REPORT

Assessment of Corrective Measures

Great River Energy, Stanton Station, Closed Bottom Ash Impoundment

Submitted to:

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Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

WSP USA Inc. (WSP) has prepared this assessment of corrective measures (ACM) report for the Bottom Ash Impoundment at Great River Energy's (GRE) Stanton Station in accordance with the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule, 40 Code of Federal Regulations (CFR) Part 257 and the North Dakota Department of Environmental Quality (NDDEQ) CCR Rule, North Dakota Administrative Code (NDAC) Title 33.1 Article 20 Chapter 08. This ACM has been prepared to evaluate potential corrective measures including source control and groundwater remediation corrective measures to address the identified statistically significant levels (SSLs) of molybdenum and arsenic in groundwater downgradient of the Bottom Ash Impoundment. Molybdenum was detected as an SSL at monitoring well MW-201 and arsenic was detected as an SSL at monitoring well MW-203.

The SSL for molybdenum at MW-201 was identified March 28, 2025, following completion of assessment monitoring statistics associated with the fourth quarter (Q4) 2024 semi-annual sampling and testing event. A notification identifying the SSL for molybdenum was prepared and both posted online and submitted to the NDDEQ on April 8, 2025 (within 30 days of identifying the SSL). The ACM was initiated on June 26, 2025, within 90 days of identifying the SSL for molybdenum.

The SSL for arsenic at MW-203 was identified July 22, 2025, following completion of assessment monitoring statistics associated with the first quarter (Q1) 2025 annual sampling and testing event and initiation of the ACM at the Bottom Ash Impoundment. A notification identifying the SSL for arsenic was prepared and both posted online and submitted to the NDDEQ on August 1, 2025 (within 30 days of identifying the SSL). The ACM for the arsenic SSL was initiated July 22, 2025, by incorporation into the ongoing ACM for the Bottom Ash Impoundment, within 90 days of identified the SSL.

1.1 Purpose

The purpose of this ACM is to identify potential corrective measures to prevent further releases, remediate any identified releases, and restore the groundwater downgradient of the Bottom Ash Impoundment to original conditions. In particular, the ACM evaluates corrective measures including source control and alternatives for groundwater corrective action at the site given the site conditions and constituents of concern. Based on the results of the ACM, further evaluation will be performed, site-specific studies completed, and a final long-term corrective action plan will be developed and implemented pursuant to 40 CFR 257.97 and -98 and NDAC 33.1-20-08-06(6) and (7). This process is typically iterative and may be composed of multiple steps to analyze the effectiveness of corrective measures to address the potential migration of CCR constituents in groundwater at the Bottom Ash Impoundment.

Both the Federal and State rules indicate that corrective measure assessments should include an analysis of the effectiveness of potential corrective measures addressing the following as stated in 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c):

- performance of potential remedies
- reliability of potential remedies
- ease of implementation of potential remedies
- potential impacts of potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination

- time required to begin and complete the remedy
- any institutional requirements that may substantially affect implementation of the selected remedy, such as state or local permit requirements
- other environmental or public health requirements that may substantially affect implementation of the selected remedy

These evaluation criteria were considered for each potential remedy and are discussed in more detail in the following sections. Once potential corrective measures are identified, they will be further evaluated, and a remedy will be selected using the criteria outlined in 40 CFR 257.97 and -98 and NDAC 33.1-20-08-06(6) and (7).

1.2 Site Background

Stanton Station was a coal-fired electric generation facility located along the Missouri River in Mercer County, approximately three miles southeast of Stanton, North Dakota. Stanton Station began generating power in 1966 and ceased power production in February 2017. Demolition of the industrial site was finished in 2019, with site restoration completed in 2020. CCRs were managed in composite-lined surface water impoundment cells and dry waste landfills regulated and permitted by the NDDEQ in accordance with NDAC Article 33.1-20, Solid Waste Management and Land Protection.

Stanton Station has two CCR units covered by the Federal and State CCR rules:

- Bottom Ash CCR Landfill (Bottom Ash Landfill)
- Bottom Ash CCR Surface Impoundment (Bottom Ash Impoundment)

Locations of the two CCR units, and the Bottom Ash Impoundment groundwater monitoring wells are shown in Figure 1. This ACM pertains only to the Bottom Ash Impoundment.

1.3 Site Closure and Restoration

Site restoration activities began in the summer of 2019 and were completed in the summer of 2020. These activities primarily included closure of the Bottom Ash Landfill and the Bottom Ash Impoundment as well as re-grading the site to promote drainage and vegetative growth.

Documentation of the closure and cover construction at the Bottom Ash Impoundment was included in the construction quality assurance (CQA) report provided to the NDDEQ (GAUSA 2021b). Construction activities associated with the closure of the Bottom Ash Impoundment included:

- Isolation of the south cell and construction of a sump within the south cell
- Closure by removal of the north and center cells, including removal of the high-density polyethylene (HDPE) liner and approximately six inches of the clay soil liner
- Regrading and stabilization of waste in the south cell and construction of a final cover system over the south cell in accordance with the final cover designs outlined in the Closure and Post-Closure Plan (GAI 2019) to minimize infiltration and erosion and to meet or exceed the requirements of 40 CFR 257.102(d)(3)(ii) and NDAC 33.1-20-08-07(3)(d)(3)(b).

Each construction activity included CQA testing and monitoring and was overseen by a professional engineer licensed in the state of North Dakota. Documentation was provided to the NDDEQ (GAUSA 2021b). Construction drawings for the Bottom Ash Impoundment closure are included in Appendix A.

2.0 SITE CONDITIONS

The Stanton Station site is located along the Missouri River, and the general area is primarily characterized by the presence of glacial deposits, with alluvial deposits dominating near-surface geology adjacent to the Missouri River. The following sections detail the regional and site geology and hydrogeology.

2.1 Regional and Site Geology

Regional geology of the area surrounding Stanton Station is documented in the Hydrogeologic Assessment Report, Stanton Station Ash Ponds (Braun 1993). Stanton Station is located in the Missouri Slope District of the Glaciated Missouri Plateau Section of the Great Plains Province. Subsurface and surficial stratigraphy of Mercer County and the adjacent Oliver County were reviewed in depth by C.G. Carlson for the North Dakota Geological Society (Carlson 1973). Primary near-surface stratigraphic units in the area of Stanton Station include the Tongue River formation and Cannonball Formation, with named lignite beds prominent in the vicinity of the site.

Near-surface geology at Stanton Station consists of two primary geologic units: the upper alluvial terrace deposits of the Missouri River, and underlying sediments and bedrock belonging to the Bullion Creek Formation, each of which have varying extents and thickness across the site (Braun 1993).

2.2 Site Hydrogeology

The principal hydrostratigraphic unit and uppermost water-bearing unit in the vicinity of the Bottom Ash Impoundment consists of alluvial deposits, which include two subunits: an upper silty sand and clay, and an underlying outwash sand and gravel. Individually, these subunits are laterally heterogeneous and geologic conditions within these subunits can be characterized by interbedded layers of gravel, sand, silt, clay, and coal.

Due to variations in subunit thickness throughout the site and the interconnected behavior of the identified subunits, groundwater in the uppermost water bearing unit is monitored in both identified subunits. Flow generally moves from southwest to northeast across the site towards the Missouri River. Depths from the ground surface to the uppermost water-bearing unit range from 5 to 20 feet in the area around Stanton Station.

2.3 Groundwater Flow Conditions

Depths to groundwater have been measured at sampled wells during each sampling event prior to purging. Groundwater elevations in the uppermost groundwater at Stanton Station are consistent with historical values and demonstrate that groundwater generally flows to the north and northeast towards the Missouri River.

The groundwater flow rate across each facility was estimated with the equation:

$$V_s = k \times {}^{i}/_{n_e}$$

Where:

V_s = the groundwater flow rate in feet per day (ft/day)

k = the hydraulic conductivity in ft/day, estimated from slug testing results from system wells

i = the hydraulic gradient in feet per feet (ft/ft), calculated based on groundwater elevations for the presented monitoring events

n_e = the effective porosity, a unitless parameter, estimated to be 0.25 for a silt/sand (Duffield 2007), reflective of site soils

Hydraulic conductivity (k) values measured on site ranged from 0.023 ft/day to 21.9 ft/day based on site-specific testing conducted in 2023 and analyzed in 2024 (WSP 2024). As the Bottom Ash Impoundment and Bottom Ash Landfill are adjacent to one another and intersect similar geologic formations within the uppermost water-bearing zone, the groundwater flow rates are assumed to be approximately the same for the facilities during each sampling event and are presented below.

- Q4 2024
  - Average gradient (i) = 0.008 ft/ft
  - Range of groundwater flow velocities (V_s): 0.0007 ft/day to 0.66 ft/day
- Q1 2025
  - Average gradient (i) = 0.007 ft/ft
  - Range of groundwater flow velocities (V_s): 0.0006 ft/day to 0.62 ft/day

3.0 GROUNDWATER MONITORING SUMMARY

3.1 Groundwater Monitoring Program

The CCR groundwater monitoring system at Stanton Station is designed to identify potential impacts from the Bottom Ash Impoundment. The Bottom Ash Impoundment monitoring wells are installed and screened at appropriate locations and depths to obtain groundwater samples from the uppermost water bearing unit. The number and spacing of the downgradient monitoring wells were selected based on the hydrogeologic conditions at the site and the areal extent of the CCR unit in closure, such that impacts to groundwater quality in the uppermost water bearing unit can be detected along potential flow pathways if they were to occur. The current groundwater monitoring system is described in the Coal Combustion Residuals Groundwater Monitoring System Certification, Revision 1 (GAI 2020).

3.2 Site-Specific Groundwater Protection Standards (GWPS)

Site-specific groundwater protection standards (GWPS) as provided in Table 1 were established for statistical comparison with assessment monitoring results. Site-specific GWPS were originally developed from upgradient and side-gradient background locations (MW-8B, MW-7A, MW-7B, MW-105, and MW-6B), with data collected between the start of the CCR monitoring program in 2016 and Q4 2021.

Per 40 CFR 257.95(h) and NDAC 33.1-20-08-06(5)(h), the site-specific GWPS must fall within one of the following categories:

- For constituents for which a maximum contaminant level (MCL) has been established by the USEPA (40 CFR 141.62 and 141.66), the MCL for that constituent will be the site-specific GWPS.
- For the following constituents, the following alternative CCR-specified limits apply within the Federal rule:

- Cobalt – 0.006 milligrams per liter (mg/L)
- Lead – 0.015 mg/L
- Lithium – 0.04 mg/L
- Molybdenum – 0.1 mg/L

- For constituents where the background baseline concentration is higher than the specified levels noted above, a statistical limit determined from the baseline data will be the site-specific GWPS.

Based on the pooled background dataset, the MCL or alternative limit as indicated above were set as the site-specific GWPS for the assessment monitoring constituents, with the exception of lithium.

Each measured concentration of lithium from the upgradient and side-gradient background locations collected to date are greater than the value specified in 40 CFR 257.95(h)(2). The pooled dataset for lithium displayed a non-normal distribution with the included data from 2016 to Q4 2021, resulting in a GWPS of 0.325 mg/L as the highest value in the pooled background dataset as shown in Table 1.

Site-specific GWPS values were originally developed when the Bottom Ash Landfill entered assessment monitoring, with data collected through Q4 2021. Background data collected since Q4 2021 have been reviewed during each assessment monitoring sampling event to confirm the continued applicability of the site-specific GWPS. Changes in the background water quality will continue to be monitored during each assessment monitoring sampling event.

3.3 Assessment Monitoring SSLs

During assessment monitoring sampling events, groundwater samples are collected and analyzed for the assessment monitoring parameters to meet the requirements of 40 CFR 257.95(b) and NDAC 33.1-20-08-06(5). Analytical data from both the annual and semi-annual assessment monitoring events have been statistically analyzed pursuant to 40 CFR 257.93(f) and NDAC 33.1-20-08-06(3)(f), using the methods for assessment monitoring statistics described in detail in the Coal Combustion Residuals Groundwater Statistical Methods Certification, Revision 2 (GAUSA 2021a).

Statistical analysis of the assessment monitoring results from groundwater sampling and analysis of the wells downgradient of the Bottom Ash Impoundment (MW-201, MW-202, MW-203) is performed using a confidence interval approach to evaluate if detected constituent concentrations were SSLs relative to the site-specific GWPS.

A confidence (α) of 95% was used for calculating the Upper Confidence Limit (UCL) and Lower Confidence Limit (LCL) of the compliance data. Confidence limits can be either parametric or non-parametric, dependent on the number of non-detects and data distribution of each data set. For determination of SSLs, the LCL is of primary interest. A confidence interval is only considered statistically above the associated GWPS if both the UCL and LCL exceed the GWPS. If only the UCL exceeds the GWPS while the LCL remains below the GWPS, the results of the test are considered inconclusive. The Unified Guidance recommends that results within this category be interpreted as “in compliance” and not an SSL (USEPA 2009). If both the UCL and LCL are below the GWPS, the data are considered not statistically significant.

An SSL was identified for molybdenum at MW-201 following the Q4 2024 assessment monitoring sampling event. Following identification of the SSL, GRE initiated an assessment of corrective measures for the Bottom Ash Impoundment.

Following initiation of the assessment of corrective measures for the Bottom Ash Impoundment, a separate SSL was identified for arsenic at MW-203 following the Q1 2025 assessment monitoring sampling event.

Data collected during assessment monitoring for arsenic and molybdenum at the background wells and the Bottom Ash Impoundment downgradient wells are shown in Appendix B.

4.0 NATURE AND EXTENT INVESTIGATION

4.1 Field Investigation Activities

Following the identification of the SSL for molybdenum at MW-201, a site investigation plan was developed to help characterize the nature and extent of molybdenum above the GWPS per 40 CFR 257.95(g)(1) and NDAC 33.1-20-08-06(5)(g)(1). The site investigation plan was expanded to also help characterize the nature and extent of arsenic above the GWPS following the identification of the SSL for arsenic at MW-203. Eight additional nature and extent wells were installed based on available information pertaining to groundwater flow direction and gradient downgradient of the Bottom Ash Impoundment. The locations of new and existing monitoring wells used to define the nature and extent of the elevated molybdenum at MW-201 and arsenic at MW-203 are shown in Figure 2.

4.1.1 Property Boundary Well Investigation

A new monitoring well was installed at the downgradient property boundary adjacent to the Missouri River (MW-PB1R) in the direction of groundwater flow. Well MW-PB1R has been installed to a depth approximately 10 feet deeper than the adjacent MW-PB1, which was previously installed as a property boundary well. MW-PB1 has intermittently had insufficient water to be sampled. Both wells (MW-PB1 and MW-PB1R) will be sampled per the schedule established for assessment monitoring within 40 CFR 257.95 and NDAC 33.1-20-08-06(5) when there is sufficient water in the wells. The boring log and well completion information for MW-PB1R and MW-PB1 are included in Appendix B.

4.1.2 June 2025 Nature and Extent Well Investigation

Following the SSL identification, eight additional monitoring wells have been installed to determine the extent of impacts of molybdenum in the vicinity of MW-201 and arsenic in the vicinity of MW-203 (Figure 2).

Five wells, MW-223, MW-224, MW-225, MW-226, and MW-230, were installed and developed in June 2025 near MW-201 to determine the extents of molybdenum. Wells were placed approximately 200 feet to the west (MW-223) and east (MW-224) of MW-201. Additionally, wells were placed in the downgradient direction of groundwater flow, approximately 200 feet (MW-225) and 500 feet (MW-226) to the north and northeast of MW-201. MW-230 was drilled within 10 feet of well MW-201 to a depth intended to intersect the locally defined “bedrock”, to a depth approximately 20 feet deeper than MW-201.

Three additional wells, MW-227, MW-228, and MW-229, were installed and developed in June 2025 near MW-203 to determine the extents of arsenic. Wells were placed approximately 200 feet to the north (MW-227) and south (MW-228) of MW-203, based on the location of the unit boundary and the generalized direction of groundwater flow. MW-229 was installed approximately 400 ft east of MW-203.

Boring logs and well completion information for the wells installed in June 2025 are included in Appendix B.

4.1.3 Additional Nature and Extent Wells

Additional site wells associated with the historical monitoring network for the Bottom Ash Impoundment (MW-1R and MW-104) will continue to be used in conjunction with the monitoring network to evaluate the nature and extent of the identified SSLs, per direction previously provided by NDDEQ (NDDEQ 2023). Additional monitoring locations downgradient of the Bottom Ash Impoundment that are associated with other facilities at Stanton Station will also be reviewed in context of determining the nature and extent of the identified SSLs.

4.1.4 Groundwater Sampling and Analysis

Groundwater samples will be collected from the new and existing nature and extent wells and analyzed for both detection monitoring and assessment monitoring analytes. Samples have not yet been collected from the recently installed nature and extent wells. The recently installed wells will be sampled in accordance with the assessment monitoring program schedule pending installation of dedicated low-flow sampling pumps (scheduled to be installed early October 2025).

4.1.5 Solids Sampling and Analysis

As part of the drilling program for the nature and extent wells in June 2025, solids samples were collected at the installed well locations during drilling and sent for analysis by SGS Canada Inc. Samples are being analyzed using the sequential extraction procedure (SEP; Tessier et al. 1979) and X-ray diffraction (XRD) including clay speciation. Results of the associated analysis have not yet been received and will be included in future submittals.

Soil samples shipped for analysis via SEP and XRD included the following:

- MW-225 from within the screened interval
- MW-226 from within the screened interval
- MW-227 from above the screened interval
- MW-230
  - A sample corresponding to the screened interval of MW-201 (10 to 20 feet below ground surface)
  - A second sample within the screened interval at MW-230 (35 to 40 feet below ground surface)
- MW-PB1R from within the screened interval

5.0 ASSESSMENT OF CORRECTIVE MEASURES

5.1 Objectives of the Corrective Measures

Potential corrective measures are evaluated using the criteria listed in 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c), including performance, reliability, ease of implementation, potential impacts, remedy duration, and institutional and public health requirements.

In addition, the following criteria listed in 04 CFR 257.97(b) and NDAC 33.1-20-08-06(7)(b) must be met by the selected corrective measure:

- Protect human health and the environment.
- Attain applicable GWPS as specified pursuant to 40 CFR 257.95(h) and NDAC 33.1-20-08-06(5)(h).

- Control the source(s) of release(s) to reduce or eliminate, to the maximum extent feasible, further releasees of assessment monitoring constituents to the environment.
- Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, considering factors such as avoiding inappropriate disturbance of sensitive ecosystems.
- Comply with standards for management of waste as specified in 40 CFR 257.98(d) and NDAC 33.1-20-08-06(8)(d).

The corrective measures evaluated as part of this ACM are not intended to be an exhaustive list of all possible corrective measures but are focused on corrective measures that are anticipated to be technically feasible and that will likely perform satisfactorily at the site.

Section 5.2 discusses corrective measures primarily associated with source control and Section 5.3 discusses corrective measures primarily associated with groundwater remediation.

5.2 Source Control Corrective Measures

The selected remedy should control the source(s) of release(s) to reduce or eliminate, to the maximum extent feasible, further releases of assessment monitoring constituents to the environment. Source control measures at the Bottom Ash Impoundment are focused both on CCR and leachate present within the closed Bottom Ash Impoundment footprint.

Prior to the initiation of assessment monitoring and the ACM, the Bottom Ash Impoundment was closed with an engineered final cover placed over waste left in place. Closure was completed in accordance with the Closure and Post-Closure Plan (GAI 2019). Although closure was performed prior to initiation of assessment monitoring and the ACM, an evaluation of the previously conducted closure as a source control measure is provided below, indicating why the steps previously taken are considered an appropriate source control measure.

Closure of the Bottom Ash Impoundment provides the primary source control measure to reduce the potential for migration for CCR constituents to groundwater. In addition, removal of leachate by pumping from the constructed sump reduces the volume of remaining leachate within the Bottom Ash Impoundment following closure.

If over the course of corrective action implementation and monitoring, the previously implemented closure measures (engineered cover and leachate removal) are determined to be inadequate, additional source control measures will be further evaluated and implemented. Two potential additional source control measures options include:

- increased leachate removal through the installation of dewatering wells
- complete closure by removal of CCR from the Bottom Ash Impoundment

Table 2 provides a summary of the source control measures compared to the evaluation criteria described in both the Federal and State rules and listed in Section 1.1, as applied to site conditions.

5.2.1 Bottom Ash Impoundment Closure

As noted in Section 1.3, primary closure of the Bottom Ash Impoundment was completed in 2020. Due to site conditions and construction sequencing, the waste on the west end of the south cell was in a soft and saturated state. The waste was stabilized as part of the closure by adding fly ash from Coal Creek Station and Spiritwood

Station (approved by the NDDEQ for beneficial use). Waste slopes were regraded to 7% slopes to direct stormwater off and away from the closed and covered impoundment and to reduce erosion.

The effectiveness of closure of the Bottom Ash Impoundment as a source control relies on the final cover and liner. The Bottom Ash Impoundment is lined with a composite liner consisting of a 60-mil HDPE geomembrane overlying 2 feet of compacted clay with a hydraulic conductivity of 1×10^{-7} cm/sec, or less.

The final cover is engineered to minimize the potential for precipitation to infiltrate through the cover and into the waste. The constructed final cover includes a composite system consisting of a geosynthetic clay liner (GCL) overlain by a 60-mil HDPE geomembrane. A 30-inch growth medium layer and 6-inch topsoil layer overly the geomembrane and are designed to support native grass vegetation which supports runoff and removal of precipitation through evapotranspiration. The CQA Engineer observed closure and final cover system construction and:

- Confirmed that all regraded waste and mixed material was compacted to a firm and unyielding surface prior to placement of the final cover system.
- Observed installation of the GCL and geomembrane including all non-destructive and destructive testing of the materials and seams. The HDPE was welded to existing geomembrane liner.
- Observed monitoring and testing of growth medium and topsoil layers to meet project specifications including compaction and soil quality criteria (sodium adsorption ratio, electrical conductivity, and organic matter) prior to seeding and mulching.

Following closure of the Bottom Ash Impoundment, an updated post-closure care plan was prepared for the site in 2022 (GAUSA 2022). Maintenance will be provided on the final cover system for the required post-closure care period so that the integrity and effectiveness of the final cover system is maintained. Maintenance activities will include, as needed, repairs to the final cover to correct any effects related to settlement, subsidence, erosion, or other events, and will be performed to prevent run-on or run-off from eroding or otherwise damaging the final cover.

5.2.2 Leachate Removal

The bottom ash within the Bottom Ash Impoundment south cell was originally hydraulically sluiced into the cell, and precipitation falling on the footprint during operation and closure construction accumulated within the bottom ash. During closure construction, free water was pumped from the south cell and additional waste material from the closure of the north and center cells was added to achieve final waste grades. In addition to removal of free water within the south cell, the constructed sump was pumped during closure construction to remove any leachate that accumulated during closure. Construction of the engineered composite cover significantly reduced the infiltration of precipitation into the waste, but residual water remains within the bottom ash that was not removed during closure construction.

The removal of leachate will reduce leakage through potential defects in the composite liner by reducing the driving head. To remove this residual water, leachate accumulating in the sump has been regularly pumped out and disposed offsite. Up until early 2025, this was accomplished with a vacuum truck pumping the sump dry as often as every few days. In 2025, GRE installed a dedicated pump and holding tank along with power and other controls. This new system pumps leachate from the sump as the leachate accumulates, maintaining the depth of leachate in the sump between approximately 1 and 1.5 feet. This system is planned to operate through the post-closure period until leachate recharge drops below the level that the installed pumps can operate or until the recharge rate is low enough that an alternative leachate management method becomes preferable.

5.2.3 Increased Leachate Removal

The current leachate removal system is pumping accumulated leachate from the sump located in the northwest corner of the Bottom Ash Impoundment south cell. Leachate accumulates in this sump by flowing through the bottom ash/waste material from areas of higher head to the lower head condition maintained at the sump. The permeability of the bottom ash and waste material, along with the gradient to the sump (distance and head differential) result in a limited flow rate.

