Addendum No. 1
Assessment of Corrective Measures
Closure Area

Prairie Creek Generating Station
Cedar Rapids, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220084.00 | August 9, 2021

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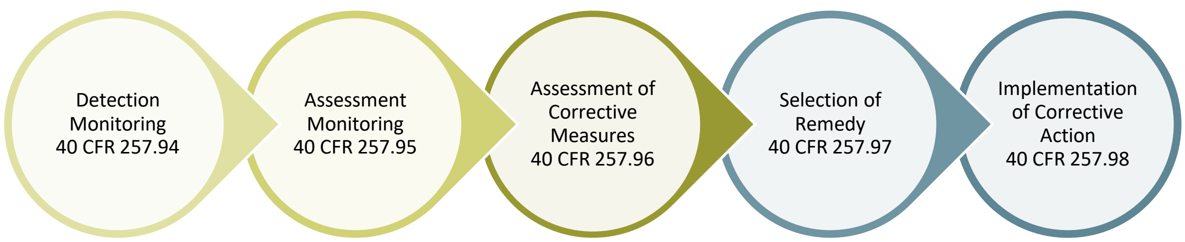
EXECUTIVE SUMMARY

Interstate Power and Light Company (IPL), an Alliant Energy company, operated a system of eight small coal combustion residual (CCR) ponds and two CCR piles at the Prairie Creek Generating Station (PCS). The ponds and piles were used to manage CCR and wastewater from the power plant, which burns coal and natural gas to generate electricity and steam.

In 2018, IPL consolidated the CCR from the ash ponds and piles into a single closure area that was capped in accordance with a permit from the Iowa Department of Natural Resources (IDNR) and U.S. Environmental Protection Agency (USEPA) standards for the Disposal of CCR from Electric Utilities, or the "CCR Rule" (Rule).

IPL samples and tests the groundwater in the area of the former ponds/piles and the closure area to comply with the Rule. Groundwater samples from some of the wells installed to monitor the closure area contained arsenic and molybdenum at levels higher than the Groundwater Protection Standards (GPS) defined in the Rule. These metals occur naturally, and both 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 at the PCS 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 PCS facility.
- Depth of groundwater.
- Direction that groundwater is moving.
- Potential sources of the arsenic and molybdenum in groundwater.
- The area where arsenic and molybdenum levels are higher than the USEPA standards.
- The people, plants, and animals that may be affected by levels of arsenic and molybdenum in groundwater that are above the GPS.

IPL has continued work to understand the items listed above since issuance of the ACM. This Addendum No. 1 has been prepared to update the ACM for PCS based on the information now available.

Based on the information currently available, IPL has updated the appropriate options, or Corrective Measures, to bring the levels of arsenic and molybdenum in groundwater below USEPA standards. These corrective measures include:

- No Further Action
- Monitored Natural Attenuation (MNA)
- Cover Upgrade with MNA
- Gradient Control with MNA
- Excavate and Dispose CCR in Off-site Landfill with MNA
- In-situ Treatment with Chemical Amendment
- Groundwater Collection
- Groundwater Management with Barrier Wall

IPL has included a "No Further Action" alternative for comparison purposes only. This alternative will not be selected as a remedy. Addendum No. 1 includes an updated evaluation that includes all eight options using factors identified in the Rule.

IPL has provided semiannual updates on its progress in evaluating Corrective Measures to address the groundwater impacts at PCS since the September 2019 ACM was issued. These semiannual updates will continue until a remedy is selected and the required Selection of Remedy report is issued.

Before a remedy is selected, IPL will hold a public meeting with interested and affected parties to discuss the ACM, including information presented in this addendum.

For more information on Alliant Energy, view the Corporate Responsibility Report at https://poweringwhatsnext.alliantenergy.com/crr/.

1.0 INTRODUCTION AND PURPOSE

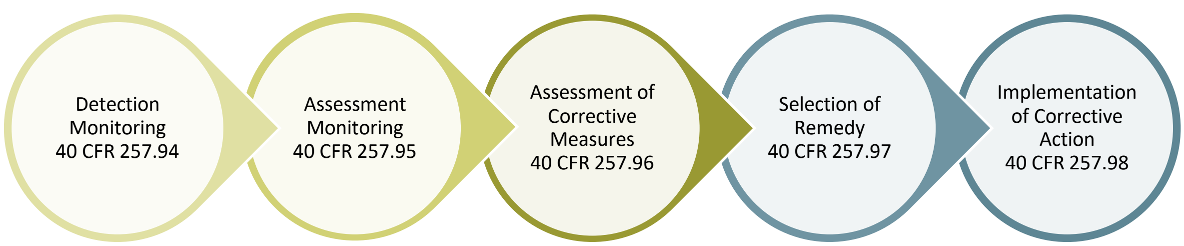
The Assessment of Corrective Measures (ACM) for the Interstate Power and Light Company (IPL) Prairie Creek Generating Station (PCS) was prepared to comply with U.S. Environmental Protection Agency (USEPA) regulations regarding the Disposal of Coal Combustion Residuals from Electric Utilities [40 CFR 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

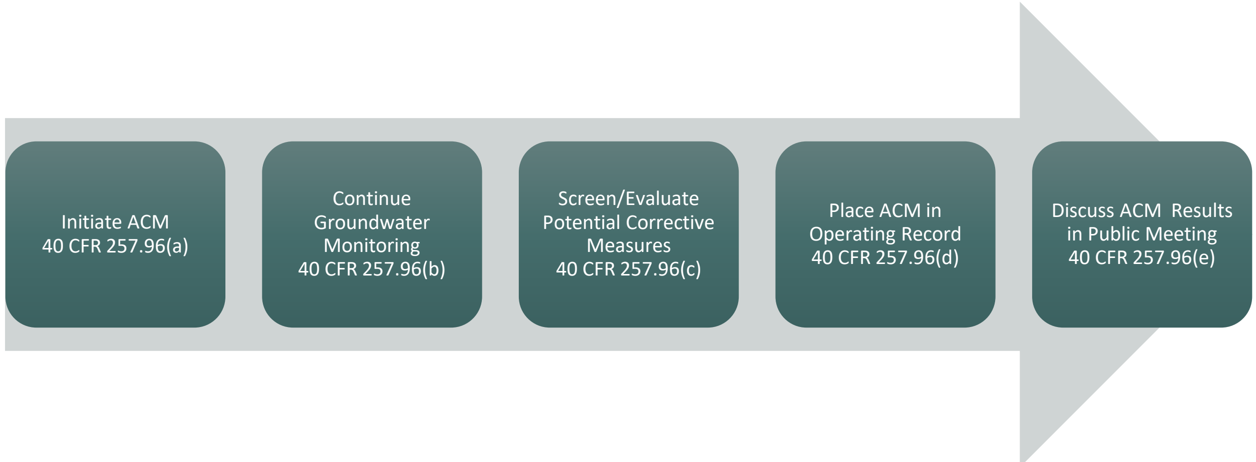
This ACM Report summarizes the remedial alternatives for addressing the Groundwater Protection Standard (GPS) exceedances observed in the October 2018 sampling event and identified in the Notification of Groundwater Protection Standard Exceedance dated February 13, 2019. The September 2019 ACM identified additional information needed to inform the selection of a corrective measure (remedy) for PCS according to 40 CFR 257.97. Since the ACM was issued, IPL has worked to obtain additional information and prepared Addendum No. 1 to update the ACM for PCS 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 to monitor the PCS 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 PCS 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 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. To facilitate the selection of a remedy for the GPS exceedances at PCS, 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

PCS is located south of Prairie Creek and west of the Cedar River, on the south side of the City of Cedar Rapids in Linn County, Iowa (**Figure 1**). The address of the plant is 3300 C Street Southwest, Cedar Rapids, Iowa. In addition to the generating station, the property also contains a closure area located within the original footprint of the Coal Combustion Residuals (CCR) impoundments, a coal stockpile, and beneficial reuse stockpile that contains a nominal amount of hydrated fly ash.

The groundwater monitoring system at PCS monitors the Closure Area, which was created when the following CCR units were closed:

- PCS Pond 1
- PCS Pond 2
- PCS Pond 3
- PCS Pond 4
- PCS Pond 5
- PCS Pond 6
- PCS Pond 7
- PCS Discharge Pond (Pond 8)
- PCS Beneficial Use Storage Area
- PCS Bottom Ash Pile

All CCR material from these units was consolidated into a single closure area in accordance with 40 CFR 257.102 and a Closure Permit issued by the Iowa Department of Natural Resources (IDNR). The closure was completed on December 19, 2018. This ACM was initiated following detection monitoring and assessment monitoring activities that occurred prior to, during, and following the closure activities, including the October 2018 sampling event when Groundwater Protection Standard exceedances were observed. A map showing the closure area, the former locations of the closed 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**.

2.0 BACKGROUND

2.1 REGIONAL GEOLOGIC INFORMATION

The uppermost geologic formation beneath PCS that meets the definition of the "uppermost aquifer," as defined under 40 CFR 257.53, is the surficial alluvial aquifer. The alluvial aquifer is comprised of Cedar River Valley sand, gravel, silt, and clay deposits. This deposit is present in the Cedar River Valley and is used for municipal water supply by the City of Cedar Rapids approximately 4.5 miles upstream of PCS. A map of the regional glacial geology in the area is included in **Appendix A**.

The alluvial aquifer is underlain by Devonian and Silurian limestone and dolostone bedrock. A bedrock geology map and cross-sections of the area are located in **Appendix A**. The Devonian and Silurian bedrock are also aquifer units and are likely hydraulically connected to the alluvial aquifer above. The Silurian limestone is several hundred feet thick at the site and is underlain by an Ordovician confining unit.

2.2 SITE GEOLOGIC INFORMATION

Monitoring wells MW-301 through MW-310A were installed to intersect the alluvial aquifer at the site. The unconsolidated material at these well locations is generally sand and silt with some clay and gravel. The total monitoring well boring depths are between 14.5 and 60 feet. The depth to bedrock at the site is variable; drilling logs for private supply wells at the site indicate that the alluvial deposits extend up to 77 feet below ground surface (bgs), and bedrock was encountered as shallow as 6 feet bgs in investigative borings installed prior to monitoring well installation. The boring logs for MW-301 through MW-310A are included in **Appendix B**.

The original monitoring network included monitoring wells MW-301 through MW-306, installed in October through December 2016. Additional compliance monitoring wells MW-307 and MW-308 were installed in November 2018 while delineation monitoring wells MW-309 and MW-310 were installed in August 2019. Piezometers MW-301A, MW-306A, MW-309A, and MW-310A were installed in June and July 2020. Bedrock was not encountered in the deeper piezometer borings. The boring for upgradient piezometer MW-301A encountered a thick lean clay layer and the well is screened within the clay. The other three piezometers are screened in sand. The total boring depths were between 45 and 60 feet. Boring logs for the additional monitoring wells and piezometers are also included in **Appendix B**.

Shallow groundwater at the site generally flows to the north, toward Prairie Creek. The groundwater flow pattern in April 2020 is shown on **Figure 3** and the groundwater flow pattern in October 2020 are shown on **Figure 4**. Deeper groundwater at the site also appears to flow generally to the north, toward Prairie Creek, as seen in the October 2020 potentiometric surface map on **Figure 5**. The groundwater elevation data for the CCR monitoring wells are provided in **Table 1**. A summary of sample events is provided in **Table 2**. The summary of analytical results and field parameters are provided in **Table 3** and **Table 4**, respectively. The vertical gradient summary is provided in **Table 5**.

Two geologic cross sections were prepared for PCS. Cross section A-A' runs through upgradient well MW-301/MW-301A, crosses the closure area, then runs through downgradient monitoring well nest MW-310/MW-310A. Cross section B-B' runs through MW-303 and traverses the site to the east to MW-307. Both cross section locations are provided on **Figure 2**, and the geologic cross sections are provided on **Figures 6** and **Figure 7**. Unconsolidated geologic material and the estimated water table 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 two upgradient (background) monitoring wells and four downgradient monitoring wells. The two initial background wells are MW-301 and MW-302. The four initial downgradient wells are MW-303, MW-304, MW-305, and MW-306. These wells were installed in October 2016 and December 2016. Two additional downgradient monitoring wells, MW-307 and MW-308, were installed in November 2018 following the closure of PCS Pond 1 and PCS Pond 2. Prior to the pond closure, the area downgradient of Ponds 1 and 2 was not accessible for well installation. Two additional downgradient monitoring wells, MW-309 and MW-310, were installed in August 2019 in accordance with the assessment monitoring requirements of 40 CFR 257.95(g)(1). The four new piezometers, MW-301A, MW-306A, MW-309A, and MW-310A, were installed in June and July 2020, to characterize site conditions in accordance with § 257.95(g)(1). Well depths range from approximately 47 to 62 feet bgs. The Groundwater Sampling and Analysis Plan was followed for the sampling and analysis of all existing and new wells.

3.0 NATURE AND EXTENT OF GROUNDWATER IMPACTS

Additional information regarding the nature and extent of groundwater impacts has been obtained since the September 2019 ACM was issued. The following new information is described further in the sections that follow:

- No new or alternative sources of arsenic and molybdenum impacts to groundwater have been identified.
- Additional wells, both shallow water table wells and deeper piezometers, have been installed to delineate the horizontal and vertical extent of groundwater impacts.
- The horizontal extent of arsenic and molybdenum concentrations that exceed the GPS continues to be evaluated. Arsenic concentrations that exceed the GPS occur in new wells installed near Prairie Creek to monitor shallow groundwater in the uppermost aquifer. No change in the horizontal extent of molybdenum impacts has been observed.
- The vertical extent of the arsenic and molybdenum concentrations that exceed the GPS has been defined. None of the samples collected from piezometers installed in 2020 since the initial ACM was issued contain arsenic or molybdenum at concentrations greater than the GPS.
- Statistical evaluations of trends in arsenic and molybdenum concentrations in groundwater are limited by the number of available samples, but indicate no statistically significant trends.
- Additional sampling is required to complete an evaluation of monitored natural attenuation as a viable component of potential corrective measures.
- The surface water/sediment, biota/food, and ecological exposure pathways continue to be evaluated and the assessments discussed in the initial ACM will continue to be updated based on the new groundwater data obtained.

3.1 POTENTIAL SOURCES

The potential sources of groundwater impacts are the former CCR units at PCS. No additional sources have been identified since the September 2019 ACM. Based on a review of existing site documents, potential sources of groundwater impacts include former PCS Ponds 1 through 8, the Bottom Ash Pile, and the Beneficial Reuse Storage Area. These CCR units were closed in 2018, and all CCR material from these units was consolidated into a single Closure Area (**Figure 2**). The information provided here is summarized from the Closure Plan for Existing CCR Surface Impoundments and CCR Landfills dated August 28, 2018, and the Construction Documentation Report dated December 18, 2018.

Approximately 90,000 cubic yards of CCR was present in PCS Ponds 1 through 8, the Bottom Ash Pile, and the Beneficial Use Storage Area prior to closure. During closure, PCS Ponds 1 through 8 were dewatered. CCR was removed from PCS Ponds 1, 2, 8, and portions of PCS Ponds 3, 4, and 7, and was consolidated in the former footprints of PCS Ponds 3 through 7 during closure. A portion of the hydrated fly ash pile was also consolidated in the Closure Area. A final cover system consisting of 18 inches of compacted clay and 6 inches of soil capable of sustaining a vegetative cover was installed over the consolidated CCR.

3.2 GROUNDWATER ASSESSMENT

3.2.1 Groundwater Depth and Flow Direction

Groundwater flow at the site is generally to the north. Depth to groundwater varies from 0 to 18 feet bgs due to topographic variations across the facility and seasonal fluctuations in the groundwater surface. The downgradient area where MW-303 through MW-306, MW-309/MW-309A, and MW-310/MW-310A are located is prone to flooding when water levels in Prairie Creek and the Cedar River are high. Groundwater elevations and flow directions are shown on the April 2020 and October 2020 water table maps and the October 2020 potentiometric surface map (**Figure 3**, **Figure 4**, and **Figure 5**). The water table below the closure area is believed to be at or below the bottom elevation of the ash. Further investigations are planned to assess the elevation of the water table in relation to the bottom of ash within the closure area. Vertical gradients for the downgradient monitoring well nests were upward in September and October 2020 (**Table 5**), indicating likely groundwater discharge to Prairie Creek.

3.2.2 Groundwater Protection Standard Exceedances Identified

The ACM process was triggered by the detection of arsenic and molybdenum at statistically significant levels exceeding the GPSs in samples from the following compliance wells:

- Arsenic: MW-303 and MW-304
- Molybdenum: MW-306

The initial statistical evaluation of the assessment monitoring results was based on the first four sampling events for the Appendix IV assessment monitoring parameters, including sampling events in May, August, and October 2018, and a supplemental sampling event for selected parameters at selected wells in March 2019. The complete results for these sampling events are summarized in **Table 3**. Some additional compliance monitoring wells had individual results exceeding the GPSs for these parameters, but the exceedances were not determined to be at statistically significant levels. The evaluation of statistically significant levels exceeding the GPSs was summarized in an Alternative Source Demonstration (ASD) completed in April 2019. The ASD identified a reduced list of wells with parameters exceeding the GPS and recommended that IPL initiate the ACM.

Since the ACM was initiated, arsenic has been detected at statistically significant levels in additional downgradient wells installed to define the extent of groundwater impacts (**Table 3**). Based on the results of sampling conducted through the October 2020 sampling event, statistically significant levels exceeding the GPSs have been identified for the following wells and parameters:

Assessment Monitoring Appendix IV Parameter	Location of SSL Above GPS	Historic Range of Detections at Wells Exceeding GPS	Groundwater Protection Standard (GPS)
Arsenic (µg/L)	Compliance Wells: MW-303, MW-304, MW-308	11-63	10
	Delineation Wells: MW-309 and MW-310	23-140	
Molybdenum (µg/L)	Compliance Well: MW-306	200-271	100

µg/L = micrograms per liter, SSL = Statistically significant level
Note: Historic range includes results from assessment monitoring beginning in May 2018 through October 2020.

The arsenic concentrations reported for samples from downgradient delineation well MW-309 are higher than the concentrations observed in compliance wells at the waste boundary, suggesting that natural sources may also contribute to the arsenic levels in the delineation wells near the creek.

3.2.3 Expanding the Groundwater Monitoring Network

The groundwater monitoring network at PCS has been expanded over time to assess the groundwater impacts observed in the initial CCR Rule monitoring system wells. The details of the groundwater monitoring network expansions at PCS are summarized below and described in **Sections 2.2** and **2.3**:

- Initial Monitoring Network (October – December 2016): MW-301, MW-302, MW-303, MW-304, MW-305, and MW-306
- Additional Compliance Monitoring Wells (November 2018): MW-307 and MW308
- Delineation Monitoring Wells (August 2019): MW-309 and MW-310
- Piezometers (June – July 2020): MW-301A, MW-306A, MW-309A, and MW-310A

The sampling results from the newer monitoring wells and piezometers, shown in **Table 3**, indicate that arsenic was detected at statistically significant levels exceeding the GPS in the first four samples from MW-308, MW-309, and MW-310. The initial two rounds of sampling results from MW-301A, MW-306A, MW-309A, and MW-310A shown in **Table 3**, indicate that arsenic and molybdenum concentrations are below the GPS in samples from the four deeper piezometers.

3.2.4 Monitored Natural Attenuation Data Collection and Evaluation

An evaluation of the potential for PCS to utilize MNA as a component of a corrective action alternative began with the initiation of an ACM at PCS. 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 PCS.

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 begin to address the objectives of tiers 1 and 2 include:

- Installation of downgradient delineation wells MW-309 and MW-310 and deeper upgradient and downgradient piezometers MW-301A, MW-306A, MW-309A, and MW-310A, 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 Appendix III and IV constituents to further characterize groundwater chemistry.

- Analysis of both total and dissolved constituents for selected parameters.

A hydrogeochemical conceptual model and summary of preliminary evaluation of groundwater contaminant attenuation at PCS is included in **Appendix C**. Preliminary findings include:

- Arsenic and molybdenum concentrations decrease significantly with depth. This is likely due to upward vertical gradients.

- The proximity of Prairie Creek to the PCS closure area limits, but does not necessarily preclude, the potential for natural attenuation within the aquifer.

- The natural geochemistry of the Prairie Creek alluvial deposits may be sufficiently different from the upgradient uplands resulting in uncertainty in assessing the potential impact of the CCR units on the downgradient chemistry.

- Arsenic may attenuate in the bottom sediments of Prairie Creek. This attenuation might occur if the creek is organic-rich, strongly anoxic, and sediments in the creek reduce the 100 to 200 milligrams per liter (mg/L) of sulfate in groundwater to sulfide.

- If any attenuative capacity is present in the aquifer, it may have been reduced by historical arsenic releases. It is possible that arsenic and molybdenum may be attenuated in the bottom sediments of Prairie Creek if organic-rich, strongly anoxic, sediments in the creek reduce the 100 to 200 mg/L of sulfate in the groundwater to sulfide. The sulfide could combine with the iron in the groundwater resulting in the precipitation of iron-arsenic sulfide and molybdenum sulfide.

A preliminary evaluation of whether the arsenic and molybdenum plume is stable, growing, or decreasing has been completed using a Mann-Kendall trend test. Trends were evaluated for wells with arsenic or molybdenum at statistically significant levels above the GPS using the results of samples collected since assessment monitoring began in May 2018. For the recently installed downgradient delineation wells, all sample results were used. The results of the trend tests are provided in **Appendix D**. No significant increasing or decreasing trends were identified. For the newer wells with only four sample results, the statistical significance of any trends cannot yet be evaluated. The trend plots provide a preliminary indication of trend for these wells, and the statistical significance can be evaluated when at least two additional rounds of sampling are completed in 2021.

Before natural attenuation is removed from consideration as a remedial alternative, the following additional data collection and evaluation is recommended:

- Perform additional rounds of groundwater sampling for arsenic and molybdenum to further assess plume stability.

- Evaluate the potential contributions of naturally present arsenic and molybdenum to the observed concentrations, including additional research on published arsenic and molybdenum groundwater concentration data from the alluvial aquifer in the vicinity of PCS and/or collection of additional site investigation data from an area near the creek, but not directly downgradient from the former impoundments.

3.3 CONCEPTUAL SITE MODEL

The following conceptual site model describes the compounds and nature of constituents above the GPS, discusses potential exposure pathways affecting human health and the environment, and presents a cursory review of their potential impacts. The conceptual site model for PCS 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 Constituents Above GPS

The nature of the constituents in groundwater at PCS that are present at concentrations greater than the GPS (arsenic and molybdenum) were described in the September 2019 ACM. No additional constituents have been identified at concentrations above a GPS. Please refer to the details discussion 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 PCS) and pathways (the ways groundwater impacts might reach receptors). In accordance with ASTM E1689-95, we have considered potential human and ecological exposures to groundwater impacted by the constituents 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 PCS, 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 PCS 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 PCS:
  - No off-site water supply wells have been identified immediately downgradient or sidegradient in the vicinity of the CCR Units.
  - The nearest identified off-site water supply well is at Jones Park, approximately 500 feet from the closure area and on the opposite side of Prairie Creek. This well is 430 feet deep and is cased to a depth of approximately 89 feet. According to the City of Cedar Rapids this well is used only for irrigation.
  - The on-site water supply wells are not used as a source of potable water. Potable water at PCS is provided by the City of Cedar Rapids. According to the City of Cedar Rapids website, the City obtains its water from the alluvial aquifer along the Cedar River. The City's wells are located 4.5 miles upstream of PCS.
- 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 facility has interacted with adjacent surface water and sediments, to the extent that the constituents identified in Section 3.2.2 are 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 PCS facility has interacted with elements of the human food chain. Based on discussions with PCS 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 interactions, which are subject to additional assessment. If this pathway is complete and surface water and organisms are impacted, groundwater to surface water interactions and the potential impacts to aquatic vegetation and fish remains a risk to human health by their consumption.

These potential human health exposure pathways will be evaluated further after results are obtained from additional monitoring. 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 PCS.

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; and

  – 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 **Sections 3.2.2** and **3.2.3** and the location of Prairie Creek downgradient of PCS, both of these ecological exposure routes need to be evaluated further, pending further evaluation of the nature and extent of groundwater impacts. Additional investigations are planned to evaluate the potential extent of impacts to Prairie Creek.

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 PCS are described in **Section 5.0**. The alternatives selected are qualitatively evaluated in **Section 6.0**.

4.1 IDENTIFICATION OF CORRECTIVE MEASURES

As described in the USEPA Solid Waste Disposal Facility Criteria Technical Manual (USEPA, 1998), corrective measures are generally composed of 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 have identified 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 the PCS site, source control has already been provided through the closure of the existing CCR units at the facility, which included the consolidation of CCR materials from multiple units into a single closure area and the installation of a vegetated low permeability soil cover. Closure activities at PCS were completed in 2018, and were already underway when the groundwater impacts that required IPL to initiate the ACM were identified in October 2018. Although more time may be required to see a groundwater quality response to the closure activities completed in 2018, additional source control measures, or enhancements to existing source control measures, are identified below:

- **Cover Upgrade.** A cap upgrade would further reduce infiltration and prevent transport of CCR constituents from unsaturated CCR materials into the groundwater.

- **Excavate 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 closure area.

Water movement through the CCR materials is the mechanism for CCR impacts to groundwater, including surface water that moves vertically through the CCR materials via infiltration of precipitation and surface water runoff. Based on the available information for this site, both the source control measures have potential to prevent further releases caused by infiltration if GPSs are not achieved by the closure activities completed in 2018, thus are retained for incorporation into alternatives for further evaluation. However, IPL continues to monitor and investigate the nature and extent of groundwater impacts.

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
- Interrupt a confirmed 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 are 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 containment measures have potential to limit the spread of the existing groundwater impacts at the site, if necessary:

- **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 and molybdenum. 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. Chemically, this may include precipitation or alteration to render arsenic and molybdenum less mobile in the environment. Evaluation of an appropriate commodity amendments, in situ arsenic and molybdenum treatment, focusing on in situ sorptive and reduction-oxidation (redox)-based precipitation remedies that may include zero valent iron, colloidal activated carbon, and adjusting the redox potential of the zone of impact will occur during the remedy selection process.

Based on the currently available information for this site, gradient control, achieved through pumping or phytotechnology, is included in the proposed alternatives. We will continue to investigate the nature and extent of the groundwater impacts at PCS 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, exposure pathways, and risks to receptors. If there are no receptors, or when active treatment is not required for the reasons discussed in Section 4.1.2, then MNA is an appropriate option. If existing or future impacts 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 and molybdenum 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 concentrations in groundwater below GPSs 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.

Based on current information and because the MNA evaluation is not yet complete, MNA has been retained for incorporation into alternatives for further evaluation. However, additional restoration measures have been added following 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 PCS:

- Alternative 1 – No Further Action
- Alternative 2 – MNA
- Alternative 3 – Cover Upgrade with MNA
- Alternative 4 – Gradient Control with MNA
- Alternative 5 – Excavate and Dispose Off-site with MNA
- Alternative 6 – In-situ Treatment with Chemical Amendment
- Alternative 7 – Groundwater Collection
- Alternative 8 – Groundwater Management with Barrier Wall

These alternatives were developed by selecting components from the reasonable and appropriate corrective measures components discussed above. 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 FURTHER ACTION

Closure of the CCR units at PCS was already underway when the groundwater impacts that required IPL to initiate the ACM process were identified. Closure activities at PCS included consolidation and capping of CCR from various CCR units into a single closure area (**Figure 2**) in accordance with the requirements for closure in place in 40 CFR 257.102(d). The closure was consistent with landfill cover systems that prevent infiltration of surface water into the CCR as described in **Section 4.1.1**. The cap limits exposure of CCR material to precipitation/surface water infiltration, which is currently believed to be the primary mechanism for mobilization of constituents to the environment and resulting GPS exceedances.

Closure activities were completed in October 2018, and additional time is required to monitor the response in groundwater conditions to the closure activities and determine whether the final cover system results in decreases in constituent concentrations below the GPS. This alternative assumes that post-closure monitoring of groundwater will continue as described in Section 2.4 of the Post-Closure Plan for the CCR units at PCS issued in August 2018.

This alternative is presented for comparison purposes only and will not be selected as a remedy. No Further Action does not meet all of the requirements and objectives of a remedy defined in 40 CFR 257.97.

5.2 ALTERNATIVE 2 – MNA

Alternative 2 includes no additional source control component or containment component and relies on the recent closure of the CCR units at PCS with CCR in place under a cap – a source control approach that has already been completed. The cap limits exposure of CCR material to precipitation/surface water infiltration, which is currently believed to be the primary mechanism for mobilization of constituents to the environment and resulting GPS exceedances. Under Alternative 2, the current post-closure groundwater monitoring program will be supplemented with MNA. MNA may include the analysis of groundwater samples for additional parameters and increased sampling frequency over and above the minimum program. Additional monitoring is intended to assist IPL with understanding, monitoring, predicting, and documenting natural processes affecting groundwater quality. MNA will track groundwater impacts and the effects of degradation mechanisms, if present, on groundwater concentrations over time.

This alternative has been retained in Addendum No. 1 as Alliant evaluates the post-closure water table conditions in the closure area. If CCR is in contact with groundwater, this alternative is unlikely to meet all of the requirements and objectives of a remedy defined in 40 CFR 257.97.

5.3 ALTERNATIVE 3 – COVER UPGRADE WITH MNA

Alternative 3 includes an upgrade to the existing cover that was constructed over the closure area in 2018 in accordance with the criteria set forth in in 40 CFR 257.102(d). Closure of the CCR units at PCS with CCR in place under a cap has already been completed. Under Alternative 3, the existing cap will be enhanced to further reduce the overall permeability of the final cover in the event the final cover system design prescribed in the CCR Rule and implemented in 2018 does not attain the GPS for arsenic and molybdenum. Cover upgrades include one, or a combination, of the following:

- Increase the thickness of the infiltration layer (low-permeability clay layer)
- Increase the overall thickness of cover to promote evapotranspiration
- Installation of a geomembrane over the existing infiltration layer (i.e., upgrade to composite cover)
- Installation of a drainage layer (e.g., geocomposite or granular soil layer) above the infiltration layer

The closure areas will also be subject to enhanced groundwater monitoring via MNA.

This alternative is expected to further reduce infiltration of surface water into the closure area. Leaching of metals and migration within groundwater may be reduced, which may eliminate GPS exceedances over time or accelerate the time required to obtain GPSs. MNA will assist to track if the groundwater impacts are reduced.

5.4 ALTERNATIVE 4 – GRADIENT CONTROL WITH MNA

Alternative 4 includes gradient control measures to interrupt any confirmed exposure pathways, and limit the spread of groundwater impacts. Under Alternative 4, gradient control measures will be installed to supplement the closure activities completed in 2018 in the event the final cover system prescribed in the CCR Rule and implemented in 2018 does not attain the GPS for arsenic and molybdenum. Gradient control measure may be used to prevent the completion of an exposure pathway for groundwater containing arsenic or molybdenum concentrations above the GPS to impact downgradient receptors. MNA is included with this alternative and will monitor groundwater impacts and the effects of degradation mechanisms, if present, on groundwater concentrations over time.

5.5 ALTERNATIVE 5 – EXCAVATE AND DISPOSE OFF-SITE WITH MNA

Alternative 5 includes the removal of the existing final cover and excavation of all CCR within the closure area. Under Alternative 5, CCR from the closure area will be excavated and transported to an approved off-site landfill after the removal of the existing final cover in the event the final cover system prescribed in the CCR Rule and implemented in 2018 does not attain the GPS for arsenic and molybdenum. Further on site releases from the CCR sources will be prevented by removing the source materials from the site, which eliminates the potential for ongoing on site leaching of constituents into groundwater. MNA is included with this alternative and will monitor groundwater impacts and the effects of degradation mechanisms, if present, on groundwater concentrations over time.

5.6 ALTERNATIVE 6 – IN-SITU TREATMENT WITH CHEMICAL AMENDMENT

Alternative 6 includes adding a chemical amendment within the groundwater plume to reduce the mobilization of arsenic and molybdenum to interrupt any confirmed exposure pathways and limit the spread of groundwater impacts. Under Alternative 6, further leaching of metals and migration within groundwater would be prevented by fixation using a chemical amendment.

5.7 ALTERNATIVE 7 – GROUNDWATER COLLECTION

Alternative 7 incorporates groundwater collection measures to supplement the closure activities completed in 2018. This alternative serves to intercept groundwater contributing to confirmed exposure pathways and to reduce the migration of groundwater impacts. With groundwater collection, impacted groundwater would be extracted by pumping for treatment.

5.8 ALTERNATIVE 8 – GROUNDWATER MANAGEMENT WITH BARRIER WALL

Alternative 8 incorporates the use of a barrier wall to mitigate impacts from arsenic and molybdenum. The barrier wall consists of two different approaches:

- Impermeable barrier: Directs upgradient groundwater away from known groundwater impacts.
- Permeable barrier: Intercepts impacted groundwater within a permeable zone to treat impacted groundwater.

