

SPSA Regional Landfill SWP No. 417 2023 Annual Airspace Capacity Report



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1.0 INTRODUCTION

This 2023 Annual Airspace Capacity Report has been prepared to assist the Southern Public Service Authority (SPSA) with management of the remaining airspace for the Regional Landfill (landfill) Cells V and VI. This report includes data and calculations for various types of airspace, two different types of densities, and anticipated remaining permitted life of Cells V and VI.

1.1 TERMS AND DEFINITIONS

The following are terms used in this report:

Analysis Period – The analysis period is the period of time between two specific topographic maps dates.

Incremental Consumed Airspace – The incremental consumed airspace is the calculated volume between two topographic maps of specific dates.

Active Area Consumed Airspace – The active area consumed airspace is the calculated volume between two topographic maps of specific dates within the boundaries of the active disposal area for the period between dates of the two topographic maps.

Total Consumed Airspace – The total consumed airspace is the total amount of airspace used (consumed) from the bottom of waste (top of the operational layer at the bottom of the landfill) to the top surface of landfill represented by a specific topographic map.

Remaining Permitted Airspace – The remaining permitted airspace is the volume between the top surface of waste (excluding closed areas) represented by a specific topographic map and the top of waste (excluding final cover soils thickness) presented in the permit drawings.

Recoverable Airspace – The recoverable airspace (also called “operating” airspace) is the volume between the landfill surface represented by a specific topographic map and a realistic grading plan (other than the permitted grades) in sections of the landfill that fall under the slope crest under existing conditions represented in the topographic map. The recoverable airspace grades are developed considering space that is greater than 5 feet above the existing surface.

1.2 ANALYSIS PERIOD

The analysis period for this report is from December 21, 2022, through December 1, 2023. The December 2022 and December 2023 topographic maps are presented in **Figure 1**.

2.0 AIRSPACE ANALYSIS

2.1 METHODOLOGY

Cell VI at the Regional Landfill began accepting a portion of the incoming waste in May 2006, but did not take all of the incoming waste until November 2006, when Cell V stopped accepting waste. The following topographic files were used in determining consumed and remaining airspace including the in-place density of the compacted MSW in Cells V and VI.

- December 21, 2022, topography prepared from aerial drone photography by SPSA utilizing Propeller Trimble Stratus software (**Figure 1**).
- December 1, 2023, topography prepared from aerial drone photography by SPSA utilizing Propeller Trimble Stratus software (**Figure 1**).
- Cells V and VI Top of Operational Layer or Bottom of Waste Grading Plan (**Figure 2**, provided by HRD).
- Cells V and VI Permitted Top of Waste Grading Plan (**Figure 3**, provided by HRD).

2.2 INCREMENTAL CONSUMED AIRSPACE

The aggregate incremental consumed airspace (the calculated volume between the December 2022 and December 2023 topographic maps) during the analysis period was calculated to be **544,151** cubic yards of fill. The fill volume represents the amount of waste placed in the landfill during the analysis period. A color-coded elevation isopac of waste surface changes during the analysis period is presented in **Figure 1**.

2.3 ACTIVE AREA CONSUMED AIRSPACE

The active area of the landfill during the analysis period was delineated using elevations isopac between the December 2022 and December 2023 topographic maps. The active area consumed airspace was calculated to be **568,498** cubic yards. The delineated active area and a color-coded elevation isopac of waste placed in the active area during the analysis period is presented in **Figure 4**.

2.4 TOTAL CONSUMED AIRSPACE

The grading plan for the bottom of waste or the top of the operational layer at the bottom of the landfill (**Figure 2**) in Cells V and VI was compared to December 2023 topographic map to obtain the total consumed airspace. The total consumed airspace as of December 1, 2023, was calculated to be **13,120,142** cubic yards. The color-coded elevation isopac of waste in the landfill within the total consumed airspace is presented in **Figure 5**.

2.5 REMAINING PERMITTED AIRSPACE

Exterior slopes of Cells V and VI are not closed; therefore, the entire surface of Cells V and VI was included in calculations for the remaining permitted airspace. The grading plan for the permitted top of waste was provided by HDR (**Figure 3**). The remaining permitted airspace as of December 1, 2023, was calculated to be **2,319,412** cubic yards. The color-coded elevation isopac of the remaining permitted airspace is presented in **Figure 6**.

2.6 RECOVERABLE AIRSPACE

A grading plan was developed for areas of fill greater than 5 in the vertical dimension above waste surface created by the settlement of waste over time. Only the space on the landfill side slopes up to the level of the existing waste top plateau was considered for the grading plan. Since the boundary of the top plateau of existing waste varies in elevation, the top of the recoverable airspace varies accordingly. The recoverable airspace excludes that actual top surface of the existing access road. Space less than 5 feet in vertical dimension is considered unrecoverable due to difficulties in

removal of existing soils on surface and pushing waste down the slope to recover the space. Also, for this report, the relocation of the existing access road for recovering airspace was not attempted, similar to what was presented in the January 2022 (for 2021) HDR airspace report. The recoverable airspace grading plan is presented in **Figure 7**. The recoverable airspace between the developed grading plan and the December 2023 topographic map is **1,890,088** cubic yards. A color-coded elevation isopac of the recoverable airspace is presented in **Figure 8**.

Table 1 below summarizes the airspace capacities calculated during this analysis.

