

## I-95 Landfill Field Conditions Summary Report

On May 11, 2020, Fairfax County entered into a [Right of Entry \(ROE\) Agreement](#), with Alpine-X to allow them to perform feasibility studies for the potential development of an indoor snow sports complex on the County-owned I-95 Landfill. This project is referred to as **Fairfax Peak**.

Alpine-X contracted with SCS Engineers, Inc. (SCS) to develop a work plan for initial geotechnical studies. Per the ROE, the final Work Plan was approved by the County on April 16, 2021, after consultation with the Virginia Department of Environmental Quality (VDEQ) and review by the County's geotechnical consultant, HDR Engineering, Inc. (HDR).

### Scope of Work

- Installation and monitoring of seven Settlement Plates located on the landfill's surface
- Cone Penetrometer Testing (CPT) at eight locations through the final cover and into the waste column
- Standard Penetration Testing (SPT) at four locations

### Settlement Survey Results

Settlement Plates are installed to measure the compression rate over time of the existing waste column, usually due to ongoing waste decomposition. In general, the rate and magnitude of the settlement will be greatest where the waste is thicker and younger.

Monitoring involved periodic surveys of the Settlement Plates to determine changes in elevation, attributed to settlement.

The seven Settlement Plates approved were installed on November 25, 2020. The results of the study are reflected in the **Table 6** below. There has been little-to-no movement in the settlement plates since their installation in November 2020. Settlement rates of municipal waste landfills tend to decline over the years, and the rate shown in the tables is a little lower than typical.

Table 6. Settlement Plate Ground Elevations

Test No.	November 25, 2020	January 11, 2021	April 1, 2021	June 24, 2021	Comment
SET-1	289.60	289.58	289.59	289.60	No movement
SET-2	245.13	245.13	245.12	245.13	No movement
SET-3	143.90	143.89	143.88	143.91	Slight upward
SET-4	266.88	266.89	266.89	266.87	Slight downward
SET-5	183.56	183.56	183.57	183.53	Plate was moved
SET-6	156.43	156.42	156.43	N/A	Plate destroyed
SET-7	150.69	150.68	150.70	150.71	Slight upward

### Cone Penetrometer Test Results

Cone Penetrometer Tests (CPTs) measure the waste thickness and characteristics at various locations across the landfill. The test involves insertion of an approximately 1-inch probe into the subsurface material to collect information about the material that it is passing through. The purpose is to document the soil behavior types, estimate the landfill's shear strength, and measure pressures to identify the presence of liquid (leachate) in the waste mass, if any.

Eight CPTs were performed by ConeTec from May 11, 2021, through May 13, 2021, with their locations reflected in **Figure 4** below. ConeTec also monitored the cab of their drill rig for methane gas throughout their drilling, but no gas was detected. The CPT test holes have a small diameter and each hole was backfilled with bentonite chips to ensure proper closure to the landfill cap.

### Standard Penetration Test Results

Standard Penetration Tests (SPTs) estimate the waste thickness to confirm the CPT data. These tests involve an 8-inch diameter boring to recover waste samples and allow for a visual inspection of the waste. This allows for an ability to 'ground truth' the CPT results and develop a better understanding of the waste characteristics, including degree of decomposition, moisture content, density, shear strength and compressibility.

The four SPT samples were performed on June 3, 4 and 7, 2021, with their locations reflected in **Figure 4** below. **Table 4** below contains a summary of the SPT Results. Overall, the average value of each SPT ranged from the relative density distinction of 'very stiff or medium dense' to 'hard or very dense' with no significant zones of leachate encountered. At the conclusion of the boring, the SPT test holes were closed and backfilled with drill cutting, a specialized bentonite grout mix product, and bentonite pellets to ensure proper closure of the landfill cap.

Table 4. Summary of SPT Results

SPT #	Cap Type*	Original Work plan Depth** (feet)	Actual Depth (feet)	Material Encountered (All borings located on graveled access road)	Average "N" Value in bpf (relative consistency)
1	S	100 to 140	108' Nearby CPT-1 hit refusal at 108'	58 feet of fill soil over waste; no liner material identified 58 to 108 ft encountered wet soil/muck, wood, fabric. Possible sand at base.	18.6 (very stiff or medium dense)
2	G	30	42' Nearby CPT-4 hit refusal at 38'	Geosynthetic pieces at 4 to 5 feet depth Geomembrane liner estimated to be at 12 - 16 feet. Auger plugged at 42 feet. Newspaper dated 1976 found.	20.6 (very stiff or medium dense)
3	G	20	30' Nearby CPT-7 hit refusal at 48'	Liner material at about 4 to 5 ft Waste from 5 to 28.5 feet Weathered bedrock at 28.5	36 (hard or very dense)
4	G	20	30' Nearby CPT-7 hit refusal at 48'	Liner material not observed Waste at 12 to >30 feet below ground	22.6*** (very stiff or medium dense)