To increase the rate of leachate removal, dewatering wells may be installed at other locations and screened within the waste just above the composite liner. Additional dewatering locations are expected to increase the rate of leachate removal by increasing the gradient to each extraction location (reduced flow distance). Increasing the rate of leachate removal will more quickly reduce the driving head over the liner, further reducing the potential for leakage.

Additional dewatering locations will require penetrating the composite cover system, including the geomembrane and GCL. Each penetration can allow for increased infiltration through the cover if not completed correctly. In addition, drilling a well through the waste to just above the liner runs the risk of penetrating the composite liner system, creating a defect that may allow for increased leakage from the unit. These risks will be considered during a more thorough evaluation if the installation of additional dewatering wells is deemed to be necessary.

5.2.4 Closure by Removal

Closure by removal involves removal of the final cover and excavation of all CCR and the composite liner system from the Bottom Ash Impoundment. Excavated materials would be transported to a separate permitted CCR landfill.

Advantages of removal over the current source control include:

- Eliminates the potential for future contamination to occur due to failure of the cover and liner systems of the Bottom Ash Impoundment.
- Reduces the required post-closure monitoring period following implementation if each of the assessment monitoring parameters returned to concentrations below the GWPS.

Disadvantages of removal over the current source control include:

- Requires destruction of the existing cover and liner systems and requires permitting efforts for a separate CCR landfill.
- Increases the overall risk to workers, the surrounding community, and the environment due to factors such as fugitive dust, heavy construction equipment operation and emissions, and potential spills and safety hazards associated with transport to a new site.
- Due to site hydrogeological changes during site restoration, assessment monitoring parameters may not rapidly return to concentrations below the GWPS.

Closure by removal will be more thoroughly evaluated if additional source control measures are deemed necessary.

5.3 Groundwater Remediation Corrective Measures

A summary of the potential groundwater remediation corrective measures evaluated as part of this ACM is included in the following sections. Corrective measures are being evaluated to address the SSLs for molybdenum and arsenic in groundwater downgradient of the Bottom Ash Impoundment unit boundary. Based on site-specific information, knowledge of remedial alternatives, and site conditions at the Bottom Ash Impoundment, the following remedies, either individually or in combination, are being evaluated using the criteria specified in 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c):

- Monitored Natural Attenuation and Enhanced Monitored Natural Attenuation
- Hydraulic Containment (Groundwater Pump and Treat)
- Geochemical Approaches (In-Situ Injection)
- Permeable Reactive Barriers
- Phytoremediation

Following this assessment of corrective measures, additional information will be gathered to further evaluate the identified potential corrective measures and determine which option(s) should be implemented at the site that meets the criteria specified in 40 CFR 257.97(b) and NDAC 33.1-20-08-06(7)(b). Table 3 provides a summary of each of the remedial technologies described below compared to the evaluation criteria described in both the Federal and State rules and listed in Section 1.1, as applied to site conditions.

5.3.1 Monitored Natural Attenuation and Enhanced Monitored Natural Attenuation

The USEPA (2015) defines monitored natural attenuation (MNA) as:

> The reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that offered by other more active methods. The ‘natural remediation processes’ that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants.

Attenuation mechanisms for inorganic constituents, like molybdenum and arsenic, can be physical and/or chemical. Physical methods include dilution, dispersion, and related processes. Chemical mechanisms for inorganic constituents include adsorption to oxyhydroxides of iron, aluminum, manganese, and other metals, and coprecipitation with common minerals such as iron sulfides or carbonates.

USEPA guidance for MNA outlines an evaluation of the potential for successful remediation for each constituent of interest, by the following tiered approach:

- Tier 1: Assessment of groundwater plume stability and constituent attenuation based on statistical analysis and geochemical testing.

- Tier 2: Identification of the attenuation mechanisms occurring at each location and estimation of the timeframe required for attenuation based on site-specific groundwater and aquifer solids characterization data, including sequential extraction data.
- Tier 3: Assessment of capacity in the aquifer system to attenuate the plume and confirmation of long-term plume stability through geochemical modeling.
- Tier 4: Design of an MNA performance monitoring program to demonstrate that MNA is progressing as predicted, verify plume stability, identify toxic and/or mobile transformation products (if any), optimize monitoring well locations, and verify attainment of MNA remediation objectives.

A successful MNA approach requires a good understanding of hydrogeologic conditions and long-term monitoring of site conditions. MNA is a relatively slow remedy when used in isolation. As such, MNA is frequently used in combination with other remedies, including source control.

MNA can be enhanced using low-energy, in-situ techniques to stimulate or increase the attenuation of contaminants or reduce contaminant loading. Options for MNA enhancements include increasing the attenuation capacity of the aquifer, decreasing the mobility of contaminants, and/or increasing the stability of immobilized contaminants (ITRC 2010).

MNA and/or enhanced MNA are potentially effective means of remediating molybdenum and arsenic downgradient of the Bottom Ash Impoundment. The effectiveness of an MNA approach is dependent on site-specific conditions. Further geochemical evaluation and groundwater modeling is required to evaluate remedial timeframes. Table 3 includes a comparison of MNA and enhanced MNA to the requirements of 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c).

MNA is being evaluated as a potential option for remediating arsenic identified in one of the downgradient wells at the adjacent Bottom Ash Landfill (Figure 1). Site-specific geochemical testing was conducted and MNA Tier 1, 2 and 3 evaluations have been completed (WSP 2023; WSP 2024). The Tier 1, 2, and 3 MNA evaluations indicated that attenuation of arsenic is occurring downgradient of the Bottom Ash Landfill, that there is adequate capacity to attenuate arsenic, and that the attenuated arsenic is modeled to be stable. Based on these findings, geochemical testing is being done and a Tier 1 MNA evaluation will be pursued to identify if MNA is a suitable remedy for attenuating arsenic and molybdenum given the downgradient conditions at the Bottom Ash Impoundment.

5.3.2 Hydraulic Containment (Groundwater Pump and Treat)

Hydraulic containment can be used to control potential hazards through reduction of risk exposure pathways. Pump and treat is one form of hydraulic containment. Pump and treat refers to the use of groundwater extraction to artificially induce a hydraulic gradient for capture or control of the migration of impacted groundwater is considered as a viable remedial technology at many sites (USEPA 1996). A pump and treat approach uses extraction wells, subsurface drains, or trenches to capture groundwater, which then may require above-ground treatment and permitted discharge to a receiving water body or reinjection into the aquifer, depending on the site conditions and regulatory requirements. A pump and treat approach may also be coupled with vertical barrier walls to more effectively direct water to the wells.

Extraction technologies are more efficient for mobile constituents which are not readily attenuated by other mechanisms such as precipitation or adsorption. As such, given the chemical behavior of both arsenic and molybdenum and site hydrogeologic heterogeneity, the technical feasibility of achieving the site GWPS for the required parameters using pump and treat as the sole corrective measure is uncertain. Bench-scale and/or pilot-scale testing would be necessary for different treatment technologies to determine the potential to remove both parameters from the site groundwater. Table 3 includes a comparison of hydraulic containment (groundwater pump and treat) to the requirements of 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c).

Based on previously completed review of hydraulic containment for the nearby Bottom Ash Landfill, hydraulic containment may not be further evaluated as a stand-alone remedy for the Bottom Ash Impoundment. Pump and treat extraction technologies tend to be more efficient for constituents that are not readily attenuated by mechanisms such as adsorption, making the application less efficient for the extraction of arsenic. If this alternative is considered further, additional chemical testing, similar to that for in situ injection, is necessary to determine the extraction potential for arsenic and molybdenum with different treatment technologies given the site-specific conditions.

5.3.3 Geochemical Approaches (In Situ Injection)

Subsurface in situ injections of reagents are a remediation technology that can be used for inorganic constituents. In situ injections for inorganic constituents rely on three mechanisms that influence solubility, mobility, and/or toxicity of inorganic constituents:

i) Oxidation-reduction potential (redox) manipulation

ii) Adsorption to aluminum, iron oxyhydroxides, or other metal oxyhydroxides, or various sulfate compounds under oxidizing groundwater conditions

iii) Adsorption to, or coprecipitation with, iron or other metal sulfides under reducing conditions

In-situ injection requires understanding the subsurface transport characteristics and (geo)chemical characteristics of the aquifer, and a thorough understanding of the reaction kinetics to derive appropriate reagent. Often this technology is bench tested and field-evaluated in a relatively small area (i.e., pilot tested) to bolster the understanding of these factors prior to remedial selection, design, and implementation.

Arsenic and molybdenum can be immobilized under different combinations of pH and redox conditions. A variety of pH and/or redox-altering technologies are available which can incorporate biological processes, chemical oxidants and reductants, and/or mechanical processes such as air sparging. These processes can be used to decrease the mobility of these constituents.

Chemical injection can be utilized to alter groundwater conditions to reduce metal mobility. Reactive chemicals can be introduced into soil and groundwater to trigger rapid and complete metal precipitation. This may involve pH adjustment to higher levels while maintaining adequate buffering capacity within the groundwater to limit the upper extent of the pH range, as solubility increases with higher pH for both arsenic and molybdenum.

Following implementation of chemical injection as a corrective measure, routine collection of additional data, including measurements of total alkalinity and ongoing measurement of pH, is necessary for ensuring that conditions remain favorable for precipitation of the contaminants of concern.

Table 3 includes a comparison of in situ injection to the requirements of 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c).

Chemical injection is currently being evaluated as a potential option for remediating arsenic identified in one of the downgradient wells at the adjacent Bottom Ash Landfill (Figure 1). Initial testing using site specific groundwater and aquifer solids and associated modeling suggest that injection of iron particles upgradient of the well of interest could increase the quantity of sorption sites, in turn reducing arsenic concentrations in groundwater downgradient of the injection locations (WSP 2025a). Bench-scale testing of alternatives at the Bottom Ash Landfill is ongoing (WSP 2025b). Based on these initial findings from the adjacent Bottom Ash Landfill, chemical injection may also be a viable option for remediating arsenic and molybdenum at the Bottom Ash Impoundment.

5.3.4 Permeable Reactive Barriers

Permeable reactive barriers (PRBs) typically involve the installation of a subsurface zone of material intended to remove constituents of interest as groundwater flows through the PRBs. PRBs can be installed in downgradient locations using conventional excavation methods or a one-pass trenching method. Excavated trenches are backfilled with reactive media to create a zone that interacts with constituents as they passively flow through the PRB in the direction of groundwater flow (ITRC 2011). PRB systems can be constructed as continuous “walls” or as “funnel-and-gate” systems where impermeable slurry walls create a “funnel” that directs groundwater to permeable “treatment gates” filled with reactive materials. Funnel-and-gate configurations can reduce the required treatment area, allowing the system to be more readily maintained. Funnel-and-gate configurations can also address issues with groundwater flow circumvention of the PRB that have been identified in more typical wall configurations. PRBs are typically keyed into an underlying low-permeability unit to minimize preferential flow under the installed barrier.

PRBs may present a viable alternative for in-situ treatment of arsenic and molybdenum under certain conditions. PRBs are often constructed of reactive materials such as zero valent iron (ZVI), zeolites, and granular activated carbon. Zeolites can be used to promote ionic exchange and/or sorption, while activated carbon can be used to induce and/or sustain reducing conditions within an aquifer. Constituents of interest interact with the reactive materials via precipitation or sorption, dependent on the chemical properties of both the chosen reactive material and the constituents of interest. While installation of a PRB could work for stabilization of the constituents of concern, materials used for PRB construction can increase the mobility of non-target metals within the aquifer based on interaction with the amendments. Pilot testing would be required to determine the effectiveness and potential for secondary impacts to groundwater chemistry based on the addition of the PRB amendments to the aquifer.

Table 3 includes a comparison of PRBs to the requirements of 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c).

PRBs may not be further evaluated at the Bottom Ash Impoundment due to uncertainty in the ability to be keyed into a competent bedrock layer. Critically, for a PRB to be effective, the barrier should ideally “extend to and be keyed into a competent bedrock layer or aquitard” to prevent circumvention of groundwater around the installed barrier (ITRC 2011). Downgradient of the Bottom Ash Impoundment, a continuous competent bedrock layer has not been identified in close proximity to the uppermost water-bearing zone.

5.3.5 Phytoremediation

Phytoremediation uses plants to degrade, immobilize, or contain constituents of interest in soil, groundwater, surface water, and sediments. Phytoremediation includes plant-based technologies and applications for hydraulic control, nutrient management, sediment control, and slope stabilization (Goldemund and Gestler 2019). Phytoremediation can be a viable alternative for areas with relatively low levels of constituents in shallow soils or groundwater.

The Interstate Technology and Regulatory Council (ITRC 2009) lists the main mechanisms involved in the phytoremediation for inorganic constituents as:

- Phytosequestration, or the ability of plants to sequester constituents within the rhizosphere, an area a few millimeters from the root surface. Phytosequestration is considered a containment mechanism.
- Phytohydraulics, or the ability of plants to capture and evaporate water. Phytohydraulics provides hydraulic control of the groundwater plume through plant root uptake and is considered a containment mechanism.
- Phytoextraction, or the process of constituent uptake into a plant. Phytoextraction is remediation through removal of the constituent of interest.

Typically, a combination of phytoremediation mechanisms acts in concert in successful phytoremediation applications for inorganic constituents such as arsenic and molybdenum.

The effectiveness of groundwater remediation using traditional phytoremediation approaches can be limited by compacted soil conditions that impede root penetration and depths to targeted groundwater. Depending on plant type, many root systems for plants used in traditional phytoremediation approaches focus on the upper 1 to 2 feet from the ground surface (ITRC 2011), while groundwater downgradient of the Bottom Ash Impoundment is approximately 5 to 10 feet below the ground surface. In addition to traditional phytoremediation approaches, engineered approaches such as the TreeWell® System, a proprietary system developed by Applied Natural Sciences, can be used to bypass the constraints of a traditional system, through promoting downward root growth, encouraging constituent treatment and focusing groundwater extraction from a target depth within the aquifer (Gatliff et al. 2016; Goldemund and Gestler 2019).

Table 3 includes a comparison of phytoremediation to the requirements of 40 CFR 257.96(c) and NDAC 33.1-20-08-06(6)(c). Phytoremediation may not be further evaluated as a corrective measure for the Bottom Ash Impoundment due to the groundwater depth in the area of concern being deeper than can typically be affected by phytoremediation.

6.0 NEXT STEPS/REMEDY SELECTION

The purpose of this ACM is to analyze the effectiveness of potential corrective measure(s) for groundwater using the criteria outlined in 40 CFR 257.96 and NDAC 33.1-20-08-06(5).

For source control, the engineered soil cover over the Bottom Ash Impoundment as well as ongoing leachate removal through the existing sump are source control corrective measures previously and currently implemented prior to assessment monitoring or the ACM. If over the course of corrective action implementation and monitoring, the previously implemented source control measures are determined to be inadequate, additional source control measures may be evaluated and implemented.

For groundwater remediation, several potential corrective measures have been evaluated and may be viable for remediation of arsenic and molybdenum downgradient of the Bottom Ash Impoundment. Additional information will be gathered to further evaluate the potential corrective measures and determine which option(s) should be implemented at the Bottom Ash Impoundment. The following sections present the additional data gathering, schedule, reporting, and next steps that will support remedy selection and corrective action implementation. The items discussed below are focused on those actions planned for the next approximately three months (until the 2025 Annual Coal Combustion Residuals Groundwater Monitoring and Corrective Action Report, due in January 2026).

6.1 Additional Data Gathering

Collection and evaluation of additional data are necessary to refine the conceptual site model, further characterize the nature and extent of groundwater impacts, and to further evaluate the feasibility and effectiveness of potential corrective measures described in this document such that an appropriate groundwater corrective measure or combination of corrective measures may be selected and implemented.

6.1.1 Continuing Nature and Extent Investigation

As discussed in Section 4.0, new and existing monitoring wells will be used to help define the extents of arsenic and molybdenum above the GWPS. Dedicated low-flow pumps are scheduled to be installed in the new nature and extent wells in late September or early October 2025. Following installation of the dedicated low-flow pumps, Q4 2025 groundwater samples will be collected from both the existing program wells and the newly installed nature and extent wells. Data from both the network wells and the newly installed nature and extent wells will be evaluated to define the extents of elevated arsenic and molybdenum following receipt of the Q4 2025 groundwater data.

6.1.2 Geochemistry Evaluation

As discussed in Section 4.1.5, solids samples were collected at the installed well locations and sent for analysis by SGS Canada Inc. Samples are being analyzed using SEP (Tessier et al. 1979) and XRD including clay speciation. Results of the associated analysis have not yet been received and will be included in future submittals. Following receipt and review of the geochemical analysis, a site-specific geochemical evaluation, including a Tier 1 MNA evaluation as described in Section 5.3.1, will be initiated to determine the attenuation capacity and stability of the aquifer materials and potential attenuation mechanisms within the aquifer for arsenic and molybdenum. The capacity and available mechanisms of the aquifer to attenuate arsenic and molybdenum will impact the effectiveness potential remedies, including MNA, enhanced MNA, in situ injection, or the implementation and installation of a PRB.

6.2 Schedule and Reporting

Per NDAC 33.1-20-08-06(6)(d), this ACM report will be provided to the NDDEQ for review and approval. The ACM will be placed in the facility's operating record in accordance with 40 CFR 257.96(d) and NDAC 33.1-20-08-06(6)(d). Following finalization of the ACM, the 2025 Annual Groundwater Monitoring and Corrective Action Report is due January 31, 2026. As required in 40 CFR 257.96(a) and NDAC 33.1-20-08-06(6)(a), a copy of this ACM and the certification of the ACM by a qualified professional engineer licensed in the state of North Dakota will be included within the Annual Report. The Annual Report will also include discussion of actions taken between finalization of this ACM and the end of 2025. A semi-annual report will be prepared describing the progress to select and design a remedy, per 40 CFR 257.97(a) and NDAC 33.1-20-08-06(7)(a). The first semi-annual report will be completed by July 31, 2026.

Remedy selection will occur as soon as feasible. Selection of a final remedy depends on a thorough evaluation and testing of the corrective action options to confirm the selected options are effective. Selected corrective actions must meet the standards described in Section 5.1.

A schedule for items anticipated to be completed by the end of 2025 for inclusion in the 2025 annual report due in January 2026 is included below:

Task Description	Estimated Completion Date
■ Dedicated Low-Flow Pump Installation	Sep-Oct 2025
■ Groundwater Sampling	Oct-Dec 2025
■ Geochemistry Lab Results and Evaluation (initiate Tier I MNA Evaluation)	Oct-Dec 2025
■ 2025 Annual Groundwater Monitoring and Corrective Action Report	Jan 2026

Prior to final selection of a corrective measure, a public meeting to present the results of the corrective measures assessment will be held a minimum of 30 days before the final selection of the remedy. Upon selection of a remedy, a final report will be prepared describing the selected remedy and how the remedy meets the standards described in Section 5.1. The final remedy selection report must be certified by a qualified professional engineer licensed in the state of North Dakota per 40 CFR 257.97(a) and approved by the NDDEQ per NDAC 33.1-20-08-06(7)(a). Once the remedy has been selected and approved by the NDDEQ, the implementation of the remedy will be initiated in accordance with 40 CFR 257.98 and NDAC 33.1-20-08-06(8).

Certification

This Assessment of Corrective Measures has been prepared in compliance with applicable requirements of the Federal CCR Rule (40 CFR 257.96) and NDDEQ CCR Rule (NDAC 33.1-20-08)

WSP USA Inc.

Erin L. Hunter, PhD
Senior Lead Consultant

Todd J. Stong, PE
Director

ELH/TJS/kg

I certify to the best of my knowledge, information, and belief that this ACM for molybdenum and arsenic at the Bottom Ash Impoundment meets the applicable requirements of 40 CFR Part 257.96 and NDAC 33.1-20-08.

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 9/24/2025
NORTH DAKOTA

Todd J. Stong, PE
North Dakota Registered Professional Engineer No. PE-6144

https://wsponlinenam.sharepoint.com/sites/gld-170737/project files/5 technical work/2025- stanton gw/acm/bai acm/final/gl21509219.000-041-rpt-0-acm_bai_24sep25.docx

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Tables

Table 1: Stanton Station Site-Specific Groundwater Protection Standards

Parameter	Units	GWPS
Appendix IV		
Antimony, Total	mg/L	0.006
Arsenic, Total	mg/L	0.01
Barium, Total	mg/L	2
Beryllium, Total	mg/L	0.004
Cadmium, Total	mg/L	0.005
Chromium, Total	mg/L	0.1
Cobalt, Total	mg/L	0.006
Fluoride	mg/L	4
Lead, Total	mg/L	0.015
Lithium, Total	mg/L	0.325
Mercury, Total	mg/L	0.002
Molybdenum, Total	mg/L	0.1
Radium-226 + Radium-228, combined	pCi/L	5
Selenium, Total	mg/L	0.05
Thallium, Total	mg/L	0.002

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
GWPS: Groundwater Protection Standard
The site-specific GWPS for lithium was derived from the pooled site background lithium values.

Table 2: Source Control Corrective Measures Comparison

Corrective Measure	Performance	Reliability	Ease of Implementation	Potential Impacts	Time to Begin and Complete	Permitting / Institutional Requirements	Other Environmental or Public Health Requirements
Closure In-Place with Cover	Performance is reliant on not having significant sustained interaction with groundwater and placed CCR, and the final cover being an engineered cover designed to minimize the potential for precipitation to infiltrate through the cover and into	Reliability of closure in-place with a cover is dependent on the continued performance of the cover system during the post-closure period, and groundwater not rising to the point of significant interaction with the CCR.	Implementation was completed in 2020. However, detailed design was required, along with permit updates with the NDDEQ. Implementation required extensive earthworks construction for reducing the footprint and	Failure of the cover system could allow more infiltration through the CCR than desired.	Begun in 2019 and completed in 2020 prior to initiating assessment monitoring or the assessment of corrective measures.	Previously permitted and approved by the NDDEQ. Deed restrictions have previously been placed based on the current site closure configuration.	Prior to completion, construction disruptions occurred. Little to no additional disruptions are anticipated unless changes are made to the existing closed in place footprint of the impoundment.
Lechate Removal (existing sump)	Performance is connected to a reduction in the hydraulic head on the composite liner system of the impoundment. As leachate is removed, the head on the liner is reduced, and the potential leakage rate through defects is subsequently reduced.	System is relatively reliable but can stop pumping if issues arise with power source, level alarms, the pump or the holding tank. Online monitoring allows for quick identification of issues.	Initial implementation began in 2020 with installation of the sump, with a dedicated pump and holding tank installed in 2025. Operations require monitoring of the pump and the tank, and coordination of transfer trucks to haul leachate for	A release of leachate could occur if the holding tank, its additional containment, or the transfer trucks failed.	Leachate removal from the sump began in 2020 during closure construction and will continue through the 30-year post-closure period as required as leachate accumulates in the sump.	Dedicated pump and holding tank design were reviewed by NDDEQ. Secondary containment is required for all piping and tanks outside the lined cover.	Offsite disposal of leachate required or alternative permitting necessary.
Increased Leachate Removal (dewatering wells)	Building upon the existing leachate removal system, increased leachate removal will more quickly reduce the head on the liner and thus more quickly reduce the potential leakage rate through defects.	Similar reliability as the existing system.	Moderate. Requires installation of additional infrastructure (additional wells for dewatering). Modeling may be required to optimize installation based on site-specific conditions.	Inaccurate drilling of additional well points through the existing cover system could lead to increased infiltration within the impoundment or create conduits through the liner system.	Design, regulatory approval, installation and commissioning may take 6-12 months. Once implemented, dewatering would continue through the 30-year post-closure period as required (as leachate accumulates at the wells).	Will require approval from the NDDEQ for the composite cover penetrations and drilling into the impoundment.	Offsite disposal of leachate required or alternative permitting necessary.
Closure by Removal	Closure by removal removes the source and eliminates the potential for future contamination to occur due to failure of the cover and liner systems.	Reliability for closure by removal is dependent on complete removal of source material and impacted material.	In order to implement closure by removal, a new landfill would need to be designed, permitted by the NDDEQ, and constructed prior to removal of material from the existing impoundment footprint.	Increase in overall risk to workers, surrounding community and the environment due to factors such as fugitive dust, heavy construction equipment operation and emissions, and potential spills and safety hazards associated with transport to the new site.	Time to begin is constrained by the need to investigate a site, design, permit, and construct a new CCR landfill, which can take upwards of 2 years. Construction of a new landfill is required prior to removal of material from the existing impoundment, which may take an additional 6 to 12 months based on the current volume of CCR.	A new landfill permit will be required.	Significant disruptions will be made to the current site configuration, along with significant construction activity for developing a new landfill, removing CCR, and hauling CCR to the new landfill.

