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Doan Brook Restoration near Horseshoe Lake Park - Geotechnical Investigation Work Plan

Northeast Ohio Regional Sewer District

Project number: 60685770

July 12, 2022

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Quality information

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			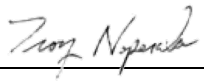
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	7/12/2022	Response to comments			

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1. Introduction

The Doan Brook Restoration near Horseshoe Lake Park is located within a historical area in the cities of Shaker Heights and Cleveland Heights, Ohio. Horseshoe Lake was formed in 1852, when a dam was built by the North Shaker community to power a wool processing mill. The North and Middle Branches of Doan Brook confluence within Horseshoe Lake before reaching the dam. In June 2022, Northeast Ohio Regional Sewer District (NEORSD) retained a Joint Venture Group comprised of companies (Stimson, GPD Group, AECOM, Enviroscience, KS Associates, River Reach Construction and Bluestone Heights Environmental Education) for site infrastructure, environmental and landscape services for the Doan Brook Restoration project near Horseshoe Lake Park. In March 2021, AECOM conducted a *Phase 1 Sediment Sampling and Characterization* of sediments within Horseshoe Lake for NEORSD as a preliminary analysis of sediment disposal and reuse options. Based on the Phase 1 analysis, the following conclusions were made: 1) the material can be managed as a non-hazardous waste and potentially used for beneficial reuse; 2) material may need additional drying and/or additives to enhance stabilization for disposal at a landfill; 3) material may not have sufficient strength for constructing a stream channel without additives or design enhancements; and 4) additional chemical and geotechnical characterization may be required for design of all remedial alternatives.

1.1 Project Approach

AECOM proposes a streamlined Phase II geotechnical investigation as well as bench-scale laboratory treatability testing. This phase of data collection will focus on analysis of the soil composition of the earthen dam, as well as further characterization of the sediments from within Horseshoe Lake. The tasks associated with the data collection components include the following:

- Conduct geotechnical borings at seven (7) locations at the existing dam crest and within Horseshoe Lake.
- Characterize horizonal extent and geotechnical parameters of the soil within the earthen dam for potential beneficial reuse options.
- Further define geotechnical properties of the sediments within Horseshoe Lake for evaluation of current stability and potential final disposition of the material (beneficial reuse or offsite disposal.
- Perform a treatability investigation to measure dewatering efficacy for several sediment. management approaches, refine key constructability assumptions, evaluate the most cost-effective method(s) for managing sediment, and determine suitability for beneficial reuse options.

Results of the above geotechnical investigations will be detailed in three key deliverables.

- Geotechnical Data Report (GDR) – provides a technical summary of all preliminary and final sampling efforts.
- Geotechnical Design Memorandum (GDM) – details the results from the geotechnical laboratory for design and constructability recommendations.
- Treatability Design Memorandum (TDM) – details the results of the treatability testing conducted to investigate cost-effective method(s) for sediment management and suitability of beneficial reuse.

2. Geotechnical Investigation

The following sections describe the field procedures and laboratory analysis of the material to be collected from the earthen dam as well as within Horseshoe Lake. Proposed sampling locations were based on Phase 1 Sediment Sampling and Characterization along with a site visit conducted on June 8, 2022, with AECOM and Ohio TestBor Inc.

2.1 Geotechnical Drilling

AECOM will oversee our subcontractor, Ohio TestBor Inc., to complete the geotechnical drilling within the project area defined in **Figure 1**. It is anticipated an ATV drilling rig with 3.25" hollow stem auger will be used. The investigation will consist of a total of seven borings, three from the earthen dam and four within Horseshoe Lake in areas free of standing water. The approximate location of the borings can be found in **Figure 1** and the planned sampling depths can be found in **Table 1**. Due to limited access and heavy forest cover it is anticipated minor tree trimming may be required and will be coordinated with an arborist from the respective city.

Table 1. Boring location ID's and planned boring depth

Boring ID	Planned Boring Depth (ft)
B-1	35
B-2	35
B-3	35
SL-6	20
SL-7	20
SL-8	20
SL-9	20

At all locations, split-spoon soil sampling in accordance with ASTM D1586 shall be performed. Borings will target four samples within the first 10 feet and then single samples at five-foot intervals thereafter using two-foot drives. All soil samples will be preserved in air-tight 2-inch diameter, 5-inch-tall glass jars. In addition, at sampling locations within Horseshoe Lake, undisturbed samples will also be collected by advancing thin-walled steel (Shelby) tubes in accordance with ASTM D1587 where soft cohesive soils are encountered.

