

Owner – Tank 1006 Dike Capacity Report

Location

NOVLUM INC. 

02/01/2022

OWNER – TANK 1006

LOCATION

CONTENTS

LIST OF FIGURES	2
LIST OF TABLES	2
1 INTRODUCTION	3
2 SUMMARY	3
3 SCAN INFORMATION	3
4 ANALYSIS.....	4
4.1 SCAN BENCHMARK	4
4.2 EXISTING CONTAINMENT ASSESSMENT	5

LIST OF FIGURES

Figure 1: Scan benchmark	4
Figure 2: Standard deviation of dike grids.....	6
Figure 3: Dike area	7
Figure 4: Dike filled to 21% (Cap. 8,593 bbl, Liq. Elev. 94 ft 4 in)	10
Figure 5: Dike filled to 41% (Cap. 16,606 bbl, Liq. Elev. 95 ft 8 in)	11
Figure 6: Dike filled to 61% (Cap. 24,716 bbl, Liq. Elev. 96 ft 11 in)	12
Figure 7: Dike filled to 80% (Cap. 32,761 bbl, Liq. Elev. 98 ft 1 in)	13
Figure 8: Dike filled to 101% (Cap. 41,254 bbl, Liq. Elev. 99 ft 3 in)	14
Figure 9: Dike filled to 121% (Cap. 49,378 bbl, Liq. Elev. 99 ft 4 in)	15
Figure 10: Dike filled to 141% (Cap. 57,595 bbl, Liq. Elev. 99 ft 4 in)	16
Figure 11: Dike filled to 160% (Cap. 65,557 bbl, Liq. Elev. 99 ft 4 in)	17
Figure 12: Dike filled to 182% (Cap. 74,236 bbl, Liq. Elev. 99 ft 4 in)	18
Figure 13: Dike filled to 202% (Cap. 82,419 bbl, Liq. Elev. 99 ft 4 in)	19
Figure 14: Dike overflow filled to 204% (Cap. 83,346 bbl, Liq. Elev. 99 ft 4 in).....	20

LIST OF TABLES

Table 1: Dike containment properties.....	5
Table 2: Dike volume vs. elevation	8

1 INTRODUCTION

The purpose of the examination was to assess the secondary containment capacity.

Calculations do not include displacement for support structures or pipelines. For Professional Engineer (PE) certified plans, the PE may need to account for site-specific conditions associated with the secondary containment structure, which may require modifications to these sample calculations to ensure good engineering practice.

2 SUMMARY

The following analysis shows that the dike **can** contain the required containment volume of the largest tank in the dike area.

Shell volume	40,851 bbl
Containment volume	44,936 bbl (110%)
Dike volume	83,346 bbl (204%)

3 SCAN INFORMATION

40 scans were taken of the dike area of Tank 1006 and merged into the final 3D model used for the data analysis.

4 ANALYSIS

4.1 SCAN BENCHMARK

The scan benchmark was concrete pad west of the tank. The benchmark elevation was set at 100 ft 0 in.

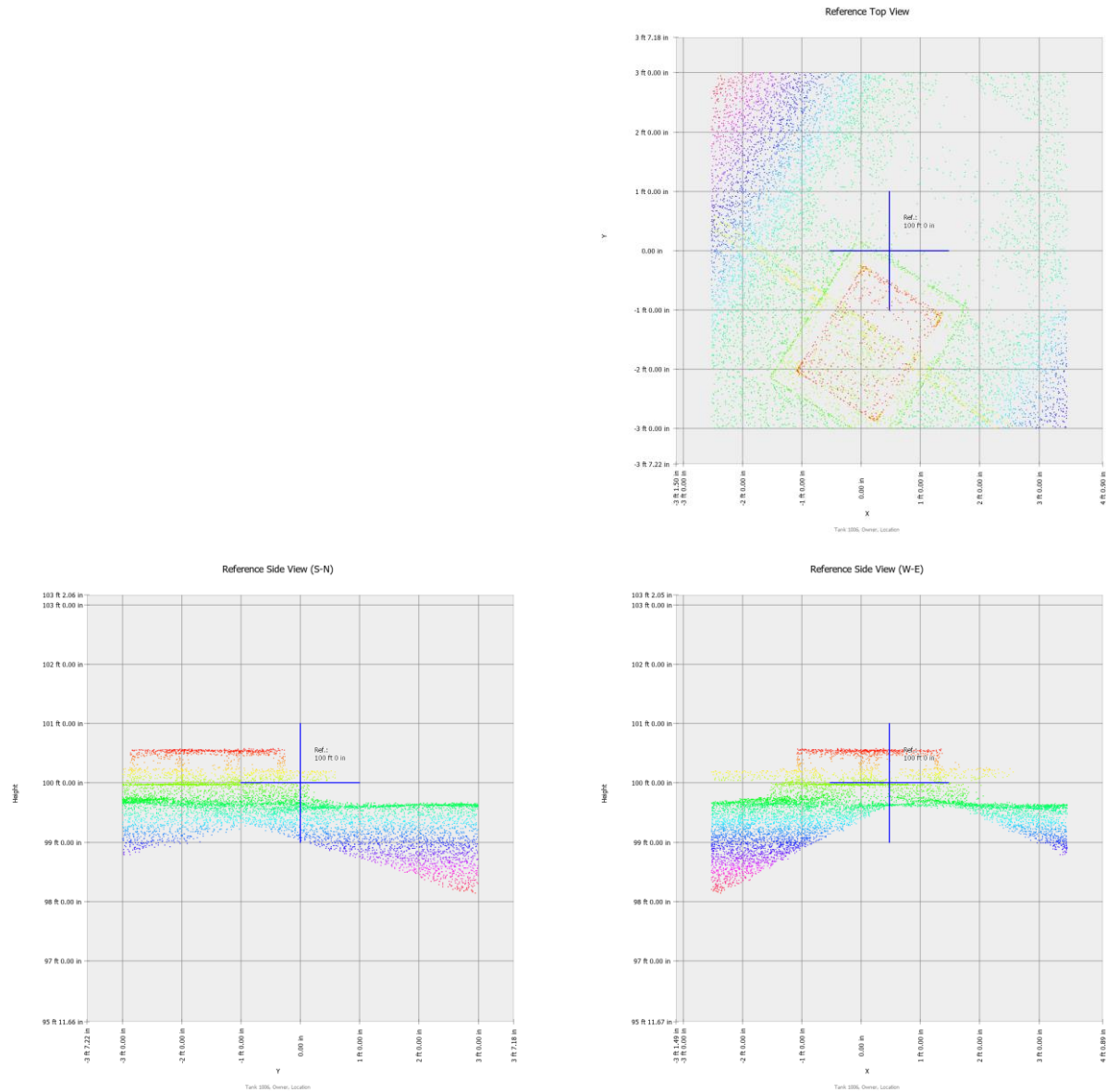


Figure 1: Scan benchmark

4.2 EXISTING CONTAINMENT ASSESSMENT

The scan benchmark was used as the point of reference for the dike analysis. The scan benchmark elevation was set at 100 ft 0 in, and all elevations are with respect to this point.