Notes:

Permeable Reactive Barriers (PRBs)	PRBs may have a limited reactive lifespan, dependent in part on the characteristics of the aquifer and the chosen reactive material. Without replacement of the reactive material within the PRB, extended performance of the corrective measure may not be possible. Additional testing may be required to select an appropriate sorptive media. PRBs also require vertical installation to key into low permeability zones and horizontal extents wide enough to prevent impacted groundwater from going around and/or under the PRB.	PRBs are a reliable corrective measure, but loss of reactivity over time may require re-installation depending on the length of time to reach the required GWPS. Reliability may be improved based on the ease of access to intercept the flow of groundwater. Additional data collection, may be needed to characterize the attenuation mechanisms present within the aquifer and select an appropriate reactive media.	Implementation is moderate to difficult. Based on differentiation of the stratigraphic units, may require additional drilling for confirmation of an appropriate confining unit for constraining hydraulic movement. Trenching is necessary for installation.	Dependent on the materials used for PRB, mobilization of additional constituents may occur based on changing conditions within the aquifer. Short-term impacts may occur during construction of the PRB, but can be mitigated through appropriate planning. Positive impacts include reduction in the volume, mobility, or toxicity of the constituent of interest through precipitation within the reactive media.	Installation of a PRB can be accomplished in roughly 1 year, depending on the final location and configuration. Bench- and/or pilot-scale testing would be necessary prior to design and construction of the remedy, which may take up to 2 years.	Deed restrictions have previously been placed based on site closure. No other institutional requirements are anticipated.	Following installation, PRBs are a passive remedy. Certain treatment media have the potential to mobilize additional naturally-occurring constituents downgradient of the PRB.
Phytoremediation	Once established, phytoremediation can effectively provide hydraulic containment, and provide potential reduction of constituents of interest through immobilization, uptake, and/or sequestration within the biomass. It may take between 3 and 5 years following planting for the system to begin performing. Phytoremediation may be limited by site climate	When implemented as an engineered system, phytoremediation must account for the characteristics of the aquifer, including the hydraulic conductivity, flow velocity, depth to impacted groundwater, and other factors. Reliability is dependent on careful design of the system.	Implementation is easy to moderate. Trees must be installed to appropriate depths to intercept impacted groundwater. Once established, trees are self-maintaining with no required external energy requirements and little maintenance.	Minimal anticipated negative impacts. Positive impacts include enhanced aesthetics, additional wildlife habitat, and minimal energy usage.	Optimization via groundwater modeling is required, which may take between 6 and 9 months. Installation is relatively short and can be substantially completed within a few months. Hydraulic control may take between 3 and 5 years following planting, but system performance is anticipated to improve over time.	Deed restrictions have previously been placed based on site closure. No other institutional requirements are anticipated.	None anticipated. Following installation, remedy is passive and does not require external energy.

Notes:

Table 3: Groundwater Remediation Corrective Measures Comparison

Corrective Measure	Performance	Reliability	Ease of Implementation	Potential Impacts	Time to Begin and Complete	Permitting / Institutional Requirements	Other Environmental or Public Health Requirements
Monitored Natural Attenuation and Enhanced Monitored Natural Attenuation	Assuming available capacity, MNA can provide continued effective performance in reducing constituent concentrations.	Reliability is dependent on aquifer conditions that favor arsenic and molybdenum attenuation or can be enhanced, and that sufficient attenuation capacity exists within the aquifer. MNA is reliable and can either be used as a stand-alone corrective measure for groundwater impacted by molybdenum and arsenic, or in combination with other technologies.	Little to no effort required for physical implementation of standard MNA, but moderate to complex effort required to fully and accurately implement, monitor, and document as a corrective measure. Enhanced MNA may require additional installation requirements, including well installation. Additional data is needed to demonstrate that the aquifer has sufficient attenuation capacity to meet the stated site objectives within a reasonable time frame.	No known impacts. MNA relies on the natural processes and existing geologic materials within the aquifer to reduce constituent concentrations, toxicity, and mobility without disturbing the installed cover or subsurface materials.	Evaluation for MNA can begin immediately, but substantial completion of evaluation and demonstration of attenuation mechanisms may require mulitple years. Long-term monitoring and reporting are likely required.	No additional requirements, as deed restrictions have previously been placed due to site closure.	Little to no physical disruption to remediation areas and no adverse construction impacts are expected.
Hydraulic Containment (Groundwater Pump and Treat)	Pump and treat can effectively provide hydraulic control throughout the operational life of the system. Performance is contingent on routine groundwater assessment throughout the pumping process, and may not be quickly effective. Performance is additionally predicated on disposal of treated water and/or waste treatment sludge. Pump and treat can be less effective for inorganic compounds, like molybdenum and arsenic.	Generally reliable for hydraulic control of the groundwater plume and migration of contaminants of interest.	Implementation is moderate, because although this is a proven approach, the site is unmanned, making implementation more difficult. Additional extraction wells and trenches would need to be installed.	Potential impacts are related to the operation of an on-site, above-ground water treatment facility and associated infrastructure for treatment and conveyance of impacted groundwater. Pumping may unintentionally alter geochemistry of the aquifer, in addition to the intended alteration of hydraulic flow pathways.	Extraction wells and trenches can be installed relatively quickly (generally within 6 to 12 months), but additional aquifer testing, overall system design, installation, and optimization, and permit approvals may be required, with lead times up to 2 years. Time for construction of any water treatment components may be variable depending on the scale of the chosen treatment process. Treatment timeline may extend for multiple years.	Depending on the effluent management strategy, a groundwater extraction permit and/or a NPDES discharge permit may be required, or an underground injection control (UIC) permit may be required if groundwater reinjection is chosen. Deed restrictions have previously been enacted based on site closure.	Above ground treatment components may be required for extended periods of time, resulting in waste residuals requiring management and disposal.

Geochemical Approaches (In-Situ Injection)	In-situ injection can rapidly alter aquifer conditions, resulting in geochemical immobilization of constituents of concern. Continued monitoring is required to ensure that aquifer conditions remain favorable for containing constituents of interest while not resulting in mobilization of other metals.	Approach is reliable if injected materials can be evenly distributed throughout the aquifer, permeability of the aquifer materials is adequate to allow for distribution, and available volume of appropriate receptors exists within the aquifer.	Moderate. May require installation of additional infrastructure for injection (additional wells for injection or other means of injection). Bench and pilot testing are required to optimize implementation.	Minimal negative impacts are anticipated if the remedy works as designed. Additional constituents may be mobilized as an unintended consequence if appropriate steps are not taken prior to remedy implementation.	Optimization via bench-scale and pilot testing is required prior to implementation, and may require up to 2 years. Additional wells can be installed relatively quickly following pilot testing. Completion time would be variable based on attenuation mechanisms within the aquifer and distribution of injected materials within the treatment area.	An underground injection control (UIC) permit may be required for in-situ injections in order to implement this corrective measure. Deed restrictions have previously been enacted based on site closure.	None anticipated. Potential for mobilization of additional redox-sensitive components. Remedy is passive following installation.
Permeable Reactive Barriers (PRBs)	PRBs may have a limited reactive lifespan, dependent in part on the characteristics of the aquifer and the chosen reactive material. Without replacement of the reactive material within the PRB, extended performance of the corrective measure may not be possible. Additional testing may be required to select an appropriate sorptive media. PRBs also require vertical installation to key into low permeability zones and horizontal extents wide enough to prevent impacted groundwater from going around and/or under the PRB.	PRBs are a reliable corrective measure, but loss of reactivity over time may require re-installation depending on the length of time to reach the required GWPS. Reliability may be improved based on the ease of access to intercept the flow of groundwater. Additional data collection, may be needed to characterize the attenuation mechanisms present within the aquifer and select an appropriate reactive media.	Implementation is moderate to difficult. Based on differentiation of the stratigraphic units, may require additional drilling for confirmation of an appropriate confining unit for constraining hydraulic movement. Trenching is necessary for installation.	Dependent on the materials used for PRB, mobilization of additional constituents may occur based on changing conditions within the aquifer. Short-term impacts may occur during construction of the PRB, but can be mitigated through appropriate planning. Positive impacts include reduction in the volume, mobility, or toxicity of the constituent of interest through precipitation within the reactive media.	Installation of a PRB can be accomplished in roughly 1 year, depending on the final location and configuration. Bench- and/or pilot-scale testing would be necessary prior to design and construction of the remedy, which may take up to 2 years.	Deed restrictions have previously been placed based on site closure. No other institutional requirements are anticipated.	Following installation, PRBs are a passive remedy. Certain treatment media have the potential to mobilize additional naturally-occurring constituents downgradient of the PRB.
Phytoremediation	Once established, phytoremediation can effectively provide hydraulic containment, and provide potential reduction of constituents of interest through immobilization, uptake, and/or sequestration within the biomass. It may take between 3 and 5 years following planting for the system to begin performing. Phytoremediation may be limited by site climate conditions and depth to groundwater.	When implemented as an engineered system, phytoremediation must account for the characteristics of the aquifer, including the hydraulic conductivity, flow velocity, depth to impacted groundwater, and other factors. Reliability is dependent on careful design of the system.	Implementation is easy to moderate. Trees must be installed to appropriate depths to intercept impacted groundwater. Once established, trees are self-maintaining with no required external energy requirements and little maintenance.	Minimal anticipated negative impacts. Positive impacts include enhanced aesthetics, additional wildlife habitat, and minimal energy usage.	Optimization via groundwater modeling is required, which may take between 6 and 9 months. Installation is relatively short and can be substantially completed within a few months. Hydraulic control may take between 3 and 5 years following planting, but system performance is anticipated to improve over time.	Deed restrictions have previously been placed based on site closure. No other institutional requirements are anticipated.	None anticipated. Following installation, remedy is passive and does not require external energy.

Notes:

Figures

LEGEND - Q2 2024 GROUNDWATER CONTOURS

- UPGRADIENT OR SIDEGRADIENT MONITORING WELL
- IMPOUNDMENT DOWNGRADIENT MONITORING WELL
- CLOSED BOTTOM ASH LANDFILL/IMPOUNDMENT FOOTPRINT (APPROX.)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER CONTOURS AND ELEVATIONS

NOTE(S)

1. AERIAL IMAGERY OBTAINED FROM UNITED STATES DEPARTMENT OF AGRICULTURE, NATIONAL AGRICULTURE IMAGERY PROGRAM, 2023.
2. GROUNDWATER CONTOURS ARE BASED ON JUNE 2024 ELEVATION INFORMATION FROM THE SHOWN MONITORING WELLS, AS WELL AS MONITORING WELLS AND PIEZOMETERS NOT SHOWN.
3. THE NORTH AND CENTER CELLS OF THE BOTTOM ASH IMPOUNDMENT WERE CLOSED BY REMOVAL OF WASTE AND LINER.
4. THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT WAS CLOSED WITH A FINAL COVER OVER PLACED WASTE.
5. THE BOTTOM ASH LANDFILL WAS CLOSED BY CONSOLIDATION OF PLACED WASTE INTO A SMALLER FOOTPRINT AND CONSTRUCTION OF A FINAL COVER.

N

0 200 400
1" = 200' FEET

GREAT RIVER ENERGY - STANTON STATION
BOTTOM ASH IMPOUNDMENT MONITORING WELL NETWORK

FIGURE 1

Path: \\corp.pbwan.net\US\Central\Data\USLK100\acad\GREAT RIVER ENERGY\STANTON\99_PROJECTS\21509219\Annual Monitoring Reports\ | File Name: 21509219_2024_WQ-Stanton\NDDEQ_Q2_GWSURF_FIGURE1.dwg

LEGEND - Q2 2024 GROUNDWATER CONTOURS

- UPGRADIENT OR SIDEGRADIENT MONITORING WELL
- IMPOUNDMENT DOWNGRADIENT MONITORING WELL
- JUNE 2025 NATURE AND EXTENT WELLS
- ADDITIONAL NATURE AND EXTENT WELLS
- CLOSED BOTTOM ASH LANDFILL/IMPOUNDMENT FOOTPRINT
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER CONTOURS AND ELEVATIONS

NOTE(S)

1. AERIAL IMAGERY OBTAINED FROM UNITED STATES DEPARTMENT OF AGRICULTURE, NATIONAL AGRICULTURE IMAGERY PROGRAM, 2023.
2. GROUNDWATER CONTOURS ARE BASED ON JUNE 2024 ELEVATION INFORMATION FROM THE SHOWN MONITORING WELLS, AS WELL AS MONITORING WELLS AND PIEZOMETERS NOT SHOWN.
3. THE NORTH AND CENTER CELLS OF THE BOTTOM ASH IMPOUNDMENT WERE CLOSED BY REMOVAL OF WASTE AND LINER.
4. THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT WAS CLOSED WITH A FINAL COVER OVER PLACED WASTE.
5. THE BOTTOM ASH LANDFILL WAS CLOSED BY CONSOLIDATION OF PLACED WASTE INTO A SMALLER FOOTPRINT AND CONSTRUCTION OF A FINAL COVER.

N

0 200 400
1" = 200' FEET

GREAT RIVER ENERGY - STANTON STATION
BOTTOM ASH IMPOUNDMENT NATURE AND EXTENT WELLS

FIGURE 2

APPENDIX A

Bottom Ash Impoundment Closure Drawings

GREAT RIVER ENERGY
STANTON STATION
SOUTH CELL ISOLATION AND SUMP CONSTRUCTION

Prepared for:

GREAT RIVER ENERGY.

Stanton Station
Stanton, North Dakota

Prepared by:

GOLDER

Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, Colorado USA 80228

SOUTH CELL ISOLATION AND SUMP CONSTRUCTION		
DRAWING NUMBER	TITLE	REVISION
1	TITLE SHEET	0
2	PROJECT DESCRIPTION AND GENERAL NOTES	0
3	SITE OVERVIEW	0
4	EXISTING CONDITIONS - SOUTH CELL	0
5	CLEANOUT AND SUMP CONSTRUCTION	0
6	BOTTOM ASH PROTECTIVE COVER	0

REFERENCE DRAWINGS		
DRAWING NUMBER	TITLE	REVISION
S1007	POND A SECTIONS AND DETAILS - SH. 2	1
S1009	OUTFALL STRUCTURES OUTLINE - PLAN AND SECTIONS	2
S1010	OUTFALL STRUCTURES REINFORCEMENT - SH. 1	2
S1013	PIPING DETAILS	2

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 4/2/2019
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
STANTON STATION

CONSULTANT

GOLDER

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USA
(303) 980-0540
www.golder.com

PROJECT
STANTON SITE RESTORATION

TITLE
TITLE SHEET

PROJECT NO. 1775717
REV. 0
1 of 6
DRAWING 1

PROJECT DESCRIPTION

THE SOUTH CELL ISOLATION AND SUMP CONSTRUCTION PROJECT CONSISTS OF CLEANING OUT EXISTING COAL COMBUSTION RESIDUALS (CCRS) WITHIN THE CONCRETE OUTLET STRUCTURE NEAR THE NORTHWEST CORNER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT, CLEANING OUT AND FILLING THE CROSS-OVER PIPELINE BETWEEN THE CENTER AND SOUTH CELL WITH PRESSURIZED GROUT, CONSTRUCTING A SUMP WITHIN THE EXISTING CONCRETE STRUCTURE IN THE SOUTH CELL, AND PLACING BOTTOM ASH PROTECTIVE COVER OVER GEOMEMBRANE-LINED PORTIONS OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT. THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT AT STANTON STATION IS SOUTH OF THE ORIGINAL FOOTPRINT OF STANTON STATION NORTH OF HIGHWAY 200A IN MERCER COUNTY.

GENERAL NOTES AND SPECIFICATIONS

1. ALL GRE AND OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK. GRE PROCEDURES SHALL BE USED FOR ALL EXCAVATIONS, HOT WORK, AND LOCK-OUT/TAG-OUT. ALL CONTRACTOR EMPLOYEES SHALL ATTEND THE GRE CONTRACTOR SAFETY ORIENTATION.
2. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY SAFETY EQUIPMENT AND PROVIDE ACCESS FOR THE OWNER'S REPRESENTATIVE TO INSPECT THE WORK. INSPECTION ACCESS IS REQUIRED THROUGHOUT THE DURATION OF THE PROJECT.
3. FOR THIS WORK, GREAT RIVER ENERGY IS THE OWNER. THE COMPANY BIDDING ON THE WORK IS THE CONTRACTOR.
4. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES LOCATED IN AND AROUND THE WORK AREA (INCLUDING MONITORING WELLS AND PIEZOMETERS) AND SHALL EXERCISE CARE WHEN WORKING NEAR THESE UTILITIES. IF ANY UNEXPECTED UTILITIES ARE LOCATED WHILE PERFORMING THE WORK, THE CONTRACTOR SHALL STOP WORK IMMEDIATELY AND INFORM THE OWNER'S REPRESENTATIVE.
5. EXISTING UTILITIES ARE ONLY SHOWN IN THE AREA NEAR THE BOTTOM ASH IMPOUNDMENT AND BOTTOM ASH LANDFILL AND LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. ABOVE-GRADE UTILITIES OR EQUIPMENT MAY BE PRESENT AND CONTRACTOR SHALL INFORM OWNER OF CONFLICTS WITH THESE UTILITIES OR EQUIPMENT.
6. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS PRIOR TO STARTING WORK, AND SHALL NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS EXIST ON THE DRAWINGS.
7. LOCATIONS AND DIMENSIONS OF EXISTING STRUCTURES ARE BASED ON DRAWINGS PROVIDED BY GRE AND SHOULD BE FIELD-VERIFIED.
8. CONTRACTOR IS RESPONSIBLE FOR SURVEY CONTROL AND FOR RECORD-KEEPING REQUIRED TO PRODUCE AS-BUILT DRAWINGS.
9. CONTRACTOR SHALL PERFORM HOUSEKEEPING DUTIES ON A DAILY BASIS TO KEEP WORK AREAS CLEAN. HOUSEKEEPING SHALL BE PERFORMED AT THE COMPLETION OF THE WORK TO THE SATISFACTION OF THE OWNER.
10. TEMPORARY EXCAVATIONS SHALL BE COMPLETED AT MAXIMUM SLOPES FOLLOWING GRE AND OSHA REQUIREMENTS.
11. ALL WORK COMPLETED IN AND AROUND THE BOTTOM ASH IMPOUNDMENT AND BOTTOM ASH LANDFILL SHALL BE COORDINATED WITH GRE. ACCESS ROUTES TO THE WORK AREA SHALL BE APPROVED BY THE OWNER PRIOR TO USE. IF ACCESS IS GIVEN VIA THE SOUTH ENTRANCE GATE, CONTRACTOR SHALL USE CARE WHEN ENTERING AND EXITING HIGHWAY 200A AND SHALL INFORM GRE EACH DAY WHEN ARRIVING OR DEPARTING THE SITE.
12. BOTTOM ASH PROTECTIVE COVER SHALL BE PLACED ON ALL AREAS OF EXPOSED GEOMEMBRANE. PROTECTIVE COVER OVER GEOMEMBRANE SIDE SLOPES SHALL BE A MINIMUM OF 3 FEET THICK.
13. BOTTOM ASH PROTECTIVE COVER SHALL BE BORROWED FROM THE CENTER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT. IF SUFFICIENT BOTTOM ASH IS UNAVAILABLE WITHIN THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT, THE CONTRACTOR MAY BORROW ADDITIONAL BOTTOM ASH FROM THE BOTTOM ASH LANDFILL AFTER APPROVAL FROM THE OWNER'S REPRESENTATIVE.
14. PROTECTIVE COVER ON THE SIDE SLOPES SHALL BE PLACED FROM THE TOE OF THE SLOPE TOWARD THE CREST USING LOW GROUND PRESSURE EQUIPMENT. CONTRACTOR TO EVALUATE PLACEMENT CONDITIONS AS WORK PROGRESSES AND MAY MODIFY THE SLOPE OF BOTTOM ASH PLACED ON GEOMEMBRANE DEPENDING ON WORK CONDITIONS. MODIFICATIONS TO BOTTOM ASH PROTECTIVE COVER PLACEMENT SLOPES SHALL BE APPROVED BY OWNER PRIOR TO WORK BEING COMPLETED.
15. CONTRACTOR IS RESPONSIBLE FOR DAMAGE TO THE GEOMEMBRANE DURING CONSTRUCTION AND REPAIRS TO THE GEOMEMBRANE PRIOR TO DEMOBILIZING FROM SITE UNLESS AGREED TO OTHERWISE WITH THE OWNER.

GENERAL NOTES AND SPECIFICATIONS (CONTINUED)

16. IN-PLACE COAL COMBUSTION RESIDUALS IN THE BOTTOM ASH IMPOUNDMENT MAY BE SATURATED AND SOFT WITH LOW BEARING STRENGTH.
17. CONTRACTOR IS RESPONSIBLE FOR DEWATERING ACTIVITIES WITHIN THE SOUTH CELL AND CENTER CELL TO COMPLETE THE WORK TO THE LINES AND GRADES SHOWN ON THE DRAWINGS AND AS DESCRIBED IN BID DOCUMENTS. WATER FROM THE SOUTH CELL AND CENTER CELL MAY BE PUMPED TO THE NORTH CELL OR MANAGED IN THE CENTER CELL AS REQUIRED.
18. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL WITHIN THEIR WORK AREA, WHICH MAY INVOLVE USING A WATER TRUCK TO CONDITION BORROW AREAS, PLACEMENT AREAS, AND ACCESS ROADS.
19. THE SOURCE OF WATER USED FOR DUST CONTROL IS THE MISSOURI RIVER. ACCESS TO THE WATER SOURCE SHALL BE ALONG THE EXISTING ROAD TO THE STANTON STATION INTAKE STRUCTURE. CONTRACTOR SHALL CONFIRM THE PUMP SUCTION LOCATION WITH THE OWNER PRIOR TO USE AND IS RESPONSIBLE FOR MAINTAINING THE EXISTING GRAVEL ROAD TO THE WATER SOURCE DURING CONSTRUCTION.
20. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING TEMPORARY ACCESS RAMPS/ROADS AS DETERMINED TO BE REQUIRED BY THE CONTRACTOR TO COMPLETE THE WORK.
21. THE CONTRACTOR IS RESPONSIBLE FOR ALL LABOR, EQUIPMENT, AND OTHER INCIDENTALS REQUIRED TO PERFORM THE WORK UNLESS OTHERWISE STATED IN THESE DRAWINGS OR THE BID DOCUMENTS.

CONSTRUCTION COORDINATION

1. DECONSTRUCTION ACTIVITIES NEAR THE FOOTPRINT OF THE ORIGINAL STANTON STATION SITE WILL BE TAKING PLACE NEAR THE BOTTOM ASH IMPOUNDMENT AND BOTTOM ASH LANDFILL DURING THIS WORK. THE CONTRACTOR SHALL BE AWARE OF WORK BEING DONE BY OTHERS AND SHALL COORDINATE CONTRACTOR'S SCHEDULE AND HAUL ROUTES TO COINCIDE WITH OTHER WORK.

