

# **Appendix Q**

## SMWF Cost Estimates

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**Table 1: Deschutes County Waste Disposal Projections**

Year	Population	Avg. Annual Growth Rate, AAGR <sup>1</sup> (%)	Per Capita Generated <sup>2</sup> (pounds)	Waste Generated (tons)	Waste Recycled (tons)	Recovery Rate <sup>3</sup>	Waste Disposed (tons)
2020	198,253	2.3%	2,991	296,470	98,491	33.22%	197,979
2025	220,678	2.0%	3,050	336,534	107,691	32.00%	228,843
2030	240,446	1.7%	3,050	366,680	135,672	37.00%	231,009
2035	258,698	1.5%	3,050	394,514	165,696	42.00%	228,818
2040	275,905	1.3%	3,050	420,754	189,339	45.00%	231,415
2045	292,443	1.2%	3,050	445,976	200,689	45.00%	245,287
2050	308,894	1.1%	3,050	471,063	211,979	45.00%	259,085
2055	326,231	1.1%	3,050	497,503	223,876	45.00%	273,627
2060	344,542	1.1%	3,050	525,426	236,442	45.00%	288,984
2065	363,880	1.1%	3,050	554,917	249,713	45.00%	305,204
2070	384,303	1.1%	3,050	586,063	263,728	45.00%	322,334
2075	405,895	1.1%	3,050	618,990	278,546	45.00%	340,445
2080	428,716	1.1%	3,050	653,792	294,206	45.00%	359,586
2085	452,820	1.1%	3,050	690,551	310,748	45.00%	379,803
2090	478,279	1.1%	3,050	729,376	328,219	45.00%	401,157
2095	505,170	1.1%	3,050	770,384	346,673	45.00%	423,711
2100	533,572	1.1%	3,050	813,697	366,164	45.00%	447,533
2105	563,571	1.1%	3,050	859,446	386,751	45.00%	472,695
2110	595,257	1.1%	3,050	907,767	408,495	45.00%	499,272
2115	628,724	1.1%	3,050	958,805	431,462	45.00%	527,343
2120	664,073	1.1%	3,050	1,012,712	455,720	45.00%	556,992
2125	701,410	1.1%	3,050	1,069,650	481,343	45.00%	588,308
2130	740,845	1.1%	3,050	1,129,789	508,405	45.00%	621,384
2135	782,498	1.1%	3,050	1,193,310	536,989	45.00%	656,320
2140	826,493	1.1%	3,050	1,260,402	567,181	45.00%	693,221
2145	872,961	1.1%	3,050	1,331,266	599,070	45.00%	732,196
2150	922,042	1.1%	3,050	1,406,114	632,751	45.00%	773,363
2155	973,882	1.1%	3,050	1,485,171	668,327	45.00%	816,844
2160	1,028,637	1.1%	3,050	1,568,672	705,902	45.00%	862,770

5-Jan-24

**Sources:**

- Deschutes County Solid Waste Management Plan (2019)
- PSU 2020 Annual Population Report Tables (for 2018-2019 population)
- Coordinated Population Forecast for Deschutes County (2022-2072) by Portland State University Population Research Center
- 2018-2021 Material Recovery and Waste Generation Rates Report
- 2022 Knott Landfill Tonnage Analysis provided by DCSW

**Assumptions:**

1. Continuation of 1.1% Average Annual Growth Rate (AAGR) from 2072
2. Current (2021) Per capita waste generation of 3,050 lbs/capita will remain steady through planning period
3. Recovery Rate will increase from 29% in 2022 at a rate of 1% per year, up to 45% in 2038, and then remain at 45%

Figure 1. Population Projections (2020-2160)

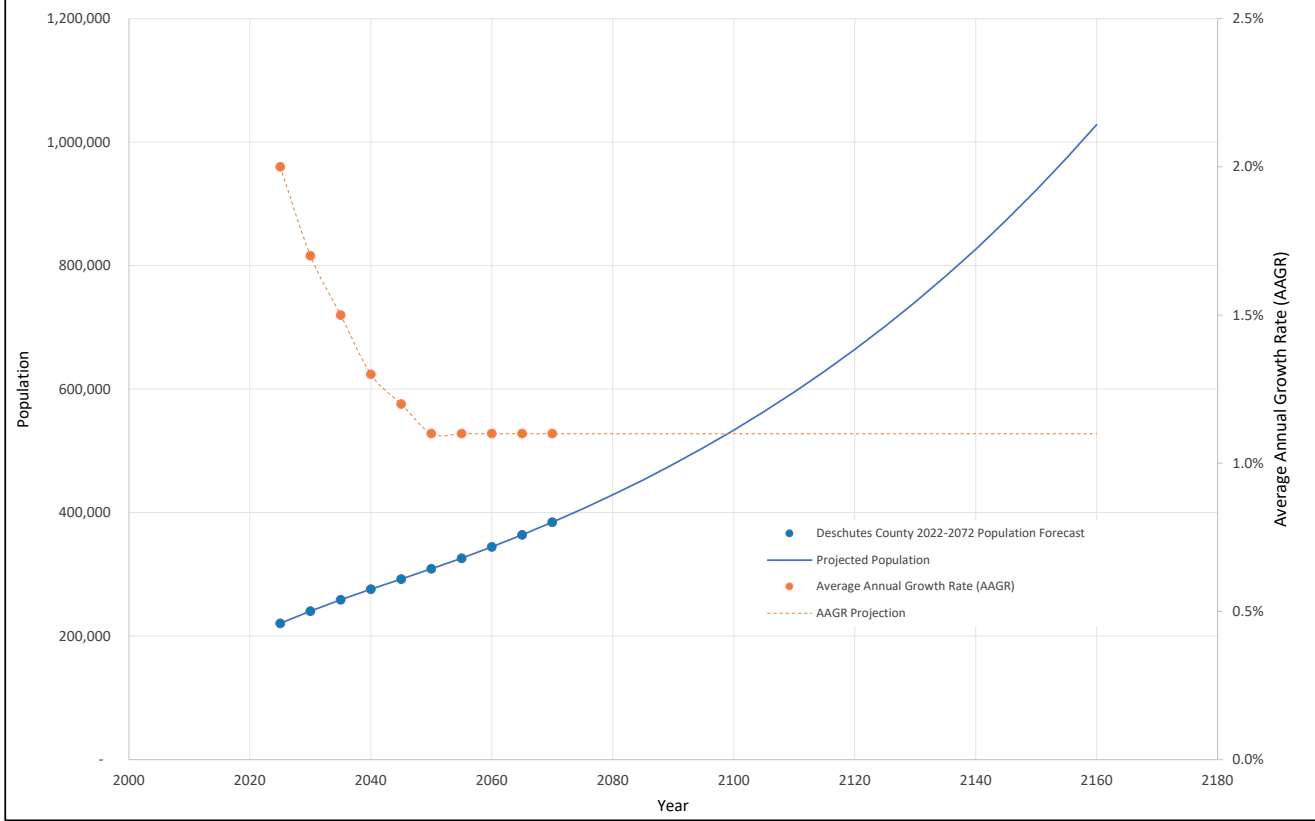


Figure 2. Deschutes County Waste Disposal Projections (2020-2160)

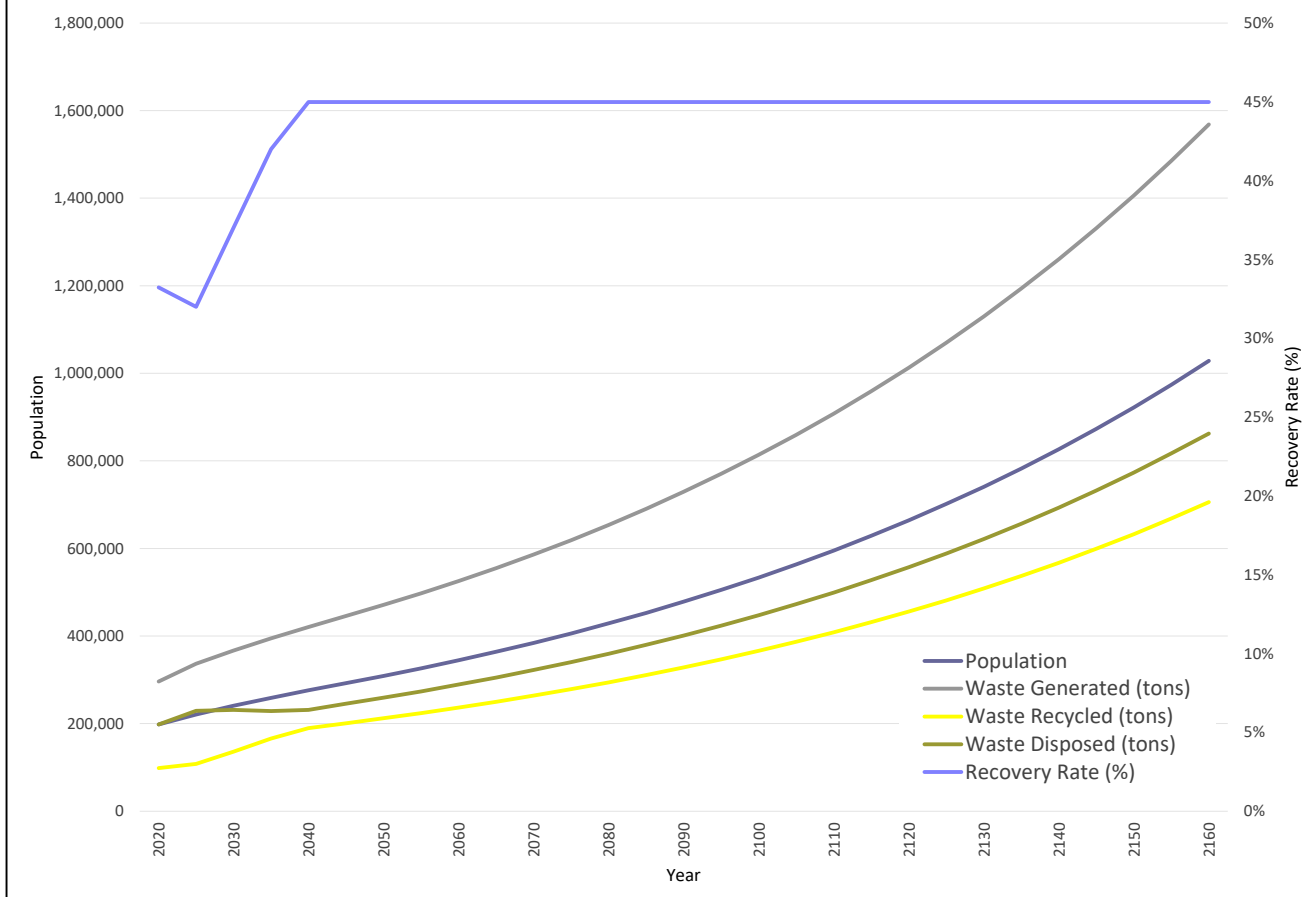
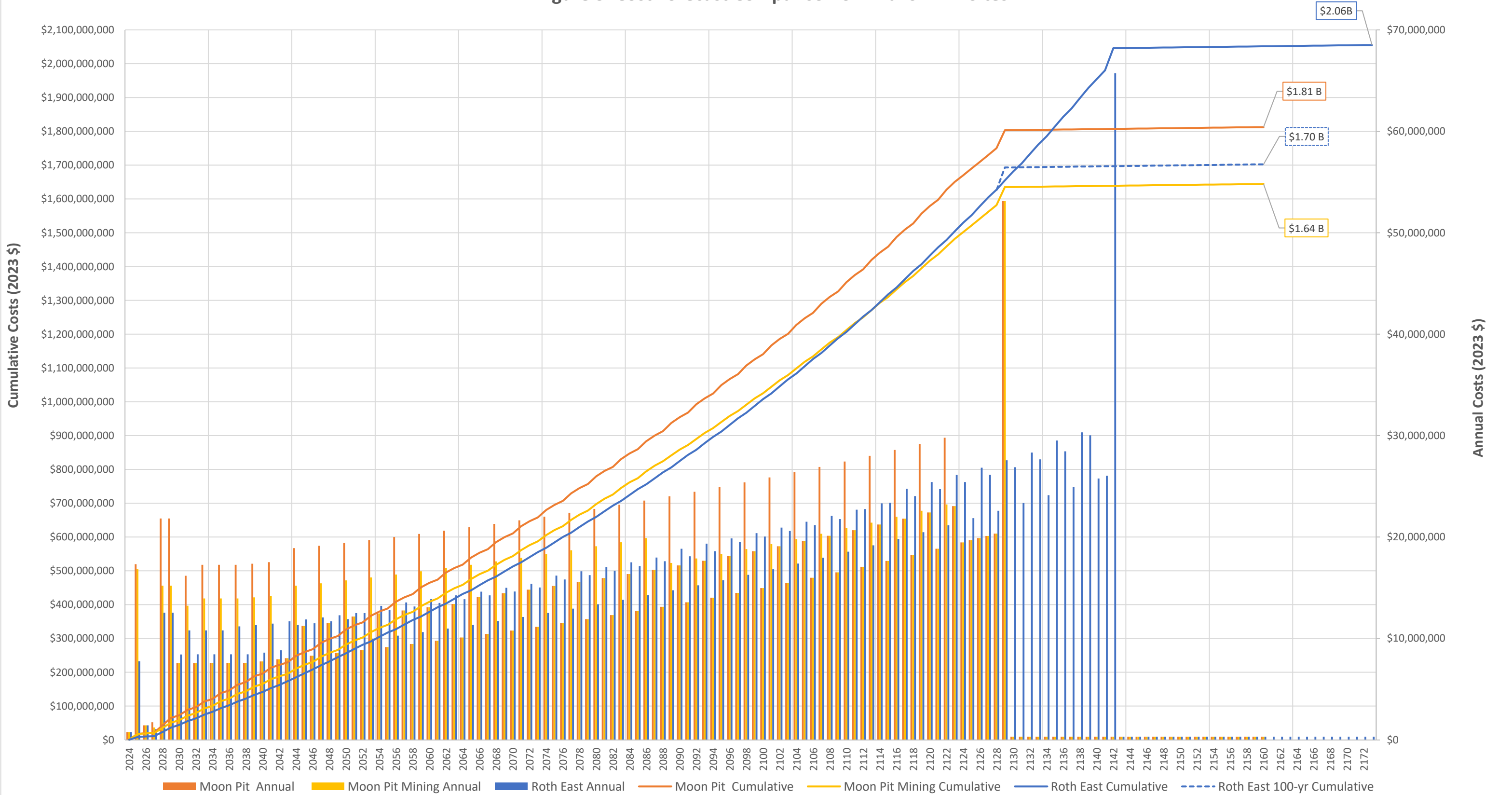