At borings located on the earthen dam, backfill will occur with a soil/cement/grout mixture. Borings within Horseshoe Lake will be backfilled with excess soil cuttings and/or a soil/cement/grout mixture. It is not anticipated that contaminated waste will be generated from these activities. All boring locations will be photographed, and GPS coordinates recorded using a handheld device so that actual locations can be shown in future figures and reports. All photographs will follow NEORSD's photograph naming standard and photograph files will be shared with NEORSD.

Rock or pavement coring is not included in this scope of work. If rock is encountered above the planned boring depth, it shall be drilled and sampled to the point of auger refusal and subsequently the hole will be abandoned.

AECOM will coordinate site access items with the City of Shaker Heights and/or the City of Cleveland Heights. AECOM anticipates coordinating tree branch trimming for better access to boring location SL-9. AECOM also anticipates parking the drill rig overnight at Horseshoe Lake Park near boring location SL-8.

Site access issues, the potential variability of the subsurface conditions and weather conditions may require the need to modify some sampling locations. AECOM may be required to field adjust the drilling locations and schedule if obstructions are encountered during the completion of the field activities.

2.2 Geotechnical Analysis

Samples collected from this investigation will be analyzed for the geotechnical parameters identified in **Table 2** by the AECOM Conshohocken Geotechnical Laboratory.

Table 2. Analytical parameters of the geotechnical analysis

Analysis Description	ASTM Standard	Quantity
Moisture Content	D 2216	10 to 20
Liquid and Plastic Limit (3-Point Method)	D 4318	10
Particle Size	D 422	10
USCS Classification	D 2487	10
Organic Content	D 2974	6 to 10
Proctor Test	D 698/1557	3
Flexible Wall Perm.	D 5084	2
Compression Test	D 4767	3
Conventional Consolidation Test	D 2435	2

2.3 Treatability Tests

A treatability investigation will be used to measure dewatering efficacy for several approaches, refine key constructability assumptions, evaluate the most cost-effective method(s) for managing sediment, and determine suitability for beneficial reuse options. AECOM's treatability laboratory will work to specify the types of dewatering approaches and/or stabilization additives to achieve the results needed for potential disposal and/or reuse options. Bulk discrete sediment samples (composites of split spoon samples throughout the vertical profile) from four sample locations (SL-6 to SL-9) (5-gallons of sediment) will be collected and shipped to AECOM's Treatability Laboratory in Austin, TX. In addition, 10-gallons of surface water will be collected from an open water source (Doan Brook, upstream of the Dam). Upon receipt, an initial characterization of the organic carbon content, particle size distribution and suspended solids measurements of the sediment and water will occur.

The as-received material will undergo stack testing where aliquots of the sediment will be homogenized and stacked to determine dewatering efficacy from gravity under its own weight (24 h).

2.3.1 Solidification/Stabilization (S/S)

Dredge material is usually stabilized and/or dewatered with a reactive pozzolanic reagent like Portland cement. Cementitious reagents are the most common commercially employed stabilization/solidification

(S/S) process options due, in part, to low cost and availability. Cementitious and/or pozzolanic reagents include Portland cement, Calciment™, fly ash, ground granulated blast furnace slag, silica fume, cement kiln dust, various forms of lime, and lime kiln dust. These reagents may be used singly or in various combinations. In low admixture concentrations, cement (and other pozzolanic reagents) is used for dewatering, consolidation, and geotechnical stability of the sediment.

2.3.1.1 Solidification/Stabilization (S/S) Treatability Tests

The objective of the S/S treatability test is to identify a range of reagents and mix ratios that can be used to successfully dewater and/or stabilize the residual material for T&D and/or beneficial reuse if stacking alone does not generate a sufficiently dry material that meets all criteria. These tests will be used to develop the cost estimates included in the alternative analysis including but not limited to:

A. **Index Testing.** Testing the physical characteristics of the untreated waste material for parameters such as moisture content, unit weight, particle size, density, strength and/or percent organics.

