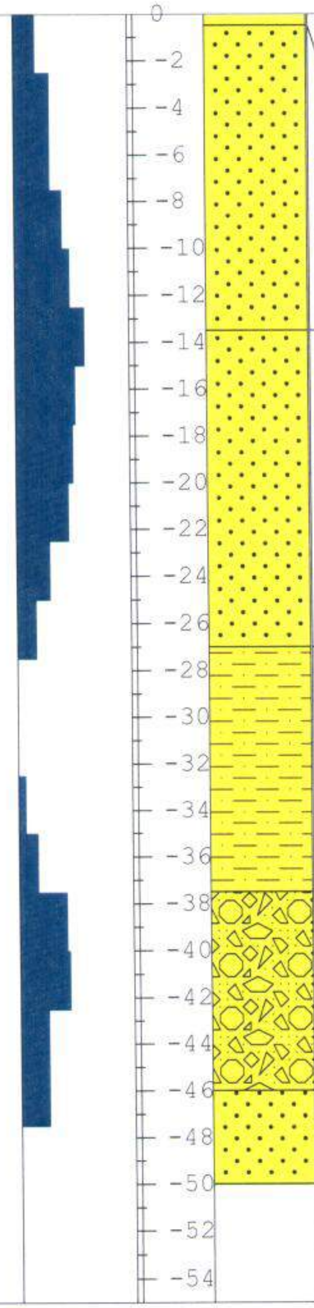
COORDINATES: *N NOT SURVEYED* / *E NOT SURVEYED*

BORING NO.: ***SB1***

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/22/15*
DATE FINISHED: *1/2213/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 5	9.0
	SS2	18"	4 5 10	15.0
	SS3	18"	3 6 9	15.0
	SS4	18"	7 9 11	20.0
	SS5	18"	7 10 13	23.0
▽	SS6	18"	7 11 18	29.0
	SS7	18"	8 11 14	25.0
	SS8	18"	8 11 13	24.0
	SS9	18"	8 11 11	22.0
	SS10	18"	4 7 7	14.0
	SS11	18"	2 3 6	8.0
	SS12	18"	0 0 0	0.0
	SS13	18"	0 0 0	0.0
	SS14	18"	1 1 2	3.0
	SS15	18"	3 4 4	8.0
	SS16	18"	0 9 11	20.0
	SS17	18"	5 11 10	21.0
	SS18	18"	4 5 7	12.0
	SS19	18"	3 4 8	12.0

SOIL CONSISTENCY HISTOGRAM / DEPTH IN FEET / PROFILE



DESCRIPTION

SILT; brown; plastic; moist; trace clay

SAND; brown; fine grained; poorly graded; well sorted; dry to moist

1'-5' sample collected for geotech analysis

@ 9'2" black stained with plant matter

SAND; gray; fine to medium grained; moist; graded; trace gravel and snail shells

@ 15' grades wet

15'-20' sample collected for geotech analysis

@17.5' grades brown

@23.5' grades fine to coarse, well graded

SILT; gray; non plastic; wet; trace clay

28'-32' sample collected for geotech analysis

@29' grades trace plant matter and snail shells

GRAVEL; brown; coarse; poorly graded; wet; trace cobbles

40'-50' sample collected for geotech analysis

SAND; light gray; coarse grained; poorly graded; wet

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

BORING LOG

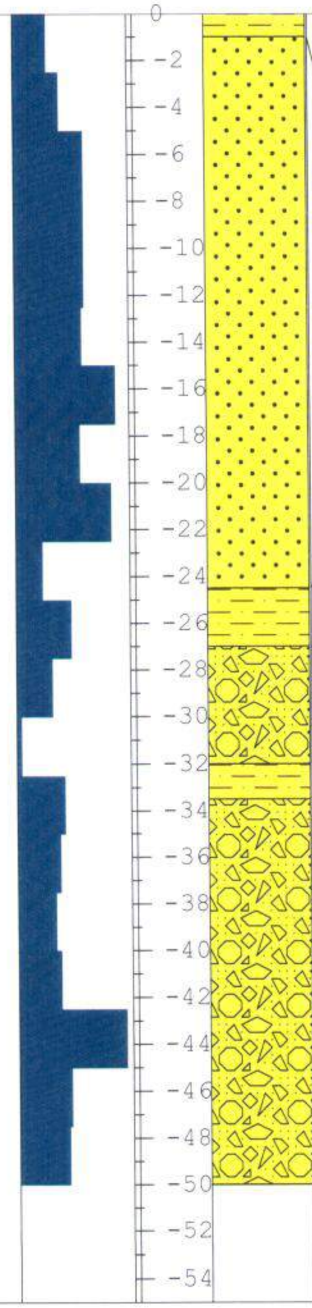
CABENO Environmental Field Services, LLC
More Than Just A Probing Company

CLIENT: Hard Hat	**COORDINATES:** *N NOT SURVEYED* / *E NOT SURVEYED*
PROJECT: Lansing, IA	**BORING NO.:** ***SB3***

LOGGED BY:	*John Noyes*
EDITED BY:	*John Noyes*
CHECKED BY:	*Mark Loerop*
DATE BEGAN:	*1/22/15*
DATE FINISHED:	*1/22/15*
GROUND SURFACE ELEVATION:	*NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	6 7 7	14.0
	SS2	18"	4 9 10	19.0
	SS3	18"	5 10 19	29.0
	SS4	18"	7 13 16	29.0
	SS5	18"	6 12 17	29.0
▽	SS6	18"	6 12 16	28.0
	SS7	18"	12 21 21	42.0
	SS8	18"	8 12 15	27.0
	SS9	18"	8 19 21	40.0
	SS10	18"	8 5 6	11.0
	SS11	18"	6 8 15	23.0
	SS12	18"	5 5 10	15.0
	SS13	18"	3 1 1	2.0
	SS14	18"	6 10 10	20.0
	SS15	18"	4 6 12	18.0
	SS16	18"	10 9 7	16.0
	SS17	18"	6 8 10	18.0
	SS18	18"	22 24 21	45.0
	SS19	18"	10 10 12	22.0
	SS20	18"	14 9 12	21.0

SOIL CONSISTENCY HISTOGRAM / DEPTH IN FEET / PROFILE



DESCRIPTION

SILT; gray to black; non plastic; moist; some bottom ash

SAND; brown; fine grained; poorly graded; moist
2'-5' sample collected for geotech analysis

13'-20' sample collected for geotech analysis
@13.5' grades wet and trace snail shells

@16' grades fine to medium grained; graded

24'-27' sample collected for geotech analysis

SILT; gray; non plastic to low plasticity; wet; some clay; trace organic plant matter

GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand
27'-32' sample collected for geotech analysis

SILT; gray to black; non plastic; wet; trace to some clay and organic plant matter

GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

CABENO Environmental Field Services, LLC

More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

COORDINATES: *N NOT SURVEYED* / *E NOT SURVEYED*

PROJECT: Lansing, IA

BORING NO.: ***SB5***

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 3	7.0
	SS2	18"	5 7 12	19.0
	SS3	18"	5 13 19	32.0
	SS4	18"	5 13 15	28.0
▽	SS5	18"	5 11 13	24.0
	SS6	18"	6 12 16	28.0
	SS7	18"	12 14 17	31.0
	SS8	18"	3 2 2	4.0
	SS9	18"	4 4 4	8.0
	SS10	18"	14 9 2	11.0
	SS11	18"	2 2 4	6.0
	SS12	18"	6 7 8	15.0
	SS13	18"	9 10 10	20.0
	SS14	18"	10 36 8	44.0
	SS15	18"	15 12 9	21.0
	SS16	18"	20 14 14	28.0
	SS17	18"	11 12 18	30.0
	SS18	18"	17 14 15	29.0
	SS19	18"	13 14 17	31.0
	SS20	18"	18 19 24	43.0

SOIL CONSISTENCY HISTOGRAM | DEPTH IN FEET | PROFILE

DEPTH IN FEET: 0, -2, -4, -6, -8, -10, -12, -14, -16, -18, -20, -22, -24, -26, -28, -30, -32, -34, -36, -38, -40, -42, -44, -46, -48, -50, -52, -54

DESCRIPTION

Depth (ft)	Description
0 – 1	SILT; black; non plastic; dry to moist
1 – 19	SAND; brown; fine grained; poorly graded; moist; trace to some bottom ash 5' bottom ash grades out 10'-16' sample collected for geotech analysis @12' grades wet and trace snail shells @ 16' grades gray to olive
19 – 22	Silty CLAY; black to dark gray; low plasticity; moist; trace fine sand and organic plant matter 18.5'-20' sample collected for geotech analysis
22 – 50	SAND & GRAVEL; black; fine to coarse; well graded; wet; trace to some silt 22'-27.5' sample collected for geotech analysis 40'-45' sample collected for geotech analysis @43.5' grades brown
50	Bottom of boring @ 50' 1" PVC temp well installed @ 50'. 10' screen, natural sand pack

BORING LOG

CLIENT: Hard Hat

COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

CABENO Environmental Field Services, LLC
More Than Just A Probing Company

PROJECT: Lansing, IA

BORING NO.: ***SB7***

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE	SOIL CONSISTENCY HISTOGRAM	DEPTH IN FEET	PROFILE	DESCRIPTION
	SS1	18"	3 2 2	4.0		0, -2		Bottom ASH; black; fine grained; poorly graded
	SS2	18"	9 11 19	20.0		-4		SAND; brown; fine grained; poorly graded; moist
	SS3	18"	4 5 13	18.0		-6		4'-10' sample collected for geotech analysis
	SS4	18"	7 14 18	32.0		-8, -10		
	SS5	18"	5 11 20	31.0		-12		
	SS6	18"	8 15 20	35.0		-14		
▽	SS7	18"	7 12 14	26.0		-16		@16' grades wet
	SS8	18"	7 9 14	23.0		-18, -20		19'-25' sample collected for geotech analysis
	SS9	18"	11 13 17	30.0		-22		@ 21' grades gray
	SS10	18"	8 12 14	26.0		-24		
	SS11	18"	2 3 3	6.0		-26		
	SS12	18"	1 1 1	2.0		-28, -30		SILT; black to gray; no plasticity; moist to wet; trace clay
	SS13	18"	3 3 6	9.0		-32		29'-32.5' sample collected for geotech analysis
	SS14	18"	2 3 4	7.0		-34		
	SS15	18"	1 2 2	4.0		-36		36'-40' sample collected for geotech analysis
	SS16	18"	0 0 0	0.0		-38, -40		
	SS17	18"	2 3 4	7.0		-42		@ 41' grading trace organic plant matter and trace intermittent 1/16" sand seams
	SS18	18"	3 2 2	4.0		-44		@ 44' is a thin, 1" gravel seam
	SS19	18"	8 4 7	11.0		-46		GRAVEL; brown; coarse; poorly graded; wet; trace to some silt and sand
	SS20	18"	2 8 9	17.0		-48, -50		46'-50' sample collected for geotech analysis last spoon blocked with large gravel
						-52, -54		Bottom of boring @ 50' 1" PVC temp well installed @ 50'. 10' screen, natural sand pack

APPENDIX B – Soil Laboratory Testing

Alliant Energy
Interstate Power and Light
Lansing Generating Station
Lansing, Iowa