Figure 3. Cost Forecast Comparison of Final SWMF Sites



**Table 2: Projected Annual Revenue for Solid Waste Disposal**

Year	Deschutes County Population	Preliminary Waste Disposal Projection (tons/yr)	Projected Annual Revenue		
			\$70 per ton	\$85 per ton	\$95 per ton
			(2023 \$)	(2023 \$)	(2023 \$)
2030	240,446	231,009	16,171,000	19,636,000	21,946,000
2031	244,534	231,207	16,184,000	19,653,000	21,965,000
2032	248,691	231,344	16,194,000	19,664,000	21,978,000
2033	252,918	231,420	16,199,000	19,671,000	21,985,000
2034	256,965	231,204	16,184,000	19,652,000	21,964,000
2035	258,698	228,818	16,017,000	19,450,000	21,738,000
2036	262,578	228,246	15,977,000	19,401,000	21,683,000
2037	266,517	227,605	15,932,000	19,346,000	21,622,000
2038	270,514	226,894	15,883,000	19,286,000	21,555,000
2039	274,302	230,070	16,105,000	19,556,000	21,857,000
2040	275,905	231,415	16,199,000	19,670,000	21,984,000
2041	279,491	234,423	16,410,000	19,926,000	22,270,000
2042	283,125	237,471	16,623,000	20,185,000	22,560,000
2043	286,805	240,558	16,839,000	20,447,000	22,853,000
2044	290,534	243,685	17,058,000	20,713,000	23,150,000
2045	292,443	245,287	17,170,000	20,849,000	23,302,000
2046	295,952	248,230	17,376,000	21,100,000	23,582,000
2047	298,937	250,734	17,551,000	21,312,000	23,820,000
2048	302,225	253,492	17,744,000	21,547,000	24,082,000
2049	305,550	256,280	17,940,000	21,784,000	24,347,000
2050	308,894	259,085	18,136,000	22,022,000	24,613,000
2051	312,292	261,935	18,335,000	22,264,000	24,884,000
2052	315,727	264,816	18,537,000	22,509,000	25,158,000
2053	319,200	267,729	18,741,000	22,757,000	25,434,000
2054	322,711	270,674	18,947,000	23,007,000	25,714,000
2055	326,231	273,627	19,154,000	23,258,000	25,995,000
2056	329,820	276,636	19,365,000	23,514,000	26,280,000
2057	333,448	279,679	19,578,000	23,773,000	26,570,000
2058	337,116	282,756	19,793,000	24,034,000	26,862,000
2059	340,824	285,866	20,011,000	24,299,000	27,157,000
2060	344,542	288,984	20,229,000	24,564,000	27,454,000
2061	348,332	292,163	20,451,000	24,834,000	27,756,000
2062	352,163	295,377	20,676,000	25,107,000	28,061,000
2063	356,037	298,626	20,904,000	25,383,000	28,369,000
2064	359,954	301,911	21,134,000	25,662,000	28,682,000
2065	363,880	305,204	21,364,000	25,942,000	28,994,000
2066	367,883	308,561	21,599,000	26,228,000	29,313,000
2067	371,929	311,956	21,837,000	26,516,000	29,636,000
2068	376,020	315,387	22,077,000	26,808,000	29,962,000
2069	380,157	318,856	22,320,000	27,103,000	30,291,000
2070	384,303	322,334	22,563,000	27,398,000	30,622,000
2071	388,531	325,880	22,812,000	27,700,000	30,959,000
2072	392,790	329,453	23,062,000	28,003,000	31,298,000
2073	397,111	333,077	23,315,000	28,312,000	31,642,000
2074	401,479	336,741	23,572,000	28,623,000	31,990,000
2075	405,895	340,445	23,831,000	28,938,000	32,342,000
2076	410,360	344,190	24,093,000	29,256,000	32,698,000
2077	414,874	347,976	24,358,000	29,578,000	33,058,000
2078	419,438	351,803	24,626,000	29,903,000	33,421,000
2079	424,052	355,673	24,897,000	30,232,000	33,789,000

Year	Deschutes County Population	Preliminary Waste Disposal Projection (tons/yr)	Projected Annual Revenue		
			\$70 per ton	\$85 per ton	\$95 per ton
			(2023 \$)	(2023 \$)	(2023 \$)
2080	428,716	359,586	25,171,000	30,565,000	34,161,000
2081	433,432	363,541	25,448,000	30,901,000	34,536,000
2082	438,200	367,540	25,728,000	31,241,000	34,916,000
2083	443,020	371,583	26,011,000	31,585,000	35,300,000
2084	447,893	375,670	26,297,000	31,932,000	35,689,000
2085	452,820	379,803	26,586,000	32,283,000	36,081,000
2086	457,801	383,981	26,879,000	32,638,000	36,478,000
2087	462,837	388,204	27,174,000	32,997,000	36,879,000
2088	467,928	392,475	27,473,000	33,360,000	37,285,000
2089	473,075	396,792	27,775,000	33,727,000	37,695,000
2090	478,279	401,157	28,081,000	34,098,000	38,110,000
2091	483,540	405,569	28,390,000	34,473,000	38,529,000
2092	488,859	410,031	28,702,000	34,853,000	38,953,000
2093	494,237	414,541	29,018,000	35,236,000	39,381,000
2094	499,673	419,101	29,337,000	35,624,000	39,815,000
2095	505,170	423,711	29,660,000	36,015,000	40,253,000
2096	510,726	428,372	29,986,000	36,412,000	40,695,000
2097	516,344	433,084	30,316,000	36,812,000	41,143,000
2098	522,024	437,848	30,649,000	37,217,000	41,596,000
2099	527,766	442,664	30,986,000	37,626,000	42,053,000
2100	533,572	447,533	31,327,000	38,040,000	42,516,000
2101	539,441	452,456	31,672,000	38,459,000	42,983,000
2102	545,375	457,433	32,020,000	38,882,000	43,456,000
2103	551,374	462,465	32,373,000	39,310,000	43,934,000
2104	557,439	467,552	32,729,000	39,742,000	44,417,000
2105	563,571	472,695	33,089,000	40,179,000	44,906,000
2106	569,770	477,895	33,453,000	40,621,000	45,400,000
2107	576,038	483,152	33,821,000	41,068,000	45,899,000
2108	582,374	488,466	34,193,000	41,520,000	46,404,000
2109	588,780	493,840	34,569,000	41,976,000	46,915,000
2110	595,257	499,272	34,949,000	42,438,000	47,431,000
2111	601,805	504,764	35,333,000	42,905,000	47,953,000
2112	608,425	510,316	35,722,000	43,377,000	48,480,000
2113	615,117	515,930	36,115,000	43,854,000	49,013,000
2114	621,884	521,605	36,512,000	44,336,000	49,552,000
2115	628,724	527,343	36,914,000	44,824,000	50,098,000
2116	635,640	533,143	37,320,000	45,317,000	50,649,000
2117	642,632	539,008	37,731,000	45,816,000	51,206,000
2118	649,701	544,937	38,146,000	46,320,000	51,769,000
2119	656,848	550,931	38,565,000	46,829,000	52,338,000
2120	664,073	556,992	38,989,000	47,344,000	52,914,000
2121	671,378	563,118	39,418,000	47,865,000	53,496,000
2122	678,763	569,313	39,852,000	48,392,000	54,085,000
2123	686,230	575,575	40,290,000	48,924,000	54,680,000
2124	693,778	581,907	40,733,000	49,462,000	55,281,000
2125	701,410	588,308	41,182,000	50,006,000	55,889,000
2126	709,125	594,779	41,635,000	50,556,000	56,504,000
2127	716,926	601,321	42,093,000	51,112,000	57,126,000
2128	724,812	607,936	42,556,000	51,675,000	57,754,000
2129	732,785	614,623	43,024,000	52,243,000	58,389,000
<b>2030-2129 Total</b>		<b>37,686,654</b>	<b>2,638,065,000</b>	<b>3,203,362,000</b>	<b>3,580,232,000</b>

**Table 3MM: Projected Landfill Volume and Area Requirements**

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2024	750,000	-	-	-	750,000
2025	7,750,000	-	-	-	7,750,000
2026	1,437,000	-	-	-	1,437,000
2027	1,049,333	-	-	-	1,049,333
2028	12,547,203	-	-	-	12,547,203
2029	12,547,203	-	-	-	12,547,203
2030	-	-	-	8,416,762	8,416,762
2031	-	2,362,000	-	8,423,976	10,785,976
2032	-	-	-	8,429,004	8,429,004
2033	-	2,362,000	-	8,431,767	10,793,767
2034	-	-	-	8,431,767	8,431,767
2035	-	2,362,000	-	8,431,767	10,793,767
2036	-	-	-	8,431,767	8,431,767
2037	-	2,756,000	-	8,431,767	11,187,767
2038	-	-	-	8,431,767	8,431,767
2039	-	2,756,000	-	8,549,812	11,305,812
2040	-	-	-	8,599,775	8,599,775
2041	-	2,756,000	-	8,711,572	11,467,572
2042	-	-	-	8,824,822	8,824,822
2043	-	2,756,000	-	8,939,545	11,695,545
2044	-	-	2,272,000	9,055,759	11,327,759
2045	-	2,756,000	-	9,115,272	11,871,272
2046	-	-	2,272,000	9,224,656	11,496,656
2047	-	2,756,000	-	9,317,687	12,073,687
2048	-	-	2,272,000	9,420,181	11,692,181
2049	-	2,756,000	-	9,523,803	12,279,803
2050	-	-	2,272,000	9,628,038	11,900,038
2051	-	2,756,000	-	9,733,946	12,489,946
2052	-	-	2,651,000	9,841,020	12,492,020
2053	-	-	-	9,949,271	9,949,271
2054	-	3,149,000	-	10,058,713	13,207,713
2055	-	-	2,651,000	10,168,431	12,819,431
2056	-	-	-	10,280,283	10,280,283
2057	-	3,149,000	-	10,393,367	13,542,367
2058	-	-	2,651,000	10,507,694	13,158,694
2059	-	-	-	10,623,278	10,623,278
2060	-	3,149,000	-	10,739,154	13,888,154
2061	-	-	2,651,000	10,857,285	13,508,285
2062	-	-	-	10,976,715	10,976,715
2063	-	3,149,000	-	11,097,459	14,246,459
2064	-	-	2,651,000	11,219,531	13,870,531
2065	-	-	-	11,341,911	11,341,911
2066	-	3,149,000	-	11,466,672	14,615,672
2067	-	-	2,651,000	11,592,805	14,243,805
2068	-	-	-	11,720,326	11,720,326
2069	-	3,149,000	-	11,849,250	14,998,250
2070	-	-	2,651,000	11,978,498	14,629,498
2071	-	-	-	12,110,262	12,110,262
2072	-	3,149,000	-	12,243,028	15,392,028
2073	-	-	2,651,000	12,377,701	15,028,701
2074	-	-	-	12,513,856	12,513,856
2075	-	3,543,000	-	12,651,508	16,194,508
2076	-	-	3,029,000	12,790,675	15,819,675
2077	-	-	-	12,931,372	12,931,372
2078	-	3,543,000	-	13,073,617	16,616,617
2079	-	-	3,029,000	13,217,427	16,246,427
2080	-	-	-	13,362,819	13,362,819
2081	-	3,543,000	-	13,509,810	17,052,810
2082	-	-	3,029,000	13,658,418	16,687,418
2083	-	-	-	13,808,661	13,808,661
2084	-	3,543,000	-	13,960,556	17,503,556