Further leaching of metals and migration within groundwater will be reduced and may be eliminated over time as impacted groundwater is redirected and/or intercepted with a barrier wall to minimize the spread of arsenic and molybdenum 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 FURTHER ACTION

As described in **Section 5.1**, Alternative 1 includes no further corrective action. Ongoing activities include post-closure monitoring of groundwater as described in Section 2.4 of the Post-Closure Plan for the CCR units at PCS issued in August 2018.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the impoundments by capping as completed in 2018 is expected to address infiltration, which is a key contributor to groundwater impacts. In combination with the closure activities completed to date, Alternative 1 is capable of and expected to attain the GPS for arsenic and molybdenum.
  - 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, which was incorporated into the requirements of 40 CFR 257.102(d). A deed notation is in place for closure with CCR left in place, which is a reliable means of communicating the onsite conditions.
  - 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. The time required to attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 5 and 10 years after closure construction is complete. Alternative 1 can provide full protection within the 30-year post-closure monitoring period.
- **Institutional Requirements.** IPL must maintain the IDNR Closure Permit. The current IDNR Closure Permit expires in 2047. As discussed in **Section 5.1**, this alternative will not be selected as a remedy as it does not meet all of the requirements and objectives of a remedy defined in 40 CFR 257.97.

6.2 ALTERNATIVE 2 – MNA

As described in **Section 5.2**, Alternative 2 includes no further corrective action. Ongoing post-closure monitoring of groundwater will be supplemented with MNA.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Ceasing wastewater discharges and closing the impoundments by capping as completed in 2018 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. In combination with the closure activities completed to date, Alternative 2 is capable of and expected to attain the GPS for arsenic and molybdenum if active MNA processes can be identified.
  - 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, which was incorporated into the requirements of 40 CFR 257.102(d). A deed notation is in place for closure with CCR left in place, which is a reliable means of communicating the on-site conditions.

- Implementation – Implementing MNA requires additional study to understand the site-specific attenuation processes that are influencing groundwater quality.

- Impacts – No additional safety or cross-media impacts are expected with Alternative 2. The potential for exposure to residual contamination is low since residual CCR is capped.

- **Timing.** The attenuation study could be initiated shortly after selection of this alternative. The time required to attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 5 and 10 years after closure construction is complete. Alternative 2 can provide full protection within the 30-year post-closure monitoring period.

- **Institutional Requirements.** IPL must maintain the IDNR Closure Permit. The current IDNR Closure Permit expires in 2047. As discussed in **Section 5.2**, this alternative may not meet all of the requirements and objectives of a remedy defined in 40 CFR 257.97 if CCR is in contact with groundwater.

6.3 ALTERNATIVE 3 – COVER UPGRADE WITH MNA

As described in **Section 5.3**, Alternative 3 includes an upgrade to the existing cover that was constructed over the closure area in 2018 in accordance with the criteria set forth in in 40 CFR 257.102(d).

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Enhancing the existing cap may further limit post-construction infiltration through the cap, 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. In combination with the closure activities completed to date, Alternative 3 is capable of and expected to attain the GPS for arsenic and molybdenum if active MNA processes can be identified.

  - Reliability – The expected reliability of an enhanced cap is good. The potential cap enhancements described in **Section 5.3** are in common use for closure in place for remediation and solid waste management. There is significant industry experience with the design and construction of this method, which was incorporated into the requirements of 40 CFR 257.102(d). A deed notation is in place for closure with CCR left in place, which is a reliable means of communicating the onsite conditions.

  - Implementation – The complexity of constructing the cap is low. The logistics of designing and installing a cap upgrade increases the complexity of the alternative due to the limited space available at the facility. Additional thickness to the cap is limited by the presence of overhead transmission lines, and associated the risk to infrastructure and personnel safety. The local availability of cap upgrade 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 the resources needed to install an upgrade that involves geosynthetic components.

- 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 upgrade the cap may represent some increase in safety risk due to site conditions and incoming/outgoing construction traffic. Cross-media impacts are not expected because it is unlikely that CCR must be exposed to upgrade the cap. The potential for exposure to residual contamination is low since CCR will remain capped.

- **Timing.** An upgrade to the existing cap can be completed within 1 year of remedy selection and issuance of required permits. The time required to attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 5 and 10 years after closure construction is complete. The cap upgrade may decrease the time to reach GPS due to reduced cover permeability. Alternative 3 can provide full protection within the 30 year post-closure monitoring period.

- **Institutional Requirements.** An amendment to the IDNR Closure Permit is likely required to implement Alternative 3.

6.4 ALTERNATIVE 4 – GRADIENT CONTROL WITH MNA

As described in **Section 5.4**, Alternative 4 includes the installation of gradient control measures to cease completion of any confirmed exposure pathways, and limit the spread of groundwater impacts.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Gradient control measures can prevent the completion of an exposure pathway for groundwater containing arsenic or molybdenum concentrations above the GPS. 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. Phytotechnology for gradient control may further reduce the potential for down-gradient migration of groundwater impacts after closure. The risk to surface water receptors is unknown, the potential for CCR to interact with groundwater remains although CCR was capped during closure. Alternative 4 further reduces the risk of potential ongoing groundwater impacts from that interaction between CCR and water. Phytotechnology offers additional flexibility to address changes in groundwater conditions or prevent cross-media impacts between groundwater and surface water. In combination with the closure activities completed to date, Alternative 4 is capable of and expected to attain the GPS for arsenic and molybdenum if active MNA processes can be identified.

  - Reliability – Depending on the method selected, the reliability of gradient control is good. There is significant industry experience with some gradient control methods used in groundwater remediation. The expected reliability of phytotechnology and is good. Phytotechnology is a more recent and proven method to limit the migration of impacted groundwater or remove impacted groundwater to restore groundwater concentrations to levels below the GPS.

  - A deed notation is in place for closure with CCR left in place, which is a reliable means of communicating the on-site conditions.

- Implementation – The complexity of constructing a gradient control system is moderate. There is a high degree of logistic complexity due to the presence of a high-traffic rail corridor adjacent to the Closure Area and off-site property owner access. The materials, equipment, and personnel required to implement Alternative 4 may vary based on the method of gradient control selected. The development, operation, maintenance and monitoring of adequate treatment for large volumes of groundwater with relatively low concentrations of molybdenum and arsenic likely increases the complexity of implementing this alternative. There is no on-site capacity to treat gradient control system discharge. If required, on-site capacity will need to be developed. Off-site ability/willingness to accept discharge is currently unknown. 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.

- Impacts – No additional safety or cross-media impacts are expected with Alternative 4. The potential for exposure to residual contamination is low since residual CCR is capped.

- **Timing.** Gradient control may be completed within 1 to 3 years of remedy selection and issuance of required permits, depending on the method of gradient control used and treatment/discharge requirements. The time required to initiate this alternative and attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 5 and 10 years once implemented. Gradient control may decrease the time to reach GPS due to groundwater removal. 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.
  - Downgradient property owner access agreements.
  - Federal, state, and local floodplain permits.
  - Receiving treatment facility approval or agency approval to construct the necessary treatment facility.
  - State and local well installation permits.
  - National Pollutant Discharge Elimination System (NPDES) permitting for post-treatment groundwater discharges.
  - State and local construction permits.
  - State and local erosion control/construction storm water management permits.

  State and local erosion control/construction storm water management permits may also be required depending on the level of disturbance required to implement the alternative.

6.5 ALTERNATIVE 5 – EXCAVATE AND DISPOSE OFF-SITE WITH MNA

As described in **Section 5.5**, Alternative 5 includes removal of the existing final cover, excavation of all CCR within the closure area, and transporting CCR off site for disposal.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance –Removing and re-disposing CCR offsite will eliminate the source material. The off-site disposal of CCR prevents further releases at PCS, 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 and molybdenum if active MNA processes can be identified.

  - Reliability – The expected reliability of excavation and off-site disposal is good. Off-site disposal facilities are required to meet the requirements in 40 CFR 257.70 or other similar requirements, and 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 low. The scale of CCR excavation, off-site transportation, and the permitting/development of off-site disposal facility airspace makes this alternative logistically complex. Significant dewatering may be required to excavate CCR if water table conditions in contact with CCR. Conditioning (e.g., drying) of excavated CCR is expected to facilitate off-site transportation and 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. Although the source area at PCS is 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.

  - 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 removed; however, the off-site potential for exposure to CCR is increased due to the relocation of the source material.

- **Timing.** Removal of CCR from the existing closure area can likely be completed within 1 to 2 years of remedy selection. 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 and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 5 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 CCR from PCS 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:
  - An amendment to the IDNR Closure Permit is likely required to implement this Alternative.
  - Depending on the off-site disposal facility, approval of off-site disposal facility owner or landfill permit for new off-site facility.
  - State and local erosion control/construction storm water management and dewatering permits.
  - Transportation agreements and permits (local roads and railroads).

  Depending on the off-site disposal facility, state solid waste comprehensive planning approvals may also be required.

6.6 ALTERNATIVE 6 – IN-SITU TREATMENT WITH CHEMICAL AMENDMENT

As described in **Section 5.6**, Alternative 6 includes adding a chemical amendment, in-situ to the area surrounding the closed CCR unit to reduce the mobilization of arsenic and molybdenum.

- **Performance, Reliability, Implementation, and Impacts.**
  - Performance – Alternative 6 further reduces the potential for ongoing groundwater impacts from that interaction between CCR and water. Application of the chemical amendment is intended to address changes in groundwater conditions. The application of a chemical amendment would be completed outside of the capped area to maintain the integrity of the cap. Alternative 6 is capable of and expected to attain the GPS for arsenic and molybdenum.

  - Reliability – 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 complexity of in-situ chemical amendment is moderate. The equipment and personnel required to implement in-situ chemical amendment application are specialized and may be in high demand. 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. In situ chemical stabilization for arsenic and molybdenum of the several feet of CCR that may still be in contact with shallow groundwater flow may is challenging given the 30-foot thickness of CCR and the presence of the low-permeability soil cap.

– Impacts – Safety impacts associated with the implementation of Alternative 6 are not significantly different than other construction projects. Although the risk to surface water receptors is unknown 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 because the CCR is capped, and groundwater impacts will be chemically stabilized.

- **Timing.** In-situ treatment with chemical amendment may be completed within 1 to 3 years of remedy selection and issuance of required permits, depending on the method of in-situ treatment used the requirements. The time required to initiate this alternative and attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 3 and 5 years once implemented. In-situ treatment may decrease the time to reach GPS based on chemical amendment efficacy. Alternative 6 is anticipated to 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:
  – Federal, state, and local floodplain permits.
  – Injection permits.
  – State and local erosion control/construction storm water management permits.
  – Federal and state wetland permitting may also be required.

6.7 ALTERNATIVE 7 – GROUNDWATER COLLECTION AND TREATMENT

As described in **Section 5.7**, Alternative 7 includes installing a groundwater collection and treatment system to prevent the migration of and/or recover groundwater with arsenic and molybdenum concentrations greater than the GPS.

- **Performance, Reliability, Implementation, and Impacts.**
  – Performance – Groundwater collection can prevent the completion of an exposure pathway for groundwater containing arsenic and molybdenum concentrations above the GPS. A 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 to interact with groundwater will 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 and molybdenum.

  – Reliability – The expected reliability of groundwater pump and treat 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. 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 complexity of the groundwater pump and treat system is low. Alternative 7 can likely be achieved through standard dewatering and conditioning methods. The development, operation, maintenance and monitoring of adequate treatment for large volumes of groundwater with relatively low concentrations of arsenic and molybdenum likely increases the complexity of implementing this alternative. There is limited on-site capacity to treat groundwater collection system discharge. If required, on-site capacity will need to be developed. Off-site ability/willingness to accept discharge is currently unknown.

– Impacts – The active nature of a groundwater plume containment provided by pumping may offer further reduction of risks if groundwater conditions change. 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.** Groundwater pump and treat may be completed within 1 to 3 years of remedy selection and issuance of required permits, and treatment/discharge requirements. The time required to attain the GPS for arsenic and molybdenum will be evaluated further during the remedy selection process, but is expected to take between 3 and 5 years after closure construction is complete. 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. 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:
  – 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 storm water management permits.
  – Federal and state wetland permitting may also be required.

6.8 ALTERNATIVE 8 – GROUNDWATER MANAGEMENT WITH BARRIER WALL

As described in **Section 5.8**, Alternative 8 includes installing a barrier wall to minimize the contact between groundwater and CCR in the closure area and prevent the migration of groundwater with arsenic and molybdenum concentrations greater than the GPS.

- **Performance, Reliability, Implementation, and Impacts.**
  – Performance – 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 to interact with groundwater will remain although CCR was capped during closure. Alternative 8 further reduces the risk of potential ongoing groundwater impacts by reducing the interaction between CCR and water. Although it acts passively, the barrier wall reduces the risk of groundwater exposure

to CCR by reducing contact. Alternative 8 is capable of and expected to attain the GPS for arsenic and molybdenum.

– Reliability – A barrier wall at PCS may consist of an impermeable wall or a permeable reactive barrier (PRB). The purpose of the impermeable barrier is to reduce contact of groundwater with CCR while the PRB treats affected groundwater as is passes through the wall. Additional information about the effectiveness of this alternative will be better understood after collection of additional data from new monitoring wells. An assessment of this alternative will also require additional information about the geology at the location of a potential impermeable barrier wall. 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 PCS 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 space available for a barrier wall may be a limiting factor at PCS. The equipment and personnel required to install a barrier wall is also specialized and may be in high demand. Highly specialized and experienced contractors are required to achieve proper installation. Dewatering may also be required for excavation and placement of a PRB wall. Success with this remedy relies on the presence of a suitable low-permeable soil layer to key an impermeable barrier into. A PRB relies on continued hydraulic conductivity of the barrier. Breaches or short-circuiting can develop and must be monitored. The groundwater flow rate may require a relatively thick PRB in order to establish long enough residence times for reduction and sequestration reactions to occur.

– Impacts – Safety impacts associated with the implementation of Alternative 8 are not significantly different than other heavy civil construction projects. Although the risk to surface water receptors is unknown 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 because CCR is within the closed CCR unit.

- **Timing.** The time required to design and install the barrier wall is estimated to be approximately 2 to 3 years. Alternative 8 is anticipated to 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:

– Federal, state, and local floodplain permits.
– State and local well installation permits.
– State and local erosion control/construction storm water management permits.
– Federal and state wetland permitting may also be required.

7.0 SUMMARY OF ASSESSMENT

Each of the identified corrective measure alternatives exhibit 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

Federal Remediation Technologies Roundtable (FRTR), 2020, Technology Screening Matrix https://frtr.gov/matrix/default.cfm, Accessed April 30, 2021.

United States Environmental Protection Agency (USEPA), 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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USEPA, 2018, Federal Register Volume 83, Number 146, p. 36443-36445, Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One), July 30, 2018.

Tables

Table 1. Groundwater Elevation Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

	Ground Water Elevation in feet above mean sea level (amsl)													
Well Number	**MW-301**	**MW-302**	**MW-303**	**MW-304**	**MW-305**	**MW-306**	**MW-307**	**MW-308**	**MW-309**	**MW-310**	**MW-301A**	**MW-306A**	**MW-309A**	**MW-310A**
Top of Casing Elevation (feet amsl)	732.55	722.27	709.46	709.66	709.61	712.54	721.16	719.67	711.80	711.93	732.07	711.50	710.54	710.68
Screen Length (ft)	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0
Total Depth (ft from top of casing)	25.10	16.98	17.01	17.09	17.00	31.91	23.27	23.21	15.00	15.00	56.15	61.85	47.31	47.47
Top of Well Screen Elevation (ft)	717.45	715.29	702.45	702.57	702.61	685.63	707.89	706.46	703.11	703.09	680.92	654.65	668.23	668.21
Measurement Date														
December 20, 2016	716.05	715.39	703.36	703.42	703.46	703.32	NI	NI	NI	NI	NI	NI	NI	NI
January 23, 2017	716.05	715.77	704.64	704.56	704.59	704.49	NI	NI	NI	NI	NI	NI	NI	NI
February 23, 2017	715.87	715.55	704.46	704.65	704.67	704.59	NI	NI	NI	NI	NI	NI	NI	NI
March 28, 2017	715.80	715.45	703.81	703.99	704.09	703.99	NI	NI	NI	NI	NI	NI	NI	NI
April 27, 2017	716.70	716.07	705.07	705.08	705.04	704.98	NI	NI	NI	NI	NI	NI	NI	NI
May 25, 2017	717.08	716.27	705.37	705.37	705.29	705.34	NI	NI	NI	NI	NI	NI	NI	NI
June 28, 2017	716.10	715.22	703.96	704.16	704.11	703.94	NI	NI	NI	NI	NI	NI	NI	NI
August 17, 2017	715.35	714.47	702.83	702.96	702.91	702.74	NI	NI	NI	NI	NI	NI	NI	NI
October 17, 2017	714.36	713.92	702.95	703.17	703.21	703.16	NI	NI	NI	NI	NI	NI	NI	NI
May 8, 2018	713.95	713.53	705.36	705.54	705.61	705.51	NI	NI	NI	NI	NI	NI	NI	NI
August 6, 2018	714.30	713.83	702.64	702.62	702.56	702.68	NI	NI	NI	NI	NI	NI	NI	NI
October 9, 2018	715.74	716.72	707.86	707.81	707.73	707.88	NI	NI	NI	NI	NI	NI	NI	NI
March 11, 2019	NM	NM	NM	704.24	704.05	NM	NM	NM	NI	NI	NI	NI	NI	NI
April 22-23, 2019	716.44	715.69	703.83	703.93	703.93	704.23	709.86	706.19	NI	NI	NI	NI	NI	NI
October 28-29, 2019	715.86	715.27	704.10	704.15	704.17	704.40	708.57	706.31	703.84	703.71	NI	NI	NI	NI
January 9, 2020	NM	NM	NM	NM	NM	NM	NM	NM	703.10	702.81	NI	NI	NI	NI
April 27, 2020	715.80	715.17	703.10	702.84	703.02	703.35	NM	NM	702.84	702.53	NI	NI	NI	NI
May 27, 2020	NM	NM	NM	NM	NM	NM	708.14	705.64	NM	NM	NI	NI	NI	NI
September 14, 2020	715.30	715.16	703.70	703.74	703.74	703.84	708.75	706.13	703.28	702.83	694.12	704.03	703.63	703.43
October 19-21, 2020	714.77	713.75	702.16	702.13	702.02	702.26	706.56	703.87	701.97	701.78	704.32	702.43	702.17	702.00
Bottom of Well Elevation (ft)	707.45	705.29	692.45	692.57	692.61	680.63	697.89	696.46	693.11	693.09	675.92	649.65	663.23	663.21

Notes:
NI = Not Installed
NM = Not Measured

Created by: RM — Date: 12/10/2020
Last rev. by: RM — Date: 4/26/2021
Checked by: NDK — Date: 4/30/2021
Proj Mgr/Scient QA/QC: TK — Date: 5/4/2021

Table 2. CCR Rule Groundwater Samples Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Sample Dates	Background Wells			Compliance Wells				Delineation Well	Compliance Wells		Delineation Wells			
	MW-301	MW-301A	MW-302	MW-303	MW-304	MW-305	MW-306	MW-306A	MW-307	MW-308	MW-309	MW-309A	MW-310	MW-310A
12/20-21/2016	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
1/23-24/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
2/23/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
3/28/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
4/26-27/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
5/25/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
6/28/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
8/17/2017	B	NI	B	B	B	B	B	NI	NI	NI	NI	NI	NI	NI
10/17/2017	D	NI	D	D	D	D	D	NI	NI	NI	NI	NI	NI	NI
5/8/2018	A	NI	A	A	A	A	A	NI	NI	NI	NI	NI	NI	NI
8/6/2018	A	NI	A	A	A	A	A	NI	NI	NI	NI	NI	NI	NI
10/9/2018	A	NI	A	A	A	A	A	NI	NI	NI	NI	NI	NI	NI
3/11/2019	--	NI	--	--	R	R	--	NI	--	--	NI	NI	NI	NI
4/22-23/2019	A	NI	A	A	A	A	A	NI	A	A	NI	NI	NI	NI
10/28-29/2019	A	NI	A	A	A	A	A	NI	A	A	A	NI	A	NI
1/9/2020	--	NI	--	--	--	--	--	NI	--	--	A	NI	A	NI
4/27/2020	A	NI	A	A	A	A	A	NI	--	--	A	NI	A	NI
5/27/2020	--	NI	--	--	--	--	--	NI	A	A	--	NI	--	NI
9/15/2020	--	A	--	--	--	--	--	A	--	--	--	A	--	A
10/19-21/2020	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Total Samples	16	2	16	16	17	17	16	2	4	4	4	2	4	2

Abbreviations:
A = Assessment Monitoring Program
B = Background Sample
NI = Not Installed
-- = Not Sampled
D = Detection Monitoring Program
R = Resample Event
NM= Not Measured

Notes:
MW-307 and MW-308 installed in November 2018.
MW-309 and MW-310 installed in August 2019.
MW-301A, MW-306A, MW-309A, and MW-310A installed in June and July 2020.

Created by: NDK Date: 1/4/2018
Last revision by: NDK Date: 5/5/2021
Checked by: MDB Date: 5/5/2021

Table 3. Groundwater Analytical Results Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Parameter Name	UPL		Background Wells																	
			MW-301								MW-301A**		MW-302							
			10/17/2017	5/8/2018	8/6/2018	10/9/2018	4/22/2019	10/28/2019	4/27/2020	10/19/2020	9/15/2020	10/21/2020	10/17/2017	5/8/2018	8/6/2018	10/9/2018	4/22/2019	10/28/2019	4/27/2020	10/19/2020
Appendix III																				
Boron, ug/L	67		26.8 J	22.8 J	30.9 J	30.6 J	<110 F1	<110	<73	<80	<80	<80	36.5 J	22.4	38.1 J	65.0 J	<110	<110	<73	<80
Calcium, mg/L	148		139	155	154	163	130	160	140	150	72	76.0	109	125	106	63.3	67	81	86	110
Chloride, mg/L	36.7		33.6	51.4	57.4	62	43	46	40	67 F1	4.1 J,B	2.6 J	36.4	69.4	33.6	20.2	19	23	28	49
Fluoride, mg/L	0.23	**UPL only**	0.17 J	0.20 J	0.16 J	0.22	<0.23	<0.23	<0.23	<0.23 F2	<0.23	<0.23	0.19 J	0.23	0.17 J	0.21	<0.23	<0.23	<0.23	<0.23
Field pH, Std. Units	8		7.46	7.51	6.81	7.63	6.99	6.69	7.09	6.89	7.50	6.85	7.71	6.98	6.55	6.50	6.64	6.37	6.27	6.67
Sulfate, mg/L	108		95.5	117	113	131	100	110	110	98 F1	6.4	7.8	82.9	69.6	72.2	55.1	56	72	66	78
Total Dissolved Solids, mg/L	642		621	784	747	743	610	680 B	640	660	440	310	505	718 D6	503	314	320	420 B	400	480
Appendix IV	**UPL**	**GPS**																		
Antimony, ug/L	0.48	6	--	0.041 J	<0.15	<0.078	<0.53	<0.53	<0.58	<0.51	<0.51	<0.51	--	0.048 J	0.17 J, B	0.092 J	<0.53	<0.53	<0.58	<0.51
Arsenic, ug/L	3.57	10	--	0.54 J	1.1 B	0.67 J	<0.75	<0.75	<0.88	<0.88	3.7	1.9 J	--	0.79 J	9.0	4.5	2.1	7.0	4.4	2.0
Barium, ug/L	332	2000	--	282	281 M1	261	230	270	260	270	290	190	--	213	254	141	130	220	210	200
Beryllium, ug/L	0.16	4	--	<0.012	--	<0.089	<0.27	<0.27	<0.27	<0.27	0.98 J	<0.27	--	<0.012	--	<0.089	<0.27	<0.27	<0.27	<0.27
Cadmium, ug/L	0.12	5	--	0.069 J	0.096 J, B	0.075 J	<0.077	0.064 J	0.066 J	0.073 J	0.49	0.054 J	--	0.041 J	0.084 J, B	<0.033	<0.077	0.053 J	0.098 J	0.062 J
Chromium, ug/L	13.5	100	--	4.1	5.8	5.2	3.6 J	5.4	4.7 J	4.9 J	5.1	1.1 J	--	1.2 B	4.4	0.78 J	<0.98	2.1 J	2.8 J	2.2 J
Cobalt, ug/L	4.7	6	--	0.028 J	0.52 J, B	0.084 J	0.12 J	0.12 J	0.23 J	<0.091	9.4	2.0	--	3.2	1.6 B	3.2	2.1	1.2	0.56	0.33 J
Fluoride, mg/L	0.23	4	--	0.20 J	0.16 J	0.22	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	--	0.23	0.17 J	0.21	<0.23	<0.23	<0.23	<0.23
Lead, ug/L	0.56	15	--	<0.033	0.66 J, B	0.17 J	<0.27	<0.27	0.27 J	<0.11	5.6	1.0	--	0.035 J	1.2 B	0.13 J	<0.27	<0.27	<0.27	<0.11
Lithium, ug/L	19.6	40	--	13.6	5.4 J	13.3	8.5 J	12.0	11	15	4.2 J	4.1 J	--	5.4 J	<4.6	4.6 J	4.7 J	5.3 J	3.8 J	8.2 J
Mercury, ug/L	DQ	2	--	<0.090	--	<0.090	<0.10	<0.10	<0.10	--	<0.10	--	--	<0.090	--	<0.090	<0.10	<0.10	<0.10	--
Molybdenum, ug/L	0.73	100	--	0.35 J	0.44 J, B	<0.57	<1.1	<1.1	<1.1	<1.1	2.1	3.1	--	0.99 J	0.78 J, B	0.67 J	<1.1	<1.1	<1.1	<1.1
Selenium, ug/L	1.47	50	--	1.3	1.3 B	0.95 J	1.1 J	1.7 J	<1.0	--	<1.0	--	--	0.54 J	1.4 B	0.37 J	<1.0	1.1 J	<1.0	--
Thallium, ug/L	0.47	2	--	<0.036	--	<0.099	<0.27	<0.27	<0.26	--	<0.26	--	--	0.039 J	--	<0.099	<0.27	<0.27	<0.26	--
Radium 226/228 Combined, pCI/L	2.37	5	--	1.00	1.07	1.09	0.596	0.708	0.477	0.975	8.30	1.47	--	0.699	3.61	1.09	0.0742	0.562	0.392	1.22
Additional Parameters Monitored for Selection of Remedy																				
Arsenic - dissolved, ug/L	UPL or GPS not applicable		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt - dissolved,# ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium - dissolved,# ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved,# ug/L			--	--	--	--	--	--	--	<50	--	97 J	--	--	--	--	--	--	--	430
Iron, ug/L			--	--	--	--	--	--	--	73 J	--	1,000	--	--	--	--	--	--	--	2,200
Magnesium ug/L			--	--	--	--	--	--	--	44,000	--	23,000	--	--	--	--	--	--	--	33,000
Manganese, dissolved,#			--	--	--	--	--	--	--	<4.0	--	690	--	--	--	--	--	--	--	77
Manganese, ug/L			--	--	--	--	--	--	--	<4.0	--	700	--	--	--	--	--	--	--	89
Molybdenum dissolved, ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium, ug/L			--	--	--	--	--	--	--	930	--	2,100	--	--	--	--	--	--	--	640
Sodium, ug/L			--	--	--	--	--	--	--	14,000	--	14,000	--	--	--	--	--	--	--	16,000
Total Alkalinity, mg/L			--	--	--	--	--	--	--	470	--	330	--	--	--	--	--	--	--	310

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL and the LOQ
30.8	Yellow highlighted cell indicate the compliance well results exceeds the GPS and the LOQ
25	Grayscale indicates Additional Parameters sampled for seleciton of remedy and evaluation of MNA.

See Page 5 for notes and abbreviations.

I:\25220084.00\Deliverables\PCS ACM Addendum\Tables\[3_CCR GW Screening Summary_PCS.xlsx]Notes and Abbreviations

Table 3. Groundwater Analytical Results Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

			Compliance Wells																
Parameter Name	**UPL**		**MW-303**								**MW-304**								
			10/17/2017	5/8/2018	8/6/2018	10/9/2018	4/22/2019	10/29/2019	4/27/2020	10/20/2020	10/17/2017	5/8/2018	8/6/2018	10/9/2018	3/11/2019	4/22/2019	10/29/2019	4/27/2020	10/20/2020
Appendix III																			
Boron, ug/L	67	**UPL only**	598	772	753	932	800	940	790	1,300	386	384	841	661	--	770	610	770	860
Calcium, mg/L	148		59.9	102	85.4	99.9	130	120	110	110	49.3	73.5	93	89.0	--	130	96	110	98
Chloride, mg/L	36.7		19.9	26.1	20.2	23.9	33	20	18	13.0	23.4	24.6	36.6	33.6	--	27	20	15	12
Fluoride, mg/L	0.23		0.80	0.5	0.60	0.71	0.35 J	0.51	0.69	0.67	0.78	0.58	0.55	0.61	--	0.41 J	0.51	0.67	0.56
Field pH, Std. Units	8		7.94	7.23	7.20	7.13	7.31	7.12	6.78	7.08	8.16	7.31	6.92	7.50	5.82	7.08	6.90	6.84	6.84
Sulfate, mg/L	108		60	146	83.3	74.7	88	95	120	130	55.1	77.3	193	167	--	140	110	110	110
Total Dissolved Solids, mg/L	642		329	580	475	515	650	580	630	580	298	423	630	541	--	680	490	590	500
Appendix IV	**UPL**	**GPS**																	
Antimony, ug/L	0.48	6	--	0.61 J	1.1 B	0.72 J	<0.53	<0.53	<0.58	<0.51	--	1.3	1.3 B	1.4	--	1.2	1.5	1.0	1.0
Arsenic, ug/L	3.57	10	--	26.9	35.1	44.5	26	52	48	56	--	15.0	12.3	14.4	12.9	11	14	11	14
Barium, ug/L	332	2000	--	87.5	82.7	94.3	150	120	130	120	--	95	121	110	--	140	110	120	110
Beryllium, ug/L	0.16	4	--	<0.012	--	<0.089	<0.27	<0.27	<0.27	<0.27	--	<0.012	--	<0.089	--	<0.27	<0.27	<0.27	<0.27
Cadmium, ug/L	0.12	5	--	<0.018	0.24 J, B	<0.033	<0.077	<0.039	0.066 J	<0.049	--	<0.018	<0.070	<0.033	--	<0.077	0.074 J	<0.039	<0.049
Chromium, ug/L	13.5	100	--	0.19 J, B	0.62 J, B	0.55 J	<0.98	<0.98	<1.1	<1.1	--	0.15 J, B	0.34 J, B	0.31 J	--	<0.98	<0.98	<1.1	<1.1
Cobalt, ug/L	4.7	6	--	0.31 J	0.66 J, B	0.43 J	1.3	0.87	1.1	0.43 J	--	0.57 J	1.1 B	0.75 J	--	1.4	1.2	1.1	1.1
Fluoride, mg/L	0.23	4	--	0.5	0.60	0.71	0.35 J	0.51	0.69	0.67	--	0.58	0.55	0.61	--	0.41 J	0.51	0.67	0.56
Lead, ug/L	0.56	15	--	0.078 J	0.48 J, B	0.31 J	0.30 J	0.43 J	1.7	0.18 J	--	0.045 J	0.24 J, B	<0.13	--	<0.27	0.27 J	<0.27	<0.11
Lithium, ug/L	19.6	40	--	19	15.4	19.9	17	17	14	21	--	10.8	6.9 J	13.4	--	17	13	11	17.0
Mercury, ug/L	DQ	2	--	<0.090	--	<0.090	<0.10	<0.10	<0.10	--	--	<0.090	--	<0.090	--	<0.10	<0.10	<0.10	--
Molybdenum, ug/L	0.73	100	--	23.1	20.7	21.7	12	20	8.4	17	--	19.8	25.4	27.6	--	23	31	26	28
Selenium, ug/L	1.47	50	--	0.24 J	0.46 J, B	0.21 J	<1.0	<1.0	<1.0	--	--	0.12 J	0.23 J, B	0.16 J	--	<1.0	<1.0	<1.0	--
Thallium, ug/L	0.47	2	--	<0.036	--	<0.099	<0.27	<0.27	<0.26	--	--	<0.036	--	<0.099	--	<0.27	<0.27	<0.26	--
Radium 226/228 Combined, pCi/L	2.37	5	--	1.26	0.847	1.08	0.632	0.393	1.41	0.560	--	1.26	0.768	1.31	--	0.628	0.274	0.707	0.958
Additional Parameters Monitored for Selection of Remedy																			
Arsenic - dissolved, ug/L	UPL or GPS not applicable		--	--	--	--	--	--	--	53	--	--	--	--	--	--	--	--	14
Cobalt - dissolved,[#] ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium - dissolved,[#] ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved,[#] ug/L			--	--	--	--	--	--	--	3,100	--	--	--	--	--	--	--	--	2,000
Iron, ug/L			--	--	--	--	--	--	--	3,400	--	--	--	--	--	--	--	--	2,000
Magnesium ug/L			--	--	--	--	--	--	--	35,000	--	--	--	--	--	--	--	--	29,000
Manganese, dissolved,[#]			--	--	--	--	--	--	--	1,400	--	--	--	--	--	--	--	--	1,200
Manganese, ug/L			--	--	--	--	--	--	--	1,400	--	--	--	--	--	--	--	--	1,200
Molybdenum dissolved, ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium, ug/L			--	--	--	--	--	--	--	4,800	--	--	--	--	--	--	--	--	5,200
Sodium, ug/L			--	--	--	--	--	--	--	34,000	--	--	--	--	--	--	--	--	40,000
Total Alkalinity, mg/L			--	--	--	--	--	--	--	370	--	--	--	--	--	--	--	--	350

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL and the LOQ
30.8	Yellow highlighted cell indicate the compliance well results exceeds the GPS and the LOQ
25	Grayscale indicates Additional Parameters sampled for seleciton of remedy and evaluation of MNA.