SUBMITTAL(S)

1. A CRITICAL PATH OR BAR GRAPH TYPE SCHEDULE, PREPARED FOR EACH CONTRACT ITEM, SHALL BE SUBMITTED.
2. A WRITTEN WORK SAFETY PLAN DESCRIBING METHODS AND PRECAUTIONS TO BE TAKEN BY THE CONTRACTOR FOR SAFE PLACEMENT OF BOTTOM ASH SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO ANY WORK BEING COMPLETED.
3. A WORK PLAN DESCRIBING THE EQUIPMENT AND METHODS THAT THE CONTRACTOR INTENDS TO EMPLOY TO ACCOMPLISH WORK. THIS PLAN SHALL ALSO INCLUDE EQUIPMENT STAGING LOCATIONS.
4. ANY MATERIALS REQUIRED TO COMPLETE THE WORK, WHICH MAY INCLUDE, BUT NOT BE LIMITED TO, PIPING, PIPING APPURTENANCES AND COUPLERS, GROUT, PIPE GROUT PLUGS, DRAIN GRAVEL, AND GEOSYNTHETICS.

ABBREVIATIONS

ADS	ADVANCED DRAINAGE SYSTEMS
CCR	COAL COMBUSTION RESIDUAL
CY	CUBIC YARD
DIA.	DIAMETER
EL.	ELEVATION
ft	FEET
GOLDER	GOLDER ASSOCIATES INC.
GRE	GREAT RIVER ENERGY
HDPE	HIGH DENSITY POLYETHYLENE
in	INCH
LF	LINEAR FEET
MIN.	MINIMUM
N.T.S.	NOT TO SCALE
TYP.	TYPICAL

REFERENCES

1. SITE LOCATION: SECTION 21, T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS PROVIDED BY INTERSTATE ENGINEERING. THE INTERIOR OF THE BOTTOM ASH IMPOUNDMENT WAS SURVEY IN SEPTEMBER OF 2018 AND THE BOTTOM ASH LANDFILL WAS SURVEYED IN 2014.
3. THE SITE AERIAL IMAGE WAS PROVIDED BY GRE AND WAS ACQUIRED IN 2018. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.
4. COORDINATES ARE BASED ON PLANT GRID SYSTEM.

QUANTITIES
EARTHWORKS

CCR CLEANOUT 120 CY → CCR PLACEMENT SOUTH CELL 120 CY

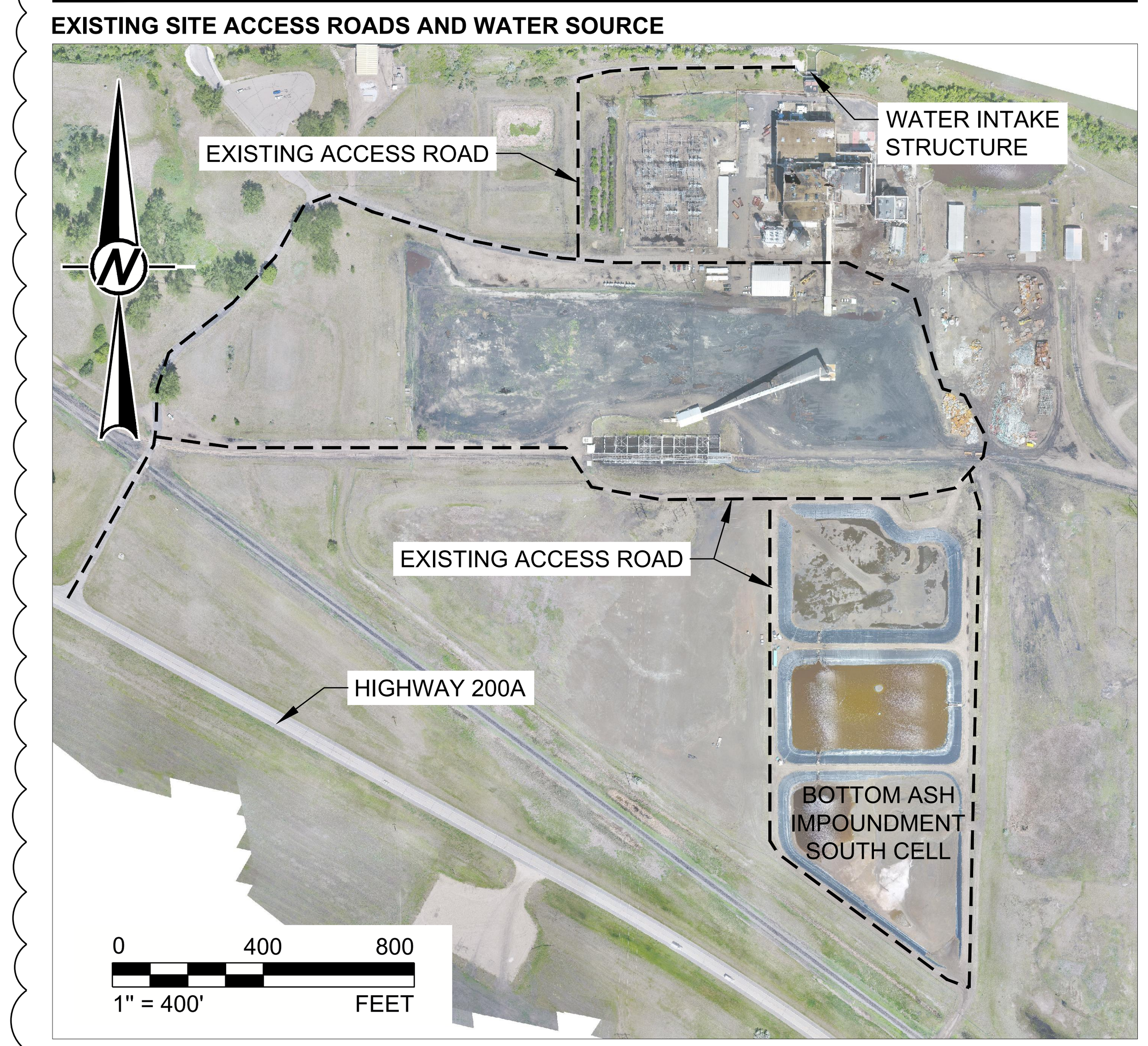
SOUTH CELL INTERNAL BOTTOM ASH 5,000 CY + BOTTOM ASH LANDFILL BOTTOM ASH 0 CY → BOTTOM ASH PROTECTIVE COVER 5,000 CY

CONSTRUCTION ITEMS

TYPE	PURPOSE	SIZE	QUANTITY	NOTES
PERFORATED ADS N-12 PLAIN END HDPE PIPE	SUMP PIPING	18 in	35 LF	OUTSIDE DIAMETER = 22 INCHES
ADS END CAP	SUMP PIPING	18 in	1 EA	
ADS N-12 HDPE 90-DEGREE ELBOW	SUMP PIPING	18 in	1 EA	BELL-BELL ELBOW
SOLID WALL DR-17 HDPE PIPE	SUMP RISER PIPING ABOVE THE CONCRETE STRUCTURE	22 in	8 LF	PE 4710 IPS (IRON PIPE SIZE) OUTSIDE DIAMETER = 22 INCHES
HDPE CAP	CAP ON TOP OF SUMP RISER PIPE	22 in	1 EA	CAP COMPATIBLE WITH DR-17 PLAIN END HDPE PIPE WITH AN OUTSIDE DIAMETER OF 22 INCHES
MARMAC COUPLER	ADS N-12 ST IB HDPE PIPE TO SOLID WALL DR-17 HDPE PIPE CONNECTION	N/A	1 EA	MARMAC OR EQUIVALENT APPROVED BY OWNER'S REPRESENTATIVE
DRAIN GRAVEL	SUMP DRAINAGE GRAVEL	N/A	50 CY	DRAIN GRAVEL TO BE APPROVED BY THE OWNER'S REPRESENTATIVE SEE SPECIFICATIONS
8-OUNCE PER SQUARE YARD NONWOVEN GEOTEXTILE	SUMP FILTER	N/A	~800 SF	
NON-SHRINK GROUT	FILL THE EXISTING 36-INCH DIAMETER REINFORCED CONCRETE PIPE BETWEEN THE SOUTH AND CENTER CELL	N/A	~20 CY	NON-SHRINK GROUT TO BE APPROVED BY THE OWNER'S REPRESENTATIVE SEE SPECIFICATIONS

QUANTITIES SHOWN ARE FOR INFORMATION ONLY. CONTRACTOR IS RESPONSIBLE FOR DETERMINING QUANTITIES REQUIRED BASED ON THE DRAWINGS, INCLUDING ANY WASTE.

EXISTING SITE ACCESS ROADS AND WATER SOURCE



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SEAL

REGISTERED PROFESSIONAL ENGINEER TODD J. STONG PE-6144 DATE 4/2/2019 NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
STANTON STATION

CONSULTANT

GOLDER

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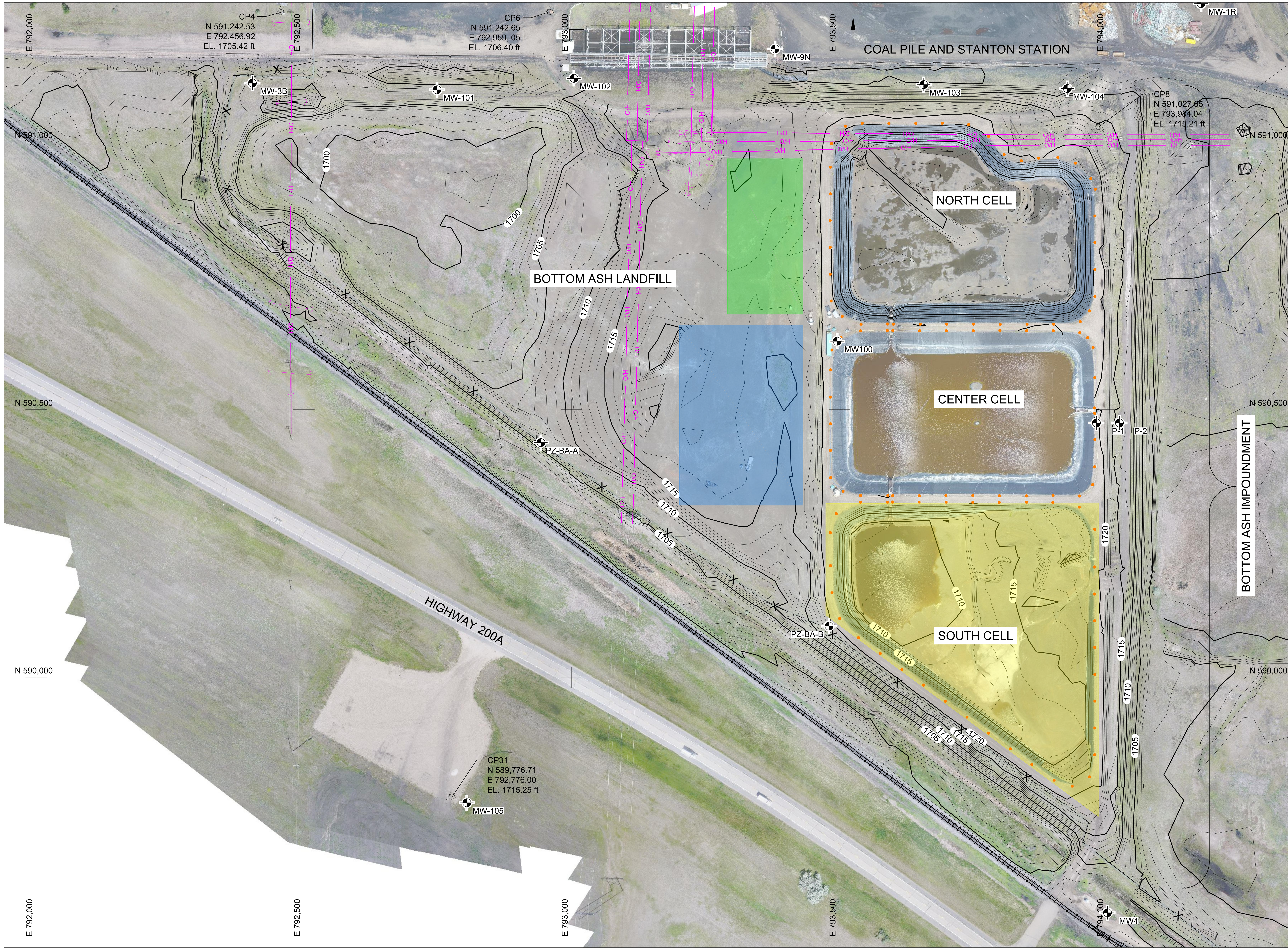
PROJECT
STANTON SITE RESTORATION

TITLE
PROJECT DESCRIPTION AND GENERAL NOTES

PROJECT NO. 1775717 | REV. 0 | 2 of 6 | DRAWING 2



LEGEND

- EXISTING GROUND TOPOGRAPHY (REFERENCE 2)
- BOTTOM ASH IMPOUNDMENT SOUTH CELL WORK AREA
- CONTRACTOR STAGING AREA
- BOTTOM ASH LANDFILL BORROW
- BOLLARDS
- RAIL LINES
- OVERHEAD ELECTRICAL
- FENCE
- MONITORING WELL/PIEZOMETER
- SURVEY CONTROL POINT

NOTES

1. THE LOCATIONS AND EXTENTS OF THE BOTTOM ASH LANDFILL BORROW TO BE APPROVED BY THE OWNER'S REPRESENTATIVE.
2. CARE SHALL BE TAKEN WHEN WORKING NEAR EXISTING MONITORING WELLS/PIEZOMETERS. ANY DAMAGE TO EXISTING MONITORING WELLS/PIEZOMETERS IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
3. THE RAIL LINE BETWEEN THE BOTTOM ASH IMPOUNDMENT/BOTTOM ASH LANDFILL AND THE COAL PILE HAS BEEN REMOVED.

REFERENCES

1. SITE LOCATION: SECTION 21, T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS ACQUIRED BY INTERSTATE ENGINEERING IN 2014 AND 2018.
3. THE SITE AERIAL IMAGE WAS PROVIDED BY GRE AND WAS ACQUIRED IN 2018. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.
4. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
5. THE CONTOUR INTERVAL IS ONE FOOT.
6. THE BOTTOM ASH LANDFILL AND BOTTOM ASH IMPOUNDMENT FACILITIES ARE CONTAINED WITHIN PROPERTY OWNED BY GREAT RIVER ENERGY.

0 100 200
1" = 100' FEET

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PE-6144
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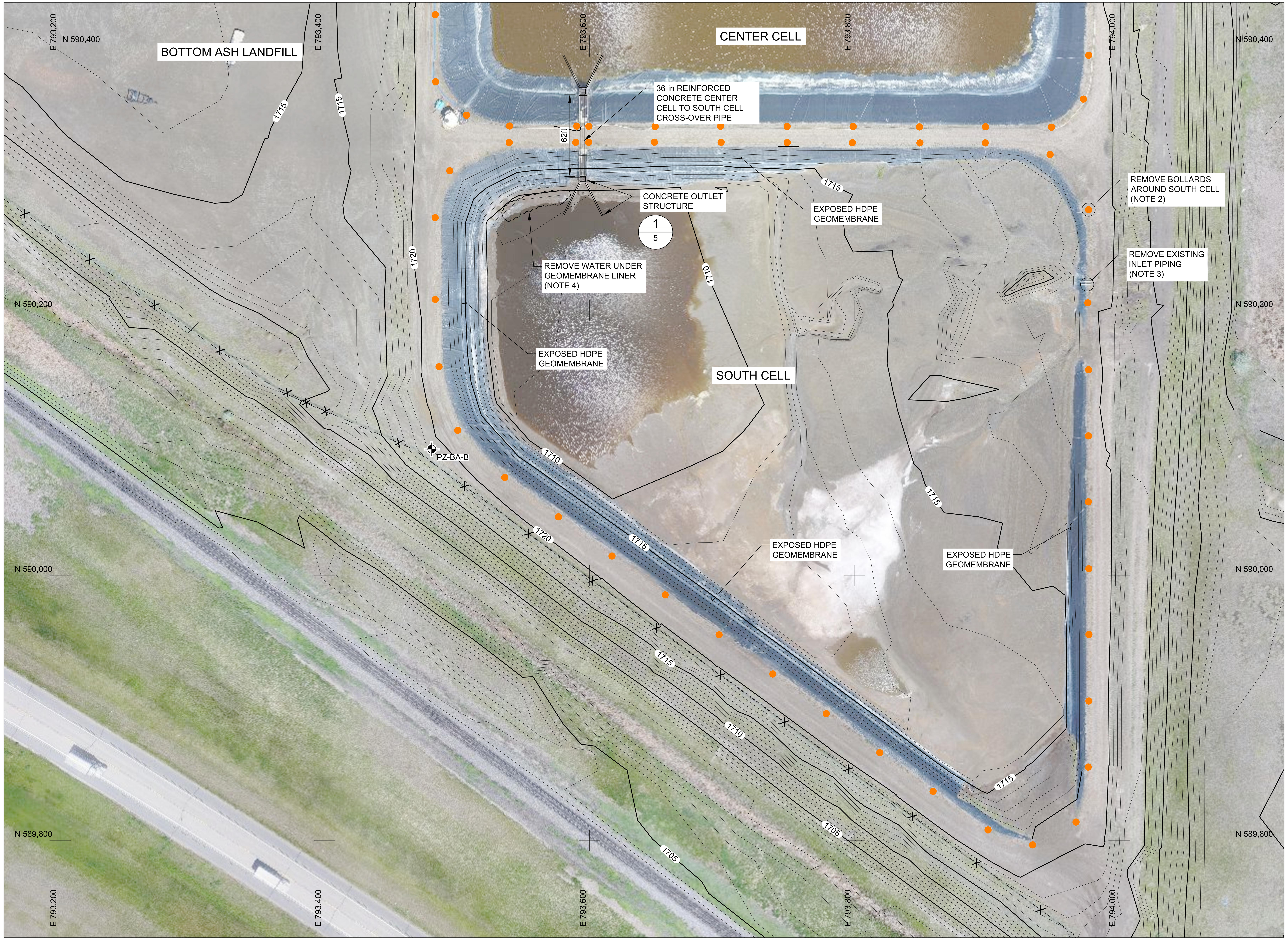
PROJECT
STANTON SITE RESTORATION

TITLE
SITE OVERVIEW

PROJECT NO.	REV.		DRAWING
1775717	0	3 of 6	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

1710	EXISTING GROUND TOPOGRAPHY (REFERENCE 2)
	BOLLARDS
X	FENCE
MW-1R	MONITORING WELL/PIEZOMETER

NOTES

1. APPROXIMATELY 36 BOLLARDS EXIST AROUND THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT.
2. BOLLARDS SHALL BE CUT OFF AT GROUND LEVEL AROUND THE SOUTH CELL AND SAFETY CABLE SHALL BE REMOVED. BOLLARDS AND SAFETY CABLE TO BE DISPOSED OF IN THE DECONSTRUCTION CONTRACTORS METAL SCRAP PILE AS APPROVED BY THE OWNER. NO METAL IS TO BE DISPOSED OF WITHIN THE BOTTOM ASH IMPOUNDMENT.
3. EXISTING INLET PLASTIC PIPING SHALL BE CUT OFF APPROXIMATELY TWO FEET BELOW THE GROUND SURFACE AND BACKFILLED WITH SOIL. PLASTIC PIPING MAY BE DISPOSED OF IN THE CENTER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT AS APPROVED BY THE OWNER. SEE REFERENCE DRAWING S1013 FOR INFORMATION ON EXISTING PIPING.
4. WATER TRAPPED UNDER THE GEOMEMBRANE LINER SHALL BE REMOVED BY HAND EXCAVATING A LOW SPOT BELOW THE TRAPPED WATER, CUTTING A HOLE IN THE GEOMEMBRANE LINER, DRAINING THE TRAPPED WATER, AND REPAIRING THE GEOMEMBRANE WITH AN EXTRUSION WELD APPROVED BY THE OWNER.

REFERENCES

1. SITE LOCATION: SECTION 21, T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS ACQUIRED BY INTERSTATE ENGINEERING IN 2014 AND 2018.
3. THE SITE AERIAL IMAGE WAS PROVIDED BY GRE AND WAS ACQUIRED IN 2018. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.
4. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
5. THE CONTOUR INTERVAL IS ONE FOOT.
6. THE BOTTOM ASH LANDFILL AND BOTTOM ASH IMPOUNDMENT FACILITIES ARE CONTAINED WITHIN PROPERTY OWNED BY GREAT RIVER ENERGY.