**Table 3MM: Projected Landfill Volume and Area Requirement (continued)**

Year	Preliminary Waste Disposal Projection (tons/yr)	Landfill Volume Required				Construction Requirements	
		Refuse Bank Yards <sup>1</sup> (cy)	Daily and Intermediate Cover <sup>2</sup> (cy)	Gross Airspace (cy)	Cumulative Airspace (cy)	Lateral Expansion (Acre)	Cell Closure (Acre)
2080	359,586	514,000	103,000	617,000	24,421,000	10.0	-
2081	363,541	519,000	104,000	623,000	25,044,000	-	10.0
2082	367,540	525,000	105,000	630,000	25,674,000	-	-
2083	371,583	531,000	106,000	637,000	26,311,000	10.0	-
2084	375,670	537,000	107,000	644,000	26,955,000	-	10.0
2085	379,803	543,000	109,000	652,000	27,607,000	-	-
2086	383,981	549,000	110,000	659,000	28,266,000	10.0	-
2087	388,204	555,000	111,000	666,000	28,932,000	-	10.0
2088	392,475	561,000	112,000	673,000	29,605,000	-	-
2089	396,792	567,000	113,000	680,000	30,285,000	10.0	-
2090	401,157	573,000	115,000	688,000	30,973,000	-	10.0
2091	405,569	579,000	116,000	695,000	31,668,000	-	-
2092	410,031	586,000	117,000	703,000	32,371,000	10.0	-
2093	414,541	592,000	118,000	710,000	33,081,000	-	10.0
2094	419,101	599,000	120,000	719,000	33,800,000	-	-
2095	423,711	605,000	121,000	726,000	34,526,000	10.0	-
2096	428,372	612,000	122,000	734,000	35,260,000	-	10.0
2097	433,084	619,000	124,000	743,000	36,003,000	-	-
2098	437,848	625,000	125,000	750,000	36,753,000	10.0	-
2099	442,664	632,000	126,000	758,000	37,511,000	-	10.0
2100	447,533	639,000	128,000	767,000	38,278,000	-	-
2101	452,456	646,000	129,000	775,000	39,053,000	10.0	-
2102	457,433	653,000	131,000	784,000	39,837,000	-	10.0
2103	462,465	661,000	132,000	793,000	40,630,000	-	-
2104	467,552	668,000	134,000	802,000	41,432,000	10.0	-
2105	472,695	675,000	135,000	810,000	42,242,000	-	10.0
2106	477,895	683,000	137,000	820,000	43,062,000	-	-
2107	483,152	690,000	138,000	828,000	43,890,000	10.0	-
2108	488,466	698,000	140,000	838,000	44,728,000	-	10.0
2109	493,840	705,000	141,000	846,000	45,574,000	-	-
2110	499,272	713,000	143,000	856,000	46,430,000	10.0	-
2111	504,764	721,000	144,000	865,000	47,295,000	-	10.0
2112	510,316	729,000	146,000	875,000	48,170,000	-	-
2113	515,930	737,000	147,000	884,000	49,054,000	10.0	-
2114	521,605	745,000	149,000	894,000	49,948,000	-	10.0
2115	527,343	753,000	151,000	904,000	50,852,000	-	-
2116	533,143	762,000	152,000	914,000	51,766,000	10.0	-
2117	539,008	770,000	154,000	924,000	52,690,000	-	10.0
2118	544,937	778,000	156,000	934,000	53,624,000	-	-
2119	550,931	787,000	157,000	944,000	54,568,000	10.0	-
2120	556,992	796,000	159,000	955,000	55,523,000	-	10.0
2121	563,118	804,000	161,000	965,000	56,488,000	-	-
2122	569,313	813,000	163,000	976,000	57,464,000	10.0	-
2123	575,575	822,000	164,000	986,000	58,450,000	-	10.0
2124	581,907	831,000	166,000	997,000	59,447,000	-	-
2125	588,308	840,000	168,000	1,008,000	60,455,000	-	-
2126	594,779	850,000	170,000	1,020,000	61,475,000	-	-
2127	601,321	859,000	172,000	1,031,000	62,506,000	-	-
2128	607,936	868,000	174,000	1,042,000	63,548,000	-	-
2129	614,623	878,000	176,000	1,054,000	64,602,000	-	86.0
<b>Total</b>	<b>37,686,654</b>	<b>53,836,000</b>	<b>10,766,000</b>	<b>64,602,000</b>		<b>347.0</b>	<b>347.0</b>

**Assumptions:**

- 1. Landfill density assumed to be 

1400
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 lbs per cubic yard air space consumed
- 2. Cover:Refuse airspace Ratio = 

20%
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 on a volumetric basis.

**Table 4MM: Liquid Management Systems (Stormwater & Leachate)**

Item	Unit	Quantity	Unit Cost	Estimated Cost
			(2023 \$)	(2023 \$)
Excavation	CY	60,000	\$ 4.00	\$ 240,000
Rock Drilling, Blasting, Crushing (2-inch Minus) <sup>2</sup>	CY	15,000	\$ 4.00	\$ 60,000
6-inch Soil Cushion Layer	CY	1,500	\$ 10.00	\$ 15,000
Lower Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Geomembrane for Leak Detection	SF	30,000	\$ 0.90	\$ 27,000
Geonet Composite	SF	30,000	\$ 0.95	\$ 28,500
Lower Geotextile Separating Layer	SF	30,000	\$ 0.85	\$ 25,500
Upper Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Primary Geomembrane	SF	90,000	\$ 0.90	\$ 81,000
16-oz Upper Geotextile Cushion	SF	90,000	\$ 0.85	\$ 76,500
12-inch Drainage Layer	CY	3,300	\$ 10.00	\$ 33,000
Pump Station	Lump Sum	1	\$ 200,000.00	\$ 200,000
Truck Loading Station	Lump Sum	1	\$ 100,000.00	\$ 100,000
Subtotal				\$ 946,500
Engineering and Administration (15%)				\$ 141,975
Contingencies (20%)				\$ 189,300
<b>Estimated Cost for Leachate System and Stormwater Pond</b>				<b>\$ 1,277,775</b>

1/5/2024

**Assumptions:**

1. 25% of the excavation volume will require rock drilling, blasting and crushing.
2. Rock Drilling, Blasting, Crushing at a discounted cost of \$4/cy, assuming contractor aggregate mining.
3. Stormwater pond is 1.38 acres and the leachate pond is 0.68 acres. Total pond area is approximately 2 acres.
4. Leachate leak detection system includes a combination geomembrane/geonet below the primary composite liner.



**Table 5MM: Estimate Of Per Acre Cost for Landfill Cell Development**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Excavation	CY	38,000	\$ 4.00	\$ 152,000
Rock Drilling, Blasting, Crushing (2-inch Minus)	CY	34,200	\$ 4.00	\$ 136,800
Embankment	CY	6,000	\$ 2.00	\$ 12,000
6-inch Soil Cushion Layer	CY	900	\$ 10.00	\$ 9,000
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Cushioning Geotextile	SF	12,000	\$ 0.85	\$ 10,200
Geonet Composite	SF	48,000	\$ 0.95	\$ 45,600
12-inch Drainage Layer	CY	1,600	\$ 10.00	\$ 16,000
Separating Geotextile	SF	36,000	\$ 0.85	\$ 30,600
8-inch Leachate Collection Pipe	LF	300	\$ 30.00	\$ 9,000
Landfill Gas Collection System	Lump Sum	1	\$ 10,000.00	\$ 10,000
Subtotal				\$ 522,400
Engineering and Administration (15%)				\$ 78,360
Contingencies (20%)				\$ 104,480
<b>Estimated Per Acre Cost Landfill Cell Development</b>				<b>\$ 705,240</b>

1/5/2024

**Assumptions:**

1. Approximately 90% of the excavation volume will require rock drilling, blasting and crushing.
2. Rock Drilling, Blasting, Crushing at a discounted cost of \$4/cy, assuming contractor aggregate mining

**Table 6MM: Estimate Of Per Acre Cost for Landfill Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Final Contouring and Grading	CY	5,000	\$ 4.00	\$ 20,000
Landfill Gas Collection System				
Landfill Gas Well	LF	100	\$ 150.00	\$ 15,000
Piping	LF	300	\$ 30.00	\$ 9,000
16-oz Geotextile Cushion	SF	48,000	\$ 0.85	\$ 40,800
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Geonet Composite Layer	SF	48,000	\$ 0.95	\$ 45,600
24-inch Top Soil/Soil Protective Layer	CY	3,500	\$ 15.00	\$ 52,500
Seed, Fertilizer and Mulch	SF	48,000	\$ 0.05	\$ 2,400
Cover System Irrigation	LF	800	\$ 5.00	\$ 4,000
Subtotal				\$ 280,500
Engineering and Administration (15%)				\$ 42,075
Contingencies (20%)				\$ 56,100
<b>Estimated Per Acre Cost for Cover System</b>				<b>\$ 378,675</b>

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**Table 7MM: Estimated Haul Costs from Transfer Stations**

Facility	2029 Waste Distribution (%)	2029 Waste Disposal Projected <sup>1</sup> (Tons)	Haul Trips Estimated <sup>2</sup> (Trips)	Round Trip Distance (Miles)	Round Trip Time (Hrs)	Total Haul Time (Hrs)	Annual Haul Cost <sup>3</sup> (\$)
Knott Transfer Station	75.91%	176454	8823	35.25	1.13	9970	\$ 1,595,141
Negus Transfer Station	16.84%	39145	1957	73.45	2.23	4365	\$ 698,343
Southwest Transfer Station	5.42%	12599	630	73.25	1.73	1090	\$ 174,368
Northwest Transfer Station	1.74%	4045	202	78.25	2.07	419	\$ 66,979
Alfalpa Transfer Station	0.09%	209	10	38.45	1.07	11	\$ 1,791
<b>Total</b>		<b>232,451</b>	<b>11,623</b>	<b>299</b>	<b>8</b>	<b>15,854</b>	<b>\$ 2,536,622</b>

Assumptions:

- 2029 Projected Waste Disposal: 

232,451	tons
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- Assumed average payload: 

20	tons/haul trip
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- Assumed haul cost per hour: 

\$ 160.00	per hour (incl. labor, equipment, depreciation, maintenance costs)
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- Round Trip estimation includes driveway (2 min & 1.1 mile, twice) and on-site time & distance (20 min & 3.25 miles)



**Table 8MM: Estimate Of Annual Operating Costs**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
<b>Administrative Labor Costs</b>				
Operations Manager	Person	0.50	\$ 188,821	\$ 94,411
Compliance & Infrastructure Manager	Person	0.25	\$ 200,693	\$ 50,173
Management Analyst	Person	0.10	\$ 164,073	\$ 16,407
Engineering Asst III	Person	0.80	\$ 120,986	\$ 96,789
Director of Solid Waste	Person	0.13	\$ 241,545	\$ 30,193
Equipment Operator	Person	7	\$ 110,000	\$ 770,000
Landfill Attendant	Person	2	\$ 80,000	\$ 160,000
Office Assistant	Person	1	\$ 70,000	\$ 70,000
<b>Administrative Labor Subtotal</b>				<b>\$ 1,287,973</b>
<b>Equipment Owning and Operating Costs</b>				
Large Dozer (Cat D8N)	Hour	500	\$ 65.00	\$ 32,500
Compactor (Cat 826C)	Hour	2,900	\$ 65.00	\$ 188,500
Scraper (Cat 623E)	Hour	1,000	\$ 75.00	\$ 75,000
Front End Loader (Cat 966F)	Hour	2,800	\$ 50.00	\$ 140,000
Water Truck	Hour	520	\$ 50.00	\$ 26,000
Small Dozer (Cat D6D)	Hour	1,040	\$ 50.00	\$ 52,000
Utility Trucks	Mile	40,000	\$ 0.60	\$ 24,000
Yard Jockey	Hour	520	\$ 50.00	\$ 26,000
Landfill Infrastructure Repair and Maintenance	LS	1	\$ 50,000	\$ 50,000
Equipment Repair and Maintenance	LS	1	\$ 250,000	\$ 250,000
<b>Equipment O &amp; O Subtotal</b>				<b>\$ 864,000</b>
<b>Environmental Monitoring Costs</b>				
Groundwater Sampling and Analysis	Sample	16	\$ 2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	\$ 2,000	\$ 24,000
Landfill Gas Sampling	Event	4	\$ 2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	\$ 2,000	\$ 8,000
Annual Reports	Each	1	\$ 30,000	\$ 30,000
Fees & Permits	LS	1	\$ 500,000	\$ 500,000
Miscellaneous Environmental Cost	LS	1	\$ 250,000	\$ 250,000
Natural Resource Mitigation O&M	LS	1	\$ 16,000	\$ 16,000
<b>Environmental Monitoring Subtotal</b>				<b>\$ 868,000</b>
<b>Haul Costs from:</b>				
Knott Transfer Station	Hour	9,970	\$ 160.00	\$ 1,595,141
Negus Transfer Station	Hour	4,365	\$ 160.00	\$ 698,343
Southwest Transfer Station	Hour	1,090	\$ 160.00	\$ 174,368
Northwest Transfer Station	Hour	419	\$ 160.00	\$ 66,979
Alfalfa Transfer Station	Hour	11	\$ 160.00	\$ 1,791
<b>Haul Cost Subtotal</b>				<b>\$ 2,536,622</b>
<b>Miscellaneous</b>				
Roadway Maintenance	LS			\$ 50,000
Site and Building Maintenance	LS			\$ 240,000
Office Supplies	LS			\$ 23,000
Insurance	LS			\$ 100,000
Engineering and Legal Services	LS			\$ 75,000
Gas/ Diesel / Oil	LS			\$ 280,000
Water (Hooker Creek charge)	gallon	5,155,253	\$ 0.01	\$ 51,553
Utilities (power, internet, septic tank/drainfield)	LS			\$ 50,000
Code Abatement/ Enforcement	LS			\$ 200,000
Other	LS			\$ 200,000
<b>Miscellaneous Subtotal</b>				<b>\$ 1,269,553</b>
Annual Transfer To Equipment Fund (491614)				\$ 750,000
<b>Total Annual Operating Costs</b>				<b>\$ 7,576,147</b>
				(used in T11 forecast)
Annual Transfer To Cell Closure Fund (491611)				\$ 1,314,040
Annual Transfer To Post-Closure Fund (491612)				\$ 90,683
Annual Transfer To Cell Expansion Fund (491613)				\$ 1,931,250
<b>Total Annual Operating Costs Including Transfers</b>				<b>\$ 10,912,120</b>