See Page 5 for notes and abbreviations.

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Table 3. Groundwater Analytical Results Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Parameter Name	UPL		Compliance Wells																	Delineation Well	
			MW-305									MW-306								MW-306A	
			10/17/2017	5/8/2018	8/6/2018	10/9/2018	3/11/2019	4/22/2019	10/29/2019	4/27/2020	10/20/2020	10/17/2017	5/8/2018	8/6/2018	10/9/2018	4/22/2019	10/29/2019	4/27/2020	10/20/2020	9/15/2020	10/20/2020
Appendix III																					
Boron, ug/L	67	UPL only	462	437	589	634	--	790	890	1,000	1,300	2,910	2,930	2,770	2,890	3,000	2,400	2,800	2,800	2,100	2,400
Calcium, mg/L	148		51.4	61.0	71.1	82.7	--	94	130	120	130	48.1	56.2	58.7	65.1	59	61	54	54.0	150	150
Chloride, mg/L	36.7		18.6	18.9	18.9	18.3	--	17	18	16	15.0	28.7	28.6	28.9	30.3	25.0	23	22	19.0	63 B	65
Fluoride, mg/L	0.23		0.63	0.61	0.62	0.61	--	0.45 J	0.31 J	0.51	0.37 J	0.30	0.30	0.26	0.32	<0.23	<0.23	0.38 J	0.29 J	<0.23	<0.23
Field pH, Std. Units	8		8.08	7.65	7.12	7.05	6.92	7.12	6.89	6.82	7.07	8.45	7.47	7.45	7.40	7.58	7.63	6.94	7.66	7.87	7.29
Sulfate, mg/L	108		44	61.9	98.2	98.9	--	150	210	240	230	139	151	195	233	160	140	110	120	330	350
Total Dissolved Solids, mg/L	642		307	348	434	424	--	520	650	710	660	403	454	506	494	440	400	420	360	840	800
Appendix IV	**UPL**	**GPS**																			
Antimony, ug/L	0.48	6	--	1.6	1.6 B	1.1	--	0.92 J	1.0	0.74 J	0.79 J	--	<0.026	<0.15	<0.078	<0.53	<0.53	<0.58	<0.51	<0.51	0.64 J
Arsenic, ug/L	3.57	10	--	14.3	13.0	6.6	11.6	5.9	7.3	6.2	9.8	--	0.58 J	0.70 J, B	0.72 J	1.9 J	1.6 J	1.3 J	1.1 J	<0.88	<0.88
Barium, ug/L	332	2000	--	63.7	90.3	95.6	--	110	130	110	140	--	54.4	59.3	62.1	110	82	73	67	180	170
Beryllium, ug/L	0.16	4	--	<0.012	--	<0.089	--	<0.27	<0.27	<0.27	<0.27	--	<0.012	--	<0.089	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
Cadmium, ug/L	0.12	5	--	0.032 J	<0.070	0.040 J	--	0.081 J	0.053 J	0.072 J	<0.049	--	0.043 J	0.085 J, B	0.075 J	<0.077	0.095 J	0.090 J	0.10	0.073 J	<0.049
Chromium, ug/L	13.5	100	--	0.18 J, B	0.28 J, B	0.14 J	--	<0.98	<0.98	<1.1	<1.1	--	0.21 J, B	0.55 J, B	0.11 J	<0.98	<0.98	<1.1	<1.1	1.9 J	<1.1
Cobalt, ug/L	4.7	6	--	0.42 J	0.64 J, B	0.60 J	--	0.63	0.77	1.1	0.73	--	0.071 J	0.43 J, B	0.079 J	0.49 J	0.26 J	0.20 J	0.17 J	1.3	0.49 J
Fluoride, mg/L	0.23	4	--	0.61	0.62	0.61	--	0.45 J	0.31 J	0.51	0.37 J	--	0.30	0.26	0.32	<0.23	<0.23	0.38 J	0.29 J	<0.23	<0.23
Lead, ug/L	0.56	15	--	<0.033	0.42 J, B	<0.13	--	<0.27	0.56	<0.27	<0.11	--	0.075 J	1.0 B	<0.13	0.40 J	0.31 J	0.48 J	0.42 J	1.8	0.79
Lithium, ug/L	19.6	40	--	10.7	9.5 J	13.3	--	15	14	12	20	--	<4.6	<4.6	<4.6	3.0 J	<2.7	<2.3	<2.5	4.1 J	6.3 J
Mercury, ug/L	DQ	2	--	<0.090	--	<0.090	--	<0.10	<0.10	<0.10	--	--	<0.090	--	<0.090	<0.10	<0.10	<0.10	--	<0.10	--
Molybdenum, ug/L	0.73	100	--	27.9	29.0	32.0	--	26	32	38	58	--	271	234	235	200	230	250	260	8.6	13
Selenium, ug/L	1.47	50	--	0.22 J	0.24 J, B	0.23 J	--	<1.0	<1.0	<1.0	--	--	<0.086	<0.16	<0.085	<1.0	<1.0	<1.0	--	<1.0	--
Thallium, ug/L	0.47	2	--	<0.036	--	<0.099	--	<0.27	<0.27	<0.26	--	--	<0.036	--	<0.099	<0.27	<0.27	<0.26	--	<0.26	--
Radium 226/228 Combined, pCi/L	2.37	5	--	2.07	1.38	1.38	--	0.109	0.352	0.301	0.525	--	0.645	1.21	1.42	1.04	0.108	0.578	0.387	0.427	0.898
Additional Parameters Monitored for Selection of Remedy																					
Arsenic - dissolved, ug/L	UPL or GPS not applicable		--	--	--	--	--	--	--	--	8.0	--	--	--	--	--	--	--	--	--	--
Cobalt - dissolved,[#] ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium - dissolved,[#] ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved,[#] ug/L			--	--	--	--	--	--	--	--	180	--	--	--	--	--	--	--	1,500	--	1,700
Iron, ug/L			--	--	--	--	--	--	--	--	220	--	--	--	--	--	--	--	1,800	--	2,800
Magnesium ug/L			--	--	--	--	--	--	--	--	36,000	--	--	--	--	--	--	--	12,000	--	45,000
Manganese, dissolved,[#]			--	--	--	--	--	--	--	--	1,100	--	--	--	--	--	--	--	100	--	360
Manganese, ug/L			--	--	--	--	--	--	--	--	1,200	--	--	--	--	--	--	--	110	--	410
Molybdenum dissolved, ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	250	--	--
Potassium, ug/L			--	--	--	--	--	--	--	--	5,400	--	--	--	--	--	--	--	860	--	1,600
Sodium, ug/L			--	--	--	--	--	--	--	--	46,000	--	--	--	--	--	--	--	54,000	--	33,000
Total Alkalinity, mg/L			--	--	--	--	--	--	--	--	340	--	--	--	--	--	--	--	160	--	200

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL and the LOQ
30.8	Yellow highlighted cell indicate the compliance well results exceeds the GPS and the LOQ
25	Grayscale indicates Additional Parameters sampled for seleciton of remedy and evaluation of MNA.

See Page 5 for notes and abbreviations.

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Table 3. Groundwater Analytical Results Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Parameter Name	UPL		Compliance Wells								Delineation Wells											
			MW-307				MW-308				MW-309				MW-309A		MW-310				MW-310A	
			4/22/2019	10/28/2019	5/27/2020	10/19/2020	4/22/2019	10/28/2019	5/27/2020	10/19/2020	10/29/2019	1/9/2020	4/27/2020	10/21/2020	9/15/2020	10/21/2020	10/29/2019	1/9/2020	4/24/2020	10/21/2020	9/15/2020	10/21/2020
Appendix III																						
Boron, ug/L	67	UPL only	840	730	630	890	5,700	6,100	6,100	6,400	1,000	1,000	1,100	1,800	530	470	950	940	880	1,300	330	340
Calcium, mg/L	148		22	18	16	21.0	59	60	68	54	120	130	120	120	100	110	88	85	87	110	180	180
Chloride, mg/L	36.7		15	3.5 J	4.2 J	<2.0	15	13	11	8.4	18	17	16	13	23 B	24	20	19	20	20	46 B	48
Fluoride, mg/L	0.23		0.54	0.67	0.49 J	0.29 J	0.77	0.26 J	0.54	<0.23	0.68	0.51	0.75	0.61	<0.23	<0.23	0.53	0.61	0.93	<0.23	<0.23	<0.23
Field pH, Std. Units	8		10.05	9.58	8.28	9.26	9.24	9.2	7.86	9.23	7.33	6.95	7.09	7.22	7.26	7.33	7.3	7.33	7.41	7.20	7.25	7.24
Sulfate, mg/L	108		52	32	32	30.0	190	190	180	150	130	130	130	170	110	110	130	130	130	170	310	330
Total Dissolved Solids, mg/L	642		150	140 B	38	80.0	450	460 B	390	370	550	650	630	620	490	460	430	500	520	580	890	850
Appendix IV	**UPL**	**GPS**																				
Antimony, ug/L	0.48	6	0.92 J	1.2	0.83 J	1.0	1.4	1.7	0.7 J	1.40	<0.53	<0.53	<0.58	<0.51	<0.51	<0.51	<0.53	<0.53	<0.58	<0.51	<0.51	0.66 J
Arsenic, ug/L	3.57	10	3.8	7.4	6.1	6.7	45	63	58	50	140	110	75	89	<0.88	<0.88	31	28	23	36	<0.88	<0.88
Barium, ug/L	332	2000	30	34	26	45.0	39	38	38	53	130	130	130	130	170	170	130	140	140	160	210	210
Beryllium, ug/L	0.16	4	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
Cadmium, ug/L	0.12	5	<0.077	<0.039	<0.039	<0.049	<0.077	0.077 J	0.04 J	0.071 J	<0.039	<0.039	<0.039	<0.049	<0.049	<0.049	<0.039	<0.039	<0.039	<0.049	<0.049	<0.049
Chromium, ug/L	13.5	100	<0.98	<0.98	<1.1	<1.1	<0.98	<0.98	<1.1	<4.4	<0.98	<0.98	<1.1	<1.1	<1.1	<1.1	<0.98	<0.98	<1.1	<1.1	<1.1	<1.1
Cobalt, ug/L	4.7	6	0.091 J	<0.091	<0.091	<0.091	<0.091	<0.091	<0.091	<0.36	0.42 J	0.23 J	0.35 J	0.14 J	0.22 J	0.32 J	0.17 J	0.095 J	0.098 J	0.11 J	0.54	2.1
Fluoride, mg/L	0.23	4	0.54	0.67	0.49 J	0.29 J	0.77	0.26 J	0.54	<0.23	0.68	0.51	0.75	0.61	<0.23	<0.23	0.53	0.61	0.93	<0.23	<0.23	<0.23
Lead, ug/L	0.56	15	<0.27	<0.27	<0.27	<0.11	<0.27	<0.27	<0.27	<0.11	0.54	<0.27	<0.27	<0.11	<0.11	<0.11	<0.27	<0.27	<0.27	<0.11	<0.11	<0.11
Lithium, ug/L	19.6	40	10	15	8.3 J	16.0	29	31	35	47	15	15	13	19	4.1 J	5.9 J	15	14	11	18	3.2 J	5.3 J
Mercury, ug/L	DQ	2	<0.10	<0.10	<0.10	--	<0.10	<0.10	<0.10	--	<0.10	<0.10	<0.10	--	<0.10	--	<0.10	<0.10	<0.10	--	<0.10	--
Molybdenum, ug/L	0.73	100	5.8	5.2	7.0	5.2	58	58	64	58	19	18	19	21	8.5	7.1	60	59	55	71	20	21
Selenium, ug/L	1.47	50	<1.0	<1.0	<1.0	--	<1.0	2.2 J	<1.0	--	<1.0	<1.0	<1.0	--	<1.0	--	<1.0	<1.0	<1.0	--	<1.0	--
Thallium, ug/L	0.47	2	<0.27	<0.27	<0.26	--	<0.27	<0.27	<0.26	--	<0.27	<0.27	<0.26	--	<0.26	--	<0.27	<0.27	<0.26	--	<0.26	--
Radium 226/228 Combined, pCI/L	2.37	5	0.166	0.238	0.341	0.233	0.301	0.000	0.117	1.05	0.801	0.543	0.837	0.815	0.783	0.509	0.439	0.232	0.341	0.351	1.21	1.27
Additional Parameters Monitored for Selection of Remedy																						
Arsenic - dissolved, ug/L	UPL or GPS not applicable		--	--	--	--	--	--	--	44	--	--	--	78	--	--	--	--	--	32	--	--
Cobalt - dissolved,# ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium - dissolved,# ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, dissolved,# ug/L			--	--	--	<50	--	--	--	<50	--	--	--	1,200	--	7,600	--	--	--	4,100	--	6,100
Iron, ug/L			--	--	--	<50	--	--	--	<50	--	--	--	1,200	--	7,500	--	--	--	4,400	--	6,300
Magnesium ug/L			--	--	--	2,300	--	--	--	3,100	--	--	--	33,000	--	29,000	--	--	--	26,000	--	48,000
Manganese, dissolved,#			--	--	--	<4.0	--	--	--	52	--	--	--	980	--	710	--	--	--	960	--	490
Manganese, ug/L			--	--	--	<4.0	--	--	--	47	--	--	--	920	--	710	--	--	--	980	--	520
Molybdenum dissolved, ug/L			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium, ug/L			--	--	--	1,600	--	--	--	5,300	--	--	--	4,800	--	1,700	--	--	--	5,800	--	1,100
Sodium, ug/L			--	--	--	4,600	--	--	--	33,000	--	--	--	34,000	--	14,000	--	--	--	53,000	--	15,000
Total Alkalinity, mg/L			--	--	--	41	--	--	--	120	--	--	--	360	--	280	--	--	--	300	--	320

4.4	Blue highlighted cell indicates the compliance well result exceeds the UPL and the LOQ
30.8	Yellow highlighted cell indicate the compliance well results exceeds the GPS and the LOQ
25	Grayscale indicates Additional Parameters sampled for seleciton of remedy and evaluation of MNA.

See Page 5 for notes and abbreviations.

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Table 3. Groundwater Analytical Summary
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Abbreviations:

UPL = Upper Prediction Limit
NA = Not Analyzed
µg/L = micrograms per liter
mg/L = milligrams per liter

GPS = Groundwater Protection Standard
LOD = Limit of Detection
LOQ = Limit of Quantitation

DQ= Double Quantification
P = Parametric UPL with 1-of-2 retesting
NP = Nonparametric UPL with 1-of-2 retesting

Notes:

B1 = Compound was found in the blank and the sample.
B = Analyte was detected in the associated Method Blank.
M1 = Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
J = Estimated concentration at or above the LOD and below the LOQ.
J1 = Result is less than the reporting limit but greater than or equal to the MDL and the concentration is an approximate value.
F1 = MS and/or MSD recovery exceeds control limits
F2 = MS/MSD RPD exceeds control limits
* = UPL is below the LOQ for background sampling. For compliance wells, only results confirmed above the LOQ are evaluated as potential Statistically Significant Increases above background.
** = Piezometer located near background water table monitoring well but groundwater flow direction is not yet confirmed.

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying report text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (USEPA) Maximum Contamination Level (MCLs), if established; otherwise, the values from 40 CFR 257.95(h)(2).
3. Interwell UPLs calculated based on results from background wells MW-301 and MW-302.

Created by:	NDK	Date:	5/1/2018
Last revision by:	NDK	Date:	4/29/2021
Checked by:	MDB	Date:	5/4/2021
Proj Mgr QA/QC:	SCC	Date:	5/7/2021

Table 4. Groundwater Field Parameters
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Well	Sample Date	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)	Groundwater Elevation (feet)
MW-301	10/17/2017	12.6	7.46	2.40	949	191.0	124.2	714.36
	5/8/2018	10.50	7.51	38.30	1060	32.70	0.72	713.95
	8/6/2018	12.3	6.81	3.60	1105	237.0	17.05	714.30
	10/9/2018	14.9	7.63	4.03	1052	60.0	9.97	715.74
	4/22/2019	10.53	6.99	6.68	987	38.2	6.92	716.44
	10/28/2019	11.34	6.69	4.63	1036	-7.3	2.8	715.86
	4/27/2020	11.1	7.09	3.50	954	208.3	6.52	715.80
	10/19/2020	11.8	6.89	3.69	983	67.9	6.0	714.77
MW-301A	9/15/2020	16.0	7.50	7.77	470.5	131.6	284.7	694.12
	10/21/2020	11.6	6.85	1.77	551.4	-92.6	--	704.32
MW-302	10/17/2017	15.0	7.71	1.40	824	181.0	4.75	713.92
	5/8/2018	7.50	6.98	3.10	708.6	-10.90	1.75	713.53
	8/6/2018	16.0	6.55	1.70	786	61.0	8.95	713.83
	10/9/2018	16.7	6.50	0.50	515	-32.0	10.52	716.72
	4/22/2019	7.86	6.64	3.34	533	-0.2	90.3	715.69
	10/28/2019	13.74	6.37	1.80	587	-5.8	6.92	715.27
	4/27/2020	8.1	6.27	1.39	587.9	30.0	27.5	715.17
	10/19/2020	13.6	6.67	2.22	761	21.5	8.15	713.75
MW-303	10/17/2017	16.4	7.94	0.00	564	-85.0	3.58	702.95
	5/8/2018	9.50	7.23	1.70	836	-92.80	1.08	705.36
	8/6/2018	16.0	7.20	0.10	764	-126.0	4.99	702.64
	10/9/2018	17.4	7.13	0.20	881	-87.0	17.20	707.86
	4/22/2019	9.59	7.31	1.14	1084	-110.3	18.40	703.83
	10/29/2019	14.47	7.12	0.35	981	-139.1	3.02	704.10
	4/27/2020	9.3	6.78	0.14	922	-143.2	25.9	703.10
	10/20/2020	15.1	7.08	0.08	853	-147.8	0.80	702.16
MW-304	10/17/2017	20.6	8.16	0.00	532	-123.0	12.65	703.17
	5/8/2018	11.80	7.31	0.10	514	-151.0	3.98	705.54
	8/6/2018	18.1	6.92	0.20	934	-89.0	10.26	702.62
	10/9/2018	18.8	7.50	0.21	812	-18.1	9.07	707.81
	3/11/2019	8.8	5.82	0.86	537	-84.2	8.7	704.24
	4/22/2019	9.64	7.08	0.93	1125	-62.0	4.99	703.93
	10/29/2019	15.67	6.90	0.28	816	-74.3	2.96	704.15
	4/27/2020	10.1	6.84	0.14	841	-85.0	1.63	702.84
	10/20/2020	15.7	6.84	0.08	771	-99.3	0.02	702.13
MW-305	10/17/2017	19.9	8.08	0.00	537	-11.0	2.29	703.21
	5/8/2018	10.90	7.65	0.08	423.7	-31.90	0.65	705.61
	8/6/2018	18.5	7.12	0.19	679	-80.0	3.43	702.56
	10/9/2018	18.3	7.05	0.20	719	168.0	9.54	707.73
	3/11/2019	7.5	6.92	1.58	526	-78.9	3.6	704.05
	4/22-23/2019	9.48	7.12	1.10	810	4.7	4.58	703.93
	10/28-29/2019	15.87	6.89	0.30	980	-11.9	1.79	704.17
	4/27/2020	9.6	6.82	0.70	971	20.5	3.97	703.02
	10/20/2020	15.5	7.07	0.10	930	-86.4	0.02	702.02
MW-306	10/17/2017	14.7	8.45	0.80	636	-128.0	3.45	703.16
	5/8/2018	13.60	7.47	3.0	663	-94.0	0.62	705.51
	8/6/2018	16.4	7.45	1.40	731	-81.0	14.59	702.68
	10/9/2018	15.6	7.40	0.45	736	-41.1	1.74	707.88
	4/22/2019	12.87	7.58	0.99	703	-97.6	21.3	704.23
	10/29/2019	12.56	7.63	0.29	633	-145.7	8.16	704.40
	4/27/2020	13.2	6.94	0.18	539.7	-142.0	3.92	703.35
	10/20/2020	12.5	7.66	0.13	538.5	-199.7	19.93	702.26

Table 4. Groundwater Field Parameters
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

Well	Sample Date	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)	Groundwater Elevation (feet)
MW-306A	9/15/2020	14.1	7.87	0.13	1180	-100.3	118.1	704.03
	10/20/2020	12.7	7.29	0.13	1054	-139.7	20.8	702.43
MW-307	4/23/2019	11.72	10.05	1.54	225	-53.1	15.6	709.86
	10/28/2019	18.43	9.58	0.27	157	-29.9	2.16	708.57
	5/27/2020	12.6	8.28	0.19	243.5	109.8	2.98	708.14
	10/19/2020	18.7	9.26	0.09	145.2	-123.4	2.09	706.56
MW-308	4/23/2019	12.11	9.24	1.16	659	-62.5	2.13	706.19
	10/28/2019	15.05	9.19	0.43	618	-58.1	2.44	706.31
	5/27/2020	12.7	7.86	0.10	1008	-22.4	2.33	705.64
	10/19/2020	14.9	9.23	0.21	318.1	-178.0	1.08	703.87
MW-309	10/29/2019	18.60	7.33	7.45	931	-103.8	4.96	703.84
	1/9/2020	15.69	6.95	4.42	1016	-335.3	1.81	703.10
	4/27/2020	13.2	7.09	0.06	898	-117.7	4.21	702.84
	10/21/2020	18.8	7.22	0.10	955	-145.9	1.86	701.97
MW-309A	9/15/2020	16.1	7.26	0.14	815	-144.8	1.30	703.63
	10/21/2020	15.7	7.33	0.13	749	-181.6	1.46	702.17
MW-310	10/29/2019	16.48	7.30	7.59	801	-129.8	3.03	703.71
	1/9/2020	15.23	7.33	3.72	784	-342.4	3.30	702.81
	4/27/2020	12.9	7.41	0.09	734	-148.01	6.30	702.53
	10/21/2020	17.5	7.20	0.14	894	-162.5	3.72	701.78
MW-310A	9/15/2020	16.0	7.25	0.19	1304	-128.9	1.72	703.43
	10/21/2020	15.3	7.24	0.11	1168	-165.8	2.82	702.00

Created by: RM Date: 12/23/2020
Last revision by: RM Date: 4/26/2021
Checked by: JR Date: 4/28/2021

Table 5. Vertical Gradients
Prairie Creek Generating Station / SCS Engineers Project #25220084.00
2020

Vertical Hydraulic Gradients	MW-301/MW-301A		MW-306/MW-306A		MW-309/MW-309A		MW-310/MW-310A	
Shallow Well	MW-301		MW-306		MW-309		MW-310	
Screen midpoint(2) (feet amsl)	712.45		683.13		698.11		698.09	
Deep Well	MW-301A		MW-306A		MW-309A		MW-310A	
Screen midpoint (feet amsl)	678.42		652.15		665.73		665.71	
Measurement Date	**Distance Between Midpoints(2) (ft)**	**Vertical Gradient (ft/ft)**	**Distance Between Midpoints (ft)**	**Vertical Gradient (ft/ft)**	**Distance Between Midpoints(2) (ft)**	**Vertical Gradient (ft/ft)**	**Distance Between Midpoints(2) (ft)**	**Vertical Gradient (ft/ft)**
9/14/2020	33.0	-0.643	31.0	0.006	32.5	0.011	32.3	0.019
10/19-21/2020	32.7	-0.320	31.0	0.005	32.4	0.006	31.7	0.007

Notes:
1: A positive vertical gradient indicates upward groundwater flow. A negative gradient indicates downward flow.
2: The well screens at MW-301 and MW-310 were not fully submerged during the September and October 2020 sampling events. The well screen at MW-309 was not fully submerged during the October 2020 sampling event. In these cases, the effective screen midpoint is calculated at the midpoint between the water table elevation and screen bottom elevation, and this value is used to calculate Distance Between Midpoints.

Created by:	RM	Date:	1/18/2021
Last rev. by:	RM	Date:	1/20/2021
Checked by:	MDB	Date:	1/20/2021
Proj Mgr QA/QC:	TK	Date:	1/28/2021

Table 6. Preliminary Evaluation of Corrective Measure Alternatives Addendum No. 1
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

	Alternative #1 No Further Action	Alternative #2 Monitored Natural Attenuation (MNA)	Alternative #3 Cover Upgrade with MNA	Alternative #4 Gradient Control with MNA	Alternative #5 Excavate and Dispose in Offsite Landfill	Alternative #6 In-Situ Treatment with Chemical Amendment	Alternative #7 Groundwater Collection	Alternative #8 Groundwater Management with Barrier Wall
CORRECTIVE ACTION ASSESSMENT - 40 CFR 257.97(b)								
257.97(b)(1) Is remedy protective of human health and the environment?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
257.97(b)(2) Can the remedy attain the groundwater protection standard?	No	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)?	Yes	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	Existing risk not impacted by this alternative	Existing risk reduced by achieving GPS in the presence of activie MNA processes.	Same as Alternative #2	Same as Alternative #2	Similar to Alternative #2. Long-term risk will be reduced by source removal.	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 for additional releases Residual risk is limited for all alternatives due to limited extent of impacts and lack of receptors	Same as Alternative #1	Same as Alternative #1 with potential further reduction in release risk due to the reduced permeability of the final cover However, limited as no additional overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Same as Alternative #1	Same as Alternative #1 with further reduction in release risk due to removal of impounded CCR from site However, limited as no additional overall risk reduction is provided due to lack of current/anticipated future receptors for groundwater impacts	Potential reduction in release risk 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	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 #1 with increased monitoring for MNA parameters	Same as Alternative #1 with increased monitoring for MNA parameters	Same as Alternative #1 with increased monitoring for MNA parameters and monitoring, operation, and maintenance of the gradient control system and any discharge-related water treatment	No on-site long-term management required Limited on-site post-closure groundwater monitoring until GPSs are achieved Receiving disposal facility will have same/similar long-term monitoring, operation, and maintenance requirements as Alternative #1	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 Addendum No. 1
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

	Alternative #1 No Further Action	Alternative #2 Monitored Natural Attenuation (MNA)	Alternative #3 Cover Upgrade with MNA	Alternative #4 Gradient Control with MNA	Alternative #5 Excavate and Dispose in Offsite Landfill	Alternative #6 In-Situ Treatment with Chemical Amendment	Alternative #7 Groundwater Collection	Alternative #8 Groundwater Management 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	None	Increased risk over Alternative #1 due to general construction activities that are not anticipated to expose CCR	None	Increased risk to environment over Alternative #3 due to CCR excavation volumes (~148K cy) required for removal and off-site re-disposal	Similar to Alternative #2 with some increased potential risk due to exposure during the application of the chemical amendment.	Similar to Alternative #2 with some increased construction risk due to drilling, trenching, and excavation for groundwater pumping and treatment system construction.	Similar to Alternative #2 with some increased construction risk due to excavation or installation of the barrier wall.
Transportation	None	None	Increased risk over Alternative #1 from construction traffic due to final cover disturbance and import of cover upgrade materials	None	Highest level of community and environmental risk due to CCR volume export (~148K cy)	Similar to Alternative #2 with increased risk from importing chemical material for stabilization/treatment.	Similar to Alternative #2 with increased risk from importing groundwater pumping and treatment system materials.	Similar to Alternative #2 with increased risk from importing barrier wall system materials.
Re-Disposal	None	None	None	None	Increased risk to community and environment due to re-disposal of large CCR volume (~148K 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.	None	None
257.97(c)(1)(v) Time until full protection is achieved	To be evaluated further during remedy selection Closure and capping was completed in 2018 Groundwater protection timeframe to reach GPS potentially 5 to 10 years following closure construction, achievable within 30-year post-closure monitoring period	Similar to Alternative #1 with the potential for increased understanding of timeframe based on MNA monitoring results	Similar to Alternative #2 with some potential for decrease in time to reach GPS due to reduced cover permeability.	Similar to Alternative #2 with potential for decrease in time to reach GPS due to groundwater removal	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	Same as Alternative #1	Same as Alternative #1	Same as Alternative #1	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	Long-term reliability of existing 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 Deed notation in place for closure with CCR left in place	Long-term reliability of existing 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 Deed notation in place for closure with CCR left in place	Long-term reliability of enhanced 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 Deed notation in place for closure with CCR left in place	Similar to Alternatives 1 through 3 Depending on the gradient control method selected, the long-term reliability can be good There is significant industry experience with some potential gradient control methods used in remediation of groundwater impacts	Success of remedy at PCS 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 #2.	Same as Alternative #2. Remedy relies upon active equipment that will require additional operations and maintenance.	Same as Alternative #2. Remedy relies on continued hydraulic conductivity of the selected barrier. Breaches or short circuiting can develop and must be monitored.
257.97(c)(1)(viii) Potential need for replacement of the remedy	Limited potential need for replacement of original cap placed in 2018 if maintained.	Same as Alternative #1	Same as Alternative #1	Same as Alternative #1	No potential need for remedy replacement	Similar to Alternative #2, 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.
SOURCE CONTROL TO MITIGATE FUTURE RELEASES - 40 CFR 257.97(c)(2)								
257.97(c)(2)(i) The extent to which containment practices will reduce further releases	Cap installed in 2018 will reduce further releases by minimizing infiltration through CCR. However, some risk of future release remains if CCR is in contact with groundwater.	Similar to Alternative #1 with the potential for reduced risk from further releases if MNA mechanisms are active.	Same as Alternative #2 with possible reduction in further release risk due to lower cap permeability/ reduced infiltration through CCR	Same as Alternative #1	Removal of CCR prevents further releases at PCS Receiving disposal site risk similar to Alternative #3	Similar to Alternative #2 with further reduction due to lower mobility of contaminants in residual source material as a result of chemical amendment.	Similar to Alternative #2 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 #2 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 for source control	Alternative does not rely on treatment technologies for source control	Alternative does not rely on treatment technologies for source control	Alternative does not rely on treatment technologies for source control	Alternative does not rely on treatment technologies for source control	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.