N

0 40 80
1" = 40' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-04-02	ISSUED FOR CONSTRUCTION	CCS	CCS	TJS	TJS
B	2018-11-05	ISSUED FOR BID	CCS	KAC	TJS	TJS
A	2018-10-24	ISSUED FOR CLIENT REVIEW	CCS	CCS	TJS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 4/2/2019
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
STANTON STATION

CONSULTANT
GOLDER

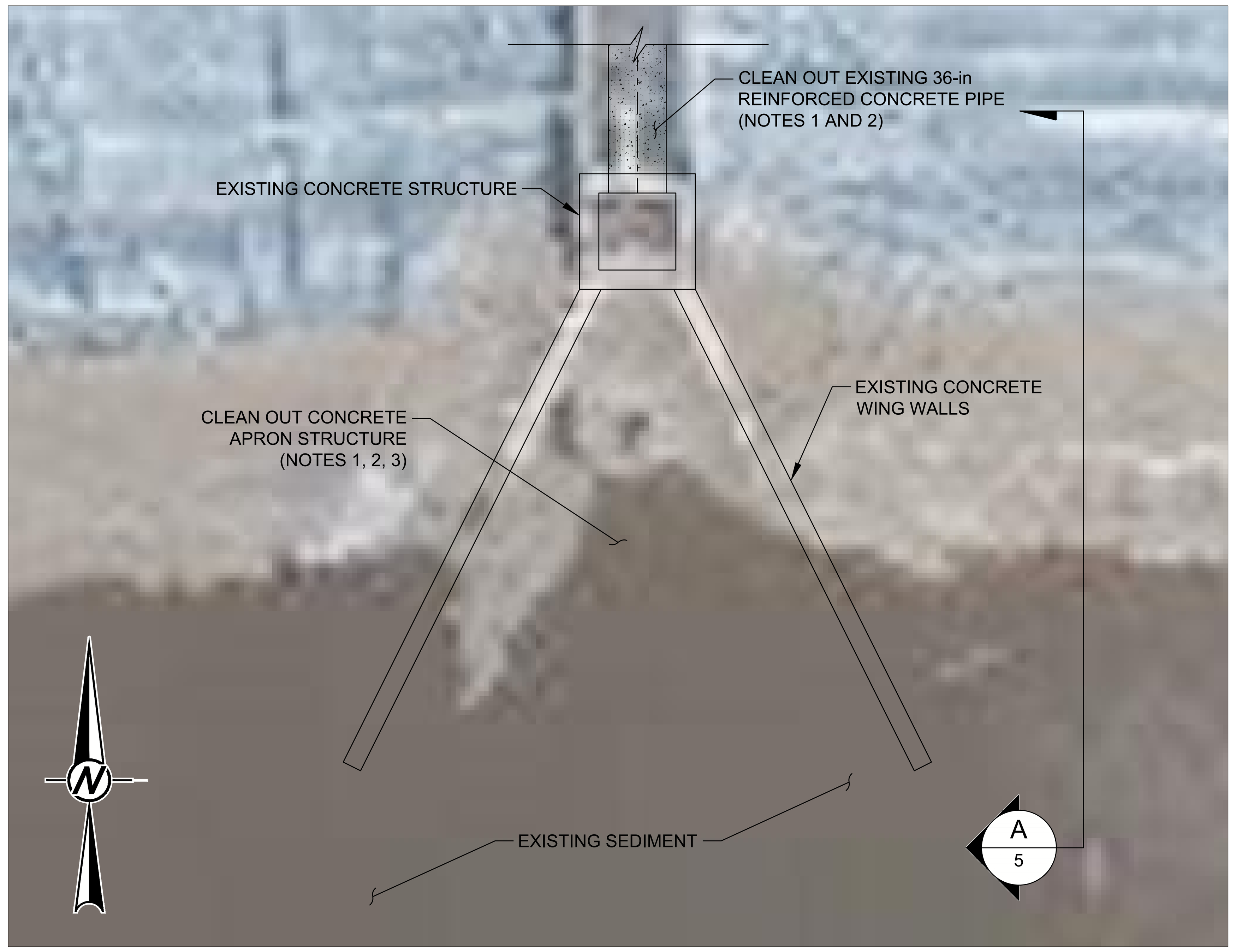
GOLDER ASSOCIATES INC.
44 UNION BLVD., SUITE 300
LAKEWOOD, COLORADO
USA
(303) 980-0540
www.golder.com

PROJECT
STANTON SITE RESTORATION

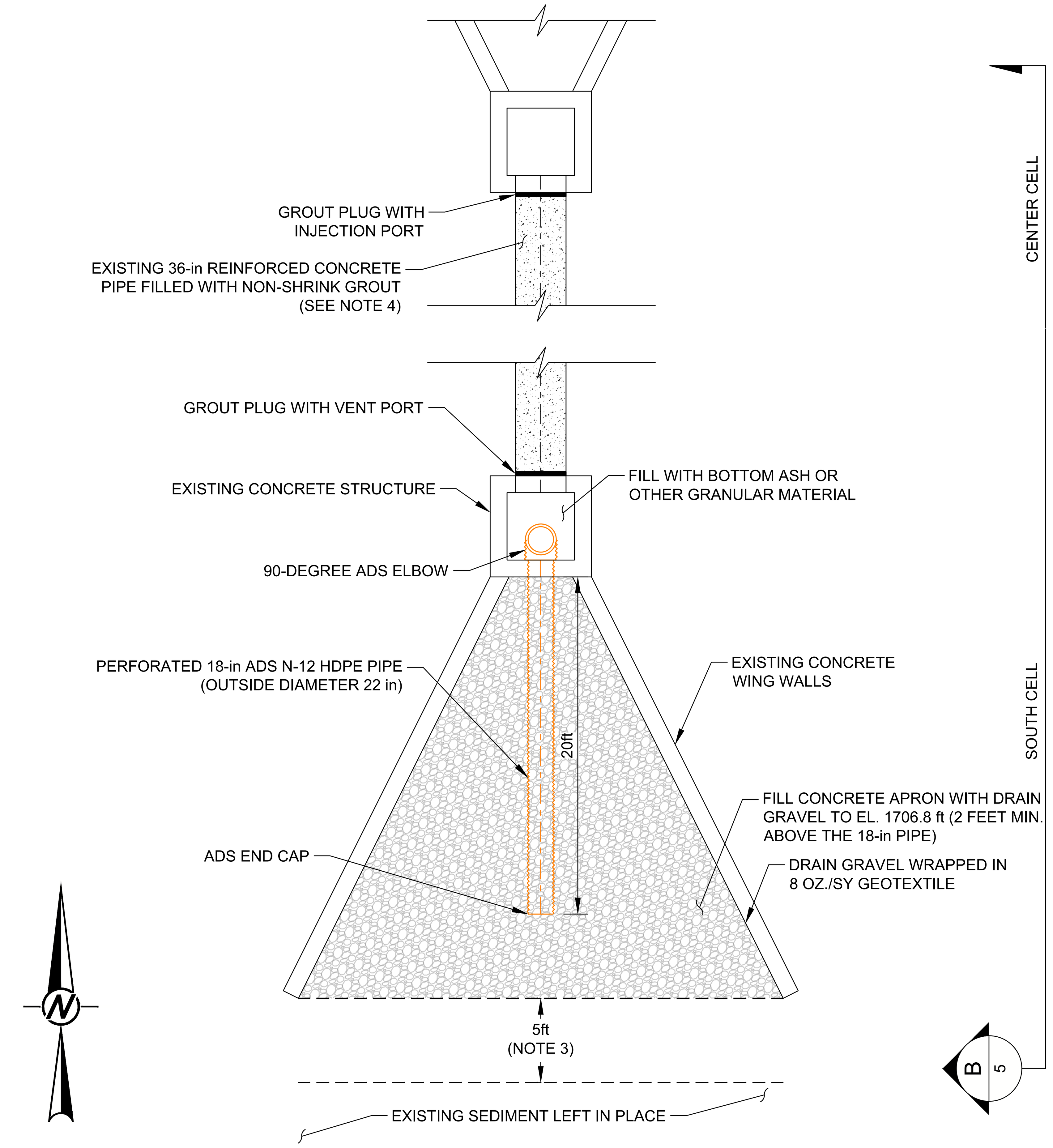
TITLE
EXISTING CONDITIONS - SOUTH CELL

PROJECT NO.	REV.	4 of 6	DRAWING
1775717	0		4

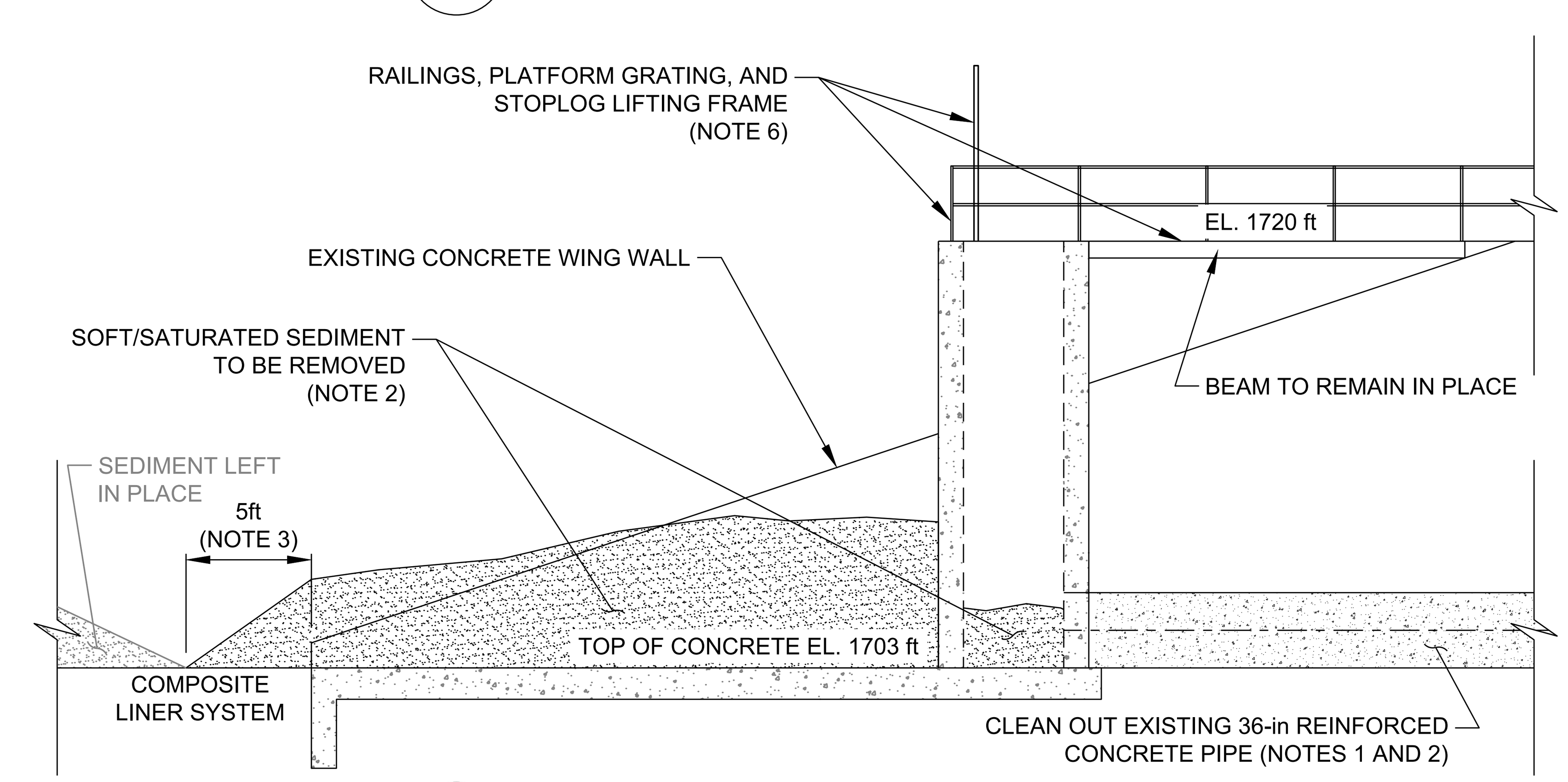
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



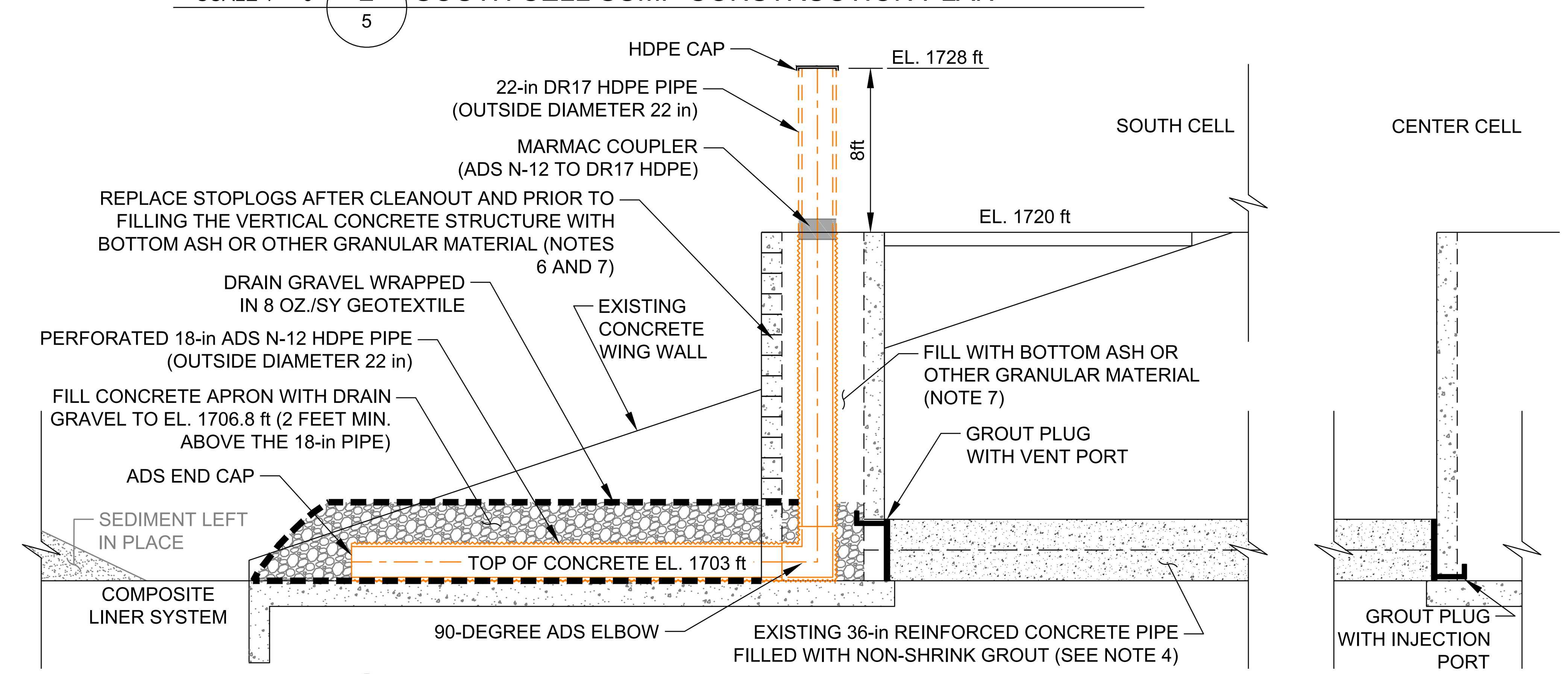
SCALE 1" = 6' | 1/5 | SOUTH CELL SUMP CLEANOUT PLAN



SCALE 1" = 6' | 2/5 | SOUTH CELL SUMP CONSTRUCTION PLAN



SCALE 1" = 6' | A/5 | SOUTH CELL SUMP CLEANOUT SECTION



SCALE 1" = 6' | B/5 | SOUTH CELL SUMP CONSTRUCTION SECTION

NOTES

1. THE EXISTING 36-INCH REINFORCED CONCRETE PIPELINE SHALL BE CLEANED AND PRESSURE WASHED PRIOR TO FILLING WITH NON-SHRINK GROUT. THE SOUTH CELL CONCRETE APRON STRUCTURE AND A PORTION OF THE CENTER CELL CONCRETE APRON STRUCTURE MAY ALSO BE REQUIRED TO BE CLEANED OUT AND PRESSURE WASHED PRIOR TO PLACEMENT OF GROUT PLUGS.
2. SOFT AND SATURATED SEDIMENT CLEANED OUT FROM THE 36-INCH PIPE AND BETWEEN THE WING WALLS IN THE CENTER AND SOUTH CELLS SHALL BE DISPOSED OF IN THE CENTER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT.
3. SEDIMENT TO BE REMOVED DOWN TO THE TOP OF CONCRETE ELEVATION OF THE CONCRETE APRON STRUCTURE AND A MINIMUM OF 5 FEET HORIZONTALLY BEYOND THE CONCRETE APRON STRUCTURE. SEE REFERENCE DRAWINGS FOR DETAILS OF THE CONCRETE STRUCTURES.
4. THE EXISTING 36-INCH PIPE SHALL BE PRESSURE-GROUTED WITH NON-SHRINK GROUT APPROVED BY THE OWNER'S REPRESENTATIVE.
5. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING TEMPORARY ACCESS RAMPS/ROADS AS DETERMINED TO BE REQUIRED BY THE CONTRACTOR TO COMPLETE THE WORK.
6. THE RAILINGS, PLATFORM GRATING, AND STOPLOG LIFTING FRAME THAT ARE A PART OF THE SOUTH CELL CONCRETE STRUCTURE SHALL BE DISPOSED OF IN THE DECONSTRUCTION CONTRACTOR'S METAL SCRAP PILE AS APPROVED BY THE OWNER. NO METAL IS TO BE DIPSOSED OF WITHIN THE BOTTOM ASH IMPOUNDMENT.
7. THE STOPLOGS SHALL BE REMOVED AS REQUIRED TO CLEAN OUT THE CONCRETE STRUCTURE AND 36-INCH REINFORCED CONCRETE PIPE. AFTER PLACEMENT OF THE SUMP DRAIN GRAVEL AND PIPING AND PRIOR TO PLACEMENT OF BOTTOM ASH OR OTHER GRANULAR MATERIAL APPROVED BY THE OWNER IN THE VERTICAL CONCRETE STRUCTURE, THE STOPLOGS SHALL BE REPLACED TO TO TOP OF THE CONCRETE STRUCTURE.
8. THE CONTRACTOR IS RESPONSIBLE FOR DEWATERING THE SOUTH CELL AND CENTER CELL TO COMPLETE THE WORK TO THE LINES AND GRADES SHOWN ON THE DRAWINGS AND AS DESCRIBED IN BID DOCUMENTS. WATER FROM THE SOUTH CELL AND CENTER CELL MAY BE PUMPED TO THE NORTH CELL OR MANAGED IN THE CENTER CELL AS REQUIRED.

REFERENCES

1. THE SITE AERIAL IMAGE WAS PROVIDED BY GRE AND WAS ACQUIRED IN 2018. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.

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SEAL

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TODD J. STONG
PE-6144
DATE 4/2/2019
NORTH DAKOTA

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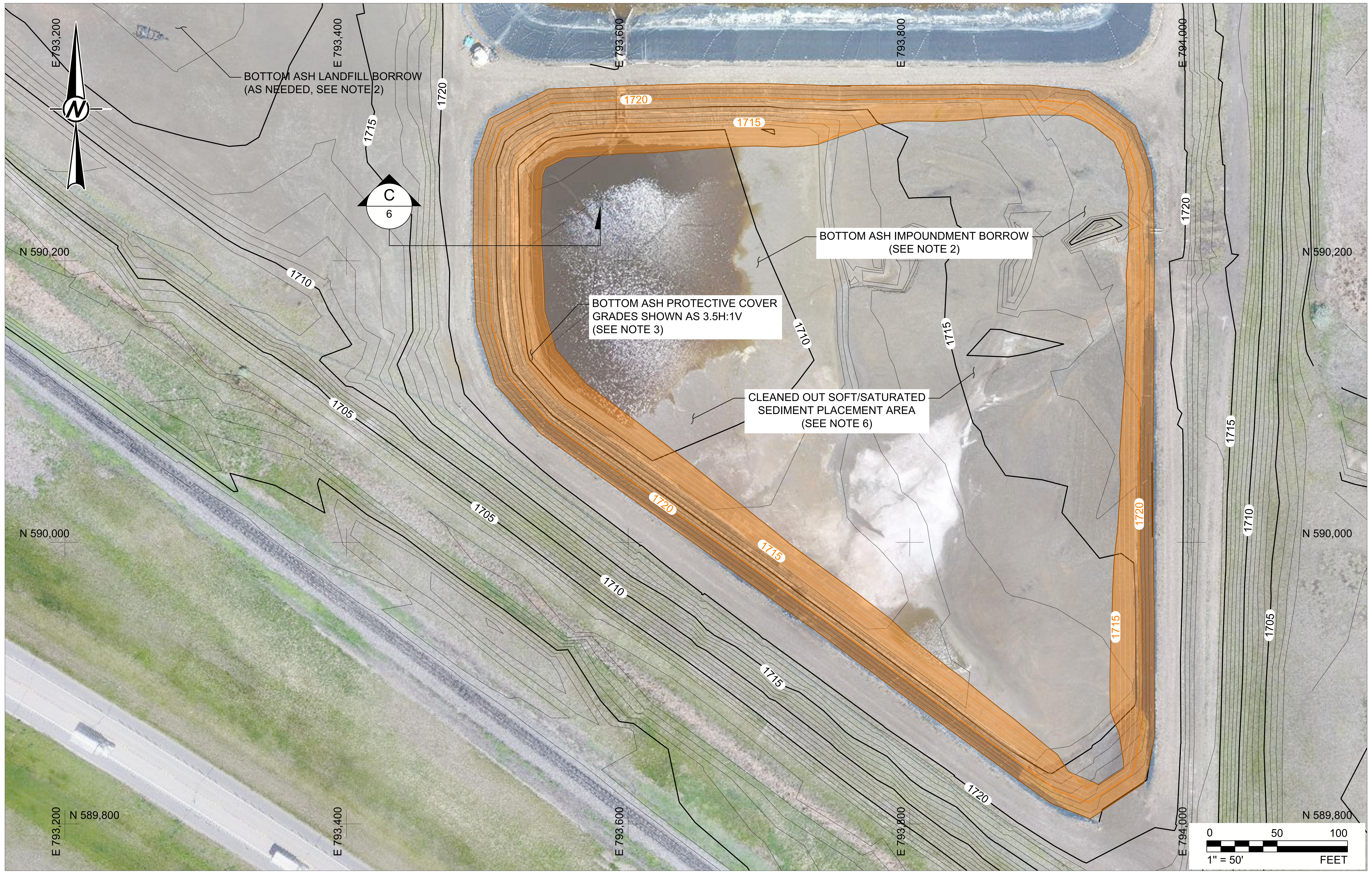
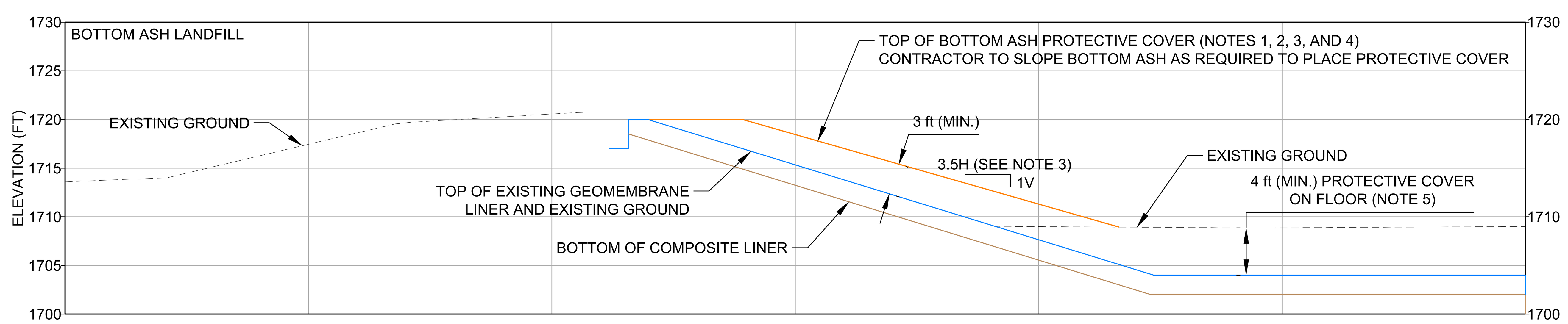
PROJECT
STANTON SITE RESTORATION

TITLE
CLEANOUT AND SUMP CONSTRUCTION

PROJECT NO.	REV.		DRAWING
1775717	0	5 of 6	5



SCALE 1" = 50' 1/6 BOTTOM ASH PROTECTIVE COVER PLAN



SCALE N.T.S. C/6 WEST SLOPE SECTION (TYPICAL BOTTOM ASH PROTECTIVE COVER)

LEGEND

- 1715 — EXISTING GROUND TOPOGRAPHY (REFERENCE 2)
- 1715 — BOTTOM ASH PROTECTIVE COVER PLACEMENT ON SIDE SLOPES (NOTES 1, 2, 3, AND 4)

NOTES

1. BOTTOM ASH PROTECTIVE COVER SHALL BE PLACED ON ALL AREAS OF EXPOSED GEOMEMBRANE. PROTECTIVE COVER OVER GEOMEMBRANE SIDE SLOPES SHALL BE A MINIMUM OF 3 FEET THICK.
2. BOTTOM ASH PROTECTIVE COVER SHALL BE BORROWED FROM THE CENTER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT. IF SUFFICIENT BOTTOM ASH IS UNAVAILABLE WITHIN THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT, THE CONTRACTOR MAY BORROW ADDITIONAL BOTTOM ASH FROM THE BOTTOM ASH LANDFILL AFTER APPROVAL FROM THE OWNER'S REPRESENTATIVE.
3. PROTECTIVE COVER ON THE SIDE SLOPES SHALL BE PLACED FROM THE TOE OF THE SLOPE TOWARD THE CREST USING LOW GROUND PRESSURE EQUIPMENT. CONTRACTOR TO EVALUATE PLACEMENT CONDITIONS AS WORK PROGRESSES AND MAY MODIFY THE SLOPE OF BOTTOM ASH PLACED ON GEOMEMBRANE DEPENDING ON WORK CONDITIONS. MODIFICATIONS TO BOTTOM ASH PROTECTIVE COVER PLACEMENT SLOPES SHALL BE APPROVED BY OWNER PRIOR TO WORK BEING COMPLETED.
4. CONTRACTOR IS RESPONSIBLE FOR DAMAGE TO THE GEOMEMBRANE DURING CONSTRUCTION AND REPAIRS TO THE GEOMEMBRANE PRIOR TO DEMOBILIZING FROM SITE UNLESS AGREED OTHERWISE WITH THE OWNER.
5. PROTECTIVE COVER OVER THE FLOOR OF THE GEOMEMBRANE SHALL BE A MINIMUM OF 4 FEET THICK OR TO A MINIMUM ELEVATION OF 1708 ft.
6. SOFT/SATURATED SEDIMENT CLEANED OUT FROM THE CROSS-OVER PIPELINE BETWEEN THE CENTER CELL AND THE SOUTH CELL AND FROM WITHIN THE CONCRETE STRUCTURES PRIOR TO CONSTRUCTION OF THE SUMP SHALL BE PLACED IN THE CENTER OF THE SOUTH CELL OF THE BOTTOM ASH IMPOUNDMENT AS APPROVED BY THE OWNER. SOFT/SATURATED SEDIMENT MAY BE STABILIZED AND BLENDED WITH EXISTING BOTTOM ASH WITHIN THE CELL TO PROVIDE A WORKABLE MATERIAL.
7. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING TEMPORARY ACCESS RAMPS/ROADS AS DETERMINED TO BE REQUIRED BY THE CONTRACTOR TO COMPLETE THE WORK.
8. THE CONTRACTOR IS RESPONSIBLE FOR DEWATERING THE SOUTH CELL AND CENTER CELL TO COMPLETE THE WORK TO THE LINES AND GRADES SHOWN ON THE DRAWINGS AND AS DESCRIBED IN BID DOCUMENTS. WATER FROM THE SOUTH CELL AND CENTER CELL MAY BE PUMPED TO THE NORTH CELL OR MANAGED IN THE CENTER CELL AS REQUIRED TO ACCOMPLISH THE WORK.