**Assumptions:** 1. Hooker Creek water charges are based on an assumed cost of \$10/1000 gallons

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**Table 9MM: Estimate Of Annual Operating Costs after Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost
				(2023 \$)
Compliance & Infrastructure Manager	Person	0.40	\$ 200,693	\$ 80,277
<b>Environmental Monitoring</b>				
Groundwater Sampling and Analysis	Sample	16	2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	2,000	\$ 24,000
Landfill Gas Sampling	Event	4	2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	2,000	\$ 8,000
Annual Reports	Each	1	30,000	\$ 30,000
Environmental Monitoring Subtotal				\$ 102,000
<b>Maintenance</b>				
Roadway	LS			\$ 5,000
Final Cover System	LS			\$ 25,000
Leachate Management System	LS			\$ 20,000
Landfill Gas Management System	LS			\$ 15,000
Surface Water Management System	LS			\$ 10,000
Maintenance Subtotal				\$ 75,000
<b>Miscellaneous</b>				
Financial Assurance Provision	LS			\$ 25,000
Utilities	LS			\$ 10,000
Other	LS			\$ 10,000
Miscellaneous Subtotal				\$ 45,000
<b>Annual Operating Costs after Closure</b>				<b>\$ 302,277</b>

**Table 10MM: Cost Estimate for Initial Development of Landfill**

Description	Year	Unit	Quantity	Unit Cost	Estimated Cost
					(2023 \$)
<b>Pre-Development</b>					
Site Characterization Study	2024	LS			\$ 750,000
Land Acquisition	2025	LS			\$ 15,370,000
Permitting	2025-26	LS			\$ 1,500,000
<b>Pre-Development Subtotal</b>					<b>\$ 17,620,000</b>
<b>Capital Expenditures</b>					
Support Facilities					
Roads (driveway pavement overlay)	2028-29	LF	2,000	\$ 50	\$ 100,000
Landfill Office	2028-29	SF	2,000	\$ 500	\$ 1,000,000
Maintenance Shop	2028-29	SF	4,000	\$ 400	\$ 1,600,000
70-foot Truck Scales	2028-29	Each	1	\$ 200,000	\$ 200,000
Utilities					
Electrical Extension & Distribution	2028-29	LS			\$ 2,300,000
Internet / Comms / Controls Systems	2028-29	LS			\$ 50,000
Water Supply, Storage, Distribution	2028-29	LS			\$ 665,000
Onsite Wastewater System	2028-29	LS			\$ 50,000
Initial Cell/Lagoon Construction					
Excavation	2028-29	CY	1,400,000	\$ 4	\$ 5,600,000
2-inch Minus Aggregate	2028-29	CY	1,260,000	\$ 4	\$ 5,040,000
Embankment	2028-29	CY	100,000	\$ 2	\$ 200,000
Liner/ Leachate Collection System	2028-29	Acre	24	\$ 221,600	\$ 5,318,400
Leachate & Stormwater Systems	2028-29	Each	1	\$ 946,500	\$ 946,500
Environmental Monitoring					
3-1100 Foot Groundwater Wells	2026	LF	3,300	\$ 200	\$ 660,000
Landfill Gas Probes	2026	LF	180	\$ 150	\$ 27,000
Natural Resource Mitigation Costs:					
Initial Mitigation Cost	2025	LS		\$ 700,000	\$ 700,000
<b>Capital Subtotal</b>					<b>\$ 24,456,900</b>
Engineering and Administration (15%)	2027-29				\$ 3,669,000
Contingencies (20%)	2028-29				\$ 4,891,000
<b>Total Initial Capital Cost</b>					<b>\$ 33,016,900</b>
<b>Initial Development Cost Schedule</b>					
2024					\$ 750,000
2025					\$ 16,820,000
2026					\$ 1,437,000
2027					\$ 1,223,000
2028					\$ 15,203,450
2029					\$ 15,203,450
<b>Total</b>					<b>\$ 50,636,900</b>

1/5/2024

**Assumptions:**

1. Acquisition price discounted \$500,000 with exclusive excavation agreement, per Hooker Creek solicitation response,
2. Estimated electrical costs include 3-phase power line extension, transformer, meter, and onsite distribution.
3. Estimated water costs include water right mitigation credits, well improvements, 0.2 MG water storage tank, and piping.
4. Approximately 90% of the excavation volume will require rock drilling, blasting and crushing.
5. Rock Drilling, Blasting, Crushing at a discounted cost of \$4/cy, assuming contractor aggregate mining

**Table 11MM: Total Estimated Costs for Operation of MSW Landfill at Moon Pit**

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2024	750,000	-	-	-	750,000
2025	16,820,000	-	-	-	16,820,000
2026	1,437,000	-	-	-	1,437,000
2027	1,223,000	-	-	-	1,223,000
2028	15,203,450	-	-	-	15,203,450
2029	15,203,450	-	-	-	15,203,450
2030	-	-	-	7,576,147	7,576,147
2031	-	5,642,000	-	7,582,641	13,224,641
2032	-	-	-	7,587,166	7,587,166
2033	-	6,347,000	-	7,589,654	13,936,654
2034	-	-	-	7,589,654	7,589,654
2035	-	6,347,000	-	7,589,654	13,936,654
2036	-	-	-	7,589,654	7,589,654
2037	-	6,347,000	-	7,589,654	13,936,654
2038	-	-	-	7,589,654	7,589,654
2039	-	6,347,000	-	7,695,909	14,042,909
2040	-	-	-	7,740,882	7,740,882
2041	-	6,347,000	-	7,841,513	14,188,513
2042	-	-	-	7,943,453	7,943,453
2043	-	-	-	8,046,718	8,046,718
2044	-	7,052,000	-	8,151,325	15,203,325
2045	-	-	3,029,000	8,204,895	11,233,895
2046	-	-	-	8,303,353	8,303,353
2047	-	7,052,000	-	8,387,093	15,439,093
2048	-	-	3,029,000	8,479,351	11,508,351
2049	-	-	-	8,572,624	8,572,624
2050	-	7,052,000	-	8,666,448	15,718,448
2051	-	-	3,408,000	8,761,779	12,169,779
2052	-	-	-	8,858,159	8,858,159
2053	-	7,052,000	-	8,955,598	16,007,598
2054	-	-	3,408,000	9,054,110	12,462,110
2055	-	-	-	9,152,870	9,152,870
2056	-	7,052,000	-	9,253,552	16,305,552
2057	-	-	3,408,000	9,355,341	12,763,341
2058	-	-	-	9,458,249	9,458,249
2059	-	7,052,000	-	9,562,290	16,614,290
2060	-	-	3,408,000	9,666,593	13,074,593
2061	-	-	-	9,772,926	9,772,926
2062	-	7,052,000	-	9,880,428	16,932,428
2063	-	-	3,408,000	9,989,113	13,397,113
2064	-	-	-	10,098,993	10,098,993
2065	-	7,052,000	-	10,209,150	17,261,150
2066	-	-	3,787,000	10,321,451	14,108,451
2067	-	-	-	10,434,987	10,434,987
2068	-	7,052,000	-	10,549,772	17,601,772
2069	-	-	3,787,000	10,665,819	14,452,819
2070	-	-	-	10,782,159	10,782,159
2071	-	7,052,000	-	10,900,763	17,952,763
2072	-	-	3,787,000	11,020,269	14,807,269
2073	-	-	-	11,141,492	11,141,492
2074	-	7,052,000	-	11,264,048	18,316,048
2075	-	-	3,787,000	11,387,953	15,174,953
2076	-	-	-	11,513,220	11,513,220
2077	-	7,052,000	-	11,639,866	18,691,866
2078	-	-	3,787,000	11,767,904	15,554,904
2079	-	-	-	11,897,351	11,897,351

**Table 11MM (Continued)**

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2080	-	7,052,000	-	12,028,222	19,080,222
2081	-	-	3,787,000	12,160,533	15,947,533
2082	-	-	-	12,294,299	12,294,299
2083	-	7,052,000	-	12,429,536	19,481,536
2084	-	-	3,787,000	12,566,261	16,353,261
2085	-	-	-	12,704,490	12,704,490
2086	-	7,052,000	-	12,844,239	19,896,239
2087	-	-	3,787,000	12,985,526	16,772,526
2088	-	-	-	13,128,366	13,128,366
2089	-	4,164,000	-	13,272,778	17,436,778
2090	-	-	3,787,000	13,418,779	17,205,779
2091	-	-	-	13,566,386	13,566,386
2092	-	4,164,000	-	13,715,616	17,879,616
2093	-	-	3,787,000	13,866,488	17,653,488
2094	-	-	-	14,019,019	14,019,019
2095	-	4,164,000	-	14,173,228	18,337,228
2096	-	-	3,787,000	14,329,134	18,116,134
2097	-	-	-	14,486,754	14,486,754
2098	-	4,164,000	-	14,646,108	18,810,108
2099	-	-	3,787,000	14,807,216	18,594,216
2100	-	-	-	14,970,095	14,970,095
2101	-	4,164,000	-	15,134,766	19,298,766
2102	-	-	3,787,000	15,301,248	19,088,248
2103	-	-	-	15,469,562	15,469,562
2104	-	4,164,000	-	15,639,727	19,803,727
2105	-	-	3,787,000	15,811,764	19,598,764
2106	-	-	-	15,985,694	15,985,694
2107	-	4,164,000	-	16,161,536	20,325,536
2108	-	-	3,787,000	16,339,313	20,126,313
2109	-	-	-	16,519,046	16,519,046
2110	-	4,164,000	-	16,700,755	20,864,755
2111	-	-	3,787,000	16,884,464	20,671,464
2112	-	-	-	17,070,193	17,070,193
2113	-	4,164,000	-	17,257,965	21,421,965
2114	-	-	3,787,000	17,447,802	21,234,802
2115	-	-	-	17,639,728	17,639,728
2116	-	4,164,000	-	17,833,765	21,997,765
2117	-	-	3,787,000	18,029,937	21,816,937
2118	-	-	-	18,228,266	18,228,266
2119	-	4,164,000	-	18,428,777	22,592,777
2120	-	-	3,787,000	18,631,493	22,418,493
2121	-	-	-	18,836,440	18,836,440
2122	-	4,164,000	-	19,043,641	23,207,641
2123	-	-	3,787,000	19,253,121	23,040,121
2124	-	-	-	19,464,905	19,464,905
2125	-	-	-	19,679,019	19,679,019
2126	-	-	-	19,895,488	19,895,488
2127	-	-	-	20,114,339	20,114,339
2128	-	-	-	20,335,596	20,335,596
2129	-	-	32,566,000	20,559,288	53,125,288
Subtotals	50,636,900	193,125,000	131,404,000	1,259,744,358	1,634,910,258
Post-Closure Operations (2130-2160) =				9,068,316	9,068,316
<b>Totals</b>				<b>1,268,812,674</b>	<b>1,643,978,574</b>
<b>Avg. Cost per Ton</b>					<b>\$43.62</b>
(2030-59 Total Costs + Initial Capital Costs Financed with 30-yr Bond @ 4.75%)				<b>30-yr Cost per Ton</b>	<b>\$59.06</b>

8-Apr-24

**Assumptions:**

1. Phase 3 Development costs (2089-2122) assume excavation by Hooker Creek in consideration for aggregate resources. Additional development approaches and opportunities exist for optimizing the removal of rock and development of airspace. This might include deeper aggregate mining in Phase 3 and excavation of Phase 2 for cover material only.