Table 6. Preliminary Evaluation of Corrective Measure Alternatives Addendum No. 1
Prairie Creek Generating Station / SCS Engineers Project #25220084.00

	Alternative #1 No Further Action	Alternative #2 Monitored Natural Attenuation (MNA)	Alternative #3 Cover Upgrade with MNA	Alternative #4 Gradient Control with MNA	Alternative #5 Excavate and Dispose in Offsite Landfill	Alternative #6 In-Situ Treatment with Chemical Amendment	Alternative #7 Groundwater Collection	Alternative #8 Groundwater Management with Barrier Wall
IMPLEMENTATION - 40 CFR 257.97(c)(3)								
257.97(c)(3)(i) Degree of difficulty associated with constructing the technology	No construction involved	No construction involved	Low complexity construction Moderate degree of design and logistical complexity to complete cap upgrade	Moderate complexity construction High degree of logistical complexity due to off-site property owner access	Low complexity construction High degree of logistical complexity including the excavation and off-site transport of ~148K cy of CCR and permitting/development of off-site disposal facility airspace Moderate to high level of dewatering effort - dewatering required for excavation of full CCR volume	Moderate degree of logistical complexity; Moderate complexity construction due to the equipment required to apply the selected amendment; requirements to ensure consistent contact and dosing of amendment; Medium degree of logistical complexity involving the import of specialty chemicals.	Moderate degree of logistical complexity; Moderate complexity construction for the installation of extraction wells and conveyance to a site-specific groundwater treatment plant.	Moderate degree of logistical complexity; 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	Not Applicable	High reliability based on historic use of capping as corrective measure	Operational reliability depends on method of gradient control required/selected, the level of extracted groundwater treatment required, and the location of groundwater treatment Overall expected reliability is good based on industry experience	Success at PCS does not rely on operational reliability of technologies Overall success relies on off-site disposal facility, which is likely same/similar to Alternative #3	Similar to Alternative #2; however, success at PCS 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 a low permeable layer to key an impermeable barrier wall into, continued hydraulic conductivity of the selected barrier if PRB. 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	No further approvals or permits required	Same as Alternative #1	Need is low in comparison to other alternatives State Closure Permit amendment likely required	Need is high in comparison to other alternatives State Closure Permit amendment likely required Approval of downgradient site owner required Approval of facility receiving gradient control discharge for treatment required, or agency approval to construct the necessary treatment facility is required	Need is highest in comparison to other alternatives State Closure Permit amendment likely 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	Lowest level of demand for MNA implementation	Low level of demand for cap construction material	Moderate level of demand expected Level of demand may vary based on method of gradient control selected	Availability of necessary equipment to develop necessary off-site disposal facility airspace and transport ~148K 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 #2; 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 #2; A site-specific, trained employee will be required to operate the groundwater treatment system.	Similar to Alternative #2; 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	Not Applicable	Not Applicable	There is no on-site capacity to treat gradient control system discharge If required, on-site capacity will need to be developed Off-site capacity to treat gradient control system discharge may exist, but ability/willingness to accept discharge is currently unknown	Off-site disposal capacity, facility logistical capacity, or the time required to develop the necessary off-site disposal and logistical capacity is a significant limiting factor	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative	Capacity and location of treatment, storage, and disposal services is unlikely to be a factor for this alternative
COMMUNITY ACCEPTANCE - 40 CFR 257.97(c)(4)								
257.97(c)(4) The degree to which community concerns are addressed by a potential remedy (Anticipated)	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	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: SK Date: 4/20/2021
Last revision by: SKK Date: 6/21/2021
Checked by: TK Date: 6/24/2021

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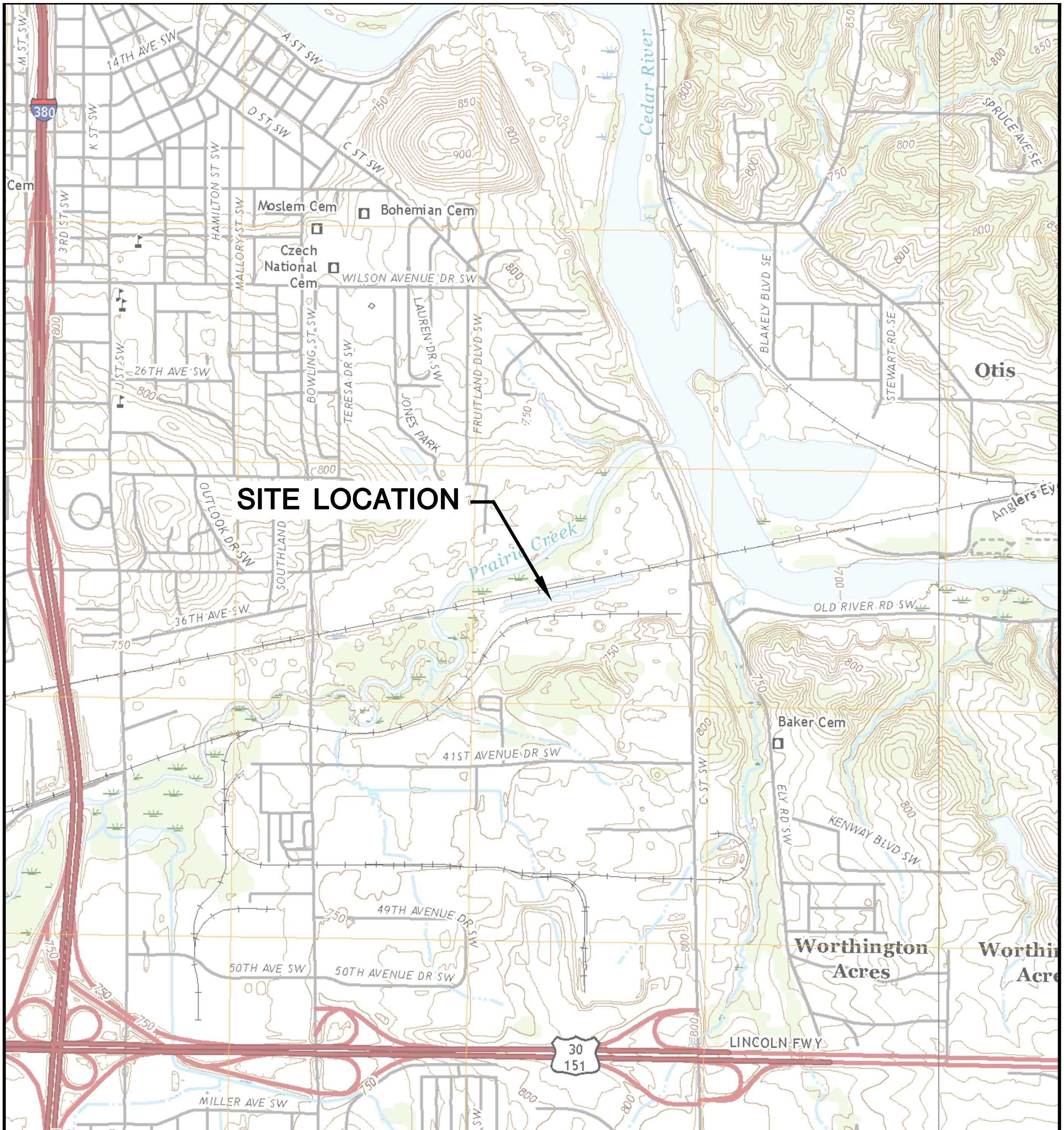
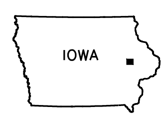
Figures



CEDAR RAPIDS SOUTH QUADRANGLE
IOWA–LINN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



CLIENT	ALLIANT ENERGY 4902 N. BILTMORE LANE, #1000 MADISON, WI 53718	SITE	ALLIANT ENERGY PRAIRIE CREEK GENERATING STATION CEDAR RAPIDS, IA	SITE LOCATION MAP

				ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE 1
PROJECT NO.	25219074.00	DRAWN BY:	BSS			
DRAWN:	11/18/2019	CHECKED BY:	MDB			
REVISED:	01/14/2020	APPROVED BY:	TK 01/30/2020			

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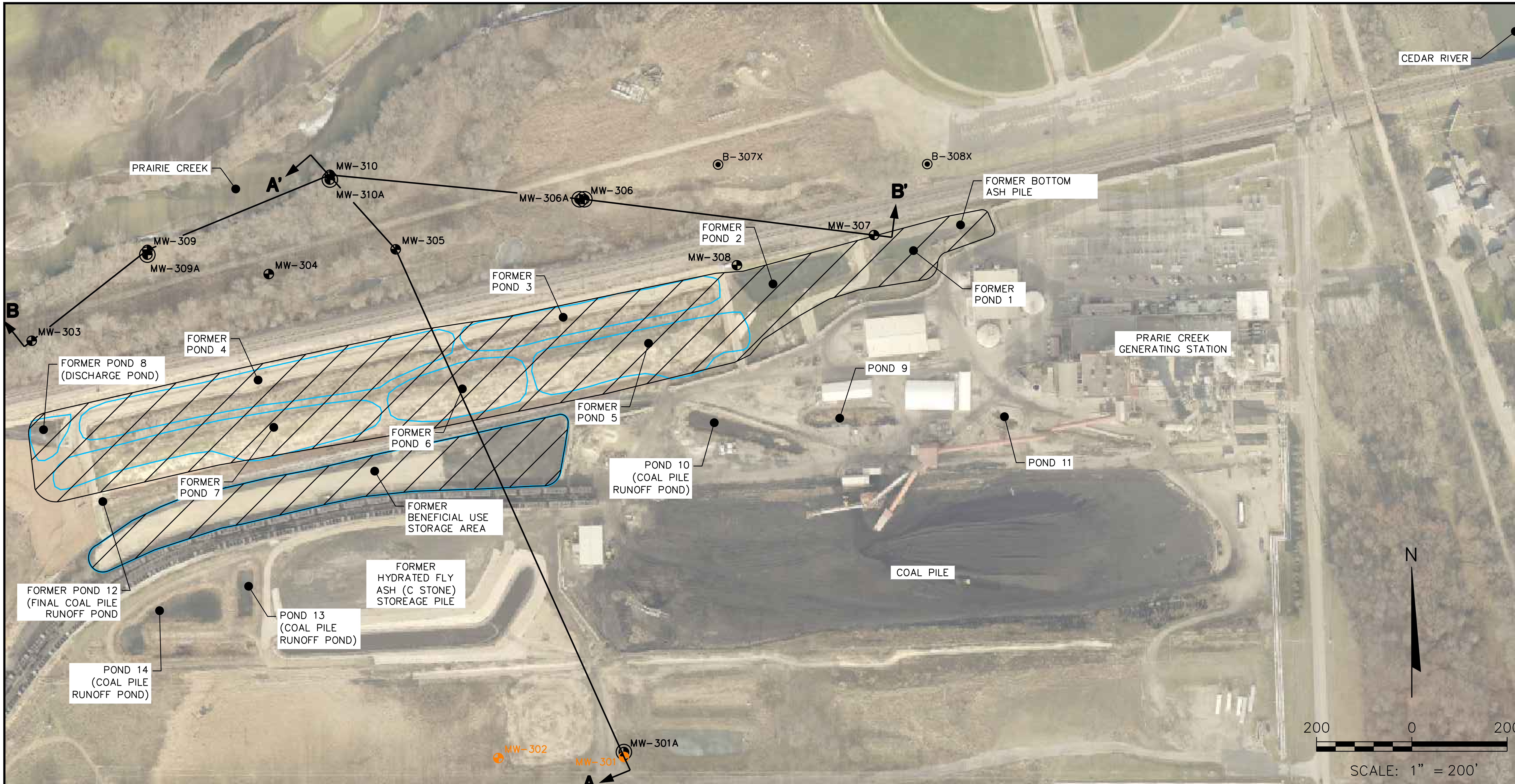

LEGEND

- MONITORING WELL
- BACKGROUND MONITORING WELL
- PIEZOMETER
- SOIL BORING
- CCR UNITS
- APPROXIMATE CLOSURE AREA (SEE NOTE 1)
- GEOLOGIC CROSS SECTION LOCATION

NOTES:

1. PCS PONDS 1-8, THE BOTTOM ASH PILE, AND THE BENEFICIAL USE STORAGE AREA WERE CLOSED IN DECEMBER 2018. LIMITS ARE APPROXIMATE.
2. AERIAL PHOTO IMPORTED FROM THE ARCMAP BASEMAP (CEDAR RAPIDS, IOWA GIS - DECEMBER 22, 2018).
3. MONITORING WELLS MW-301 THROUGH MW-306 INSTALLED BY CASCADE DRILLING BETWEEN OCTOBER 31 AND DECEMBER 6, 2016.
4. MONITORING WELLS MW-307 AND MW-308 INSTALLED BY CASCADE DRILLING ON NOVEMBER 27, 2018.
5. MONITORING WELLS MW-309 AND MW-310 INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING ON AUGUST 5-6, 2019.
6. MONITORING WELLS MW-301A AND MW-306A INSTALLED BY CASCADE DRILLING ON JUNE 22-24, 2020.
7. MONITORING WELLS MW-309A AND MW-310A WERE INSTALLED BY CASCADE DRILLING ON JULY 23, 2020.
8. THE BACKGROUND MONITORING WELLS FOR THE PRAIRIE CREEK GENERATING STATION ARE: MW-301 AND MW-302.

PROJECT NO.	25220084.00	DRAWN BY:	BSS	ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT: ALLIANT ENERGY 4902 N. BILTMORE LANE, #1000 MADISON, WI 53718	SITE: ALLIANT ENERGY PRAIRIE CREEK GENERATING STATION CEDAR RAPIDS, IA	SITE PLAN AND MONITORING WELL LOCATIONS
DRAWN:	11/18/2019	CHECKED BY:	MDB/NDK				FIGURE
REVISED:	06/18/2021	APPROVED BY:	TK 07/21/2021				2

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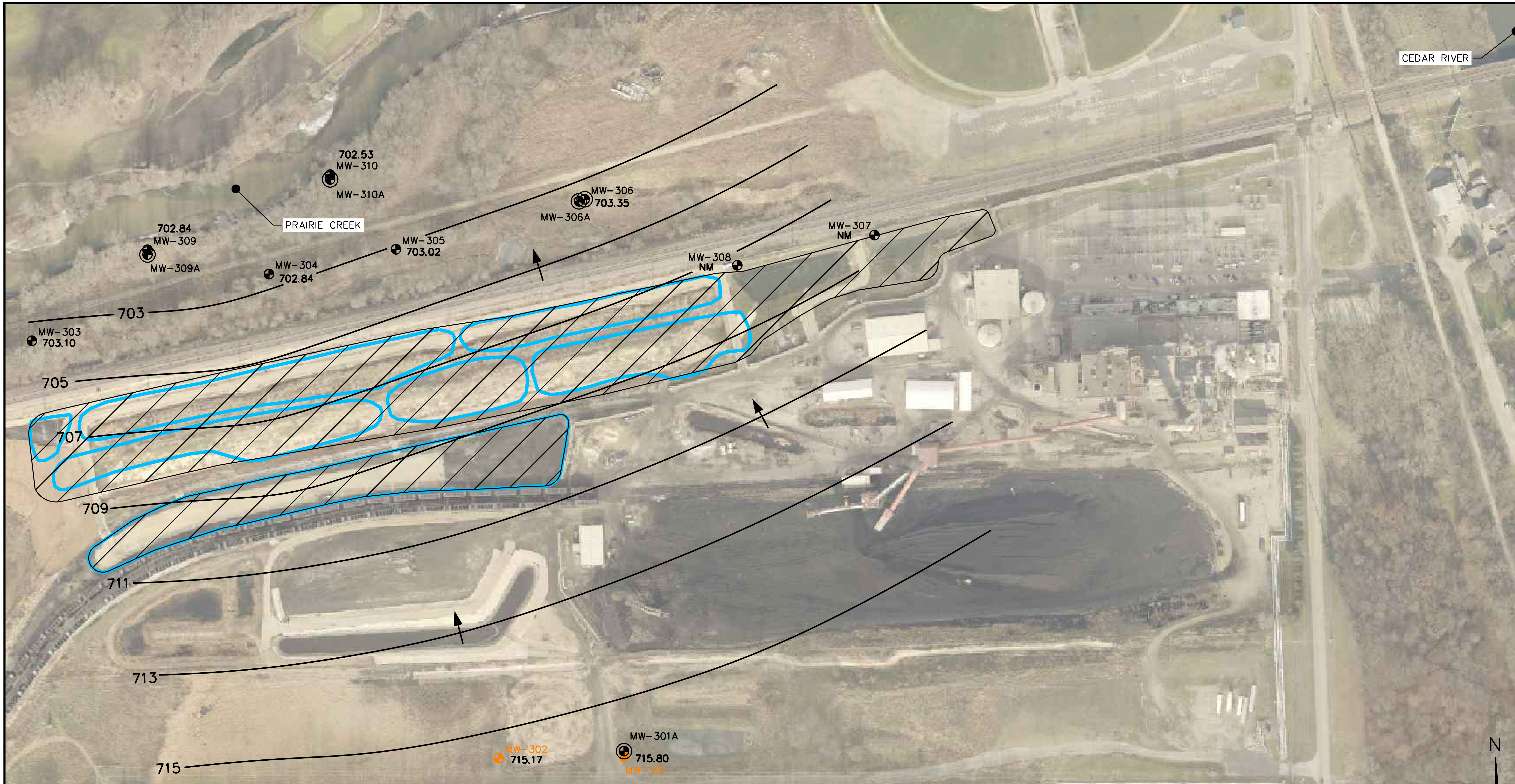

LEGEND

- MONITORING WELL
- BACKGROUND MONITORING WELL
- PIEZOMETER
- CCR UNITS
- APPROXIMATE CLOSURE AREA
- 716.44 — WATER TABLE ELEVATION (APRIL 27, 2020)
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. SEE FIGURE 2 FOR BASE MAP NOTES.
2. DUE TO THE COVID-19 PANDEMIC, WELLS ON THE GENERATING STATION PROPERTY (MW-307 AND MW-308) WERE NOT MEASURED IN APRIL 2020. THESE WELLS WERE MEASURED AND SAMPLED IN MAY 2020.

PROJECT NO.	25220084.00	DRAWN BY:	BSS/ZTW
DRAWN:	07/03/2019	CHECKED BY:	MDB
REVISED:	05/10/2020	APPROVED BY:	SCC 05/10/2021

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

CLIENT: ALLIANT ENERGY, 4902 N. BILTMORE LANE, MADISON, WI 53718

SITE: IPL-PRAIRIE CREEK GENERATING STATION, 3300 C ST. SW, CEDAR RAPIDS, IA 52404

WATER TABLE MAP – APRIL 2020

FIGURE 3

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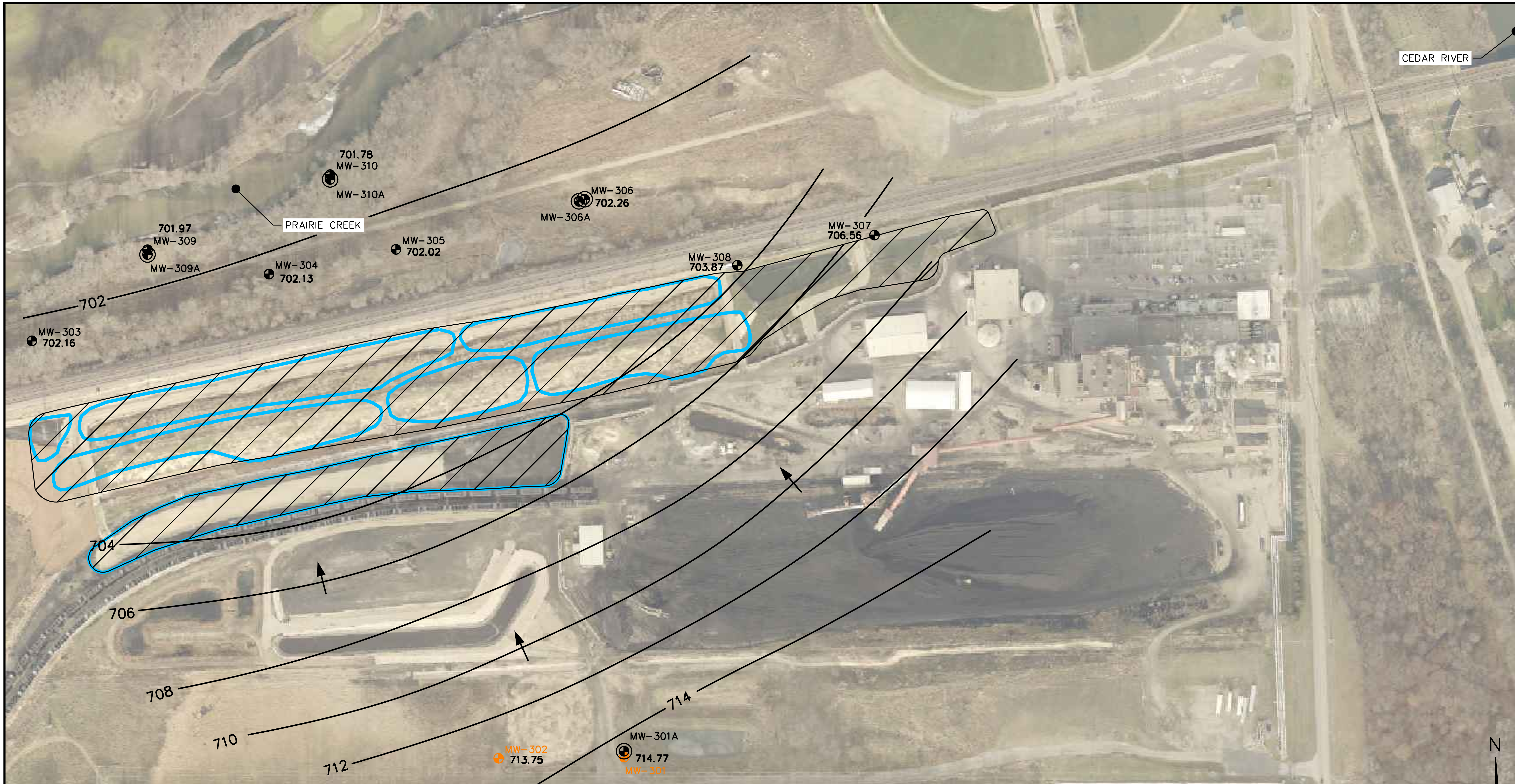

LEGEND

- MONITORING WELL
- BACKGROUND MONITORING WELL
- PIEZOMETER
- CCR UNITS
- APPROXIMATE CLOSURE AREA
- 716.44 WATER TABLE ELEVATION (OCTOBER 19-21, 2020)
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. SEE FIGURE 2 FOR BASE MAP NOTES.

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25220084.00	DRAWN BY:	BSS/ZTW
DRAWN:	07/03/2019	CHECKED BY:	MDB
REVISED:	05/10/2020	APPROVED BY:	SCC 05/10/2021

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

CLIENT: ALLIANT ENERGY, ALLIANT ENERGY, 4902 N. BILTMORE LANE, MADISON, WI 53718

SITE: IPL-PRAIRIE CREEK GENERATING STATION, 3300 C ST. SW, CEDAR RAPIDS, IA 52404

WATER TABLE MAP – OCTOBER 2020

FIGURE 4

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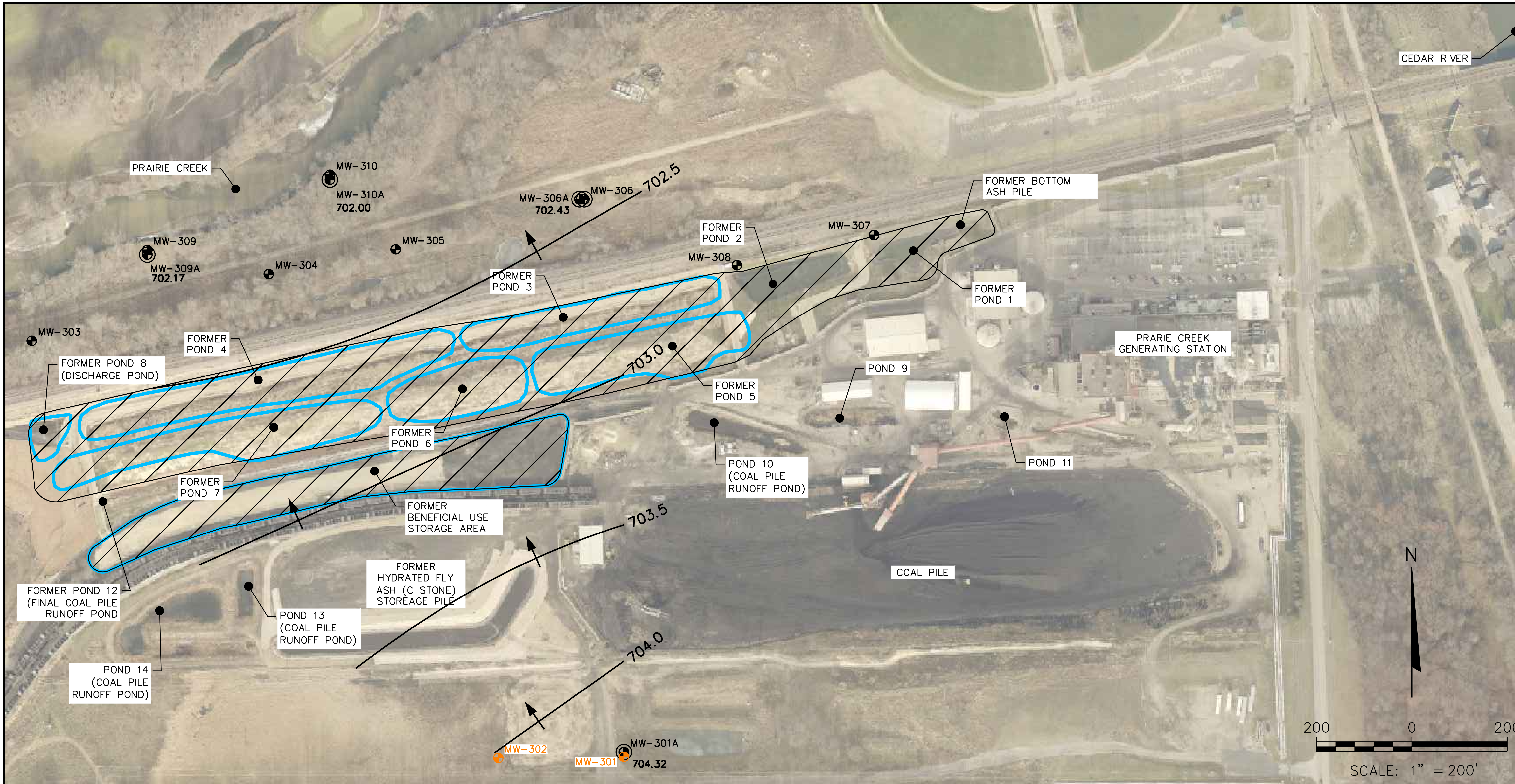

LEGEND

- MONITORING WELL
- BACKGROUND MONITORING WELL
- PIEZOMETER
- CCR UNITS
- APPROXIMATE CLOSURE AREA
- **862.95** POTENTIOMETRIC SURFACE MEASURED OCTOBER 2020
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. SEE FIGURE 2 FOR BASE MAP NOTES.

PROJECT NO.	25220084.00	DRAWN BY:	BSS
DRAWN:	04/26/2021	CHECKED BY:	MDB/NDK
REVISED:	05/07/2021	APPROVED BY:	SCC 05/10/2021

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

CLIENT: ALLIANT ENERGY
ALLIANT ENERGY
4902 N. BILTMORE LANE
MADISON, WI 53718

SITE: IPL-PRAIRIE CREEK GENERATING STATION
3300 C ST. SW
CEDAR RAPIDS, IA 52404

POTENTIOMETRIC SURFACE MAP
OCTOBER 2020

FIGURE
5

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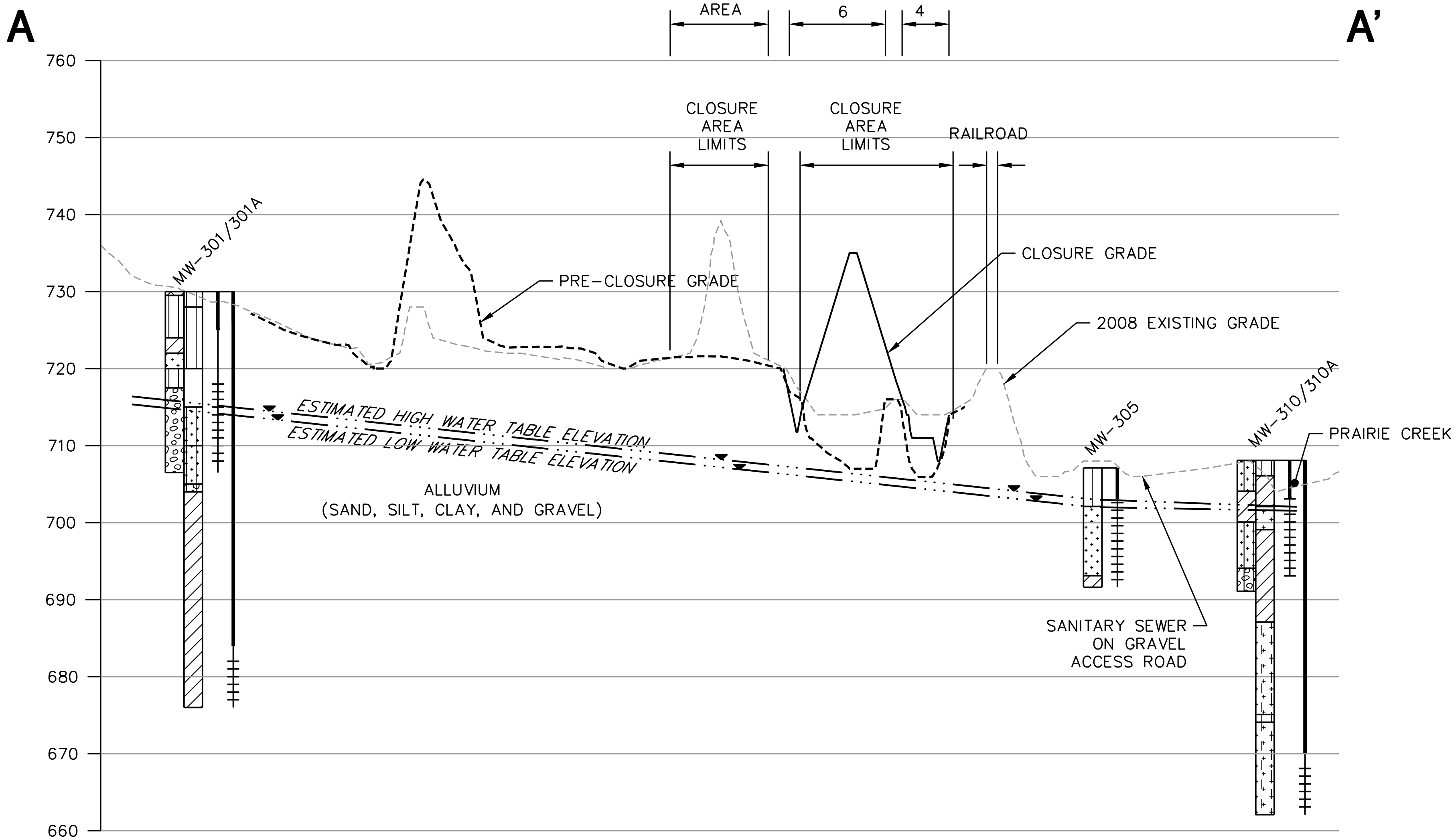

LEGEND

- TOPSOIL
- SAND, POORLY GRADED, WITH SILT (SP)
- SILT, WITH SAND (ML)
- SILTY SAND (SM)
- LEAN CLAY, WITH SAND (CL)
- GRAVEL, POORLY GRADED (GP)
- SILTY GRAVE (GM)
- SAND, WELL GRADED, LITTLE OR NO FINES (SW)
- SAND, WELL GRADED WITH SILT (SW-SM)
- WATER TABLE ELEVATION

NOTES:

1. 2008 EXISTING GRADE IS BASED ON THE STATE OF IOWA'S LIDAR PROGRAM OBTAINED FROM GEODATA.IOWA.GOV.
2. PRE-CLOSURE GRADE IS A COMPOSITE OF A SURVEY OF THE CCR IMPOUNDMENTS AND FLY ASH STOCKPILES, DATED 09/26/2016 BY FRENCH-RENEKER ASSOCIATES, AND A SURVEY OF THE REMAINDER OF THE PLANT PROPERTY BY ANDERSON BOGERT DATED 06/05/2017.
3. PROPOSED CLOSURE GRADE FROM PRAIRIE CREEK GENERATION STATION INTERSTATE POWER & LIGHT CO. (A SUBSIDIARY OF ALLIANT ENERGY) CCR SURFACE IMPOUNDMENT CLOSURE PLAN AND SITE STORM WATER MANAGEMENT PREPARED BY SARGENT & LUNDY AND DATED 08/01/2018.
4. HIGH WATER TABLE ELEVATION MEASURED IN APRIL 2020 AND LOW WATER TABLE ELEVATION MEASURED IN OCTOBER 2020.

