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Post-Construction Report/Corrective Measures Implementation Report/Remedial Action Completion Report for the Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)

SEMS Number: 71

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DISCLAIMER

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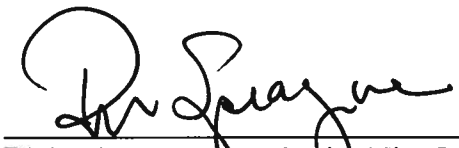
and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina

CERTIFICATION

PCR/CMIR/RACR for the WADB in Support of Steel Creek IOU (U)
SRNS-RP-2024-00015, Revision 1, June 2024

[REF: 40CFR270.11 (d)(1)]

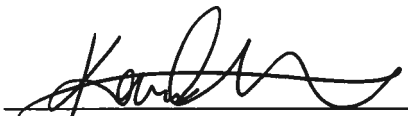
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."



8/22/24

Richard M. Sprague, Senior Vice President
Environment, Safety, Health, and Quality (ESH&Q)
for Savannah River Nuclear Solutions, LLC
as the Co-Operator with the U.S. Department of Energy
Savannah River Operations Office

Date Signed



8/27/24

Karen D. Morrow, Director
Remediation and Deactivation &
Decommissioning Division
U.S. Department of Energy
Savannah River Operations Office
Owner and Co-Operator

Date Signed

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LIST OF ABBREVIATIONS AND ACRONYMS

~	approximate, approximately
>, ≥	greater than, greater than or equal to
<, ≤	less than, less than or equal to
ac	Acres
BMP	Best Management Practices
CMI	Corrective Measures Implementation
CMIR	Corrective Measures Implementation Report
CMS	Corrective Measures Study
ESD	Explanation of Significant Differences
FFA	Federal Facility Agreement
ft	feet/foot
FS	Feasibility Study
ha	Hectares
IOU	Integrator Operable Unit
LUC	Land Use Controls
LUCIP	Land Use Control Implementation Plan
m	Meters
m^3	cubic meters
NARA	North Ash Remediation Area
PAB	P-Area Ash Basin
pCi/g	picocuries per gram
PCR	Post-Construction Report
RA	Remedial Action
RACR	Remedial Action Completion Report
RAIP	Remedial Action Implementation Plan
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
SARA	South Ash Remediation Area
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
WADB	Wetland Area at Dunbarton Bay
yd^3	cubic yards

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1.0 GENERAL DESCRIPTION

1.1 Purpose and Scope

This Post-Construction Report/Corrective Measures Implementation Report/Remedial Action Completion Report (PCR/CMIR/RACR) documents the completion of construction activities and field implementation of the remedial action (RA) in support of the closure of the Wetland Area at Dunbarton Bay (WADB) in Support of Steel Creek Integrator Operable Unit (IOU). It provides verification that the remedial action objectives (RAOs) established in the *Record of Decision Remedial Alternative Selection for the Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)* (Savannah River Nuclear Solutions [SRNS] 2018a) (ROD) and the *Explanation of Significant Difference for the Revision 1 Record of Decision Remedial Alternative Selection for the Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)* (SRNS 2023a) (ESD) have been met for the closure of the WADB in Support of Steel Creek IOU (here after referred to as WADB). A summary of the activities performed to implement the RA requirements in accordance with the ROD, the ESD, and the *Corrective Measures Implementation/Remedial Action Implementation Plan for the Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)* (SRNS 2018b) (CMI/RAIP) is included.

The RA selected in the ROD for the WADB was excavation of ash and contaminated soil media and implementation of land use controls (LUCs). The RA selected in the ESD expands the LUC boundary for the WADB. The PCR (for the expanded LUC boundary) and the CMIR/RACR are combined into a single report because construction activities are complete and only the LUC portion of the remedy for the entire WADB remains.

The initial design for the implementation of the remedy selected in the ROD consisted of two distinct areas of ash excavation: the North Ash Remediation Area (NARA) and the South Ash Remediation Area (SARA) (Figure 1). As documented in the *Post-Construction Report for the Wetland Area at Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)* (2020), excavation of ash in the NARA was completed, but

unexpected conditions during remedy implementation prevented completion of the RA in the SARA. An ESD (SRNS 2023a) to the Revision 1 ROD was issued in 2023 that allowed for the expansion of LUCs in lieu of excavation of the remaining ash in the SARA.

This PCR/CMIR/RACR specifically addresses RA implementation of LUCs for the remaining portions of the SARA and the RA completion for the entire WADB (i.e., NARA and SARA). The RAOs for the WADB have been met, and no further response is needed to protect human health and the environment.

This PCR/CMIR/RACR was completed after final inspection of construction and a determination that the RA was complete. A field visit by the United States Environmental Protection Agency (USEPA) Region 4 and South Carolina Department of Health and Environmental Control (SCDHEC) was conducted in February 2024. This PCR/CMIR/RACR is submitted to USEPA and SCDHEC for approval in accordance with Federal Facility Agreement (FFA) (FFA 1993) requirements.

Items that are addressed in the PCR/CMIR/RACR include the following:

- A brief description of the WADB background including RA requirements and objectives from the ROD and ESD;
- A chronology of completed events related to remediation of the WADB;
- A summary of construction activities performed;
- Deviations from the original design per the approved CMI/RAIP;
- Performance standards and quality control inspections, including a summary of performance test results documenting verification of compliance with the acceptance criteria in the CMI/RAIP;
- Final inspection and verification of WADB closure;
- As-Built drawings;
- LUCs; and
- Project costs.

1.2 Operable Unit Background

Similar to other reactor areas at SRS, P Area utilized a coal-fired powerhouse to generate steam and electricity with coal ash (coal combustion products) produced as a waste of boiler operations. In P Area, this ash was mixed with water and transferred to P-Area Ash Basin (PAB) via a sluice line. During the years of 1973 to 1974, significant amounts of ash within the PAB were removed and placed around the perimeter of the PAB and to the north along the access road that resulted in downgradient migration of ash. An additional contributor, an outfall north of the PAB (Outfall P-007) received releases of contaminants (cesium-137) from process line discharges that originated from the P-Area Disassembly Basin.

In 2010, the area of ash overflow was discovered during the removal activities at the PAB beginning at the southern edge of the PAB and extending into a downgradient Carolina Bay called Dunbarton Bay. Since this area was outside the scope of the remedial action for the PAB, the ash overflow area in Dunbarton Bay was administratively assigned as a subunit of the Steel Creek IOU in the SRS FFA and identified as the WADB. The WADB is listed as a Resource Conservation Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act Unit in Appendix C of the FFA for SRS.

1.2.1 General Description and Location

The WADB is located southeast of the PAB within the Steel Creek IOU boundary near the headwaters of Meyers Branch (see Figure 1). WADB (Figure 2) is subdivided into the following sections:

- NARA includes a ~2.5 hectares (ha) (6.1 acres [ac]) of ash remediation plus an additional 1.9 ha (4.7 ac) that were used for stormwater conveyance, temporary stockpiles, and erosion and sediment control measures. (Figure 3)

- SARA was subdivided into four zones. Zone 1, the southernmost zone, includes ~0.4-ha (1-ac) of ash remediation and is adjacent to a 30-meter (m) (100-foot[ft])

buffer area that was established to protect the wetlands associated with Dunbarton Bay. Zones 2 through 4 include 1.6 ha (4 ac) with no ash remediation and an additional ash area (0.4 ha [~1 ac]) (Figure 4). The original boundaries of the area subject to LUCs were expanded to include SARA. The volume of ash remaining outside of the wetlands and buffer area is estimated to be 16,820 cubic meters (m^3) (22,000 cubic yards [yd^3]).