REFERENCES

1. SITE LOCATION: SECTION 21, T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS ACQUIRED BY INTERSTATE ENGINEERING IN 2014 AND 2018.
3. THE SITE AERIAL IMAGE WAS PROVIDED BY GRE AND WAS ACQUIRED IN 2018. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.
4. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
5. THE CONTOUR INTERVAL IS ONE FOOT.
6. THE BOTTOM ASH LANDFILL AND BOTTOM ASH IMPOUNDMENT FACILITIES ARE CONTAINED WITHIN PROPERTY OWNED BY GREAT RIVER ENERGY.

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A	2018-10-24	ISSUED FOR CLIENT REVIEW	CCS	CCS	TJS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 4/2/2019
NORTH DAKOTA

CLIENT
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PROJECT
STANTON SITE RESTORATION

TITLE
BOTTOM ASH PROTECTIVE COVER

PROJECT NO.	REV.		DRAWING
1775717	0	6 of 6	6

GREAT RIVER ENERGY
SCOPE OF WORK G
SOUTH CELL CLOSURE

Prepared for:

GREAT RIVER ENERGY.

Stanton Station
Stanton, North Dakota

Prepared by:

GOLDER

Golder Associates Inc.
7245 W Alaska Dr., Suite 200
Lakewood, Colorado USA 80226

SOUTH CELL CLOSURE DRAWING LIST		
DRAWING NO.	TITLE	REVISION
G1	TITLE SHEET	0
G2	GENERAL NOTES AND QUANTITIES	0
G3	EXISTING CONDITIONS	0
G4	TOP OF WASTE	0
G5	TOP OF FINAL COVER	0
G6	SECTIONS	0
G7	DETAILS	0

ADDITIONAL OVERALL SITE INFORMATION IS INCLUDED ON DRAWINGS 1 THROUGH 7

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
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NORTH DAKOTA
DATE 7/19/19

CLIENT
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PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

TITLE
TITLE SHEET

PROJECT NO. 1775717
REV. 0
G1 of G7
DRAWING G1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

PROJECT DESCRIPTION

THE SOUTH CELL CLOSURE CONSTRUCTION SCOPE OF WORK CONSISTS OF REGRADING IN-PLACE AND COAL COMBUSTION RESIDUALS AND OTHER WASTE MATERIALS PLACED WITHIN THE SOUTH CELL IMPOUNDMENT TO BETWEEN 3% AND 15% GRADES. PLACING GEOSYNTHETIC CLAY LINER, GEOMEMBRANE, GROWTH MEDIUM, AND TOPSOIL AS REQUIRED TO COVER THE IMPOUNDMENT AND DIRECT SURFACE WATER OFF THE FINAL COVERED FACILITY.

SOUTH CELL CLOSURE GENERAL NOTES AND SPECIFICATIONS

1. COAL COMBUSTION RESIDUALS, COAL, AND OTHER SOIL-LIKE MATERIALS DEPOSITED IN THE SOUTH CELL SHALL BE PLACED AND COMPACTED TO PRODUCE A FIRM AND UNYIELDING TOP OF WASTE SURFACE. THESE MATERIALS SHALL BE MOISTURE-CONDITIONED DURING PLACEMENT.
2. THE WATER WITHIN THE SOUTH CELL SHALL NOT BE DISCHARGED BY THE CONTRACTOR. ONLY THE OWNER CAN REMOVE THIS WATER. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE OWNER'S REPRESENTATIVE WHEN CONTACT WATER NEEDS TO BE PUMPED FROM THE NORTHWEST CORNER SUMP. THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE BEFORE CONTACT WATER GETS ABOVE ELEVATION 1716 FT.
3. THE APPROXIMATE DISTANCE FROM THE TOPSOIL BORROW AREA TO THE SOUTH CELL CLOSURE EXTENTS IS 0.6 MILES ONE-WAY.
4. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING HAUL ROADS BETWEEN THE SOUTH CELL, RIVER, WATER SOURCE, DEPOSITION LOCATIONS, WATER DISCHARGE LOCATIONS, AND BORROW AREAS TO PROVIDE ADEQUATE ACCESS THROUGHOUT CONSTRUCTION.
5. CARE SHALL BE TAKEN WHEN WORKING IN AND AROUND THE BOTTOM ASH IMPOUNDMENT SOUTH CELL TO AVOID DAMAGE TO THE LINER SYSTEM, PROTECTIVE COVER, OR SUMP SYSTEM. CONTRACTOR IS RESPONSIBLE FOR MARKING ANY DAMAGE AND FOR INFORMING THE OWNER OF DAMAGE AS SOON AS POSSIBLE. CONTRACTOR IS RESPONSIBLE FOR REPAIRS TO LINER, PROTECTIVE COVER, OR SUMP SYSTEM DAMAGED AS A PART OF PERFORMING THIS SCOPE OF WORK.
6. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING RAMPS AND/OR ACCESS ROADS OVER GEOMEMBRANE-LINED SLOPES TO PROTECT THE SUMP AND LINER SYSTEM IN THE SOUTH CELL. PROTECTIVE COVER SHALL BE MAINTAINED AT A MINIMUM THICKNESS OF THREE (3) FEET AND AS APPROVED BY THE OWNER'S REPRESENTATIVE.
7. BOLLARDS, PILLARS/PEDESTALS, AND THEIR FOUNDATIONS AROUND THE SOUTH CELL ARE TO BE CUT AND REMOVED TO GRADE BY OTHERS PRIOR TO THE START OF WORK. IF ANY BELOW GRADE STRUCTURES ARE ENCOUNTERED DURING THE EXECUTION OF THIS WORK, THE CONTRACTOR SHALL REMOVE AND DISPOSE OF MATERIALS IN THE BOTTOM ASH IMPOUNDMENT SOUTH CELL AS APPROVED BY THE OWNER'S REPRESENTATIVE.

ABBREVIATIONS

AC	ACRE
BAL	BOTTOM ASH LANDFILL
CCR	COAL COMBUSTION RESIDUAL
C&D	CONSTRUCTION AND DEMOLITION
℄	CENTERLINE
CY	CUBIC YARD
DWG	DRAWING
EL.	ELEVATION
ft	FEET
GCL	GEOSYNTHETIC CLAY LINER
GOLDER	GOLDER ASSOCIATES INC.
GRE	GREAT RIVER ENERGY
HDPE	HIGH DENSITY POLYETHYLENE
in	INCH
LF	LINEAR FOOT
MIN.	MINIMUM
NTS	NOT TO SCALE
SF	SQUARE FOOT
SOW	SCOPE OF WORK
TYP.	TYPICAL

REFERENCES

1. SITE LOCATION: T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. AERIAL IMAGE IS A COMBINATION OF IMAGERY OBTAINED FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGE PROGRAM, ACQUIRED IN 2018, AND IMAGERY PROVIDED BY GRE, ACQUIRED IN JUNE 2018.
3. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY KBM, INC. ON APRIL 27, 2001 (SITE WIDE), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2014 (BOTTOM ASH IMPOUNDMENT AND LANDFILL AREA), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2017 (COAL PILE AREA), AND A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2018.

BID ITEM QUANTITIES

TYPE	LOCATION/PURPOSE	SIZE	QUANTITY	NOTES
WASTE REGRADING	SOUTH CELL	N/A	5,000 CY	
POLYMER TREATED GCL	SOUTH CELL FINAL COVER	N/A	174,600 SF	
60-MIL TEXTURED HDPE GEOMEMBRANE	SOUTH CELL FINAL COVER	N/A	174,600 SF	
GROWTH MEDIUM	SOUTH CELL FINAL COVER	N/A	16,800 CY	
FERTILIZER	SOUTH CELL FINAL COVER	N/A	4.5 AC	
TOPSOIL (BORROW)	SOUTH CELL FINAL COVER	N/A	4,000 CY	
SEED AND MULCH (FINAL COVER MIX)	SOUTH CELL FINAL COVER	N/A	4.5 AC	SEE SPECIFICATION FOR SEED MIX
SILT FENCE EROSION CONTROLS	SOUTH CELL, AS NEEDED	36 in	1,400 LF	

* QUANTITIES PRESENTED MAY NOT ACCOUNT FOR WASTE, SHRINK, SWELL, OR OTHER ADDITIONAL QUANTITY REQUIRED TO COMPLETE THE WORK.
* ITEMS ABOVE REFLECT QUANTITIES TO BE MEASURED AS DESCRIBED IN THE MEASURE AND PAYMENT.
* ADDITIONAL MATERIALS REQUIRED TO COMPLETE THE WORK MAY NOT BE SHOWN IN THIS TABLE (SEE MEASURE AND PAYMENT)

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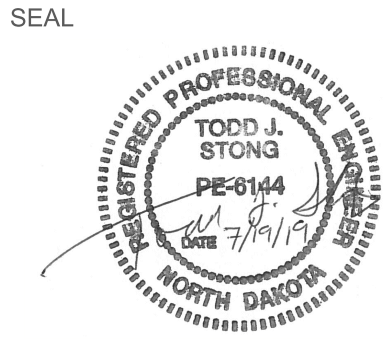
SEAL



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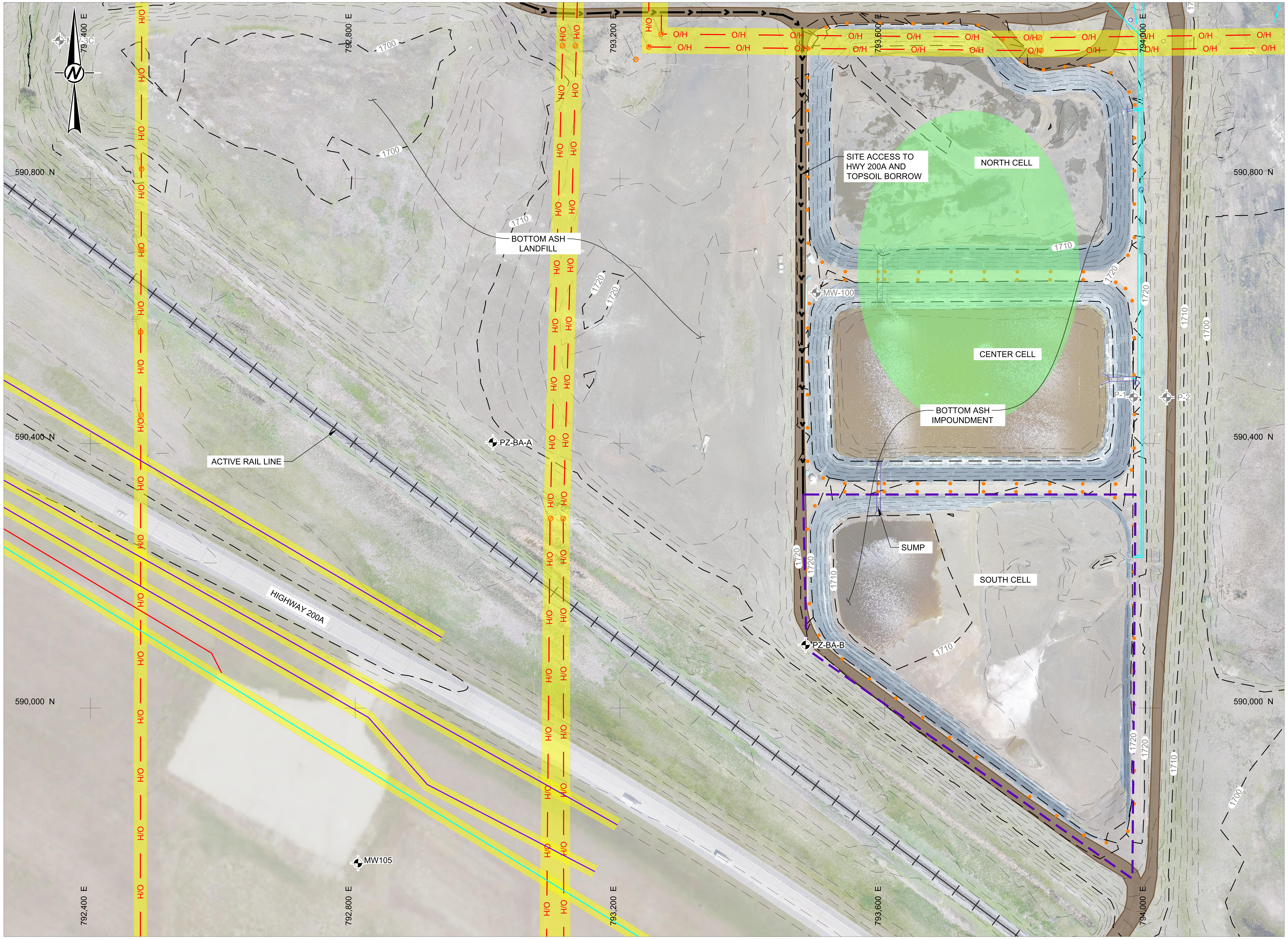
PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

TITLE
GENERAL NOTES AND QUANTITIES

PROJECT NO. 1775717
REV. 0
G2 of G7
DRAWING G2



LEGEND

- EXISTING GROUND TOPOGRAPHY (REFERENCES 3 AND 4)
- SOUTH CELL CLOSURE EXTENTS (APPROXIMATE)
- POTENTIAL TOPSOIL BORROW AREA HAUL ROUTE (0.6 MILES ONE-WAY)
- EXISTING POWER POLES
- WATER PIPING (BURIED) (NOTE 1)
- ELECTRICAL (BURIED) (NOTE 1)
- O/H — OVERHEAD ELECTRIC LINE (ACTIVE) (NOTE 1)
- COMMUNICATIONS (BURIED) (NOTE 1)
- ACTIVE UTILITY (NOTE 1)
- EXISTING ACCESS ROAD
- ACTIVE RAIL LINE
- BOLLARD FOUNDATIONS (NOTE 3)
- MW-10 MONITORING WELLS/PIEZOMETERS (NOTE 2)
- MW-10 MONITORING WELLS/PIEZOMETERS TO BE ABANDONED (BY OTHERS)
- GROWTH MEDIUM STOCKPILE (NOTE 4)

NOTE(S)

1. LOCATIONS AND DIMENSIONS OF EXISTING UTILITIES ARE APPROXIMATE AND ARE BASED ON DESIGN DRAWINGS AND/OR AS-BUILT INFORMATION PROVIDED BY GRE AND SHOULD BE FIELD VERIFIED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING UTILITIES WHEN PERFORMING WORK NEAR MARKED LINES .
2. CARE SHALL BE TAKEN WHEN WORKING NEAR EXISTING MONITORING WELLS/PIEZOMETERS. ANY DAMAGE TO MONITORING WELLS/PIEZOMETERS IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
3. BOLLARDS, PILLARS/PEDESTALS, AND THEIR FOUNDATIONS AROUND THE SOUTH CELL ARE TO BE CUT AND REMOVED TO GRADE BY OTHERS PRIOR TO THE START OF WORK. IF ANY BELOW GRADE STRUCTURES ARE ENCOUNTERED DURING THE EXECUTION OF THIS WORK, THE CONTRACTOR SHALL REMOVE AND DISPOSE OF MATERIALS IN THE BOTTOM ASH IMPOUNDMENT SOUTH CELL AS APPROVED BY THE OWNER'S REPRESENTATIVE.
4. GROWTH MEDIUM WILL BE STOCKPILED IN THE AREA INDICATED IN THE DRAWING OR COME DIRECTLY FROM SOW F (SITE REGRADE) GENERAL CUT.

REFERENCE(S)

1. SITE LOCATION: T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. AERIAL IMAGE IS A COMBINATION OF IMAGERY OBTAINED FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGE PROGRAM, ACQUIRED IN 2018, AND IMAGERY PROVIDED BY GRE, ACQUIRED IN JUNE 2018.
3. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY KBM, INC. ON APRIL 27, 2001 (SITE WIDE), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2014 (BOTTOM ASH IMPOUNDMENT AND LANDFILL AREA), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2017 (COAL PILE AREA), AND A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2018.
4. EXISTING GROUND TOPOGRAPHY CONTOUR INTERVAL IS TWO (2) FEET.

0 80 160
1" = 80' FEET

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0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
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PE-6144
NORTH DAKOTA

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PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

TITLE
EXISTING CONDITIONS

PROJECT NO. 1775717 | REV. 0 | G3 of G7 | DRAWING G3

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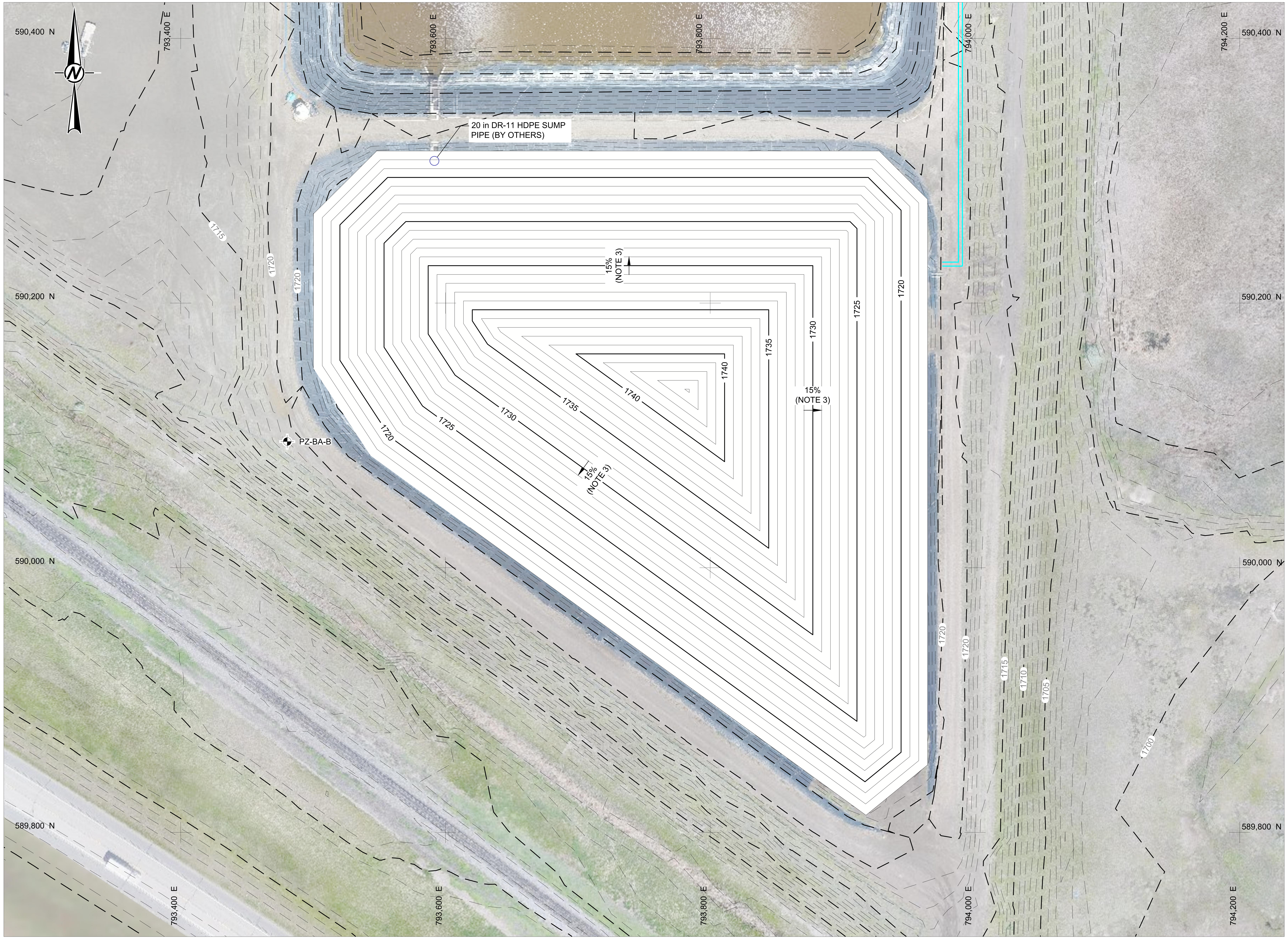

LEGEND

- 3600 — EXISTING GROUND TOPOGRAPHY (REFERENCES 3 AND 4)
- 3600 — TOP OF WASTE GRADES (NOTES 1 AND 3 AND REFERENCE 4)
- MW-10 — MONITORING WELLS/PIEZOMETERS (NOTE 2)
- WATER PIPING (BURIED)
- 20 in DR-11 HDPE SUMP PIPE (BY OTHERS)

NOTE(S)

1. COAL COMBUSTION RESIDUALS, COAL, AND OTHER SOIL-LIKE MATERIALS DEPOSITED IN THE SOUTH CELL IMPOUNDMENT SHALL BE PLACED AND COMPACTED TO PRODUCE A FIRM AND UNYIELDING TOP OF WASTE SURFACE. THESE MATERIALS SHALL BE MOISTURE-CONDITIONED DURING PLACEMENT.
2. CARE SHALL BE TAKEN WHEN WORKING NEAR EXISTING MONITORING WELLS/PIEZOMETERS. ANY DAMAGE TO MONITORING WELLS/PIEZOMETERS IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
3. TOP OF WASTE GRADES ARE APPROXIMATE AND MAY VARY DEPENDING ON THE AMOUNT OF MATERIAL REQUIRED TO BE CONTAINED AS A PART OF THE STANTON STATION SITE RESTORATION CONSTRUCTION. TOP OF WASTE GRADES SHALL NOT BE LESS THAN 3% OR GREATER THAN 15% UNLESS OTHERWISE APPROVED BY THE OWNER'S REPRESENTATIVE.
4. BOLLARDS, PILLARS/PEDESTALS, AND THEIR FOUNDATIONS AROUND THE SOUTH CELL ARE TO BE CUT AND REMOVED TO GRADE BY OTHERS PRIOR TO THE START OF WORK. IF ANY BELOW GRADE STRUCTURES ARE ENCOUNTERED DURING THE EXECUTION OF THIS WORK, THE CONTRACTOR SHALL REMOVE AND DISPOSE OF MATERIALS IN THE BOTTOM ASH IMPOUNDMENT SOUTH CELL AS APPROVED BY THE OWNER'S REPRESENTATIVE.

REFERENCE(S)

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2. AERIAL IMAGE IS A COMBINATION OF IMAGERY OBTAINED FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGE PROGRAM, ACQUIRED IN 2018, AND IMAGERY PROVIDED BY GRE, ACQUIRED IN JUNE 2018.
3. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY KBM, INC. ON APRIL 27, 2001 (SITE WIDE), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2014 (BOTTOM ASH IMPOUNDMENT AND LANDFILL AREA), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2017 (COAL PILE AREA), AND A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2018.
4. EXISTING GROUND TOPOGRAPHY AND TOP OF WASTE CONTOUR INTERVAL IS ONE (1) FOOT.

