CCR Groundwater Sampling and Analysis Plan

BOTTOM ASH POND 2

Sherburne County (Sherco) Generating Plant
Becker, Minnesota
Carlson McCain Project No.: 3404-19

Prepared for:

Northern States Power Company, a Minnesota Corporation

September 21, 2020

CARLSON McCAIN

15650 36TH AVENUE N, SUITE 110
PLYMOUTH, MN 55446

TEL 952.346.3900
FAX 952.346.3901

CARLSONMCCAIN.COM

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CCR GROUNDWATER SAMPLING AND ANALYSIS PLAN

Sherco Bottom Ash Pond 2
Becker, Minnesota

I hereby certify that this plan, specification, or report was prepared by or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota.

Additionally, I certify that the groundwater sampling and analysis program identified in this plan has been developed to meet the requirements of § 257.93, Groundwater sampling and analysis requirements, as included in 40 CFR Part 257, Subpart D, Disposal of Coal Combustion Residuals from Electric Utilities.

Signature of Preparer:

David Katzner, P.G. #57700
Carlson McCain, Inc.

Date: September 21, 2020

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This report presents a groundwater sampling and analysis program for Bottom Ash Pond 2 (BAP2) at the Sherburne County Generating Plant (Sherco) located in Becker, Minnesota. The Sherco plant is owned and operated by Northern States Power Company, a Minnesota Corporation (NSPM). The BAP2 location is shown on Figure 1 and an aerial photograph and site layout map for the BAP are shown on Figure 2.

The BAP2 is a new coal combustion residuals (CCR) surface impoundment and is required to comply with provisions of the U.S. Code of Federal Regulations (CFR), Title 40, Parts 257 and 261 relating to disposal of CCR from electric utilities. In particular, this report addresses the requirements of 40 CFR §257.93, *Groundwater sampling and analysis requirements*, specifically for the groundwater monitoring system described in the CCR Groundwater Monitoring System Certification for BAP2 (Carlson McCain, 2020).

As shown in Figure 2, BAP2 is situated amidst four other surface impoundments, including Scrubber Solids Ponds 1, 2, and 3 adjacent to the south of the BAP2, and Bottom Ash Pond #1 (BAP1) adjacent to the west of the BAP2. Ponds 1 and 2 ceased receiving CCR prior to October 19, 2015 and therefore not subject to regulation under 40 CFR §257. Pond 1 was closed in 1995 and Pond 2 was closed in 2014. Pond 3 and BAP1 are currently receiving CCR and have groundwater monitoring systems and sampling and analysis programs meeting the requirements of 40 CFR Sections §257.91 and §257.93, as described in the CCR Groundwater Monitoring System Certification Reports (Carlson McCain, 2017a and 2017b) and CCR Groundwater Sampling Plans (NSPM, 2018a and 2018b) for the ponds. The areas adjacent to the north and east of Pond 3 have been evaluated for potential development of future Scrubber Solids Ponds 4 and 5. To date, no construction has taken place and these ponds remain in the planning phase.

This CCR Groundwater Sampling and Analysis Plan (SAP) will be reviewed annually, and updated as necessary. Deviations from the procedures described herein may be required due to unforeseen circumstances. Such deviations will be clearly noted on field data sheets and reports.

1.1 Overview

This SAP is organized into five sections, including this introductory section:

- Section 1.0 provides introduction and objectives;
- Section 2.0 briefly describes the site hydrogeology and conceptual model;
- Section 3.0 discusses a general sampling plan;
- Section 4.0 describes detailed groundwater sampling procedures; and
- Section 5.0 describes recordkeeping and reporting requirements.

Additionally, the following documents and information data are included as appendices:

- Appendix A contains the Statistical Analysis Plan for use in detection and/or assessment monitoring;
- Appendix B provides the data validation summary form that will be used for data validation of field sampling data and analytical laboratory reports; and
- Appendix C provides field data sheet and Chain-of-Custody templates which may be used.

The sampling and analysis program is designed and will be implemented to comply with subparts (a) to (j) of 40 CFR §257.93 as shown in the table below.

CFR §257.93 Subpart	CFR §257.93 Subpart Description	Section of SAP
(a)	(1) Sample collection (2) Sample preservation and shipment (3) Analytical procedures (4) Chain of custody control (5) Quality assurance and quality control	Section 4.4 Section 4.6 Sections 3.1 and 3.7 Section 4.5.3 Section 3.7
(b)	Sampling and analytical methods	Sections 3.5 and 4.0, Table 2
(c)	Measurement of groundwater elevations	Section 4.3.3
(d)	Background water quality dataset	Section 2.2 of Appendix A (Statistical Analysis Plan)
(e)	Number of samples collected when conducting detection monitoring and assessment monitoring must be consistent with statistical procedures	Section 3.5 and Sections 2.6 and 3.1 of Appendix A
(f)	Selection of statistical methods used in evaluating groundwater monitoring data for each specified constituent	Sections 2.6 and 3.1 of Appendix A
(g)	Compliance with performance standards, as appropriate, based on statistical method used	Sections 2 and 3.1 of Appendix A
(h)	Determining whether or not there is a statistically significant increase over background values for each groundwater monitoring program	Sections 2.6 and 3.1 of Appendix A
(i)	Measuring "total recoverable metals" concentrations in measuring groundwater quality	Sections 3.5 and 4.4.2 and Table 2
(j)	Recordkeeping, notification and internet requirements	Section 5.5

1.2 Monitoring Objectives

On-site monitoring wells will be used to evaluate groundwater quality at the BAP2, with the primary objective of determining whether there has been a statistically significant increase (SSI) over background of specific monitoring parameters listed in Appendix III of 40 CFR §257, or an exceedance of the groundwater protection standard for monitoring parameters listed in Appendix IV of 40 CFR §257. This determination is made by implementing detection monitoring and assessment monitoring programs as described in the Statistical Analysis Plan, which is attached as Appendix A.

1.3 Data Quality Objectives

Monitoring at the facility is expected to continue for a number of years, and monitoring data may be used to determine appropriate corrective actions. It is therefore critical that this data is representative of actual conditions at the BAP2, and that data quality is maintained throughout the sampling, analysis, and reporting stages. The procedures presented herein are intended to provide representative groundwater data at all wells as required by §257.93(a), and ensure a high level of data quality.

2.0 SITE HYDROGEOLOGY AND CONCEPTUAL MODEL

The site hydrogeology is discussed in detail in the facility's *CCR Groundwater Monitoring System Certification* (Carlson McCain, 2020). The facility is located in the Anoka Sand Plain physiogeographic region. The site consists of moderate to highly permeable outwash material above and below a low permeability glacial till. Pre-Cambrian granite, the first bed rock encountered, is considered impermeable. Groundwater flows to the southwest beneath the facility toward the Mississippi River. No perched conditions are found. Groundwater travel velocities are estimated at 4 to 54 feet/year (Carlson McCain, 2020).

The conceptual model for the hypothetical release of a constituent of concern from the BAP2 focuses on groundwater as the transport mechanism. As discussed above, the water table beneath BAP2 typically occurs below the low permeability glacial till. Exfiltration from the BAP2 area is anticipated to move vertically downward from the base until it reaches the water table and/or till contact. If the exfiltration first contacts the till, it may flow through the till in the downgradient direction, but may also flow locally along the till contact to a zone of higher permeability within the till or a discontinuity of the till until it reaches the water table. Upon reaching the water table, the constituent of concern will likely travel mainly horizontally to the southwest and toward the Mississippi River.

Based on this conceptual model, the groundwater monitoring system targets the water table as the primary monitoring zone; and down-gradient wells are located on the south and west sides of the pond in order to detect a potential release.

3.0 GENERAL SAMPLING PLAN

3.1 Project Organization & Responsibilities

The BAP2 is operated by NSPM. Groundwater samples will be collected by Pace Analytical and chemical analysis will be performed by NSPM's Chestnut Testing Lab and Pace Analytical Laboratory (radium analysis only). Both the Chestnut and Pace labs are certified by the Minnesota Department of Health (MDH) and/or National Environmental Laboratory Accreditation Program (NELAP), and detailed Quality Assurance Plans are on file at each laboratory that were prepared as part of certification.

Reporting and data analysis are performed by an engineering and environmental consultant, Carlson McCain, Inc. Section 3.2 below lists personnel associated with the site and their responsibilities.

3.2 Personnel and Responsibilities

3.2.1 NSPM Staff

- Site Representative: Steve Bluhm, Senior Engineer, NSPM Sherco Plant
  1. Responsible for coordination of access to the site and wells as needed.
- Site Representative: Eric Ealy, Environmental Analyst, NSPM
  1. Responsible for overall coordination of laboratory service, project consultants, and recordkeeping and reporting deadlines.
  2. As the owner's liaison, this person will facilitate communication between the owner and consultant.
- Site Representative: Manuel Castillo, Environmental Analyst, NSPM
  1. Responsible for ensuring required information, as it becomes available, is posted to the facility's operating record.
  2. Provide notification to the relevant State and/or Tribal authority when information has been placed in the operating record and on NSPM's publicly accessible internet site.
  3. Responsible for placing required information, as it becomes available, on NSPM's CCR website.

3.2.2 Environmental Consulting Firm and Project Staff

- Project Engineer: Nick Bonow, PE/PG, Carlson McCain, Inc., Plymouth, MN

1. Certify installation of the groundwater monitoring system at BAP2 pursuant to §257.91.
2. Certify that the selected statistical method is appropriate for evaluating the groundwater monitoring data for BAP2 pursuant to §257.93(f)(6).
3. Assist Project Manager with data analysis and report preparation.

- Project Manager: David Katzner, PG, Carlson McCain, Inc., Plymouth, MN

1. Complete a sampling and analysis plan prior to initial receipt of CCR in BAP2.
2. Annual review and update of the sampling and analysis plan.
3. Planning, coordinating, monitoring, and evaluating of project field activities.
4. Before sampling, correspond with the Pace Field Services Team Leader and field staff, and oversee sampling activities to ensure that the sampling and analysis plan is being followed including sampling purposes, sampling methodology, number of samples, sample preservation methods, chain-of-custody (COC) procedures and analyses required.
5. Maintain a record of all samples collected and the sample identification information on each sample.
6. Manage data acquired from field assessments and laboratory analyses and import into groundwater database.
7. Complete data validation reports for each routine sampling event.
8. Meet with team members, as needed, to discuss and review analytical results prior to completion of reports.
9. Prepare analytical results for posting to the operating record.
10. Complete statistical analysis for comparison to background groundwater quality and/or groundwater protection standards.
11. Prepare annual groundwater monitoring and corrective action reports pursuant to §257.90(e).