Table 1. Summary of Airspace Capacities at SPSA Regional Landfill

Description	Volume (cubic yards)
Incremental Consumed Airspace	544,151
Active Area Consumed Airspace	568,498
Total Consumed Airspace	13,120,142
Remaining Permitted Airspace	2,319,412
Recoverable Airspace Remaining	1,890,088

3.0 WASTE DENSITY ANALYSIS

3.1 WASTE TONNAGE

The monthly tonnage of materials received at the site from December 2022 through December 2023 is presented in **Table 2**. The tonnage values for the months of December 2022 and December 2023 were interpolated to arrive at the tonnage numbers for the analysis period. The total tonnage deposited in the landfill during the analysis period was calculated to be 441,578 tons.

Table 2. Summary of 2023 Monthly Waste Flow Tonnages

Month	Weight (Tons)
December 2022 (from Dec 21st)	13,234
January 2023	33,409
February 2023	25,295
March 2023	30,101
April 2023	29,343
May 2023	40,185
June 2023	55,534
July 2023	41,791
August 2023	45,862
September	47,954
October	43,475
November	34,200
December (through Dec 1 st)	1,195
Total	441,578

Although cover material from the borrow pit (future Cell VII) is brought in on a daily basis and placed on the working face at the end of each day, the material is not weighed, and therefore not included in monthly waste flow tonnages shown in **Table 2**. Although not directly accounted for in the waste tonnages, the cover material is accounted for in the total airspace consumed, and therefore in the cumulative and operational waste density calculations discussed below.

3.2 WASTE DENSITY

Two different waste densities were considered in this analysis. The **cumulative waste density** is defined as the waste density based on total consumed airspace and total waste tonnage deposited in the landfill. The **operational waste density** is defined as the waste density based on active area consumed airspace and waste tonnage deposited in the landfill during the corresponding analysis period. **Table 3** presents the cumulative waste densities and operational waste densities from 2008 through 2023. Information for years 2008 through 2021 as reported by HDR in their January 2022 report. The cumulative waste density as of December 1, 2023, was calculated to be **1,966** lbs/cubic yards. The operational waste density for the analysis period in this report was calculated to be **1,623** lbs/cubic yards.

Table 3. Cumulative and Operational Waste Densities from 2008 through 2023

Airspace Management Report	Survey Date	Total Disposed to Date (Tons)	Total Airspace Consumed (cy)	Recoverable Airspace (cy)	Cumulative Waste Density (lbs/cy) ⁽¹⁾	Active Area Consumed Airspace (cy)	Operational Waste Density (lbs/cy)
February 2008	12/27/07	6,753,342	7,942,485	7,292,881	1,701		
February 2009	12/28/09	7,768,309	9,310,547	6,144,716	1,669		
November 2009	10/29/09	8,274,614	9,550,947	5,712,089	1,733		
January 2011	1/5/11	8,618,420	9,859,976	5,395,091	1,748		
February 2012	1/31/12	8,825,464	9,808,952	5,419,716	1,799		
February 2013	2/14/13	9,078,922	9,901,716	5,336,169	1,833		
March 2014	3/18/14	9,647,921	10,075,542	10,075,542	1,915		
March 2015	3/15/15	9,992,157	10,320,231	4,918,558	1,900		
November 2015	11/24/15	10,274,587	10,489,200	4,740,401	1,959		
January 2017	1/19/17	10,627,401	10,697,546	4,543,105	1,987		
December 2017	12/16/19	10,865,168	10,831,703	4,412,901	2,008	278,569	2,533
December 2018	12/17/18	11,177,785	11,152,613	3,728,814	2,005	204,462	2,326
December 2019	12/5/19	11,466,983	11,423,983	3,408,065	2,008	332,716	1,738
December 2020	12/15/20	11,805,770	11,821,884	3,036,939	1,997	355,981	1,903
December 2021	12/17/21	12,110,991	12,083,851	2,644,503	1,998	343,303	1,773
December 2022	12/21/22	12,457,943	12,368,354	2,436,918	2,014	330,976	2,096
December 2023	12/1/22	12,899,521	13,120,142	1,890,088	1,966	544,151	1,623

(1) Disposed includes both MSW and ash up to survey dates. Tonnage of clean soil fill from Clearfield and other imported soil used for daily and intermediate cover have been deducted from the disposed tons in 2022.