0 200

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 10X

PROJECT NO.	25220084.00	DRAWN BY:	BSS
DRAWN:	07/03/2019	CHECKED BY:	MDB/NDK
REVISED:	06/28/2021	APPROVED BY:	TK 07/21/2021

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

CLIENT: ALLIANT ENERGY, 4902 N. BILTMORE LANE, MADISON, WI 53718

SITE: IPL-PRAIRIE CREEK GENERATING STATION, 3300 C ST. SW, CEDAR RAPIDS, IA 52404

CROSS SECTION A-A'

FIGURE 6

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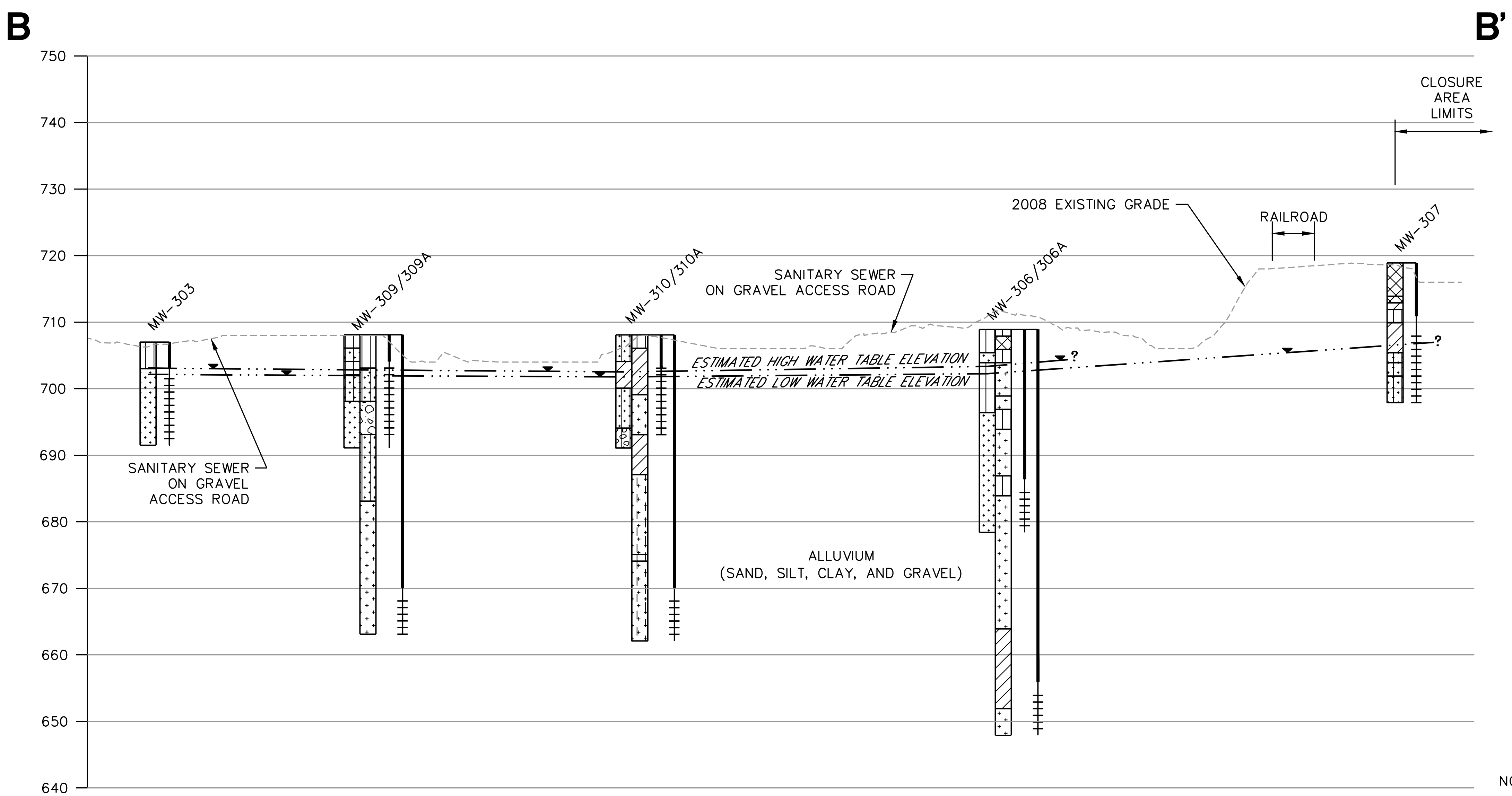

LEGEND

- TOPSOIL
- SAND, POORLY GRADED, WITH SILT (SP)
- SILT, WITH SAND (ML)
- SILTY SAND (SM)
- LEAN CLAY, WITH SAND (CL)
- GRAVEL, WELL GRADED, LITTLE OR NO FINES (GW)
- SILTY GRAVE (GM)
- SAND, WELL GRADED, LITTLE OR NO FINES (SW)
- SAND, WELL GRADED WITH SILT (SW-SM)
- WATER TABLE ELEVATION

0 200

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION = 10X

NOTES:

1. 2008 EXISTING GRADE IS BASED ON THE STATE OF IOWA'S LIDAR PROGRAM OBTAINED FROM GEODATA.IOWA.GOV.
2. HIGH WATER TABLE ELEVATION MEASURED IN APRIL 2020 AND LOW WATER TABLE ELEVATION MEASURED IN OCTOBER 2020.

PROJECT NO.	25220084.00	DRAWN BY:	KP
DRAWN:	04/26/2021	CHECKED BY:	NDK
REVISED:	06/18/2021	APPROVED BY:	TK 07/21/2021

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

CLIENT: ALLIANT ENERGY, 4902 N. BILTMORE LANE, MADISON, WI 53718

SITE: IPL-PRAIRIE CREEK GENERATING STATION, 3300 C ST. SW, CEDAR RAPIDS, IA 52404

CROSS SECTION B-B'

FIGURE 7

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Appendix A

Regional Geological and Hydrogeological Information

Table PC-2. Regional Hydrogeologic Stratigraphy
Prairie Creek Generating Station / SCS Engineers Project #25215053.01

Age of Rocks	Hydrogeologic Unit	General Thickness (feet)	Name of Rock Unit*	Type of Rock
Quaternary (0-1 million years old)	Surficial Aquifers • Alluvial • Buried-Channel • Drift	0 to 400	Undifferentiated	• Sand, gravel, silt, and clay • Sand, gravel, silt, and clay • Till (sandy, pebbly clay), sand, and silt
Pennsylvanian (280 to 310 million years old)	Aquiclude, locally contains waterbearing sandstone	0 to 70	Undifferentiated	• Shale, sandstone, limestone, and coal
Mississippian (310 to 345 million years old	Mississippian Aquifer	0 to 220	Meramecian Series Osagean Series Kinderhookian Series	• Limestone and sandstone • Dolomite, limestone, and shale • Limestone, dolomite, and siltstone
Devonian (345 to 400 million years old)	Devonian Aquiclude	0 to 350	Yellow Spring Group Lime Creek Group	• Shale, dolomite, and siltstone • Dolomite and shale
	Devonian Aquifer	0 to 400	Cedar Valley Limestone Wapsipinicon Limestone	• Limestone and dolomite • Dolomite, limestone, and shale
Silurian (400 to 425 million years old)	Silurian Aquifer	0 to 450	Gower Dolomite Hopkinton Dolomite Kankakee Limestone Edgewood Dolomite	• Dolomite, with some chert and limestone
Ordovician (425 to 500 million years old)	Aquiclude	300 to 600	Maquoketa Shale Galena Dolomite Decorah Formation Platteville Formation	• Dolomite and shale • Dolomite and chert • Limestone and shale • Limestone and shale
	Cambrian-Ordovician aquifer	400 to 650	St. Peter sandstone Prairie du Chien Formation Jordan Sandstone St. Lawrence Dolomite	• Sandstone • Dolomite, sandstone, and shale • Sandstone • Dolomite
Cambrian (500 to 600 million years old)	Cambrian confining beds	90 to 290	Franconia Sandstone	• Shale, siltstone, and sandstone
	Dresbach Aquifer	157 to 1644	Dresbach Group Galesville Sandstone Eau Claire Sandstone Mt. Simon Sandstone	• Sandstone • Sandstone, shale, and dolomite • Sandstone
Precambrian (600 million to more than 2 billion years old)	Precambrian rocks	Unknown	Crystalline rocks, undifferentiated	• Sandstone, igneous and metamorphic rocks

*This nomenclature and classification of rock units in this report are those of the Iowa Geological Survey and do not necessarily coincide with those accepted by the U.S. Geological Survey.

Source: "Water Resources of East-Central Iowa," Iowa Geologic Survey Water Atlas No. 6.

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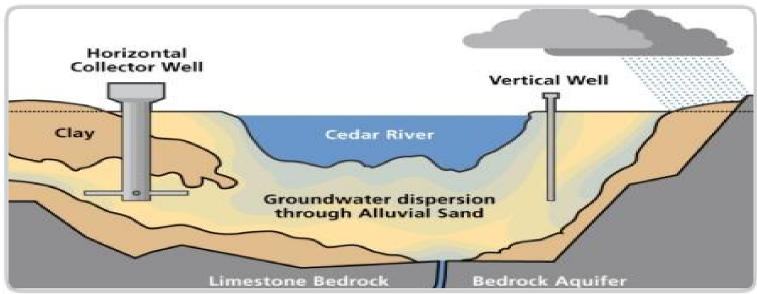
Our Watershed



SHARE

Where Does Our Water Come From?

The City of Cedar Rapids obtains its drinking water supplies from shallow vertical and collector wells constructed in the sand and gravel deposits along the Cedar River. Those deposits form an underground water-bearing layer called an alluvial aquifer. Because of continuous pumping of the City's wells, most of the water in the aquifer is pulled from the river. The rest of the water is supplied as water percolates up from a deeper bedrock aquifer or down from the top of the ground.

Our drinking water from those wells benefits from natural filtration through the riverbank. This natural sand filtration has proven beneficial, pre-treating the water before it ever reaches the City's two treatment plants (both conventional lime-softening facilities).

Watershed Monitoring

In order to most effectively manage our water resources, the Cedar Rapids Water Division has worked with state and federal agencies to complete a source water assessment, identifying potential contamination sources in the Cedar River watershed. The results of that assessment, paired with a continuous monitoring program, help us better understand our watershed. We have confirmed that some contaminants, including nitrate, herbicides and bacteria, enter the Cedar River watershed upstream from our wells. The watershed of the Cedar River upstream from Cedar Rapids is over 6,500 square miles and extends into southern Minnesota. Monitoring of these contaminants will continue to ensure a strong watershed protection program.

If you are interested in reviewing our source water assessment or any monitoring results, please contact the CRWD at 319-286-5910.

Surficial Aquifers

The surficial aquifers are located within the unconsolidated materials above the bedrock surface. They are subdivided into alluvial, buried-channel, and drift aquifers.

The alluvial aquifers are deposits located along present-day watercourses. They consist of sands and gravels interbedded with less-permeable silts and clays and lie beneath the flood plains of larger rivers and creeks. In the eastern half of the report area, the Iowa, Cedar, Wapsipinicon, and Maquoketa Rivers as well as Buffalo Creek alternately flow through narrow bedrock gorges and wide flood plains (fig. 22). Thus the alluvial aquifers occur irregularly in the valleys of these rivers.

The buried-channel aquifers (fig. 23) are the unconsolidated material deposited by ancient streams that carved valleys prior to or between glacial advances. Many of these ancient valleys were scoured deeply into the bedrock and are much wider than the valleys of present streams (fig. 24). Buried channels may be easily recognized on the bedrock topography map (fig. 25), but are only poorly expressed in the modern landscape. While they are not generally expressed as primary features of present topography, they exert noticeable influences on modern drainage. Prairie Creek near Cedar Rapids, Deep Creek near Preston, and the lower stretches of the Cedar, Wapsipinicon, and Maquoketa Rivers follow the courses of buried channels. See figures 22 and 23. In addition, most of the irregularly occurring alluvial aquifers in the eastern half of the report area are located where modern stream valleys intersect buried bedrock channels.

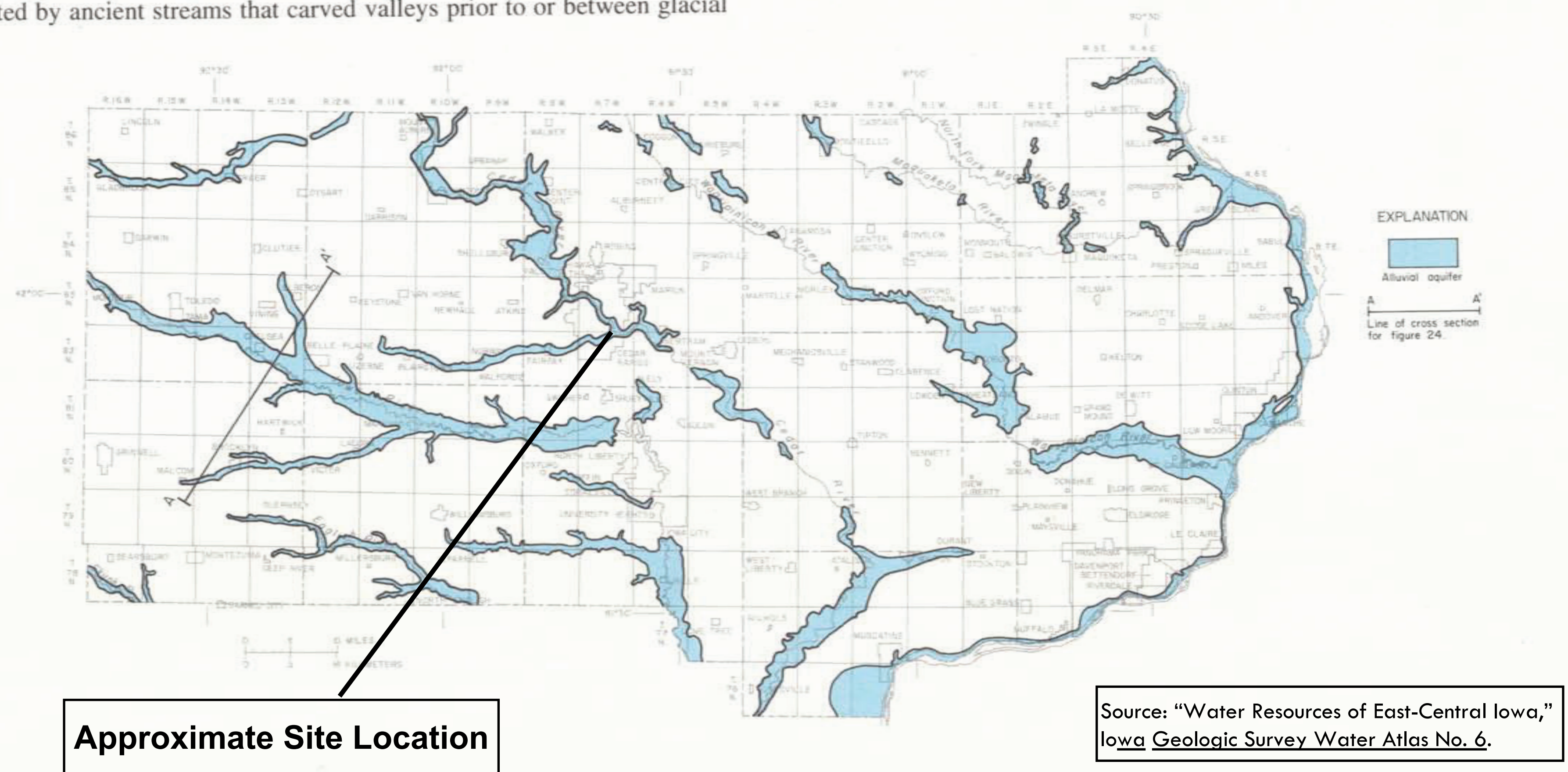
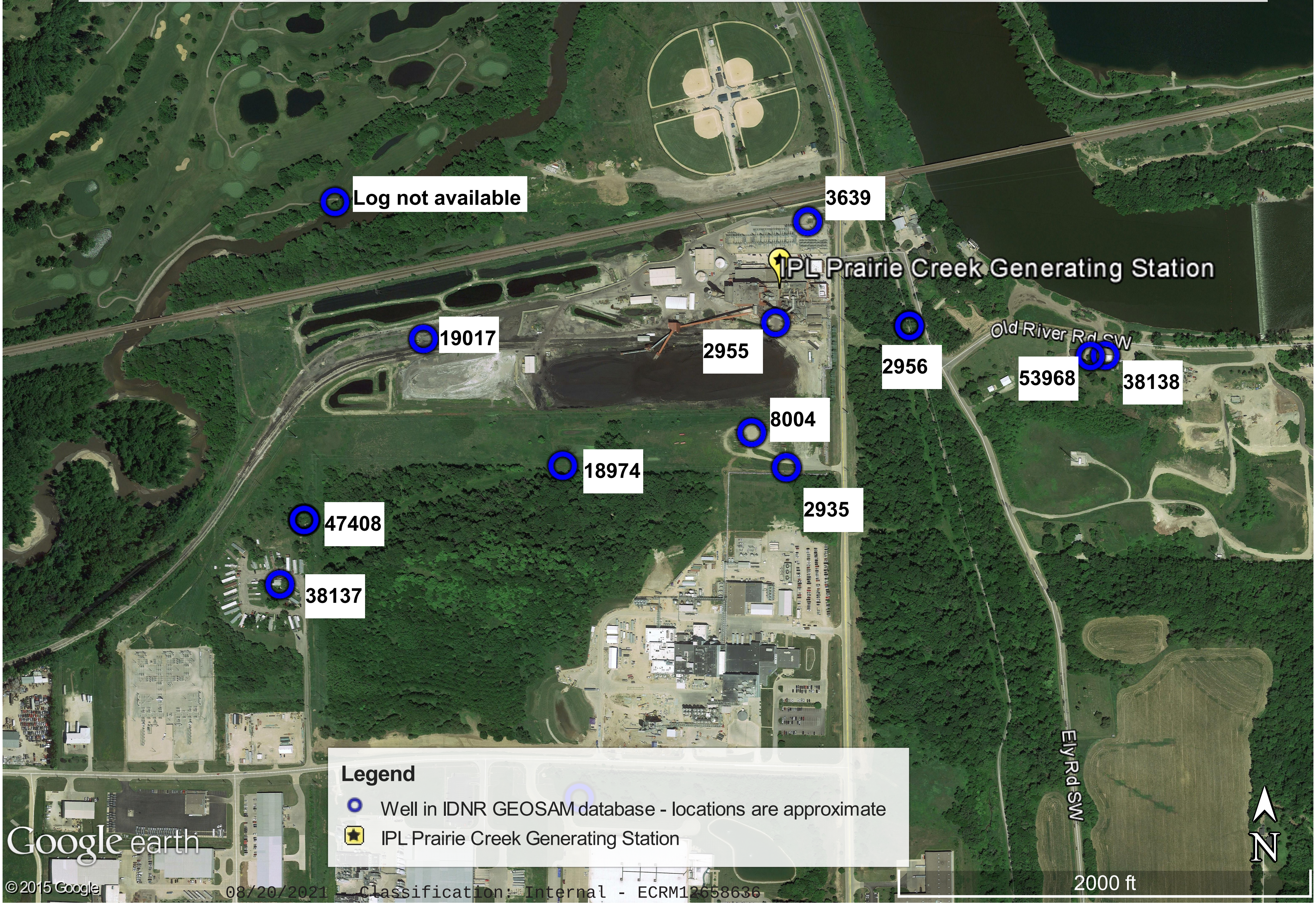


Figure 22.—Areal distribution of alluvial aquifers in east-central Iowa

Historical Well Logs Near Prairie Creek Generating Station

Labeled well locations are included in IDNR's GEOSAM database. Logs are not available for all well borings. Well locations are approximate.



FORM NO. 79 - In stock and for sale by Mid-West Prtg. Co., Tulsa W-2935

STATE IOWA	CEDAR RAPIDS (LINN)
NE/c SE NE	CENTRAL IOWA POWER CO-OP
SEC. 3	Test hole No. 1
TWP. 82N RGE. 7W	COMMENCED / COMPLETED
3	Art Bruinekool
	CASING RECORD
	LOGGED Aug 11, 1947 BY SEDtJr.
Elev. 722±	REMARKS S.W.L. 19.6' below L.S - 8-11-47
T.D. 75'	
CB7-3	

Alluv. prob Iowan

soil reddish brn, silty
sd med to crse, dirty, brn to red
yel crser this is clean
Gray clay masses sdy Aluv.
slt sdy, calc, gr.
sd crs pbls
some pbls
cht pbls
sd med poorly sorted, rd, bright
slt & clay bl gr. v. fn; slt lam, wh, qtz
sd, crse to v. crsw. some grav.
71 yel bedrock reported

Otis
TD 75'
Bertram

100

722
80-1

General | Construction | Logs | Stratigraphy | Water | Storage

Identification

Date Received	
Owner Name	Hide-A-Way Manor
Alt Name	
WNumber	38137
PWTS ID	
Storet ID	
SDWIS ID	2411834
USGS ID	
Project	SOURCE WATER PROTECTION
Operator	Unknown

Location

State	Iowa
County	Linn
Quadrangle	Cedar Rapids South, Iowa
Township	T82N
Range	R7W
Section	3
Quarter	SW NE NE
Latitude	41.9401300000
Longitude	-91.6478370000
Accuracy	GPS +/- 20 m.
UTM X	612089
UTM Y	4644013

Site

Site Type	Drilled hole
Well Status	Active
Field Located	
Elevation	741 ft
Elevation Accuracy	Digital Elevation Model Accurate to 5 ft
Landscape Position	Valley

Drilling

Drilling Company	Unknown
Drilling Date	
Drill Method	Unknown
Bedrock Depth	
Well Depth	142 ft
Total Depth	142 ft
Well Types	Public Access
Aquifers	Silurian

FORM NO. 79—In stock and for sale by Ross-Martin Co., Tulsa

W-19017

STATE Iowa | Cedar Rapids (Linn)

SW NW SW NE | Iowa Elec. L & P #5

SEC. 3

TWP. 82 RGE. 7W

COMMENCED | COMPLETED 10/66

Thorpe

CASING RECORD

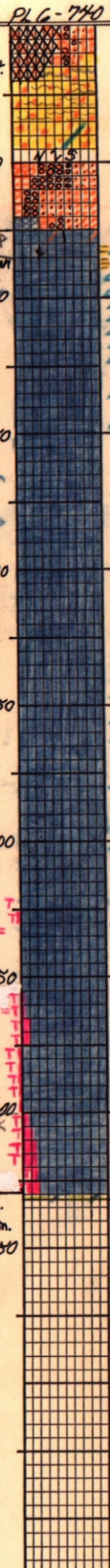
LOGGED July 1974 BY Gilmore

REMARKS

El. 715' Topo.

TD. 432'

PLG-740



Pleist.

Till, dull yel brn, oxid, leached grding to sd & grav.

aa. mixed w/ gr slt.

Till aa + Slt & clay

Slt, olive gr, clayey, sdy

aa. sli calc.

Slt, tan, sli sdy, few pieces of grav. size. calc

50

Sd & grav., varicolored.

Sd & grav aa + broken Dol, crm-tan, pt SL-dense, vf.

WAP

Dol, m-lt gr, dense, sli vuggy, few emb sd grains + Dol, lt yel gr, Xln, vf-f, sli sdy, sli vuggy.

Silurian Niag.

Dol, gr orng pnk, Xln, vf. + Dol, yel gr, Xln, f.

100

Dol, pale orng - yel orng, Xln, vf.

150

Dol aa to gr orng pnk, Xln, vf-f, sli vuggy

Dol, mod yel brn - gr orng pnk, Xln, vf-f, mod dense

Dol, pnk orng - yel gr, Xln, vf-m

200

Dol, orng-pnk, orng yel, Xln, f-m, vuggy

Dol, lt gr orng pnk, Xln, f-vf, sli vuggy

Dol, orng-pnk, orn-yel, Xln, f-m, sli vuggy

Dol aa + lt gr orng pnk.

250

Dol, gr orng pnk, v pale orng, orng yel, Xln, f-vf, sli vuggy

Dol, v pale orng, Xln, f-vf,

300

Cht, lt gr - wht, S., trip. Dol, v pale orng - v. pale yel orng, Xln, f-vf.

Dol, gr orng pnk, Xln, f-m.

Dol, v pale orng - lt gr orng pnk, Xln, f.

350

Cht, wht, yel gr, S-R, trip. Dol, gr orng pnk - pale orng, Xln, f-m, vuggy

aa. + Dol, yel gr, Xln, f.

Cht, off wht gr, yel gr, porcel, trip. Dol, mixed aa.

Cht aa. Dol, lt gr yel, Xln, f-m.

Dol aa, + some gr orng pnk aa.

Dol, v pale yel brn - yel gr, Xln, m-f, few pyrite fleck

400

Gank

Cht, wht, yel gr, sli mott gr, S-R, sli trip. Dol aa, few gr orng pnk pieces.

Few pyrite flecks in cht. & dol.

Dol, yel gr, some sulfide mott, Xln, f.

Sh, lt grn gr, pulv, dolo. 30% Dol aa - recirc. + trace of Edgewood s/s.

Maq. Brain.

TD. 432

450

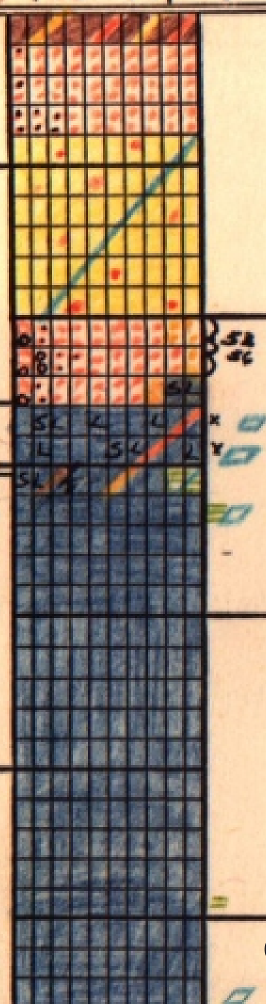
715
75
640

430
75
355

3

FORM NO. 79—In stock and for sale by Ross-Martin Co., Tulsa. W-18974

STATE Iowa	Cedar Rapids (Linn)
SENESWNE	Central Iowa Power #4
SEC. 3	
TWP. 82 RGE. 7W	COMMENCED 8-22-66 COMPLETED 9-14-66
3	Thorpe well co.
	CASING RECORD 42" csg 0-5', 32" csg +1'-23', 24" csg +1'7"-69'7", 16" csg +2'10"-90'
	LOGGED 10-22-71 BY Gilmore
EL. 722'	REMARKS Cable tools
TD. 439'	SWL- 40'-58', PL - 113.9'
	Yield- 600 gpm
PL6-717	



Fill, pale yelbrn, sdy, silty, calc.
Sd, yelbrn, med, sli clayey

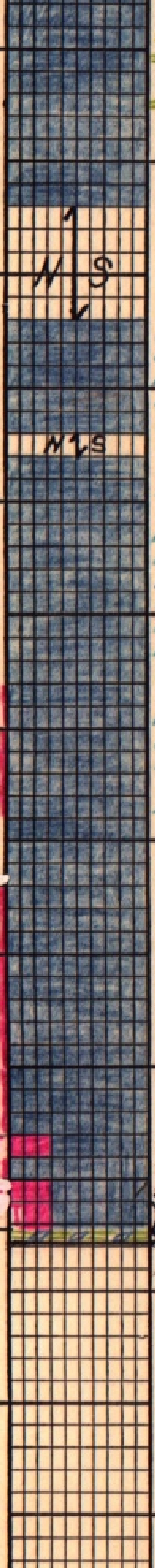
Sd, yelbrn, m-crs, sli clayey
Silt, dusky yel, calc, few emb Sd grains, calc.

Sd & Gravel, 95% qtz, clean

Sd & gr aa + Dol, pale yel orng, SL-L, oxid.
Dol, brn gr-m gr, SL-L, vuggy, tr emb sd, hard
Dol aa - lt gr - lt brn gr
Dol aa, sli dker & grding to crs sltgrd. Dol, pale-v pale
Dol yel brn, xln, vf, tr emb sd. Sh, gr grn, chunky calc.
Dol v. pale yel brn, yel gr, xln, vf-crs.
aa & Dol, pale orng, dense
Dol, pale orng, dense-f, few vugs, few dk gr zones.

Dol, pale orng, dense - xln, tr emb calcite

08/20/2021 - Classification: Internal - ECRM12658636



Dol aa, more Xln, some pin point por.
Dol, pale orng - pnk orng, Xln, f, pt dense, few gr zones

200

Dol, orng pnk - pale orng, Xln, v.f., pin point por.

Dol, mod orng pnk - paleorng, Xln, vf-f, pt dense, sli por, vuggy, calcite - clear - yel.

250

Dol, grorng, orng pnk, dense, f, emb calcite

Dol aa few gr zones
Dol, v. pale orng, dense - f, emb calcite - yel - clear
300
Dol aa + some orng pnk

Dol, pale orng, tr pnk, Xln, f, emb calcite, pin point por
Cht, yelgr, wht, trip. Dol aa.
Cht aa foss.

Cht, lt gr, wht, trip, foss. Dol, v. pale orng, Xln, f, sli vuggy - por, trace orng pnk,
Cht aa. Dol, v. pale orng, trace orng pnk, Xln, f-vf.
350
Dol, pale orng, grorng pnk, dense, f, sli vuggy & por.

Cht, v lt gr, wht, sli trip. S. Dol, pale - v pale orng, Xln, f-m.
Dol aa, sli vuggy

Cht aa. Dol, v. pale orng, Xln, f-vf.
Cht, lt gr, wht, sli trip. Dol, v. pale yelbrn, pale orng, Xln, f-m.
Cht, lt - v lt gr, S. Dol aa.
400
Cht, lt gr, wht, pale yelbrn, S, sli trip. Dol aa sli vuggy
Cht aa. Dol, pale gr orng, Xln, f-m.
Cht, lt - v lt gr, S, sli mott. Dol aa.

Kank.
Cht, off wht, lt gr, S-R, sli trip. Dol aa, some dissem. pyrite.
Cht aa. Dol, v. pale yel brn, Xln, f-m
Cht, off wht, yelbrn, lt gr, S-R, sli trip. Dol aa w/ dk gr mott., pt sli brn & arg.
Sh, grngr, chunky, dolo.
Maq.
TD. 439'
450

3

720
60
660

722
436
286

FORM NO. 79—In stock and for sale by Ross-Martin Co., Tulsa. W-8004

STATE IOWA	CEDAR RAPIDS (LINN)
NW NESENE APP. C ~~NE SE~~	CENTRAL IOWA POWER COOP #3
SEC. 3 SWNWNESENE	(REA)
TWP. 82N RGE. 7W	COMMENCED COMPLETED AUG. 21 – SEPT. 14, 1956
	HOEG & AMES
	CASING RECORD 77' OF 20" CASING
	99' OF 12" CASING (CEMENTED)
	LOGGED FEB. 25, 1957 BY NORTHUP
EL 722'	REMARKS SWL 38.67'
TD [redacted] 434	PL 144.9' @
	SWL 39.12'
ml 3/57	PWL 145± ' @ 476 gpm
EK8-1	

PLEIS.

50

WAPSI.

Bert.

SILURIAN

100

NIAG.

150

77'

93

99

LOESS YEL., NON CALC.
TILL YELLOW, OXIDIZED, LEACHED

TILL YELLOW, UNOXIDIZED, UNLEACHED

TILL SLI. MIXED - AA, BECOMING GR.
GRAVEL f.-A-a; SD. LT GR. CRSE TO f. -A-a

GRAVEL f.-A-a.
GRAVELON; SD. GR.+ YEL. CRSE. A-a

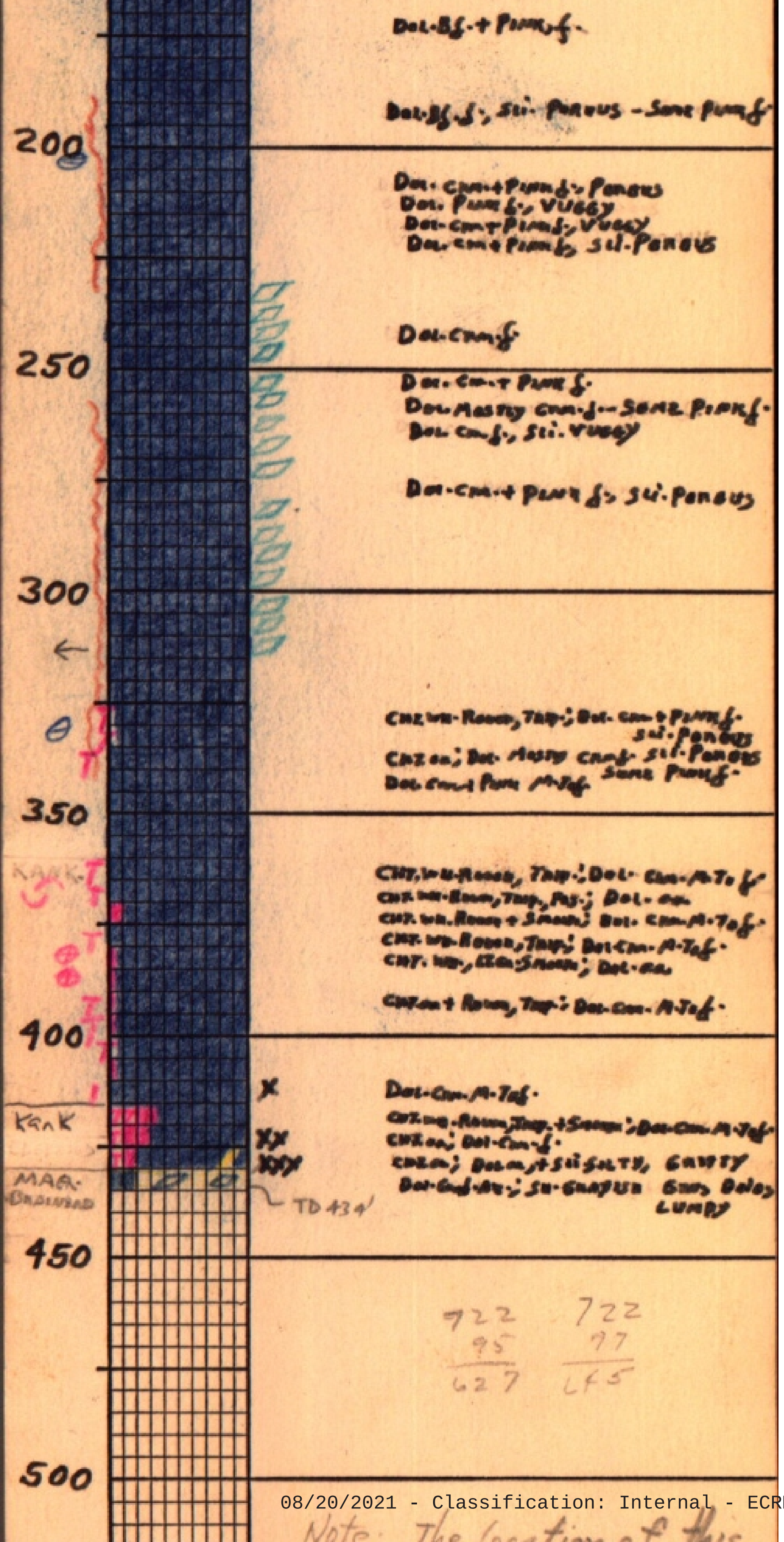
LS. LT GR, B f.; LITHO, DOLO.
LS. LT GR, LITHO, DOLO.
DOL. CRM. A-T. f. CALC.; LS-AA
DOL. CRM. f.; SH-GR.
DOL. CRM. f.B f. SAC.