B. **Sample Screening.** Mixing and screening the samples with different reagents and mix ratios. It is expected that the material will be mixed with three or more combinations of lime, lime kiln dust, fly ash, Portland cement, Calciment™ and/or other reagents. AECOM may also evaluate the effectiveness of mixing with surrounding soils or other low-cost additives that are readily available. The mixtures will be screened for ability to pass paint-filter testing, relative strength (using a pocket penetrometer at specified time intervals) and a subset of the mixes will be identified for optimized mix testing.

C. **Optimized Mix Development.** Successful mixes from the screening phase will be mixed again and tested further for moisture content and unconfined compressive strength (ASTM D2166). The planned final disposition of the material will determine performance requirements for this treatability testing. Other criteria may include cure time (which would define how quickly the material can be moved after mixing), workability and strength.

2.3.2 Sample Handling, Transport, and Custody

Sample handling in the field will conform to appropriate sample custody procedures including proper sample identification, COC forms, and packaging and shipping procedures. Sample labels will be attached to all sample bottles to ensure proper sample identification. Each label will identify the sample location, date and time sampled, initials of the sampler, analysis to be performed, and the applicable preservative.

AECOM field personnel will sign and date the “Relinquished” blank on the COC form when the samples are delivered to the laboratory. A copy of the COC will be retained by the sampling group.

3. Data Evaluation

Upon completion of the geotechnical investigation and analysis, the data and information collected will be organized and compiled into three deliverables. AECOM will first develop a Geotechnical Data Report (GDR) to provide a technical summary of all preliminary and final sampling efforts. The GDR will detail data obtained from borings including the drilling logs, samples collected, and field conditions during sampling. The second deliverable, the Geotechnical Design Memorandum (GDM), will detail the results from the geotechnical laboratory for design and constructability recommendations. Lastly, the Treatability Design Memorandum (TDM), which will detail results of the treatability testing conducted to investigate cost-effective method(s) and options for sediment management and suitability of beneficial reuse of the sediment. All reports will be signed by a professional engineer registered in the State of Ohio.

4. Project-Specific Hazard Assessment and Planning

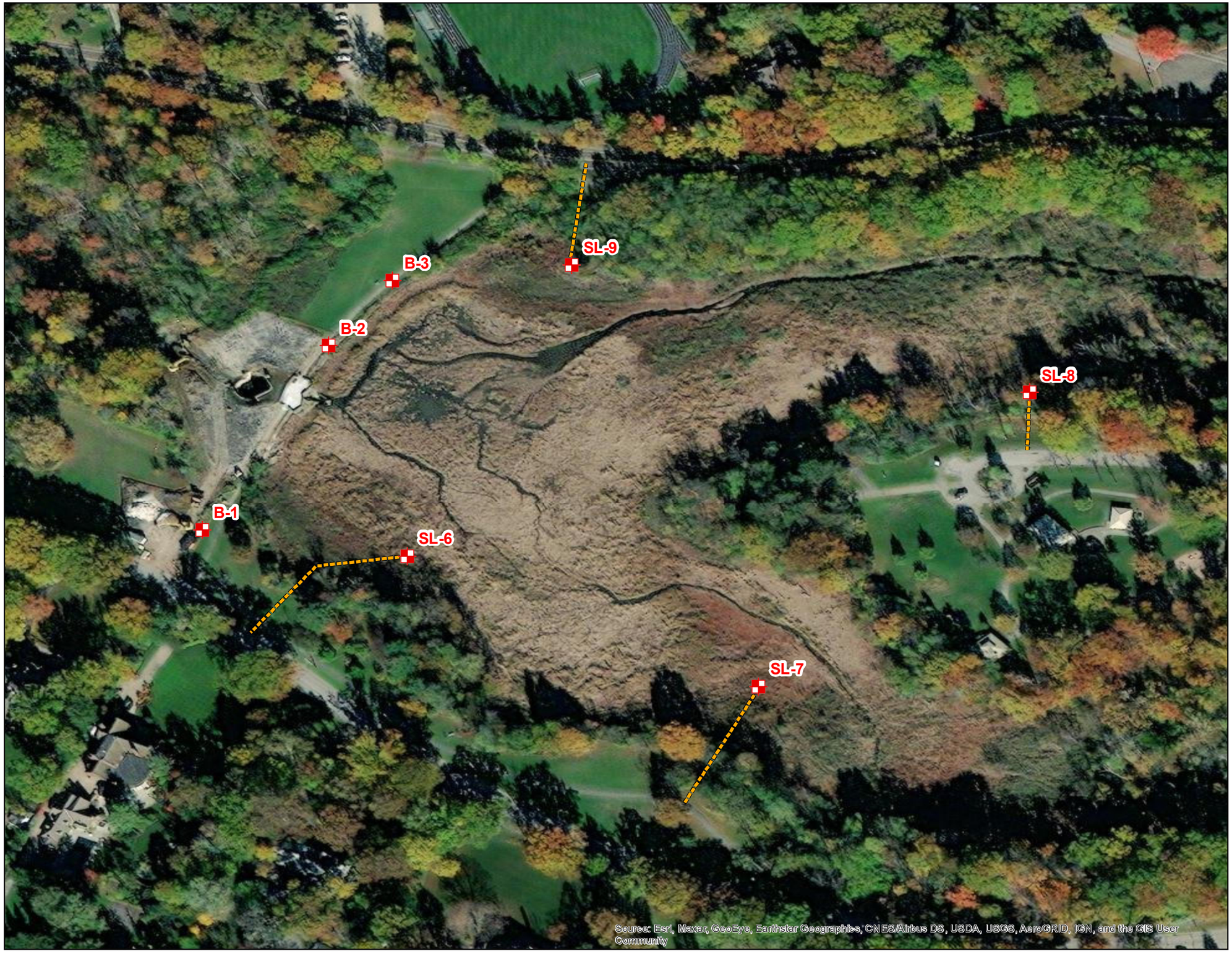
The team will update the project-specific Health and Safety Plan (HASP) for hazards associated with this scope of work. The HASP will incorporate AECOM safety requirements for drilling, applicable Client requirements and current COVID-19 safety requirements. A task-specific HASP will be refined for each field sampling task and will be available for review by NEORSD and others upon request.