4.0 LANDFILL LIFE

4.1 CELLS V AND VI LIFE

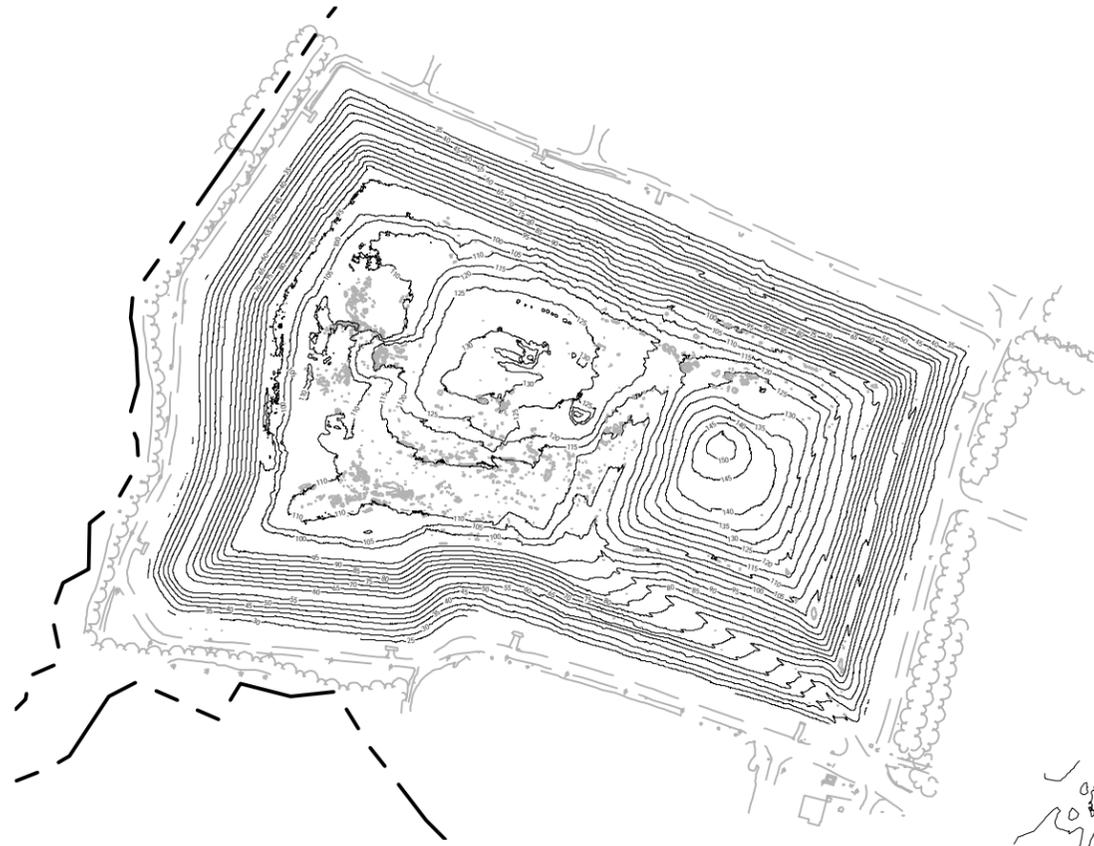
The current landfill operations include receipt of municipal solid waste (MSW) ash residue and MSW from the western SPSA communities. This operation is likely to remain unchanged through at least

June 30, 2024, at which time the contract with WIN Waste Innovations is anticipated to be terminated. Following termination of the WIN Waste Innovations agreement, it is anticipated that total of approximately 506,000 tons per year of MSW (450,000 tons of SPSA member MSW plus 56,000 tons of other waste materials), with a 1 percent annual growth rate, will be disposed of at the landfill at an estimated operational density of 1,600 lbs/cy (0.8 tons/cy).

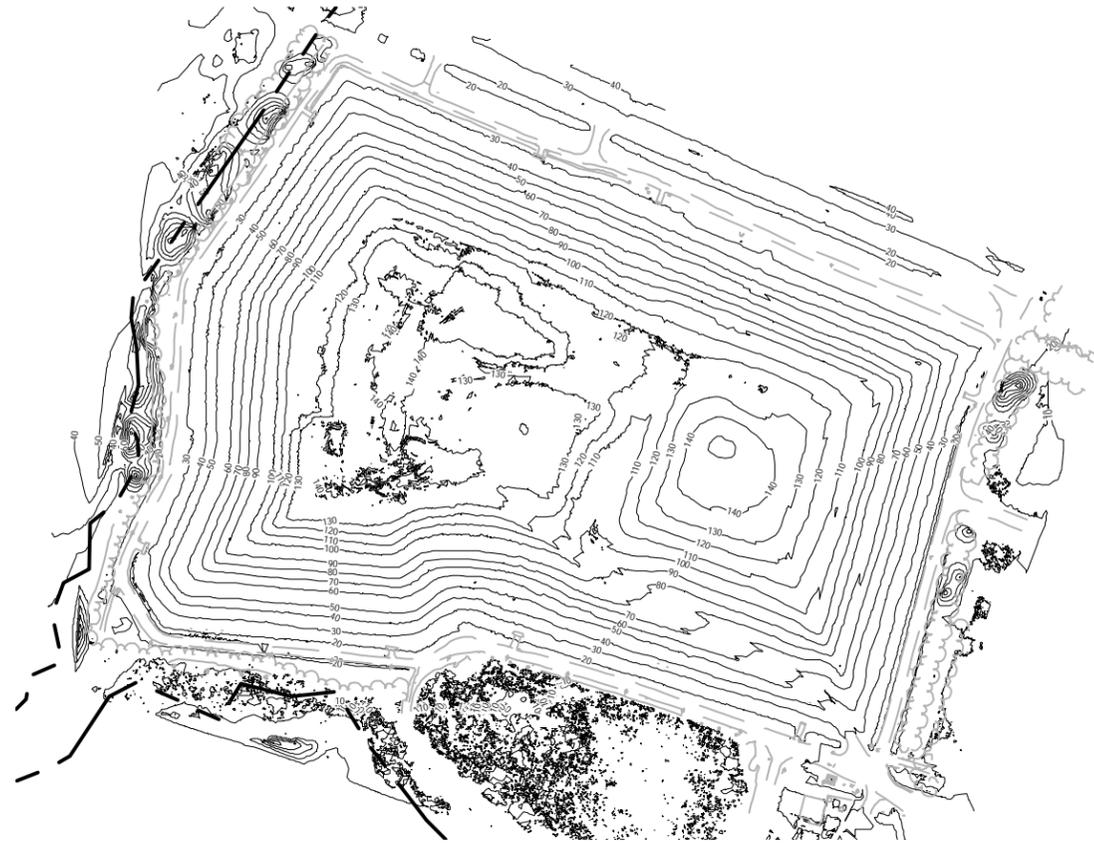
Using the anticipated overall operational waste density for 2024 of 1,600 lbs/cubic yards, the 1,890,088 cubic yards airspace (recoverable airspace) will be consumed approximately 3 years from the December 2023 survey, or by November 2026.