**Table 3M: Projected Landfill Volume and Area Requirements**

Year	Preliminary Waste Disposal Projection (tons/yr)	Landfill Volume Required				Construction Requirements	
		Refuse Bank Yards <sup>1</sup> (cy)	Daily and Intermediate Cover <sup>2</sup> (cy)	Gross Airspace (cy)	Cumulative Airspace (cy)	Lateral Expansion (Acre)	Cell Closure (Acre)
2029	-	-	-	-	-	24.0	-
2030	231,009	330,000	66,000	396,000	396,000	-	-
2031	231,207	330,000	66,000	396,000	792,000	8.0	-
2032	231,344	330,000	66,000	396,000	1,188,000	-	-
2033	231,420	331,000	66,000	397,000	1,585,000	9.0	-
2034	231,204	330,000	66,000	396,000	1,981,000	-	-
2035	228,818	327,000	65,000	392,000	2,373,000	9.0	-
2036	228,246	326,000	65,000	391,000	2,764,000	-	-
2037	227,605	325,000	65,000	390,000	3,154,000	9.0	-
2038	226,894	324,000	65,000	389,000	3,543,000	-	-
2039	230,070	329,000	66,000	395,000	3,938,000	9.0	-
2040	231,415	331,000	66,000	397,000	4,335,000	-	-
2041	234,423	335,000	67,000	402,000	4,737,000	9.0	-
2042	237,471	339,000	68,000	407,000	5,144,000	-	-
2043	240,558	344,000	69,000	413,000	5,557,000	-	-
2044	243,685	348,000	70,000	418,000	5,975,000	10.0	-
2045	245,287	350,000	70,000	420,000	6,395,000	-	8.0
2046	248,230	355,000	71,000	426,000	6,821,000	-	-
2047	250,734	358,000	72,000	430,000	7,251,000	10.0	-
2048	253,492	362,000	72,000	434,000	7,685,000	-	8.0
2049	256,280	366,000	73,000	439,000	8,124,000	-	-
2050	259,085	370,000	74,000	444,000	8,568,000	10.0	-
2051	261,935	374,000	75,000	449,000	9,017,000	-	9.0
2052	264,816	378,000	76,000	454,000	9,471,000	-	-
2053	267,729	382,000	76,000	458,000	9,929,000	10.0	-
2054	270,674	387,000	77,000	464,000	10,393,000	-	9.0
2055	273,627	391,000	78,000	469,000	10,862,000	-	-
2056	276,636	395,000	79,000	474,000	11,336,000	10.0	-
2057	279,679	400,000	80,000	480,000	11,816,000	-	9.0
2058	282,756	404,000	81,000	485,000	12,301,000	-	-
2059	285,866	408,000	82,000	490,000	12,791,000	10.0	-
2060	288,984	413,000	83,000	496,000	13,287,000	-	9.0
2061	292,163	417,000	83,000	500,000	13,787,000	-	-
2062	295,377	422,000	84,000	506,000	14,293,000	10.0	-
2063	298,626	427,000	85,000	512,000	14,805,000	-	9.0
2064	301,911	431,000	86,000	517,000	15,322,000	-	-
2065	305,204	436,000	87,000	523,000	15,845,000	10.0	-
2066	308,561	441,000	88,000	529,000	16,374,000	-	10.0
2067	311,956	446,000	89,000	535,000	16,909,000	-	-
2068	315,387	451,000	90,000	541,000	17,450,000	10.0	-
2069	318,856	456,000	91,000	547,000	17,997,000	-	10.0
2070	322,334	460,000	92,000	552,000	18,549,000	-	-
2071	325,880	466,000	93,000	559,000	19,108,000	10.0	-
2072	329,453	471,000	94,000	565,000	19,673,000	-	10.0
2073	333,077	476,000	95,000	571,000	20,244,000	-	-
2074	336,741	481,000	96,000	577,000	20,821,000	10.0	-
2075	340,445	486,000	97,000	583,000	21,404,000	-	10.0
2076	344,190	492,000	98,000	590,000	21,994,000	-	-
2077	347,976	497,000	99,000	596,000	22,590,000	10.0	-
2078	351,803	503,000	101,000	604,000	23,194,000	-	10.0
2079	355,673	508,000	102,000	610,000	23,804,000	-	-

**Table 3M: Projected Landfill Volume and Area Requirements (continued)**

Year	Preliminary Waste Disposal Projection (tons/yr)	Landfill Volume Required				Construction Requirements	
		Refuse Bank Yards <sup>1</sup> (cy)	Daily and Intermediate Cover <sup>2</sup> (cy)	Gross Airspace (cy)	Cumulative Airspace (cy)	Lateral Expansion (Acre)	Cell Closure (Acre)
2080	359,586	514,000	103,000	617,000	24,421,000	10.0	-
2081	363,541	519,000	104,000	623,000	25,044,000	-	10.0
2082	367,540	525,000	105,000	630,000	25,674,000	-	-
2083	371,583	531,000	106,000	637,000	26,311,000	10.0	-
2084	375,670	537,000	107,000	644,000	26,955,000	-	10.0
2085	379,803	543,000	109,000	652,000	27,607,000	-	-
2086	383,981	549,000	110,000	659,000	28,266,000	10.0	-
2087	388,204	555,000	111,000	666,000	28,932,000	-	10.0
2088	392,475	561,000	112,000	673,000	29,605,000	-	-
2089	396,792	567,000	113,000	680,000	30,285,000	10.0	-
2090	401,157	573,000	115,000	688,000	30,973,000	-	10.0
2091	405,569	579,000	116,000	695,000	31,668,000	-	-
2092	410,031	586,000	117,000	703,000	32,371,000	10.0	-
2093	414,541	592,000	118,000	710,000	33,081,000	-	10.0
2094	419,101	599,000	120,000	719,000	33,800,000	-	-
2095	423,711	605,000	121,000	726,000	34,526,000	10.0	-
2096	428,372	612,000	122,000	734,000	35,260,000	-	10.0
2097	433,084	619,000	124,000	743,000	36,003,000	-	-
2098	437,848	625,000	125,000	750,000	36,753,000	10.0	-
2099	442,664	632,000	126,000	758,000	37,511,000	-	10.0
2100	447,533	639,000	128,000	767,000	38,278,000	-	-
2101	452,456	646,000	129,000	775,000	39,053,000	10.0	-
2102	457,433	653,000	131,000	784,000	39,837,000	-	10.0
2103	462,465	661,000	132,000	793,000	40,630,000	-	-
2104	467,552	668,000	134,000	802,000	41,432,000	10.0	-
2105	472,695	675,000	135,000	810,000	42,242,000	-	10.0
2106	477,895	683,000	137,000	820,000	43,062,000	-	-
2107	483,152	690,000	138,000	828,000	43,890,000	10.0	-
2108	488,466	698,000	140,000	838,000	44,728,000	-	10.0
2109	493,840	705,000	141,000	846,000	45,574,000	-	-
2110	499,272	713,000	143,000	856,000	46,430,000	10.0	-
2111	504,764	721,000	144,000	865,000	47,295,000	-	10.0
2112	510,316	729,000	146,000	875,000	48,170,000	-	-
2113	515,930	737,000	147,000	884,000	49,054,000	10.0	-
2114	521,605	745,000	149,000	894,000	49,948,000	-	10.0
2115	527,343	753,000	151,000	904,000	50,852,000	-	-
2116	533,143	762,000	152,000	914,000	51,766,000	10.0	-
2117	539,008	770,000	154,000	924,000	52,690,000	-	10.0
2118	544,937	778,000	156,000	934,000	53,624,000	-	-
2119	550,931	787,000	157,000	944,000	54,568,000	10.0	-
2120	556,992	796,000	159,000	955,000	55,523,000	-	10.0
2121	563,118	804,000	161,000	965,000	56,488,000	-	-
2122	569,313	813,000	163,000	976,000	57,464,000	10.0	-
2123	575,575	822,000	164,000	986,000	58,450,000	-	10.0
2124	581,907	831,000	166,000	997,000	59,447,000	-	-
2125	588,308	840,000	168,000	1,008,000	60,455,000	-	-
2126	594,779	850,000	170,000	1,020,000	61,475,000	-	-
2127	601,321	859,000	172,000	1,031,000	62,506,000	-	-
2128	607,936	868,000	174,000	1,042,000	63,548,000	-	-
2129	614,623	878,000	176,000	1,054,000	64,602,000	-	86.0
<b>Total</b>	<b>37,686,654</b>	<b>53,836,000</b>	<b>10,766,000</b>	<b>64,602,000</b>		<b>347.0</b>	<b>347.0</b>

**Assumptions:**

- 1. Landfill density assumed to be 

1400
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 lbs per cubic yard air space consumed
- 2. Cover:Refuse airspace Ratio = 

20%
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 on a volumetric basis.



**Table 4M: Liquid Management Systems (Stormwater & Leachate)**

Item	Unit	Quantity <sup>3</sup>	Unit Cost (2023 \$)	Estimated Cost (2023 \$)
Excavation and Embankment	CY	60,000	\$ 4.00	\$ 240,000
Rock Drilling, Blasting, Crushing (2-inch Minus)	CY	15,000	\$ 12.00	\$ 180,000
6-inch Soil Cushion Layer	CY	1,500	\$ 10.00	\$ 15,000
Lower Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Geomembrane for Leak Detection	SF	30,000	\$ 0.90	\$ 27,000
Geonet Composite	SF	30,000	\$ 0.95	\$ 28,500
Lower Geotextile Separating Layer	SF	30,000	\$ 0.85	\$ 25,500
Upper Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Primary Geomembrane	SF	90,000	\$ 0.90	\$ 81,000
16-oz Upper Geotextile Cushion	SF	90,000	\$ 0.85	\$ 76,500
12-inch Drainage Layer	CY	3,300	\$ 10.00	\$ 33,000
Pump Station	Lump Sum	1	\$ 200,000.00	\$ 200,000
Truck Loading Station	Lump Sum	1	\$ 100,000.00	\$ 100,000
Subtotal				\$ 1,066,500
Engineering and Administration (15%)				\$ 159,975
Contingencies (20%)				\$ 213,300
<b>Estimated Cost for Leachate System and Stormwater Pond</b>				<b>\$ 1,439,775</b>

1/5/2024

**Assumptions:**

1. 25% of the excavation volume will require rock drilling, blasting and crushing.
2. Rock Drilling, Blasting, Crushing cost assumes no contractor mining, just processing for County uses
3. Stormwater pond is 1.38 acres and the leachate pond is 0.68 acres. Total pond area is approximately 2 acres.
4. Leachate leak detection system includes a combination geomembrane/geonet below the primary composite liner.

**Table 5M: Estimate Of Per Acre Cost for Landfill Cell Development**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Excavation	CY	38,000	\$ 4.00	\$ 152,000
Rock Drilling, Blasting, Crushing (2-inch Minus)	CY	34,200	\$ 12.00	\$ 410,400
Embankment	CY	6,000	\$ 2.00	\$ 12,000
6-inch Soil Cushion Layer	CY	900	\$ 10.00	\$ 9,000
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Cushioning Geotextile	SF	12,000	\$ 0.85	\$ 10,200
Geonet Composite	SF	48,000	\$ 0.95	\$ 45,600
12-inch Drainage Layer	CY	1,600	\$ 10.00	\$ 16,000
Separating Geotextile	SF	36,000	\$ 0.85	\$ 30,600
8-inch Leachate Collection Pipe	LF	300	\$ 30.00	\$ 9,000
Landfill Gas Collection System	Lump Sum	1	\$ 10,000.00	\$ 10,000
Subtotal				\$ 796,000
Engineering and Administration (15%)				\$ 119,400
Contingencies (20%)				\$ 159,200
<b>Estimated Per Acre Cost Landfill Cell Development</b>				<b>\$ 1,074,600</b>

1/5/2024

**Assumptions:**

1. Approximately 90% of the excavation volume will require rock drilling, blasting and crushing.
2. Rock Drilling, Blasting, Crushing cost assumes no contractor mining, just processing for County uses

**Table 6M: Estimate Of Per Acre Cost for Landfill Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Final Contouring and Grading	CY	5,000	\$ 4.00	\$ 20,000
Landfill Gas Collection System				
Landfill Gas Well	LF	100	\$ 150.00	\$ 15,000
Piping	LF	300	\$ 30.00	\$ 9,000
16-oz Geotextile Cushion	SF	48,000	\$ 0.85	\$ 40,800
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Geonet Composite Layer	SF	48,000	\$ 0.95	\$ 45,600
24-inch Top Soil/Soil Protective Layer	CY	3,500	\$ 15.00	\$ 52,500
Seed, Fertilizer and Mulch	SF	48,000	\$ 0.05	\$ 2,400
Cover System Irrigation	LF	800	\$ 5.00	\$ 4,000
Subtotal				\$ 280,500
Engineering and Administration (15%)				\$ 42,075
Contingencies (20%)				\$ 56,100
<b>Estimated Per Acre Cost for Cover System</b>				<b>\$ 378,675</b>

1/5/2024

**Table 7M: Estimated Haul Costs from Transfer Stations**

Facility	2029 Waste Distribution (%)	2029 Waste Disposal Projected <sup>1</sup> (Tons)	Haul Trips Estimated <sup>2</sup> (Trips)	Round Trip Distance (Miles)	Round Trip Time (Hrs)	Total Haul Time (Hrs)	Annual Haul Cost <sup>3</sup> (\$)	Cost per Ton (\$/ton)
Knott Transfer Station	75.91%	176454	8823	35.25	1.13	9970	\$ 1,595,141	\$9.04
Negus Transfer Station	16.84%	39145	1957	73.45	2.23	4365	\$ 698,343	\$17.84
Southwest Transfer Station	5.42%	12599	630	73.25	1.73	1090	\$ 174,368	\$13.84
Northwest Transfer Station	1.74%	4045	202	78.25	2.07	419	\$ 66,979	\$16.56
Alfalfa Transfer Station	0.09%	209	10	38.45	1.07	11	\$ 1,791	\$8.56
<b>Total</b>		<b>232,451</b>	<b>11,623</b>	<b>299</b>	<b>8</b>	<b>15,854</b>	<b>\$ 2,536,622</b>	<b>\$10.91</b>