\*"S" means soil cap, "G" means geomembrane cap

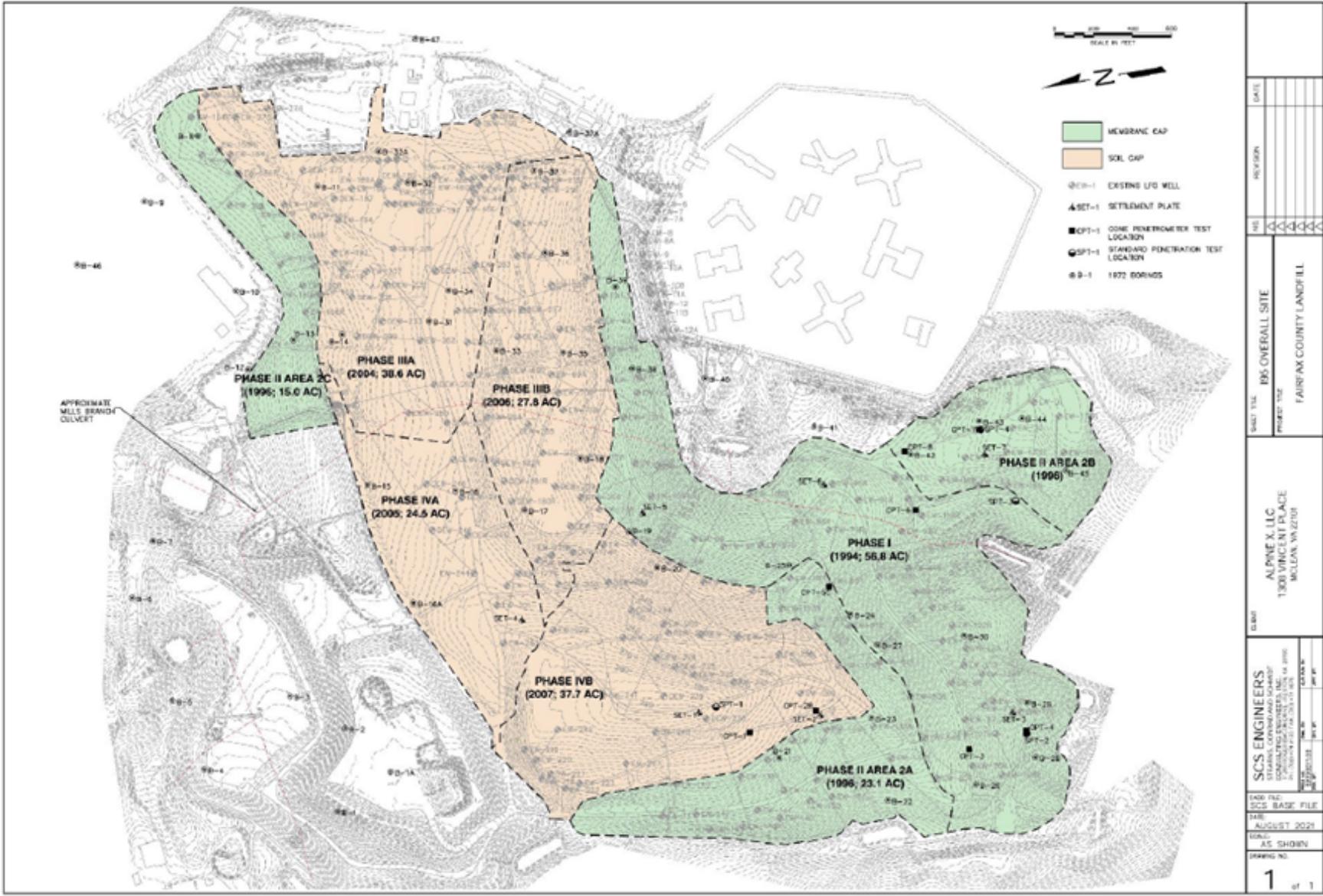
\*\* Original depth based on estimated waste depths from historic topographical maps; actual depths reflect field adjustments based on CPT data

\*\*\*Excludes refusal blow count at the bottom of the boring

### Primary Conclusions

- Considering the relatively low magnitude of settlement measured, the consultant recommended monitoring any remaining settlement plates for a longer period.
- Additional testing will be performed to provide the data necessary for the structural design of the project.
- SPT borings with the associated blow count data were consistent with the CPT findings, which indicate that most of the waste is medium dense/stiff.
- No significant soft areas or large voids were encountered in the waste mass. Overall, the waste was found to be moderate to well-decomposed.
- The data generated from these studies have not revealed issues related to the waste mass that would compromise or limit the development.
- The data indicate that the I-95 landfill is generally stable, does not exhibit high rates of settlement and does not contain excessive leachate.

Figure 4. Site Map Showing Settlement Plates, CPT and SPT Locations, and Soil and Geomembrane Cap Areas



DATE	
REVISION	
NO.	
SHEET TITLE	IB6-OVERALL SITE
PROJECT TITLE	FAIRFAX COUNTY LANDFILL
CLIENT	ALPINE X, LLC 1300 VINCENT PLACE MOLLAH, VA 22105
DESIGNER	SCS ENGINEERS CONSULTING ENGINEERS, INC. 14 000 2010 UNIVERSITY PARK DRIVE DUBLIN, VA 22029
DATE PLOTTED	
DATE	
TIME	
FILE	
DATE	AUGUST 2024
SCALE	AS SHOWN
DRAWING NO.	
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