Table 1: Dike containment properties

Tank ID	Tank 1006
Shell bottom elevation	93 ft 7 in
Shell diameter	78 ft 0.00 in
Shell height	48 ft 0.00 in
Shell volume	40,851 bbl
Containment volume	44,936 bbl (110%)
Dike elevation at low point	89 ft 6 in
Dike fill elevation at overflow	99 ft 0 in
Dike area at overflow	104,499 ft ²
Dike volume at overflow	83,346 bbl (204%)
Dike volume uncertainty	286 bbl (1%)
Dike data precision (1σ)	0.18 in

Standard Deviation

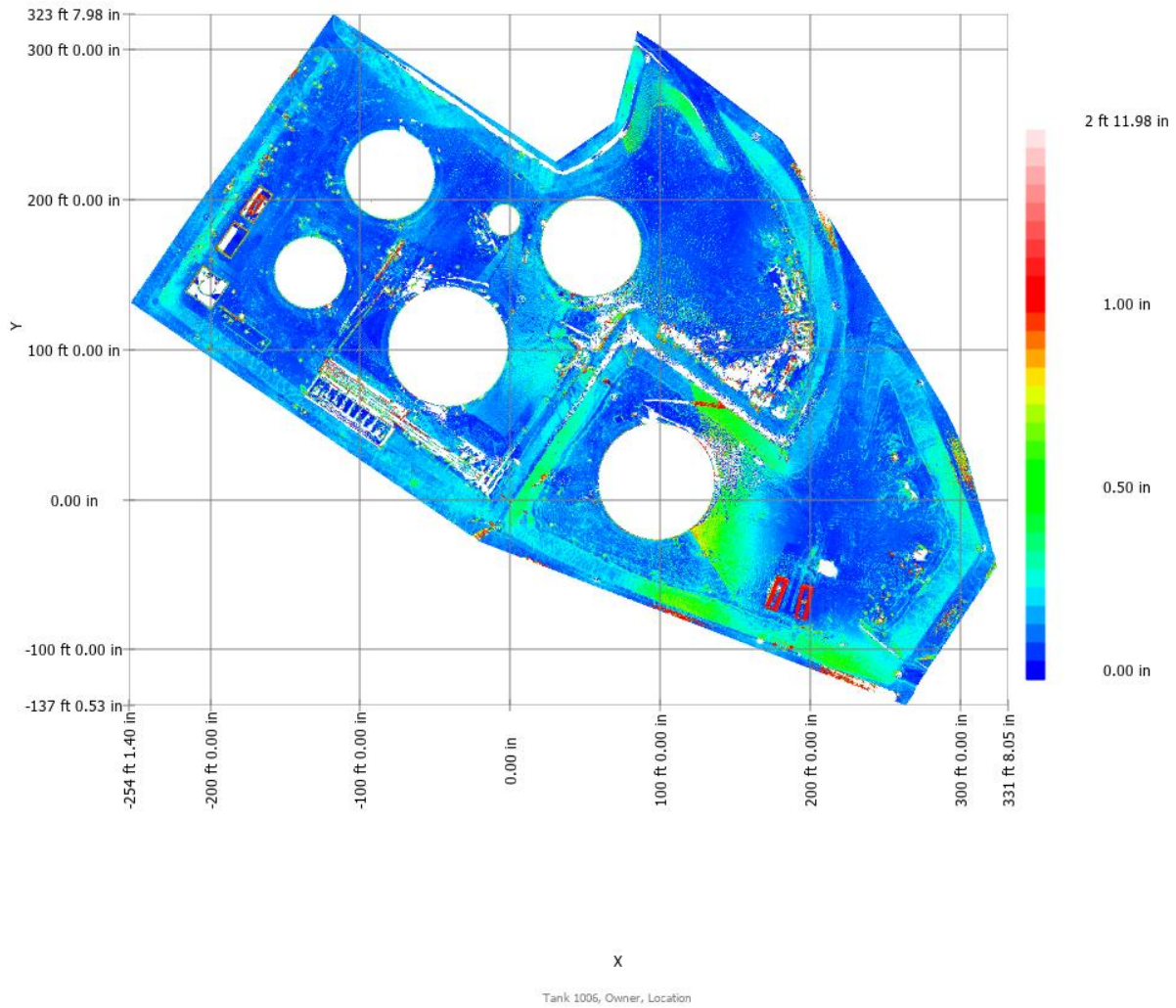


Figure 2: Standard deviation of dike grids

Dike Area

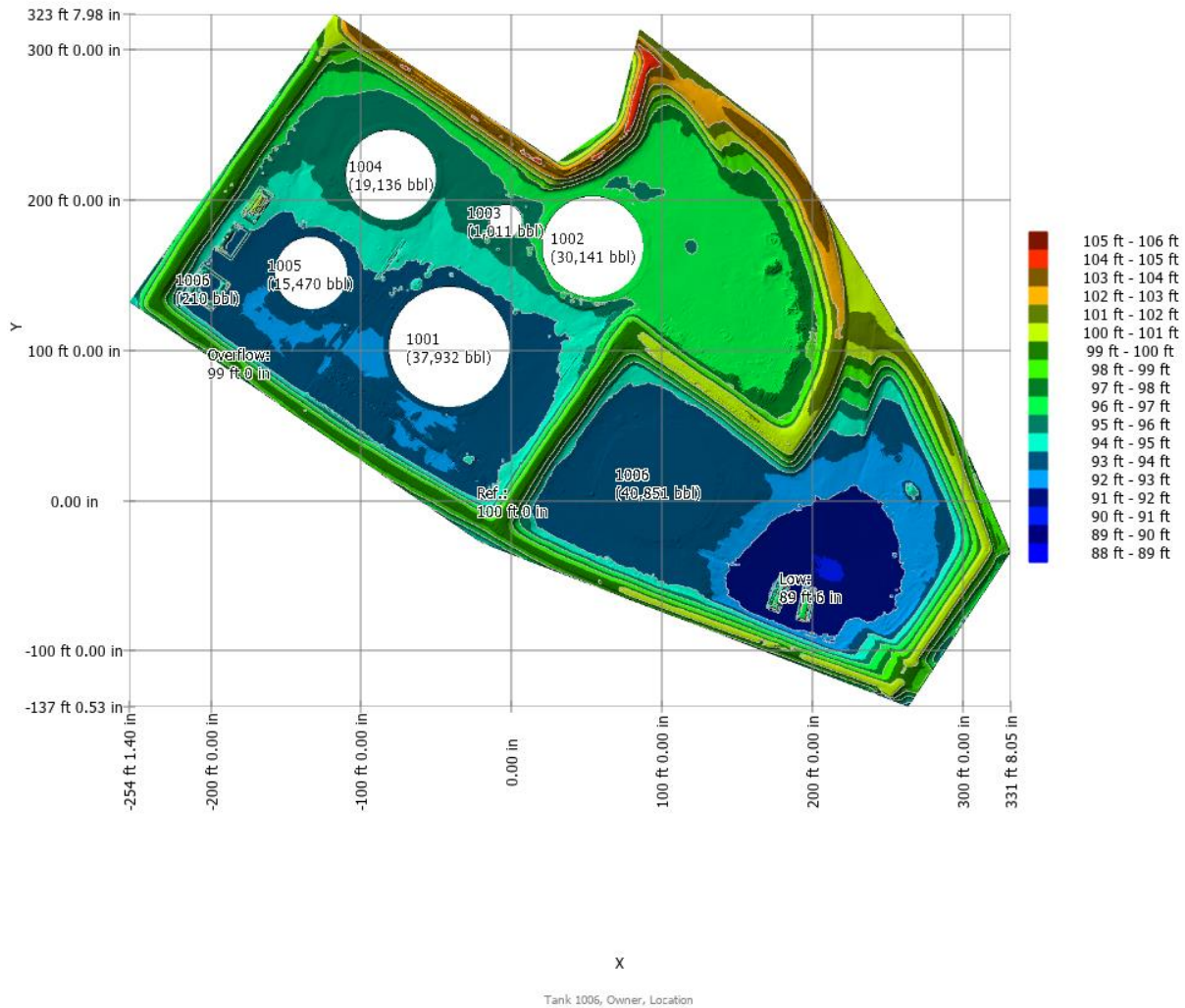


Figure 3: Dike area

Table 2: Dike volume vs. elevation

Liquid Height (ft-in)	Area (ft²)	Incr. Capacity (bbl)	Capacity (bbl)	% of Shell Volume (%)
89' 7"	0	0	0	0
89' 8"	0	0	0	0
89' 9"	0	0	0	0
89' 10"	0	0	0	0
89' 11"	0	0	0	0
90' 0"	0	0	0	0
90' 1"	0	0	0	0
90' 2"	0	0	0	0
90' 3"	0	0	0	0
90' 4"	0	0	0	0
90' 5"	0	0	0	0
90' 6"	0	0	0	0
90' 7"	0	0	0	0
90' 8"	0	0	0	0
90' 9"	0	0	0	0
90' 10"	0	0	0	0
90' 11"	1	0	0	0
91' 0"	104	1	1	0
91' 1"	353	5	6	0
91' 2"	775	11	17	0
91' 3"	1,311	19	36	0
91' 4"	1,930	29	65	0
91' 5"	2,728	40	105	0
91' 6"	3,506	52	157	0
91' 7"	4,316	64	221	1
91' 8"	5,103	76	297	1
91' 9"	5,798	86	383	1
91' 10"	6,453	96	479	1
91' 11"	7,061	105	584	1
92' 0"	7,607	113	697	2
92' 1"	8,141	121	818	2
92' 2"	8,612	128	946	2
92' 3"	9,062	135	1,080	3
92' 4"	9,531	141	1,222	3
92' 5"	10,002	148	1,370	3
92' 6"	10,505	156	1,526	4
92' 7"	11,053	164	1,690	4
92' 8"	11,573	172	1,862	5
92' 9"	12,185	181	2,043	5
92' 10"	12,800	190	2,233	5
92' 11"	13,461	200	2,432	6
93' 0"	14,004	208	2,640	6
93' 1"	14,576	216	2,857	7
93' 2"	15,162	226	3,082	8
93' 3"	15,783	235	3,317	8
93' 4"	17,193	253	3,570	9
93' 5"	19,290	286	3,856	9
93' 6"	21,256	316	4,172	10
93' 7"	22,834	340	4,512	11
93' 8"	28,603	425	4,937	12
93' 9"	29,277	435	5,372	13
93' 10"	29,848	443	5,815	14
93' 11"	30,322	450	6,265	15
94' 0"	30,714	456	6,721	16
94' 1"	31,069	461	7,182	18