Safety Factor Assessment

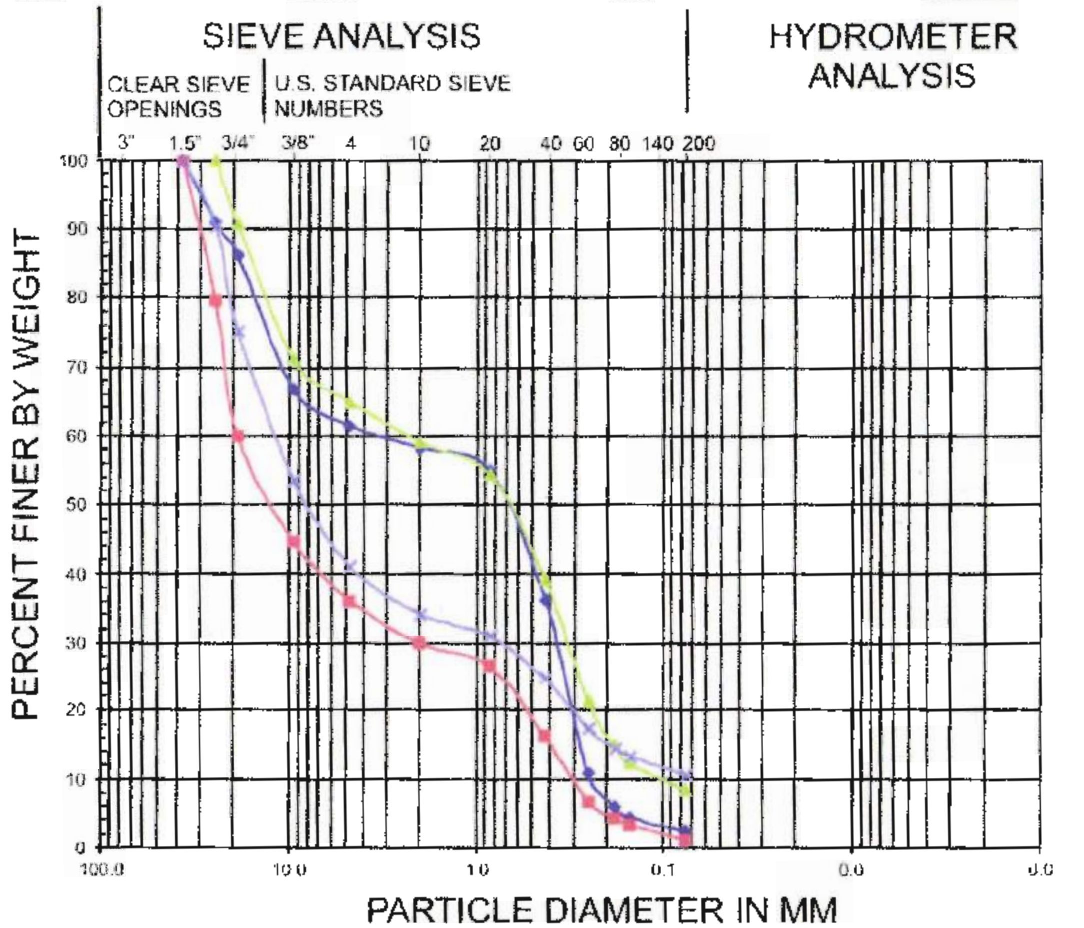
APPENDIX B

UPDATE TO ADD SB-7 · SEPARATE 8½x11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL – Lansing Generating Station · Tested By: Test America · Date: 2/3/2015
Boring No.: SB-1, SB-3 & SB-5 "SAND & GRAVEL"



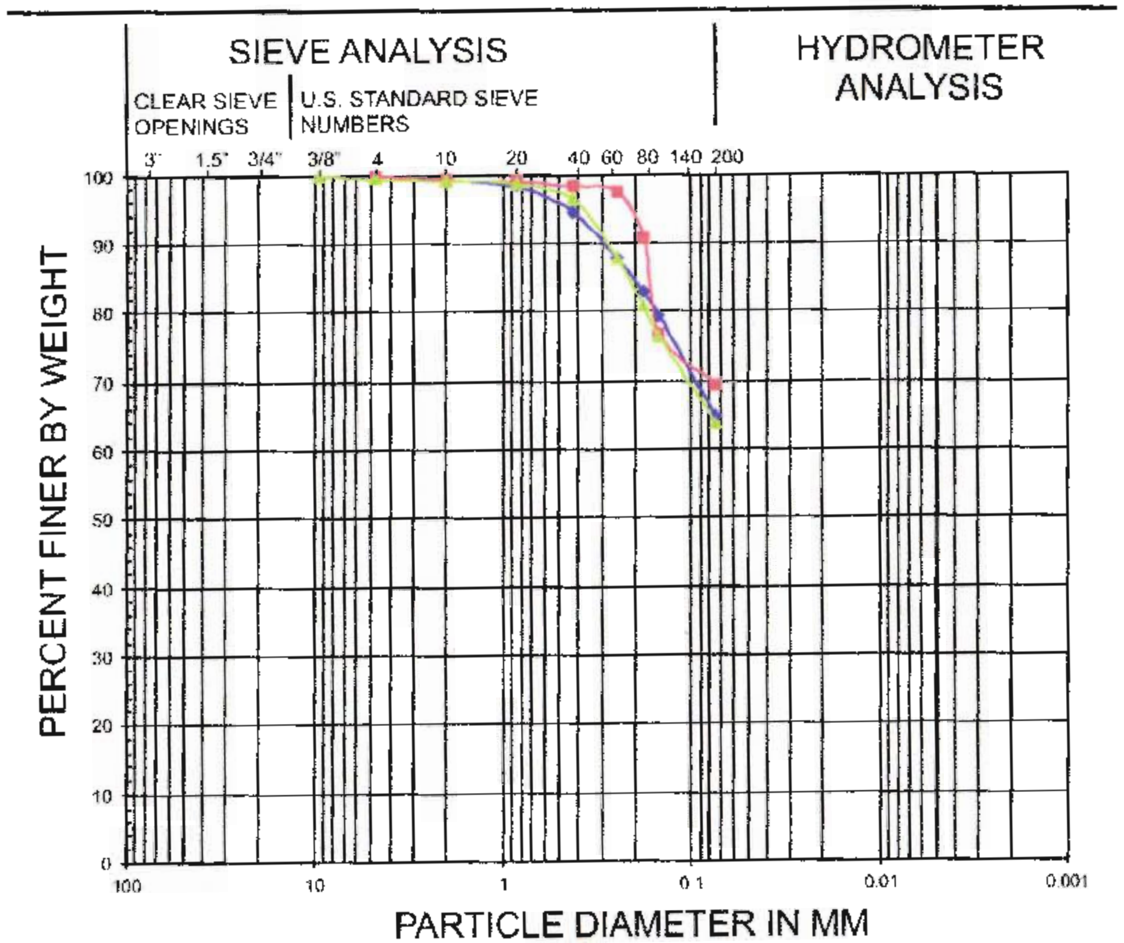
COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W %
◆	SB-1	40 - 50	SAND & GRAVEL	SW / GW	16.5
■	SB-3	27 - 32	SAND & GRAVEL	SW / GW	13.4
▲	SB-5	22 - 27.5	SAND & GRAVEL	SW / GW	32.1
×	SB-5	44 - 45	SAND & GRAVEL	SW / GW	9.8

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL – Lansing Generating Station · Tested By: Test America · Date: 2/3/2015
Boring No.: SB-1, SB-3 & SB-5 "SANDY SILT"



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W %
◆	SB-1	28 - 32	Sandy Silt	ML	28	26	36.1
■	SB-3	24.5 - 27	Sandy Silt	ML	27	23	25.4
▲	SB-5	18.5 - 20	Sandy Silt	ML	24	20	21.8

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS

SCALE: NONE · DATE: 5-14-15
DRAWN BY: JFD · CHECKED BY: TJH · APPROVED BY: MWL

HARD HAT SERVICES™ Engineering, Construction and Management Solutions

CLIENT / LOCATION: INTERSTATE POWER AND LIGHT (IPL) LANSING GENERATING STATION PROJECT 2320 POWER PLANT DR LANSING, IA 52151

DRAWING DESCRIPTION: SEEPAGE CONTROL CUT-OFF WALL PARTICLE SIZE DISTRIBUTION SB-1 & SB-3

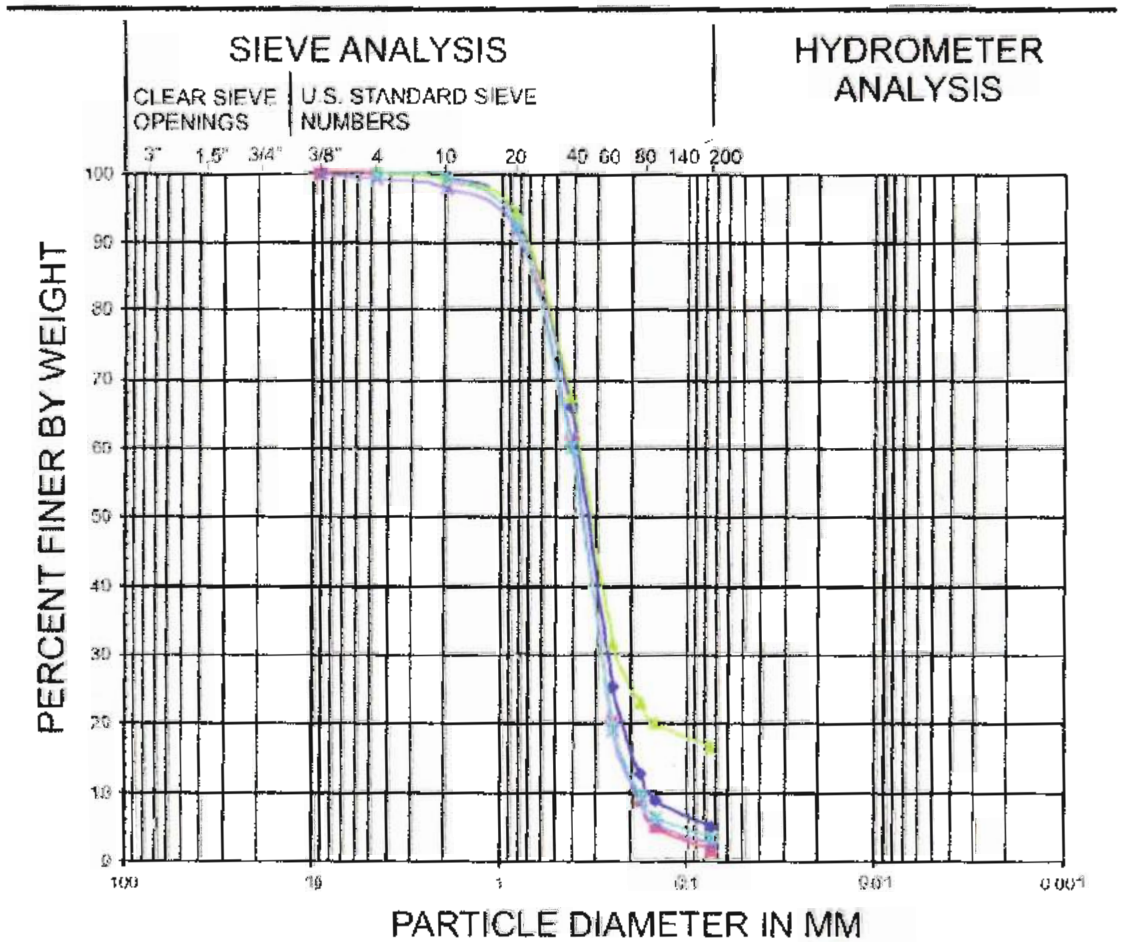
JOB 154.021.003
SHT. 8
DWG. 154021SW-08-12

APPENDIX B
UPDATE TO ADD SB-7
SEPARATE 8½ x 11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project: IPL - Lansing Generating Station Tested By: TestAmerica Date: 2/3/2015
Boring No.: SB-1, SB-3 & SB-5 "UPPER SAND"



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W%
	SB-1	1 - 5	Medium - Fine Sand	SP	4.1
	SB-1	15 - 20	Medium - Fine Sand	SP	20.1
	SB-3	2 - 5	Silty Medium - Fine Sand	SM	3.1
	SB-3	13 - 20	Medium - Fine Sand	SP	19.0
	SB-5	10 - 16	Medium - Fine Sand	SP	13.3

REV	DATE	BY	APP	DESCRIPTION
5	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS
4				
3				
2				
1				

SCALE: NONE DATE: 5-14-15
DRAWN BY: JFD CHECKED BY: TJH APPROVED BY: MWL

HARD HAT SERVICES ™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SEEPAGE CONTROL CUT-OFF WALL
PARTICLE SIZE DISTRIBUTION
SB-5

JOB 154.021.003
SHT. 9
DWG. 154021SW-08-12

HEC

Harrington Engineering & Construction, Inc.