Figures

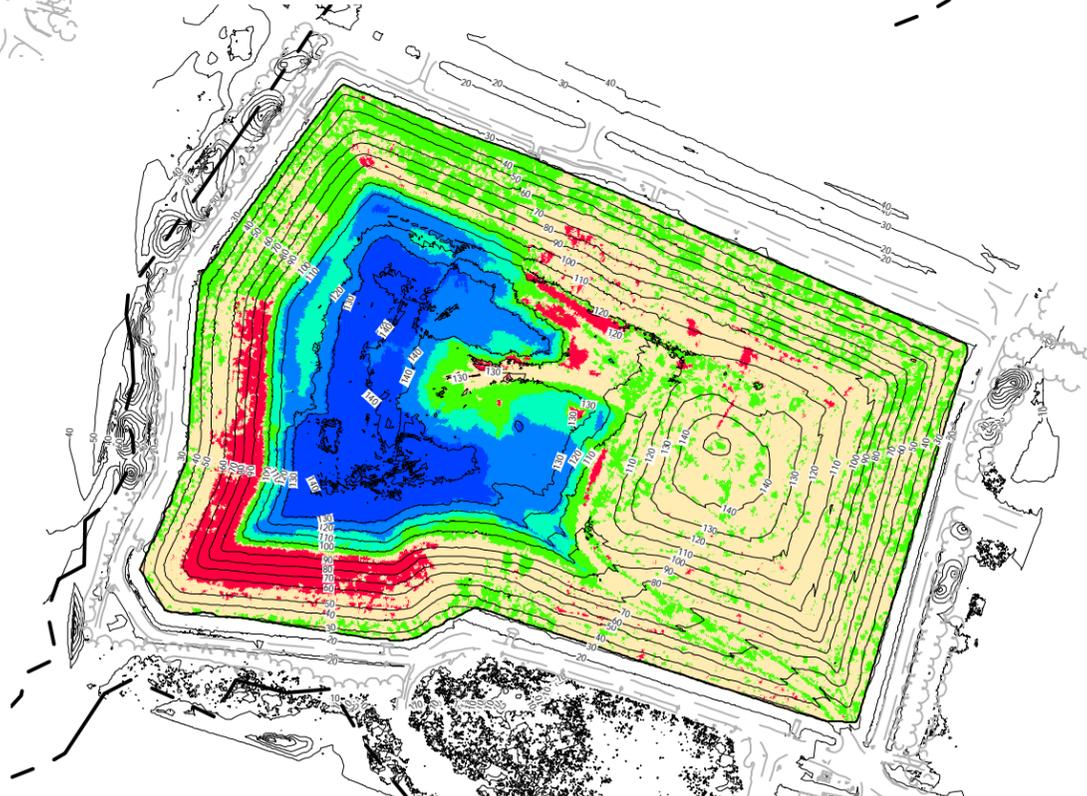
Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-7.89	-1.00	Red
2	-1.00	0.00	Orange
3	0.00	5.00	Yellow
4	5.00	10.00	Light Green
5	10.00	20.00	Blue
6	20.00	37.42	Dark Blue



TOPOGRAPHIC SURVEY
(DATED DECEMBER 21, 2022)



TOPOGRAPHIC SURVEY
(DATED DECEMBER 1, 2023)