The HASP and THA will be reviewed at each field task kick-off-meeting and the THA will be reviewed at the daily safety meetings. All field staff, subcontractors, and oversight personnel will attend the field safety meetings that are conducted at the beginning of each workday. All employees will be fit for duty, adhere to standards of conduct, and empowered and expected to “stop work” in the event that an unsafe condition exists in their work area, or if they observe any unsafe act being performed. The unsafe conditions and hazards will be documented and reported to the Health & Safety Manager and necessary controls and corrective actions will be taken.

5. References

AECOM (2021). NEORSD – Upper Shaker Lake Phase 1 Sediment Sampling and Characterization. May 2021.

Figure



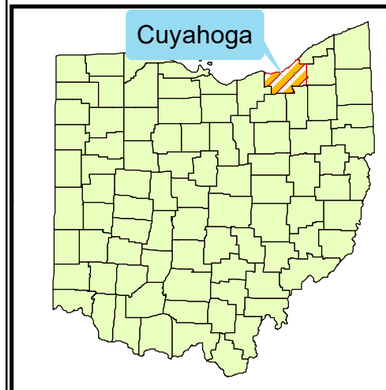
N
W E
S

Legend

Proposed boring locations

Access Path

Note:
Boring location SL-9 will require tree branch removal/clearing for drill rig to access SL-9. Other boring locations do not require any clearing for drill rig access.



0 75 150 300 Feet

1 in = 148 feet

AECOM

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PROPOSED BORING LOCATIONS

DOAN BROOK RESTORATION NEAR HORSHOE LAKE PARK

UPPER SHAKER LAKE, CUYAHOGA COUNTY, OHIO

Date:	Proj. No.:	Figure:
6/28/2022	60685770	1

Project Management Initials: Designer: AA Checked: BA Approved:_____ ANSI B 11" x 17"
Last saved by: ALDEAA (2022-06-28) Last Plotted: 2021-12-20
Filename: C:\USERS\ALDEAA\AECOM\GDS GIS SERVICES - GIS CAD PROJECTS\DCS AMERICAS\REM\WESTIF463\OHIO TESTBOR\28.06.22E\02. WORK\FIGURE 1 – PROPOSED BORING LOCATIONS.MXD