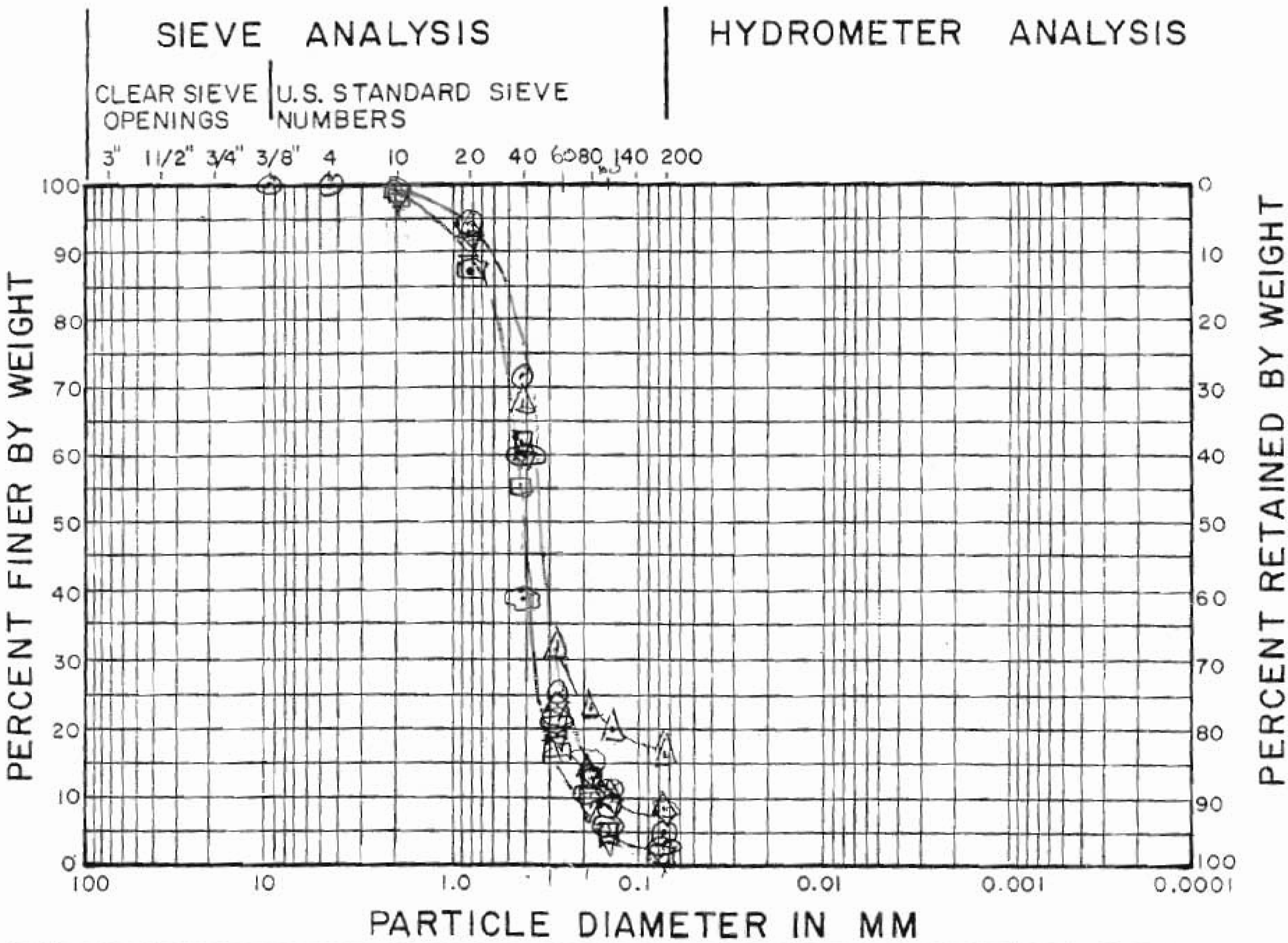
Particle Size Distribution

"UPPER SAND"

PROJECT ____________________ TESTED BY ____________ DATE ____________

PROJECT NO. ____________________ CALC BY ____________ DATE ____________

BORING NO. ____________________ CHKD BY ____________ DATE ____________



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
⊙	SB-1		1-5	MED-FINE SAND	SP			4.1
⊡	SB-1		15-20	"	SP			20.1
△	SB-3		2-5	SILTY MED-FINE SAND	SM			3.1
▽	SB-3		13-20	MED-FINE SAND	SP			19.0
⊖	SB-5		10-16	"	SP			13.3
◇	SB-7		4-10	"	SP-SM			3.1
▭	SB-7		19-25	"	SP			17.1

HE&C

Harrington Engineering & Construction, Inc.

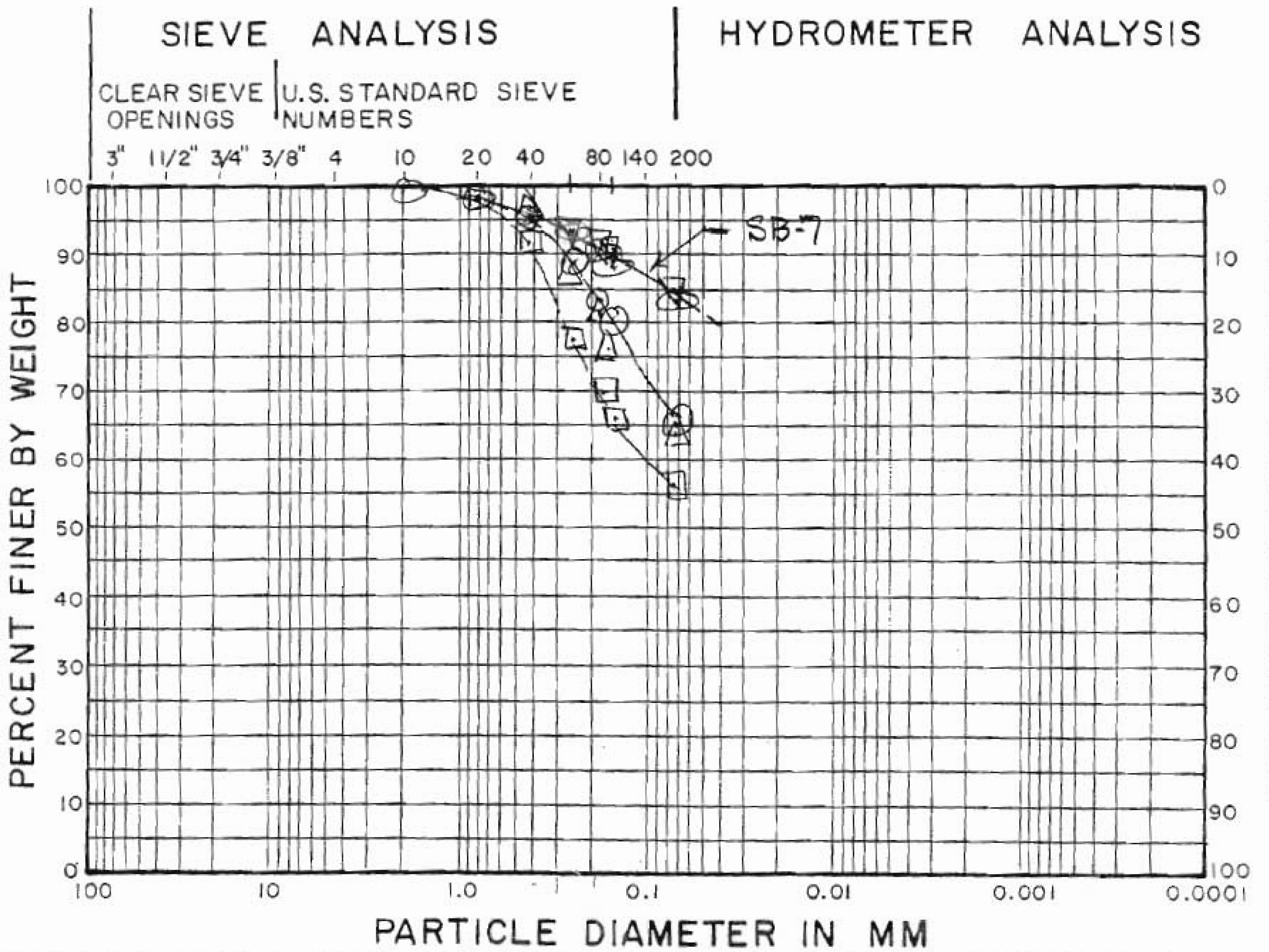
Particle Size Distribution

"SANDY SILT"

PROJECT________ TESTED BY________ DATE________

PROJECT NO.________ CALC BY________ DATE________

BORING NO.________ CHKD BY________ DATE________



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
○	SB-1		28-32	SANDY SILT	ML	28	26	36.1
□	SB-3		24.5-27	SANDY SILT	ML	27	23	23.4
△	SB-5		18.5-20	SANDY SILT	ML	24	20	21.8
▽	SB-7		29-32.5	SANDY SILT	ML	29	25	27.0
⬭	SB-7		36-40	SANDY SILT	ML	31	26	35.7

Harrington Engineering & Construction, Inc.