1.2.2 Nature and Extent of Contamination

Data collected in accordance with a Sampling and Analysis Plan (SRNS 2011) was used to support a human health risk assessment, a principal threat source material evaluation, an ecological risk assessment, and contaminant migration/ groundwater quality evaluations. The Focused Corrective Measures Study/Feasibility Study (CMS/FS) Report (SRNS 2013) was developed to evaluate remedial alternatives for hazardous substances existing at the WADB.

The ROD identified the primary source of contamination at the WADB is coal ash from the PAB and runoff from Outfall P-007. Arsenic, cesium-137(+D), potassium-40, radium- 226(+D), and uranium-238(+D) were identified as human health refined contaminants of concern (RCOCs).

1.3 Remedial Action Requirements and Objectives

1.3.1 Remedial Action Objectives

As stated in the ROD (SRNS 2018a), the RAO for the WADB is as follows:

- Prevent the IOU onsite worker from exposure to RCOCs in surface ash/soil exceeding 1.0E-06 risk or exceeding SRS background concentrations.

1.3.2 Selected Remedial Action

As stated in the ROD (SRNS 2018a), the selected RA for the WADB is excavating 17,332 m^3 (22,670 yd^3) of ash and contaminated soil from the boundary of the PAB to the edge of the 30-m (100-ft) buffer at Dunbarton Bay (Table 3a) and transporting the waste to an

approved ex situ containment facility located off-SRS property (Table 3b). The 30-m (100-ft) buffer (Figure 5) was established to protect Dunbarton Bay's sensitive ecosystem from damage caused by excavation and construction activity.

Additionally, the original selected remedy includes LUCs for 10 ha (25 ac) (i.e., Dunbarton Bay and buffer area), since some materials would remain in place at the WADB. The ESD, issued in 2023, expanded the original LUC boundary to 15.4 ha (38 ac) for contaminated media that would remain in place at the WADB in the SARA and the additional ash discovered outside of the boundary of the SARA (SRNS 2023a) (Figure 1).

LUCs for the WADB will remain in effect until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure and include the following:

- Warning and limited access signs (Figure 6) at the subunit boundaries to prevent unrestricted use and access to areas where ash and contaminated soil are present (Dunbarton Bay and buffer area).

- Notifying USEPA and SCDHEC in advance of any major changes in land use that would necessitate re-evaluation of the remedy or excavation of waste.

- Institutional controls (i.e., administrative controls) and use restrictions for onsite workers via the Site Use/Site Clearance Program. Other administrative controls to ensure worker safety include work controls, worker training, and worker briefing of health and safety requirements.

- SRS access controls against trespassers as described in the 2013 RCRA Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.

This remedy was selected because it meets the RAO, provides overall protection of human health and the environment, complies with Applicable or Relevant and Appropriate

Requirements, and is cost-effective. The remedy provides a high level of long-term protection to the radioactive and hazardous constituents that remain in place.

1.4 Chronology of Events

A tabular summary of major milestones related to the RA for the WADB is provided in Table 1.

Construction activities associated with the NARA and Zone 1 of the SARA were completed in November 2019. After demobilization, SRNS performed a final acceptance inspection to ensure completion of scope.

A Land Use Control Implementation Plan (LUCIP) (SRNS 2018c) was approved in 2018 for the installation of warning signs at ingress points to the Dunbarton Bay and buffer area. The warning signs were installed following completion of construction activities in the NARA and Zone 1 of SARA. In accordance with the LUCIP, a survey plat of the LUC boundary was prepared and included in the PCR (SRNS 2020).

During the excavation activities in Zone 1 of the SARA, unexpected site conditions were encountered that delayed completion of the remaining zones in the SARA. As a result of the additional ash discovery and water-saturated soil conditions encountered during remedial activities which hampered excavation in the SARA, the original boundaries of the area subject to LUCs were expanded as described in the ESD to the ROD (SRNS 2023a) to include the SARA (1.6 ha [4 ac]) and the additional ash area (0.4 ha [~1 ac]) (Figure 1).

The ESD to expand the LUC boundary was issued to the public in August 2023. In October 2023, RA implementation began when SRS site forces repositioned the warning signs and surveyed the expanded LUC boundaries. An Addendum to the Revision 1 LUCIP was approved on July 31, 2023, that documents the expanded LUC boundary.

2.0 CONSTRUCTION ACTIVITIES

A PCR (SRNS 2020) was approved in 2020 that specifically addressed construction activities in the NARA and Zone 1 of the SARA. These construction activities previously

reported in the 2020 PCR are included by reference in this report. This section of the PCR/CMIR/RACR discusses further implementation of the RA to support the expanded LUC boundary as discussed in the ESD.

2.1 Construction Team

SRNS provided project management, oversight, stormwater inspections, confirmation sampling, worker protection, and regulatory integration during implementation of the RA construction activities in the NARA and Zone 1 of the SARA. During the construction phase of the project, SRNS Design Engineering provided Title 3 (Construction) support. The prime contractor was a partnership between Terraner PMC, LLC and Envirocon, Inc. Refer to the PCR (SRNS 2020) for complete details.

Six (6) access control warning signs were installed and reported in the 2020 PCR. The ESD expanded the LUC boundary requiring repositioning of the signage. The activity to reposition the three signs and to perform a new survey to include the expanded LUC boundary was implemented by SRS site forces.

2.2 Equipment

Refer to Table 2 and the PCR (SRNS 2020) for a summary of the general equipment types used during construction.

2.3 Remedial Action Implementation

Refer to the PCR (SRNS 2020) for a summary of construction activities performed during the RA implementation in the NARA and Zone 1 of the SARA.

Three of the six access control warning signs installed as described in the PCR (SRNS 2020) were repositioned as shown in Figure 7 to support the expanded LUC boundary. Because much of the area subject to LUCs is within a wetland that is not readily accessible, warning signs were repositioned along access roads near the LUC area. The LUC boundary map is shown in Appendix B.

3.0 DEVIATIONS FROM ORIGINAL DESIGN

Several design and construction changes were needed throughout the project to resolve construction problems. The project team reviewed all changes prior to implementation to ensure compliance with regulatory requirements in the ROD and the CMI/RAIP. Consistent with the CMI/RAIP, notifications were made to USEPA and SCDHEC as appropriate. Table 4 provides a summary of changes and includes the basis and resolution of deviations from the original design.

The most significant change from the original design was the expansion of the LUC boundary to include Zones 2 through 4 of the SARA. This design change was made in collaboration with USEPA and SCDHEC after discovery of the presence of shallow perched water in the SARA and the discovery of additional ash outside of the limits of ash boundary in the SARA at greater depths within Zone 1. The perched water and saturated conditions significantly hampered heavy equipment operation due to unstable soils, resulted in the requirement to aerate the ash (additional handling) to reduce the moisture content within the limits allowed by Three Rivers Landfill, and increased disposal cost due to the weight of the wet ash. Additional ash was identified within and outside the limits of disturbance on the west side of the SARA. Upon discovery of additional ash outside of the limits of disturbance, an initial investigation was conducted, and the area of additional ash was estimated to be ~0.4 ha (1 ac). Ash was found at depths varying from 0.5- to 1.2-m (1.5- to 4-ft) deep in this area outside the limits of disturbance. Additional ash found outside of the limits of ash, but within the limits of disturbance, was excavated in Zone 1 and within the SARA access corridors. Ash was found to extend 0.9-m (3-ft) deep in locations with Zone 1 in areas that were initially estimated to be between 0.3- to 0.6-m (1- to 2-ft) deep.