CUT/FILL

LEGEND

--- PROPERTY BOUNDARY

--- LANDFILL BOUNDARY

NAME	CUT (Cu. Yd.)	FILL (Cu. Yd.)
SPSA TOPO 12-21-2022 VS. SPSA TOPO 12-01-2023	34,117	578,268

FIGURE 1. SPSA TOPO 12-21-2022 VS. SPSA TOPO 12-1-2023

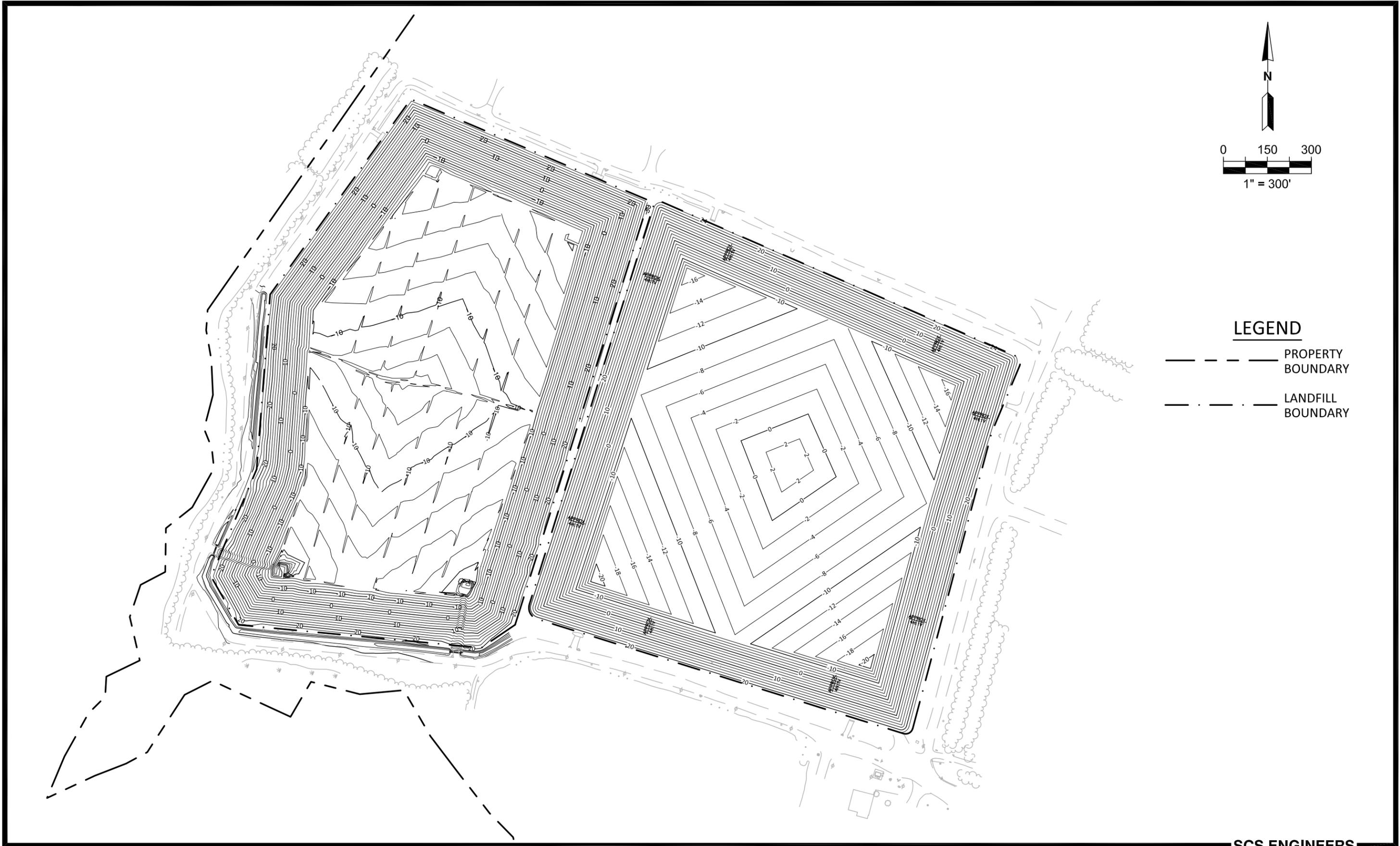
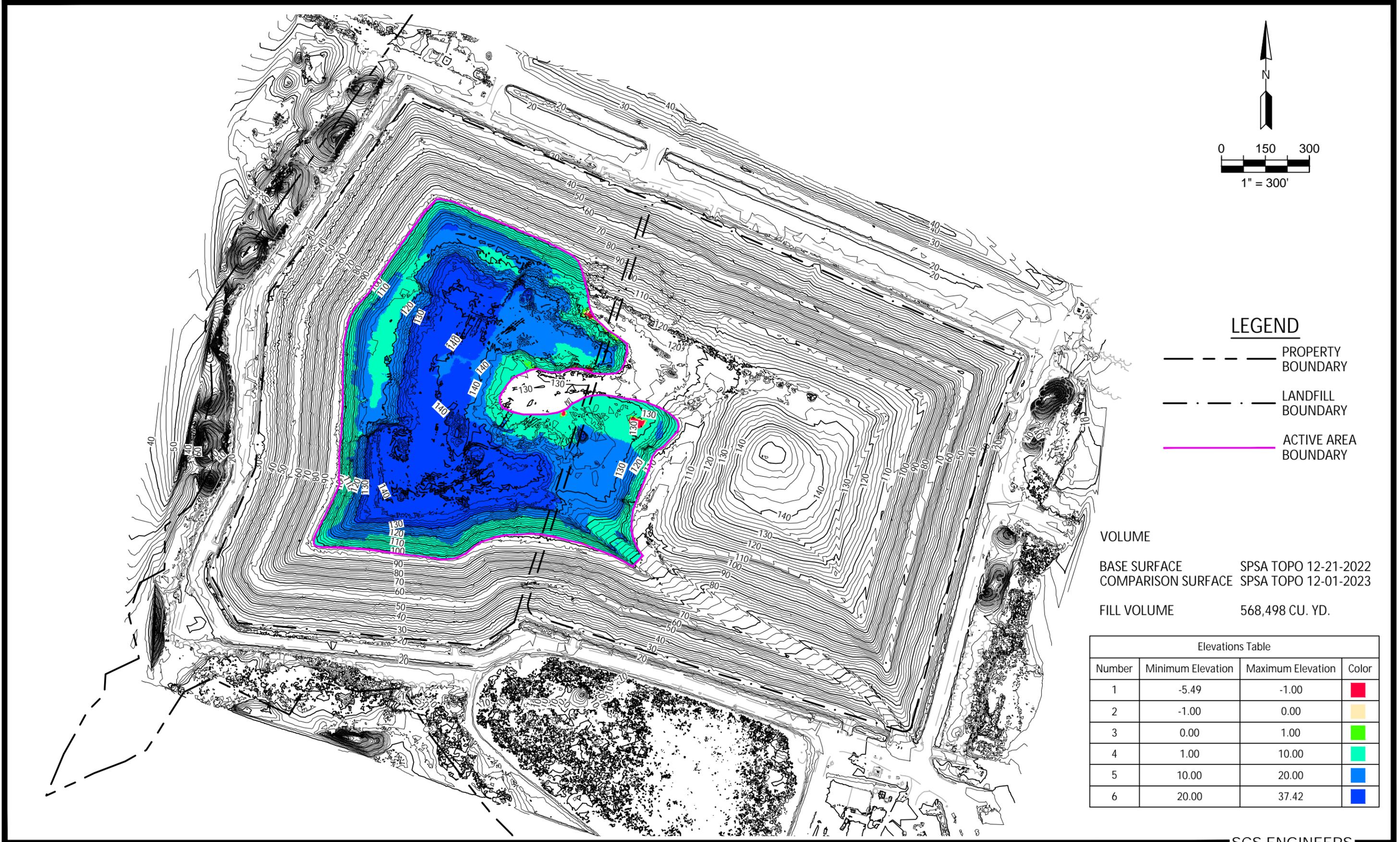