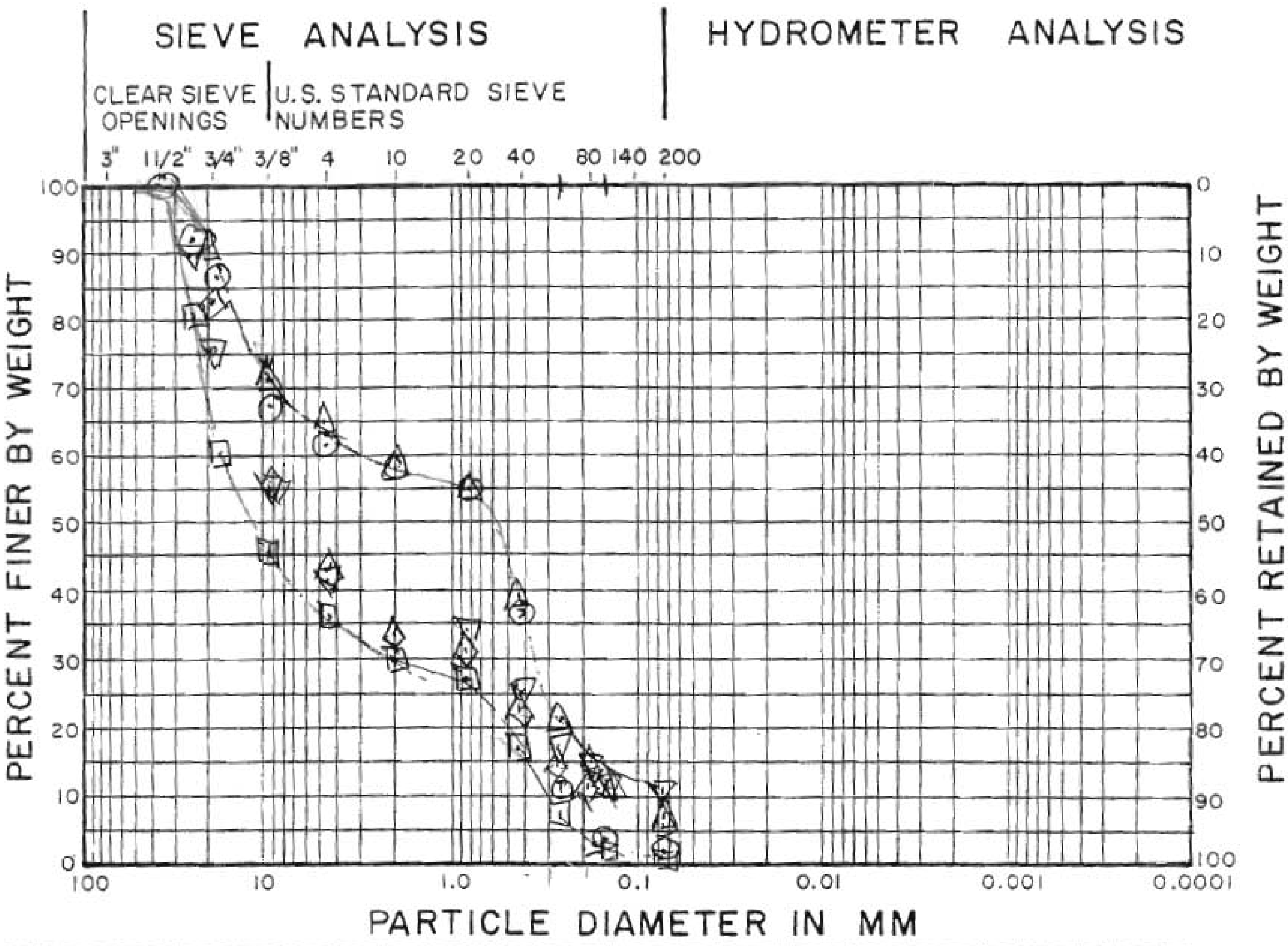
Particle Size Distribution

"SANDY GRAVEL"

PROJECT ______ TESTED BY ______ DATE ______

PROJECT NO. ______ CALC BY ______ DATE ______

BORING NO. ______ CHKD BY ______ DATE ______



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
○	SB-1		40-50	SAND & GRAVEL	SW/GW			16.5
□	SB-3		27-32	"	"			13.4
△	SB-5		22-27.5	"	"			32.1
▽	SB-5		44-45	"	"			9.8
◇	SB-7		46-50	"	"			35.7

APPENDIX C – Earthquake and Liquefaction Analysis

Alliant Energy
Interstate Power and Light
Lansing Generating Station
Lansing, Iowa

Safety Factor Assessment

USGS Design Maps Detailed Report

ASCE 7-10 Standard (43.334°N, 91.168°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 0.059$ g

From Figure 22-2 [2] $S_1 = 0.039$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 0.059 g, F_a = 1.600

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.039 g, F_v = 2.400

Equation (11.4–1): $S_{MS} = F_aS_S = 1.600 \times 0.059 = 0.094$ g

Equation (11.4–2): $S_{M1} = F_vS_1 = 2.400 \times 0.039 = 0.095$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

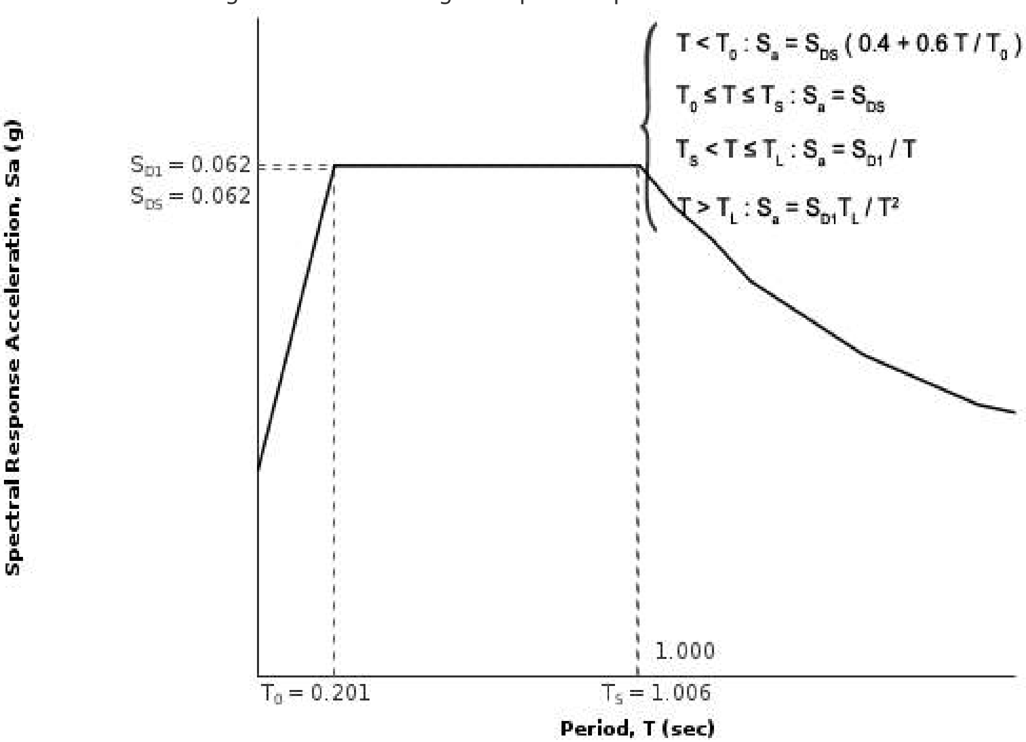
Equation (11.4–3): $S_{DS} = ⅔ S_{MS} = ⅔ \times 0.094 = 0.062$ g

Equation (11.4–4): $S_{D1} = ⅔ S_{M1} = ⅔ \times 0.095 = 0.063$ g

Section 11.4.5 — Design Response Spectrum

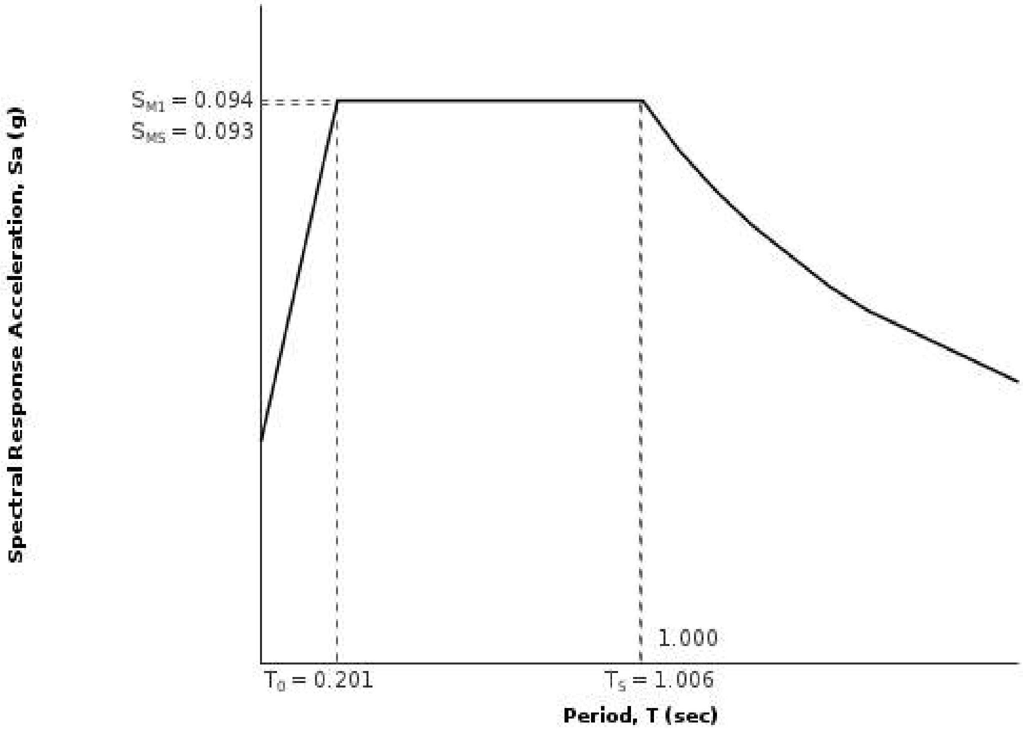
From Figure 22-12 [3] T_L = 12 seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.028

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.600 \times 0.028 = 0.044$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.028 g, F_{PGA} = 1.600

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.905

From Figure 22-18 [6] C_{R1} = 0.862

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.062 g, Seismic Design Category = A

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.063 g, Seismic Design Category = A

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ “the more severe design category in accordance with Table 11.6-1 or 11.6-2” = A

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

Simplified Seed and Idriss Liquefaction Analysis
SPT Based Analysis
Lansing Generating Station
Interstate Electric Power
Equations from "Soil Liquefaqction During Earthqakes" Idriss & Boulanger
Soil Conditions at Boring SB-1 "Critical Slope Stability Cross-Section

Input Parameters:

Peak Ground Acceleration (g) =	0.04
Earthquake Magnitude, M =	7.7
Water Table Depth (ft) =	20
Average Soil Density above water table (lb/ft^3) =	115.0
Average Soil Density below water table (lb/ft^3) =	120.0
Borehole Diameter (mm) =	100

Rod Lengths assumed equal to depth plus 5.0 feet (for the above ground extension)