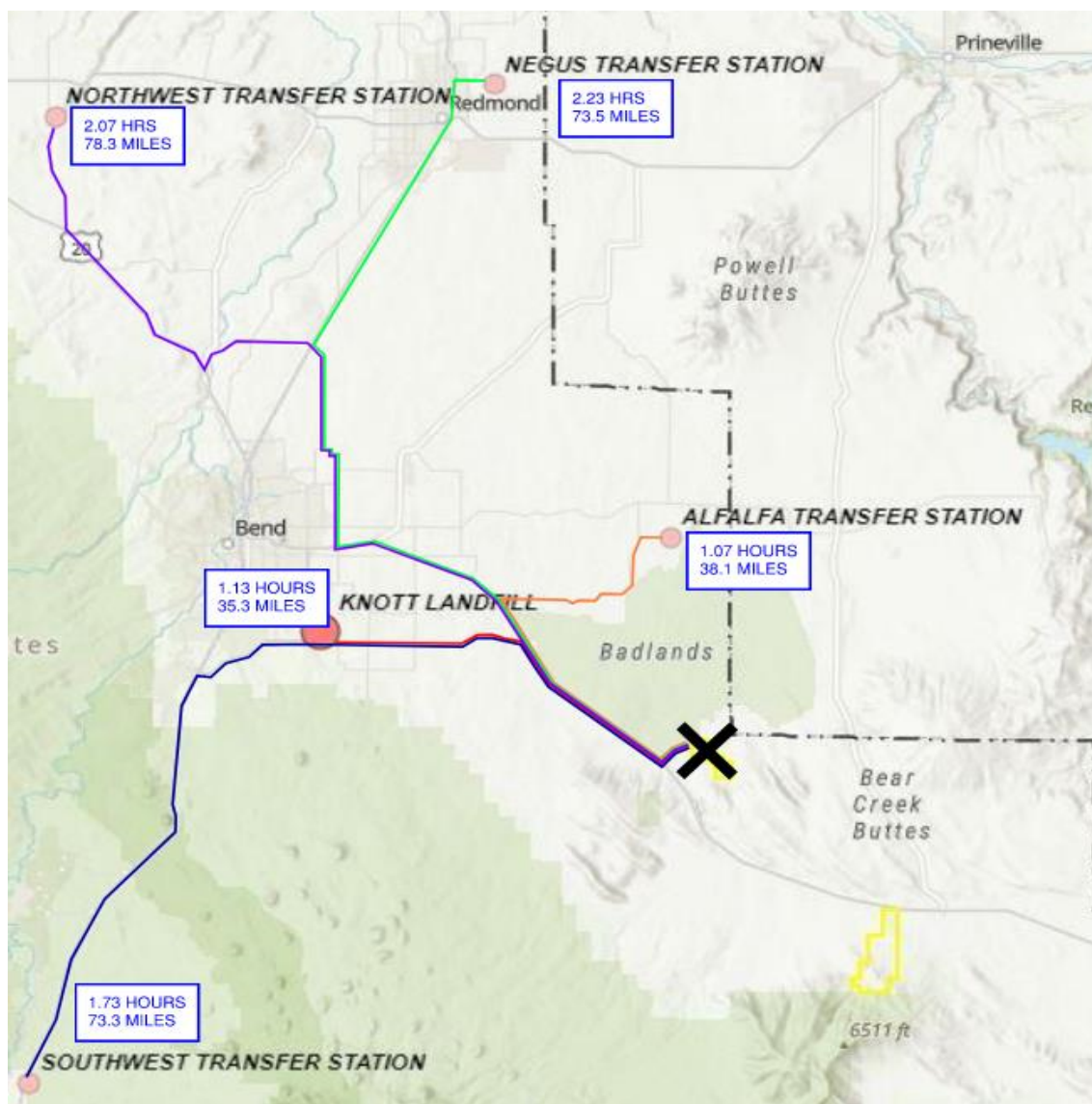
Assumptions:

- 2029 Projected Waste Disposal: 

232,451	tons
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- Assumed average payload: 

20	tons/haul trip
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- Assumed haul cost per hour: 

\$ 160.00	per hour (incl. labor, equipment, depreciation, maintenance costs)
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- Round Trip estimation includes driveway (2 min & 1.1 mile, twice) and on-site time & distance (20 min & 3.25 miles)



**Table 8M: Estimate of Annual Operating Costs**

Item	Unit	Quantity	Unit Cost	Estimated Cost
				(2023 \$)
<b>Administrative Labor Costs</b>				
Operations Manager	Person	0.50	\$ 188,821	\$ 94,411
Compliance & Infrastructure Manager	Person	0.25	\$ 200,693	\$ 50,173
Management Analyst	Person	0.10	\$ 164,073	\$ 16,407
Engineering Asst III	Person	0.80	\$ 120,986	\$ 96,789
Director of Solid Waste	Person	0.13	\$ 241,545	\$ 30,193
Equipment Operator	Person	7	\$ 110,000	\$ 770,000
Landfill Attendant	Person	2	\$ 80,000	\$ 160,000
Office Assistant	Person	1	\$ 70,000	\$ 70,000
<b>Administrative Labor Subtotal</b>				<b>\$ 1,287,973</b>
<b>Equipment Owning and Operating Costs</b>				
Large Dozer (Cat D8N)	Hour	500	\$ 65.00	\$ 32,500
Compactor (Cat 826C)	Hour	2,900	\$ 65.00	\$ 188,500
Scraper (Cat 623E)	Hour	1,000	\$ 75.00	\$ 75,000
Front End Loader (Cat 966F)	Hour	2,800	\$ 50.00	\$ 140,000
Water Truck	Hour	520	\$ 50.00	\$ 26,000
Small Dozer (Cat D6D)	Hour	1,040	\$ 50.00	\$ 52,000
Utility Trucks	Mile	40,000	\$ 0.60	\$ 24,000
Yard Jockey	Hour	520	\$ 50.00	\$ 26,000
Landfill Infrastructure Repair and Maintenance	LS	1	\$ 50,000	\$ 50,000
Equipment Repair and Maintenance	LS	1	\$ 250,000	\$ 250,000
<b>Equipment O &amp; O Subtotal</b>				<b>\$ 864,000</b>
<b>Environmental Monitoring Costs</b>				
Groundwater Sampling and Analysis	Sample	16	\$ 2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	\$ 2,000	\$ 24,000
Landfill Gas Sampling	Event	4	\$ 2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	\$ 2,000	\$ 8,000
Annual Reports	Each	1	\$ 30,000	\$ 30,000
Fees & Permits	LS	1	\$ 500,000	\$ 500,000
Miscellaneous Environmental Cost	LS	1	\$ 250,000	\$ 250,000
Natural Resource Mitigation O&M	LS	1	\$ 16,000	\$ 16,000
<b>Environmental Monitoring Subtotal</b>				<b>\$ 868,000</b>
<b>Haul Costs from:</b>				
Knott Transfer Station	Hour	9,970	\$ 160.00	\$ 1,595,141
Negus Transfer Station	Hour	4,365	\$ 160.00	\$ 698,343
Southwest Transfer Station	Hour	1,090	\$ 160.00	\$ 174,368
Northwest Transfer Station	Hour	419	\$ 160.00	\$ 66,979
Alfalfa Transfer Station	Hour	11	\$ 160.00	\$ 1,791
<b>Haul Cost Subtotal</b>				<b>\$ 2,536,622</b>
<b>Miscellaneous</b>				
Roadway Maintenance	LS			\$ 50,000
Site and Building Maintenance	LS			\$ 240,000
Office Supplies	LS			\$ 23,000
Insurance	LS			\$ 100,000
Engineering and Legal Services	LS			\$ 75,000
Gas/ Diesel / Oil	LS			\$ 280,000
Water (Hooker Creek charge)	gallon	5,155,253	\$ 0.01	\$ 51,553
Utilities (power, internet, septic tank/drainfield)	LS			\$ 50,000
Code Abatement/ Enforcement	LS			\$ 200,000
Other	LS			\$ 200,000
<b>Miscellaneous Subtotal</b>				<b>\$ 1,269,553</b>
Annual Transfer To Equipment Fund (491614)				\$ 750,000
<b>Total Annual Operating Costs</b>				<b>\$ 7,576,147</b>
				(used in T11 forecast)
Annual Transfer To Cell Closure Fund (491611)				\$ 1,314,040
Annual Transfer To Post-Closure Fund (491612)				\$ 90,683
Annual Transfer To Cell Expansion Fund (491613)				\$ 3,470,940
<b>Total Annual Operating Costs Including Transfers</b>				<b>\$ 12,451,810</b>
				(for DCSW budgeting)

**Table 9M: Estimate Of Annual Operating Costs after Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost
Compliance & Infrastructure Manager	Person	0.40	\$ 200,693	\$ 80,277
				(2023 \$)
Environmental Monitoring				
Groundwater Sampling and Analysis	Sample	16	\$ 2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	\$ 2,000	\$ 24,000
Landfill Gas Sampling	Event	4	\$ 2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	\$ 2,000	\$ 8,000
Annual Reports	Each	1	\$ 30,000	\$ 30,000
Environmental Monitoring Subtotal				\$ 102,000
Maintenance				
Roadway	LS			\$ 5,000
Final Cover System	LS			\$ 25,000
Leachate Management System	LS			\$ 20,000
Landfill Gas Management System	LS			\$ 15,000
Surface Water Management System	LS			\$ 10,000
Maintenance Subtotal				\$ 75,000
Miscellaneous				
Financial Assurance Provision	LS			\$ 25,000
Utilities	LS			\$ 10,000
Other	LS			\$ 10,000
Miscellaneous Subtotal				\$ 45,000
<b>Annual Operating Costs after Closure</b>				<b>\$ 302,277</b>

**Table 10M: Cost Estimate for Initial Development of Landfill**

Description	Year	Unit	Quantity	Unit Cost	Estimated Cost
					(2023 \$)
<b>Pre-Development</b>					
Site Characterization Study	2024	LS			\$ 750,000
Land Acquisition	2025	LS			\$ 15,870,000
Permitting	2025-26	LS			\$ 1,500,000
<b>Pre-Development Subtotal</b>					<b>\$ 18,120,000</b>
<b>Capital Expenditures</b>					
Support Facilities					
Roads (driveway pavement overlay)	2028-29	LF	2,000	\$ 50	\$ 100,000
Landfill Office	2028-29	SF	2,000	\$ 500	\$ 1,000,000
Maintenance Shop	2028-29	SF	4,000	\$ 400	\$ 1,600,000
70-foot Truck Scales	2028-29	Each	1	\$ 200,000	\$ 200,000
Utilities					
Electrical Extension & Distribution	2028-29	LS			\$ 2,300,000
Internet / Comms / Controls Systems	2028-29	LS			\$ 50,000
Water Supply, Storage, Distribution	2028-29	LS			\$ 665,000
Onsite Wastewater System	2028-29	LS			\$ 50,000
Initial Cell/Lagoon Construction					
Excavation	2028-29	CY	1,400,000	\$ 4	\$ 5,600,000
2-inch Minus Aggregate	2028-29	CY	1,260,000	\$ 12	\$ 15,120,000
Embankment	2028-29	CY	100,000	\$ 2	\$ 200,000
Liner/ Leachate Collection System	2028-29	Acre	24	\$ 221,600	\$ 5,318,400
Leachate & Stormwater Systems	2028-29	Each	1	\$ 1,066,500	\$ 1,066,500
Environmental Monitoring					
3-1100 Foot Groundwater Wells	2026	LF	3,300	\$ 200	\$ 660,000
Landfill Gas Probes	2026	LF	180	\$ 150	\$ 27,000
Natural Resource Mitigation Costs:					
Initial Mitigation Cost	2025	LS		\$ 700,000	\$ 700,000
<b>Capital Subtotal</b>					<b>\$ 34,656,900</b>
Engineering and Administration (15%)	2027-29				\$ 5,199,000
Contingencies (20%)	2028-29				\$ 6,931,000
<b>Total Initial Capital Cost</b>					<b>\$ 46,786,900</b>
<b>Initial Development Cost Schedule</b>					
2024					\$ 750,000
2025					\$ 17,320,000
2026					\$ 1,437,000
2027					\$ 1,733,000
2028					\$ 21,833,450
2029					\$ 21,833,450
<b>Total</b>					<b>\$ 64,906,900</b>

**Table 11M: Total Estimated Costs for Operation of MSW Landfill at Moon Pit Site**

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2024	750,000	-	-	-	750,000
2025	17,320,000	-	-	-	17,320,000
2026	1,437,000	-	-	-	1,437,000
2027	1,733,000	-	-	-	1,733,000
2028	21,833,450	-	-	-	21,833,450
2029	21,833,450	-	-	-	21,833,450
2030	-	-	-	7,576,147	7,576,147
2031	-	8,597,000	-	7,582,641	16,179,641
2032	-	-	-	7,587,166	7,587,166
2033	-	9,671,000	-	7,589,654	17,260,654
2034	-	-	-	7,589,654	7,589,654
2035	-	9,671,000	-	7,589,654	17,260,654
2036	-	-	-	7,589,654	7,589,654
2037	-	9,671,000	-	7,589,654	17,260,654
2038	-	-	-	7,589,654	7,589,654
2039	-	9,671,000	-	7,695,909	17,366,909
2040	-	-	-	7,740,882	7,740,882
2041	-	9,671,000	-	7,841,513	17,512,513
2042	-	-	-	7,943,453	7,943,453
2043	-	-	-	8,046,718	8,046,718
2044	-	10,746,000	-	8,151,325	18,897,325
2045	-	-	3,029,000	8,204,895	11,233,895
2046	-	-	-	8,303,353	8,303,353
2047	-	10,746,000	-	8,387,093	19,133,093
2048	-	-	3,029,000	8,479,351	11,508,351
2049	-	-	-	8,572,624	8,572,624
2050	-	10,746,000	-	8,666,448	19,412,448
2051	-	-	3,408,000	8,761,779	12,169,779
2052	-	-	-	8,858,159	8,858,159
2053	-	10,746,000	-	8,955,598	19,701,598
2054	-	-	3,408,000	9,054,110	12,462,110
2055	-	-	-	9,152,870	9,152,870
2056	-	10,746,000	-	9,253,552	19,999,552
2057	-	-	3,408,000	9,355,341	12,763,341
2058	-	-	-	9,458,249	9,458,249
2059	-	10,746,000	-	9,562,290	20,308,290
2060	-	-	3,408,000	9,666,593	13,074,593
2061	-	-	-	9,772,926	9,772,926
2062	-	10,746,000	-	9,880,428	20,626,428
2063	-	-	3,408,000	9,989,113	13,397,113
2064	-	-	-	10,098,993	10,098,993
2065	-	10,746,000	-	10,209,150	20,955,150
2066	-	-	3,787,000	10,321,451	14,108,451
2067	-	-	-	10,434,987	10,434,987
2068	-	10,746,000	-	10,549,772	21,295,772
2069	-	-	3,787,000	10,665,819	14,452,819
2070	-	-	-	10,782,159	10,782,159
2071	-	10,746,000	-	10,900,763	21,646,763
2072	-	-	3,787,000	11,020,269	14,807,269
2073	-	-	-	11,141,492	11,141,492
2074	-	10,746,000	-	11,264,048	22,010,048
2075	-	-	3,787,000	11,387,953	15,174,953
2076	-	-	-	11,513,220	11,513,220
2077	-	10,746,000	-	11,639,866	22,385,866
2078	-	-	3,787,000	11,767,904	15,554,904
2079	-	-	-	11,897,351	11,897,351