94' 2"	31,398	466	7,649	19
94' 3"	31,673	470	8,119	20
94' 4"	31,942	475	8,593	21
94' 5"	32,202	479	9,072	22
94' 6"	32,437	481	9,554	23
94' 7"	32,664	485	10,038	25
94' 8"	32,876	488	10,526	26
94' 9"	33,086	491	11,018	27
94' 10"	33,298	494	11,512	28
94' 11"	33,496	497	12,009	29
95' 0"	33,690	500	12,509	31
95' 1"	33,882	503	13,012	32
95' 2"	34,056	506	13,517	33
95' 3"	34,244	508	14,026	34
95' 4"	34,420	511	14,537	36
95' 5"	34,596	513	15,050	37
95' 6"	34,768	516	15,566	38
95' 7"	34,938	519	16,085	39
95' 8"	35,108	521	16,606	41
95' 9"	35,275	524	17,129	42
95' 10"	35,445	526	17,655	43
95' 11"	35,608	528	18,184	45
96' 0"	35,781	531	18,715	46
96' 1"	35,951	534	19,248	47
96' 2"	36,111	536	19,784	48
96' 3"	36,286	539	20,323	50
96' 4"	36,436	541	20,864	51
96' 5"	36,590	543	21,407	52
96' 6"	36,767	546	21,953	54
96' 7"	36,927	548	22,501	55
96' 8"	37,077	550	23,051	56
96' 9"	37,231	553	23,603	58
96' 10"	37,385	555	24,158	59
96' 11"	37,560	557	24,716	61

97' 0"	37,724	560	25,276	62
97' 1"	37,875	562	25,838	63
97' 2"	38,029	564	26,402	65
97' 3"	38,182	567	26,969	66
97' 4"	38,332	569	27,538	67
97' 5"	38,486	571	28,109	69
97' 6"	38,638	573	28,683	70
97' 7"	38,790	576	29,258	72
97' 8"	38,943	578	29,836	73
97' 9"	39,099	580	30,417	74
97' 10"	39,252	583	30,999	76
97' 11"	39,406	585	31,584	77
98' 0"	39,561	587	32,171	79
98' 1"	39,714	589	32,761	80
98' 2"	39,869	592	33,352	82
98' 3"	40,020	594	33,946	83
98' 4"	40,173	596	34,543	85
98' 5"	40,326	599	35,141	86
98' 6"	40,480	601	35,742	87
98' 7"	40,637	603	36,345	89
98' 8"	40,793	605	36,951	90
98' 9"	40,947	608	37,558	92
98' 10"	41,104	610	38,168	93
98' 11"	41,263	612	38,781	95
99' 0"	41,413	615	39,395	96
99' 1"	41,570	617	40,012	98
99' 2"	41,732	619	40,632	99
99' 3"	41,889	622	41,254	101
99' 4"	104,499	42,092	83,346	204

Dike filled to 21% (Cap. 8,593 bbl, Liq. Elev. 94 ft 4 in)

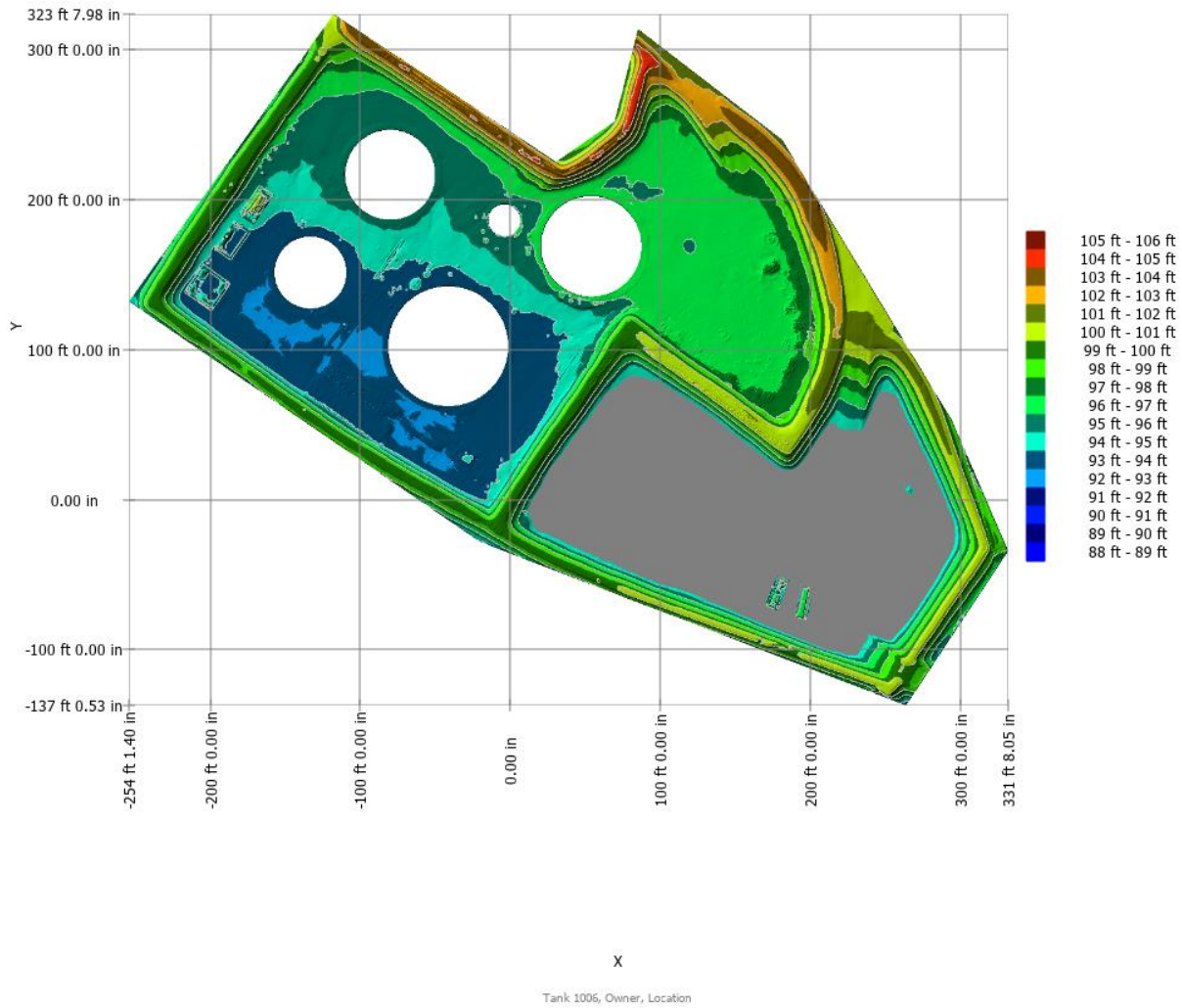


Figure 4: Dike filled to 21% (Cap. 8,593 bbl, Liq. Elev. 94 ft 4 in)