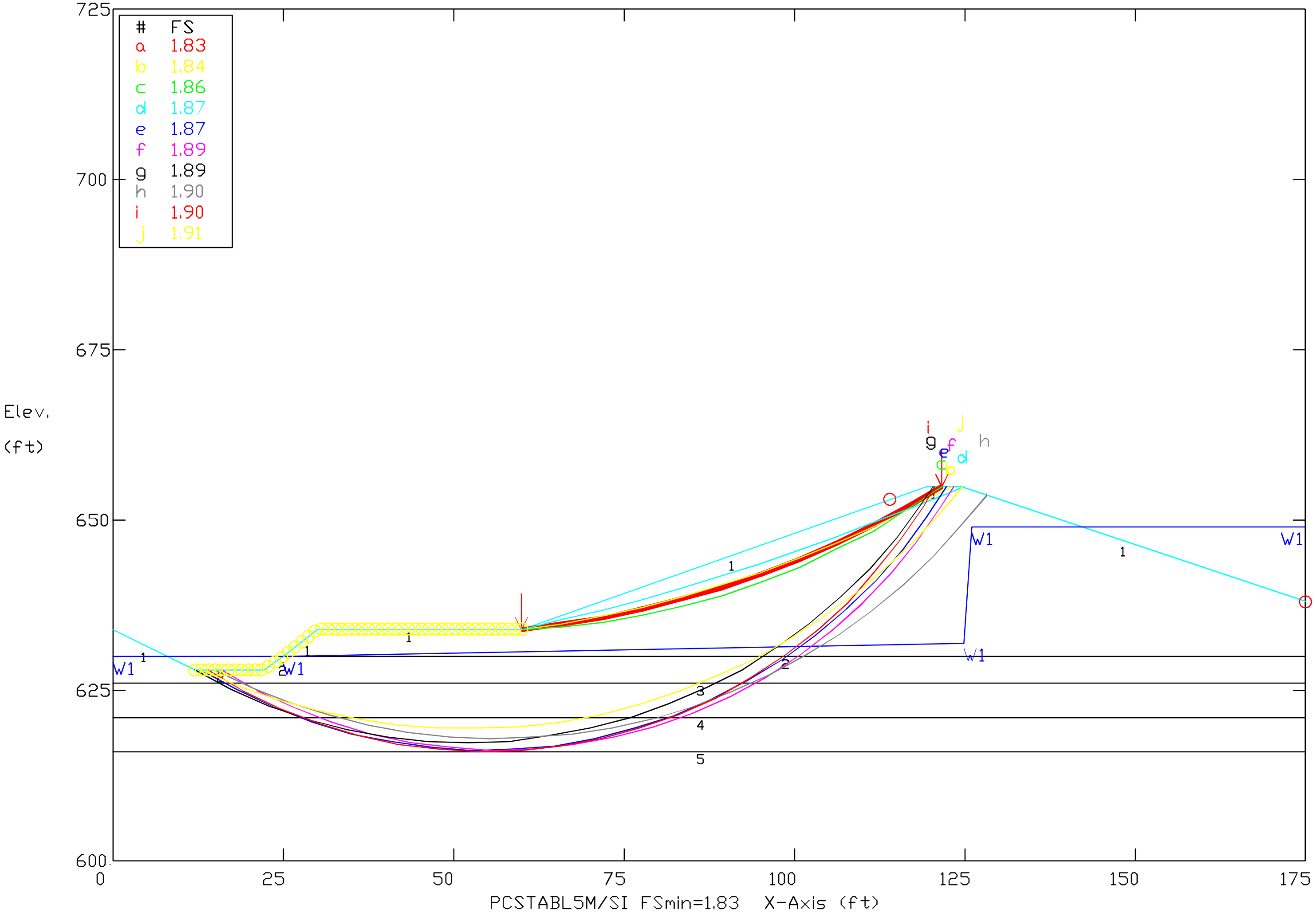
SPT #	Depth (ft)	Measured N	Soil Type (USCS)	Flag "Clay" "Unsaturated"	Fines Content (%)	Energy Ratio, ER (%)	C_e	C_b	C_r	N_{60}	σ_{vc} (lb/ft^2)	σ_{vc}' (lb/ft^2)	C_n	$(N_1)_{60}$	ΔN for fines content	$(N_1)_{60\text{-}cs}$	Stress Reduction Coeff, r_d	CSR	MSF for sand	k_σ for sand	CRR 7.5M & 1 atm	CRR	Factor of Safety
1	2.4	9	SP	Unsaturated	5	75%	1.25	1	0.75	8.4	276	276	1.70	14.3	0.0	14.3	1.00	0.026	0.95	1.10	0.151	n.a.	n.a.
2	4.8	15	SP	Unsaturated	5	75%	1.25	1	0.75	14.1	552	552	1.70	23.9	0.0	23.9	1.00	0.026	0.95	1.10	0.266	n.a.	n.a.
3	7.2	15	SP	Unsaturated	5	75%	1.25	1	0.8	15.0	828	828	1.60	24.0	0.0	24.0	0.99	0.026	0.95	1.10	0.268	n.a.	n.a.
4	9.6	20	SP	Unsaturated	5	75%	1.25	1	0.85	21.3	1104	1104	1.38	29.4	0.0	29.4	0.99	0.026	0.95	1.10	0.451	n.a.	n.a.
5	12	23	SP	Unsaturated	5	75%	1.25	1	0.85	24.4	1380	1380	1.24	30.3	0.0	30.3	0.98	0.025	0.95	1.09	0.502	n.a.	n.a.
6	14.4	29	SP	Unsaturated	5	75%	1.25	1	0.85	30.8	1656	1656	1.13	34.8	0.0	34.8	0.97	0.025	0.95	1.06	1.072	n.a.	n.a.
7	16.8	25	SP	Unsaturated	5	75%	1.25	1	0.95	29.7	1932	1932	1.05	31.1	0.0	31.1	0.97	0.025	0.95	1.02	0.561	n.a.	n.a.
8	19.2	24	SP	Unsaturated	5	75%	1.25	1	0.95	28.5	2208	2208	0.98	27.9	0.0	27.9	0.96	0.025	0.95	0.99	0.380	n.a.	n.a.
9	21.6	22	SP		5	75%	1.25	1	0.95	26.1	2492	2392	0.94	24.6	0.0	24.6	0.95	0.026	0.95	0.98	0.280	0.261	2.00
10	24	14	SP		5	75%	1.25	1	0.95	16.6	2780	2530	0.91	15.2	0.0	15.2	0.94	0.027	0.95	0.98	0.158	0.147	2.00
11	26.4	8	SP		5	75%	1.25	1	0.95	9.5	3068	2669	0.89	8.5	0.0	8.5	0.93	0.028	0.95	0.98	0.108	0.100	2.00
12	28.8	0	ML		70	75%	1.25	1	1	0.0	3356	2807	0.87	0.0	5.6	5.6	0.92	0.029	0.95	0.98	0.089	0.083	2.00
13	31.2	0	ML		70	75%	1.25	1	1	0.0	3644	2945	0.85	0.0	5.6	5.6	0.92	0.029	0.95	0.97	0.089	0.083	2.00
14	33.6	3	ML		70	75%	1.25	1	1	3.8	3932	3083	0.83	3.1	5.6	8.7	0.91	0.030	0.95	0.97	0.109	0.100	2.00
15	36	8	GP		3	75%	1.25	1	1	10.0	4220	3222	0.81	8.1	0.0	8.1	0.90	0.031	0.95	0.96	0.105	0.096	2.00
16	38.4	20	GP		3	75%	1.25	1	1	25.0	4508	3360	0.79	19.8	0.0	19.8	0.89	0.031	0.95	0.94	0.204	0.182	2.00
17	40.8	21	GP		3	75%	1.25	1	1	26.3	4796	3498	0.78	20.4	0.0	20.4	0.88	0.031	0.95	0.93	0.211	0.187	2.00
18	43.2	12	GP		3	75%	1.25	1	1	15.0	5084	3636	0.76	11.4	0.0	11.4	0.87	0.032	0.95	0.95	0.128	0.115	2.00
19	45.6	12	SP		5	75%	1.25	1	1	15.0	5372	3775	0.75	11.2	0.0	11.2	0.86	0.032	0.95	0.94	0.127	0.114	2.00

APPENDIX D – Slope Stability Analysis

Alliant Energy
Interstate Power and Light
Lansing Generating Station
Lansing, Iowa

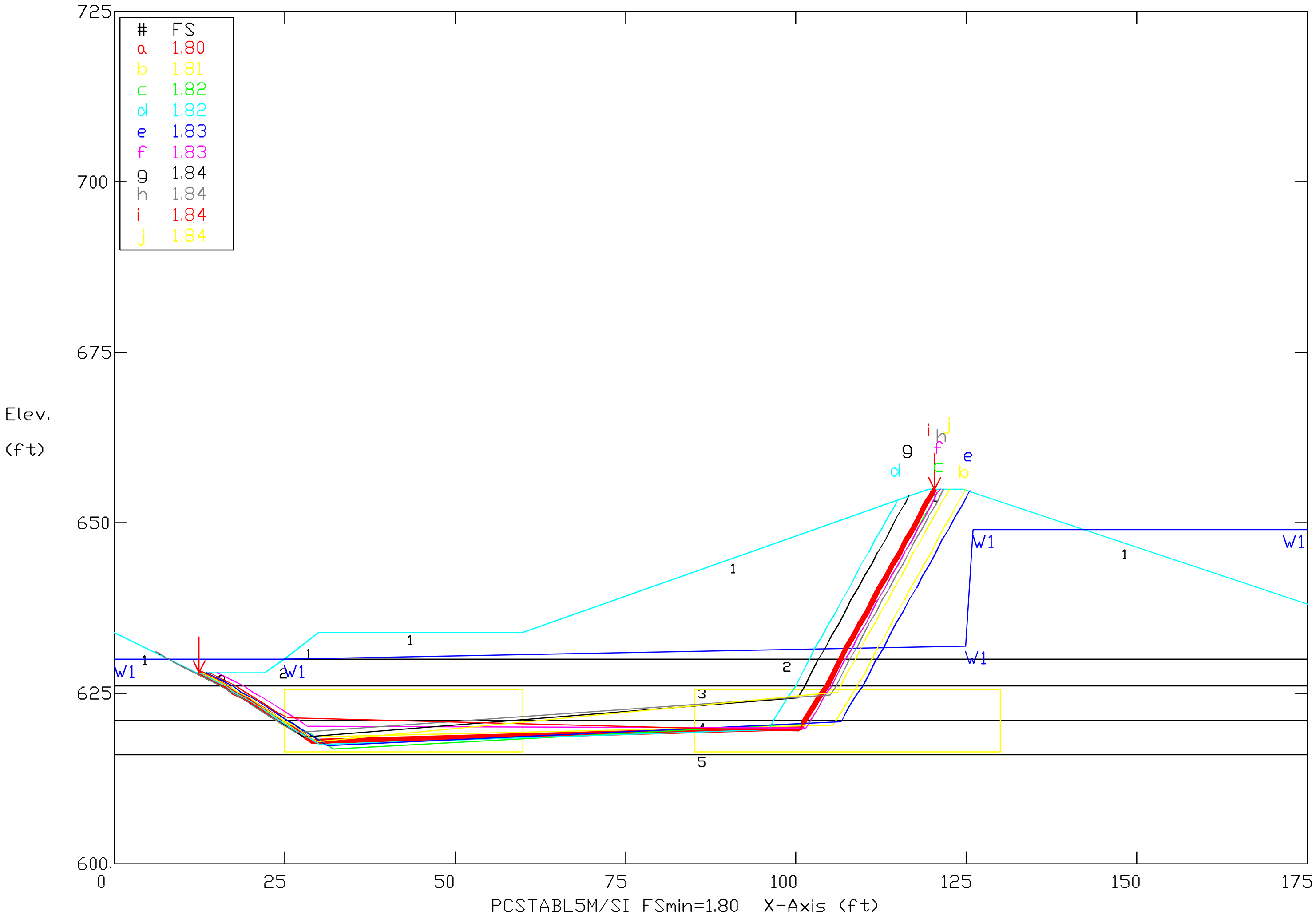
Safety Factor Assessment

LSG - Main Ash Pond Creek Side Static Case & Normal H2O Levels (@ 649')
Ten Most Critical. E:LGS00C.PLT 05-12-16 10:04am