0 40 80
1" = 40' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 7/19/19
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
STANTON STATION
STANTON, NORTH DAKOTA

CONSULTANT

GOLDER

GOLDER ASSOCIATES INC.
7245 W ALASKA DR., SUITE 200
LAKEWOOD, COLORADO
USA
(303) 980-0540
www.golder.com

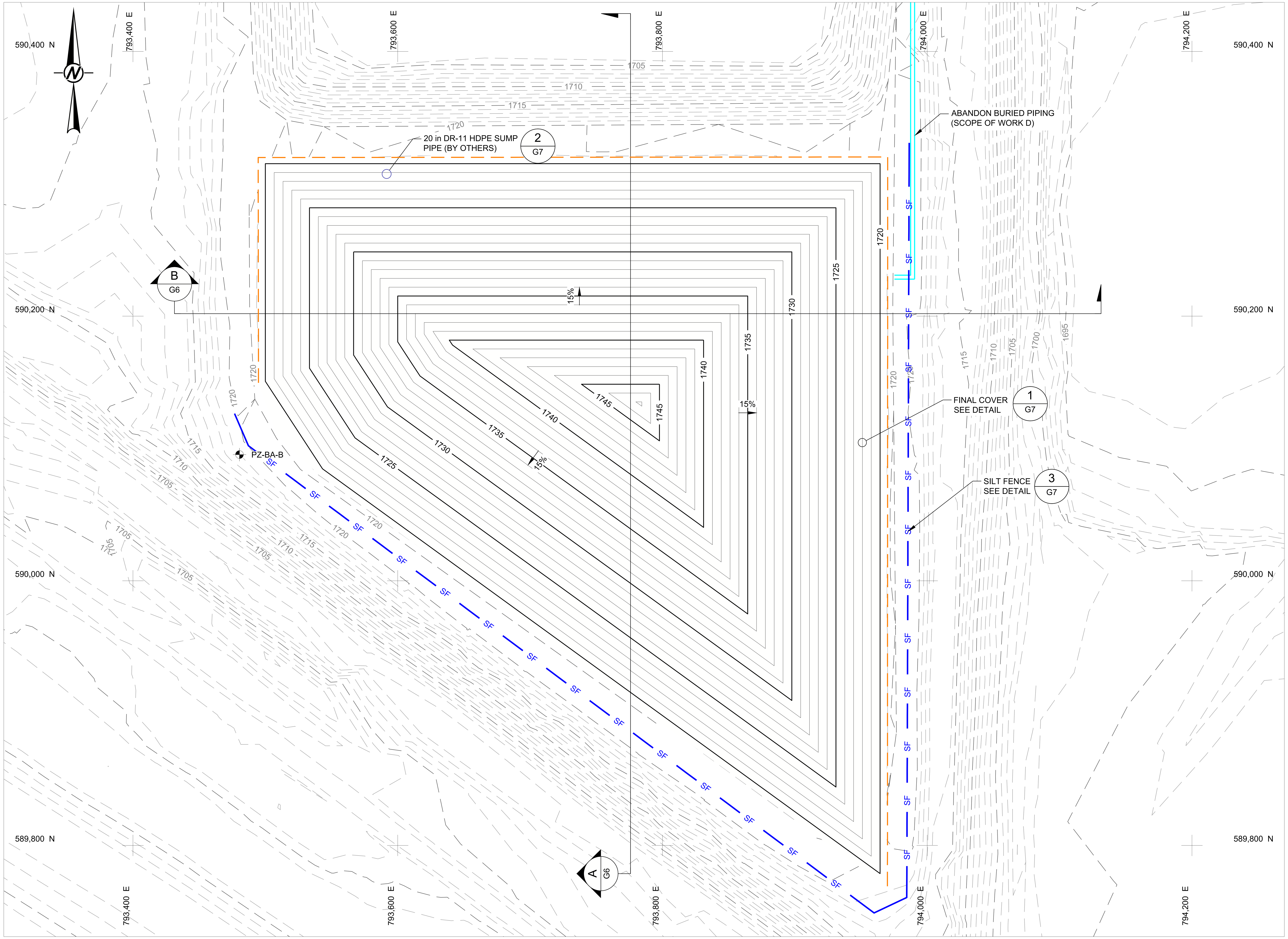
PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

TITLE
TOP OF WASTE

PROJECT NO. 1775717
REV. 0
G4 of G7
DRAWING G4

Path: \\Denver\acad\GREAT RIVER ENERGY\STANTON\99_PROJECTS\1775717\SITE RESTORATION_G - South Cell Closure\02_PRODUCTION\DWG\ | File Name: 18941940007.dwg | Last Edited By: bpurcell Date: 2019-07-16 Time:10:50:10 AM | Printed By: BPurcell Date: 2019-07-23 Time:12:26:00 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
1 in



LEGEND

- 3600 — EXISTING GROUND TOPOGRAPHY (REFERENCES 2 AND 3)
- 3600 — TOP OF FINAL COVER GRADES (NOTES 1 AND 2) (REFERENCE 3)
- APPROXIMATE TIE-IN LOCATION TO SCOPE OF WORK D NORTH, CENTER CELLS CLOSURE AND SCOPE OF WORK E BOTTOM ASH LANDFILL CLOSURE AND SCOPE OF WORK F SITE RESTORATION GRADING (NOTE 4)
- SF — SILT FENCE (AS REQUIRED) (NOTE 3)
- WATER PIPING (BURIED)
- 20 in DR-11 HDPE SUMP PIPE PENETRATION
- MW-10 — MONITORING WELLS/PIEZOMETERS (NOTE 5)

NOTE(S)

1. THE AREA RECEIVING FINAL COVER IS APPROXIMATE. ALL AREAS OF WASTE PLACEMENT SHALL RECEIVE FINAL COVER.
2. TOP OF FINAL COVER GRADES ARE APPROXIMATE AND THE FINAL SLOPES MAY VARY DEPENDING ON THE AMOUNT OF MATERIAL REQUIRED TO BE CONTAINED AS A PART OF THE STANTON STATION SITE RESTORATION CONSTRUCTION. ALL AREAS OF WASTE PLACEMENT WILL RECEIVE FINAL COVER. TOP OF FINAL COVER GRADES SHALL NOT BE LESS THAN 3% OR GREATER THAN 15% UNLESS OTHERWISE APPROVED BY THE OWNER'S REPRESENTATIVE.
3. CONTRACTOR SHALL FOLLOW BEST MANAGEMENT PRACTICES FOR INSTALLATION AND MAINTENANCE OF EROSION CONTROL MEASURES. ALL PERMANENT AND TEMPORARY EROSION CONTROL FEATURES ARE SUBJECT TO REVIEW FOR EFFECTIVENESS AND NECESSARY ADJUSTMENTS WILL BE MADE AS DIRECTED BY THE OWNER'S REPRESENTATIVE.
4. SOUTH CELL CLOSURE GRADING SHALL TIE INTO THE SCOPE OF WORK D, E AND F ALONG THE APPROXIMATE TIE-IN LINE INDICATED. SCOPE OF WORK D, E AND F GRADING IS NOT SHOWN FOR CLARITY.
5. CARE SHALL BE TAKEN WHEN WORKING NEAR EXISTING MONITORING WELLS/PIEZOMETERS. ANY DAMAGE TO MONITORING WELLS/PIEZOMETERS IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.

REFERENCE(S)

1. SITE LOCATION: T144N, R84W, MERCER COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY KBM, INC. ON APRIL 27, 2001 (SITE WIDE), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2014 (BOTTOM ASH IMPOUNDMENT AND LANDFILL AREA), A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2017 (COAL PILE AREA), AND A GROUND SURVEY PERFORMED BY INTERSTATE ENGINEERING IN 2018.
3. EXISTING GROUND TOPOGRAPHY AND TOP OF FINAL COVER CONTOUR INTERVAL IS ONE (1) FOOT.

0 40 80
1" = 40' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 7/19/19
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PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

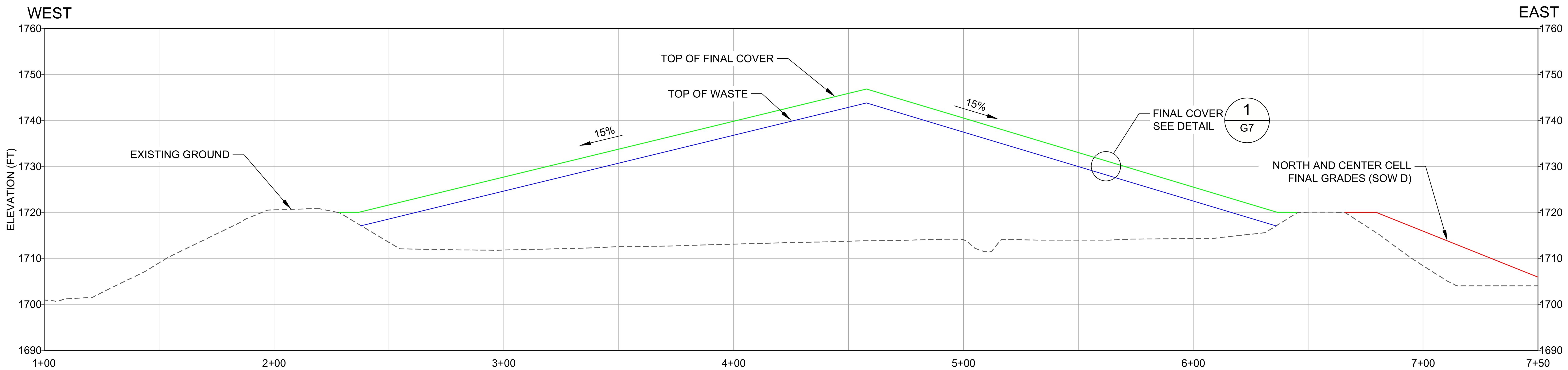
TITLE
TOP OF FINAL COVER

PROJECT NO. 1775717
REV. 0
G5 of G7
DRAWING G5

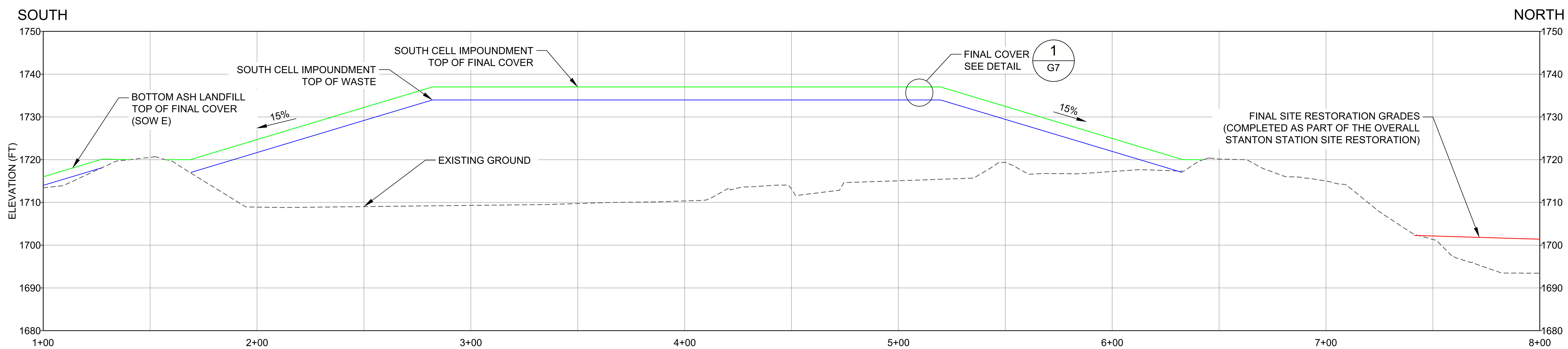
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

LEGEND

- - - - EXISTING GROUND TOPOGRAPHY
— TOP OF WASTE GRADES
— TOP OF FINAL COVER GRADES
— FINAL SITE RESTORATION GRADES



SCALE 1" = 30' A/G5 BOTTOM ASH IMPOUNDMENT CLOSURE SOUTH-NORTH SECTION
2X VERTICAL EXAGGERATION



SCALE 1" = 30' B/G5 BOTTOM ASH IMPOUNDMENT CLOSURE WEST-EAST SECTION
2X VERTICAL EXAGGERATION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

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PE-6144
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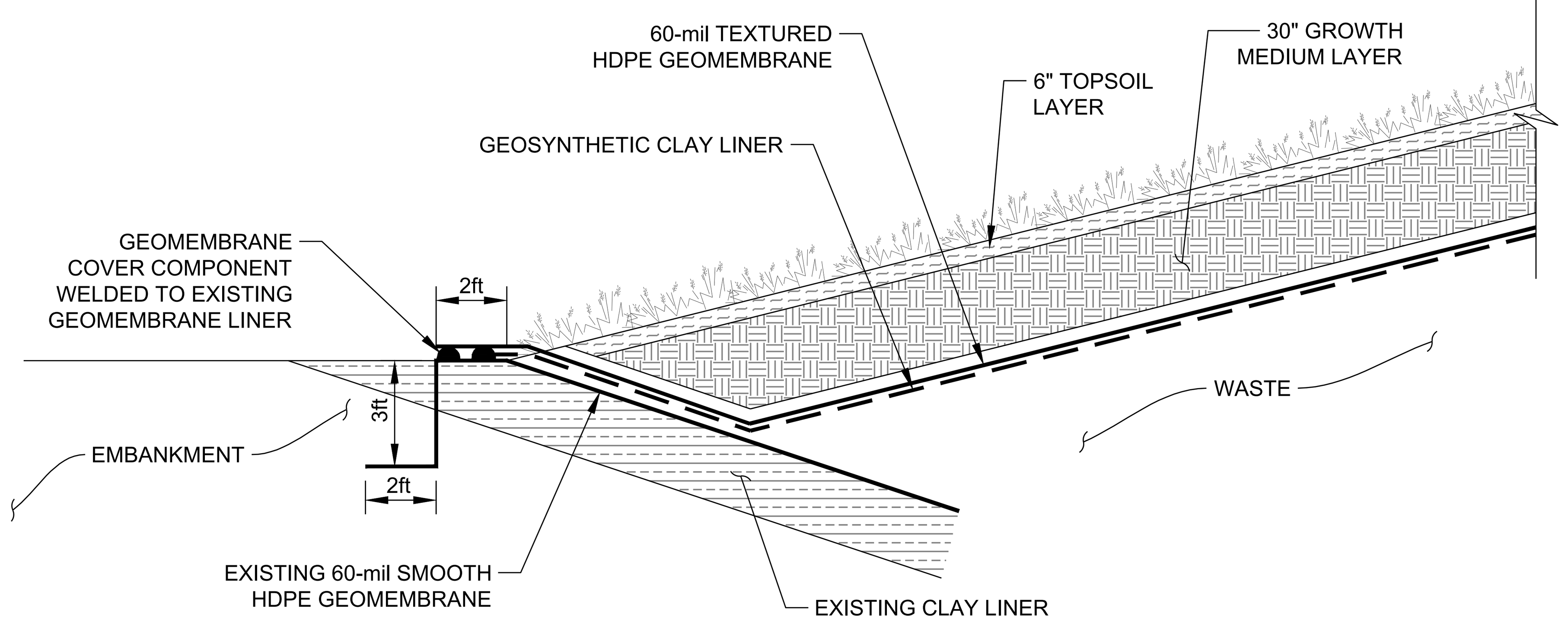
PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

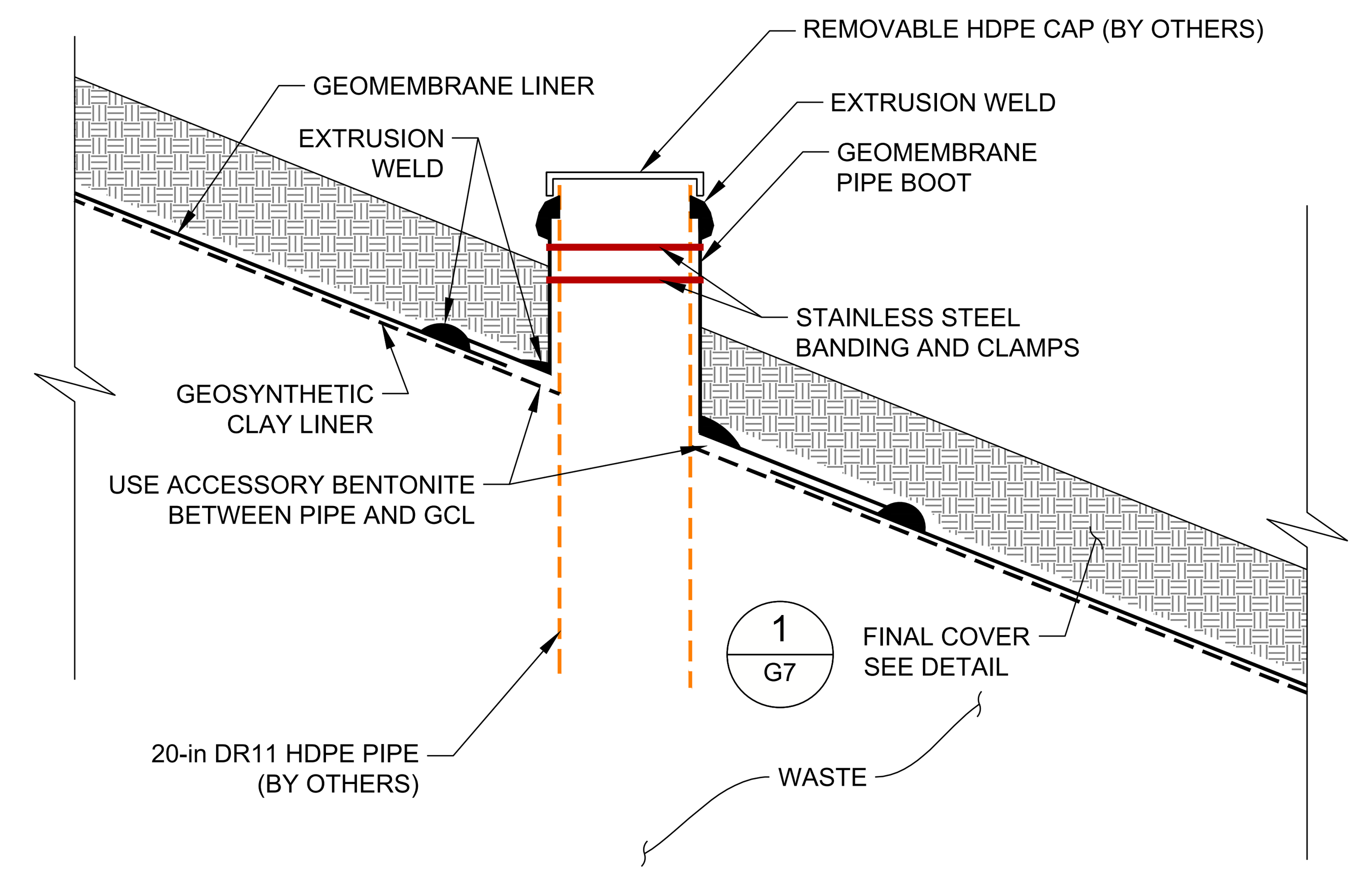
TITLE
SECTIONS

PROJECT NO. 1775717 | REV. 0 | G6 of G7 | DRAWING G6

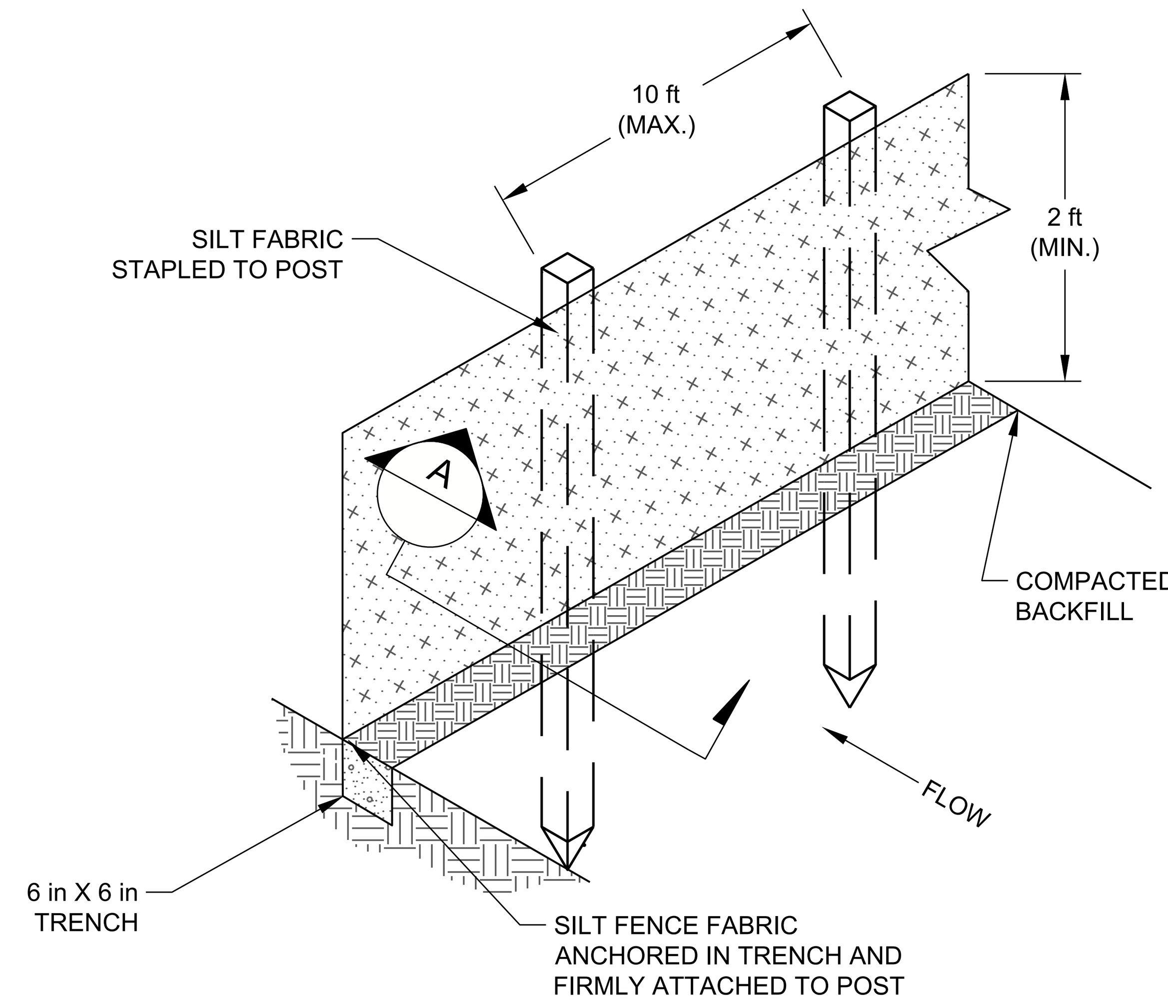
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