DOL. CRM. f.

DOL. AA + SLI. VUGGY

DOL. CRM. + B f. f.
DOL. CRM. f.
DOL. CRM. + PINK f.

DOL. CRM. + PINK A.T. f.
DOL. CRM. + PINK f.


200
250
300
350
400
450
500
Dol-cm-f.
Dol-Cm-M-Tof-
TD 434'
722
95
627
722
77
645

...The location of this well should be checked. The map provided by the Company indicates the plant is in the

NE ¼ sec. 3-82-7W
Elev. should be checked also.

A set of geophysical logs was ran 3-23-76. Caliper and radiation logs gave indications of major cavities from 200-220', and 300-320'. These

logs are on file with the Carbonate Hydrology Project data.

3-24-76
Bunker

LB

722
430

292

FORM NO. 79 -- In stock and for sale by Mid-West Ptg. Co., Tulsa 3629

STATE: IOWA

Cedar Rapids (Linn)

SE SE-NE-NE

Central Iowa Power Co-op #1 (NORTH) R.E.A.

SEC. 3

TWP. 82N RGE. 7W

COMMENCED: May 5-1949 COMPLETED: June 1, 1949

Hoes & Ames - Ed Martin

CASING RECORD: 110' of 12" casing cemented in 20" hole - open 12" hole below

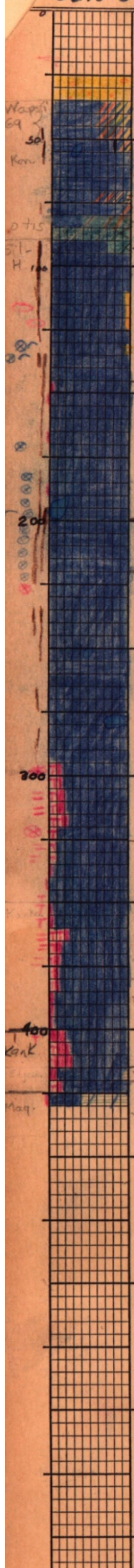
LOGGED BY: M. Parker RW.

EL. 722'

TD 434'

CE10-6

REMARKS: Pump setting 290'. 2nd Prod. Test after 1st acid. SWL. 24.50' PWL 250±' @ 248 gpm for 1½ hrs. When rate ~~was increased to 256 gpm~~ well started pumping air



silt, lt-tan. fn-sd, rd, emb. calc.
a.a.
Dol. yel-tan. fn-xln, sdy, silty.
a.a.
Dol. buff, speckled, tan. v.sdy, silty. spkled
Dol. lt to med gray, v.fn to sublith. 20% a.a.
Dol. a.a. emb. calcite in part.
Dol. gray, mottled. v.fn - sublt.
Dol. gray & tan. fn-xln. sdy, arg. Sh. dk grn, sdy. Trace.
Dol, gray & tan. fn-med xln. spkl. silty, sdy
Dol. gray, tan, & greenish, fn-med. sdy, arg.
Ls, bf-gr, mot, sl-frag. tr grn. shale
630
Dol, yel-pk, f-m sac por.

Sd, A, clr.
v.small qtz. X's

722
92
630

Dol, yel, f sac, less por.
Dol, yel-pk, f sac, dens, little por; Sh yel grn unc.
vug. fos.
por.
Cht, wh-bf, G-S; Dol, pk brn f dns, vug

Dol, pk-bf, f, vug fos.

Dol, crm f vug fos.

Dol, pk + pch, f, vug.
crm

Cht, wh-bf, T-G; Dol, crm v.f.

pk-crm f-m

722
350
372

372

Dol, gr bf.

Cht, wh G, S, T

722
415
307

Cht, some bf.
Dol, mot w blk pyr.; Sh, gr amor.
Dol, crm, m
Sh, grn, soft.; Dol, grn f

722
425
297

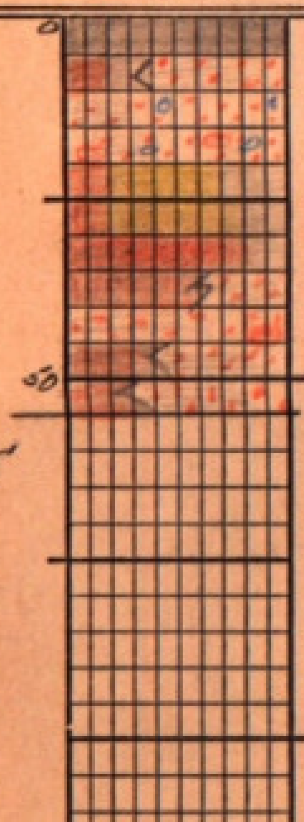
→ Driller reports shale at 432' - TD 434'. When measured hole was found to be 5' deeper than shown on samples.

722
425
297

FORM NO. 79 - In stock and for sale by Mid-West Prtg. Co., Tulsa W-2956

STATE: Iowa	CEDAR RAPIDS (LINN)
NW-SW-NW	Central Iowa Power Co-op #3('47)
SEC. 2	
TWP. 82N RGE. 7W	COMMENCED / COMPLETED: August 13, 1947
	Pella Tank & Pipe Co. Brunskool
	CASING RECORD: cased with 5 3/16" casing (removed)
	LOGGED: Aug. 25, 1947 BY M. Parker
El. 715±	REMARKS: No water level data
T.D. 55'	Test hole abandoned

CB8-1



Top soil dk. brn. silty sdy.
Sd. fn-med. R-a dirty clay tan v. sdy.
Sd. med-crse R-a. dirty.
Sd. a.a. some gravel
Clay lt. gray silty sdy v-silty calc
a.a.
Clay lt.-gray-tan v.v.sdy.
clay a.a. & sd. fn-med a-r.
Sd. med-crse a-r. dirty some gravel

715
55
660

FORM NO. 79 - In stock and for sale by Mid-West Prtg. Co., Tulsa W-2955

STATE
Iowa

CEDAR RAPIDS (LINN)

NE-SE-NE

Central Iowa Power Coop. Testhole #2

SEC.
3

TWP. 82N RGE. 7W

COMMENCED

COMPLETED

Art Bruinekool

CASING RECORD
5 3/16" casing to bedrock

3

LOGGED
Aug 13, 1947

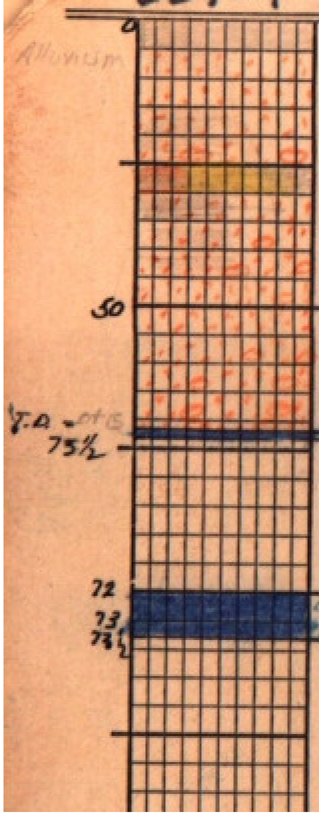
BY
M Parker

REMARKS

El. 722±

T.D. 73½

CB7-9



Soil reddish brn. silty
Sd. med-crse a-r brn-red. dirty
Sd crse-v.crse R-a yellow-tan clean.
Sd. med-crse l-a. yellow. v. clayey
Sd. med-crse. med. gravel dirty.
Clay gray v. fn. sdy silty calc.
Sd med v. clayey.
Sd. med-crse. few crse pbls. dirty

Sd. grey med-crse. few crse pbls. cleaner
Sd. fn-crse poorly sorted.
Sd. yellow fn-crse A-Rd. poorly sorted. bnll.
Sd. crse-v.crse some gravel

72-73½ Dol yel-crm. crypto-sublith.

Probably Bertram

Dol. yel-crm. cryptoxln-sublith ab. calcite
Dol. sublith. lt. yellow-crm. & core.
crypto-xln-sublith subconch.

General | Construction | Logs | Stratigraphy | Water | Storage

Identification

Date Received	
Owner Name	New Shack Tavern, The
Alt Name	
WNumber	38138
PWTS ID	
Storet ID	
SDWIS ID	2409013
USGS ID	
Project	SOURCE WATER PROTECTION
Operator	Unknown

Location

State	Iowa
County	Linn
Quadrangle	Cedar Rapids South, Iowa
Township	T82N
Range	R7W
Section	2
Quarter	NW SW NE
Latitude	41.9431790000
Longitude	-91.6330300000
Accuracy	GPS
UTM X	613311
UTM Y	4644371

Site

Site Type	Drilled hole
Well Status	Not Used
Field Located	
Elevation	728 ft
Elevation Accuracy	Digital Elevation Model Accurate to 5 ft
Landscape Position	Valley

Drilling

Drilling Company	Unknown
Drilling Date	
Drill Method	Unknown
Bedrock Depth	
Well Depth	120 ft
Total Depth	120 ft
Well Types	Public Access
Aquifers	Silurian

General | Construction | Logs | Stratigraphy | Water | Storage

Identification

Date Received	
Owner Name	New Shack Tavern, The
Alt Name	
WNumber	53968
PWTS ID	
Storet ID	
SDWIS ID	2413414
USGS ID	
Project	SOURCE WATER PROTECTION
Operator	Unknown

Location

State	Iowa
County	Linn
Quadrangle	Cedar Rapids South, Iowa
Township	T82N
Range	R7W
Section	2
Quarter	NW SW NE
Latitude	41.9431730000
Longitude	-91.6332960000
Accuracy	GPS +/- 20 m.
UTM X	613289
UTM Y	4644370

Site

Site Type	Drilled hole
Well Status	Not Used
Field Located	
Elevation	731 ft
Elevation Accuracy	Digital Elevation Model Accurate to 5 ft
Landscape Position	Valley

Drilling

Drilling Company	Unknown
Drilling Date	
Drill Method	Unknown
Bedrock Depth	
Well Depth	40 ft
Total Depth	40 ft
Well Types	Public Access
Aquifers	Alluvium

Iowa Department of Natural Resources Geological Survey Bureau
109 Trowbridge Hall Iowa City, Ia. 52242-1319 PH (319) 335-1575

WELL RECORD 47408

Permit No. ______

Site identification

Property Owner Kloubec Aquaculture Well Number ______

Address 3800 C St SW C.R.

Tenant ______

Well Depth 335 ft Date Completed 7 / 25 / 96

Drill method

☒ rotary ☐ auger ☐ cable other ______

Hole size

inch	from (ft)	to (ft)
12	0	20
8	20	100
6	100	335

Record all depth measurements from ground level (GL). Use (+) for above GL measurements.

Location

County Linn

___ mi. N/S and ___ mi. E/W of intersection of ______ and ______

___ 1/4 of the ___ 1/4 of the ___ 1/4 of Sec 3 TWP 82 RNG 7 (W)

Show exact location of well in section grid with a dot (●).

Sketch map of well location on property

N W E S 1 mile 200 ft

☐ upland ☒ hillside ☐ valley Elevation (if known) ______

Casing

Drive shoe (yes) Pitless adaptor (yes)

Size (ID/OD)	Type / Wt	Depth top	Depth bottom	Amount (length)
6 SDR 21	PVC	+1	100	101
4½ SCH 40	PVC	95	215	120

Perforated or slotted casing? (yes)

Perforated / slotted from 175 ft to 215 ft

Perforated / slotted from ______ ft to ______ ft

Casing grouted? (yes)

Type	Depth Top	Depth Bottom	Amount
Benseal	0	20	2 SACKS
Bentonite + Drill cuttings	20	100	

Formation log

From	To	Color	Hardness	Formation description
0	38	Yellow		Clay
38	78			Limestone
78	170			Devonian
170	335			Silurian

use additional sheets as needed

Well screen? (no)

Diameter	Slot size	Depth Top	Depth Bottom	Length	Material

Bottom capped (no) with ______

Seals / Packers (no) kind ______ depth ______ ft

Gravel packed (no) from ______ ft to ______ ft type ______ amount ______

Well developed? (yes)

Explain A.R.

Pump installed? (yes)

Date ___ / ___ / ___

Installer's name Same

Type of pump Sub Depth to intake 200 ft

Pump diameter 4 Rated capacity 70 GPM

Water information

Aquifer: ☐ sand/gravel ☒ limestone ☐ sandstone

Main water-supply zone from 175 ft to 335 ft

Final water level (static water level) 110 ft (below) GL.

Pumping water level 180 ft below GL; ☐ tape ☐ airline ☐ E-line Est

At yield of 100 GPM; ☐ orifice ☐ volumetric ☒ estimate Date 7/25

Water quality test? (yes / no)

Date tested ___ / ___ / ___

Tested by ______

Test results ______

Remarks (including depth of lost drilling fluids, materials, or tools)

Well use

☐ Domestic ☐ Municipal ☐ Industrial
☒ Livestock ☐ Public Supply ☐ Monitoring
☐ Test Well ☐ Irrigation ☐ Other ______ (explain)

Contractor Gingerich Well & Pump

Address 1321 Locust Ave, Kalona

Driller Kurt Gingerich Certification no. 40046

Bedrock Aquifers

The bedrock hydrogeologic map (fig. 26) shows the aquifers and confining beds that make up the bedrock surface in east-central Iowa. Pennsylvanian confining beds are the bedrock in the extreme southwest corner of the area, in southeast Muscatine County and southwest Scott County, and in other small outlying localities. The Mississippian aquifer is found beneath the surficial deposits in most of the southwest part of the region. The Devonian confining beds comprise the bedrock surface in an area about 25 miles wide extending from the northwest corner to the south-central part of the report area. They have been partly or completely removed in parts of the Belle Plaine and Poweshiek buried bedrock channels.

The Devonian aquifer is the bedrock in a broad belt that parallels the northeast side of the Devonian confining beds. This belt is from 12 to 25 miles wide and extends from northern Benton and Linn Counties to the southern border of Muscatine County. The Devonian and Silurian aquifers are separated by an irregular zone of relatively thin shale occurring near the base of the Devonian and represented by a single line on figure 26.

The Silurian aquifer comprises the bedrock surface over most of the eastern half of the area. In the extreme northeastern border area the Ordovician confining beds are found at the bedrock surface. They also appear in several buried bedrock channels where the Silurian aquifer has been removed locally by erosion.

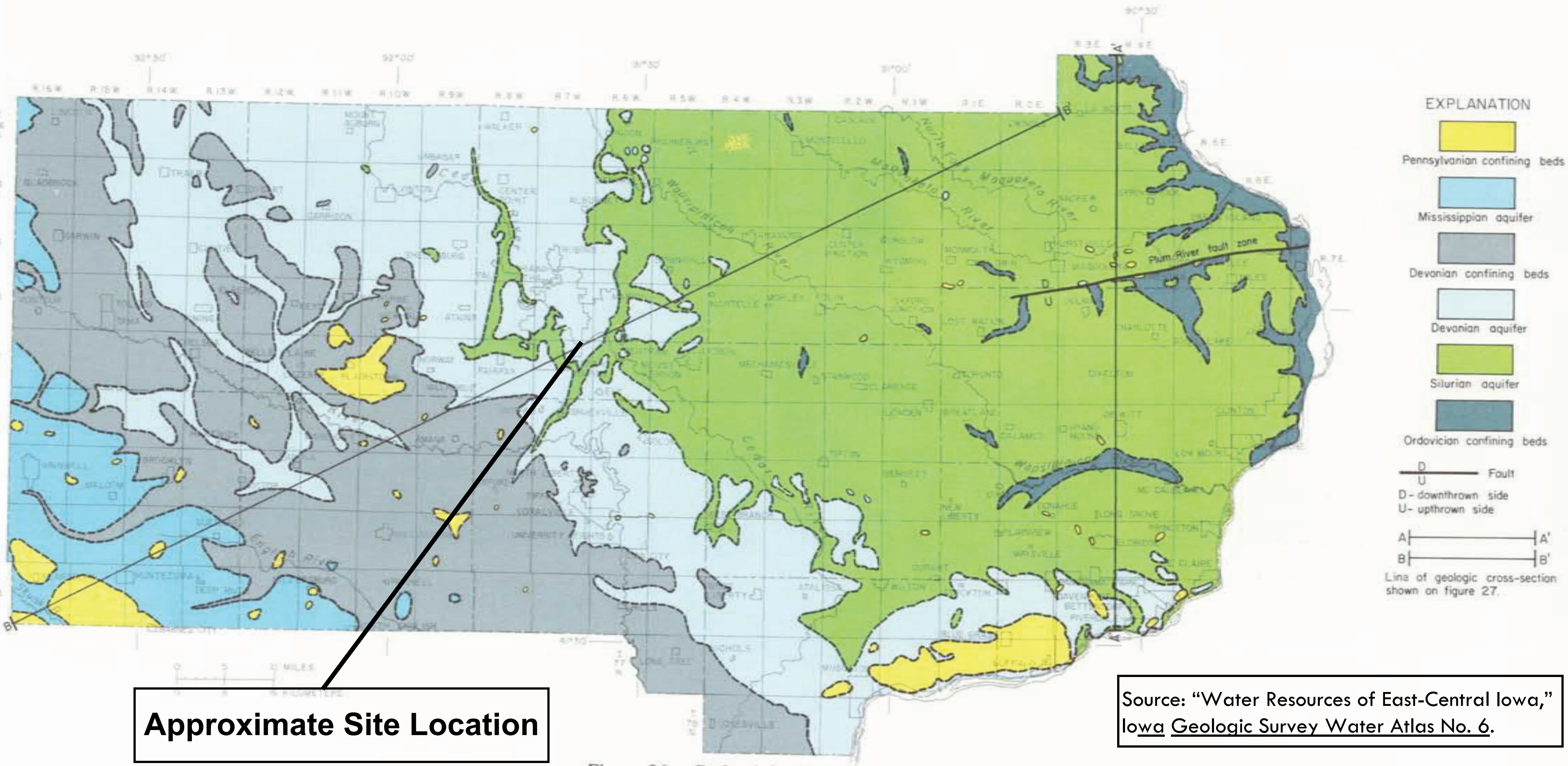


Figure 26.—Bedrock hydrogeologic map

The Cambrian-Ordovician aquifer and the underlying Dresbach aquifer are not at the bedrock surface in east-central Iowa. These aquifers are shallowest in the northeastern part of the area; they slope southwest and become progressively deeper in the subsurface. Figure 27 shows that all the rock units are approximately parallel to each other and dip (slope) toward the southwest.

A major structural feature, the Plum River fault zone, extends approximately 30 miles through southern Jackson County and northwest Clinton County. This structure continues eastward approximately 40 miles into northwest Illinois, where it was originally recognized and mapped (Kolata and Buschbach, 1976). As much as 400 feet of vertical displacement has been inferred by the Illinois State Geological Survey in the vicinity of Savannah, Illinois, and similar displacements may occur in Iowa between Preston and Maquoketa. In the vicinity of Preston, an uplifted area south of the fault zone is indicated by the anomalous presence of the Ordovician confining beds at the land surface. Preliminary results from an ongoing research drilling program in the Devonian and Silurian aquifers have indicated a possible extension of the structure as far west as southern Linn County, Iowa. The Plum River fault zone is probably quiescent, as no evidence of geologically recent movement along the fault has been found.

The fault zone has cut the various bedrock aquifers and confining beds, and faulting has placed them adjacent to rock units of dissimilar hydrologic characteristics (fig. 27). Depending on the local displacement or associated fracturing, the fault may serve either as a barrier to or a conduit for ground water movement. Where an aquifer is placed against a confining bed the fault may serve as an impediment to ground-water movement. Where two different aquifers are placed against one another by the fault there may be continuity between the two aquifers.

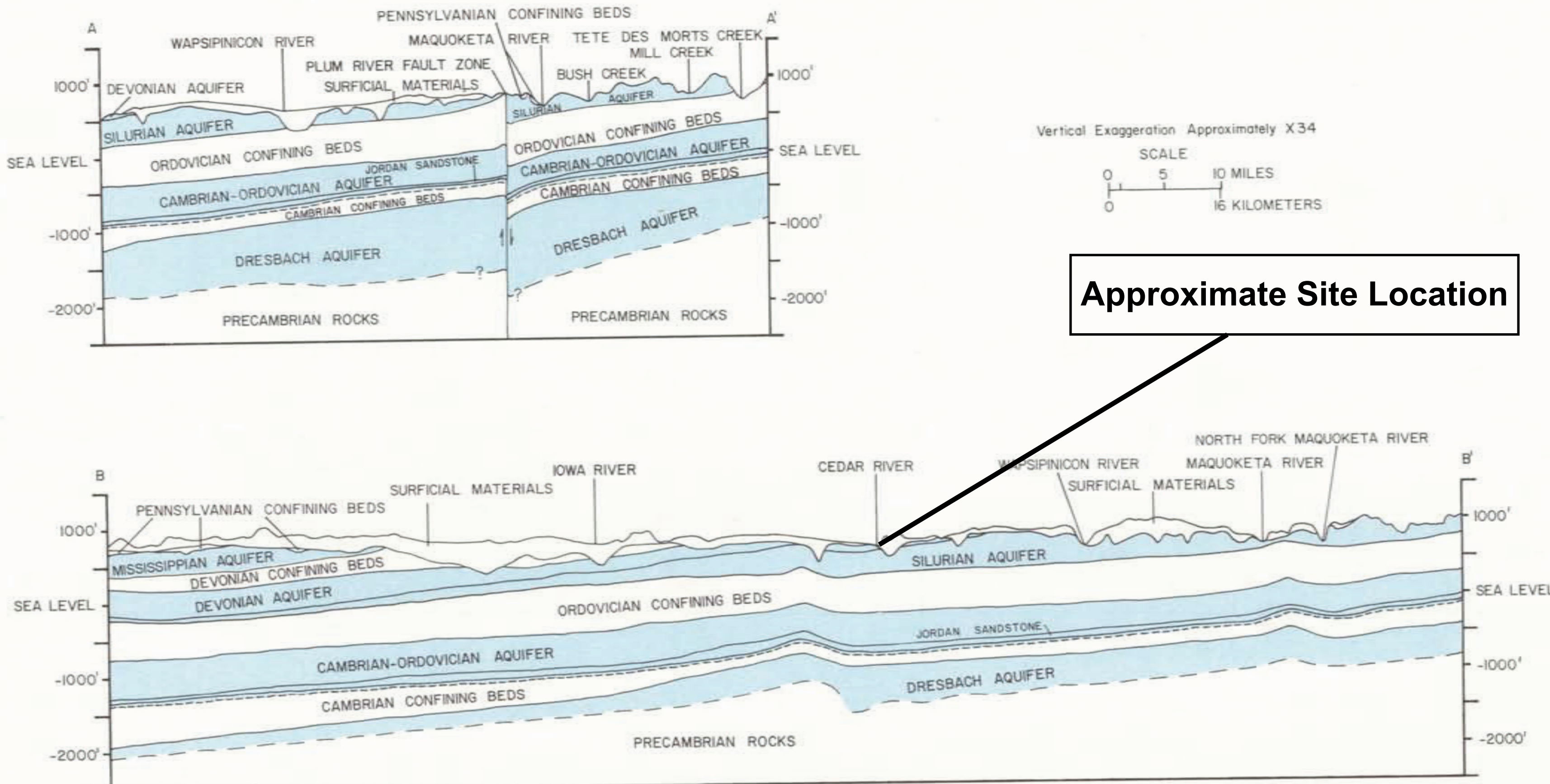


Figure 27.—Hydrogeologic cross sections

Source: "Water Resources of East-Central Iowa," Iowa Geologic Survey Water Atlas No. 6.

Appendix B

Boring Logs

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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-301

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	10/31/2016	10/31/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-301	Feet	730.0 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,447,401 N, 5,426,409 E S/C/N
SW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W

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

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

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
				TOPSOIL.										
			0.5–6	SILT WITH SAND, very dark grayish brown (10YR 3/2).	ML									
S1	19	3 4 4 6						0.5		M				
S2	24	2 7 6 9						0.3		M				
			6–8	LEAN CLAY WITH SAND, dark grayish brown (10YR 4/2).	CL									
S3	22	3 3 4 6	8–10	POORLY GRADED SAND WITH SILT, dark yellowish brown (10YR 3/4), medium grained.	SP			0.4		M				
S4	23	3 4 4 5	10–12.5	SANDY SILT, dark yellowish brown (10YR 3/4).	ML			0.3		M				
S5	12	4 9 11 12	12.5–16	POORLY GRADED GRAVEL, dark yellowish brown (10YR 3/4), coarse grained.	GP			0.3		W				water at 12.5 ft bgs.

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 53711	Tel: (608) 224-2830 Fax:

Boring Number MW-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	17	5 11 11 11	17	POORLY GRADED GRAVEL, dark yellowish brown (10YR 3/4), coarse grained. *(continued)*				0.3		W				
			18											
S7	17	5 8 9 9	19					0.2		W				
			20		GP									
S8	23	2 2 1 4	21					0.2		W				
			22											
			23											
				End of boring at 23.5 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
Prairie Creek Generating Station SCS#: 25220057		MW301A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Roy Buckenberger Cascade	6/23/2020	6/23/2020	vibratory

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW301A	Feet	Feet	6.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids, Iowa

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	Topsoil. 10YR3/4.	ML									
			2–10	Silt with trace fine sand. 10YR3/4.	ML									
1	36								1.0	M				
2	36								1.0	W				
			10–15	No Return.										
	0													

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

Signature	Firm	
Zach Watson	SCS Engineers 2830 Dairy Dr., Madison, WI, 53718	Tel: Fax:

Boring Number MW301A

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
			15–20	Silty Sand. Fine Sand. Well Graded. 10YR3/4.	SM									
3	60									W				
			20–25	Tan and Rust colored Silty Sand. 2.5Y4/3 and 10YR3/4.	SM									
4	60									W				
			25–26	Silty Gravel. 2.5Y2.5/1	GM									
			26–40	Lean Clay. Stiff and uniform. No coarse material. Grey. 5Y4/1.	CL									
5	60								1.3	W				
6	60								1.0	W				
7	60								1.5	W				

Boring Number MW301A

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
				Lean Clay. Stiff and uniform. No coarse material. Grey. 5Y4/1. *(continued)*										
			41											
			42											
8	60								1.0	W				
			43											
			44											
			45											
			46											
			47		CL									
9	60								1.0	W				
			48											
			49											
			50											
			51											
10	48		52						1.5	W				
			53											
			54											

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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-302

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	10/31/2016	10/31/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-302	Feet	720.3 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,447,399 N, 5,426,146 E S/C/N
SW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ____ ° ____ ' ____ "
Long ____ ° ____ ' ____ "
Local Grid Location: ☐ N ☐ E; Feet ☐ S; Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–1	TOPSOIL.										
			1–4.5	SILT WITH SAND, very dark grayish brown (10YR 3/2).	ML									
S1	5	1 4 8 9						0.5		M				water at 4.0 ft bgs.
			4.5–6	SILTY SAND, greenish gray (5GY6/1).	SM									
S2	14	2 3 3 7	6	POORLY GRADED SAND, greenish gray (5GY 6/1), coarse grained.	SP			1.0		W				
S3	12	1 2 2 2	8	Same as above except, dark yellowish brown (10YR 3/4).				0.7		W				
S4	24	2 3 4 6			SP			0.5		W				
S5	14	1 2 2 2						0.5		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
2830 Dairy Drive Madison, WI 53711
Tel: (608) 224-2830
Fax:

Boring Number MW-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	23	2 3 4 4	17	SILT, greenish gray (5GY 6/1).	ML			0.3		W				
				End of boring at 17 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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-303

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	12/6/2016	12/6/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-303	Feet	707.0 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,275 N, 5,425,166 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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	SILT, very dark grayish brown (10YR 3/2).	ML									
S1	20	20 20 27 34						0.2		M				
			4–15.5	POORLY GRADED SAND, very dark grayish brown (10YR 3/2), coarse grained.	SP									
S2	12	2 17 20 21						0.2		W				saturation @ 5ft.
S3	16	7 8 8 6						0.2		W				
S4	17	4 3 3 3						0.2		W				
S5	17	1 1 2 3		Same as above except, brown (10YR 5/3), trace fine gravel.						W				
				End of boring at 15.5 ft bgs.										

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 53711	Tel: (608) 224-2830 Fax:

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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-304

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	12/6/2016	12/6/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-304	Feet	707.1 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,415 N, 5,425,664 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W

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

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

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–7.5	SILT, very dark grayish brown (10YR 3/2),	ML									
S1	6	50/0.2						0.2		M				water in borehole at 3 ft bgs.
S2	5	6 5 7 7						0.3		W				saturation @ 5ft.
			7.5–14.5	POORLY GRADED SAND, very dark grayish brown, medium to coarse grained.	SP									
S3	5	3 4 6 9								W				
S4	12	1 2 2 2								W				
S5	23	4 6 6 8								W				
			14.5–15.5	SILTY CLAY, gray.	CL									
			15.5	End of boring at 15.5 ft bgs.										

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 53711
Tel: (608) 224-2830
Fax:

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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-305

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	12/5/2016	12/5/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-305	Feet	707.1 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,467 N, 5,425,930 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ° ' " Long ° ' "
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–5	SILT, very dark grayish brown (10YR 3/2), trace sand.	ML									
S1	17	1 3 5 6						0.2		M				water in borehole at 3 ft bgs.
			5–14	POORLY GRADED SAND, dark brown (10YR 3/3), coarse sand.	SP									
S2	12	1 3 4 5						0.1		W				saturation @ 5ft.
S3	18	1 1 3 4						0.9		W				
S4	14	9 13 21 19						0.4		W				
S5	16	14 15 23								W				
			14–15.5	LEAN CLAY, very dark gray (10YR 3/1).	CL									
				End of boring at 15.5 ft bgs.										

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 53711
Tel: (608) 224-2830
Fax:

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 - Prairie Creek Generating Station SCS#: 25215135.60		MW-306

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/2/2016	11/2/2016	HSA

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-306	Feet	710.1 Feet	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,572 N, 5,426,326 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–3.5	SILT, dark yellowish brown (10YR 3/4).	ML									
S1	9.5	4 5 5 5	3.5–5	POORLY GRADED SAND, very dark grayish brown (10YR 3/2), coarse grained.	SP			0.7		W				Plastic debris- water at 4 ft bgs
S2	14	1 1 1 1	5–12.5	SILT, very dark grayish brown (10YR 3/2).	ML			0.5		W				
S3	NR	3 2 1 1						-		-				plastic debris
S4	NR	1 1 2 3						-		-				
S5	10	1 2 3 3	12.5–16	POORLY GRADED SAND, very dark gray (10YR 3/1), coarse grained.	SP			0.1		W				plastic and glass debris

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 53711	Tel: (608) 224-2830 Fax:

Boring Number MW-306

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	22	2 1 1 1		POORLY GRADED SAND, very dark gray (10YR 3/1), coarse grained. *(continued)*				0.4		W				plastic debris
			17											
			18											
S7	19	2 1 1 1	19					0.3		W				
			20											
S8	6	2 1 1 2	21					0.2		W				
			22											
S9	14	8 4 4 12	23	Same as above except, dark gray (5Y 4/1).	SP			0.6		W				
			24											
			25											
S10	20	4 4 15 22	26					0.3		W				
			27											
S11	12	8 8 20 31	28					0.2		W				
			29											
			30											
				End of boring at 30.5 ft bgs.										