Disposal agreements with Three Rivers Landfill limited the amount of ash that could be disposed of to 30,580 m^3 (40,000 yd^3). The presence of additional ash within Zone 1 and outside of the limits of disturbance jeopardized the ability to find a disposal facility for the increased volume of remaining ash that was likely in Zones 2 through 4 of the SARA. A meeting was held with U.S. Department of Energy (USDOE), USEPA and SCDHEC on

June 18, 2019, to discuss the change in conditions. Due to the additional ash discovered, saturated conditions, and disposal volume limits established by Three Rivers Landfill, the USDOE, USEPA, and SCDHEC agreed to suspend further excavation of the remaining SARA until an ESD to the ROD was approved to expand the original boundaries of the area subject to LUCs to include the Zones 1 through 4 of the SARA and the additional ash area. The final LUC boundary includes the area depicted in the as-built survey for the Dunbarton Bay and buffer area as presented in the PCR (SRNS 2020), the SARA, and the additional ash area for a total area of 15.4 ha 38 (ac) within the boundary.

4.0 VERIFICATION SAMPLING, TESTING AND ANALYSIS, PERFORMANCE STANDARDS, AND CONSTRUCTION QUALITY CONTROL

To ensure the performance requirements and standards were achieved, project team personnel comprised of SRNS Engineering, Project Management, Safety, Subcontract Technical Representatives, Quality Assurance, and Design Engineering performed routine monitoring/surveillance activities. A Quality Assurance Project Plan was submitted by the subcontractor and reviewed and approved by SRNS Quality Assurance personnel. SRNS Engineering performed routine field oversight, verification of confirmation sampling results, sampling data management, and evaluation and acceptance of the analytical results.

4.1 Performance Requirements/Standards

SRNS Design Engineering provided Title III Construction Support, which included the following activities:

- Review of all requests for information by the subcontractor when conditions arose in the field that did not match the original condition as described on the design documents, and clarification of the path forward in response to the identified conditions;
- Review of all vendor submittals for conformance with the design requirements in the CMI/RAIP (SRNS 2018b) and drawings;
- Inspection of the subcontractor’s workmanship, materials, and equipment;

- Weekly (minimum frequency) inspection of field conditions to ensure that erosion prevention and sediment control features were functioning properly and to identify if maintenance of existing best management practices (BMPs) was required or if additional BMPs were necessary to ensure pollutants were not entering or leaving the established stormwater conveyance system or along the construction site's borders; and
- Verification of as-built record drawings.

4.2 Construction and Quality Control

Confirmation sampling was performed in accordance with the approved field sampling plan (FSP) (SRNS 2018d). Once favorable results were confirmed, the excavation areas were graded and stabilized. Confirmation sampling results are provided in PCR Appendix A (SRNS 2020).

5.0 VERIFICATION OF CONSTRUCTION COMPLETION AND FINAL INSPECTION

(1) As detailed in Section 4.0, the construction activities required for the RA have met the acceptance criteria established in the approved CMI/RAIP, but with allowances for deviations outlined in Section 3.0.

(2) As detailed in Section 5.1, the RA is verified as complete, and construction and testing was in accordance with the ROD RAO. Section 5.1's verification is typically based upon the result of performance tests and quality control inspections provided in the verification in Section 4.0.

(3) As outlined in Section 5.2, the final walkdown inspection with participation of USEPA and SCDHEC (as applicable) has been performed and issues have been closed out.

5.1 Verification of Remedial Action Completion

Per Section 4.0, construction activities required for the RA have met the acceptance criteria established in the CMI/RAIP (SRNS 2018b), the FSP (SRNS 2018d), and the ESD (SRNS

2023a). The confirmation sample results were formally evaluated in Appendix A of the PCR.

SRNS inspections were held with the subcontractor to review punch list items that were developed to ensure that the end state of the ash excavation project area met the criteria of the design requirements, including the Storm Water Pollution Prevention Plan requirements. A final acceptance inspection of the ash remediation area specifically addressed in the NARA and Zone 1 of the SARA, not including the activities for the ESD, was held on November 7, 2019, and SRNS approved the site conditions.

Construction activities in the SARA are complete. SRNS inspections were held with the SRS site forces to ensure that the LUCs met the criteria of the design requirements. A final acceptance inspection of the LUC area was held on October 18, 2023, and SRNS approved the site conditions.

5.2 Final Inspection for Acceptance of WADB Closure

A field visit to the WADB construction site was held on October 8, 2019, with the participation of USDOE, USEPA, and SCDHEC, after completion of the excavation and at the end of the stabilization. This field visit served the purpose of an inspection walkdown for the RA selected in the ROD (excavation of ash and contaminated soil media and implementation of LUCs).

A final inspection walkdown for the ESD portion (LUC boundary expansion and access control warning sign repositioning) was performed by Environmental Compliance and Area Completion Projects Post Closure Waste Site Inspector/Maintenance Coordinator and Engineering on October 18, 2023.

A regulatory field inspection meeting for the Seventh Five-Year Remedy Review Report for SRS OUs with Native Soil Covers and/or Land Use Controls was held on February 28, 2024. The participants in the meeting were USDOE, USEPA, SCDHEC, and SRNS personnel. The meeting also served as the final walk down inspection for the WADB. During the meeting, the participants viewed drone footage of the WADB and were

provided an opportunity to walk down the OU. The USEPA and SCDHEC elected not to perform a walk down because the drone footage provided a better view of the OU.

6.0 AS-BUILT DOCUMENTATION

6.1 As-Built Drawings

As-Built documentation of the WADB is provided in Appendix A.

A final as-built survey plat of the area subject to LUCs is provided in Appendix B. This survey plat includes the location for six access control warning signs and the expanded LUC boundary, which includes the ash that will remain in place in Dunbarton Bay and the 30-m (100-ft) buffer area.

6.2 Well Modifications

Two monitoring wells (PAS-001C and PAS-001D) were abandoned on January 7, 2019, prior to the start of this RA to allow for ash excavation. Well abandonment reports were sent to SCDHEC on August 1, 2019, and are provided in the PCR Appendix D (SRNS 2020).

7.0 POST- PCR/CMIR/RACR ACTIVITIES AND LAND USE CONTROL IMPLEMENTATION PLAN

The RA for the WADB is complete and the NARA supports unrestricted land use. Ash remains in Zones 2 through 4 of the SARA, and additional ash has been found outside of the original limits of the ash boundary. Therefore, LUCs will be necessary. As presented in Section 4.7 of the approved LUCIP Addendum (SRNS 2023b), post-closure activities will involve annual inspections and maintenance. Annual inspections will be performed to ensure that access warning signs are in place and are legible. Maintenance (including general housekeeping and necessary upkeep of the warning signs) will be performed as needed.

A photograph of a typical warning sign is provided in Figure 6. The SRNS post-closure maintenance organization will perform inspections in accordance with the inspection

checklist for the WADB (Appendix D) per the requirements of the LUCIP Addendum (SRNS 2023b). Maintenance activities and LUCs will be reported during the five-year review of the remedy.

7.1 5-Year Remedy Review

Section 300.430(f)(ii) of the National Contingency Plan (NCP) requires that a five-year remedy review be performed if hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure remain in the Operable Unit. The three parties - SCDHEC, USEPA, and USDOE - have determined that a five-year review of the remedy for the WADB will be performed to ensure that the remedy continues to provide adequate protection of human health and the environment.