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2080	-	10,746,000	-	12,028,222	22,774,222
2081	-	-	3,787,000	12,160,533	15,947,533
2082	-	-	-	12,294,299	12,294,299
2083	-	10,746,000	-	12,429,536	23,175,536
2084	-	-	3,787,000	12,566,261	16,353,261
2085	-	-	-	12,704,490	12,704,490
2086	-	10,746,000	-	12,844,239	23,590,239
2087	-	-	3,787,000	12,985,526	16,772,526
2088	-	-	-	13,128,366	13,128,366
2089	-	10,746,000	-	13,272,778	24,018,778
2090	-	-	3,787,000	13,418,779	17,205,779
2091	-	-	-	13,566,386	13,566,386
2092	-	10,746,000	-	13,715,616	24,461,616
2093	-	-	3,787,000	13,866,488	17,653,488
2094	-	-	-	14,019,019	14,019,019
2095	-	10,746,000	-	14,173,228	24,919,228
2096	-	-	3,787,000	14,329,134	18,116,134
2097	-	-	-	14,486,754	14,486,754
2098	-	10,746,000	-	14,646,108	25,392,108
2099	-	-	3,787,000	14,807,216	18,594,216
2100	-	-	-	14,970,095	14,970,095
2101	-	10,746,000	-	15,134,766	25,880,766
2102	-	-	3,787,000	15,301,248	19,088,248
2103	-	-	-	15,469,562	15,469,562
2104	-	10,746,000	-	15,639,727	26,385,727
2105	-	-	3,787,000	15,811,764	19,598,764
2106	-	-	-	15,985,694	15,985,694
2107	-	10,746,000	-	16,161,536	26,907,536
2108	-	-	3,787,000	16,339,313	20,126,313
2109	-	-	-	16,519,046	16,519,046
2110	-	10,746,000	-	16,700,755	27,446,755
2111	-	-	3,787,000	16,884,464	20,671,464
2112	-	-	-	17,070,193	17,070,193
2113	-	10,746,000	-	17,257,965	28,003,965
2114	-	-	3,787,000	17,447,802	21,234,802
2115	-	-	-	17,639,728	17,639,728
2116	-	10,746,000	-	17,833,765	28,579,765
2117	-	-	3,787,000	18,029,937	21,816,937
2118	-	-	-	18,228,266	18,228,266
2119	-	10,746,000	-	18,428,777	29,174,777
2120	-	-	3,787,000	18,631,493	22,418,493
2121	-	-	-	18,836,440	18,836,440
2122	-	10,746,000	-	19,043,641	29,789,641
2123	-	-	3,787,000	19,253,121	23,040,121
2124	-	-	-	19,464,905	19,464,905
2125	-	-	-	19,679,019	19,679,019
2126	-	-	-	19,895,488	19,895,488
2127	-	-	-	20,114,339	20,114,339
2128	-	-	-	20,335,596	20,335,596
2129	-	-	32,566,000	20,559,288	53,125,288
Subtotals	64,906,900	347,094,000	131,404,000	1,259,744,358	1,803,149,258
Post-Closure Operations (2130-2160) =				9,068,316	9,068,316
<b>Totals</b>				<b>1,268,812,674</b>	<b>1,812,217,574</b>
				<b>Avg. Cost per Ton</b>	<b>\$48.09</b>
(2030-59 Total Costs + Initial Capital Costs Financed with 30-yr Bond @ 4.75%)				<b>30-yr Cost per Ton</b>	<b>\$68.28</b>



**Table 3R: Projected Landfill Volume and Area Requirements**

Year	Preliminary Waste Disposal Projection (tons/yr)	Landfill Volume Required				Construction Requirements	
		Refuse Bank Yards <sup>1</sup> (cy)	Daily and Intermediate Cover <sup>2</sup> (cy)	Gross Airspace (cy)	Cumulative Airspace (cy)	Lateral Expansion (Acre)	Cell Closure (Acre)
2029	-	-	-	-	-	24.0	-
2030	231,009	330,000	66,000	396,000	396,000	-	-
2031	231,207	330,000	66,000	396,000	792,000	6.0	-
2032	231,344	330,000	66,000	396,000	1,188,000	-	-
2033	231,420	331,000	66,000	397,000	1,585,000	6.0	-
2034	231,204	330,000	66,000	396,000	1,981,000	-	-
2035	228,818	327,000	65,000	392,000	2,373,000	6.0	-
2036	228,246	326,000	65,000	391,000	2,764,000	-	-
2037	227,605	325,000	65,000	390,000	3,154,000	7.0	-
2038	226,894	324,000	65,000	389,000	3,543,000	-	-
2039	230,070	329,000	66,000	395,000	3,938,000	7.0	-
2040	231,415	331,000	66,000	397,000	4,335,000	-	-
2041	234,423	335,000	67,000	402,000	4,737,000	7.0	-
2042	237,471	339,000	68,000	407,000	5,144,000	-	-
2043	240,558	344,000	69,000	413,000	5,557,000	7.0	-
2044	243,685	348,000	70,000	418,000	5,975,000	-	6.0
2045	245,287	350,000	70,000	420,000	6,395,000	7.0	-
2046	248,230	355,000	71,000	426,000	6,821,000	-	6.0
2047	250,734	358,000	72,000	430,000	7,251,000	7.0	-
2048	253,492	362,000	72,000	434,000	7,685,000	-	6.0
2049	256,280	366,000	73,000	439,000	8,124,000	7.0	-
2050	259,085	370,000	74,000	444,000	8,568,000	-	6.0
2051	261,935	374,000	75,000	449,000	9,017,000	7.0	-
2052	264,816	378,000	76,000	454,000	9,471,000	-	7.0
2053	267,729	382,000	76,000	458,000	9,929,000	-	-
2054	270,674	387,000	77,000	464,000	10,393,000	8.0	-
2055	273,627	391,000	78,000	469,000	10,862,000	-	7.0
2056	276,636	395,000	79,000	474,000	11,336,000	-	-
2057	279,679	400,000	80,000	480,000	11,816,000	8.0	-
2058	282,756	404,000	81,000	485,000	12,301,000	-	7.0
2059	285,866	408,000	82,000	490,000	12,791,000	-	-
2060	288,984	413,000	83,000	496,000	13,287,000	8.0	-
2061	292,163	417,000	83,000	500,000	13,787,000	-	7.0
2062	295,377	422,000	84,000	506,000	14,293,000	-	-
2063	298,626	427,000	85,000	512,000	14,805,000	8.0	-
2064	301,911	431,000	86,000	517,000	15,322,000	-	7.0
2065	305,204	436,000	87,000	523,000	15,845,000	-	-
2066	308,561	441,000	88,000	529,000	16,374,000	8.0	-
2067	311,956	446,000	89,000	535,000	16,909,000	-	7.0
2068	315,387	451,000	90,000	541,000	17,450,000	-	-
2069	318,856	456,000	91,000	547,000	17,997,000	8.0	-
2070	322,334	460,000	92,000	552,000	18,549,000	-	7.0
2071	325,880	466,000	93,000	559,000	19,108,000	-	-
2072	329,453	471,000	94,000	565,000	19,673,000	8.0	-
2073	333,077	476,000	95,000	571,000	20,244,000	-	7.0
2074	336,741	481,000	96,000	577,000	20,821,000	-	-
2075	340,445	486,000	97,000	583,000	21,404,000	9.0	-
2076	344,190	492,000	98,000	590,000	21,994,000	-	8.0
2077	347,976	497,000	99,000	596,000	22,590,000	-	-
2078	351,803	503,000	101,000	604,000	23,194,000	9.0	-
2079	355,673	508,000	102,000	610,000	23,804,000	-	8.0

Assumptions:

- 1. Landfill density assumed to be 

1400
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 lbs of solid waste per cubic yard consumed.
- 2. Cover:Refuse Ratio equals 

20%
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 on a volumetric basis.

**Table 3R: Projected Landfill Volume and Area Requirements (continued)**

Year	Preliminary Waste Disposal Projection (tons/yr)	Landfill Volume Required				Construction Requirements	
		Refuse Bank Yards <sup>1</sup> (cy)	Daily and Intermediate Cover <sup>2</sup> (cy)	Gross Airspace (cy)	Cumulative Airspace (cy)	Lateral Expansion (Acre)	Cell Closure (Acre)
2080	359,586	514,000	103,000	617,000	24,421,000	-	-
2081	363,541	519,000	104,000	623,000	25,044,000	9.0	-
2082	367,540	525,000	105,000	630,000	25,674,000	-	8.0
2083	371,583	531,000	106,000	637,000	26,311,000	-	-
2084	375,670	537,000	107,000	644,000	26,955,000	9.0	-
2085	379,803	543,000	109,000	652,000	27,607,000	-	8.0
2086	383,981	549,000	110,000	659,000	28,266,000	-	-
2087	388,204	555,000	111,000	666,000	28,932,000	9.0	-
2088	392,475	561,000	112,000	673,000	29,605,000	-	8.0
2089	396,792	567,000	113,000	680,000	30,285,000	-	-
2090	401,157	573,000	115,000	688,000	30,973,000	10.0	-
2091	405,569	579,000	116,000	695,000	31,668,000	-	8.0
2092	410,031	586,000	117,000	703,000	32,371,000	-	-
2093	414,541	592,000	118,000	710,000	33,081,000	10.0	-
2094	419,101	599,000	120,000	719,000	33,800,000	-	8.0
2095	423,711	605,000	121,000	726,000	34,526,000	-	-
2096	428,372	612,000	122,000	734,000	35,260,000	10.0	-
2097	433,084	619,000	124,000	743,000	36,003,000	-	9.0
2098	437,848	625,000	125,000	750,000	36,753,000	-	-
2099	442,664	632,000	126,000	758,000	37,511,000	10.0	-
2100	447,533	639,000	128,000	767,000	38,278,000	-	9.0
2101	452,456	646,000	129,000	775,000	39,053,000	-	-
2102	457,433	653,000	131,000	784,000	39,837,000	10.0	-
2103	462,465	661,000	132,000	793,000	40,630,000	-	9.0
2104	467,552	668,000	134,000	802,000	41,432,000	-	-
2105	472,695	675,000	135,000	810,000	42,242,000	10.0	-
2106	477,895	683,000	137,000	820,000	43,062,000	-	9.0
2107	483,152	690,000	138,000	828,000	43,890,000	-	-
2108	488,466	698,000	140,000	838,000	44,728,000	10.0	-
2109	493,840	705,000	141,000	846,000	45,574,000	-	9.0
2110	499,272	713,000	143,000	856,000	46,430,000	-	-
2111	504,764	721,000	144,000	865,000	47,295,000	10.0	-
2112	510,316	729,000	146,000	875,000	48,170,000	-	10.0
2113	515,930	737,000	147,000	884,000	49,054,000	-	-
2114	521,605	745,000	149,000	894,000	49,948,000	10.0	-
2115	527,343	753,000	151,000	904,000	50,852,000	-	10.0
2116	533,143	762,000	152,000	914,000	51,766,000	-	-
2117	539,008	770,000	154,000	924,000	52,690,000	12.0	-
2118	544,937	778,000	156,000	934,000	53,624,000	-	10.0
2119	550,931	787,000	157,000	944,000	54,568,000	-	-
2120	556,992	796,000	159,000	955,000	55,523,000	12.0	-
2121	563,118	804,000	161,000	965,000	56,488,000	-	10.0
2122	569,313	813,000	163,000	976,000	57,464,000	-	-
2123	575,575	822,000	164,000	986,000	58,450,000	12.0	-
2124	581,907	831,000	166,000	997,000	59,447,000	-	10.0
2125	588,308	840,000	168,000	1,008,000	60,455,000	-	-
2126	594,779	850,000	170,000	1,020,000	61,475,000	12.0	-
2127	601,321	859,000	172,000	1,031,000	62,506,000	-	10.0
2128	607,936	868,000	174,000	1,042,000	63,548,000	-	-
2129	614,623	878,000	176,000	1,054,000	64,602,000	12.0	-
2130	621,384	888,000	178,000	1,066,000	65,668,000	-	10.0
2131	628,219	897,000	179,000	1,076,000	66,744,000	-	-
2132	635,130	907,000	181,000	1,088,000	67,832,000	12.0	-
2133	642,116	917,000	183,000	1,100,000	68,932,000	-	10.0
2134	649,179	927,000	185,000	1,112,000	70,044,000	-	-
2135	656,320	938,000	188,000	1,126,000	71,170,000	13.0	-
2136	663,540	948,000	190,000	1,138,000	72,308,000	-	10.0
2137	670,839	958,000	192,000	1,150,000	73,458,000	-	-
2138	678,218	969,000	194,000	1,163,000	74,621,000	13.0	-
2139	685,679	980,000	196,000	1,176,000	75,797,000	-	12.0
2140	693,221	990,000	198,000	1,188,000	76,985,000	-	-
2141	700,846	1,001,000	200,000	1,201,000	78,186,000	-	-
2142	708,556	1,012,000	202,000	1,214,000	79,400,000	-	104.0
<b>Total</b>	<b>46,319,902</b>	<b>66,168,000</b>	<b>13,232,000</b>	<b>79,400,000</b>		<b>387.0</b>	<b>387.0</b>

5-Jan-24

Assumptions:

- 1. Landfill density assumed to be 

1400
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 lbs of solid waste per cubic yard consumed.
- 2. Cover:Refuse Ratio equals 

20%
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 on a volumetric basis.