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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
Prairie Creek Generating Station SCS#: 25220057		MW306A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Roy Buckenberger Cascade	6/23/2020	6/23/2020	vibratory

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW306A	Feet	Feet	6.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐	Lat / Long	Local Grid Location
State Plane N, E S/C/N 1/4 of 1/4 of Section , T N, R	Lat ° ' " Long ° ' "	Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids, Iowa

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
			0–1	Topsoil. Organic Material.	ML									
1	60		1–3	Waste. Plastic wrapping. Soil.						W				
			3–5	Tan/Brown soil/silt. 10YR3/4.	ML									
2	60		5–10	Dark Black Sand and Silt. Well Graded. 10YR2/1.	SW					W				
			10–12	Well Graded Sand. Light Grey. 2.5Y3/1.	SW									
3	60		12–15	Silt with fine sand.	ML					W				

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

Signature	Firm	
Zach Watson	SCS Engineers 2830 Dairy Dr., Madison, WI, 53718	Tel: Fax:

Boring Number MW306A

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
			15–22	Well graded sand. 2.5Y3/1.	SW									
4	60									W				
			22–25	Silt with Sand. 5Y4/2.	ML									
5	60									W				
			25–35	Well Graded Sand.	SW									
6	60									W				
7	60									W				
			35–40	Finer sand than above.	SW									
8	60									W				

Boring Number MW306A

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
9	60		40–45	Well Graded Sand. Fine sand to gravel. Some rocks greater than 1 inch in size.	SW					W				
10	60		45–50	Lean Clay. Soft. 2.5Y3/2. Sand Lens at 54 feet.	CL				0.5	W				
11	60		50–55						2.0	W				
			55						2.5					
12	60		57–61	Well Graded Sand. Fine to Coarse grained. Few fines.	SW					W				

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
Prairie Creek Generating Station SCS#: 25218184		MW-307

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling, LP	11/27/2018	11/27/2018	sonic

		Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-307	708.5 Feet	718.9 Feet	6.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,497 N, 5,426,934 E S/C/N
NE 1/4 of NE 1/4 of Section 3, T 83 N, R 7 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location: ☐ N ☐ S Feet; ☐ E ☐ W Feet

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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	Topsoil and clay, black, (10YR 2/1), (Fill).										
S1			1–3							M				
			5	Black ash? (Fill).										
			6	LEAN CLAY, black (10YR 2/1), (Fill).	CL									
S2			7	SILT, dark gray/black, (5YR 3/1).	ML					M				
S3			9	LEAN CLAY, dark gray, (5YR 2.5/2).	CL					M				
S4			11							M				
S5			13.5	SILTY SAND, coarse sand, light brown, (2.5YR 3/1).	SM					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 3900 kilroy Airport Way Long Beach, CA 90806	Tel: Fax:

Boring Number MW-307

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			16	SILTY SAND, fine to medium, light brown, (2.5YR 4/4).	SM					W				
S7			17–21	SILTY SAND, medium to coarse, light brown, (2.5YR 5/4).	SM					W				
			21	End of boring at 21 feet below ground surface.										

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
Prairie Creek Generating Station SCS#: 25218184		MW-308

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling, LP	11/27/2018	11/27/2018	sonic

		Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-308	711.5 Feet	717.5 Feet	6.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,434 N, 5,426,646 E S/C/N
NE 1/4 of NE 1/4 of Section 3, T 83 N, R 7 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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	Topsoil, black.										
			0.5	LEAN CLAY, black, (2.5YR 2.5/1), (Fill).										
S1			2		CL					M				
			3.5	LEAN CLAY, brown, (2.5YR 4/4), (Fill).										
S2			4		CL				1.5	M				
			5.5	Ash, black, (2.5YR 3/1), (Fill).										
S3			6							M				
S4			7.5							M				
			8	LEAN CLAY with silt, gray, (5YR 5/1).										
S5			9		CL					M				
			10	SANDY SILT, dark gray, (5YR 2.5/1).										
S6			11							W				
			12.5		ML									
S7			14	Same as above but (5YR 2.5/2).						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 3900 kilroy Airport Way Long Beach, CA 90806 Tel: Fax:

Boring Number MW-308

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
				SANDY SILT, dark gray, (5YR 2.5/1). *(continued)*										
			16											
S8			17	Same as above but (5YR 2.5/1).	ML					W				
			18											
			19											
S9			20	SILTY SAND, coarse, (5YR 4/2).	SM					W				
			21	End of boring at 21 feet below ground surface.										

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 - Prairie Creek Generating Station SCS#: 25218218.00		MW-309

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Crank Roberts Environmental Drilling, Inc.	8/5/2019	8/5/2019	4 1/4" hollow stem auger

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-309	Feet MSL	708.1 Feet MSL	8.5 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,466 N, 5,425,409 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W

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

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

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
S1	8	1 3 3 4	0–2	SILT, dark brown, (10YR 2/1), with sand, trace gravel.	ML					M				
S2	18	3 3 2 3	2–4	SILTY SAND.	SM					M				
S3	12	1 1 1 2	4–6	SILT, with sand, brown, (10YR 3/2), soft.	ML					W				
S4	12	2 2 1 2	6–10	SILTY SAND, mottled grey, tan, and brown.	SM					W				
				Variable color - grey, rust, and tan.										
S5	20	0 1 2 1		Coarser sand.						W				
S6	12	0 0 1 1	10–15	POORLY GRADED SAND, coarse, some fine and medium sand.	SP					W				
S7	12	1 1 3 3		With organic material.						W				

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

Signature	Firm SCS Engineers	Tel: Fax:

Boring Number MW-309

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
S8	12	1 2 4 5	16		SP					W				Blind drilled from 16' to 17'
			17	End of Boring.										

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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
Prairie Creek Generating Station SCS#: 25220057		MW309A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Roy Buckenberger Cascade	7/23/2020	7/23/2020	vibratory

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW309A	Feet	Feet	6.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids, Iowa

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
1	60		0–5	Topsoil. Organic material, roots, trace coarse material. 10YR2/1.	ML					M				
2	60		5–10	Silty Sand. Fine to medium grained sand. Well Graded. 10YR3/4.	SM					W				
3	60		10–15	Well graded Gravel with sand. Four inch lens of silt with sand. 7.5YR2/1. Well Graded sand with gravel towards base (14-15 feet).	GW					W				

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

Signature	Firm	
Zach Watson	SCS Engineers 2830 Dairy Dr., Madison, WI, 53718	Tel: Fax:

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
				Silty Sand. Fine to coarse sand with a few lenses of silt with sand. 2.5Y3/2.										
			16											
			17											
4	60									W				
			18											
			19											
			20		SM									
			21											
			22											
5	60									W				
			23											
			24											
			25	Well graded Sand. Fine to coarse grained sand. 2.5Y3/2.										
			26											
			27											
6	60									W				
			28											
			29											
			30											
			31											
			32											
7	60				SW					W				
			33											
			34											
			35											
			36											
			37											
8	60									W				
			38											
			39											
			40											

Boring Number MW309A

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
9	60		41–45	Well graded Sand. Fine to coarse grained sand. 2.5Y3/2. *(continued)*	SW					W				
			46											

State of Wisconsin
Department of Natural Resources

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

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
IPL - Prairie Creek Generating Station SCS#: 25218218.00		MW-310

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Crank Roberts Environmental Drilling, Inc.	8/6/2019	8/6/2019	4 1/4" hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-310	Feet MSL	708.09 Feet MSL	8.5 in.

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,623 N, 5,425,792 E S/C/N
NW 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Linn		Cedar Rapids

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	SILTY SAND, brown, (10YR 2/1), (topsoil).	SM									
S1	12	1 2 2 4	1							M				
S2	2	6 6 4 4	3							M				
			4	LEAN CLAY, brown, (10YR 2/1), some lenses of silty sand, organic material.	CL									
S3	10	4 4 2 3	5							M				
S4	6	3 1 1 2	7							M				
			8	SILTY SAND, coarse.	SM									
S5	20	3 2 1 1	9							W				
S6	18	3 2 1 1	11							W				
S7	12	1 1 2 2	13							W				
			14	SILTY GRAVEL, with sand.	GM									

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:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A

Boring Number MW-310 Use only as an attachment to Form 4400-122.

Sample									Soil Properties					
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
S8	12	1 5 4 3	16		GM					W				Blind drilled from 16' to 17'
			17	End of Boring.										

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
Prairie Creek Generating Station SCS#: 25220057		MW310A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Roy Buckenberger Cascade	7/23/2020	7/23/2020	vibratory

Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW310A	Feet	Feet	6.0 in

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane N, E S / C / N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids, Iowa

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	Topsoil. Organic material, roots and plant material.	ML									
1	60		2–9	Lean Clay. Soft, trace coarse material. 2.5Y3/2.	CL					M				
2	60								0.5	W				
3	60		9–15	Fine to Coarse Sand. Well Graded Sand. 2.5Y3/1.	SW					W				

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

Signature: Zach Watson

Firm: SCS Engineers
2830 Dairy Dr., Madison, WI 53718
Tel:
Fax:

Boring Number MW310A

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
4	60		15–21	Lean Clay. trace coarse material (Fine Sand). 5Y4/1.	CL				1.5	W				
5	60		21–33	Well graded sand with silt and gravel. 5Y4/2.	SW-SM					W				
6	60									W				
7	60									W				
			33–34	Silt with gravel.	ML									
8	60		34–40	Well graded sand with silt and gravel. 5Y4/2.	SW-SM					W				

Boring Number MW310A

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
9	60		41–46	Well graded sand with silt and gravel. 5Y4/2. *(continued)*	SW-SM					W				

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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 - Prairie Creek Generating Station SCS#: 25215135.60		B-307X

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/1/2016	11/1/2016	HSA

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

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,645 N, 5,426,607 E S/C/N
NE 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–5	SILT WIH SAND, very dark gray (10YR 3/1), trace coarse gravel.	ML									
S1	16	2 4 6 6						0.7		M				glass debris
			5–16	SILT, very dark gray (10YR 3/1), trace coarse gravel.	ML									
S2	14	1 4 8 17						0.7		M				soil staining-glazed look.
S3	22	5 9 13 14						1.4		M				wood debris
S4	18	4 5 13 15						2.6		M				black soil staining
S5	16	2 3 4 8						1.6		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 53711
Tel: (608) 224-2830
Fax:

Boring Number B-307X

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	23	2 5 6 6	17	SILT, very dark gray (10YR 3/1), trace coarse gravel. *(continued)*				1.3		M				black soil staining
S7	16	4 3 5 7	18, 19					9.5		M				black soil staining-petro odor
S8	16	5 15 25	20, 21, 22					3.4		W				water at 20 ft bgs - plastic debris
S9	1	100/0.1	23, 24, 25		ML			1.7		W				
S10	10	20 13 18 21	26, 27					1.6		W				plastic debris
S11	8	3 5 5 5	28, 29, 30					1.9		W				plastic debris
S12	10	2 3 7 7	31, 32	POORLY GRADED SAND, very dark gray (5Y3/1), medium grained.				1.5		W				
S13	8	3 10 16 16	33, 34		SP					W				plastic debris
				End of boring at 34.5 ft bgs.										

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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 - Prairie Creek Generating Station SCS#: 25215135.60		B-308X

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mike Mueller Cascade Drilling	11/1/2016	11/1/2016	HSA

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

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 3,448,646 N, 5,427,076 E S/C/N
NE 1/4 of NE 1/4 of Section 3, T 82 N, R 7 W
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	Civil Town/City/ or Village
	Linn	Cedar Rapids

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
			0–12.5	SILT WITH GRAVEL, very dark gray (10YR 3/1), coarse gravel.	ML									
S1	14	8 12 10 10						1.8		M				
S2	8	1 7 7 7						1.3		M				plastic debris
S3	9	3 3 9 12						2.6		W				water at 8.5 ft bgs.
S4	NR	11 10 5 4						-		-				
			12.5–15	SILT WITH SAND, very dark gray (10YR 3/1).	ML									
S5	8	5 8 7 11						2.1		W				plastic debris
			15–16	SILT WITH GRAVEL, very dark gray (10YR 3/1), coarse grained.	ML									

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 53711 | Tel: (608) 224-2830 Fax:

Boring Number B-308X

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	3	6 21 15 6	17	SILT WITH GRAVEL, very dark gray (10YR 3/1), coarse grained. *(continued)*				1.9		W				
S7	NR	1 5 1 4	18, 19		ML			-		-				
			20	LIMESTONE, pale yellow (5Y 8/3), highly weathered.										
S8	2	100/0.4	21, 22					1.4		W				plastic debris
S9	12	37 41 44 58	23, 24, 25					1.3		W				
S10	4	27 19 14 33	26, 27					1.5		W				
S11	3	100/0.3	28					1.7		W				
				End of boring at 28 ft bgs.										

Appendix C

Hydrogeochemical Conceptual Model and Preliminary Summary of Groundwater

Subject: Conceptual Site Model

From: Bernd W. Rehm Date: 5 August 2021

Project: SCS -Alliant. Prairie Creek Generating Station. CCR Support. 158-002d

Introduction.

Prairie Creek Generating Station (PCS) and its associated coal combustion residual (CCR) management units began operation in 1958. The PCS CCR closures in December 2018 include eight ponds, a bottom ash pile, and the beneficial use storage area (Figure 1). Material from a hydrated fly ash storage pile was also incorporated into the closure. Materials were consolidated and capped within a Closure Area located within the footprint of six of the original ponds (3 through 8).

The two easternmost ponds, bottom ash pile, hydrated fly ash storage pile and the beneficial use storage area were excavated and consolidated within the CCR limits. The base of the Closure Area appears to consist of native soils, presumably alluvium consisting of sand, silty sand, silt and clay deposits. The elevation of the base of the CCR appears to be on the order of 704 to 709 feet (Foth Environment & Infrastructure , December 2018. IPLC PCGS CCR Surface Impoundments Closure and Hard Hat Services, October 2016 CCR Surface Impoundment Inflow Design Flood Control Plan). A compacted soil cover with a hydraulic conductivity of < 5 E-7 cm/s was placed over the consolidated CCR.

The following document uses information provided by SCS to develop a conceptual site model (CSM) for groundwater beneath the PCS and the consolidated CCR. A discussion of the need and possible options for groundwater remedies based on the CSM follows.

Conceptual Site Model.

Hydrogeology. Fourteen borings and monitoring wells (Figure 1) have been installed on the PCGS between 2016 and 2020 (Alliant Energy's CCR Rule Compliance Data and Information web site). Ten monitoring wells are installed to a depth of less than 25 feet below ground surface (bgs) and completed at the water table. Four monitoring wells have been completed as piezometers to depths of about 45 to 60 feet bgs.

The site to the north of the CCR limits has a ground surface elevation of about 710 feet (elevations from the Alliant Energy's CCR Rule Compliance Data and Information web site). The boring logs show the first 5 to 10 feet of soil consist of silty sand, silt and clay units. This is underlain by at least 5 to 10 feet of fine to coarse well-graded sand or gravel with sand to an elevation of about 695 feet to the east and 685 feet to the west. The soil is often described as dark grey, black or greenish grey suggesting reduced or anoxic conditions. Only the MW-306A boring found a 12-foot thick layer of soft lean clay below an elevation of about 670 feet. The boring was terminated after passing through 4 feet of well-graded sand. Borings for MW-309A and -310A did not encounter the clay to an elevation of ~660 feet.

To the south of the CCR limits, borings encountered interbedded sand, silt and clay to a depth of about 13 feet followed by sand or poorly graded gravel to 24 ft. The soil is typically described as brown or yellowish brown suggesting oxidized conditions. Boring MW-301A was advanced to an elevation of about 676 feet (54-foot depth) with lean stiff clay found from 26 to 54 feet bgs.

The general topography suggests that the geology north of the CCR limits reflects alluvial deposits within the Prairie Creek Valley. The topographic setting and geology encountered by the upgradient borings suggest that the shallow sediments south of the CCR units may have a different origin or depositional setting even though their Unified Soil Classifications are similar. The area to the south of the CCR limits may reflect the geology of the uplands bordering the valley.

Shallow wells found the water table in October 2020 to be about 15 feet bgs, at an elevation of ~714 feet, to the south and upgradient of the CCR limits (Alliant Energy's CCR Rule Compliance Data and Information web site). To the north of the CCR limits, the water table is very flat at elevations generally on the order of 702 to 703 feet. The water table is found above the silty sand silt and clay found between elevations of 695 and 690 feet such that the sand above these elevations appears to form an “upper” aquifer. The well-graded sand below 685 feet to the west and below 690 feet to the east forms a “lower” aquifer. To the east of the CCR limits, that water table at MW-307 and -308 was reported between elevations of 704 to 709 feet in 2020. Ground surface in this area is about 720 feet in elevation placing the water table 11 to 16 feet bgs.

The elevation of the surface of Prairie Creek defines the hydraulic head at the assumed area of groundwater discharge. Staff gauges will be installed to provide more specific information.

Based on USGS topographic mapping, the creek surface elevation is between 700 and 702 feet, making the creek the likely point of groundwater discharge north of the CCR limits. The Alliant Energy's CCR Rule Compliance Data and Information web site notes that the 2020 horizontal hydraulic gradient on the water table to the north of the CCR limits is 0.004 to 0.008. The elevation of the water table beneath the CCR limits is not known but can be estimated based on water levels observed within the groundwater monitoring network. Given the CCR surface elevation of ≥ 720 feet, the presence of a mound on the surface of the water table beneath the CCR cannot be ruled out. Assuming there is no mound, ReSolution Partners (RP) estimates the water table gradient appears to steeper, on the order of 0.011, beneath the CCR limits based on the water levels observed at MW-301 and -302. The degree to which the CCR is saturated can be estimated if it is assumed that the low permeability of the soil cover on the CCR precludes infiltration of precipitation and the formation of a water table mound beneath the CCR limits. Pre-closure and closure documentation suggest the elevation of the base of the CCR appears to vary from 704 to 709 feet. Linear interpolation from MW-301 to MW-305 suggests that 2 to 4 feet of CCR are saturated and in contact with shallow groundwater.

Vertical gradients at well pairs between the CCR limits and the creek are reported by SCS to be upward at 0.005 to 0.019 (Alliant Energy's CCR Rule Compliance Data and Information web site), slightly higher than the horizontal gradients in the area. This is consistent with Prairie Creek being a point of groundwater discharge. At the upgradient and upland location of MW-301 and -301A, the vertical gradient is strongly downward from the sand or gravel into the underlying clay (from -0.32 to -0.64). The downward vertical gradients may be over-estimated given potential hydraulic disequilibrium following the deep well installation.

The hydraulic conductivity of shallow sand near the water table and to the north of the CCR limits range from 1 E-2 to 2 E-1 cm/s (except for MW-308 at 5E-3 cm/s which is screened in sandy silt, Alliant Energy's CCR Rule Compliance Data and Information web site). The deeper piezometers were reported with comparable hydraulic conductivities. The geometric mean is reported as 2.7 E-2 cm/s. Using this value and an assumed porosity of 0.4, SCS estimated that horizontal groundwater flow velocities in 2020 ranged from 80 to 170 m/yr (260 to 550 ft/yr). It is on the order of 120 m from the CCR limits to Prairie Creek resulting in a 0.7 to 1.4 year groundwater travel time from the CCR limits to the creek.

Geochemistry. The groundwater beneath the PCGS was sampled during two or

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three events in 2020 and analyzed for a varying list of analytes (Alliant Energy's CCR Rule Compliance Data and Information web site). Table 1 of this document summarizes the mean concentrations for multiple analyses or the results of a single analysis for in-field parameters, major cations and anions and selected trace metals. Arsenic, lithium and molybdenum were included in the summary because at least one sample collected during 2020 exceeded groundwater protection standards.

Shallow upgradient (background, MW-301 and -302) groundwater is slightly acidic and oxic. Primary ions are calcium (120 mg/L) and bicarbonate (390 mg/L) with some sulfate (88 mg/L) and chloride (45 mg/L). Total iron concentrations (73 and 2,200 µg/L) were greater than dissolved iron concentrations (<50 and 430 µg/L). The concentrations were positively correlated with turbidity. This suggests that analyses of unfiltered water samples included ions dissolved from suspended solids during sample preservation and analysis. Total and dissolved manganese concentrations were comparable ranging from <4.0 to 89 µg/L. Total arsenic concentrations ranged from <0.88 to 4.4 µg/L, with a potential high bias due to inclusion of suspended sediment in the analyses (dissolved arsenic concentrations were not measured). Total molybdenum concentrations were <1.1 µg/L and dissolved molybdenum was not determined. Total lithium concentrations ranged from 3.8 to 15 µg/L.

The deep upgradient well (MW-301A) was installed in clay in June 2020 and sampled on two occasions, September and October 2020. Between the two sampling events the water level in the well rose by 10 feet, the DO decreased by 7 mg/L and the ORP decreased by 140 mV. The water was very turbid in September (290 NTU) and turbidity was not reported in October. These observations suggest that the monitoring well was not in hydraulic and chemical equilibrium in response to well installation.

Given the possible differences geologic setting between the upgradient wells and the downgradient wells, the geochemistry in the upland may not represent “background” for the compliance wells to the north of the CCR units. The natural geochemistry of the Prairie Creek alluvial deposits may be sufficiently different from the upgradient uplands to result in uncertainty in assessing the potential impact of the CCR units on the downgradient chemistry. In the potential absence of “background” geochemistry of the alluvial deposits, the following discussion assumes the upland setting as a point of comparison for the compliance monitoring wells.

Shallow downgradient compliance and delineation wells’ chemistry appear to fall into three general groups with the deep wells forming a fourth group, each correspond to three hydrogeologic settings:

- MW-303, -304, -305, -309 and -310 located to the north of the CCR limits,
- MW-306, and -308 located at the east end of the CCR limits,
- MW-307 east of the CCR limits, and
- MW-306A, -309A and -310A which may be nominally "upgradient" of the shallow wells due to upward hydraulic gradients.

Each group will be discussed separately.

The groundwater north of the CCR limits becomes slightly more alkaline from west to east (6.9 to 7.3 SU) and from south to north (7.1 to 7.3 SU). The DO and ORP are low (generally ≤ 0.2 mg/L and < -90 to -220 mV, respectively). The anoxic conditions are supported by the observation that the sediment in the area is often described as grey to black or greenish which suggests the presence of reduced iron and manganese. The driver for the anoxic conditions is not certain, but the presence of organic matter in the shallow alluvium may cause the anoxic conditions. The water samples generally have very little suspended sediment (0 to 5 NTU). This is consistent with the comparable dissolved and total iron concentrations reported from these wells. Calcium (87 to 130 mg/L) and bicarbonate (300 to 370 mg/L) are the major ions comparable to the shallow upgradient wells. Sulfate concentrations range from 110 to 240 mg/L, and chloride from 14 to 20 mg/L. Sulfate concentrations are higher and chloride concentrations lower than the upgradient shallow groundwater. The presence of sulfate suggests that the ORP of the shallow groundwater is not low enough to result in sulfate reduction and sulfide formation (note sulfide has not been measured in the field). Except for MW-305 with ~200 µg/L iron, the wells produce from ~2,000 to 6,000 µg/L of iron. Manganese concentrations range from ~100 to 1,000 µg/L. Four of the five wells north of the CCR limits produce samples with total arsenic concentrations exceeding the 10 µg/L GPS (11 to 110 µg/L). The exceedances are consistent over the several sampling events and the dissolved concentrations are comparable to the total concentrations. The arsenic concentration at MW-303 have increased by a factor of ~3 from 20 to 56 µg/L since 2016 without any evident response to the 2018 closure. There is no trend of decreasing concentrations with downgradient distance from the CCR limit.

The two wells at the east end of the CCR limits (MW-306 and -308) are more alkaline (pH typically 7.7 to 9.2 SU) than the wells to the west, but comparably anoxic (DO < 0.2 mg/L and ORP typically less than -100 mV). Calcium concentrations are lower (~60

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mg/L) while sodium concentrations are higher (~44 mg/L). Among the anions, bicarbonate is ~140 mg/L lower, sulfate is slightly higher at 150 mg/L and chloride is higher at 15 mg/L. Overall, the total dissolved solids content of ~390 mg/L is lower than the wells to the west at 530 to 690 mg/L. Monitoring well MW-308 produces total arsenic at concentrations (54 µg/L) comparable to the western wells, as well as 41 µg/L of lithium. The concentrations of both elements were comparable over two sampling events. MW- 306 yields total molybdenum at 260 µg/L. Again, the dissolved molybdenum concentrations confirmed the total concentrations. Molybdenum concentration trends reported by SCS (e-mail 27 April 2021) indicate concentrations were between 270 and 300 µg/L prior to closure in December 2018; decreased to ~190 µg/L in 2019 and then increased steadily to 240 µg/L in 2020.

Monitoring well MW-307 is about 300 feet to the east of the CCR limits. Groundwater from this well is anoxic, the most alkaline on the site (pH~8.8 SU) and is reported with the lowest level dissolved solids (~60 mg/L). Calcium and bicarbonate are the primary major ions. Iron and manganese were not detected in the water. Total arsenic was not detected, lithium concentrations were comparable to background levels. Molybdenum concentrations were higher than background but still well below the GPS.

The hydraulic data from three deeper wells to the north of the CCR limits indicate upward groundwater flow, suggesting the groundwater is likely unaffected by CCR leaching. The groundwater from the deep wells is slightly alkaline (pH of ~ 7.3 to 7.6 SU) and anoxic (DO ,0.2 mg/L and ORP between -100 and -200 mV). Calcium and magnesium are found at comparable concentrations (~45 mg/L) as are bicarbonate and sulfate (`~270 and 260 mg/L, respectively). Chloride concentrations (~45 mg/L) are higher than shallow groundwater downgradient of the CCR limits, but comparable to the shallow background results. Total arsenic was not detected, lithium concentrations were comparable to the shallow background and molybdenum was higher than the shallow background but less than half of its GPS.

Summary. Shallow groundwater flow to the northwest at 80 to 170 m/yr. It likely discharges into Prairie Creek on the order to 100 to 200 m from the CCR limits. The degree to which the CCR is saturated by the shallow groundwater is unknown. Deeper groundwater to the north of the CCR limits flows upward under hydraulic gradients that are higher than the horizontal gradients at the water in the same area.

The current upland wells are assumed to represent the “background” geochemistry of the compliance wells that may be completed in alluvial sediments distinct form the upland sediments. Shallow groundwater downgradient of the CCR limits contains arsenic from 11 to 110 µg/L, well above its GPS of 10 µg/L. There is no trend of decreasing arsenic concentrations from the CCR limits to the creek. At the east end of the CCR limits, one monitoring well is reported with molybdenum and one with lithium at concentrations above their GPS values. There is insufficient data to determine if there are spatial trends in the concentrations.

Preliminary Observations on Potential Groundwater Remedies

Three elements are found above GPS downgradient of the CCR limits: arsenic, lithium and molybdenum. The evaluation of potential remedies will address these three elements.

Monitored Natural Attenuation. Arsenic in groundwater extends from the downgradient limits of the CCR to monitoring wells adjacent to Prairie Creek. The Alliant Energy's CCR Rule Compliance Data and Information web site notes that arsenic concentration trends over the 2 to 3 years since the CCR was capped have been flat to increasing. The arsenic concentrations, therefore, probably reflect an equilibrium leaching condition given the extended history of the ash pond system relative to the approximate 1 year groundwater travel time from the CCR limits to the creek.

Groundwater north of the CCR is anoxic and iron appears to be in a soluble ferrous form. Therefore, ferric iron oxyhydroxide that could potentially adsorb and coprecipitate arsenic is not present. The attenuative capacity present in the aquifer may have been reduced by historical arsenic releases. There is insufficient spatial data to determine whether lithium or molybdenum have reached Prairie Creek. In addition, molybdenum concentrations have been increasing since 2019. Given the high groundwater flow rates, site groundwater chemistry and lithium and molybdenum chemistry, it is likely that both elements have also reached the creek.

It is possible that arsenic and molybdenum may be attenuated in the bottom sediments of Prairie Creek if organic-rich, strongly anoxic, sediments in the creek reduce the 100 to 200 mg/L of sulfate in the groundwater to sulfide. The sulfide could combine with the iron in the groundwater resulting in the precipitation of iron-arsenic sulfide and molybdenum sulfide.

The attenuative capacity of the aquifer and Prairie Creek sediments can be evaluated with further site and laboratory investigations.

***In Situ* Stabilization.** Potential *in situ* chemical stabilization for arsenic, lithium and molybdenum of the several feet of CCR that may still be in contact with shallow groundwater flow may no longer be practical or cost-effective given the 30-foot thickness of CCR and the presence of the low-permeability soil cap.

Permeable Reactive Barrier (PRB). An approximately 1,500-foot long PRB could be placed between the CCR limits and Prairie Creek. Borings suggest that the 5- to 10-foot thick "upper aquifer" may be the primary groundwater flow pathway for arsenic, lithium and molybdenum. Additional monitoring wells placed at the top of the "lower aquifer" would be needed to confirm that CCR constituents are limited to the "upper aquifer". If confirmed, the PRB would be on the order of 15 feet deep to the east and 20 feet deep to the west.

The presence of aqueous iron and sulfate suggests that the PRB could use zero-valent iron (ZVI) to further reduce the ORP, driving formation of sulfide that could potentially sequester arsenic and molybdenum by coprecipitation. However, the very high groundwater flow rate may require a relatively thick PRB in order to establish long enough residence times for reduction and sequestration reactions to occur. Evaluating PRB thickness would require laboratory column testing and/or in-field pilot testing. A ZVI remedy would not likely affect lithium. This may not be a concern unless the single location with lithium concentrations slightly above its GPS is confirmed.

Cutoff Wall. There appears to be several feet of CCR in contact with the groundwater below the low permeability cap that leaches arsenic, lithium and molybdenum. Coupling the minimization of infiltration through the unsaturated CCR with prevention of active groundwater contact with the CRR may cut off the release of these elements to the downgradient monitoring well. A ~3,500-foot long by ~25-foot deep cutoff wall (e.g. sheet piling or slurry wall) surrounding the CCR limits could isolate the CCR from the flowing groundwater. If the geology found to the north of the CCR extends below the closure area, the cutoff wall could key into the silt and clay alluvium found at an elevation of ~700 feet. Borings surrounding the CCR limits would be required to determine whether the subsurface geology is suitable for a cutoff wall.

Final

Table 1. Groundwater chemistry summary (April, September and October 2020).