3.2.3 Field Sampling and Analytical Laboratory Staff

- Field Services Team Leader: Chris Pelosi, Pace Analytical, Minneapolis, MN (Field Sampling)
- Field Sampler: Riley Jacobson, Pace Analytical, Minneapolis, MN (Field Sampling)

1. Before sampling, correspond with Carlson McCain project manager to discuss and establish sampling purposes, sampling methodology, number of samples, and size of samples, sample preservation methods, COC requirements, analyses required, and which samples will be duplicated in the field.
2. Be responsible for equipment needed for sampling, which would include personal protective equipment (PPE), sampling equipment, sample containers and coolers, water-level meters, monitoring devices, and any other equipment

deemed necessary.

3. Oversee process of sending analytical samples to appropriate laboratories with properly completed COC records.

- Laboratory Project Manager: Steve Davis, NSPM Chestnut Laboratory (Chemical Analyses)

  1. Responsible for samples submitted to the laboratory, including those released to a subcontracted laboratory.
  2. Responsible for summarizing quality assurance/quality control (QA/QC) requirements for the project, including those samples analyzed by subcontracted laboratories.
  3. Maintain laboratory schedule and ensure that technical requirements are understood by laboratory personnel.
  4. Provide technical guidance to Carlson McCain project manager.
  5. Ensure accuracy of the laboratory data.

- Laboratory Project Manager: Carin Ferris, Pace Analytical, Greensburg, PA (Radium Laboratory Analyses)

  1. Responsible for radium samples submitted to the laboratory, including those released to a subcontracted laboratory.
  2. Responsible for summarizing quality assurance/quality control (QA/QC) requirements for the project, including those samples analyzed by subcontracted laboratories.
  3. Maintain laboratory schedule and ensure that technical requirements are understood by laboratory personnel.
  4. Provide technical guidance to Carlson McCain project manager.
  5. Ensure accuracy of the laboratory data.

3.3 Schedule

Sampling media are identified in the table below along with routine sampling event windows and reporting schedules. Routine sampling will be coordinated by the groundwater project manager and will occur on a semi-annual basis with one event typically occurring in the spring, and one event during the fall.

Media	Sampling Event Window	Anticipated Operating Record Posting Date
Groundwater	Spring: March 15 - May 15 Fall: September 15 - November 15	August 15 January 15

Special sampling events may be scheduled outside of the routine monitoring schedule, as determined by the project manager. Special sampling events may include, but are not limited to, additional groundwater monitoring events (e.g. exceedance-triggered resampling during detection or assessment monitoring) or groundwater sampling conducted during groundwater investigations or corrective actions. Analytical parameters analyzed during special sampling events are discussed in Section 3.5.3 and listed in Table 2.

Parameter concentrations from each sampling event will typically be recorded in the facility's operating record according to the anticipated operating record posting dates listed above. However, the posting dates may be extended if the data validation identifies deficiencies which require correction. Additional discussion on reporting for the facility is provided in Section 5.0.

3.4 Groundwater Monitoring System

The groundwater monitoring system for the BAP2 consists of nine wells: upgradient wells P-17, P-152A, P-158, P-177 and P-178A; and downgradient monitoring wells P-173, P-174, P-175 and P-176. All wells are completed in the water table aquifer, which is the uppermost monitorable unit at the facility. Additional information on the groundwater monitoring system is provided in the CCR Groundwater Monitoring System Certification for BAP2 (Carlson McCain, 2020). Monitoring locations are summarized in Table 1 and illustrated in Figure 2. Water table elevation contours depicting typical groundwater flow at the site are shown on Figure 3.

3.5 Monitoring Parameters

Analytical parameters required for routine monitoring are listed in Table 2, along with their preferred analytical methods, reporting limits, groundwater protection standards, and sampling frequency. In accordance with §257.93(i), total metals concentrations will be measured for all groundwater samples obtained as part of the monitoring program discussed in this plan.

The specific parameters analyzed during each sampling event will depend on whether detection monitoring (§257.94), assessment monitoring (§257.95), or a special sampling event is occurring at the facility. Depending upon the monitoring program status, analytical parameters may include general chemistry parameters, the parameters listed in Appendix III of 40 CFR Part 257, and the parameters listed in Appendix IV of 40 CFR Part 257, as described below and shown in Table 2.

3.5.1 Detection Monitoring

During detection monitoring, Appendix III parameters, total suspended solids (TSS) and field parameters will be analyzed during each routine monitoring event. Parameters to be analyzed, analytical methods, detection limits and applicable groundwater standards are listed in Table 2. Primary/preferred analytical methods are identified, however the specific method used may vary depending upon sample quality considerations (e.g. matrix interference) and equipment availability.

3.5.2 Assessment Monitoring

Assessment monitoring may be initiated in response to a statistically significant increase over background of a detection monitoring parameter, as described in the Statistical Analysis Plan located in Appendix A to this document. During assessment monitoring, all Appendix IV parameters will be analyzed during the spring monitoring event in addition to the detection monitoring parameters. Only those Appendix IV parameters detected during the spring monitoring event will be analyzed during the subsequent fall monitoring event. Appendix IV parameters, preferred analytical methods, detection limits and applicable groundwater protection standards are listed in Table 2.

3.5.3 Special Sampling

During a special sampling event, analytical parameters will include the general chemistry parameters listed in Table 2, along with additional case-specific parameters as determined by the project manager.

3.6 Sample Containers

All sampling containers and preservatives are supplied by the laboratory. Details regarding sample bottles and preservation methods are provided in Table 3. The Laboratory Quality Assurance Project Plan describes specific procedures for the cleaning, testing, labeling and storage of sample containers and for the preparation and addition of preservatives. Chemical preservatives are added in the laboratory before samples are collected.

3.7 Quality Assurance/Quality Control

The sampling procedures presented in this plan have been designed to minimize variability in the sample results due to improper handling of the samples. Data quality will be maintained by minimizing sample contamination. Field personnel will work under the assumption that contamination exists in surface soils and vegetation near sampling points, wash water, etc. Exposure to these media will be minimized. Section 4.0 discusses precautions to be used in order to minimize sample contamination.

As described in Section 3.1, NSPM's Chestnut Testing Laboratory and Pace Analytical Laboratory will be performing analysis of groundwater samples. Both laboratories are certified to ensure that state and national standards regarding specific procedures for the cleaning, testing, labeling, and storage of sample containers and for the preparation and addition of preservatives is maintained. As such, each laboratory will be required to have their own quality assurance (QA) procedures on file to guarantee that reliable and reproducible data is being generated.

Quality control (QC) samples such as duplicate samples and equipment (rinse) blanks will be collected in the field to evaluate any variability in laboratory analytical methods and detect potential background contamination. Additional information on these samples is provided in Section 4.4.4 of this Plan. In addition, basic QA/QC review of the data will be completed during data validation, as described in Section 5.1.1 of this SAP, to ensure that groundwater sample analysis requirements are being met by the laboratory.

3.8 Reporting Limits

Preferred test methods and associated current reporting limits (RLs) are shown on Table 2. All RLs on Table 2 are currently the best that can be attained based on current instrument conditions; and the current RLs are at least as low as the groundwater protection standards for Appendix IV constituents. A detection below the laboratory RLs will be reported as non-detected quantities (“ND” values). Alternatively, non-detected values can also be reported with a “<” symbol as long as the RL is clearly defined.

Radium results are reported with a degree of uncertainty. For consistency, the reported value will be considered the detected value without the degree of uncertainty factored in. Any reported values less than the RL will be considered ND values.

4.0 GROUNDWATER SAMPLING PROCEDURES

4.1 Advance Preparation for Sampling

4.1.1 Quality Assurance for Field Procedures

Special care will be taken in the field to prevent cross-contamination or background contamination of groundwater samples due to the following mishaps:

- Improper storage or transportation of equipment;
- Placing sample bottles on or near a potential source of contamination, such as on an uncovered surface or near vehicle exhaust;
- Handling bottles or equipment with dirty hands or gloves; or
- Inadequate cleaning of well purging or sampling devices.

Field personnel will work under the assumption that contamination exists in nearby soil, ambient air, and rinse water, so exposure to these media will be minimized by taking the following precautions:

- The area surrounding the well head will be kept as clean as practical.
- A new pair of nitrile gloves will be put on at each well before sampling activities begin. Gloves will be replaced if they become soiled while performing sampling activities.
- The length of time that sample bottles remain open will be minimized, to avoid exposure to airborne dust or volatile contaminants in ambient air.
- Sample containers will be filled upwind from any source of engine exhaust, such as a vehicle or generator. If conditions are dusty, an effort will be made to shield the sample collection area from airborne contamination.
- The amount of rinse water left on washed materials will be minimized.

4.2 Selection of Sample Collection Techniques

Monitored constituents for the BAP2 do not include volatile organic compounds and therefore are relatively insensitive to purging and sampling methodology; however, compliance parameters such as metals can be sensitive to changes in equilibrium chemical conditions and sample turbidity. Therefore, pumping equipment and pumping rates have been selected to minimize agitation and sampling induced errors. Sampling rates will not exceed 0.2 gallons per minute or the purging rate, whichever is less.

4.2.1 Purging and Sampling Equipment

Monitoring system wells are equipped with 1.66-inch diameter dedicated PVC bladder pumps. The dedicated bladder pumps will be used for both purging and sampling at any given well.

If the dedicated bladder pump fails in any well, a non-dedicated bladder pump or a variable speed impeller style submersible pump is a secondary choice and a single use bailer may be used as a contingency method to sample the wells. Examples of secondary and contingency equipment that may be used purge and sample the wells includes the following:

- ***QED Sample Pro Portable Bladder Pump***
  - Diameter: 1.75"
  - Material: Stainless Steel
  - Bladder: Polyethylene
  - Pump discharge lines: reinforced PVC tubing
  - Pump type: Bladder
  - Maximum Lift: 250 feet
  - Pump rate: Variable based on discharge tubing diameter and sample depth
  - Manufacturer Phone #: (800) 624-2026

- ***Grundfos Redi-Flo2 Pump***
  - Diameter: 1.8"
  - Material: Stainless Steel
  - Pump discharge lines: reinforced PVC tubing
  - Pump type: Positive displacement using an impeller design
  - Maximum Lift: 280 feet
  - Pump rate: Variable, Up to 8 gpm depending on sample depth and setting of the variable frequency drive
  - Manufacturer Phone #: (800) 333-1366

- Contingency Equipment – disposable bailers. Scenarios where bailer would be appropriate include:

  1. Failure of both the dedicated bladder pump and available secondary pumps;
  2. A well with a short water column (2' or less) such that a pump cannot be properly operated; or
  3. A well with an extremely low recharge rate such that:
     a. it cannot sustain enough water to fill the pump and tubing
     b. it cannot sustain enough water for sampling when purged at 0.2 gpm

4.2.2 Decontamination, Storage and Transport of Equipment

All non-dedicated equipment coming in contact with the water sample or well, will be decontaminated in the field and in the lab. Field decontamination will be performed between each sampling point. Lab decontamination will be performed between each facility. Decontamination is not required for single-use, disposable equipment such as filters and disposable bailers, so long as they are only used at a single well.