8.0 PROJECT COSTS

The estimated capital cost as detailed in the Focused CMS/FS for the WADB (SRNS 2013) was prepared in 2011 and is provided in Table 5. This estimated cost was for the entire NARA and SARA portions of the remediation area. The actual cost is separated into two sections.

The first portion includes remediation costs associated with Zone 1 of the SARA and the entire portion of the NARA. Although the total actual capital cost is only nine percent (9%) greater than the estimated cost, only 60% of original project area was excavated. The increased cost per area is due to the extremely wet conditions in the SARA access corridors and in Zone 1, as well as increased disposal costs and tipping fees. Ash found outside of the initial limits of ash boundary resulted in additional costs for excavation and reconstruction of a stable surface for heavy equipment travel. The high moisture content of the ash resulted in increased equipment costs and costs for additional handling (e.g., farming/aerating). Increases in the disposal cost per ton and tipping fees increased the initial estimate (SRNS 2018a) of $43 per ton to $63 per ton for disposal.

The second portion of the remediation costs include implementation of the LUCs for SARA Zones 2 through 4 to include repositioning of the warning signs and surveying the expanded LUC boundaries.

9.0 REFERENCES

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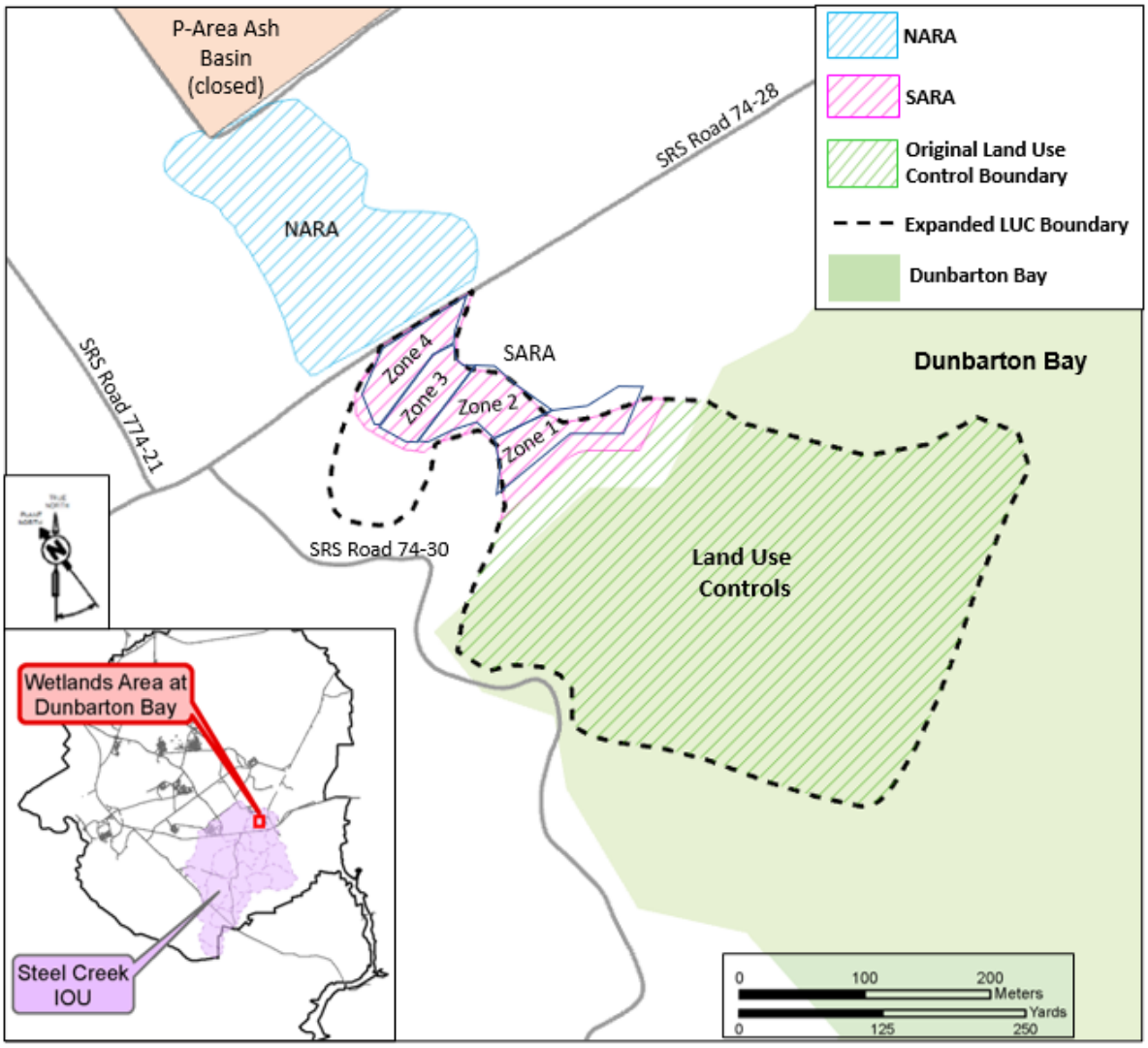