Parameters	Units	Background			Compliance/Delineation											Groundwater Protection Standard
					Group 1					Group 2		Group 3	Group 4			
		MW-301	MW-301A	MW-302	MW-303	MW-304	MW-305	MW-309	MW-310	MW-306	MW-308	MW-307	MW-306A	MW-309A	MW-310A	
Screen Bottom Elevation	ft	707.5	675.9	705.3	692.5	692.6	692.6	693.1	693.1	680.6	696.5	697.9	649.7	663.2	663.2	---
Lithology	---	Gravel	Clay	Sand	Sand	Sand	Sand	Sand	Silty Sand	Sand	Sandy Silt	Silty Sand	Sand	Sand	Sand	---
pH	SU	6.99	7.18	6.47	6.93	6.84	7.01	7.09	7.31	7.30	8.75	8.77	7.58	7.3	7.25	---
DO	mg/L	3.6	4.8	1.8	0.1	0.1	0.4	1.5	1.3	0.2	0.2	0.2	0.1	0.1	0.2	---
ORP	mV	140	20	26	-150	-90	-33	-200	-220	-170	-100	-120	-120	-160	-150	---
SEC	µS/cm	970	510	670	890	810	950	960	800	540	660	190	1070	780	1240	---
Turbidity	NTU	6	*290*	18	14	1	2	3	4	12	2	3	70	1	2	---
Calcium	mg/L	150	74	98	110	100	130	120	94	54	61	19	150	110	180	---
Magnesium		*44*	*23*	*33*	*35*	*29*	*36*	*33*	*26*	*12*	*3.1*	*2.3*	*45*	*29*	*48*	---
Sodium		*14*	*14*	*16*	*34*	*40*	*46*	*34*	*53*	*54*	*33*	*4.6*	*33*	*14*	*15*	---
Potassium		*0.93*	*2.1*	*0.64*	*4.8*	*5.2*	*5.4*	*4.8*	*5.8*	*0.86*	*5.3*	*1.6*	*1.6*	*1.7*	*1.1*	---
Alkalinity		*470*	*330*	*310*	*370*	*350*	*340*	*360*	*300*	*160*	*120*	*41*	*200*	*280*	*320*	---
Sulfate		104	7.1	72	130	110	240	140	140	120	170	31	340	110	320	---
Chloride		54	3.4	39	16	14	16	15	20	21	9.7	2.9	64	24	47	---
TDS		650	380	440	610	550	690	630	530	390	380	59	820	480	870	---
Iron	µg/L	*73*	*1,000*	*2,200*	*3,400*	*2,000*	*220*	*1,200*	*4,400*	*1,800*	*<50*	*<50*	*2,800*	*7,500*	*6,300*	---
Iron, dissolved		*<50*	*97*	*430*	*3,100*	*2,000*	*180*	*1,200*	*4,100*	*1,500*	*<50*	*<50*	*1,700*	*7,600*	*6,100*	---
Manganese		*<4.0*	*700*	*89*	*1,400*	*1,200*	*1,200*	*920*	*980*	*110*	*47*	*<4.0*	*410*	*710*	*520*	---
Manganese, dissolved		*<4.0*	*690*	*77*	*1,400*	*1,200*	*1,000*	*980*	*960*	*100*	*52*	*<4.0*	*360*	*710*	*490*	---
Arsenic		<0.88	2.8	3.2	**52**	**13**	8.0	**91**	**29**	1.2	**54**	6.4	<0.88	<0.88	<0.88	10
Arsenic, dissolved		---	---	---	***53***	***14***	*8.0*	***78***	***32***	---	***44***	---	---	---	---	10
Molybdenum		<1.1	2.6	<1.1	12.7	<0.27	48	19	62	**260**	61	6.1	11	7.8	21	100
Molybdenum, dissolved		---	---	---	---	---	---	---	---	**250**	---	---	---	---	---	100
Lithium, total		13	4.2	6.0	18	14	16	16	14	<2.5	**41**	12.2	5.2	5	4.3	40

Notes: Summary prepared from SCS, 18 April 2021 e-mail, Table 5

Concentration are total dissolved plus suspended analytes unless noted otherwise. Dissolved filtered at 0.45 um.

Values are average of 2 or 3 observations unless presented in italic text.

[shaded] Shading indicates uncertain result due to significant difference between 2 observations

52 Concentration exceeds groundwater protection standard.

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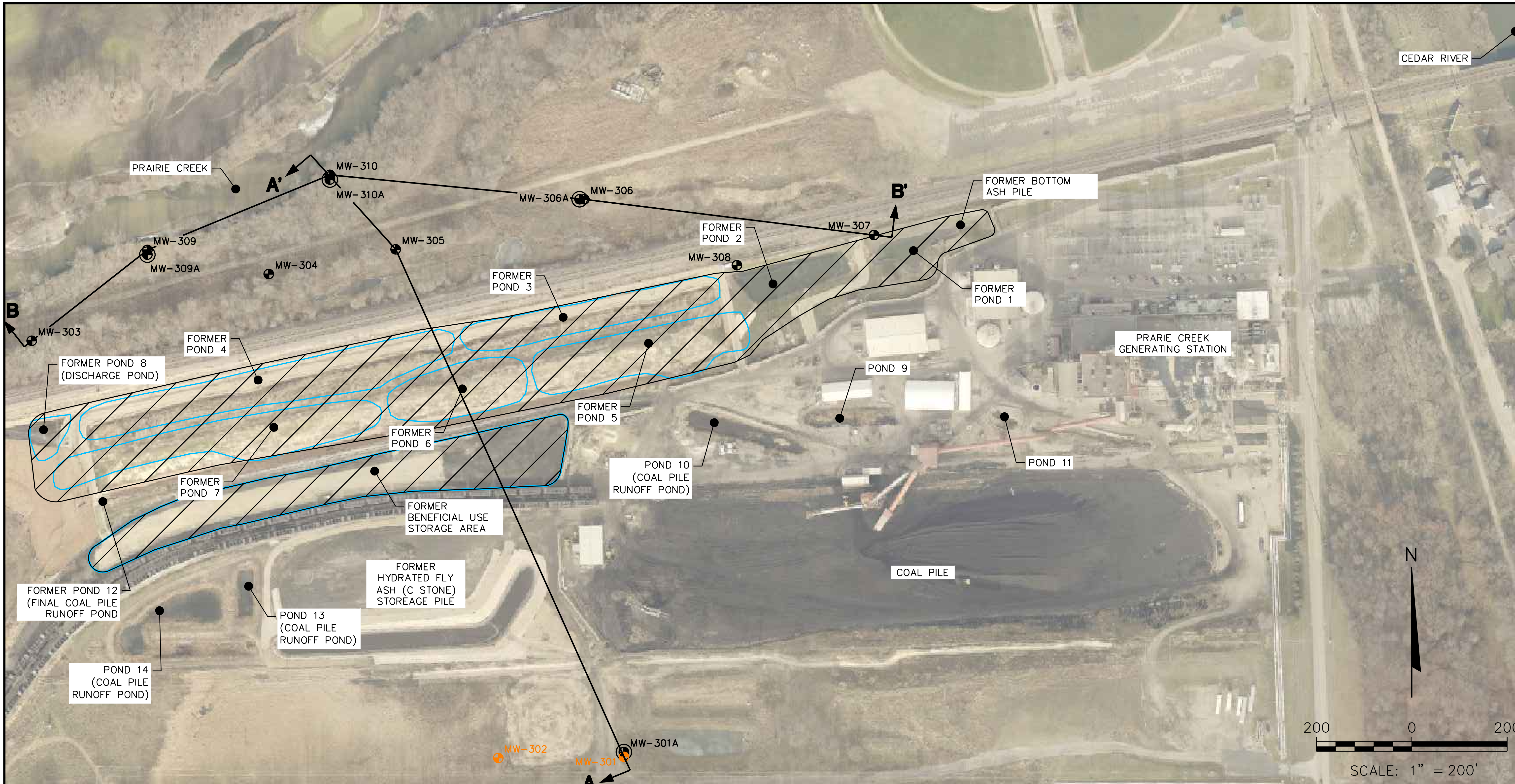


LEGEND

- MONITORING WELL
- BACKGROUND MONITORING WELL
- PIEZOMETER
- CCR UNITS
- APPROXIMATE CLOSURE AREA (SEE NOTE 1)
- GEOLOGIC CROSS SECTION LOCATION

NOTES:

1. PCS PONDS 1-8, THE BOTTOM ASH PILE, AND THE BENEFICIAL USE STORAGE AREA WERE CLOSED IN DECEMBER 2018. LIMITS ARE APPROXIMATE.
2. AERIAL PHOTO IMPORTED FROM THE ARCMAP BASEMAP (CEDAR RAPIDS, IOWA GIS - DECEMBER 22, 2018).
3. MONITORING WELLS MW-301 THROUGH MW-306 INSTALLED BY CASCADE DRILLING BETWEEN OCTOBER 31 AND DECEMBER 6, 2016.
4. MONITORING WELLS MW-307 AND MW-308 INSTALLED BY CASCADE DRILLING ON NOVEMBER 27, 2018.
5. MONITORING WELLS MW-309 AND MW-310 INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING ON AUGUST 5-6, 2019.
6. MONITORING WELLS MW-301A AND MW-306A INSTALLED BY CASCADE DRILLING ON JUNE 22-24, 2020.
7. MONITORING WELLS MW-309A AND MW-310A WERE INSTALLED BY CASCADE DRILLING ON JULY 23, 2020.
8. THE BACKGROUND MONITORING WELLS FOR THE PRAIRIE CREEK GENERATING STATION ARE: MW-301 AND MW-302.

PROJECT NO.	25220084.00	DRAWN BY:	BSS
DRAWN:	11/18/2019	CHECKED BY:	MDB/NDK
REVISED:	04/26/2021	APPROVED BY:	

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

CLIENT: ALLIANT ENERGY
4902 N. BILTMORE LANE, #1000
MADISON, WI 53718

SITE: ALLIANT ENERGY
PRAIRIE CREEK GENERATING STATION
CEDAR RAPIDS, IA

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

I:\25220084.00\Drawings\Site Plan and Monitoring ell Locations.dwg, 4/28/2021 1:37:21 PM

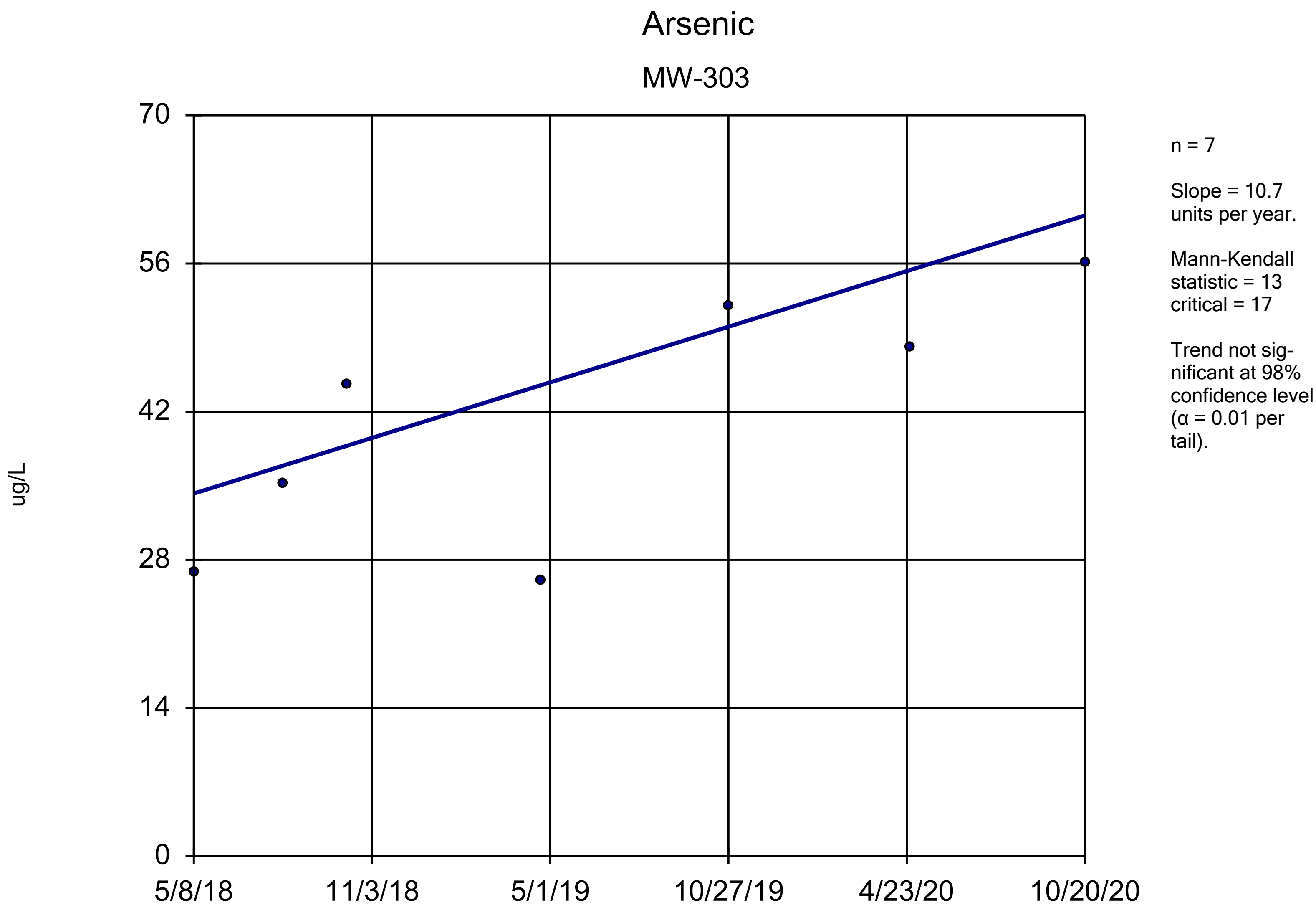
Appendix D

Mann-Kendall Trend Test

Trend Test

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020   Printed 5/7/2021, 5:42 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Arsenic (ug/L)	MW-303	10.7	13	17	No	7	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-304	-0.5423	-8	-20	No	8	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-308	-2.63	0	8	No	4	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-309	-84.6	-4	-8	No	4	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-310	-5.055	0	8	No	4	0	n/a	n/a	0.02	NP
Molybdenum (ug/L)	MW-306	5.703	1	17	No	7	0	n/a	n/a	0.02	NP



Sen's Slope Estimator Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Arsenic (ug/L)   Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020

	MW-303
5/8/2018	26.9
8/6/2018	35.1
10/9/2018	44.5
4/22/2019	26
10/29/2019	52
4/27/2020	48
10/20/2020	56

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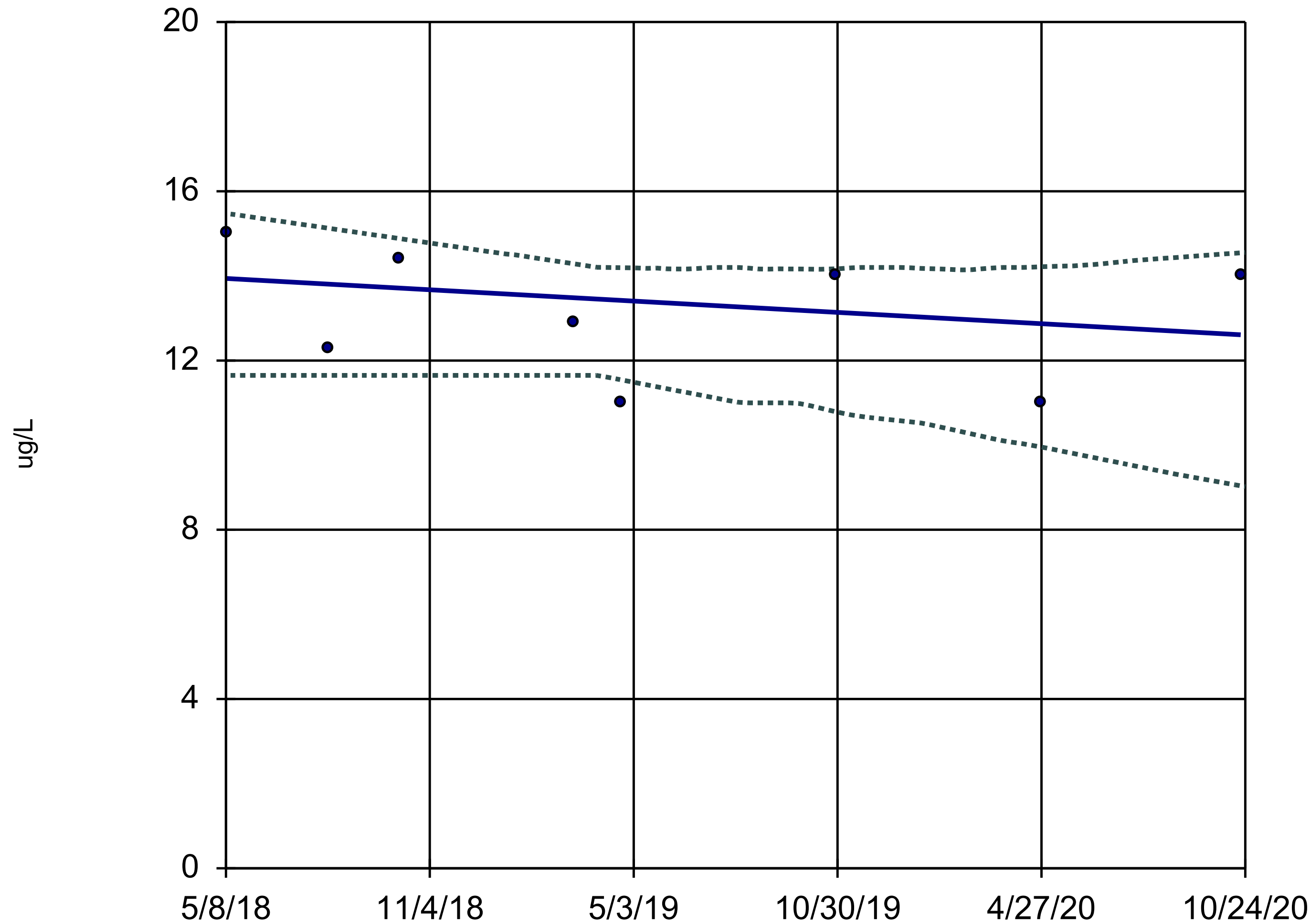

n = 8

Slope = -0.5423 units per year.

Mann-Kendall statistic = -8
critical = -20

Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope and 95% Confidence Band   Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Arsenic (ug/L)   Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020

	MW-304
5/8/2018	15
8/6/2018	12.3
10/9/2018	14.4
3/11/2019	12.9
4/22/2019	11
10/29/2019	14
4/27/2020	11
10/20/2020	14

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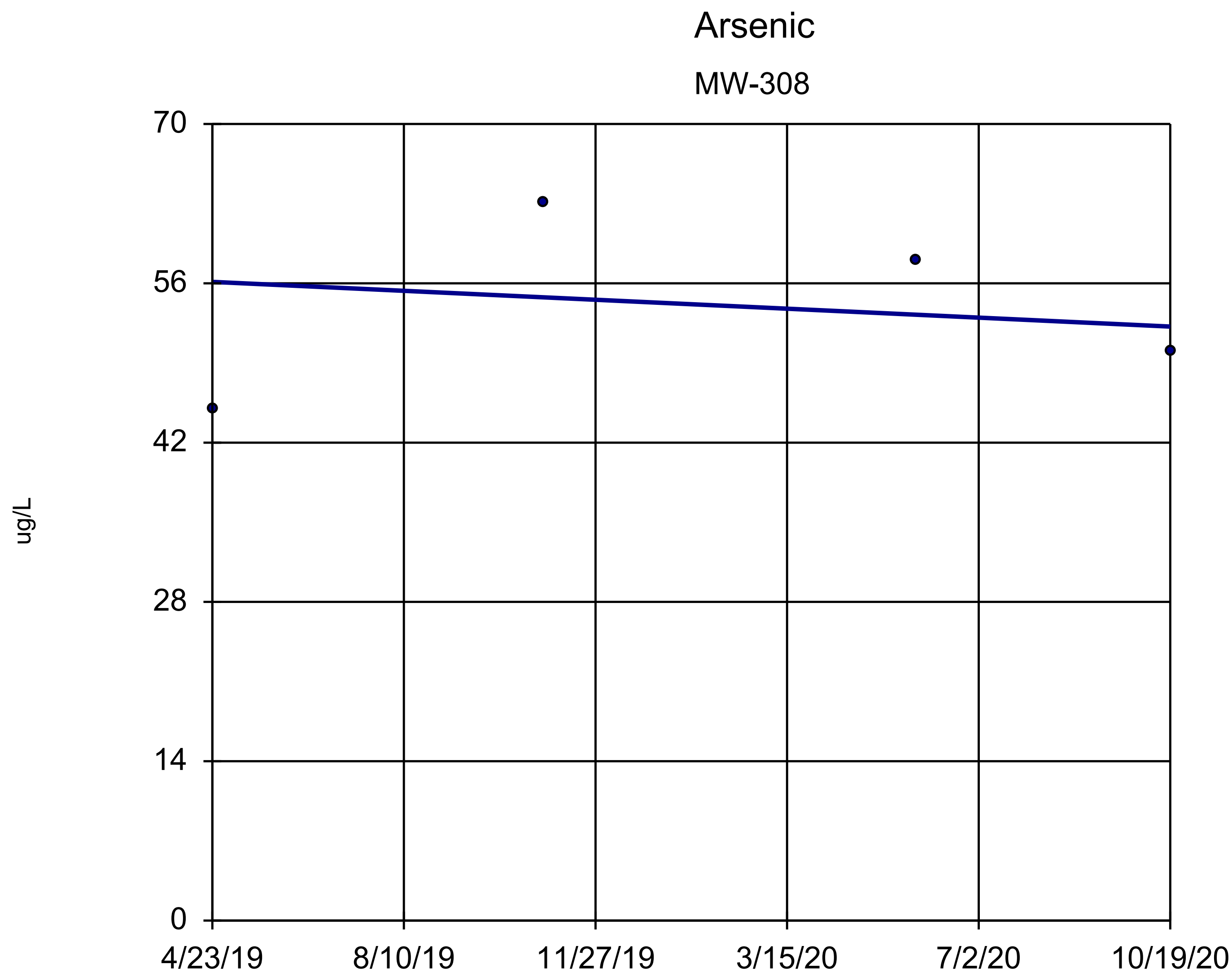

n = 4

Slope = -2.63 units per year.

Mann-Kendall statistic = 0 critical = 8

Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

	MW-308
4/23/2019	45
10/28/2019	63
5/27/2020	58
10/19/2020	50

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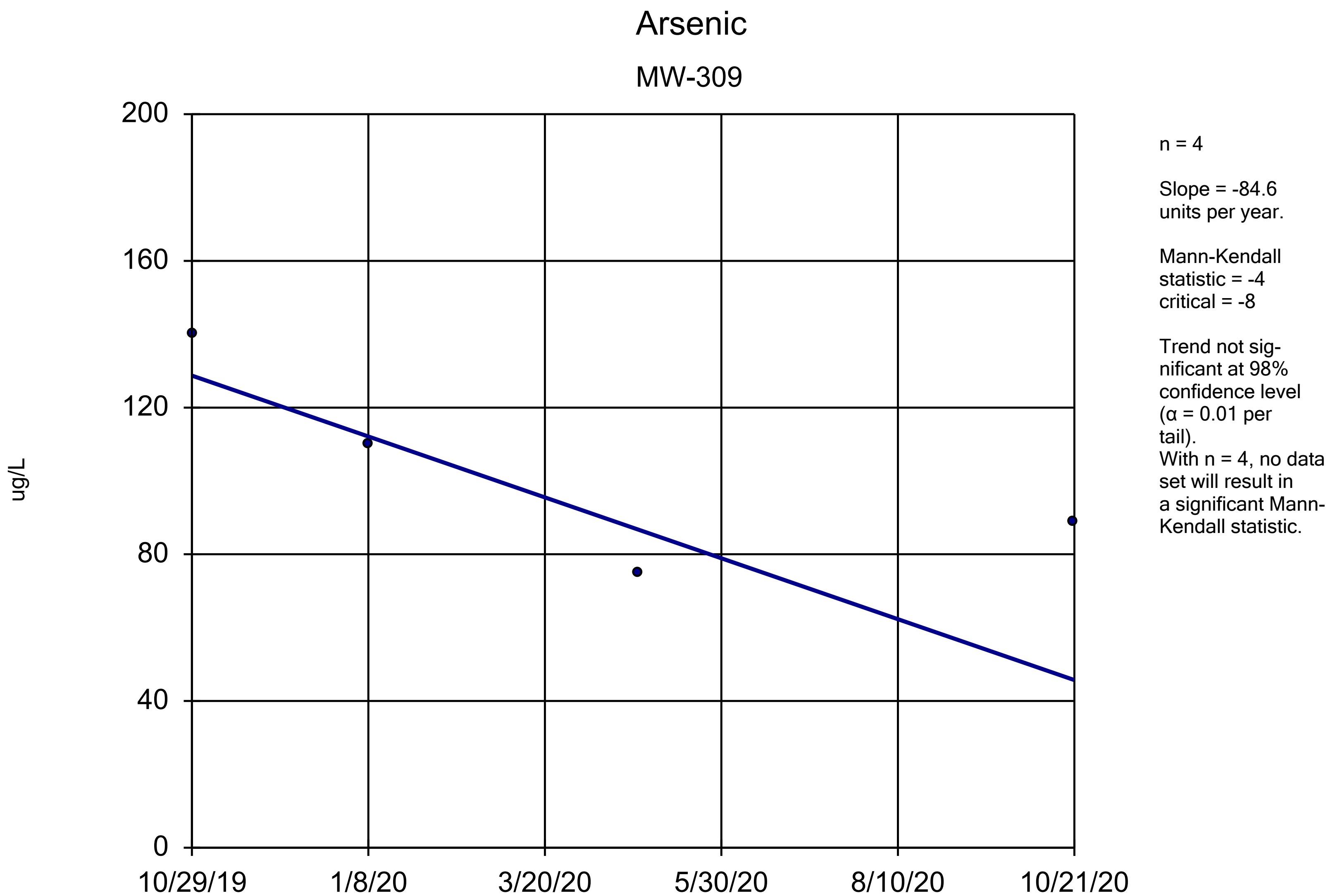

Sen's Slope Estimator   Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

	MW-309
10/29/2019	140
1/9/2020	110
4/27/2020	75
10/21/2020	89

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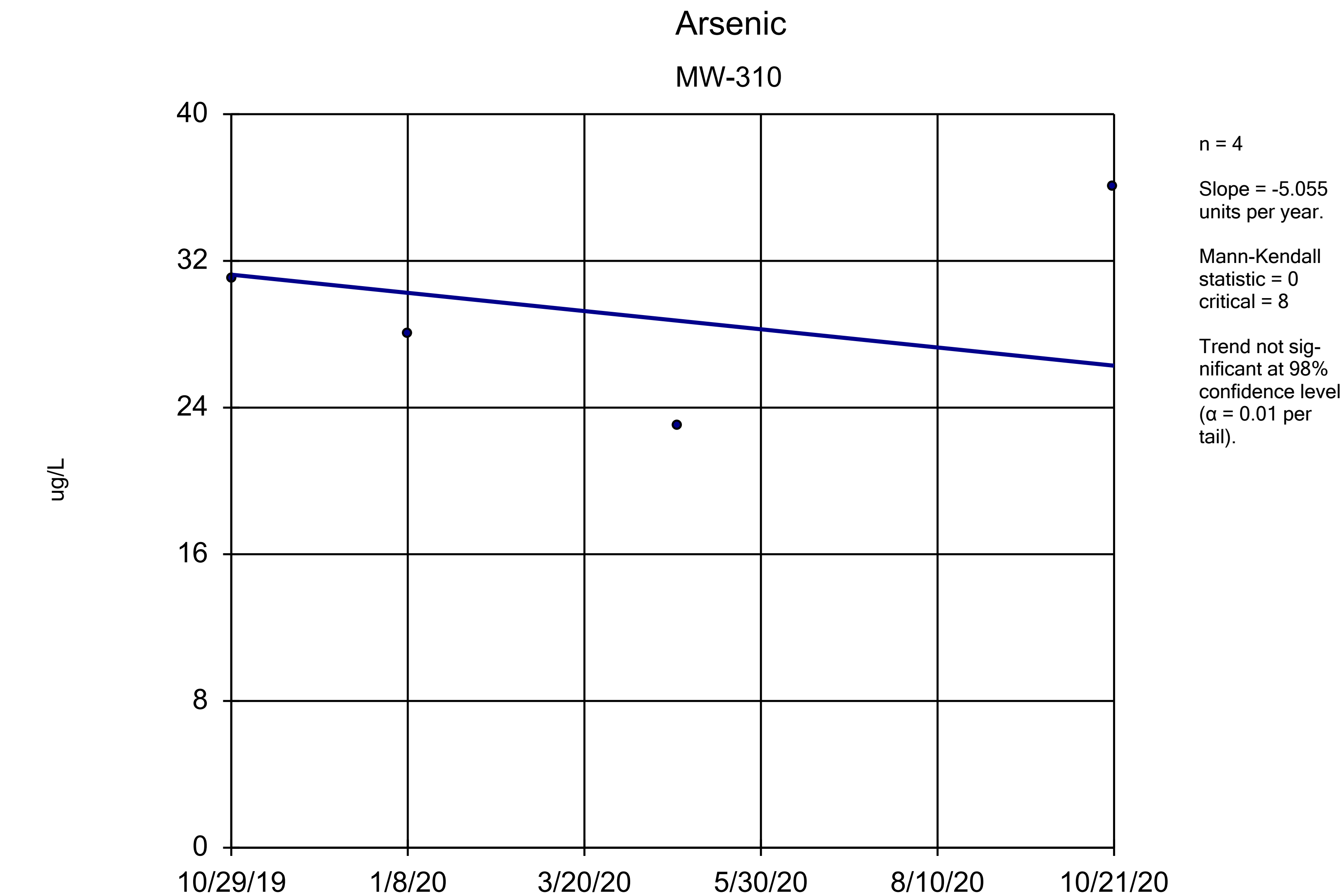

Sen's Slope Estimator Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

	MW-310
10/29/2019	31
1/9/2020	28
4/27/2020	23
10/21/2020	36

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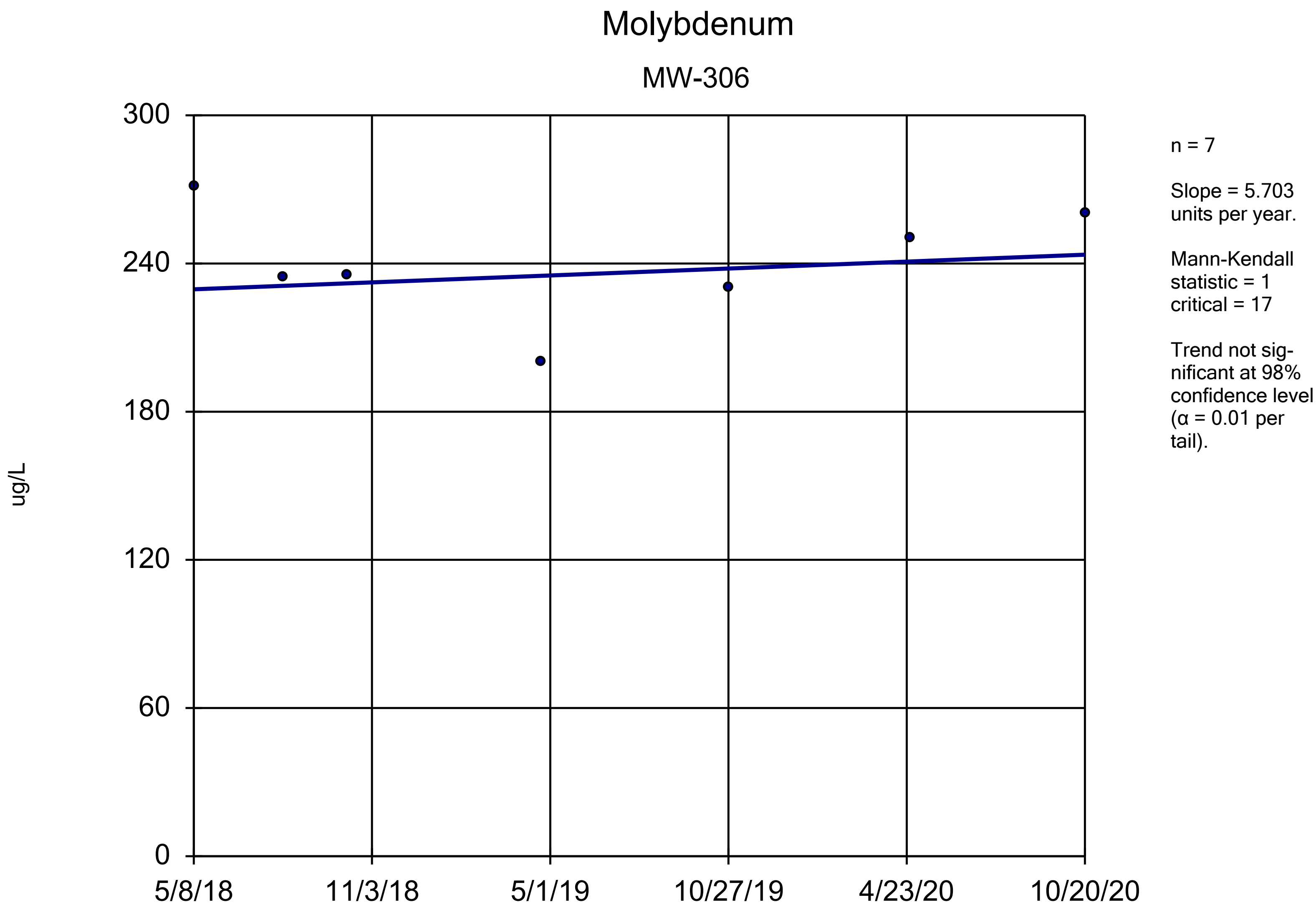

Sen's Slope Estimator Analysis Run 5/7/2021 5:40 PM

Prairie Creek Generating Station Client: SCS Engineers Data: PCS - Chem-export-Dec2020

Sen's Slope Estimator

Constituent: Molybdenum (ug/L)   Analysis Run 5/7/2021 5:42 PM

Prairie Creek Generating Station   Client: SCS Engineers   Data: PCS - Chem-export-Dec2020

	MW-306
5/8/2018	271
8/6/2018	234
10/9/2018	235
4/22/2019	200
10/29/2019	230
4/27/2020	250
10/20/2020	260