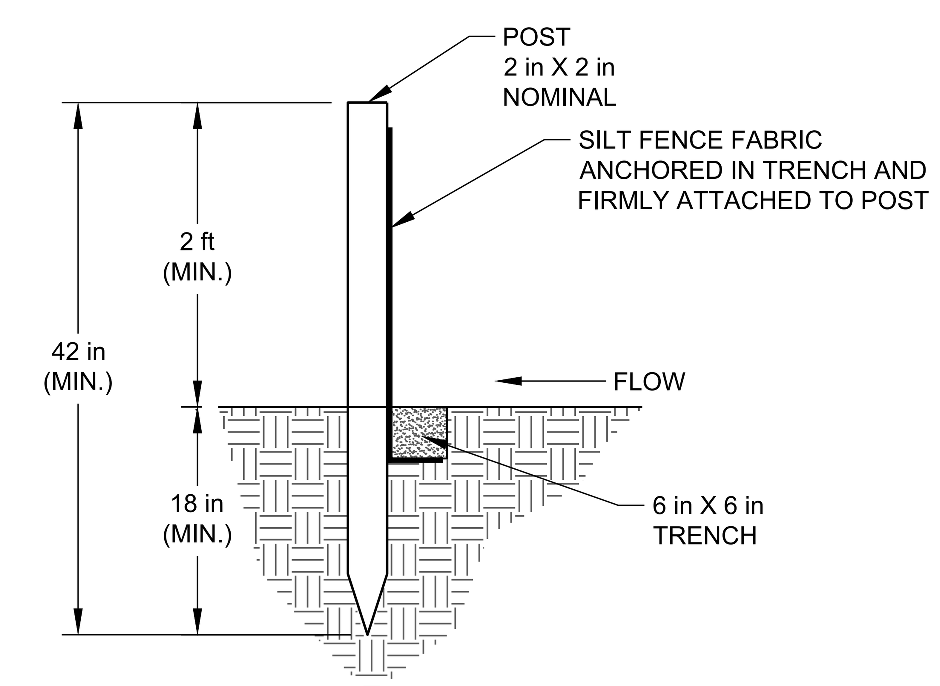


NTS 1 G7 SOUTH CELL COMPOSITE FINAL COVER



NTS 2 G7 SUMP PIPE PENETRATION DETAIL



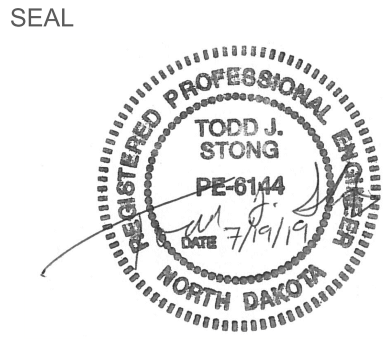


SECTION A

NTS 3 G7 SILT FENCE DETAIL

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2019-07-19	ISSUED FOR CONSTRUCTION	MRS	MRS	RFS	TJS

SEAL



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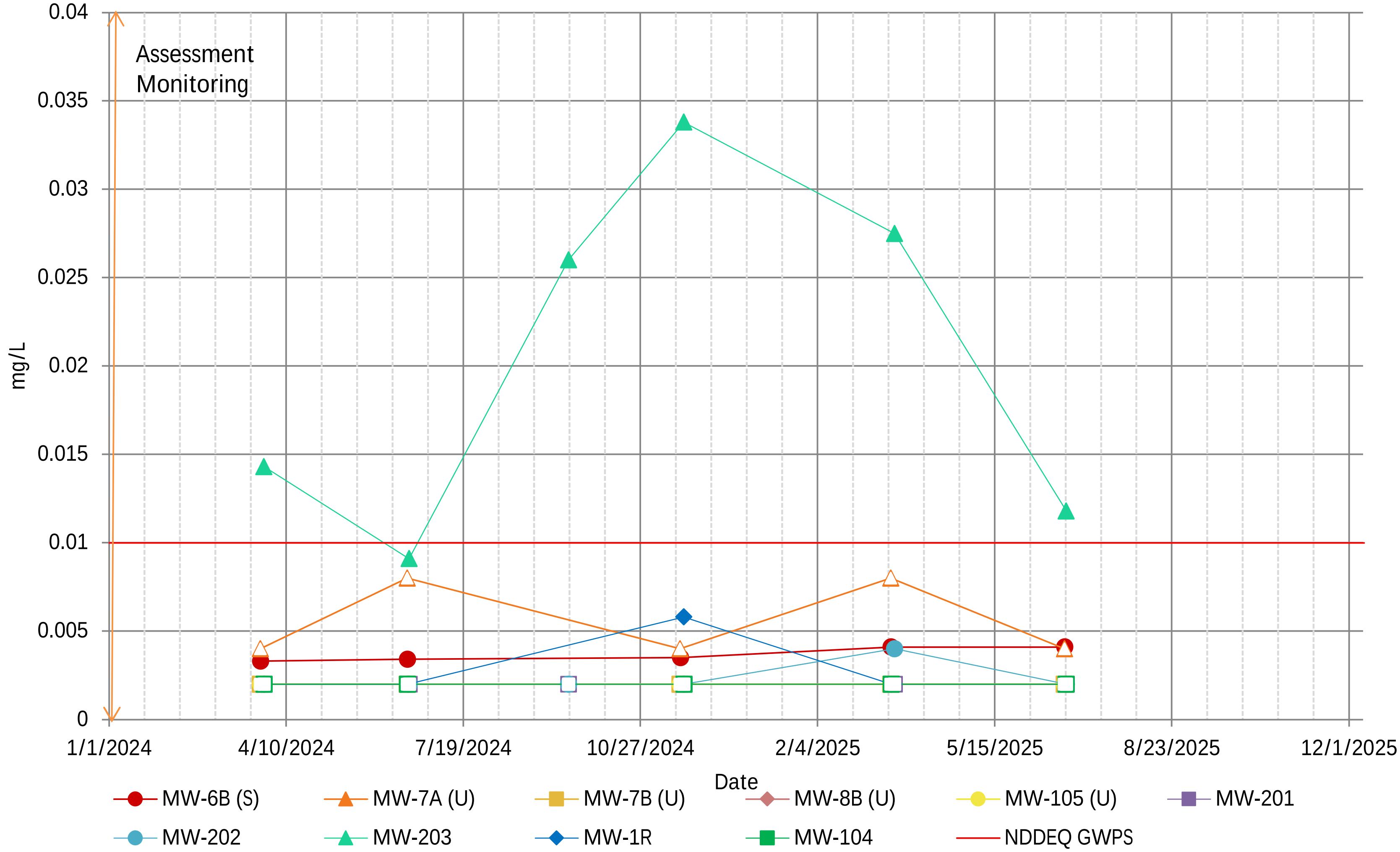
PROJECT
STANTON SITE RESTORATION
SOUTH CELL CLOSURE

TITLE
DETAILS

PROJECT NO. 1775717 | REV. 0 | G7 of G7 | DRAWING G7

APPENDIX B

Bottom Ash Impoundment Arsenic and Molybdenum Assessment Monitoring Data



Non-detects are shown as open symbols at the practical quantitation limit.

Figure BAI-ACM-1

Groundwater Arsenic Concentrations

Great River Energy

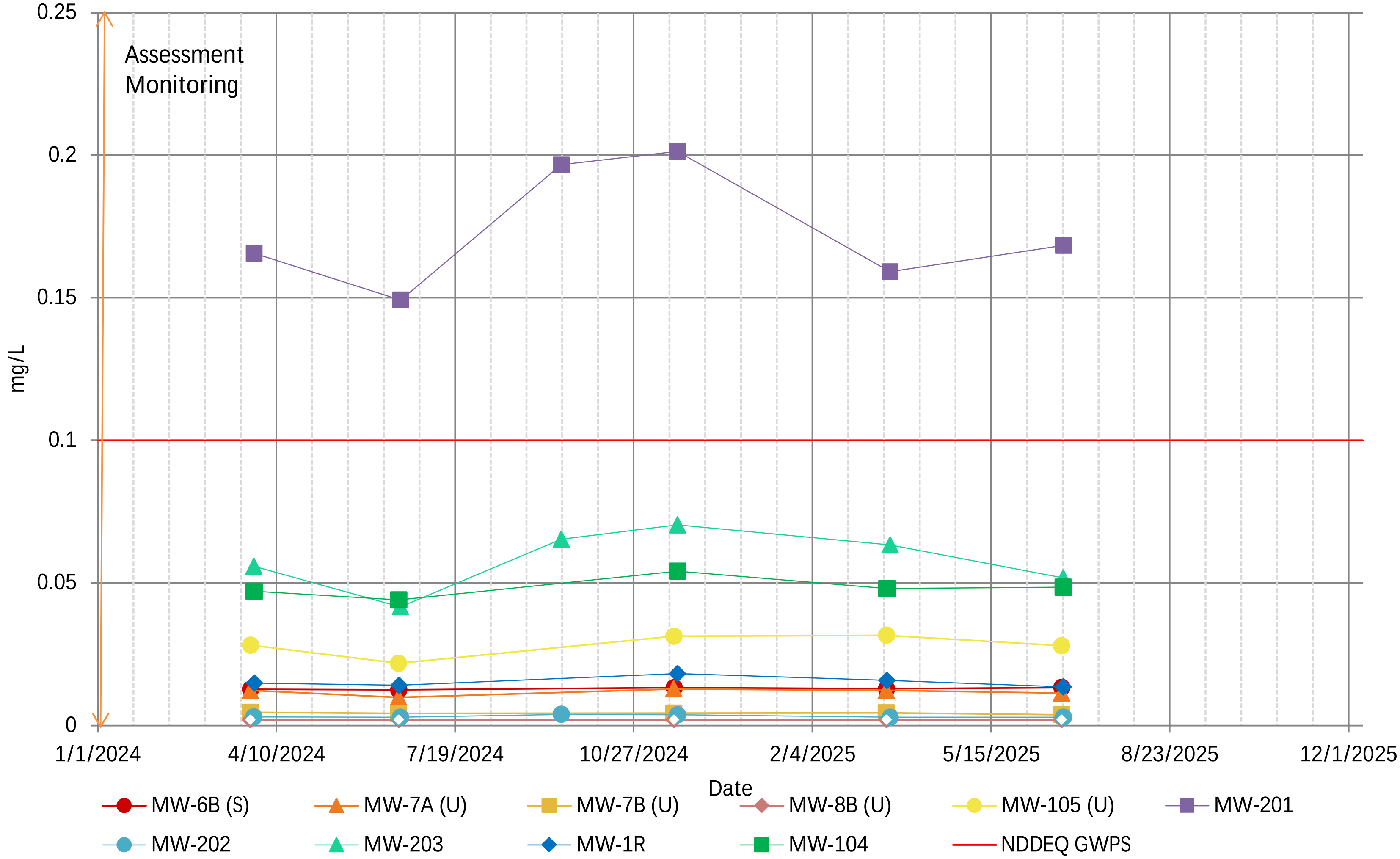
Stanton Station BAI Network

Denver, Colorado, USA

9/18/2025

GL21509219.000

WSP USA Inc.



Non-detects are shown as open symbols at the practical quantitation limit.

Figure BAI-ACM-2

Groundwater Molybdenum Concentrations

Great River Energy

Stanton Station BAI Network

Denver, Colorado, USA

9/18/2025

GL21509219.000

WSP USA Inc.

https://wsponlinenam.sharepoint.com/sites/GLD-170737/Project Files/5 Technical Work/2025- Stanton GW/Time Series/[TimeSeries - Stanton BAI Up + Extended Down App IV (

APPENDIX C

June 2025 Boring Logs and Well Completion Information

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-223

Location: See Exploration Plan

Latitude: 47.2828° Longitude: -101.3321°

Elevation.: 1702.53 (Ft.)

Depth (Ft.)	Material Description	Elevation (Ft.)	Installation Details	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.3	**TOPSOIL**, dark brown	1702.2	PVC Cap; Protective Casing; Cement								
	LEAN CLAY WITH SAND (CL), dark brown, stiff		Cement			X	18	3-5-5 N=10	15.0		
4.5		1698	Cuttings								
	POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, grayish tan, medium dense		PVC Riser	5		X	12	4-5-6 N=11	17.4		10
9.5		1693	Bentonite								
10.5	**FAT CLAY (CH)**, gray, medium stiff	1692	Silica Sand	10		X	1	1-1-4 N=5	46.2		
11.0	**POORLY GRADED SAND (SP)**, fine grained, tannish brown	1691.5			▽						
	LEAN CLAY (CL), trace sand, gray, stiff waterbearing at 12'		Prepack PVC Screen								
16.0		1686.5		15		X	18	2-3-8 N=11	29.7	43-11-32	95

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were provided by others.

Water Level Observations
▽ While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started
06-17-2025

Boring Completed
06-17-2025

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-224

Location: See Exploration Plan

Latitude: 47.2828° Longitude: -101.3309°

Depth (Ft.) Elevation.: 1701.37 (Ft.)

Depth (Ft.)	Material Description	Elevation (Ft.)	Installation Details	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.3	**TOPSOIL**, dark brown	1701	PVC Cap; Protective Casing; Cement							
4.5	**LEAN CLAY WITH SAND (CL)**, dark brown, stiff	1696.9	Cuttings		X	18	4-4-7 N=11	11.4		
10.5	**SANDY LEAN CLAY (CL)**, grayish tan, stiff	1690.9	PVC Riser; Bentonite; Silica Sand		X	16	3-5-5 N=10	23.6		
11.0	**SILTY SAND (SM)**, fine grained, brown, waterbearing	1690.4		▽	X	18	4-5-4 N=9	38.4	NP	48
15.0	**SANDY FAT CLAY (CH)**, light brown	1686.4	Prepack PVC Screen							
16.0	**CLAYEY SAND (SC)**, trace clay, fine grained, light brown, medium dense, waterbearing	1685.4			X	18	6-10-10 N=20	17.4		39

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were provided by others.

Water Level Observations
▽ While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started
06-17-2025

Boring Completed
06-17-2025

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-225

Location: See Exploration Plan

Latitude: 47.2832° Longitude: -101.3312°

Depth (Ft.) Elevation.: 1701.42 (Ft.)

Depth (Ft.)	Material Description	Elevation (Ft.)	Installation Details	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.3	**TOPSOIL**, dark brown	1701.2	PVC Cap; Protective Casing; Cement			X	18	2-5-7 N=12	17.0		
	LEAN CLAY WITH SAND (CL), dark brown, stiff		Cuttings; PVC Riser	5		X	18	4-5-7 N=12	19.6		
9.5		1691.9	Bentonite; Silica Sand								
	CLAYEY SAND (SC), fine grained, tan to gray, loose to medium dense			10		X	18	2-1-3 N=4	21.7		15
	waterbearing at 12'				▽						
16.0		1685.4	Prepack PVC Screen	15		X	18	8-10-14 N=24	15.8		

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were provided by others.

Notes

Water Level Observations
▽ While drilling

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Logged by
J. Hoeven

Boring Started
06-17-2025

Boring Completed
06-17-2025

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-226

Location: See Exploration Plan

Latitude: 47.2837° Longitude: -101.3302°

Depth (Ft.) Elevation.: 1699.52 (Ft.)

Installation Details: PVC Cap; Protective Casing; Cement; Cuttings; PVC Riser; Bentonite; Silica Sand; Prepack PVC Screen

Depth (Ft.)	Material Description	Elevation (Ft.)	Water Level Observations	Sample Depth (Ft.)	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.3	**TOPSOIL**, dark brown	1699.3							
	LEAN CLAY WITH SAND (CL), trace gravel, dark brown, very stiff to stiff			0	18	4-8-9 N=17	14.0		
				5	16	4-5-5 N=10	12.3		
10.0		1689.5	▽	10	7	3-4-7 N=11	18.6		
	POORLY GRADED SAND (SP), fine grained, brown, medium dense to very loose, waterbearing								
16.0	1" seam of coal at 15.75'	1683.5		15	12	0-0-3 N=3	16.6		3

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were provided by others.

Water Level Observations
▽ While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started
06-17-2025

Boring Completed
06-17-2025

1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-227

Location: See Exploration Plan

Latitude: 47.2822° Longitude: -101.3299°

Depth (Ft.) Elevation.: 1701.1 (Ft.)

Depth (Ft.)	Material Description	Elevation (Ft.)	Installation Details	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1.0	**TOPSOIL**, brown	1700.1	PVC Cap; Protective Casing; Cement			14	3-7-8 N=15	12.7		
	SANDY LEAN CLAY (CL), brown to dark gray, very stiff to stiff, coal inclusions		Cuttings; PVC Riser			12	5-9-11 N=20	12.7		51
10.8		1690.4	Bentonite; Silica Sand	While drilling (approx. 9.5 ft)		7	2-4-8 N=12	25.4	42-24-18	67
16.0	**CLAYEY SAND (SC)**, fine grained, tan, medium dense, waterbearing	1685.1	Prepack PVC Screen			11	4-8-10 N=18	26.7		

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were provided by others.

Water Level Observations
While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started

Boring Completed

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-228

Location: See Exploration Plan

Latitude: 47.2814° Longitude: -101.3301°

Elevation.: 1703.25 (Ft.)

Depth (Ft.)	Material Description	Elevation	Installation Details	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1.0	**TOPSOIL**, dark brown	1702.3	PVC Cap; Protective Casing; Cement; PVC Riser				15	3-8-9 N=17	9.0		
5.5	**CLAYEY SAND (SC)**, fine grained, dark brown, medium dense to very loose	1697.8	Bentonite; Silica Sand	5	▽		11	3-2-1 N=3	18.6		24
10.0	**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, tan, very loose, waterbearing	1693.3	Prepack PVC Screen	10			13	2-2-5 N=7	27.5	49-15-34	45
11.0	**SANDY LEAN CLAY (CL)**, tan, medium stiff	1692.3									

Boring Terminated at 11 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were provided by others.

Water Level Observations
▽ While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-9½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started

Boring Completed

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-229

Location: See Exploration Plan

Latitude: 47.2816° Longitude: -101.3287°

Elevation.: 1702.54 (Ft.)

Depth (Ft.)	Material Description	Elevation (Ft.)	Installation Details	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
			PVC Cap; Protective Casing							
1.0	**TOPSOIL**, dark brown	1701.5	Cement		X	12	3-7-5 N=12	10.0		
4.5	**CLAYEY SAND (SC)**, fine grained, dark brown, medium dense	1698	Cuttings							
9.5	**POORLY GRADED SAND (SP)**, fine grained, tan, medium dense	1693	PVC Riser; Bentonite; Silica Sand	▽ (~9.5)	X	11	7-7-8 N=15	11.0		
12.8	**FAT CLAY WITH SAND (CH)**, grayish tan, medium stiff	1689.8			X	15	1-2-3 N=5	29.8	97-17-80	84
13.0	**TOPSOIL**	1689.5								
16.0	**FAT CLAY (CH)**, trace sand, dark gray, stiff	1686.5	Prepack PVC Screen		X	15	2-5-7 N=12	24.9		

Boring Terminated at 16 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were provided by others.

Notes

Water Level Observations
▽ While drilling

Advancement Method
3¼" HSA, 0-14½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Logged by
J. Hoeven

Boring Started

Boring Completed

Terracon
1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-230

Location: See Exploration Plan

Latitude: 47.2828° Longitude: -101.3315°

Depth (Ft.) Elevation.: 1701.63 (Ft.)

Installation Details: PVC Cap; Protective Casing; Cement; Cuttings; PVC Riser; Bentonite; Silica Sand; Prepack PVC Screen; Collapse

Depth (Ft.)	Material Description	Elevation (Ft.)
0.3	**TOPSOIL**, dark brown	1701.3
5.5	**FAT CLAY WITH SAND (CH)**, brown, stiff to medium stiff	1696.1
19.5	**CLAYEY SAND (SC)**, fine to medium grained, brown and gray, medium dense; waterbearing at 15'	1682.1
24.5	**POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)**, fine grained, dark gray, medium dense, waterbearing	1677.1
30.9	**WELL GRADED GRAVEL WITH SAND (GW)**, fine to coarse grained, gray and brown, medium dense, waterbearing	1670.7
39.5	**SANDY SILT (ML)**, gray, hard, waterbearing	1662.1
41.0	**LEAN CLAY (CL)**, trace silt, gray, hard	1660.6

Auger Refusal at 41 Feet

Depth (Ft.)	Water Level Observations	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0-1.5		18	3-6-9 N=15	17.9		
5		2	3-2-3 N=5	18.3		
10		18	3-4-8 N=12	26.6		
15	▽	18	3-9-9 N=18	19.7		39
20		18	5-12-14 N=26	19.9		11
25		18	5-10-12 N=22	6.7		3
30		10	5-8-12 N=20	18.5		
35		18	14-19-19 N=38	21.6		70
40		9	20-50/3"	15.2	29-18-11	99

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were provided by others.

Water Level Observations
▽ While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-39½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started

Boring Completed

GRE-Stanton & GHM 2023-2025
HWY 200 | Stanton, ND
Terracon Project No. M2255048

1502 Grumman Ln, Ste 4
Bismarck, ND

Boring Log No. MW-PB1R

Location: See Exploration Plan

Latitude: 47.2868° Longitude: -101.3289°

Depth (Ft.) Elevation.: 1695.68 (Ft.)

Installation Details: PVC Cap; Protective Casing; Cement; Cuttings; PVC Riser; Bentonite; Silica Sand; Prepack PVC Screen

Depth (Ft.)	Material Description	Elevation (Ft.)
0.3	**TOPSOIL**, dark brown	1695.3
4.5	**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, tan, medium dense	1691.2
19.5	**CLAYEY SAND (SC)**, fine grained, tan to gray, medium dense to very loose; waterbearing at 14½'	1676.2
24.5	**LEAN CLAY (CL)**, brownish gray, medium stiff	1671.2
34.5	**CLAYEY SAND (SC)**, fine grained, grayish brown, very loose to loose, waterbearing	1661.2
36.0	**CLAYEY SAND (SC)**, fine to medium grained, grayish blue, medium dense, waterbearing	1659.7

Boring Terminated at 36 Feet

Depth (Ft.)	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0-1.5	8	3-5-5 N=10	12.8		
5	8	5-5-6 N=11	11.2		
10	10	2-2-3 N=5	11.3		
15	18	1-2-1 N=3	24.2		
20	18	2-2-3 N=5	31.3	44-15-29	98
25	14	1-1-1 N=2	27.0		
30	12	2-2-2 N=4	25.3		48
35	18	8-11-13 N=24	25.1		23

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were provided by others.

Water Level Observations
While drilling

Drill Rig
DR #1174

Hammer Type
Automatic

Driller
J. Okeefe

Notes

Advancement Method
3¼" HSA, 0-34½'

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
J. Hoeven

Boring Started

Boring Completed

BORING LOG NO. MW-PB1

PROJECT: GRE Stanton Monitoring Well Installation

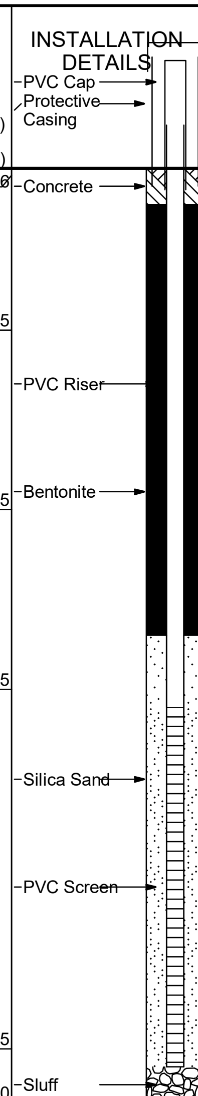
CLIENT: Golder Associates Inc Lakewood, CO

SITE: 4001 Highway 200A Stanton, ND

LOCATION See Exploration Plan

Latitude: 47.2866° Longitude: -101.3289°

Surface Elev.: 1696 (Ft.)



DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS
0.2	**TOPSOIL**, brown	1696			3-4-5 N=9
4.5	**LEAN CLAY (CL)**, brown, medium stiff	1691.5	5		2-2-2 N=4
9.5	**SANDY LEAN CLAY (CL)**, light brown, soft	1686.5	10		2-2-2 N=4
14.5	**CLAYEY SAND**, light brown, loose	1681.5	15	▽	1-2-1 N=3
24.5	**SILT WITH SAND**, gray, very loose, fine-grained, waterbearing at 15½'	1671.5	20		0-1-2 N=3
26.0	**SILTY SAND**, gray, very loose, fine to medium-grained, waterbearing, fat clay seams	1670	25		0-1-1 N=2

Boring Terminated at 26 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3¼" Inside Diameter, Hollow Stem Auger 0-24½

Abandonment Method:
Boring converted to monitoring well installation

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While sampling*

Terracon

1805 Hancock Dr PO Box 2084
Bismarck, ND

Boring Started: 08-11-2020	Boring Completed: 08-11-2020
Drill Rig: B-57	Driller: Mike R.
Project No.: M2205068	

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