Dike filled to 41% (Cap. 16,606 bbl, Liq. Elev. 95 ft 8 in)

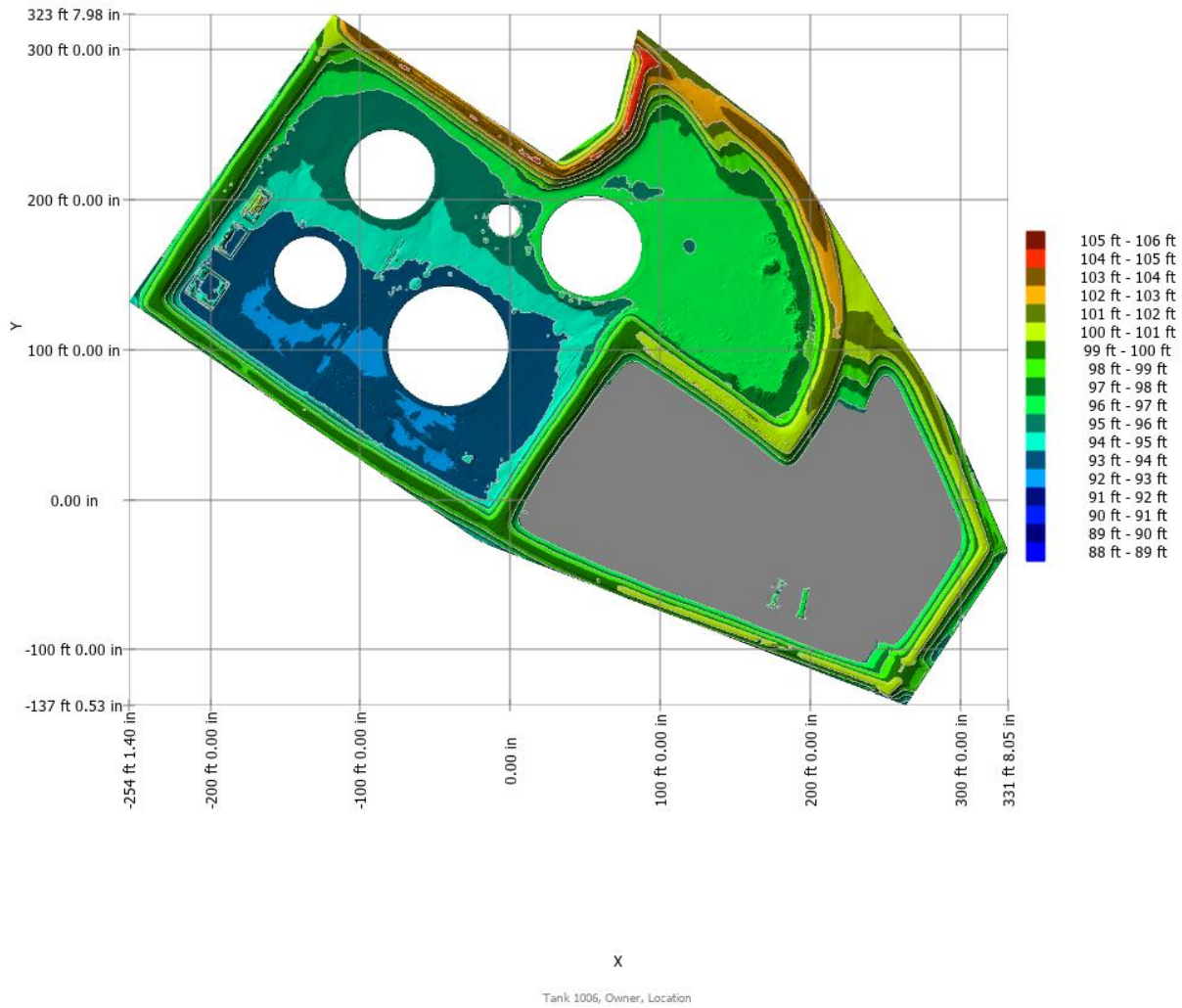


Figure 5: Dike filled to 41% (Cap. 16,606 bbl, Liq. Elev. 95 ft 8 in)

Dike filled to 61% (Cap. 24,716 bbl, Liq. Elev. 96 ft 11 in)

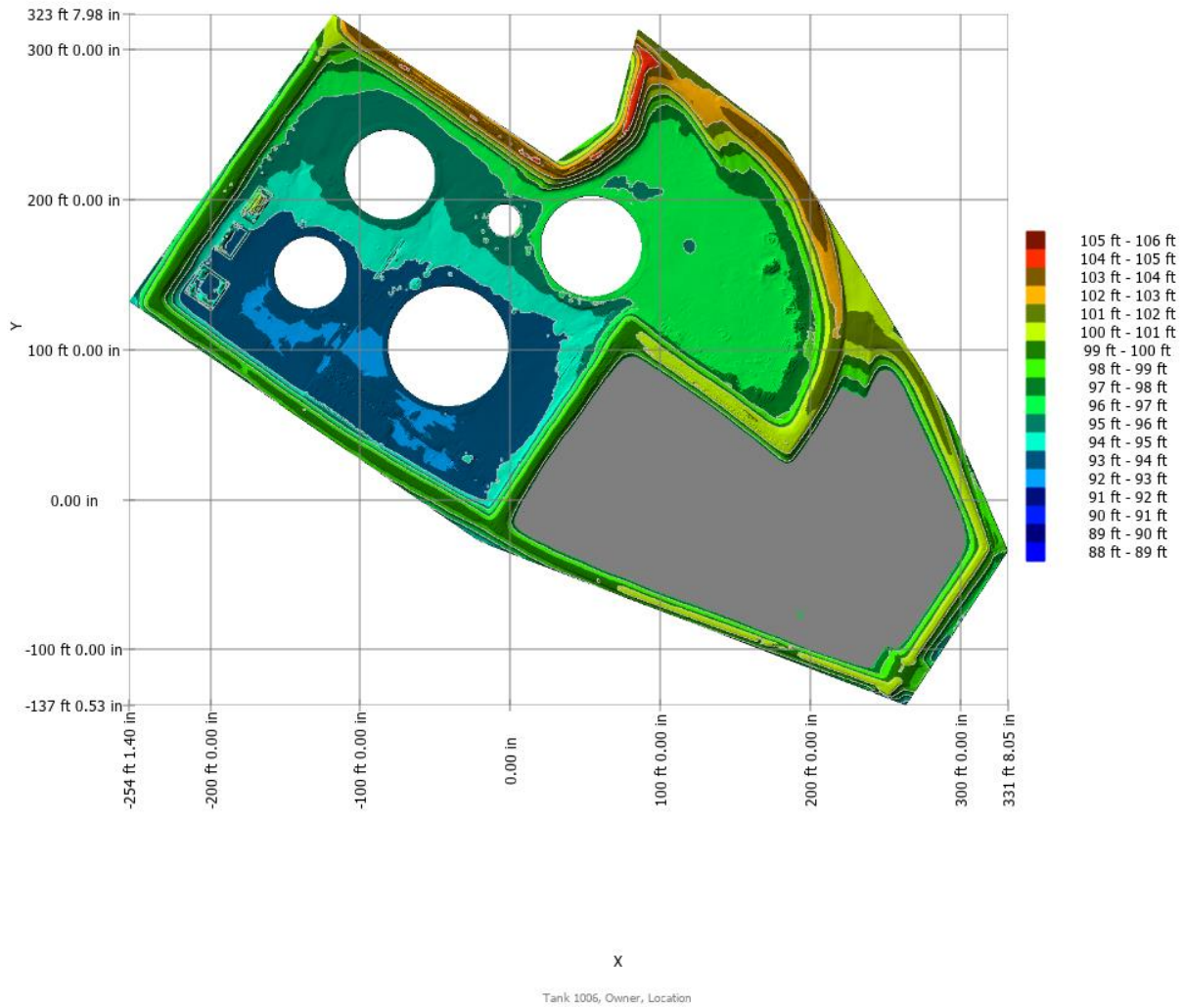


Figure 6: Dike filled to 61% (Cap. 24,716 bbl, Liq. Elev. 96 ft 11 in)