Figure 1. WADB Location and Project Areas

Figure 2. Wetland Area at Dunbarton Bay Entrance

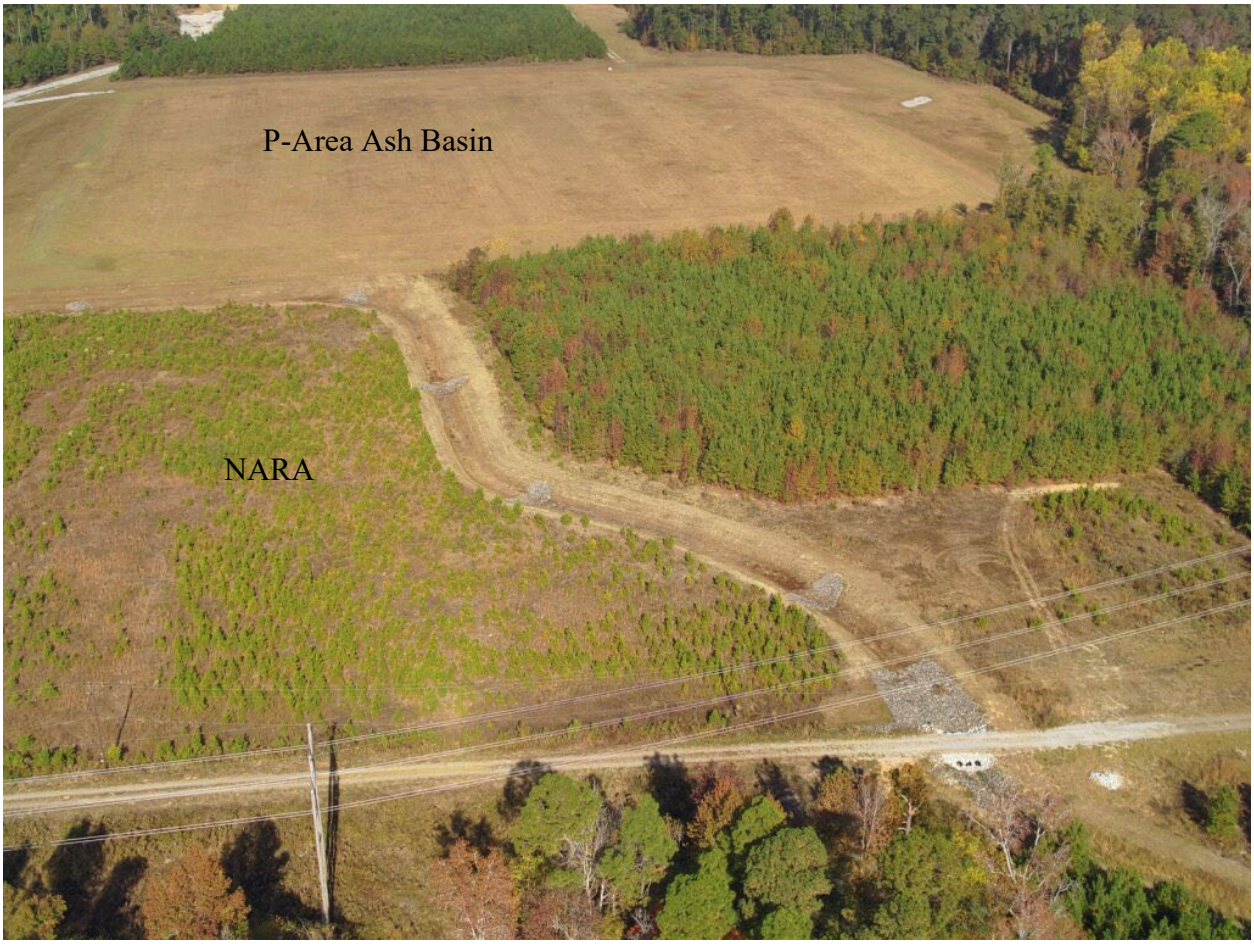

Figure 3. Aerial View of NARA Location

Figure 4. Aerial View of SARA Zones 2, 3 and 4 Location

Figure 5. Buffer Area and SARA Zone 1 after Stabilization (2019)

Figure 6. Access Control Warning Sign

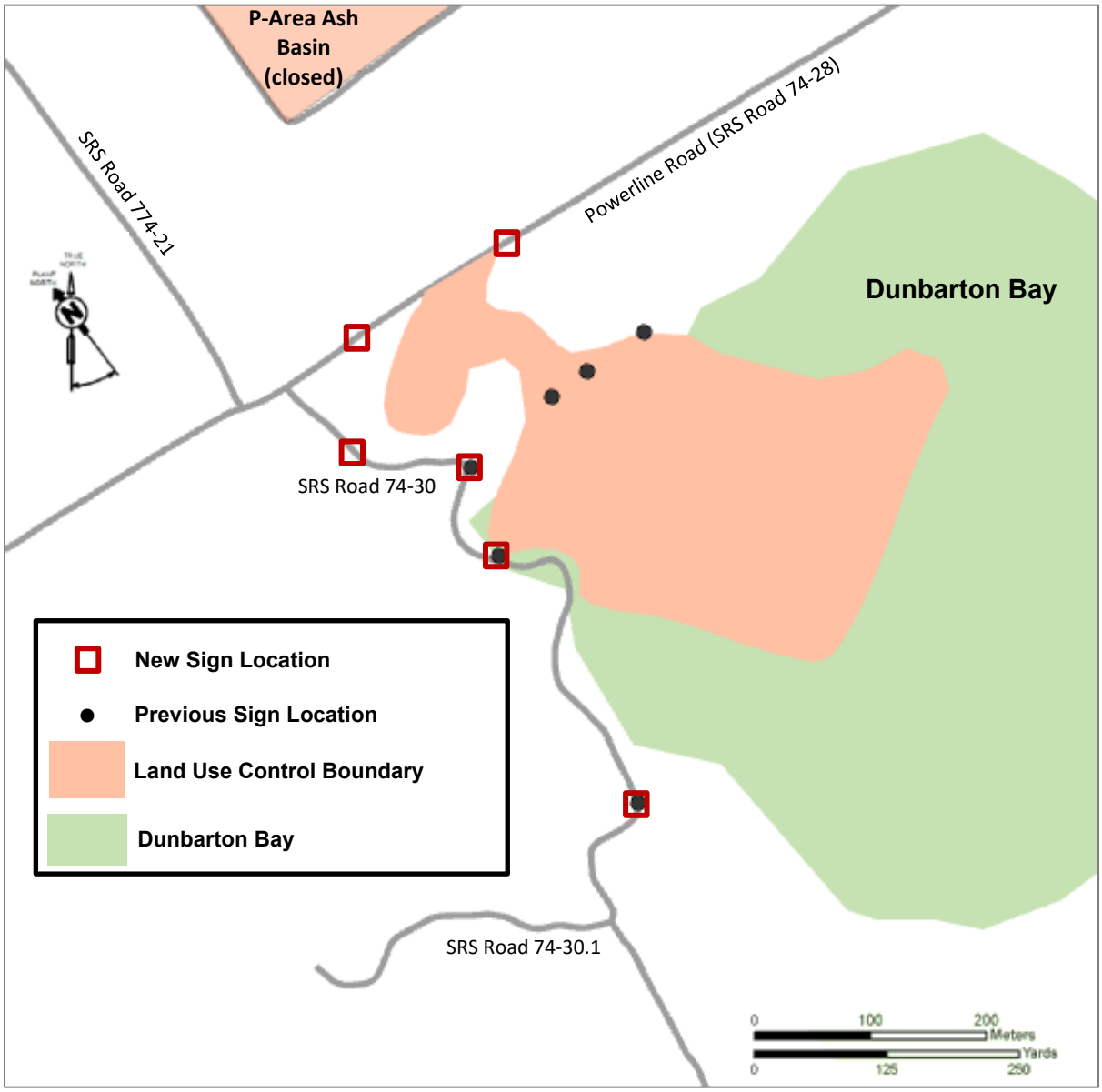

Figure 7. Repositioning of Access Control Warning Sign

Table 1. Chronology of Events

Description of Activity	Start Date
ROD (SRNS 2018a) signed	June 20, 2018
Subcontract Award	November 19, 2018
LUCIP approved	November 28, 2018
RA start/land clearing	January 17, 2019
Mobilization of office trailers/equipment	February 6, 2019
Improve existing road and install construction entrance	February 18, 2019
SARA – Clear and grub for sediment control features	February 18, 2019
SARA – Install perimeter sediment controls	February 18, 2019
SARA – Additional ash found outside the limits of ash	February 24, 2019
Haul ash and root balls to landfill	February 26, 2019
NARA – Clear and grub for sediment control features	February 27, 2019
SARA – Install flow dissipater	March 7, 2019
NARA – Install initial sediment trap outlet structure	March 7, 2019
NARA – Install stormwater channel and perimeter berms	March 6, 2019 (berms) April 9, 2019 (channel)
SARA – Clear and grub zone 1	March 28, 2019
SARA – Excavate zone 1 ash, stockpile	April 15. 2019
SARA – Confirmation Sampling (S-08 and S-09)	May 1, 2019 and May 15, 2019
SARA – Stabilization (Zone 1)	Jun 6, 2019
NARA – Clear and grub ash excavation areas	May 7, 2019
NARA – Excavate & Stockpile Ash	May 17, 2019
Core Team Meeting held to discuss SARA changed conditions	June 18, 2019
A de-scope letter was issued to the subcontractor to eliminate the excavation of ash in Zones 2-4 of the SARA	June 24, 2019
NARA – Confirmation Sampling (N-01, N-02 & N-04)	June 27, 2019
NARA – Confirmation Sampling (N-06 & N-07)	July 25, 2019
NARA – Confirmation Sampling (N-03 & N-05)	August 1, 2019 (additional dates for sampling within grid N-05 include August 20, September 4, and September 25)
NARA – Stabilization	August 7, 2019
SARA – As-Built survey	September 5, 2019
Core team meeting held to discuss the end state of the completed portion of the RA and to discuss the path forward for disposition of the ash in the remaining zones	September 17, 2019
NARA – As-Built survey	November 1, 2019
SRNS final acceptance inspection	November 7, 2019
Install access control warning signs (wetland area)	January 7, 2020
LUC Boundary Survey	June 2, 2020
EPA approval of PCR Revision 1	October 26, 2020
SCDHEC approval of PCR Revision 1.	November 19, 2020
Addendum to Revision 1 LUCIP approved	July 31, 2023
ESD issued.	August 10, 2023