Each source of control water and deionized water will be evaluated before use in the decontamination process. Control water is defined by ASTM D5088-90 as "water used for equipment washing and rinsing that has a known chemistry". An example of an acceptable source of control water is potable water from a municipal water supply system that has a known history of being free of contaminants. This water will be used for the wash and intermediate rinses of sampling equipment during field decontamination. The deionized water will be used for the final rinse of sampling equipment which contacts sample water or the inside of the well.

Field Decontamination

A. Equipment that <u>does</u> contact sample water or the inside of the well:

1. If visually dirty, clean (inside and outside, where possible) with a scrub brush made of inert material.
2. Rinse with clean control water.
3. Inspect for remaining particles or surface film and repeat the first two steps, if necessary.
4. Rinse with control water.
5. Shake off remaining water.

In general, equipment will be handled in a manner that will minimize cross-contamination between wells and avoid introducing surface or ambient air contamination into a well.

4.3 Preliminary Field Work

4.3.1 Order of Sampling

Due to inorganics being relatively insensitive to purging and sampling methodology as well as the use of dedicated or disposable sampling equipment, the chance for cross contamination is minimal and therefore no sampling order is specified.

4.3.2 Field Inspections and Field Decisions

Upon arrival at each monitoring point the well will be inspected to verify that the well apron is intact. Any well damage, tampering, missing parts, labels, or locks will be noted and unless noted, it will be assumed that the well is locked, labeled and is of sound integrity. Field conditions will be recorded on the field data sheet in Appendix C. Any running vehicle or field generator will be located downwind of the sampling station. If any condition is discovered that may interfere with obtaining representative analytical results, the condition will be corrected before sampling proceeds.

The well will be unlocked. Protective gloves will be donned before removing the inner riser cap to a clean storage spot. Any visual or olfactory evidence of well contamination will be noted on the field data sheets.

Deviations from the approved protocol may be required due to unforeseen circumstances. Any change in protocol will be approved by the field crew leader and will be clearly noted on the field sheets. The change in protocol will also be documented and evaluated in the annual groundwater monitoring and corrective action report.

4.3.3 Water Level Measurements

Initial static water levels will be measured and recorded at each well prior to any well evacuation or sampling. Water level and other pertinent field data will be recorded on the field data sheet in Appendix C.

Routine sampling events should typically be completed within one to two days, but the sampling crew will make an effort to collect all initial water level measurements within a 24-hour time interval to provide comparable numbers by which to calculate the groundwater flow direction and gradient. Unforeseen circumstances may arise which may prevent the completion of all water level measurements within 24-hours. In these instances, the collection of the water level measurements will occur in the shortest time frame possible. In all cases, sampling shall be completed within a period of time short enough to avoid temporal variation in groundwater elevation which could preclude accurate determination of groundwater flow rate and direction.

Water levels will be measured with an electric water level sensor probe**.** The electric water level sensor probe will be lowered down the well until the light illuminates and a tone sounds, indicating contact of the probe with the water surface. Depth to water will be recorded to the nearest 0.01 feet.

The depth-to-water will be referenced to a marked and surveyed measuring point, generally the top of the innermost well casing. Where a measuring point has not been marked, the measuring point will be assumed to be at the top of the innermost casing on the north side of the casing. The water column volume will be calculated based on the static water level and the nominal diameter of the inner well casing or open hole and noted on the field sheets. When reporting water level elevation, the depth to water measurement will be converted to Mean Sea Level using the surveyed elevation of the measuring point.

4.3.4 Field Water-Quality Measurements

Specific conductance, pH, dissolved oxygen, temperature and turbidity will be measured in the field immediately before sample collection. All measurements will be recorded on the field data sheet in Appendix C.

Unless collected with a bailer, and with the exception of turbidity, all field measurements will be taken within a closed flow cell designed to allow measurement of these parameters while minimizing changes in temperature, pressure, and dissolved gases from the in-situ aquifer environment.

The flow cell has the following characteristics:

- Air tight fittings for installation of all probes;
- An intake which is connected directly to the pump discharge line;
- A discharge line approximately 3 feet long that is connected to the flow cell with an air tight connection;
- A maximum volume of no greater than five times the per minute volumetric rate of inflow to the cell to maintain measurement sensitivity to temporal changes in water quality; and,
- A minimum volume of 500 ml to provide enough thermal mass to minimize external temperature effects.

The flow cell and lines will be shielded from strong winds and direct sunlight to the extent practicable. The flow of groundwater through the flow cell will be as continuous and steady as practical. Discharge velocities through the flow cell will be kept low to prevent problems of streaming potential with probes. All probes will be fully immersed without touching the sides of the non-metallic flow cell. The probes will be allowed to equilibrate with fresh aquifer water before recording measurements.

At a minimum, the general care, maintenance, calibration procedures, and operation of each measurement device will follow the manufacturer's specifications described in the instruction/owner's manual for each device. Specific procedures for measurement of individual field water quality parameters are described below.

Specific Conductance

The conductivity meter will be checked against known standards and results documented on the calibration log sheet each day before taking measurements at the well. The conductivity cell will be inspected to be sure it is in good condition with no chips in the coating.

pH

Before sampling is begun each day, the pH meter will be calibrated by a two-point calibration method, using a pair of buffers with pH values representative of the range of values expected in the field (pH = 4 and 7 or, alternately, pH = 7 and 10). Daily calibration will be documented on the Calibration Sheet.

Dissolved Oxygen (DO)

Special care will be taken to store the probe in a moist environment and to otherwise protect the delicate membrane on the end of the probe. Before taking measurements, the membrane at the tip of the probe will be checked to verify that it is in good condition. The probe will be calibrated to atmospheric oxygen (per manufactures specifications) daily. The Calibration Sheet will be used to document instrument calibration.

Readings will be reported to the nearest 0.1 mg/L dissolved oxygen. Readings should appear stable on the display to be considered valid. If fluctuating readings are observed, that condition will be documented on the Calibration Sheet.

4.3.5 Well Purging and Stabilization

Before a water sample is collected, the well will be evacuated to ensure that samples contain fresh formation water. The time at which purging begins will be recorded on the field data sheet. Care will be taken to minimize any turbidity which may result from purging the well. While the well is being purged, the field water quality parameters described above and the quantity of water evacuated will be recorded on the field sheets. Previous sampling results indicate that collection of purge water is not necessary at this facility.

Pump Intake Depth Setting

- In water table wells with sufficient recharge, the pump intake will be set approximately two feet above the well bottom to avoid uptake of sediments.
- In wells which recover very slowly, the pump intake may be set approximately one feet from the bottom of the well to avoid potential aeration problems.

Purging Rate

- A purging rate will be selected that minimizes draw down while still allowing the well to be purged in a reasonable length of time. Sampling rates will not exceed 0.2 gallons per minute or the purging rate, whichever is less.
- Care will be taken to avoid any significant amount of cascading or turbulence in the well.

Stabilization

- Wells that have adequate recharge rates will be purged and sampled as described below. Purging will be conducted in a manner that, to the extent practical, removes all "old" water in the well so it is replaced by fresh formation water.
- A minimum of three water column volumes must be purged before sampling. Field water quality parameters will be measured after each water column volume.
- Sampling will occur after stabilization immediately following purging.
- Well evacuation will be continuous between purging and sampling.

Criteria for Stabilization

Field water quality parameters will be measured after each water column volume is purged. One water column volume is defined as the volume of a cylinder with a height (h) equal to that of the static water column inside the well and a diameter (d) equal to the diameter of the well casing.

$$\text{Volume} = \pi(d/2)^2 h$$

Three consecutive measurements which meet the criteria listed below will be used to demonstrate stabilization:

- Temperature +/- 0.1 degrees Celsius;
- Specific conductance (temperature corrected EC) +/- 5% of the most recent reading; and,
- pH +/- 0.10 units.

For medium to high-yield wells, samples for laboratory analysis will be collected only after purging a minimum of three water column volumes and achieving stabilization of field water quality parameters. If field parameters do not stabilize after five water-column volumes, then field staff will verify that the probes and related equipment are functioning properly and that operator error is not an issue. Samples will be collected after five water-column volumes have been purged, even if field measurements have not stabilized.

4.4 Sample Collection

The same pump will be used for both purging and sampling. Pumping will be continuous and sampling will immediately follow purging. If pumping is not continuous, it will be noted on the field data sheets. For each well, the time at which sampling activities begin and end will be recorded on the field data sheets.

4.4.1 Sampling Rate

The pumping rate for sample collection will be less than the purging rate or 0.2 gallons per minute, whichever is less.

4.4.2 Sample Filtration

All groundwater samples are to be analyzed for total metals, so no filtration will be performed.

4.4.3 Filling Sample Containers

Table 3 summarizes the type of container, filling and preservation method, and holding time for each type of sample. The manner in which sample containers will be filled is described in greater detail below for each parameter group.

The potential for background or cross-contamination of samples will be minimized by following the field quality assurance procedures listed in this SAP. Sample bottles will not be opened until it is time to fill them. Sampling personnel will not touch the inside or rim of sample bottles or caps. If contact occurs, the sample bottle will be replaced.

Except for any pre-printed labels from the laboratory containing sample identification information such as the "project name" or "well name", bottles will be labeled at the well by field personnel according to the procedures described in Section 4.5, "Documentation of Sampling Event". To prevent a mix up with sample bottle identification, no sampling point-specific information such as "sample date" and "sample time" will be filled out in advance.

The order in which sample containers will be filled is listed below. Any replicate samples will be collected immediately after the corresponding primary sample.

1) metals
2) general parameters
3) radionuclides

The end of the discharge tube will be held as close as possible to the sample bottle without allowing the tubing to contact the container. The exception to this rule is for dissolved oxygen and general parameters, where the container is filled from the bottom up by inserting the tube into the bottom of the container. Sampling personnel will use their body to shield the sample bottle from wind and airborne dust while filling the bottle.

Metals and Radionuclides

Nitric acid (i.e. HNO_3) will be added as a preservative to sample bottles for metals and radium analysis. The acid will be added to the bottles at the laboratory prior to the sampling event.