Dike filled to 80% (Cap. 32,761 bbl, Liq. Elev. 98 ft 1 in)

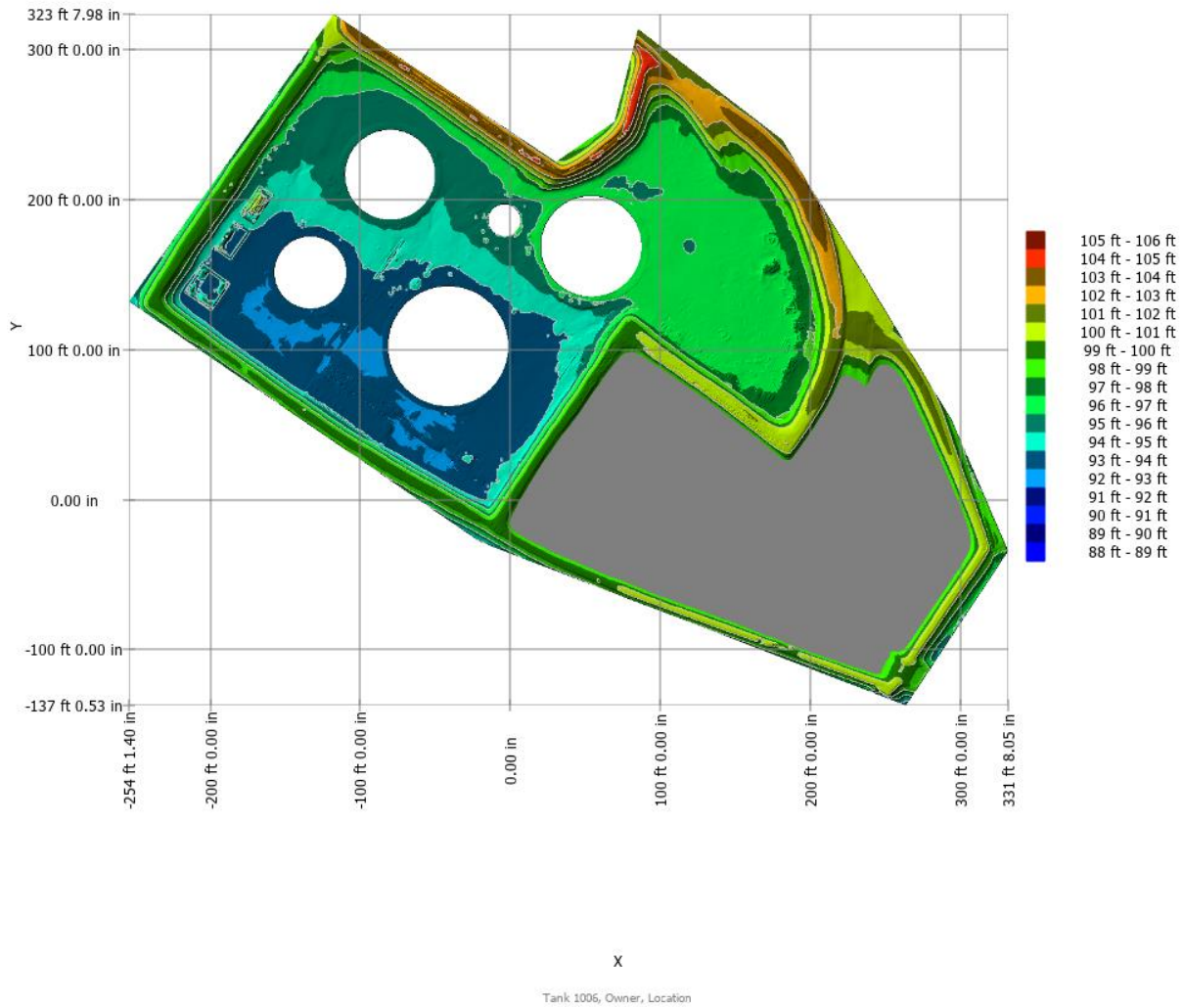


Figure 7: Dike filled to 80% (Cap. 32,761 bbl, Liq. Elev. 98 ft 1 in)

Dike filled to 101% (Cap. 41,254 bbl, Liq. Elev. 99 ft 3 in)

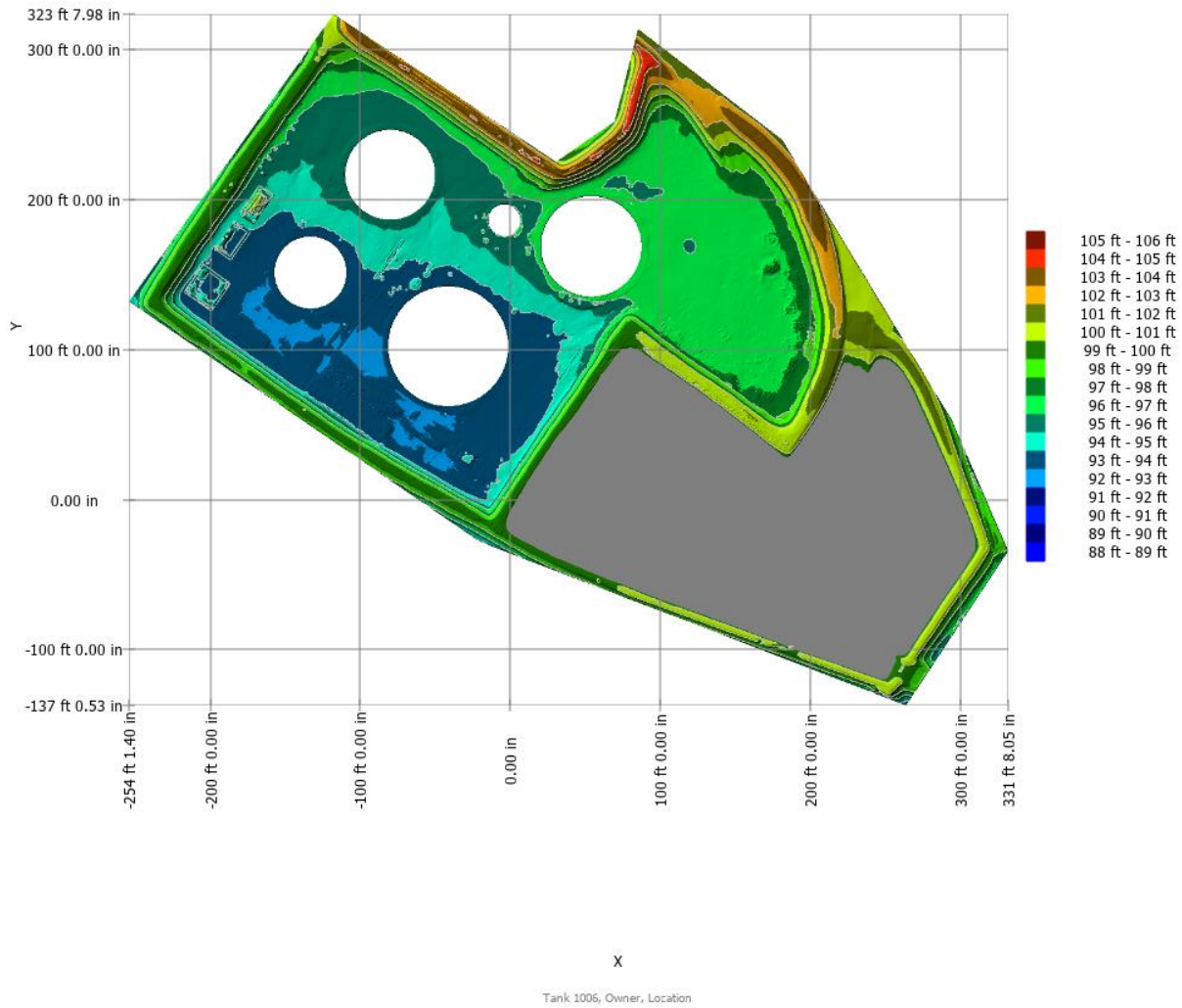


Figure 8: Dike filled to 101% (Cap. 41,254 bbl, Liq. Elev. 99 ft 3 in)