FIGURE 2. CELLS V AND VI TOP OF OPERATIONAL LAYER OR BOTTOM OF WASTE GRADING PLAN



FIGURE 3. CELLS V AND VI PERMITTED TOP OF WASTE GRADING PLAN



LEGEND

- PROPERTY BOUNDARY
- . - LANDFILL BOUNDARY
- ACTIVE AREA BOUNDARY

VOLUME

BASE SURFACE SPSA TOPO 12-21-2022
 COMPARISON SURFACE SPSA TOPO 12-01-2023
 FILL VOLUME 568,498 CU. YD.

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-5.49	-1.00	Red
2	-1.00	0.00	Yellow
3	0.00	1.00	Light Green
4	1.00	10.00	Green
5	10.00	20.00	Blue
6	20.00	37.42	Dark Blue

FIGURE 4. ELEVATION ISOPAC FOR 2023 ACTIVE AREA CONSUMED AIRSPACE

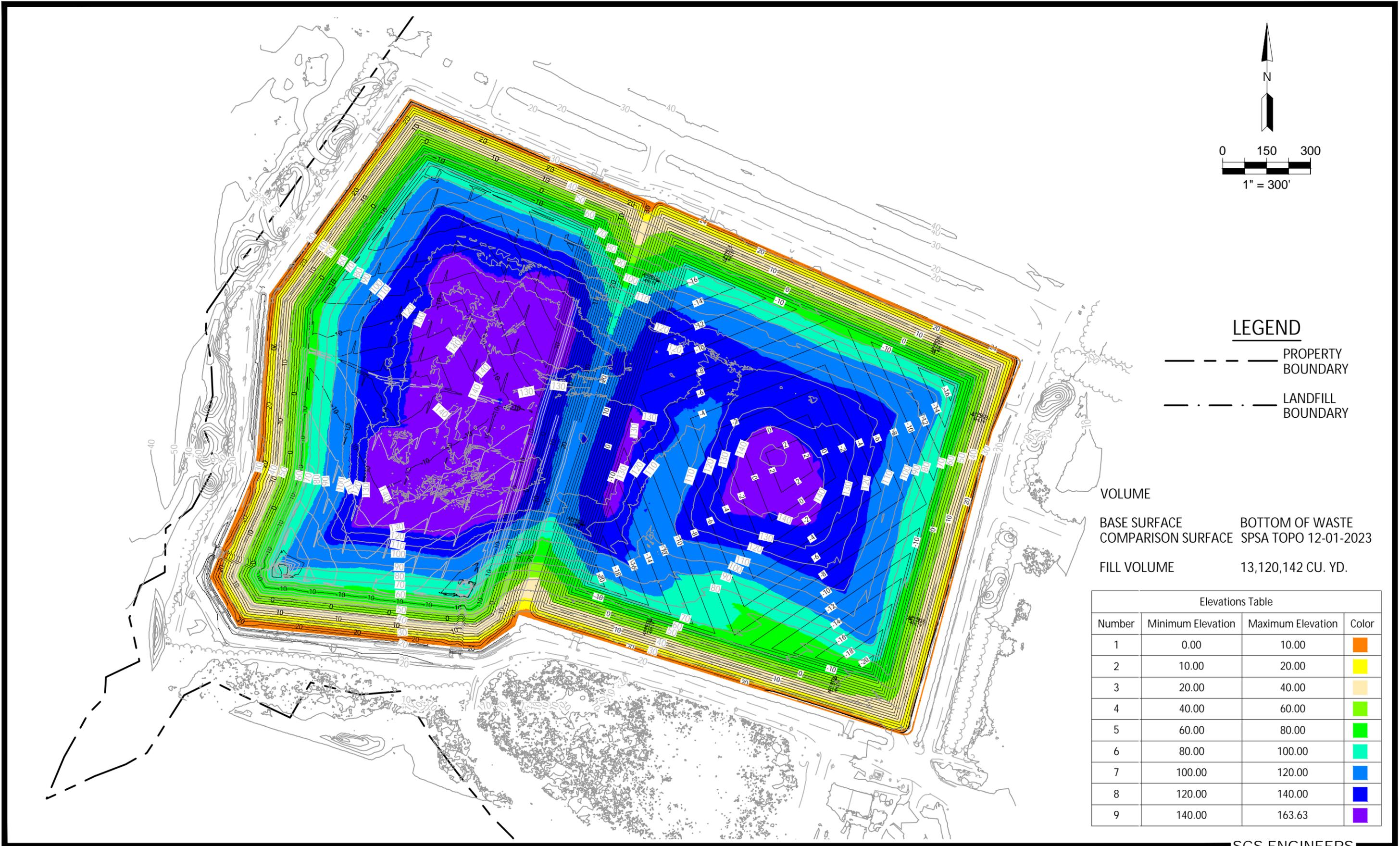
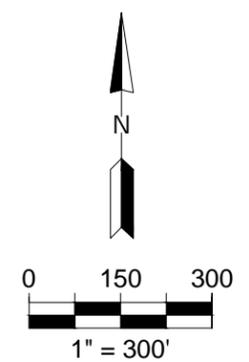
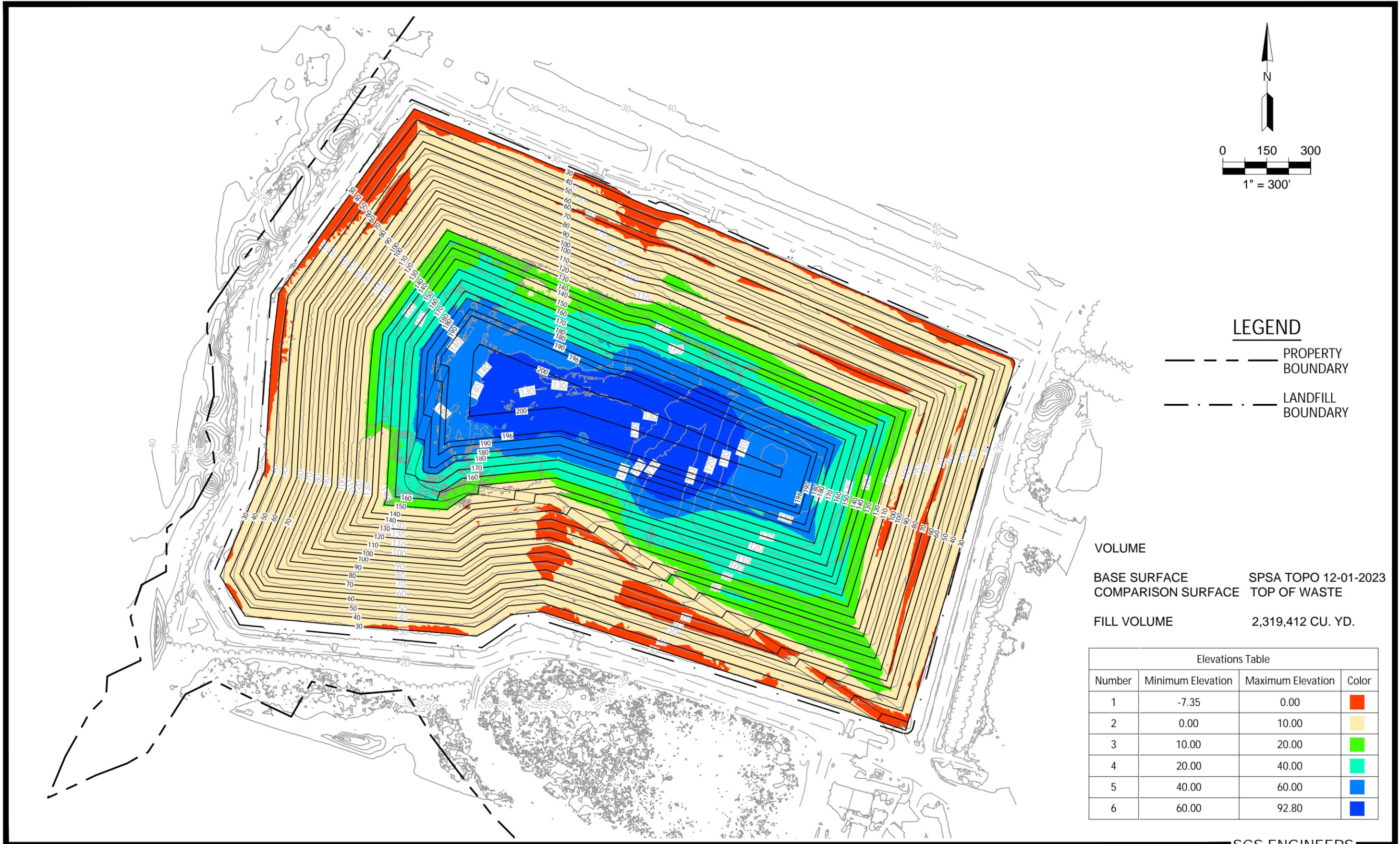