Plastic bottles will be used for sample collection. Containers will be filled approximately 95% full (up to the neck). Containers will not be rinsed or overfilled. Samples will be collected in a manner that minimizes turbulence and aeration. The sample bottles for metals analyses will be clearly labeled as "unfiltered", in accordance with the filtration criteria required for total metals analysis.

General Parameters

The sample containers for laboratory analyses of general parameters – anions, TDS, TSS, pH, fluoride, and sulfate – will not be rinsed in the field or allowed to overflow excessively during sample collection. Samples will be collected by delivering water to the bottom of the container via tubing until the container is completely full and there is no headspace.

4.4.4 Equipment Rinses and Replicates

All quality assurance/quality control (QA/QC) samples will be collected in the same manner and type of container as the corresponding primary samples. A field (equipment or rinse) blank will be collected to detect method or background contamination. Replicate samples will be collected to evaluate variability in analytical methods. The project manager may specify which wells to collect the QA/QC samples at. If the project manager does not specify the wells, at least one of the QA/QC samples will be obtained from a downgradient well.

QA/QC samples will be assigned identification aliases on the sample bottle label and on the chain of custody sheet to avoid alerting laboratories that the sample is a blank or replicate sample. The true identity of the QA/QC samples will be recorded on the sampling field data sheet.

Field Methods (Equipment Rinses) Blank
One field method (i.e. equipment, rinse) blank for each event will be collected. Sample containers and preservatives used for each blank will be the same as those used for each primary sample. All containers shall be pre-cleaned according to the laboratory's QA/QC program, in the same manner as primary sample bottles. The sample rinse container will be filled in the field in a manner that simulates actual field sampling methods. The field blank water will be run through all of the same non-dedicated tubes, sample collection devices, filters, etc. that the actual sample water will encounter. Equipment (rinse) blanks will be filled with laboratory-prepared, triple deionized water.

Duplicate Samples
One duplicate set of all parameters will be collected and analyzed for each sampling event. Duplicate samples for each parameter group will be collected immediately after the corresponding primary sample, with a sampling stream that is steady and continuous. {*Note*: *All duplicates are not sampled together, but are sampled immediately after the primary sample from each parameter group*.} The time of duplicate sample collection will be recorded on the field data sheet.

4.5 Documentation of Sampling Event

4.5.1 Forms

Appendix C, "Example Forms", currently contains photocopies of the following forms:

- Well Sampling Field Data Log Sheet
- Chain of Custody / Analytical Request Document

These forms have been designed for documentation of field activities and collection of data. They also provide a means to verify whether or not this protocol was followed during a number of key steps in the groundwater sampling event.

All entries for a given sampling point will be completed before leaving that sampling point. This includes filling in all appropriate blanks and circling or checking all choices which appear on the forms.

4.5.2 Sample Identification

Each sample bottle will be labeled with the following information:

- Site name
- Sampling point name
- Date and time of sample collection
- Filtered or unfiltered analysis
- Preservation method
- Analysis code

Sample containers will receive appropriate preservatives in advance by the laboratory, and laboratory staff will enter "parameter names" or "preservation method" onto labels prior to the sampling event. The laboratory may also provide pre-printed labels which contain some of the sample identification information listed above, empty labels to fill out and affix to the bottles or labels which are already affixed to the bottles. All information not provided on labels by the laboratory will be recorded on the label by field personnel at the time of sample collection, using a waterproof pen or marker. If no labels were provided by the laboratory, sample identification information will be recorded directly onto the bottle, using a waterproof pen or marker, by field personnel at the time of sample collection.

4.5.3 Chain-of-Custody

A chain-of-custody (COC) record will be initiated in the field at the time of sampling. A copy will accompany each cooler on its way to the laboratory.

All signatures related to sample custody will be made in ink on the COC form. Each time responsibility for custody of the samples changes, the new and previous custodians will sign the record and note the date and time. A copy of the signed record will be made by the receiving laboratory. The final signed COC will be included with the laboratory analytical results for each routine monitoring event.

Field Chain of Custody Documentation

One or more signatures will be entered to identify the field sampling crew. A sample will be considered to be in custody if it is in one of the following states:

- In actual physical possession;

- In plain view of the custodian; or,
- In a secured area or container, restricted to authorized personnel.

4.5.4 Exceptions to Sampling Protocol

This protocol defines the procedures to be followed during every sampling event. Exceptions to this protocol will be noted on the field data sheets. The annual groundwater monitoring and corrective action report will include the following details for each deviation from the protocol:

- Reason for the change;
- Identification of all samples and parameters that may have been impacted, either in terms of the quantitative or legal integrity of their reported values; and,
- Significance of the potential impact on data integrity.

If there has been any potentially significant impact on sample integrity, then it will be noted on the data validation form and will appear as a footnote to each affected parameter whenever the results are reported or referred to in the annual groundwater monitoring and corrective action report.

4.5.5 Field Conditions

Atypical field conditions during the sampling event will be recorded on the field data sheets. The default assumption will be "typical weather and field conditions exist for that time of year". At a minimum, the following field conditions will be considered:

- Air temperature;
- Precipitation; and
- Airborne dust.

4.6 Sample Handling and Transport

This section describes the procedures that will be followed between the time samples are collected and the time they are either shipped or delivered to an analytical laboratory.

Once collected, all samples will be stored on ice in a cooler. Each cooler will be accompanied by a chain-of-custody. The samples will be kept cool (at 6 degrees C or less) during transport to the laboratory. Before shipping the samples, field personnel will perform the following tasks:

- Verify that someone will be present to process the samples at the lab when they arrive.
- Verify that laboratory personnel understand the specific chain of custody and storage/preservation requirements.
- Check labeling and documentation to ensure that sample identity will be clear to laboratory personnel.

- If samples are shipped via an independent courier, the COC will be enclosed with the samples in the cooler. A tamper proof seal will be fastened to the container.

5.0 RECORDKEEPING AND REPORTING

5.1 Data Quality Assurance/Quality Control

5.1.1 Data Validation

Basic data validation will be performed on all data by the project manager or the project manager's designee. In general, data validation will be performed according to the Data Validation Summary form, which is attached as Appendix B to this SAP, and will be completed for each sampling event. The laboratory data will be checked for completeness and accuracy against Tables 1, 2, and 3 of this SAP for each sampling event. The completeness criteria will ensure that all parameters were analyzed from all required sampling points using the preferred methods. Assessment of accuracy will include verification that the limits and units are reported as required and the sample/parameter names are consistent with those required and provided in the sampling documentation. Qualifiers and laboratory control data will be reviewed for evidence of any matrix and cross-media effects that could influence samples, and will be identified on the data validation form if determined necessary by the data validator. Issues and/or inconsistencies that may impact the validity of sampling data, as determined by the data validator, will be discussed on the data validation form and reported to the laboratory for correction or explanation, as appropriate. Corrective actions may include recalculation, reanalysis, or resampling, depending on the problem identified.

5.1.2 Annual Monitoring Task Review

A review of environmental monitoring tasks will be performed annually to ensure they are being completed, and to identify process improvements, if needed. The following tasks will be evaluated:

- Collection, reporting and evaluation of sample blanks and equipment (rinse) blanks;
- Generation of reports and graphs necessary to identify data anomalies;
- Documentation of Alternate Source Demonstrations (ASD); and,
- Inclusion of COC and field sheets with semi-annual monitoring reporting.

5.2 Data Processing and Analysis

Analytical data will be managed using the software MANAGES©, which is developed by the Electrical Power Research Institute. This software program integrates statistical processing with an analytical database. NSPM reserves the right to perform the analysis using comparable tools at a later date.

Pursuant to §257.93 (h), groundwater data will be evaluated to determine if constituent concentrations in groundwater exhibit SSIs over the upgradient or background water quality, or exceed the groundwater protection standard. A Statistical Analysis Plan for the BAP2 is presented in Appendix A, and includes detailed descriptions of the statistical approach (i.e. interwell vs. intrawell testing), the detection monitoring program, and the assessment monitoring program. The Statistical Analysis Plan will generally follow applicable portions of the 2009 EPA guidance document *Unified Guidance for Statistical Analysis of Groundwater Data at RCRA Facilities* (Unified Guidance) (EPA, 2009), and the statistical options and protocols in the MANAGES© software are consistent with the recommendations of the Unified Guidance.

5.3 Routine Semi-Annual Monitoring Events

After each routine sampling event (i.e. once in the spring and once in the fall), the data is typically received by the project manager via email and will be reviewed as follows:

- Data validation will be completed as described in Section 5.1.1 of this Plan within 14 days of receipt of the data.
- Appropriate statistical analysis for the detection monitoring or assessment monitoring program will be performed on the data in accordance with the Statistical Analysis Plan, attached as Appendix A to this SAP.
- Appropriate reporting on the statistical analysis will be performed for the detection monitoring or assessment monitoring program, in accordance with the Statistical Analysis Plan.
- If applicable, pursuant to §257.95 (d)(1), appendix III and appendix IV constituent concentrations will be recorded in the BAP2 operating record.

5.4 Annual Groundwater Monitoring and Correction Action Report

According to §257.90(e), CCR units must prepare an annual groundwater monitoring and corrective action report each year that complies with the following:

"For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

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

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

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

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

(5) *Other information required to be included in the annual report as specified in §§ 257.90 through 257.98; and*

(6) *A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:*

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;
(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;
(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):
(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and
(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.
(iv) If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:
(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;
(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;
(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and
(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.
(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and
(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

The report will be prepared and posted in the facility operating record no later than January 31st of each year for the preceding calendar year. The typical organization of the annual report will be similar to that listed below:

Title Page
- Facility Name & Location; and
- Report certification.

1.0 Executive Summary

2.0 Introduction
- Annual Groundwater Monitoring Report Requirements

3.0 Site Description
- Site Hydrogeology

4.0 Monitoring Results
- Compliance with §257.90(e)
- Groundwater Monitoring System
- Well Installation or Decommissioning
- Summary of Monitoring Data
- Transition between monitoring programs
- Other Information

5.0 Discussion
- Key Actions Completed
- Problems
- Problems Encountered
- Resolution of Problems
- Key Activities for next year

6.0 References

Tables
- CCR Groundwater Monitoring System
- Summary of Data Collected
- Count of Parameters Analyzed by Well
- Spring Groundwater Summary Data
- Fall Groundwater Summary Data

Figures
- Site Location Map
- CCR Groundwater Monitoring System
- Spring Water Table Elevation Contour Map
- Fall Water Table Elevation Contour Map

Appendices
- Spring Monitoring Event Laboratory Report and Field Datasheets
- Fall Monitoring Event Laboratory Report and Field Datasheets

5.5 Recordkeeping, Notifications and Internet Requirements

Recordkeeping, notifications and posting to the publicly accessible web site will be performed in accordance with §257.105 (h), §257.106 (h), and §257.107 (h) respectively.