Dike filled to 121% (Cap. 49,378 bbl, Liq. Elev. 99 ft 4 in)

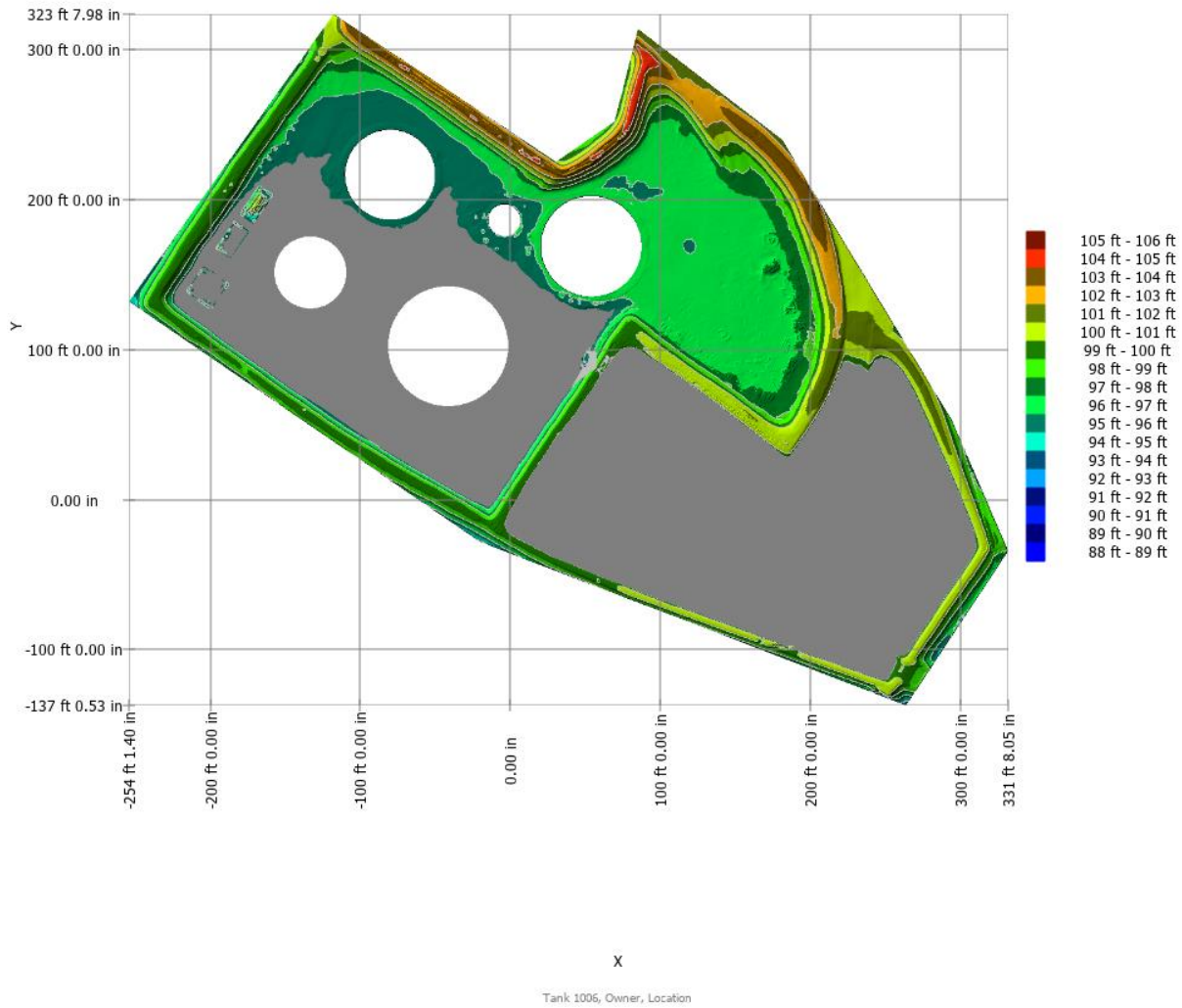


Figure 9: Dike filled to 121% (Cap. 49,378 bbl, Liq. Elev. 99 ft 4 in)

Dike filled to 141% (Cap. 57,595 bbl, Liq. Elev. 99 ft 4 in)

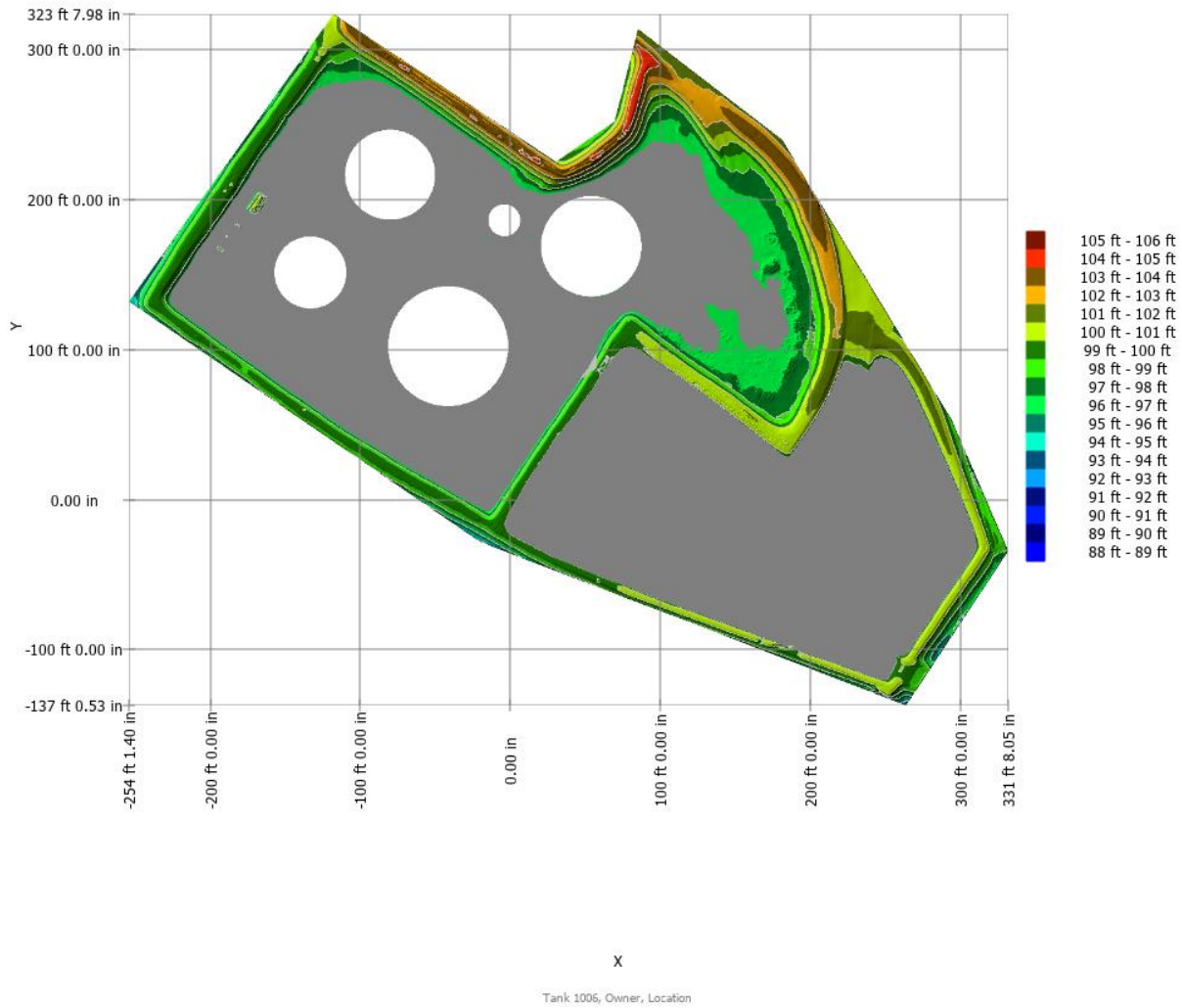


Figure 10: Dike filled to 141% (Cap. 57,595 bbl, Liq. Elev. 99 ft 4 in)