Table 1. Chronology of Events *(Continued/End)*

Description of Activity	Start Date
Reposition access warning signs (SARA)	October 17, 2023
Final field acceptance inspection of the LUC area	October 18, 2023
Final inspection walkdown for the ESD portion	October 18, 2023
Expanded LUC Boundary Survey	November 6, 2023
USEPA and SCDHEC final inspection for acceptance of WADB closure	February 28, 2024

Table 2. Equipment Types and Activities

General Equipment Type	Equipment Use
D-6 Dozer with global positioning system	Excavation of ash/finish grading of clean soil.
Excavator	Excavation of ash/loading ash in dump trucks.
Excavator – Long Reach	Excavation of ash in saturated area of SARA and ash excavation in NARA, loading ash in dump trucks
Tandem Axle Dump Trucks	Hauling root balls, ash and contaminated soil to Three Rivers Landfill, hauling vegetation to Construction and Demolition Landfill, general use for hauling materials within the construction site.
Articulated Dump Truck	Hauling ash within excavation areas.
Water Trucks	Dust suppression, adding water to ash to meet landfill water content and sod watering.
Front End Loader	Load soil into dump trucks/general construction activities associated with stormwater channels and grading.
Skid steer	General site operations.
Pickups	General site operations.
Track Sod Installer	Installation of sod.
All-Terrain Vehicle	General site operations.

Table 3a. Approximate Volumes of Excavated Ash Excavated

Approximate Quantities of Ash and Contaminated Soil Quantities by Area	Volume *(yd^3)*
SARA Zone 1	4,600
SARA Western Corridor	800
SARA Eastern Corridor	850
NARA	15,820
NARA Additional Ash SW Corner	400
NARA Additional Ash East Side at Stormwater Channel	200

Table 3b. Approximate Weights of Ash Disposed of at Three Rivers Landfill

Approximate Quantities of Ash and Contaminated Soil Quantities by Area	Weight *(tons)*
Root balls/ash contaminated vegetation	743
Total Ash Shipped to TRL	29,394

Table 4. Summary of Design Changes

Item	Change	Reason
1	Ash was excavated from the western access corridor of the SARA. Upon verification by SRNS that all ash had been removed, rip rap was placed at the bottom of the excavation. A fabric liner, common fill from within the project limits, and crusher run were then placed to backfill this area.	Additional ash was discovered outside of the original boundary for the limits of ash within the SARA. In order to provide heavy equipment access to Zone 1 of the SARA, the area between the limits of ash initial boundary and established limits of disturbance it was necessary to remove the ash and to a create a suitable/stable subgrade.
2	Three Rivers Landfill temporarily suspended acceptance of ash shipments due to the high moisture content of the ash. Three Rivers Landfill Engineers issued a specification requiring all future shipments of ash to have a moisture content between 21.5% and 25.5%. Ash stockpiles were required to be aerated to reduce water content and sampling was required prior to shipment to Three Rivers Landfill.	Ash excavated from the SARA was saturated and unsuitable for the planned disposal methods by Three Rivers Landfill. Three Rivers Landfill issued acceptance criteria for soil moisture, daily maximum totals, and moisture sampling requirements. During a meeting held with Three Rivers Landfill personnel, a maximum limit of 30,582.2 m^3 (40,000 yd^3) of ash was imposed based on the capacity of the 1.2-ha (3-ac) disposal site dedicated for ash disposal.
3	Ash was excavated from an area within the dissipater channel on the SARA. Upon verification by SRNS inspection that all ash had been removed, the construction of the dissipater channel proceeded as designed.	Additional ash was found outside of the original boundary for the limits of ash on the eastern side of the SARA. This additional ash was discovered approximately (~)0.6-m (2-ft) below ground surface.
4	Ash was excavated at the outfall structure of the sediment trap on the NARA. Upon verification by SRNS inspection that all ash had been removed, the installation of the outlet structure proceeded as designed.	Additional ash was found outside of the original boundary for the limits of ash on the eastern side of the NARA near the sediment trap outlet structure. The additional ash was found 6 inches below original ground surface.
5	Ash was excavated below planned grades in the southwestern section of the sediment trap in the NARA. This area is within sampling grid N-05. Upon verification by SRNS inspection and confirmation sampling the area was backfilled with common fill from within the project limits.	Addition ash was found at greater depths than anticipated in the southern section of the NARA (area of sampling grid N-05).
6	Ash was excavated from the southwest corner of the NARA outside the original boundary of the limits of ash and within the clearing and grubbing limits of the project area. Upon verification by SRNS inspection that the ash had been removed, a diversion berm was constructed as designed and the rest of the area was graded to match adjacent topography.	Additional ash was found outside of the original boundary for the limits of ash on the southwestern corner of the NARA.

Table 4. Summary of Design Changes *(continued/end)*

Item	Change	Reason
7	Ash was excavated below planned grade depths in Zone 1 of the SARA. Upon verification by SRNS inspection that all ash had been removed and the return of the confirmation sampling results, small depressions resulting from over excavation of ash were filled using in situ material adjacent to the depressions. Larger depressions were filled with common fill from within the project limits as necessary to provide positive drainage and to form a smooth surface for the installation of sod.	Additional ash was found at greater depths than anticipated in Zone 1 of the SARA.
8	Zone 1 of the SARA was graded to direct subsurface seepage water toward the low elevation in the southeast corner of Zone 1. A check dam at the seepage point between Zone 1 and Zone 2 was installed to prevent sediment migration from Zone 2 into Zone 1.	A dense clay layer just beneath the ash restricted rainwater infiltration resulting in pockets of perched water in the shallow sediments. Water seeped from the interface of the Zone 1 and Zone 2.
9	Construction activities were suspended for Zones 2 through 4 of the SARA.	The ash volume in the SARA is greater than anticipated because it was found deeper than previously estimated and additional areas of ash were found outside the initial limits of ash boundary. The additional ash volumes potentially exceed disposal capacity identified by Three Rivers Landfill personnel. Extremely wet conditions were encountered in the SARA which hampered excavation and required stockpiling and drying to meet landfill acceptance criteria, resulting in a significant cost increase.
10	Expanded LUC boundary.	An ESD to the Revision 1 ROD was issued in 2023 that allowed for the expansion of LUCs in lieu of excavation of the remaining ash in the SARA.