5.5.1 Recordkeeping

The following information, as it becomes available, will be placed in the facility's operating record in accordance with §257.105 (h):

(1) The annual groundwater monitoring and corrective action report as required by §257.90(e).
(2) Documentation of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices as required by §257.91(e)(1).
(3) The groundwater monitoring system certification as required by § 257.91(f).
(4) The selection of a statistical method certification as required by § 257.93(f)(6).
(5) Within 30 days of establishing an assessment monitoring program, the notification as required by § 257.94(e)(3).
(6) The results of appendices III and IV to this part constituent concentrations as required by § 257.95(d)(1).
(7) Within 30 days of returning to a detection monitoring program, the notification as required by § 257.95(e).
(8) Within 30 days of detecting one or more constituents in appendix IV to this part at statistically significant levels above the groundwater protection standard, the notifications as required by § 257.95(g).
(9) Within 30 days of initiating the assessment of corrective measures requirements, the notification as required by § 257.95(g)(5).
(10) The completed assessment of corrective measures as required by § 257.96(d).
(11) Documentation prepared by the owner or operator recording the public meeting for the corrective measures assessment as required by § 257.96(e).
(12) The semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report as required by § 257.97(a), except that the selection of remedy report must be maintained until the remedy has been completed.
(13) Within 30 days of completing the remedy, the notification as required by § 257.98(e).
(14) The demonstration, including long-term performance data, supporting the suspension of groundwater monitoring requirements as required by § 257.90(g).

5.5.2 Notifications

Notifications will be provided to the relevant State and/or Tribal authority when information has been placed in the operating record and on NSPM's publicly accessible internet site in accordance with §257.106(h) including the following:

(1) Provide notification of the availability of the annual groundwater monitoring and corrective action report specified under § 257.105(h)(1).

(2) Provide notification of the availability of the groundwater monitoring system certification specified under § 257.105(h)(3).
(3) Provide notification of the availability of the selection of a statistical method certification specified under § 257.105(h)(4).
(4) Provide notification that an assessment monitoring programs has been established specified under § 257.105(h)(5).
(5) Provide notification that the CCR unit is returning to a detection monitoring program specified under § 257.105(h)(7).
(6) Provide notification that one or more constituents in appendix IV to this part have been detected at statistically significant levels above the groundwater protection standard and the notifications to land owners specified under § 257.105(h)(8).
(7) Provide notification that an assessment of corrective measures has been initiated specified under § 257.105(h)(9).
(8) Provide notification of the availability of assessment of corrective measures specified under § 257.105(h)(10).
(9) Provide notification of the availability of the semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report specified under § 257.105(h)(12).
(10) Provide notification of the completion of the remedy specified under § 257.105(h)(13).
(11) Provide the demonstration supporting the suspension of groundwater monitoring requirements specified under § 257.105(h)(14).

5.5.3 Internet Requirements

The following information, as it becomes available, will be placed on NSPM's CCR website in accordance with §257.107 (h):

(1) The annual groundwater monitoring and corrective action report specified under § 257.105(h)(1).
(2) The groundwater monitoring system certification specified under § 257.105(h)(3).
(3) The selection of a statistical method certification specified under § 257.105(h)(4).
(4) The notification that an assessment monitoring program has been established specified under § 257.105(h)(5).
(5) The notification that the CCR unit is returning to a detection monitoring program specified under § 257.105(h)(7).
(6) The notification that one or more constituents in appendix IV to this part have been detected at statistically significant levels above the groundwater protection standard and the notifications to land owners specified under § 257.105(h)(8).
(7) The notification that an assessment of corrective measures has been initiated specified under § 257.105(h)(9).
(8) The assessment of corrective measures specified under § 257.105(h)(10).

(9) *The semiannual reports describing the progress in selecting and designing remedy and the selection of remedy report specified under § 257.105(h)(12), except that the selection of the remedy report must be maintained until the remedy has been completed.*

(10) *The notification that the remedy has been completed specified under § 257.105(h)(13).*

(11) *The demonstration supporting the suspension of groundwater monitoring requirements specified under § 257.105(h)(14).*

6.0 REFERENCES

Carlson McCain, 2017a. CCR Groundwater Monitoring System Certification; Scrubber Solids Pond No. 3. Sherburne County (Sherco) Generating Plant; Becker, Minnesota. Prepared for Northern States Power Company, a Minnesota Corporation. October, 2017.

Carlson McCain, 2017b. CCR Groundwater Monitoring System Certification; Bottom Ash Pond. Sherburne County (Sherco) Generating Plant; Becker, Minnesota. Prepared for Northern States Power Company, a Minnesota Corporation. October, 2017.

Carlson McCain, 2020. CCR Groundwater Monitoring System Certification, Bottom Ash Pond 2. Sherburne County (Sherco) Generating Plant; Northern States Power Company Prepared for Northern States Power Company, a Minnesota Corporation. Becker, Minnesota. September 21, 2020.

EPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. Environmental Protection Agency Office of Resource Conservation and Recovery. March, 2009.

NSPM, 2018a. CCR Ground Water Sampling Plan – Revision #1, Sherco Bottom Ash Pond. Northern States Power Company, a Minnesota Corporation. December, 2018.

NSPM, 2018b. CCR Ground Water Sampling Plan – Revision #1, Sherco Bottom Ash Pond. Northern States Power Company, a Minnesota Corporation. December, 2018.

Tables

TABLE 1
CCR GROUNDWATER MONITORING SYSTEM
Bottom Ash Pond 2

Well ID	Minnesota Unique Well ID	Date Installed	Location Site Coordinates (ft)		Elevation Top of Riser Pipe	Screen Length (ft)	Elevation Top of Screen	Elevation Bottom of Screen	Monitoring Status	Hydrologic Location
			Easting	Northing						
P-17	NA	8/26/81	2030284	866284	964.34	20	923	903	Routine Semi-annual	Up-Gradient
P-152A	806318	10/10/14	2031472	866696	965.87	10	933.6	923.6	Routine Semi-annual	Up-Gradient
P-158	812967	9/23/15	2029122	866410	966.55	10	927	917	Routine Semi-annual	Up-Gradient
P-173	844707	11/3/19	2029805	865402	998.49	10	928.4	918.4	Routine Semi-annual	Down-Gradient
P-174	844706	11/5/19	2029311	865400	1000.67	10	928.5	918.5	Routine Semi-annual	Down-Gradient
P-175	844705	11/2/19	2029018	865613	1002.92	10	928.8	918.8	Routine Semi-annual	Down-Gradient
P-176	844703	11/5/19	2029019	865941	1002.65	10	928.5	918.5	Routine Semi-annual	Down-Gradient
P-177	844704	11/4/19	2029568	866324	966.26	10	929.8	919.8	Routine Semi-annual	Up-Gradient
P-178a	844708	11/5/19	2030540	865533	966.46	10	929.2	919.2	Routine Semi-annual	Up-Gradient

*Notes:

Elevation is feet above mean sea level

TABLE 2
CCR MONITORING PARAMETERS
Bottom Ash Pond 2

		Parameter List	Parameters	Units	Preferred Method	GWPS	Reporting Limt	Frequency
Assessment Monitoring Parameters	Detection Monitoring Parameters	App III	Boron, total	mg/L	200.7	NA	0.05	Spring & Fall
		App III	Calcium, total	mg/L	200.7	NA	1.25	Spring & Fall
		App III	Chloride, total	mg/L	300	NA	1	Spring & Fall
		App III	Fluoride, total	mg/L	300	NA	0.75	Spring & Fall
		App III	pH (lab)	pH	4500-H+B	NA	-	Spring & Fall
		App III	Sulfate, total	mg/L	300	NA	1	Spring & Fall
		App III	Total Dissolved Solids (TDS)	mg/L	2540C	NA	20	Spring & Fall
		Gen. Chem.	Total Suspended Solids (TSS)[1]	mg/L	2540D	NA	4	Spring & Fall
		Field	pH (field)	pH	150.1	NA	-	Spring & Fall
		Field	Specific Conductance @ 25C (field)	umhos/cm	2510	NA	-	Spring & Fall
		Field	Turbidity	NTU	2130	NA	-	Spring & Fall
		Field	Water Level Elevation (MSL)	ft	C-017-1	NA	-	Spring & Fall
		App IV	Antimony, total	mg/L	200.8	0.006	0.0005	Spring & Fall[2]
		App IV	Arsenic, total	mg/L	200.8	0.01	0.0005	Spring & Fall[2]
		App IV	Barium, total	mg/L	200.8	2	0.0005	Spring & Fall[2]
		App IV	Beryllium, total	mg/L	200.8	0.004	0.0005	Spring & Fall[2]
		App IV	Cadmium, total	mg/L	200.8	0.005	0.0001	Spring & Fall[2]
		App IV	Chromium, total	mg/L	200.8	0.1	0.0005	Spring & Fall[2]
		App IV	Cobalt, total	mg/L	200.8	0.006	0.0005	Spring & Fall[2]
		App IV	Fluoride, total	mg/L	300	4	0.75	Spring & Fall[2]
		App IV	Lead, total	mg/L	200.8	0.015	0.0005	Spring & Fall[2]
		App IV	Lithium, total	mg/L	200.7	0.04	0.015	Spring & Fall[2]
		App IV	Mercury, total	mg/L	245.1	0.002	0.0002	Spring & Fall[2]
		App IV	Molybdenum, total	mg/L	200.8	0.1	0.0005	Spring & Fall[2]
		App IV	Radium, total	pCi/L	903.1+904.0	5	0.8	Spring & Fall[2]
		App IV	Selenium, total	mg/L	200.8	0.05	0.0005	Spring & Fall[2]
		App IV	Thallium, total	mg/L	200.8	0.002	0.0005	Spring & Fall[2]
	Special Event[3]	Gen. Chem	Alkalinity, total	mg/L	2320B	NA	10	Special Event
		Gen. Chem	Bromide, total	mg/L	300	NA	0.8	Special Event
		Gen. Chem	Magnesium, total	mg/L	200.7	NA	1.25	Special Event
		Gen. Chem	Potassium, total	mg/L	200.7	NA	1.25	Special Event
		Gen. Chem	Sodium, total	mg/L	200.7	NA	1.25	Special Event
		Gen. Chem	Specific Conductance, lab	umhos/cm	120.1	NA	-	Special Event

Notes:

1 TSS is not an App III or IV parameter, but is analyzed for evaluation of quality of unfiltered samples.

2 Individual App IV parameters are only sampled during the Fall sampling event if detected in any monitoring system well listed in Table 1 during the previous Spring sampling event.