Dike filled to 160% (Cap. 65,557 bbl, Liq. Elev. 99 ft 4 in)

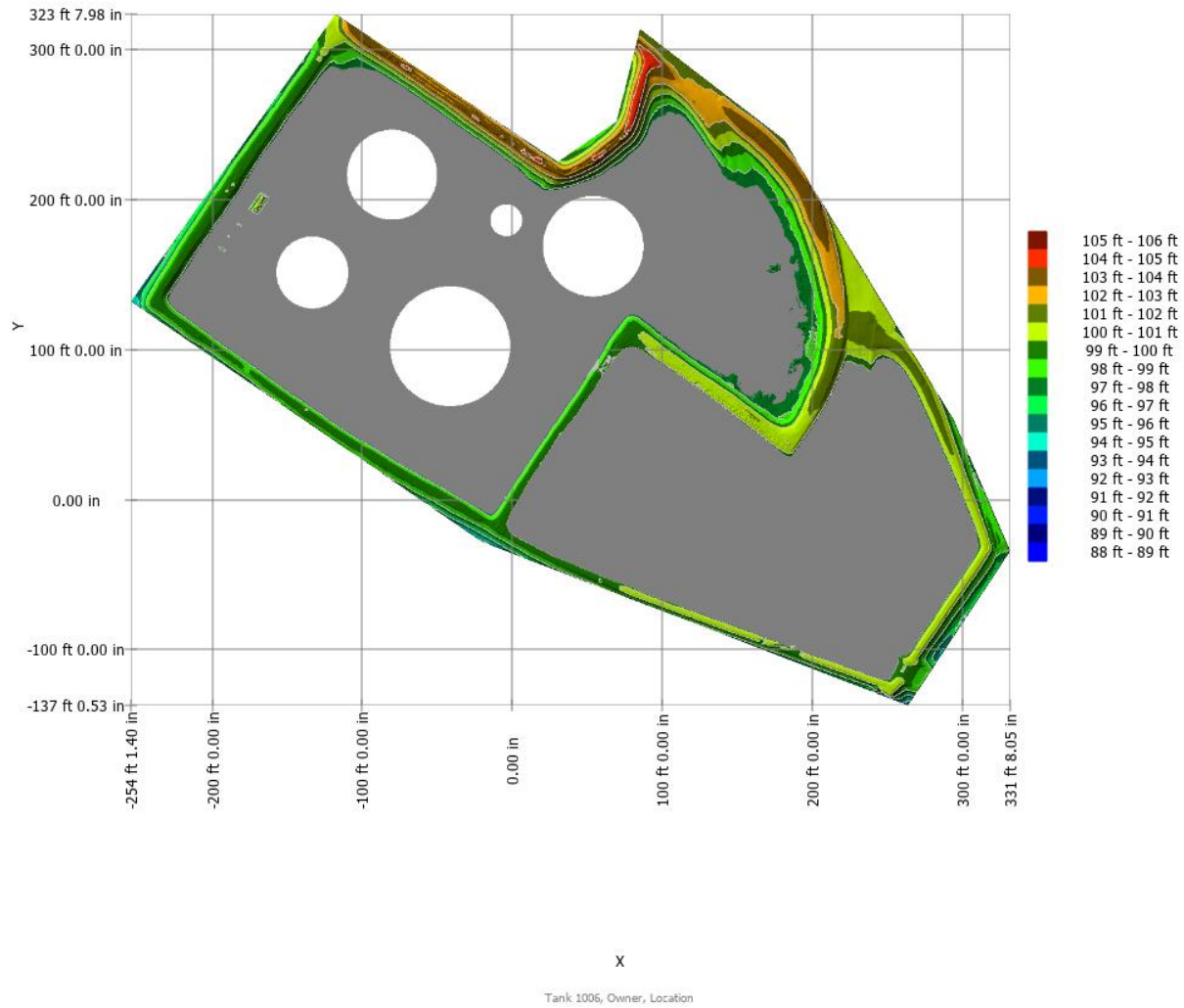


Figure 11: Dike filled to 160% (Cap. 65,557 bbl, Liq. Elev. 99 ft 4 in)

Dike filled to 182% (Cap. 74,236 bbl, Liq. Elev. 99 ft 4 in)

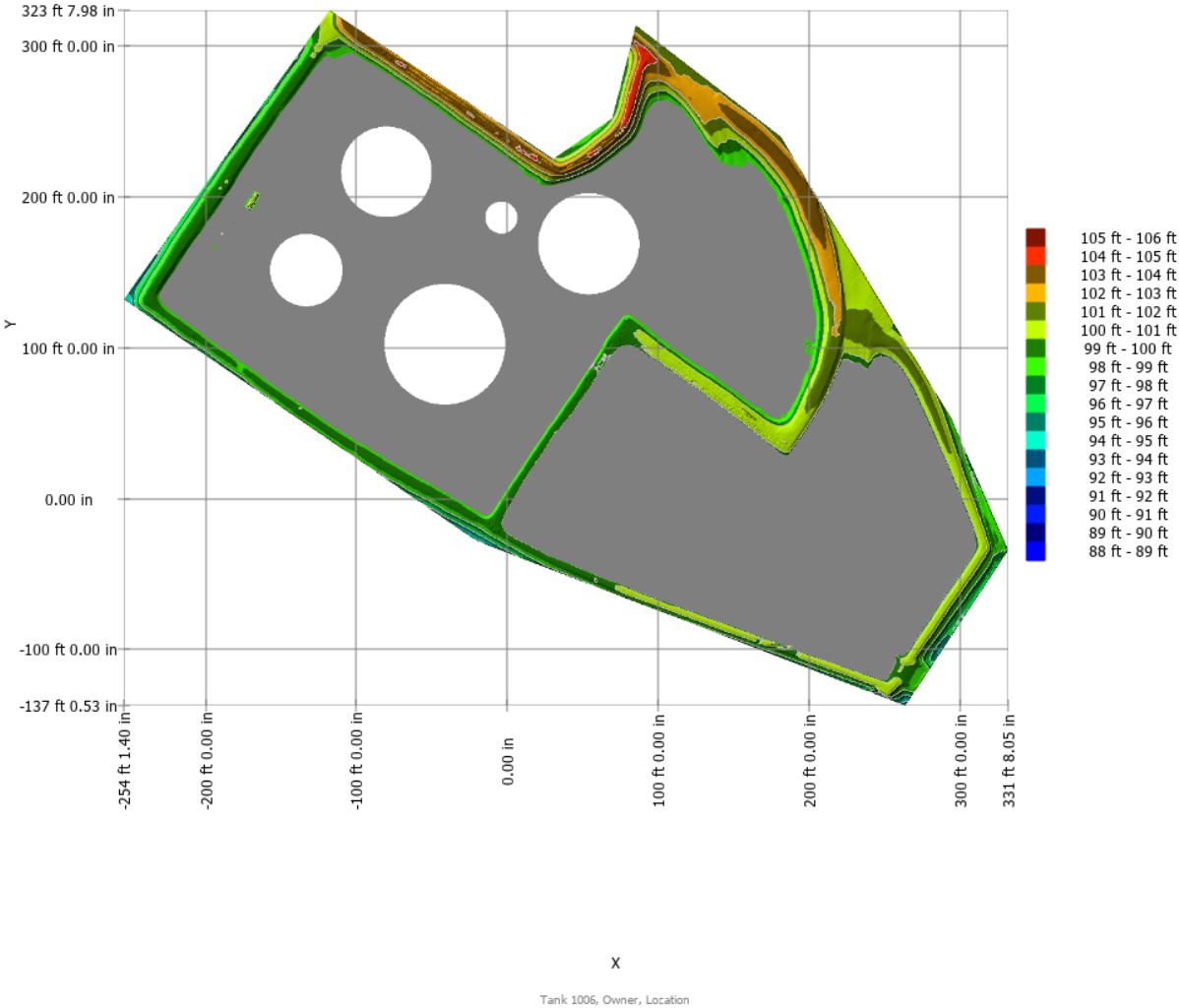


Figure 12: Dike filled to 182% (Cap. 74,236 bbl, Liq. Elev. 99 ft 4 in)