Table 5. Project Cost Comparison

Project Construction Cost Comparison			
	ROD Cost *($K)*	**Incurred Cost** *($K)*	**Delta Cost** *(%)*
WADB Ash Excavation/Disposal Capital Cost	$9,826	$10,747	(+9%)
WADB LUC Portion		$27	
WADB Operations and Maintenance Costs	$1,708	NA	NA

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APPENDIX A

As-Builts

North Ash Remediation Area (NARA)
and
South Ash Remediation Area (SARA)

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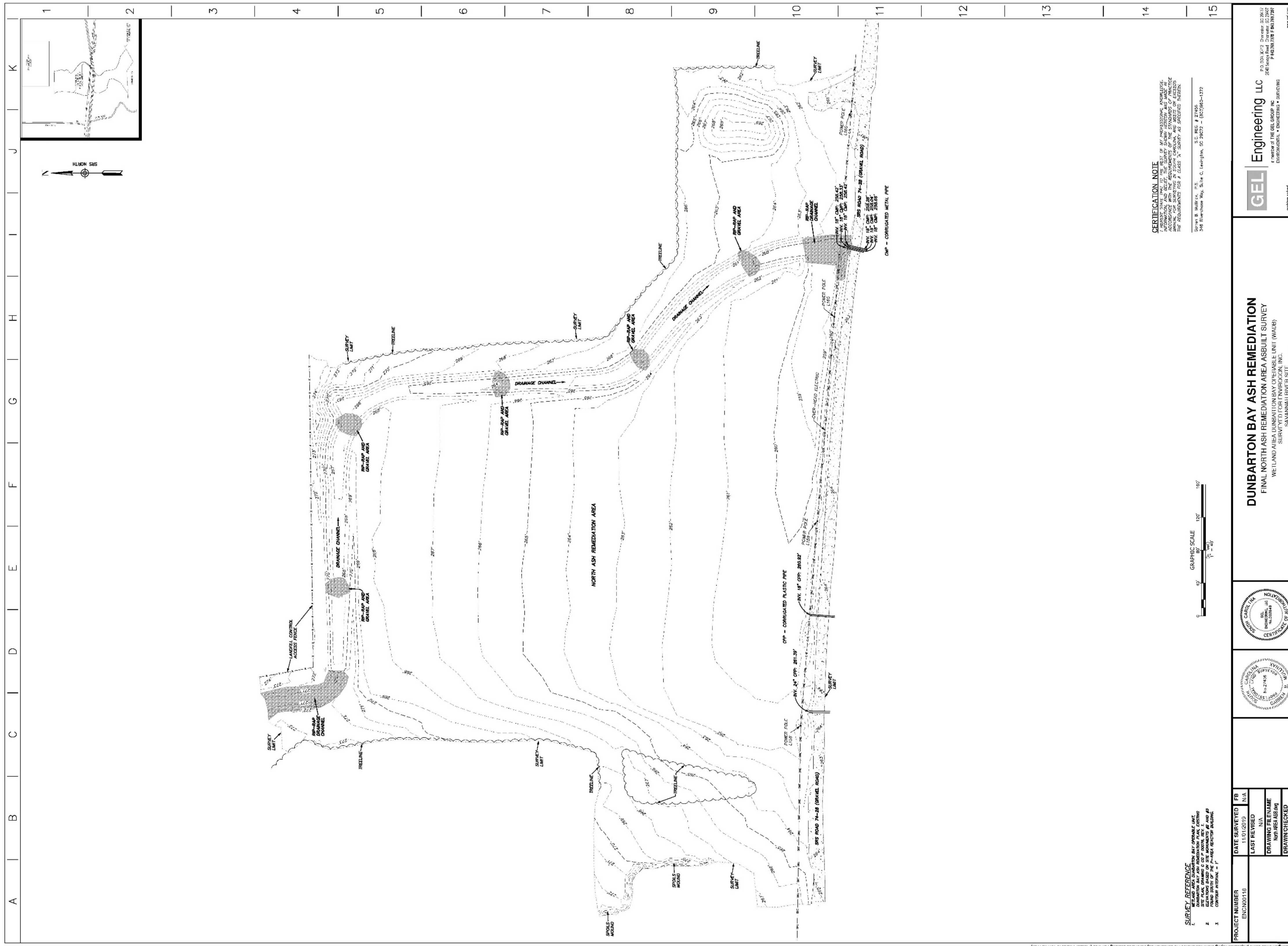
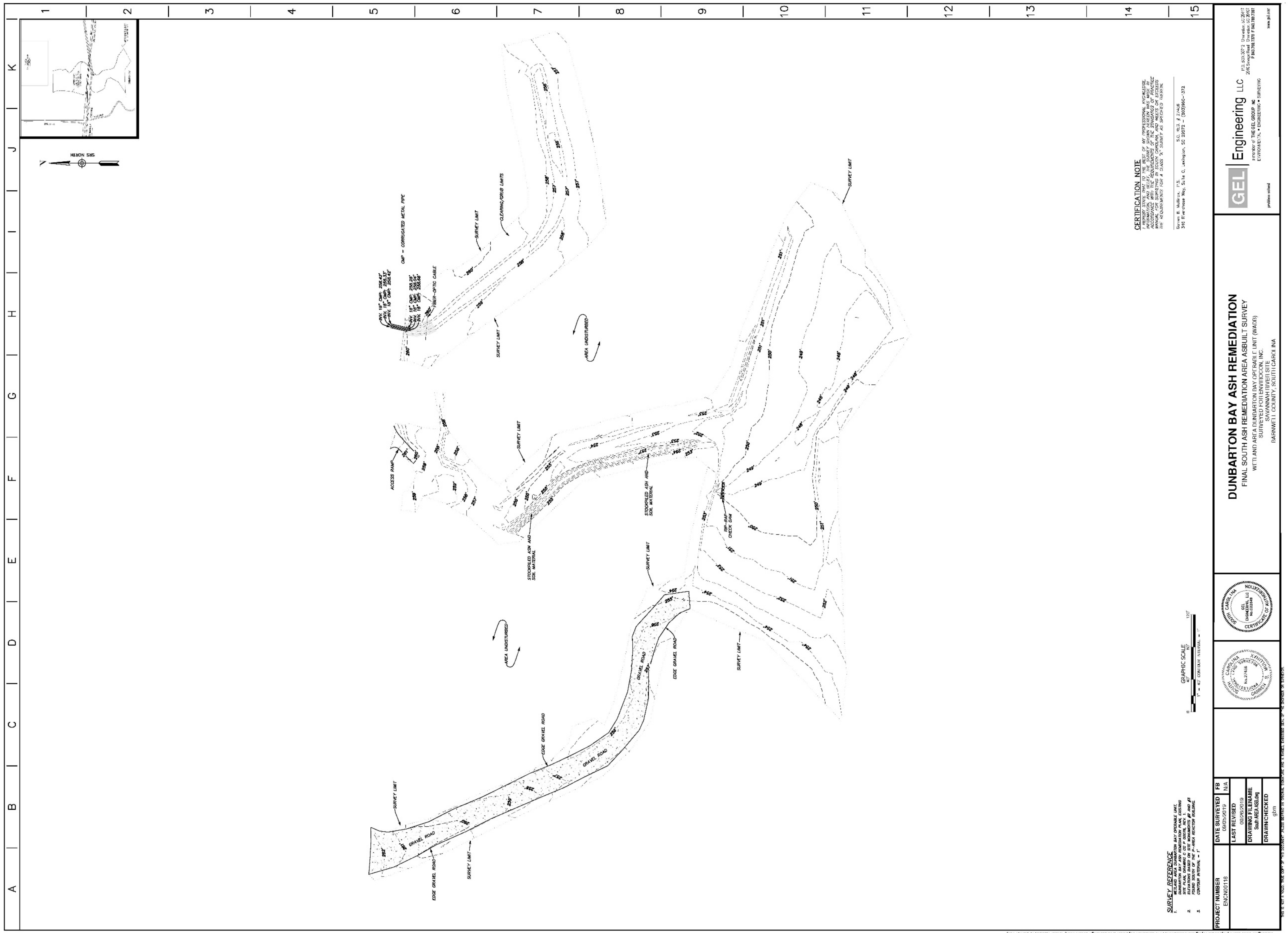
NARA