3 Special events will include the general chemistry parameters listed and case-specific parameters determined by the GW project manager. Frequency will be determined by the GW project manager.

GWPS = Groundwater protection standard

NA = GWPS not applicable

TABLE 3
SAMPLE CONTAINERS, FILLING METHOD, PRESERVATION AND HOLDING TIMES
Bottom Ash Pond 2

Parameter Group[1]	Bottle Volume and Type[2]	Fill Method[3]	Preservation[4]	Holding Time
Major and Minor Ions (C1, S04)	1 liter, polyethylene	No head space	Cool, non-preserved	28 days
Metals (unfiltered)	250 mL; polyethylene	Leave head space	HNO3 to pH<2; lab cool	6 months (except for mercury)
Mercury	Water for mercury analysis will be collected in the same container as other metals above.		See above	Holding time for mercury is 28 days
General Parameters TDS TSS Specific Conductance	1 liter, polyethylene	No head space	Cool, non-preserved	 7 days 7 days 7 days
Radium	2 liter, polyethylene	Leave head space	HNO3 to pH<2; lab cool	180 days

Notes and Common Abbreviations for Table 3 on Chain of Custody:

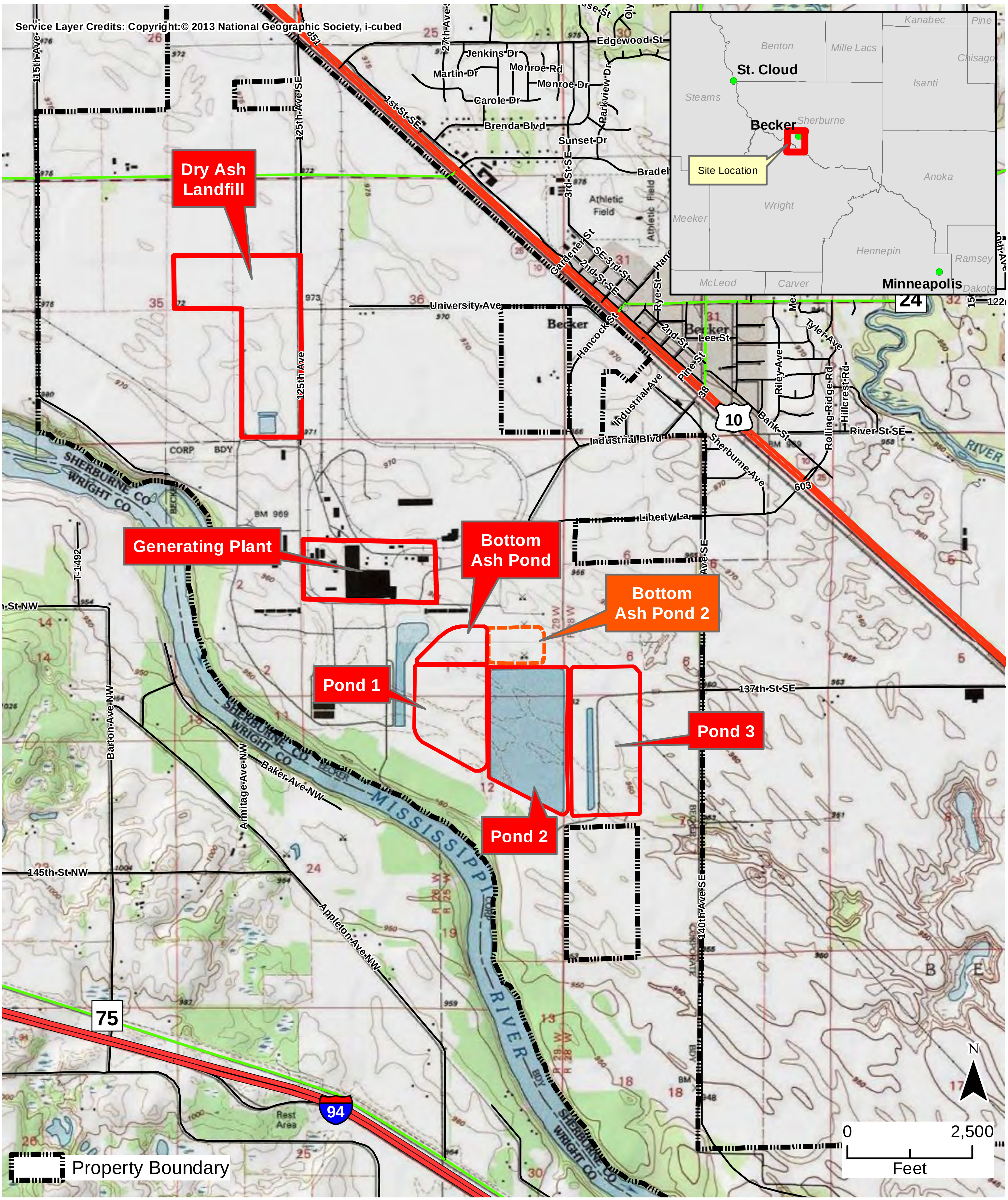
1. **Parameter Names/Groups**
   Some of these parameter names (e.g., “metals”) actually represent groups of several individual analytes. Specific analytes for each category are listed in Table 3.

2. **Bottle Volume and Type**
   mL: milliliter

3. **Fill Method**
   No headspace: Fill container completely. Container will not be rinsed or overfilled.
   Leave Headspace: Fill container about 90 to 95% full. Do not allow preservative (if present) to be diluted by overfilling container.

4. **Preservation**
   Cool: Place sample bottle inside sealed inert plastic bag. Place in cooler with sufficient ice to quickly achieve and maintain a sample temperature of 6°C until received by laboratory personnel.
   HNO3 to pH<2: Add a predetermined amount of high-purity HNO3 to bring the sample pH to 2 or less. Preservative is added to container in the laboratory before going into the field unless otherwise noted.

Figures



CARLSON McCAIN

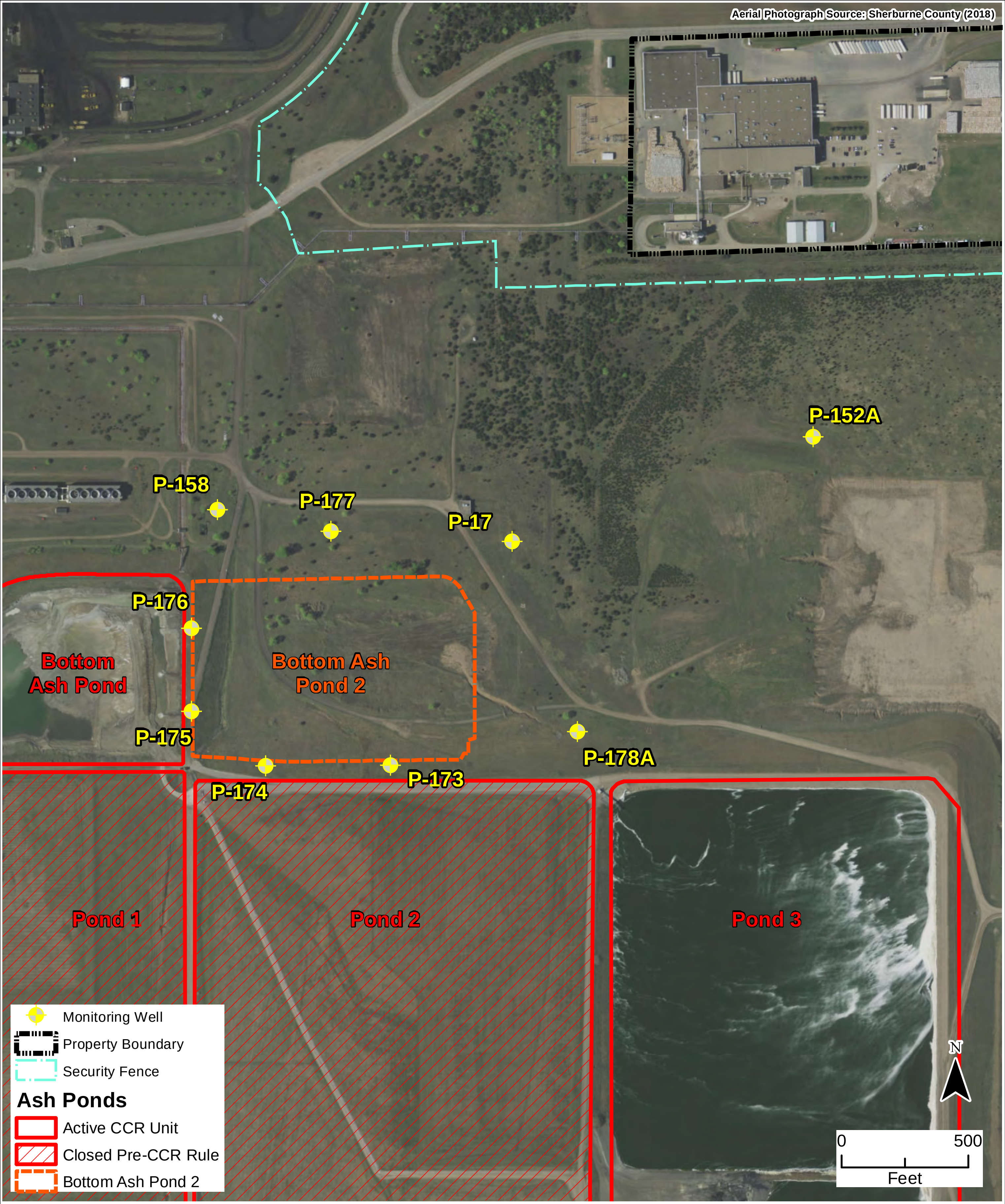
CCR GROUNDWATER SAMPLING AND ANALYSIS PLAN