Dike filled to 202% (Cap. 82,419 bbl, Liq. Elev. 99 ft 4 in)

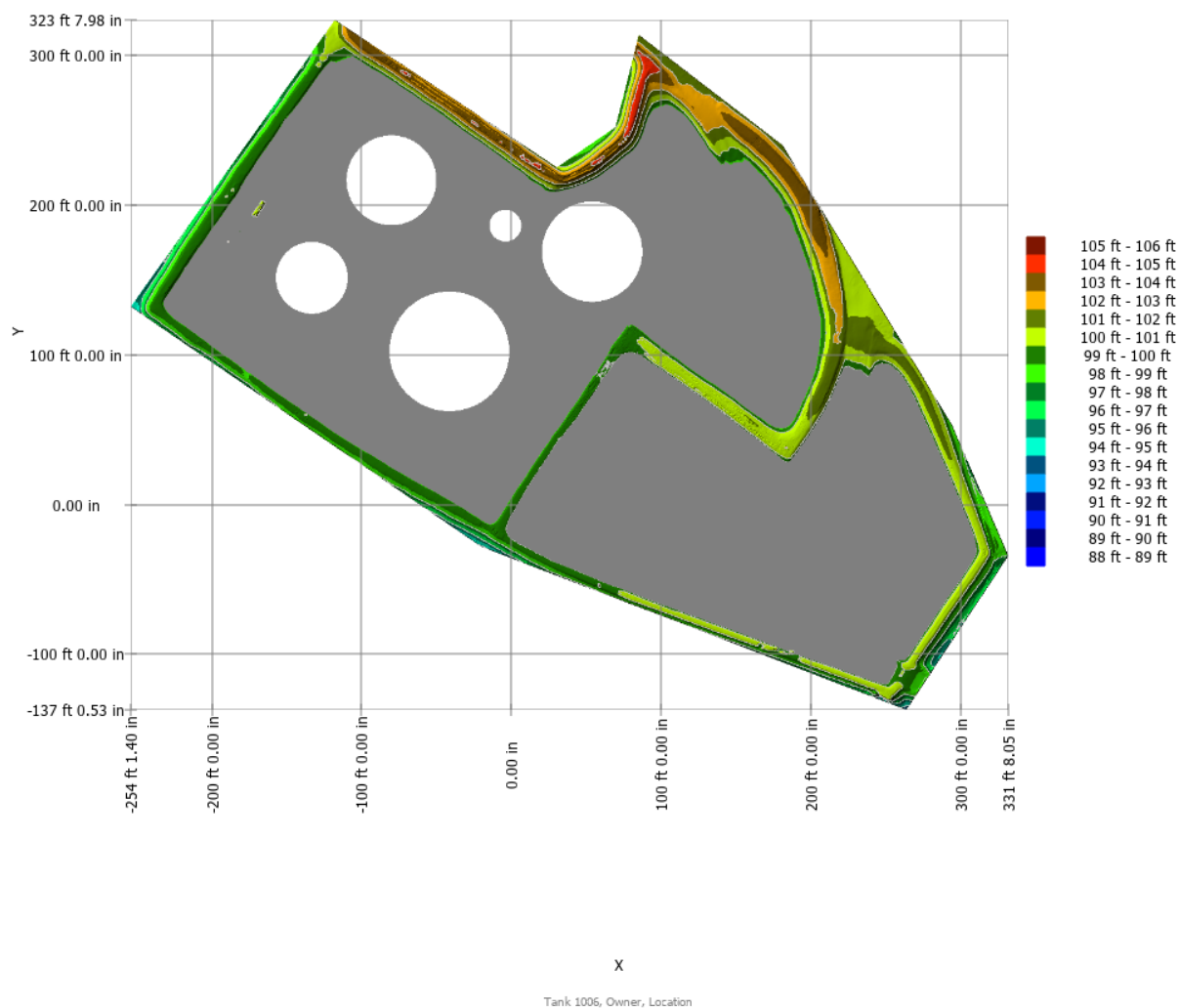


Figure 13: Dike filled to 202% (Cap. 82,419 bbl, Liq. Elev. 99 ft 4 in)

Dike overflow filled to 204% (Cap. 83,346 bbl, Liq. Elev. 99 ft 4 in)

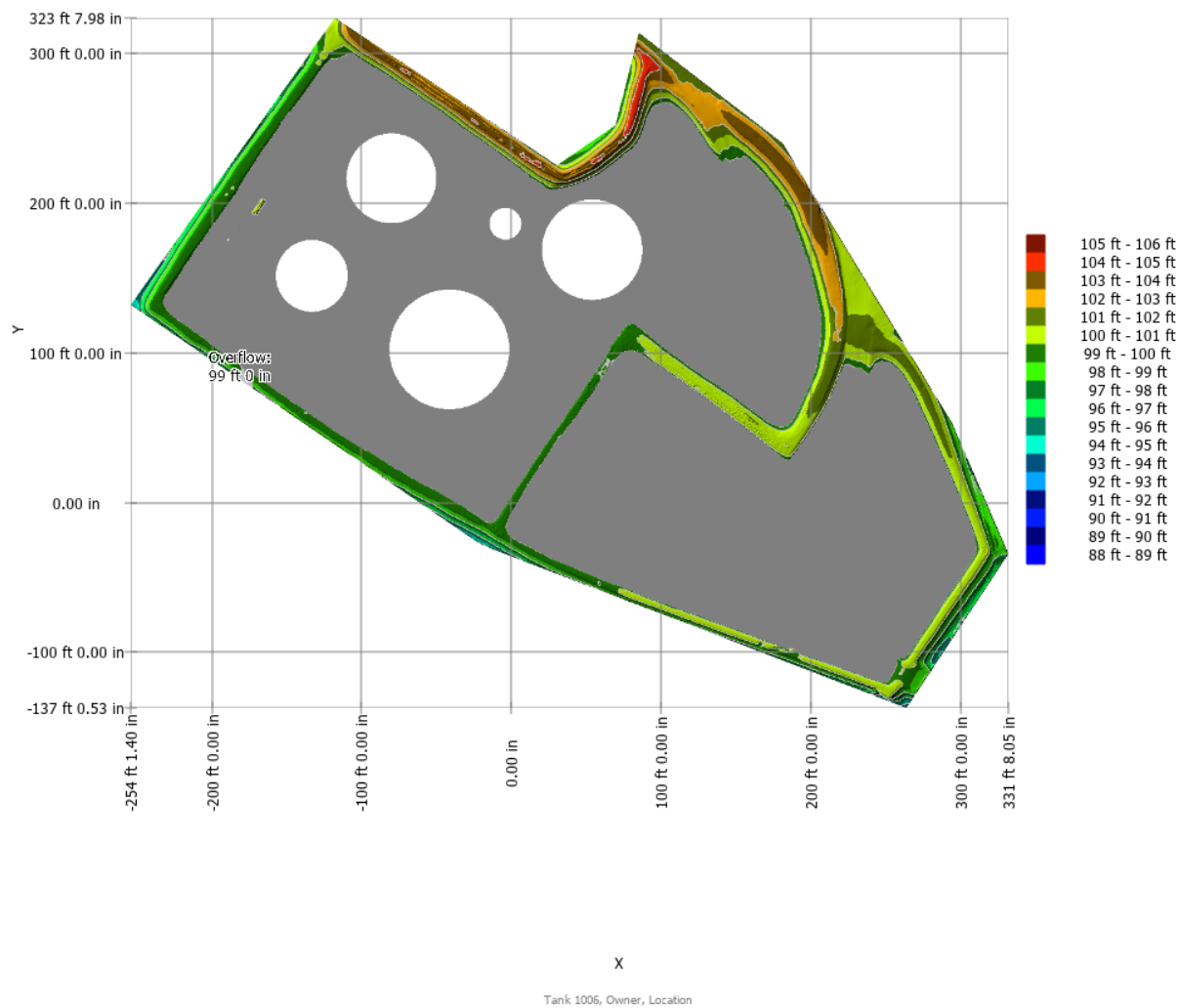


Figure 14: Dike overflow filled to 204% (Cap. 83,346 bbl, Liq. Elev. 99 ft 4 in)