FIGURE 5. ELEVATION ISOPAC FOR 2023 TOTAL CONSUMED AIRSPACE



LEGEND

--- PROPERTY BOUNDARY

-.-.- LANDFILL BOUNDARY

VOLUME

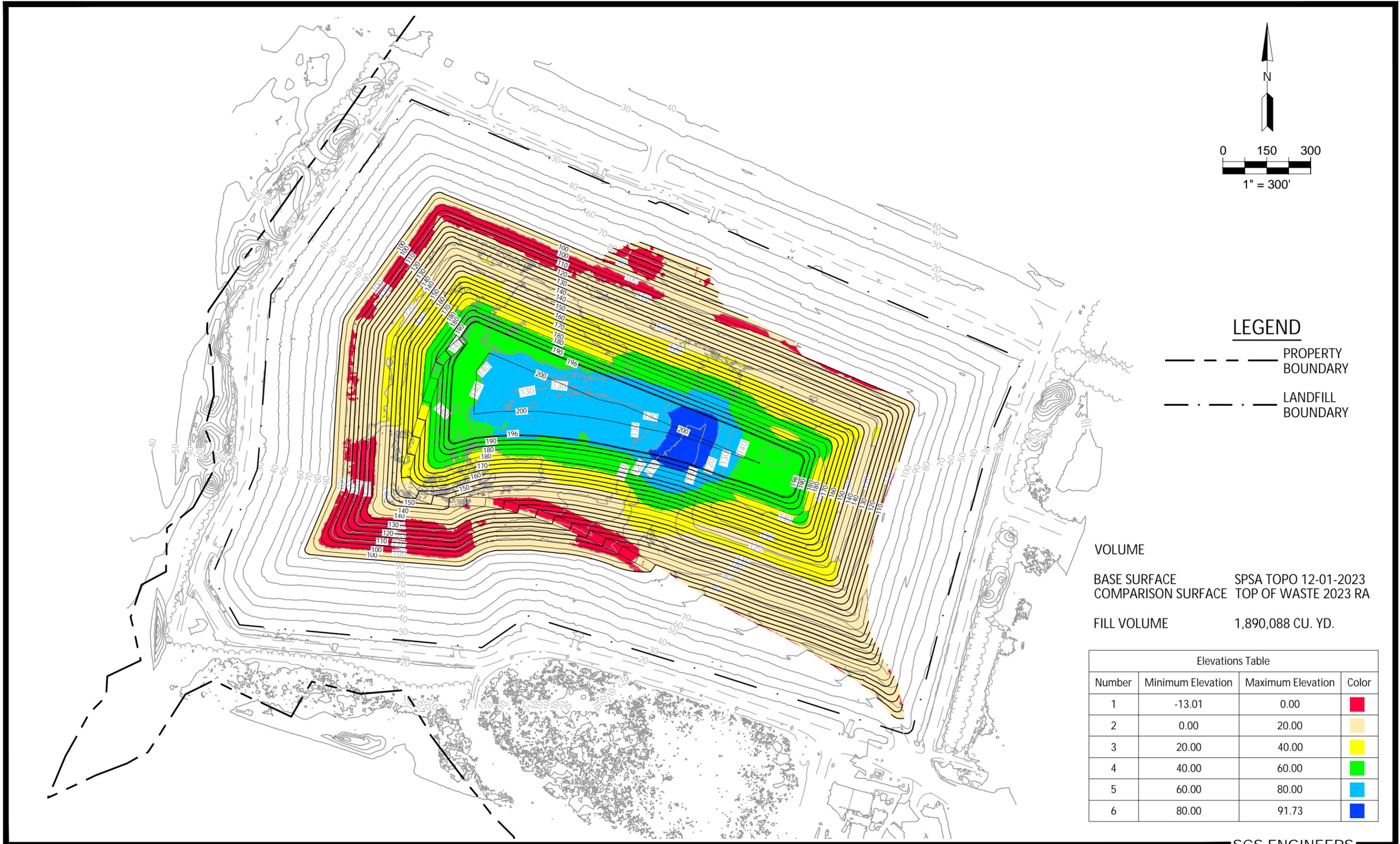
BASE SURFACE SPSA TOPO 12-01-2023

COMPARISON SURFACE TOP OF WASTE

FILL VOLUME 2,319,412 CU. YD.

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-7.35	0.00	Red
2	0.00	10.00	Yellow
3	10.00	20.00	Light Green
4	20.00	40.00	Teal
5	40.00	60.00	Blue
6	60.00	92.80	Dark Blue

FIGURE 6. ELEVATION ISOPAC FOR 2023 REMAINING PERMITTED AIRSPACE



LEGEND

- PROPERTY BOUNDARY
- . - . LANDFILL BOUNDARY

VOLUME
 BASE SURFACE SPSA TOPO 12-01-2023
 COMPARISON SURFACE TOP OF WASTE 2023 RA
 FILL VOLUME 1,890,088 CU. YD.

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-13.01	0.00	Red
2	0.00	20.00	Yellow
3	20.00	40.00	Green
4	40.00	60.00	Light Blue
5	60.00	80.00	Dark Blue
6	80.00	91.73	Blue

FIGURE 8. ELEVATION ISOPACH FOR 2023 RECOVERABLE AIRSAPCE