Bottom Ash Pond 2

Sherburne County Generating Plant
Becker, Minnesota

FIGURE 1

SITE LOCATION MAP

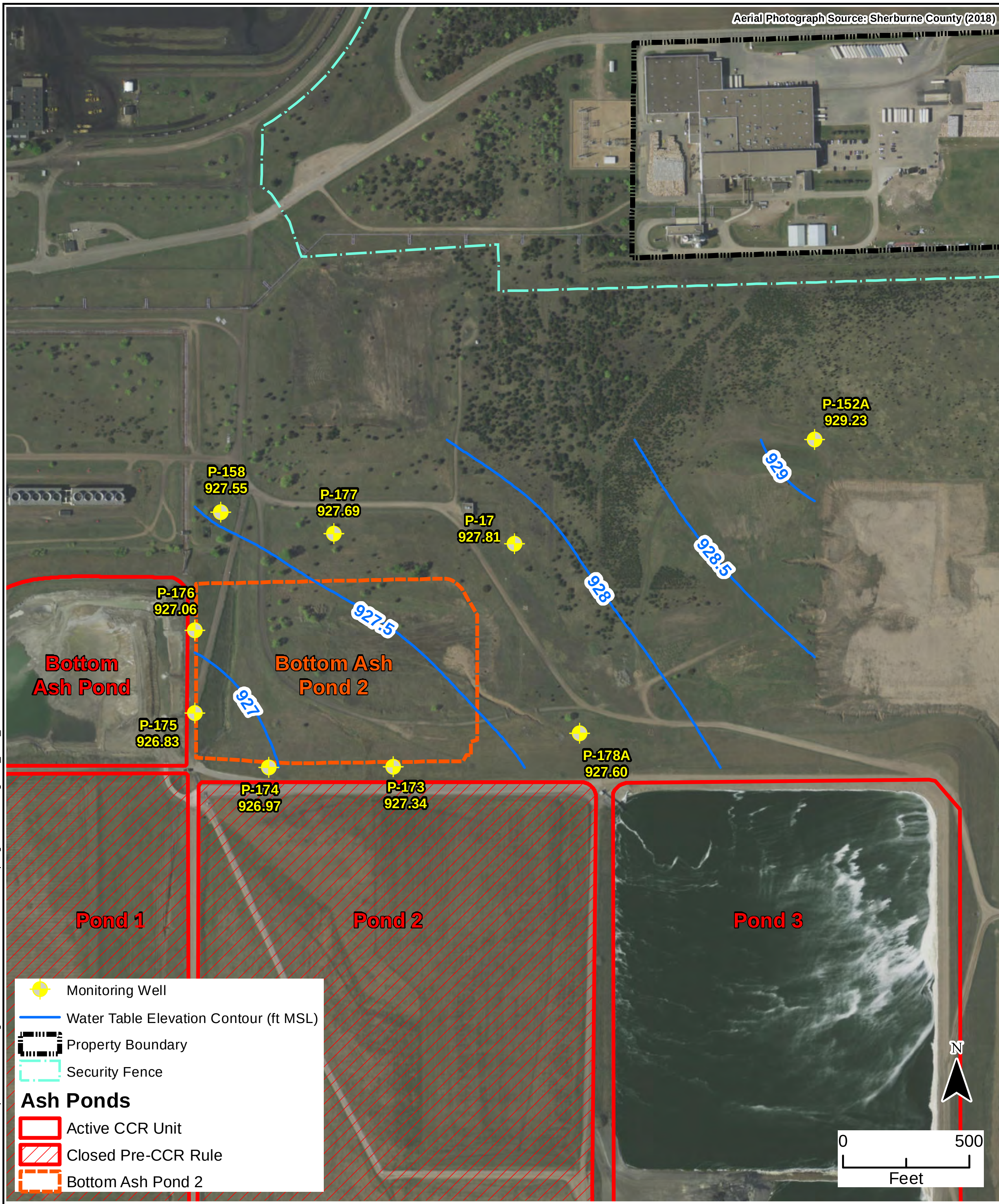


CARLSON McCAIN

CCR GROUNDWATER SAMPLING AND ANALYSIS PLAN
Bottom Ash Pond 2
Sherburne County Generating Plant
Becker, Minnesota

FIGURE 2
CCR GROUNDWATER MONITORING SYSTEM

Document Path: P:\Projects\XCEL\6559 Ash Operations and Mgmt\Sherco\2020 BAP2 CCR Sampling Plan\GIS\Figure2_BAP_CCR_EMS.mxd



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CARLSON McCAIN

CCR GROUNDWATER SAMPLING AND ANALYSIS PLAN
Bottom Ash Pond 2
Sherburne County Generating Plant
Becker, Minnesota

FIGURE 3
WATER TABLE ELEVATION CONTOUR MAP (7/29-30/2020)

Appendix A

Statistical Analysis Plan

STATISTICAL ANALYSIS PLAN

BOTTOM ASH POND 2

Sherburne County (Sherco) Generating Plant
Becker, Minnesota
Carlson McCain Project No.: 3404-19

Prepared for:

Northern States Power Company, a Minnesota Corporation

September 21, 2020

CARLSON McCAIN

15650 36TH AVENUE N, SUITE 110
PLYMOUTH, MN 55446

TEL 952.346.3900
FAX 952.346.3901

CARLSONMCCAIN.COM

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Statistical Analysis Plan
Sherco Bottom Ash Pond 2
Table of Contents

1. Introduction

On April 17, 2015, the US Environmental Protection Agency (EPA) published the final rule for the management of Coal Combustion Residuals (CCR). The CCR rule is formally promulgated in the U.S. Code of Federal Regulations, Title 40, Parts 257 and 261 (EPA, 2015) along with amendments to the rule published in July, 2018 (EPA, 2018) and August, 2020 (EPA, 2020). This rule is applicable to the Bottom Ash Pond 2 (Facility) at the Sherburne County Generating Plant (Sherco), which is owned and operated by Northern States Power Company, a Minnesota Corporation (NSPM). The Facility is located approximately 1.2 miles SW from the city of Becker, Minnesota, on the Sherco Plant property.

Pursuant to the 40 CFR, §257.90(b)(2), a groundwater sampling and analysis program must be developed in accordance with 40 CFR, §257.93 prior to initial receipt of CCR at the Facility. The program must address the selection of statistical methods, and the selected statistical method(s) must be certified by a Qualified Professional Engineer. This Statistical Analysis Plan (Plan) describes the method(s) to be used in identifying a statistically significant increase (SSI) over the upgradient or background groundwater quality. This Plan is included as Appendix A within the Facility's *Sherco Bottom Ash Pond 2, CCR Groundwater Sampling and Analysis Plan* (Carlson McCain, 2020b), and the reader is referred to the Sampling and Analysis Plan for additional information on the site-specific hydrogeology, groundwater monitoring system, sampling and analysis procedures, and reporting requirements.

2. Statistical Method

The fundamental goal of statistical analysis is to provide a quantifiable means to evaluate whether a CCR management unit has released contaminants into the groundwater. Upon completion of each compliance monitoring event, detected constituents will be statistically evaluated to identify if an SSI over background has occurred. Statistical methods used to test for an SSI will be implemented in accordance with the EPA's Unified Guidance Document (EPA 2009). The computer software MANAGES©, developed by the Electrical Power Research Institute, will be used to perform the analysis; however, NSPM reserves the right to perform the analysis using comparable statistical tools at a later date.

As groundwater monitoring progresses, the use of the selected statistical method will be subject to ongoing review. NSPM reserves the right to use other statistical tests in place of, or in addition to, the methods specified in this Plan if such methods are better suited for analysis of future results. Additionally, the methods in this Plan have been developed in accordance with the requirements of the CCR rule as published on April 17, 2015 (EPA, 2015), and as amended, and modifications to this Plan may occur if further revisions or amendments are made to the CCR rule. If test methods are changed this work plan will be revised, as appropriate, and its certification updated.

2.1 Inter-well vs Intra-well Analysis

Based on the site hydrogeology and existing groundwater monitoring system described in the CCR Groundwater Monitoring System Certification (Carlson McCain, 2020), the site is well suited for inter-well analysis based upon the following:

- Historical data indicate consistent groundwater gradients and flow directions beneath the Facility.
- Groundwater travel times are sufficiently fast, 4 to 54 ft/yr, ensuring the bi-annual samples collected are independent (Carlson McCain, 2020).
- The monitoring wells that comprise the groundwater monitoring system at the Facility are all completed in the same aquifer and are positioned to detect a release from the Facility.
- Baseline data reflect background sources which can be characterized with up-gradient wells.

2.2 Background Data

The background data set is comprised of eight rounds of groundwater samples collected from each of the background wells in the groundwater monitoring system during a five-month period from March of 2020 through July of 2020, meeting the requirements of §257.94(b). Samples were also collected from downgradient wells during the same time period. Each sample was analyzed for each of the parameters listed in Appendix III and Appendix IV of 40 CFR §257, as required by §257.94(b). Up-gradient data are defined by five wells: P-17, P-152A, P-158, P-177 and P-178A.

Background data will be evaluated and the data set amended, if appropriate, at a frequency of every two to three years.

2.3 Data review & Outliers

Data review for each sampling event will include:

- Basic statistics will be prepared for each well, and parameter. This will include: total observations, % non-detects, pooled mean, mean, median, standard deviation, and type of distribution.
- Time series plots will be prepared for each well and parameter.

During background data set update, data will be reviewed for outliers and trends. The review will include:

- Data will be reviewed for trends in background wells using either parametric or non-parametric methods.
- Grubbs Outlier testing will be conducted on background wells.

If the data is determined to be an outlier, one of three options is possible: keep the data point "as is" in the database, replace the data point with a corrected value, or discard the data point from statistical calculations. The decision to keep, replace or discard a statistical outlier will be made on a case-by-case basis. In general, observations should be kept in the data set unless there is evidence of errors that would invalidate the data.

2.4 Non-detects, Testing for Normality & Trends

Statistical analysis will take into account the data's distribution type, normal or non-normal. The Shapiro-Wilk test for normality will be performed for each combination of well and parameter. As part of the normality test, non-detect values will be replaced as a function of percent non-detect. If the percentage of non-detects is less than 50%, the non-detect value will be replaced with one-half the laboratory reporting limit (EPRI 2016). If the percentage of non-detects is 50% or higher, a non-parameteric test will be used in lieu of parametric testing. Analytical results between the reporting limit and the method detection limit, i.e. "J-flagged" values, will be utilized if provided by the laboratory.

The presence of temporal effects such as seasonality or other time-dependent trends may be identified using time series plots, analysis of variance (ANOVA), a formal trend test such as Mann-Kendall, or one of the tests for autocorrelation listed in Chapter 14 of the Unified Guidance (EPA, 2009). If temporal trends are apparent, the data set will be adjusted as recommended in the Unified Guidance.

2.5 Duplicate Data

Blind duplicate samples are collected in the field as part of the Facility's quality assurance / quality control (QA/QC) program. Results from these samples will be used strictly for QA/QC evaluation and not for statistical analysis.

2.6 Detection Monitoring and Determination of Statistically Significant Increases

During detection monitoring, each Appendix III parameter listed in Table 2 of the Sampling and Analysis Plan will be statistically evaluated to determine whether an SSI has occurred. The appropriate test method, parametric or non-parametric, will be determined for each parameter, well and event combination based on the background evaluation criteria discussed in Sections 2.3 and 2.4, above. Interwell Prediction Intervals will be the primary method to compare compliance data to background data during detection monitoring. Compliance well data will be compared to the upper limit of the prediction interval generated using pooled background data from the upgradient wells. Interwell prediction limits on future values (or means), will be constructed in accordance with the procedures outlined Chapters 18 and 19 of the Unified Guidance to target appropriate annual site-wide false positive rates and statistical power.