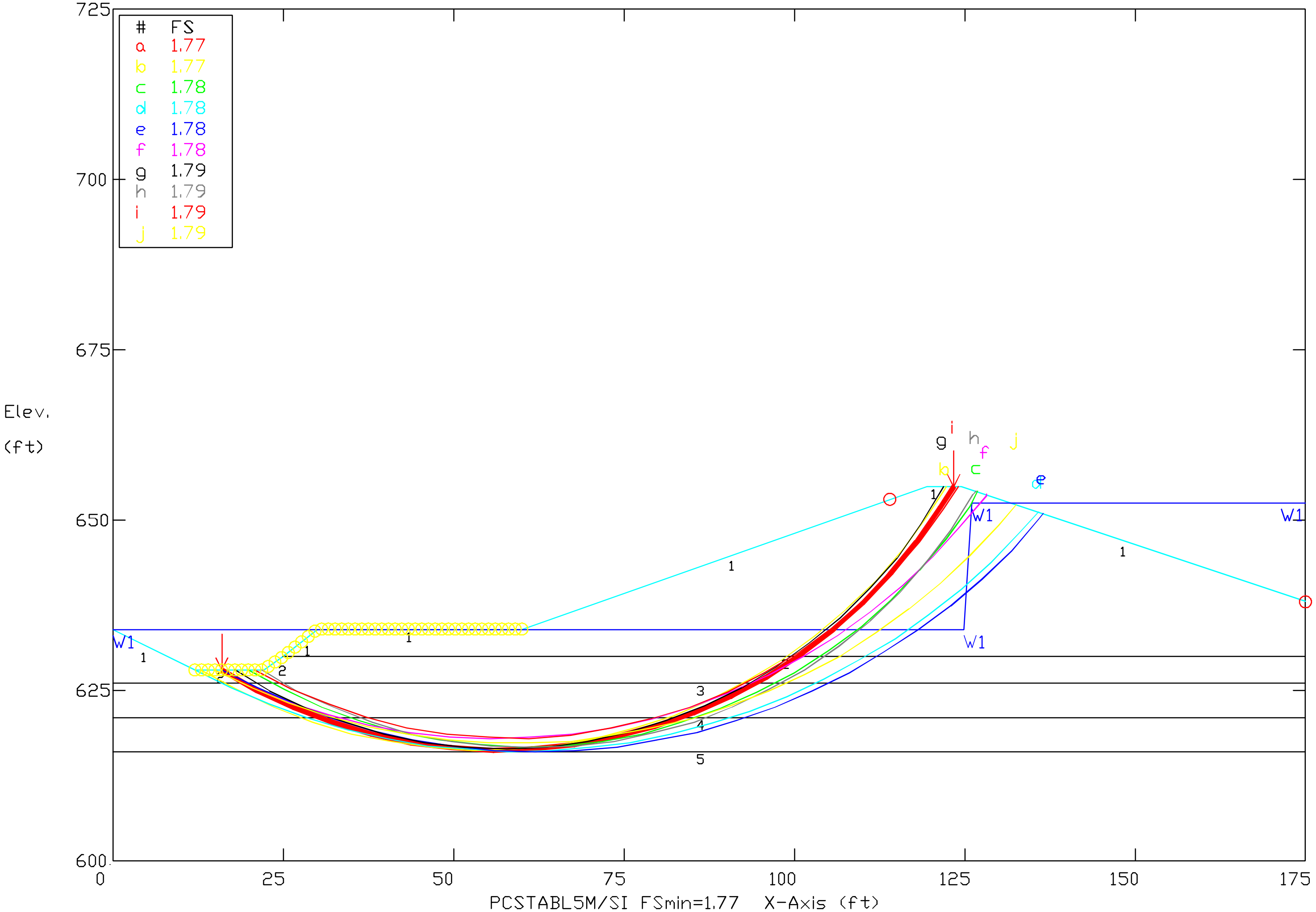
Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Dike	110	115	0	32	0	0	W1
2	SP	108	108	0	36	0	0	W1
3	ML Dess.	100	100	0	26	0	0	W1
4	ML Loose	100	100	0	26	0	0	W1
5	SW/GW	120	120	0	35	0	0	W1

LSG - Main Ash Pond Creek Side Static Case & Normal H2O Levels (@ 649')
Ten Most Critical. E:LGS00B.PLT 05-12-16 10:07am



Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Dike	110	115	0	32	0	0	W1
2	SP	108	108	0	36	0	0	W1
3	ML Dess.	100	100	0	26	0	0	W1
4	ML Loose	100	100	0	26	0	0	W1
5	SW/GW	120	120	0	35	0	0	W1

LSG - Main Ash Pond Creek Side Static Case & High H2O Levels (@ 652.5')
Ten Most Critical. E:LGS00CW.PLT 05-12-16 10:21am



Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	110	115	0	32	0	0	W1
2 SP	108	108	0	36	0	0	W1
3 ML Dess.	100	100	0	26	0	0	W1
4 ML Loose	100	100	0	26	0	0	W1
5 SW/GW	120	120	0	35	0	0	W1

LSG - Main Ash Pond Creek Side Static Case & High H2O Levels (@ 652.5')
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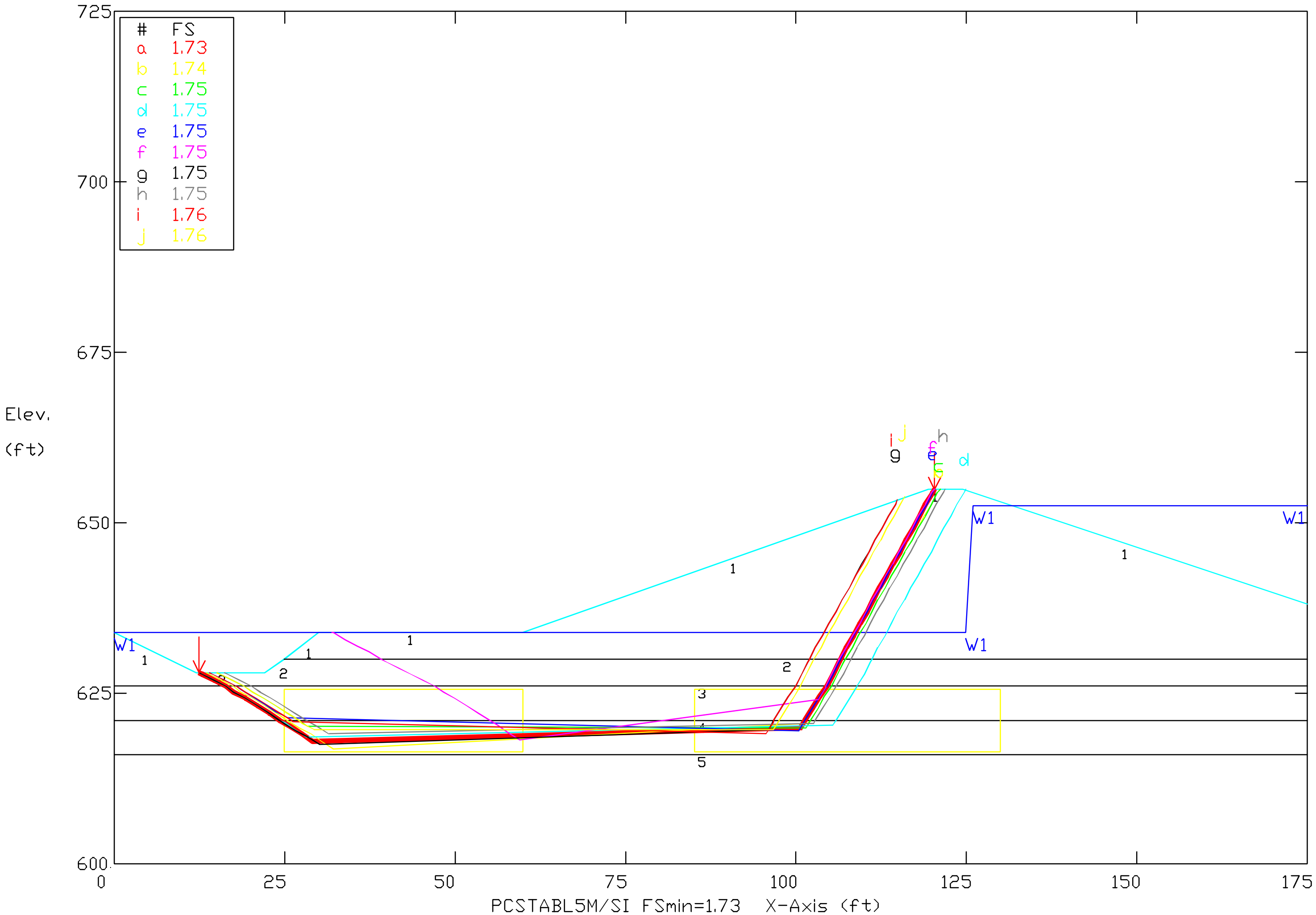
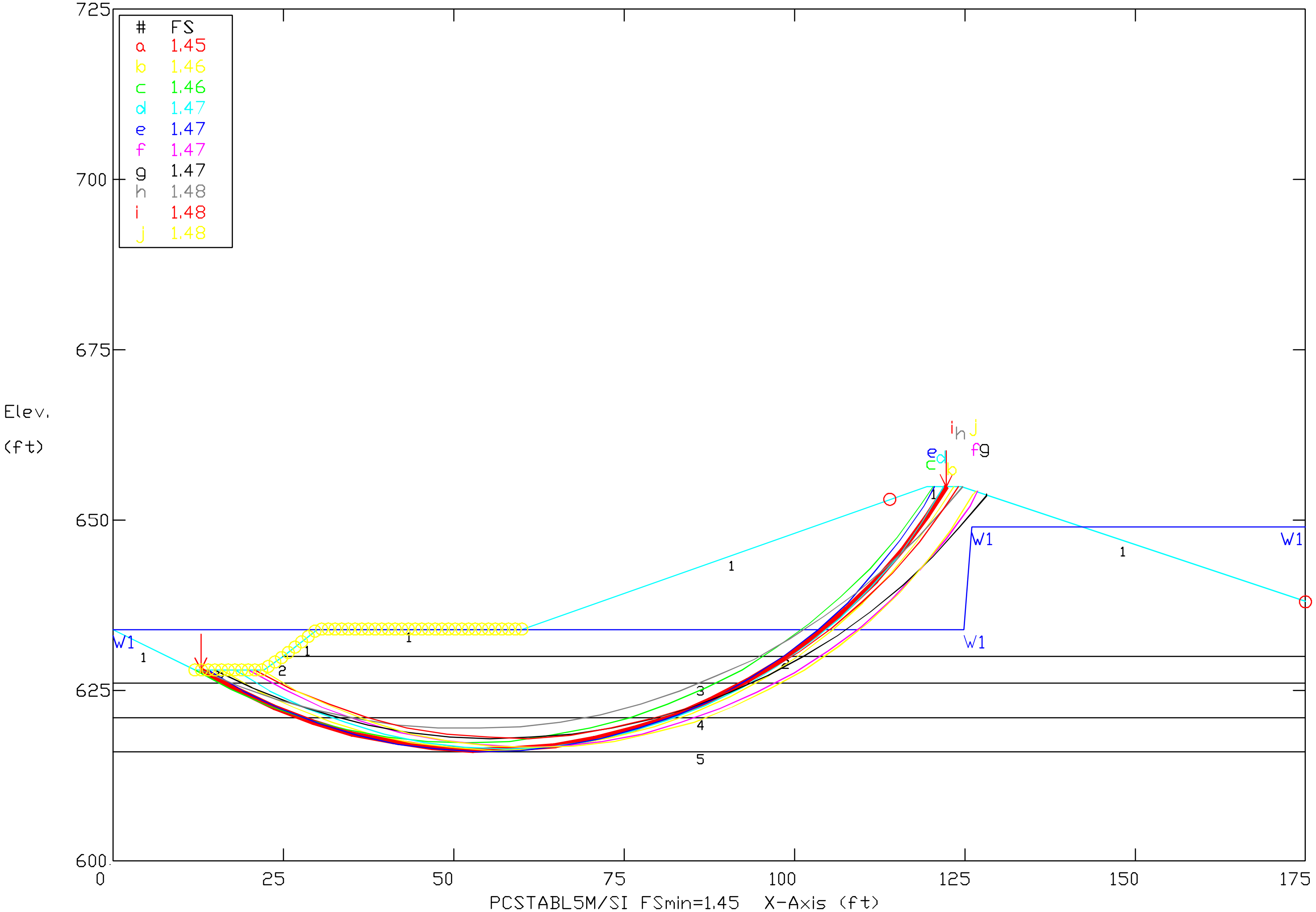


Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	110	115	0	32	0	0	W1
2 SP	108	108	0	36	0	0	W1
3 ML Dess.	100	100	0	26	0	0	W1
4 ML Loose	100	100	0	26	0	0	W1
5 SW/GW	120	120	0	35	0	0	W1