DUNBARTON BAY ASH REMEDIATION
FINAL NORTH ASH REMEDIATION AREA ASBUILT SURVEY
NORTH ASH REMEDIATION AREA
GEL Engineering LLC

SARA


DUNBARTON BAY ASH REMEDIATION
CERTIFICATION NOTE
GRAPHIC SCALE
SURVEY REFERENCE
GEL Engineering LLC

APPENDIX B

Survey Plat of Area Subject to Land Use Controls

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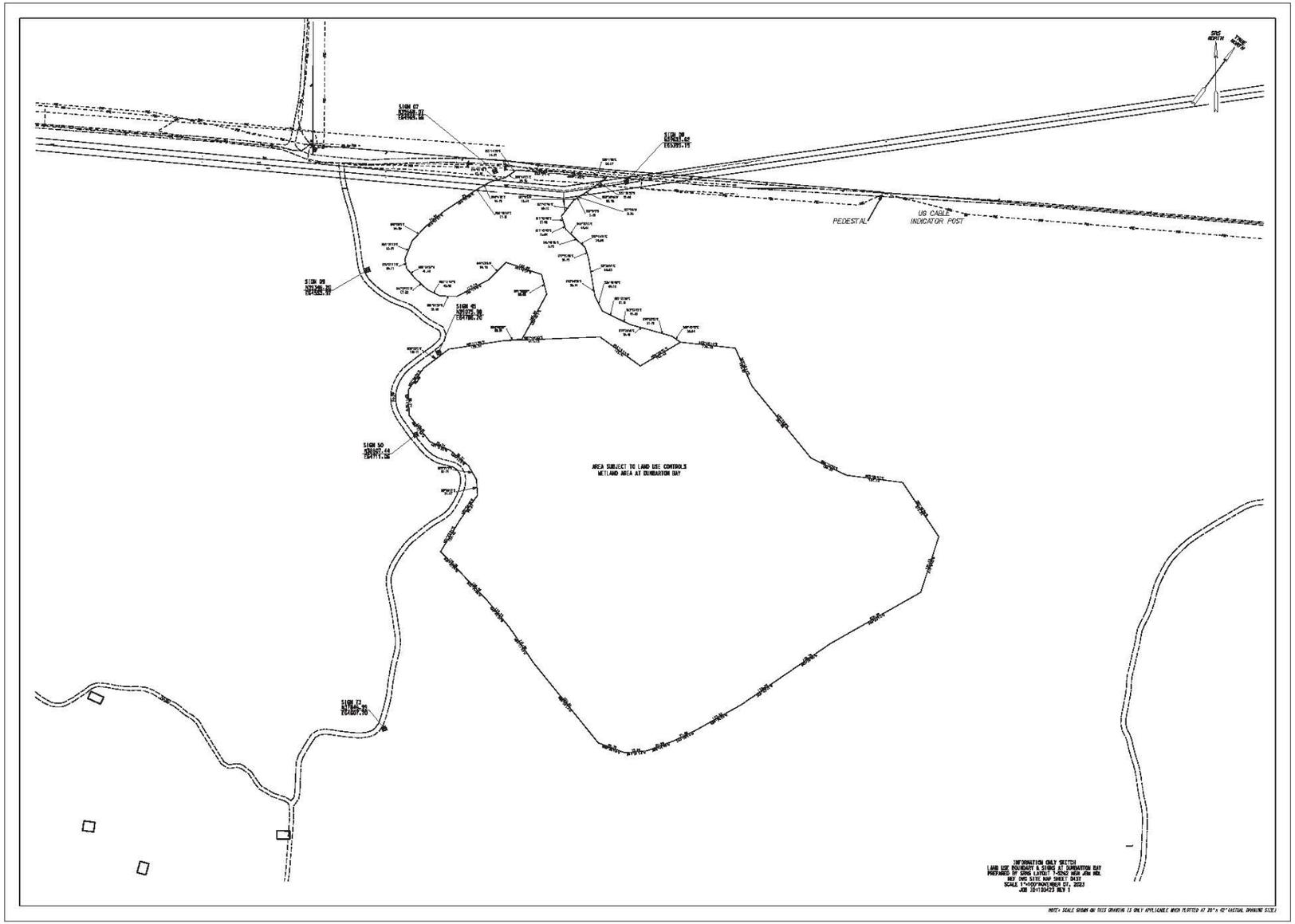
Survey Plat


PEDESTAL
UG CABLE INDICATOR POST
AREA SUBJECT TO LAND USE CONTROLS
WETLAND AREA AT DUMBARTON DAY

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BOUNDARY CORNER TABLE			
Point #	Northing	Easting	Description
1	39639.72	65505.39	BOUNDARY
2	39786.05	65585.83	BOUNDARY
3	39850.27	65569.25	BOUNDARY
4	39890.18	65453.02	BOUNDARY
5	39833.51	65396.41	BOUNDARY
6	39779.05	65292.68	BOUNDARY
7	39780.67	65236.02	BOUNDARY
8	39800.51	65196.75	BOUNDARY
9	39839.35	65154.60	BOUNDARY
10	39871.18	65127.98	BOUNDARY
11	39900.84	65122.47	BOUNDARY
12	39960.16	65146.26	BOUNDARY
13	40007.65	65190.42	BOUNDARY
14	40055.10	65247.92	BOUNDARY
15	40080.11	65284.48	BOUNDARY
16	40125.65	65352.67	BOUNDARY
17	40131.04	65362.27	BOUNDARY
18	40153.38	65401.09	BOUNDARY
19	40166.99	65450.26	BOUNDARY
20	40183.37	65474.37	BOUNDARY
21	40191.87	65486.63	BOUNDARY
22	40178.02	65645.94	BOUNDARY
23	40171.71	65718.60	BOUNDARY
24	40166.28	65781.04	BOUNDARY
25	40134.72	65737.61	BOUNDARY
26	40104.39	65691.50	BOUNDARY
27	40102.65	65688.81	BOUNDARY
28	40099.78	65684.37	BOUNDARY
29	40093.04	65673.92	BOUNDARY
30	40041.55	65634.00	BOUNDARY
31	40014.90	65642.52	BOUNDARY
32	39998.86	65647.65	BOUNDARY
33	39968.15	65679.73	BOUNDARY
34	39962.85	65685.36	BOUNDARY
35	39939.32	65710.85	BOUNDARY
36	39902.41	65722.55	BOUNDARY
37	39815.39	65737.12	BOUNDARY
38	39779.24	65743.72	BOUNDARY
39	39730.91	65768.15	BOUNDARY
40	39705.43	65820.15	BOUNDARY
41	39687.34	65857.04	BOUNDARY
42	39666.16	65933.65	BOUNDARY
43	39649.69	65993.20	BOUNDARY

SIGN LOCATION TABLE			
Point #	Northing	Easting	Description
7	39668.07	64969.66	SIGN
8	39633.62	65399.19	SIGN
9	39346.20	64553.97	SIGN
45	39075.98	64786.20	SIGN
50	38807.44	64711.06	SIGN
73	37846.99	64607.70	SIGN

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