If compliance data exceeds the upper prediction limit, a one-of-two pass resampling will be performed. The specific well and parameter will be re-sampled and re-analyzed. Re-sample results will be incorporated into the database, the new data will be reviewed as described in steps 2.3 & 2.4 above, and the data re-processed statistically. If the statistical analysis again reports the compliance data in exceedance of the upper prediction limit, an SSI will be confirmed.

For constituents which report 100% non-detects in background and compliance wells, the double quantification rule will be applied. Whereas, if the constituent concentration in a compliance well exceeds the highest historical laboratory reporting limit for two consecutive events, an SSI will be confirmed.

3. Response to a Verified SSI

In accordance with §257.94 item (e); NSPM will:

1) Within 90 days of the determination of an SSI, demonstrate that a source other than the Facility caused the SSI. Due to the complexity of chemical analysis, hydrogeology and background influences, the components of an alternate source demonstration (ASD) are not prescriptive. However, an ASD shall contain sufficient information to confirm the CCR Unit is not the cause of the SSI, and shall be certified by a qualified professional engineer. If a certified ASD is provided, the Facility may continue with detection monitoring.
    a. The ASD will be included in the Facility's annual groundwater monitoring and corrective action report.
2) If a successful ASD is not made within 90 days of the SSI, the Facility must initiate assessment monitoring as required under §257.95.
    a. A notification that an assessment monitoring program has been established will be placed in the Facility's operating record and posted to the CCR web site.

3.1 Assessment Monitoring

Assessment monitoring will be initiated if a successful ASD is not completed within 90 days of identifying an SSI, and will include the following steps:

1) Within 90 days of triggering an assessment monitoring program, and annually thereafter, sample each well for the Appendix IV parameters listed in Table 2 of the Sampling and Analysis Plan.
2) Within 90 days of receiving results from step 1), above, resample all wells for Appendix III parameters and detected (i.e. concentration above the reporting limit) Appendix IV parameters.
3) Establish groundwater protection standards (GWPS) for each detected Appendix IV parameter. The GWPS shall be the U.S. EPA Maximum Contaminant Level (MCL), the levels for specific constituents listed in §257.95(h)(2), or the background concentrations for the constituent, whichever is higher.
4) Determine whether concentrations of Appendix IV parameters exceed the GWPS. This will be done using confidence intervals. If the lower confidence limit exceeds the GWPS at the 95% confidence level then the constituent has been detected at a statistically significant level above the GWPS.
5) If concentrations of all Appendix III and Appendix IV parameters continue to be above background concentrations but below the applicable groundwater protection standard, assessment monitoring will continue.
6) If one or more Appendix IV parameters is shown by step 4) to exceed the GWPS, the following actions will be taken:
    a. Place a notification in the operating record identifying the GWPS exceedances
    b. Characterize the nature and extent of the release

c. Notify adjacent landowners located in the delineated extent of the contamination, and document notifications in the operating record.
d. Within 90 days:
   i. Prepare an ASD for the exceedance, or
   ii. Initiate an assessment of corrective measures in accordance with §257.96.

Assessment monitoring will continue until two consecutive rounds demonstrate Appendix III and Appendix IV constituents are below background levels, at which time the Facility may return to detection monitoring.

4. References

Carlson McCain, 2020a. CCR Groundwater Monitoring System Certification, Bottom Ash Pond 2. Sherburne County (Sherco) Generating Plant; Becker, Minnesota. Prepared for Northern States Power Company, a Minnesota Corporation. September, 2020.

Carlson McCain, 2020b. CCR Groundwater Sampling and Analysis Plan, Sherco Bottom Ash Pond 2, Becker, Minnesota. Northern States Power Company, a Minnesota Corporation. September, 2020.

EPA, 2009. Statistical analysis of Groundwater Monitoring Data at RCRA Facilities: Unified guidance. Environmental Protection Agency Office of Resource Conservation and Recovery. EPA 530/R-09-007. March, 2009

EPA, 2015. 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule, Federal Register vol. 80, no. 74. Environmental Protection Agency. April 17, 2015.

EPA, 2018. 40 CFR Part 257; Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria, Federal Register vol. 83, no. 146. Environmental Protection Agency. July 30, 2018.

EPA, 2020. 40 CFR Part 257; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure

Part A: Deadline to Initiate Closure, Federal Register vol. 85, no. 168. Environmental Protection Agency. August 28, 2020.

EPRI, 2016. Presentation by Kirk Cameron on Treating Non-detects. Groundwater Resource Center Workshop, Statistical Methods for Analysis of Groundwater Monitoring Data. Electrical Power Research Institute, October, 2016.

5. Professional Engineer Certification

"I hereby certify that the selected statistical method described herein is appropriate for evaluating the ground water monitoring data for the Bottom Ash Pond at the Sherburne County Generating Plant, pursuant to 40 CFR 257.93(f). I am a duly licensed Professional Engineer under the laws of the state of Minnesota".

Nicholas Bonow, PE, PG	September 21, 2020
License No. 47510	Date
Carlson McCain, Inc.	

NICHOLAS BONOW
LICENSED PROFESSIONAL ENGINEER
47510
STATE OF MINNESOTA

License renewal date: June 30, 2022

Appendix B

Data Validation Summary Form

Xcel Energy
RESPONSIBLE BY NATURE®

414 Nicollet Mall
Minneapolis, MN 55401-1993

Data Validation Summary

Monitoring Event Information			
Facility / Site:	**Sherco BAP2 - CCR**	**Sampling Event:**	
Regulator:	**EPA**	**Sample Locations:**	**P-17, P-152A, P-158, P-173, P-174, P-175, P-176. P-177. P-178A**
Sampling and Analysis Plan (SAP) Version:		**Sampling Window:**	
Sampler:		**Date Sampling Completed:**	
Laboratory Supervisor:			

Review Items					
R[1]	A[2]		R[1]	A[2]	
☐	A	Locations of samples collected	☐	A	Field data parameters obtained and reported
☐	A	Number of samples collected	☐	A	Parameters analyzed and reported
☐	A	Chain of custody prepared correctly	☐	A	Date/time analyses were performed, and individuals who performed them
☐	A	Case narrative discussing any missing, qualified or rejected data	☐	AL	Laboratory blank data (method blanks, preparation blanks)
☐	A	Batch/field/lab identifications (IDs) and ID correspondence sheet	☐	A	Field blank data (duplicate ± 20%, trip, rinse detections and equipment blanks)
☐	AC	Holding times	☐	AL	Spike data (including matrix spike/ matrix spike duplicate)
☐	A	Preservation and cooler receipt	☐	AL	Laboratory control samples (LCS)
☐	A	Cooler temperature upon receipt	☐	A	Units of measurement
☐	A	Analytical technique and method numbers (i.e., from SW-846, ASTM, etc.)	☐	A	Quantification Limits (Method detection limits (MDL), Reporting Limits (RLs), Practical Quantif. Limits (PQL)
☐	A	Dilution factors	☐	A	Data results/Laboratory EDD
☐	A	Date/time of sample collection	☐	A	Data imported to Manages and matches reported data
☐	A	Date/time sample was received by the laboratory	☐	A	Supporting field data (e.g., field sampling data sheets, field logbook notes, etc.)
☐		Date/time of sample extraction (if applicable)			

[1] R = Review. If checked, item was provided and reviewed.
[2] A = Acceptability. "A" means the data provided is acceptable. "AL" means the data is acceptable via laboratory QA/QC. "AC" means the data is acceptable with comment below. "D" means a deficiency exists with the data which is discussed below.

Review Comments

Data Validation Summary[3]

[3] The validation provided on this form is based on currently available information and does not preclude any results from being invalidated or otherwise removed from the dataset as a result of future review or analysis.

Date of Validation: ____________________ **Validator Signature:** ______________________________

Appendix C

Field Data Sheet and Chain-of-Custody Templates

Pace Analytical® Field Services Division

Well Sampling Field Data Log Sheet

Well Description and Presampling Information

Client ____________ **Project** ____________ **Project No.** ____________

Monitoring Point ID ____________ Labeled ____________

Inside Diameter ____________ (inches) Key # ____________ ☐ Locked ☐ Not Locked

Casing Material: ☐ PVC ☐ Steel ☐ Stainless Steel

Depth Measurement and Elevations (from top of well casing)

Top of Casing Elevation ____________ Feet

Total Well Depth ____________ Feet

Static water level measurement before purging (Start Depth) ____________ Feet

Static water level measurement at time of sampling (Final Depth) ____________ Feet

Static Water Level Elevation Before Purging ____________ Feet

Purge Method ____________ Pump ID ____________

Date Purged ____________ Water Column ____________ Feet

Time Purged ____________ One Casing Volume ____________ Gallons

Pump Rate ____________ GPM / LPM Volume Purged ____________ Gallons

Field Sampling Data

Date Sampled ____________

Time Sampled ____________

Sampling Equip. ____________

Meter ID ____________

Analyzed by ____________

Field Parameter Measurements of Sample

pH ____________ (units) D.O ____________ (mg/l)

Spec. Cond. ____________ (μmhos/cm) Turbidity ____________ (NTU)

Temp. ____________ (°C) Eh ____________ (mV)

Other ____________

Field Measurements Temp. Corrected: ☐ Yes ☐ No ☐ NA

Sample for Soluble Metals Filtered in Field: ☐ Yes ☐ No ☐ NA

Weather Conditions During Sampling: ____________

Sample Description: ____________

Observations: ____________

Stabilization Test

Time	pH (units)	Specifc Conductance (μmhos/cm)	Temp (°C)	D.O. (mg/l)	Turbidity (NTU)	Eh (mV)	Volume Purged (cumulative gal)

Samples chilled immediately after collection: ☐ Yes ☐ Other ____________

Form Revised: 01/25/2018

Name/Affiliation of Sampler(s): ____________

Lead Technician Signature: ____________ Date: ____________

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A Required Client Information:		Section B Required Project Information:	Section C Invoice Information:
Company:		Report To:	Attention:
Address:		Copy To:	Company Name:
			Address:
Email To:		Purchase Order No.:	Pace Quote Reference:
Phone:	Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:		Project Number:	Pace Profile #:

REGULATORY AGENCY		
☐ NPDES	☐ GROUND WATER	☐ DRINKING WATER
☐ UST	☐ RCRA	☐ OTHER ______

Site Location
STATE: ______

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test↓ Y/N													Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1																																
2																																
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE	
PRINT Name of SAMPLER:	
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-Feb-2007