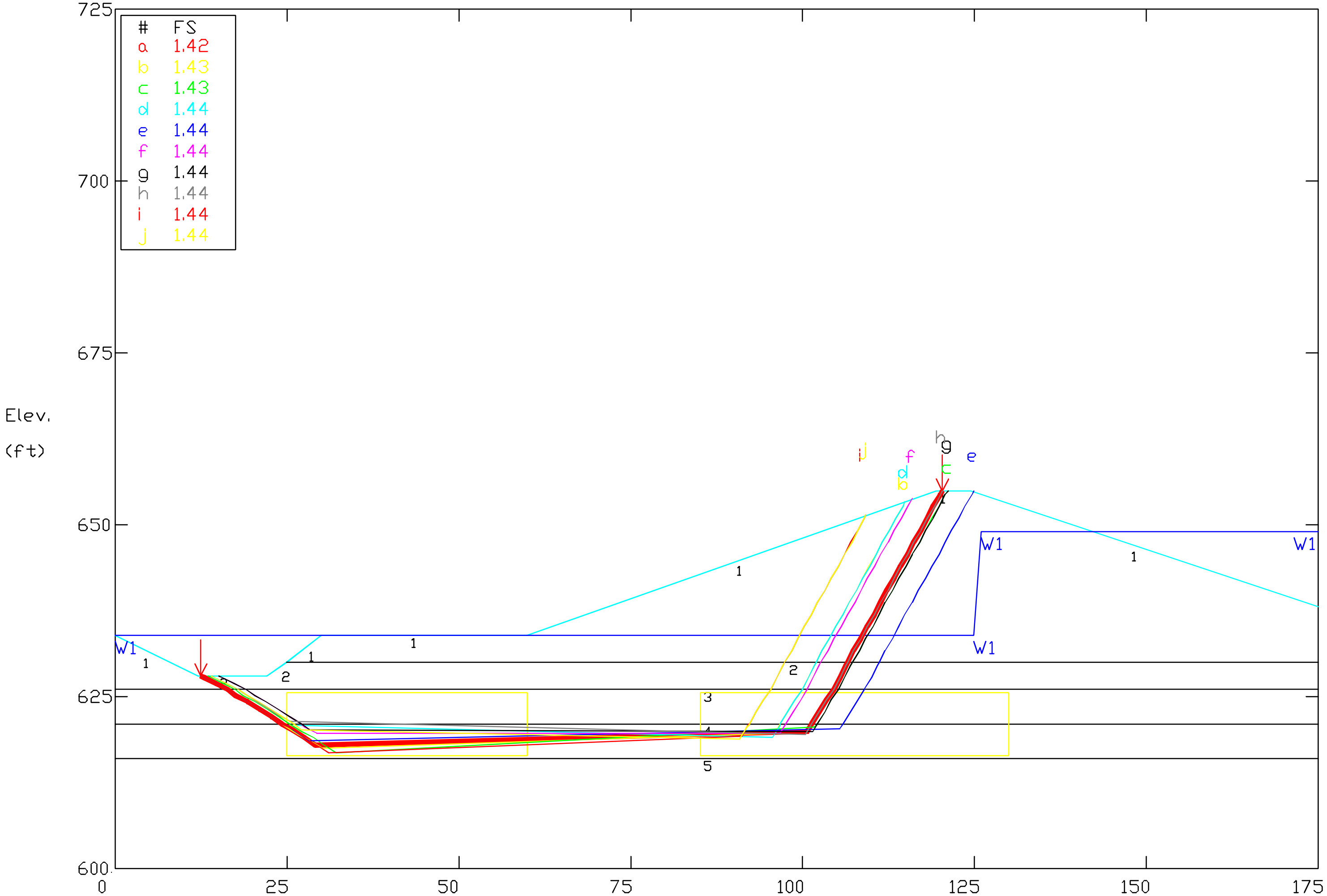
LSG - Main Ash Pond Creek Side EQ Case (0.040 & 0.027) & Normal Water

Ten Most Critical. E:LGS00CEQ.PLT 05-12-16 10:56am



Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	110	115	0	32	0	0	W1
2 SP	108	108	0	36	0	0	W1
3 ML Dess.	100	100	0	26	0	0	W1
4 ML Loose	100	100	0	26	0	0	W1
5 SW/GW	120	120	0	35	0	0	W1

LSG - Main Ash Pond Creek Side EQ Case (0.040 & 0.027) & Normal Water
Ten Most Critical. E:LGS00BEQ.PLT 05-12-16 10:58am



PCSTABL5M/SI FSmin=1.42 X-Axis (ft)

Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	110	115	0	32	0	0	W1
2 SP	108	108	0	36	0	0	W1
3 ML Dess.	100	100	0	26	0	0	W1
4 ML Loose	100	100	0	26	0	0	W1
5 SW/GW	120	120	0	35	0	0	W1

Appendix G

Updated Closure Plan (November 2020)

Closure Plan for Existing CCR Surface Impoundment – Amendment No. 2
Upper Ash Pond

Lansing Generating Station
2320 Power Plant Drive
Lansing, Iowa 52151

Prepared for:

Interstate Power and Light Company
2320 Power Plant Drive
Lansing, Iowa 52151

SCS ENGINEERS

25220100.00 | November 13, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

Table of Contents

Figures

Appendices

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PE CERTIFICATION

11/13/20

I, Eric J. Nelson, hereby certify the following:

- This Closure Plan meets the requirements of 40 CFR 257.102(b)(1)
- The final cover system described in this Closure Plan meets the design requirements in 40 CFR 257.102(d)(3)

The Closure Plan was prepared by me or under my direct supervision, and I am a duly licensed Professional Engineer under the laws of the State of Iowa.

11/13/2020

(signature) (date)

Eric J. Nelson

(printed or typed name)

License number 23136

My license renewal date is December 31, 2020.

Pages or sheets covered by this seal:

All pages

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1.0 INTRODUCTION AND PROJECT SUMMARY

On behalf of Interstate Power and Light Company (IPL), SCS Engineers (SCS) has prepared this updated Closure Plan for the Upper Ash Pond at the Lansing Generating Station (LAN) as required by 40 CFR 257.102(b).

40 CFR 257.102(b) *"Written closure Plan – (1) Content of the plan. The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section."*

The LAN facility includes two active coal combustion residual (CCR) units:

- LAN Upper Ash Pond
- LAN CCR Landfill

The subject of this updated Closure Plan is the Upper Ash Pond. **Figure 1** shows the site location, and **Figure 2** shows the site layout and location of the Upper Ash Pond. IPL is currently evaluating closure of the CCR surface impoundment using a hybrid approach that includes a combination of CCR removal, consolidation within the CCR surface impoundment limits, and in-place closure with a cap. CCR will be capped with a final cover system that meets the requirements of 40 CFR 257.102. IPL is currently in the process of finalizing studies to support their remedy selection per 40 CFR 257.97. Once a final remedy is selected, IPL will integrate the remedy into design plans and obtain permits/approvals from the State of Iowa to close the CCR surface impoundment. Additional information on the LAN Upper Ash Pond is provided below.

The Upper Ash Pond is located southwest of the plant and adjacent to the LAN CCR Landfill (**Figure 2**). The Upper Ash Pond was constructed for the purpose of settling CCR from the LAN process wastewater streams and clarification of water prior to discharge. Currently the pond receives CCR and non-CCR waste streams. Water from the LAN Upper Ash Pond discharges to the discharge canal from the plant via National Pollutant Discharge Elimination System (NPDES) permit Outfall 002. The surface impoundment is approximately 17 acres in size.

2.0 PROPOSED CLOSURE PLAN NARRATIVE

40 CFR 257.102(b)(1)(i) *"A narrative description of how the CCR unit will be closed in accordance with this section."*

The LAN Upper Ash Pond will be closed by a combination of CCR removal, consolidation within the CCR surface impoundment limits, and in-place closure with a cap. Clean closure and final cover areas will be determined during final design.

The LAN Upper Ash Pond closure will meet the requirements of the Federal CCR Rule and State Regulations. The closure will include the following tasks:

- Dewatering of ponds, where required to meet 40 CFR 257.102(d)(2)(i)
- Potential clean excavation of some portion of the surface impoundment
- Consolidation of CCR from clean closure areas into select impoundment areas to establish final cover subgrade elevations

- Stabilization of CCR to meet the requirements of 40 CFR 257.102(d)(2)(ii)
- Capping of CCR material with a final cover system per 40 CFR 257.102(d)(3)
- Establishing final grades to preclude ponding storm water on the cap
- Direct non-contact storm water drainage off the cap
- Restoration of all areas disturbed during construction

Slopes and final grades may vary if settlement occurs in the fill material during material placement and grading, or the estimated fill material volumes are different than what is estimated. Final grades will be designed to provide flexibility to accommodate these changes. Side slopes may be adjusted but will not be more steep than 4H:1V or less than 2 percent (except the drainage swales).

CCR and accumulated sediment will be consolidated within the boundary of the impoundment and the area will be closed by covering the CCR with the final cover system described in **Section 3.0.**

3.0 FINAL COVER SYSTEM AND PERFORMACE

40 CFR 257.102(b)(1)(ii). *"if closure of the CCR unit will be accomplished through removal of CCR from the CRR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section."*

"(c) Closure by removal of CCR. An owner or operator may elect to close a CCR unit by removing and decontaminating all areas affected by releases from the CCR unit. CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 257.95(h) for constituents listed in appendix IV to this part."

Portions of the LAN Upper Ash Pond to be closed by removal of CCR will either be dewatered with CCR removed mechanically (e.g., with an excavator) or dredged hydraulically while the water in the impoundment remains. All dewatering discharges, whether from pumping or hydraulic dredging, will be treated to meet the discharge limits established in the individual NPDES permit for LAN. Treated water will be discharged via existing Outfall 002 (see **Figure 2**).

Removal of CCR will be guided visually by direct observation during mechanical excavation and by elevations with visual verification of sediment samples during hydraulic excavation.

40 CFR 257.102(b)(1)(iii). *"If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section."*

"(d) Closure performance standard when leaving CCR in place.

(1) The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:

(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;"

The final cover system design will minimize or eliminate infiltration, as further described below.

(ii) *Preclude the probability of future impoundment of water, sediment, or slurry;*

The final cover system will meet these criteria, as further described below.

(iii) *Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;*

The final cover system will be designed to provide slope stability and to prevent sloughing or movement during the closure and post-closure care period. Stability of the final cover system will be assessed as part of the final cover design for state approvals once state requirements for the final cover system are determined.

(iv) *Minimize the need for further maintenance of the CCR unit; and*

Maintenance of the final cover will be minimized by the establishment of vegetative cover and the erosion control systems, which are further described below.

(v) *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices."*

All closure activities for the LAN Upper Ash Pond must be completed by October 17, 2023, per 40 CFR 257.103(f)(2)(iv)(A) pending the USEPA's approval of the CCR surface impoundment operating extension beyond April 11, 2021, as requested by IPL according to 40 CFR 257.103(f)(3).

"(2) Drainage and stabilization of CCR surface impoundments. The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of paragraphs (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section."

(i) *Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.*

Free liquids will be dewatered from the pond and remaining waste will be mixed with dry CCR or otherwise adequately stabilized prior to final cover system placement.

(ii) *Remaining wastes must be stabilized sufficient to support the final cover system.*

The remaining wastes will be stabilized prior to final cover system placement.

"(3) Final cover system"

The final cover system (see **Figure 3** for detail) for the Upper Ash Pond will include the following, at a minimum, from the bottom up:

- Eighteen-inch-thick soil infiltration layer (minimum permeability of $1x10^{-5}$)
- Six-inch-thick vegetative soil layer

This final cover will meet the minimum requirements of 40 CFR 257.102(d)(3)(i)(A) through (D) as follows:

- Per 257.102(d)(3)(i)(A), the Upper Ash Pond final cover system will include an 18-inch soil layer with a permeability of $1x10^{-5}$ centimeters per second (cm/sec) or less. The permeability of the proposed final cover system is less than the permeability of the natural subsoils under the pond identified during facility design as documented in the October 2017 "CCR Surface Impoundment Structural Stability Assessment" prepared by Hard Hat Services, for the LAN facility. There is no liner system present in the Upper Ash Pond.

- Per 257.102(d)(3)(i)(B), the cover system will provide at least 18 inches of earthen material to minimize infiltration.

- Per 257.102(d)(3)(i)(C), erosion of the final cover system will be minimized with a vegetative soil layer with a minimum of 6-inches of un-compacted rooting zone material.

- Per 257.102(d)(3)(i)(D), the design of the final cover system will minimize disruptions to the final cover system. The stability of the final cover system will be assessed during final design once state requirements are determined.

- The design of the final cover will accommodate settling and subsidence of the CCR fill below the cover. The CCR will be placed and compacted prior to final cover placement. The final cover system will be designed with minimum and maximum slopes that will accommodate settlement and minimize disruptions to the cover.

All final cover materials will be tested to confirm they meet the required specifications, and construction will be overseen and documented by a licensed professional engineer. Final cover soil layers will be checked for thickness. All areas will be restored after final cover is placed. Vegetation will be monitored and maintained.

4.0 MAXIMUM INVENTORY OF CCR

40 CFT 257.102(b)(1)(iv). *"An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit."*

The estimated maximum inventory of CCR ever on site in the LAN Upper Ash Pond, over the active life of the Upper Ash Pond, is approximately 485,000 cubic yards of CCR are currently present in the LAN Upper Ash Pond. This estimate is based on 2020 in place survey, borings, and material test data. This volume does not include the volume present in the LAN CCR Landfill.

5.0 LARGEST AREA OF CCR UNIT REQUIRING FINAL COVER

40 CFR 257.102(b)(1)(v). *"An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life."*

Based on the geometry of the LAN Upper Ash Pond described above, the estimated largest area of final cover required would be approximately 17 acres. The 17 acres assumes the entire pond footprint must be capped and is delineated by the berms and access roads.

6.0 SCHEDULE OF SEQUENTIAL CLOSURE ACTIVITIES

40 CFR 257.102(b)(1)(vi). *"A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed.*

The preliminary schedule for closure of the Upper Ash Pond is provided in Appendix A.

7.0 COMPLETION OF CLOSURE ACTIVITES

40 CFR 257.102(f)(1). *"Except as provided for in paragraph (f)(2) of this section, the owner or operator must complete closure of the CCR unit:*

(i) *For existing and new CCR landfills and any lateral expansion of a CCR landfill, within six months of commencing closure activities."*

This does not apply to the Upper Ash Pond.

(ii) *"For existing and new CCR impoundments and any lateral expansion of a CCR surface impoundment, within five years of commencing closure activities."*

Closure of the Upper Ash Pond will be completed by October 17, 2023.

40 CFR 257.102(f)(3). *"Upon completion, the owner or operator of the CCR unit must obtain a certification from a qualified professional engineer verifying that closure has been completed in accordance with the closure plan specified in paragraph (b) of this section and the requirements of this section."*

A qualified professional engineer will oversee final cover construction. The engineer will verify final cover materials and methods, and oversee material testing. At the end of construction, the engineer will provide a report summarizing and documenting construction and will certify compliance with the requirements.

8.0 REFERENCES

40 CFR Part 257, Subtitle D – Environmental Protection Agency Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.

Hard Hat Services, 2017, CCR Surface Impoundment Structural Stability Assessment, Lansing Generating Station, Interstate Power and Light Company, October 18, 2017.

Sargent & Lundy, 2016, Closure Plan for Existing CCR Surface Impoundment, Lansing Generating Station, Interstate Power and Light Company, August 26, 2016.

Sargent & Lundy, 2018, Closure Plan for Existing CCR Surface Impoundment (Revision 1), Lansing Generating Station, Interstate Power and Light Company, February 14, 2018.

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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	INTERSTATE POWER AND LIGHT LANSING GENERATING STATION LANSING, IOWA

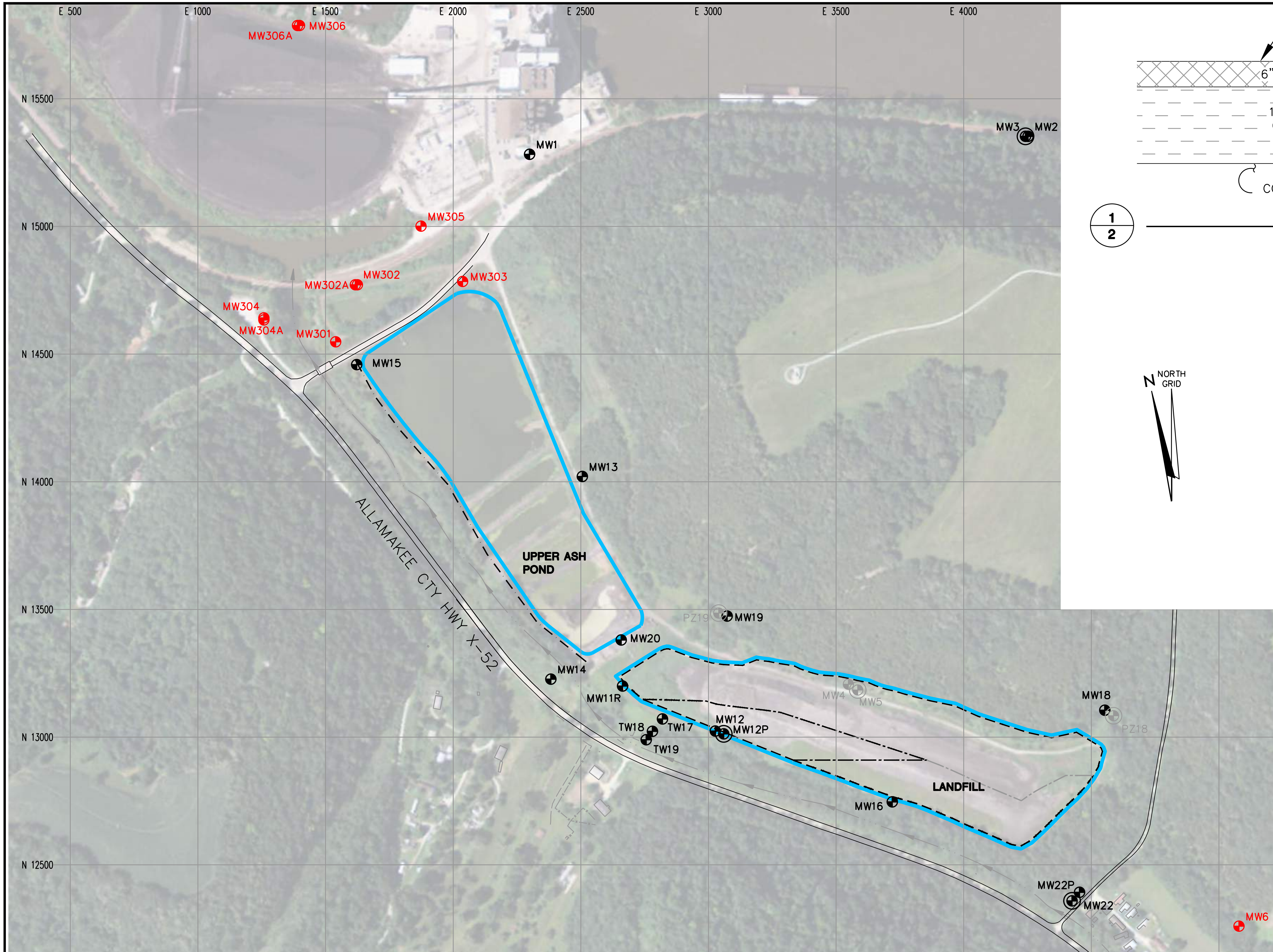
SITE LOCATION MAP

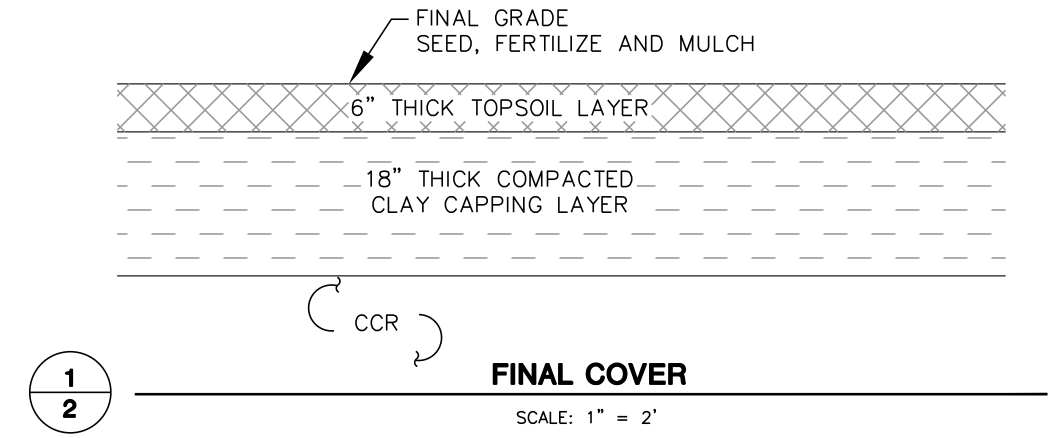
PROJECT NO.	25220100.00	DRAWN BY:	RJG
DRAWN:	11/27/2019	CHECKED BY:	PG
REVISED:	09/25/20	APPROVED BY:	EJN 11/13/2020

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

FIGURE 1

I:\25220100.00\Drawings\Site Location Map.dwg, □/28/2020 □:51:01 AM





FINAL COVER

SCALE: 1" = 2'

NORTH GRID

LEGEND

— — — —	APPROVED LIMITS OF WASTE
·—·—·—	LIMITS OF PHASE 1 FINAL COVER
—·—·—·	LIMITS OF PHASE 2 FINAL COVER
— · — · —	SLURRY WALL
···→···→	EXISTING STREAM
MW17	EXISTING MONITORING WELL
MW12P	EXISTING PIEZOMETER
MW4	ABANDONED MONITORING WELL
MW5	ABANDONED PIEZOMETER
MW301	CCR MONITORING WELL
(blue line)	CCR UNITS

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.

400 0 400

SCALE: 1" = 400'

PROJECT NO.	25219070.00	DRAWN BY:	RJG
DRAWN:	11/27/2019	CHECKED BY:	PG
REVISED:	01/20/2020	APPROVED BY:	EJN 11/13/2020

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: INTERSTATE POWER AND LIGHT, LANSING POWER STATION, LANSING, IOWA

SITE PLAN

FIGURE 2

I:\25220100.00\Drawings\2 Site Plan.dwg, /28/2020 3:17 AM

Appendix A

Pond Closure Schedule

Estimated Pond Closure Schedule
Lansing Generating Station
Iowa Power and Light Company

ID	Task Name	Duration	Start	Finish
1	Engineering	411 days	Thu 3/5/20	Thu 9/30/21
2	Permitting	293 days	Wed 11/18/20	Fri 12/31/21
3	Procurement	257 days	Wed 4/14/21	Thu 4/7/22
4	Dewatering and Closure Construction	207 days	Mon 1/2/23	Tue 10/17/23