**Table 4R: Liquid Management Systems (Stormwater & Leachate)**

Item	Unit	Quantity <sup>2</sup>	Unit Cost	Estimated Cost (2023 \$)
Excavation and Embankment	CY	60,000	\$ 4.00	\$ 240,000
6-inch Soil Cushion Layer	CY	1,500	\$ 10.00	\$ 15,000
Lower Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Geomembrane for Leak Detection	SF	30,000	\$ 0.90	\$ 27,000
Geonet Composite	SF	30,000	\$ 0.95	\$ 28,500
Lower Geotextile Separating Layer	SF	30,000	\$ 0.85	\$ 25,500
Upper Geosynthetic Clay Liner	SF	30,000	\$ 1.00	\$ 30,000
Primary Geomembrane	SF	90,000	\$ 0.90	\$ 81,000
16-oz Upper Geotextile Cushion	SF	90,000	\$ 0.85	\$ 76,500
12-inch Drainage Layer	CY	3,300	\$ 10.00	\$ 33,000
Pump Station	Lump Sum	1	\$ 200,000.00	\$ 200,000
Truck Loading Station	Lump Sum	1	\$ 100,000.00	\$ 100,000
Subtotal				\$ 886,500
Engineering and Administration (15%)				\$ 132,975
Contingencies (20%)				\$ 177,300
<b>Estimated Cost for Leachate System and Stormwater Pond</b>				<b>\$ 1,196,775</b>

1/5/2024

**Assumptions:**

1. Stormwater pond is 1.38 acres and the leachate pond is 0.68 acres. Total pond area is approximately 2 acres.
2. Leachate leak detection system includes a combination geomembrane/geonet below the primary composite liner.

**Table 5R: Estimate Of Per Acre Cost for Landfill Cell Development**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Rough Excavation <sup>1</sup>	CY	-	\$ 4.00	\$ 0
Finish Excavation <sup>2</sup>	CY	15,000	\$ 4.00	\$ 60,000
Embankment	CY	5,000	\$ 2.00	\$ 10,000
6-inch Soil Cushion Layer	CY	900	\$ 10.00	\$ 9,000
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Cushioning Geotextile	SF	12,000	\$ 0.85	\$ 10,200
Geonet Composite	SF	48,000	\$ 0.95	\$ 45,600
12-inch Drainage Layer	CY	1,600	\$ 10.00	\$ 16,000
Separating Geotextile	SF	36,000	\$ 0.85	\$ 30,600
8-inch Leachate Collection Pipe	LF	300	\$ 30.00	\$ 9,000
Landfill Gas Collection System	Lump Sum	1	\$ 10,000.00	\$ 10,000
Subtotal				\$ 291,600
Engineering and Administration (15%)				\$ 43,740
Contingencies (20%)				\$ 58,320
<b>Estimated Per Acre Cost Landfill Cell Development</b>				<b>\$ 393,660</b>

1/5/2024

Assumption:

1. Two thirds of cell excavation would occur as a part of daily cover borrow operations by DCSW staff.
2. One-third of total excavation if fine grading to cell subgrade design elevations.

**Table 6R: Estimate Of Per Acre Cost for Landfill Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost (2023 \$)
Final Contouring and Grading	CY	5,000	\$ 4.00	\$ 20,000
Landfill Gas Collection System				
Landfill Gas Well	LF	100	\$ 150.00	\$ 15,000
Piping	LF	300	\$ 30.00	\$ 9,000
16-oz Geotextile Cushion	SF	48,000	\$ 0.85	\$ 40,800
Geosynthetic Clay Liner	SF	48,000	\$ 1.00	\$ 48,000
Geomembrane	SF	48,000	\$ 0.90	\$ 43,200
Geonet Composite Layer	SF	48,000	\$ 0.95	\$ 45,600
24-inch Top Soil/Soil Protective Layer	CY	3,500	\$ 15.00	\$ 52,500
Seed, Fertilizer and Mulch	SF	48,000	\$ 0.05	\$ 2,400
Cover System Irrigation	LF	800	\$ 5.00	\$ 4,000
Subtotal				\$ 280,500
Engineering and Administration (15%)				\$ 42,075
Contingencies (20%)				\$ 56,100
<b>Estimated Per Acre Cost for Cover System</b>				<b>\$ 378,675</b>

**Table 7R: Estimated Haul Costs from Transfer Stations**

Facility	2029 Waste Distribution (%)	2029 Waste Disposal Projected <sup>1</sup> (Tons)	Haul Trips Estimated <sup>2</sup> (Trips)	Round Trip Distance (Miles)	Round Trip Time (Hrs)	Total Haul Time (Hrs)	Annual Haul Cost <sup>3</sup> (\$)	Cost per Ton (\$/ton)
Knott Transfer Station	75.91%	176454	8823	52.9	1.53	13499	\$ 2,159,792	\$12.24
Negus Transfer Station	16.84%	39145	1957	91.1	2.63	5148	\$ 823,606	\$21.04
Southwest Transfer Station	5.42%	12599	630	90.9	2.13	1342	\$ 214,684	\$17.04
Northwest Transfer Station	1.74%	4045	202	95.9	2.47	500	\$ 79,922	\$19.76
Alfalfa Transfer Station	0.09%	209	10	55.7	1.47	15	\$ 2,460	\$11.76
<b>Total</b>		<b>232,451</b>	<b>11,623</b>	<b>387</b>	<b>10</b>	<b>20,503</b>	<b>\$ 3,280,465</b>	<b>\$14.11</b>

Assumptions:

- 2029 Projected Waste Disposal: 

232,451
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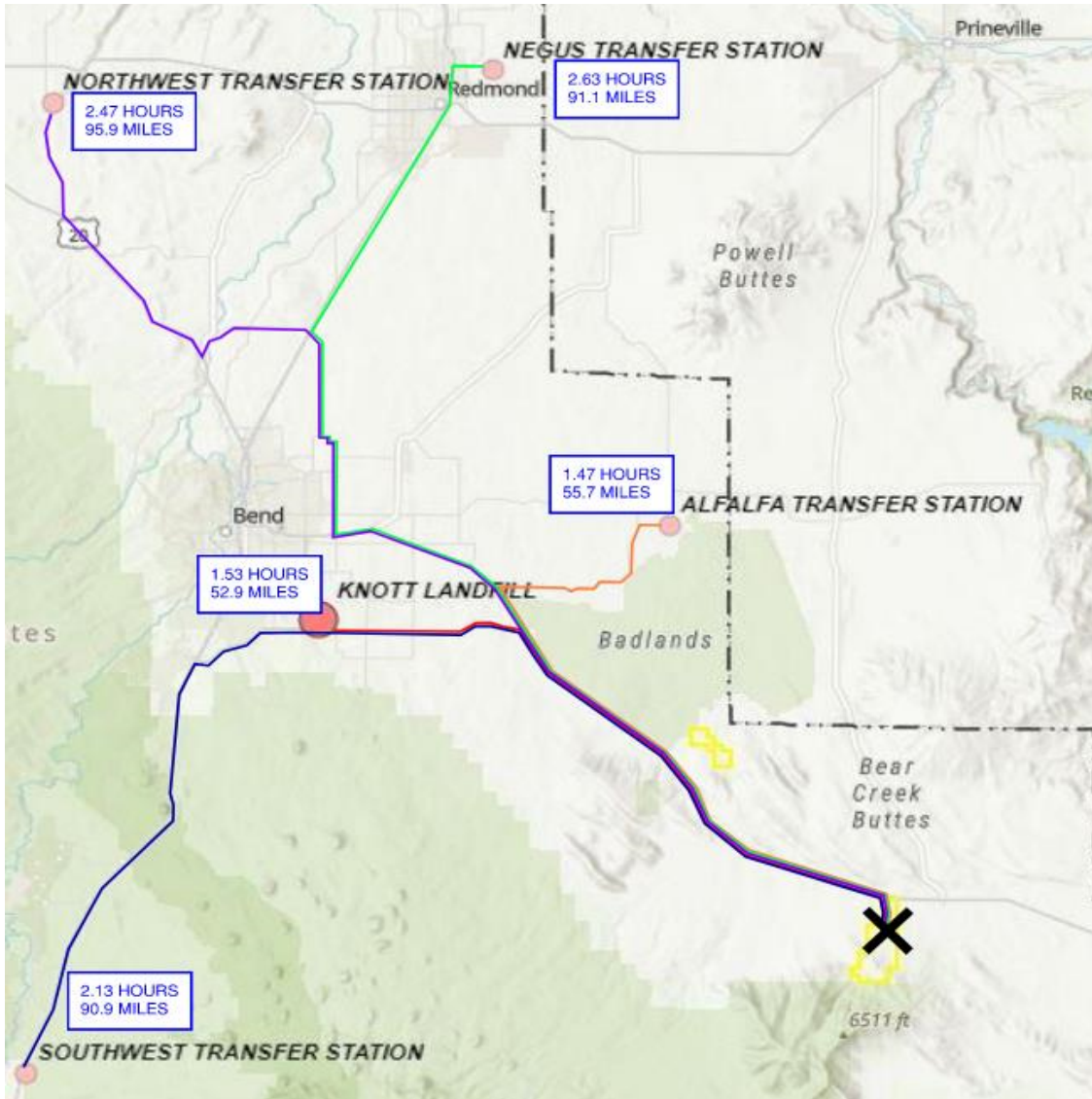
 tons
- Assumed average payload: 

20
----

 tons/haul trip
- Assumed cost per hour: 

\$ 160.00
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 per hour (incl. labor, equipment, depreciation, maintenance costs)
- Round Trip estimation includes driveway (5 min & 2.9 mile, twice) and on-site time & distance (20 min & 5 miles)



**Table 8R: Estimate Of Annual Operating Costs**

Item	Unit	Quantity	Unit Cost	Estimated Cost
				(2023 \$)
<b>Administrative Labor Costs</b>				
Operations Manager	Person	0.50	\$ 188,821	\$ 94,411
Compliance & Infrastructure Manager	Person	0.25	\$ 200,693	\$ 50,173
Management Analyst	Person	0.10	\$ 164,073	\$ 16,407
Engineering Asst III	Person	0.80	\$ 120,986	\$ 96,789
Director of Solid Waste	Person	0.13	\$ 241,545	\$ 30,193
Equipment Operator	Person	7	\$ 110,000	\$ 770,000
Landfill Attendant	Person	2	\$ 80,000	\$ 160,000
Office Assistant	Person	1	\$ 70,000	\$ 70,000
<b>Administrative Labor Subtotal</b>				<b>\$ 1,287,973</b>
<b>Equipment Owning and Operating Costs</b>				
Large Dozer (Cat D8)	Hour	500	\$ 65.00	\$ 32,500
Compactor (Cat 836C)	Hour	2,900	\$ 65.00	\$ 188,500
Scraper (Cat 623)	Hour	1,000	\$ 75.00	\$ 75,000
Front End Loader (Cat 966F)	Hour	2,800	\$ 50.00	\$ 140,000
Water Truck	Hour	520	\$ 50.00	\$ 26,000
Small Dozer (Cat D6D)	Hour	1,040	\$ 50.00	\$ 52,000
Utility Trucks	Mile	40,000	\$ 0.60	\$ 24,000
Yard Jockey	Hour	520	\$ 50.00	\$ 26,000
Landfill Infrastructure Repair and Maintenance	LS	1	\$ 50,000	\$ 50,000
Equipment Repair and Maintenance	LS	1	\$ 250,000	\$ 250,000
<b>Equipment O &amp; O Subtotal</b>				<b>\$ 864,000</b>
<b>Environmental Monitoring Costs</b>				
Groundwater Sampling and Analysis	Sample	16	\$ 2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	\$ 2,000	\$ 24,000
Landfill Gas Sampling	Event	4	\$ 2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	\$ 2,000	\$ 8,000
Annual Reports	Each	1	\$ 30,000	\$ 30,000
Fees & Permits	LS	1	\$ 500,000	\$ 500,000
Miscellaneous Environmental Cost	LS	1	\$ 250,000	\$ 250,000
Natural Resource Mitigation O&M	LS	1	\$ 50,000	\$ 50,000
<b>Environmental Monitoring Subtotal</b>				<b>\$ 902,000</b>
<b>Haul Costs</b>				
Knott Transfer Station	Hour	13,499	\$ 160	\$ 2,159,792
Negus Transfer Station	Hour	5,148	\$ 160	\$ 823,606
Southwest Transfer Station	Hour	1,342	\$ 160	\$ 214,684
Northwest Transfer Station	Hour	500	\$ 160	\$ 79,922
Alfalfa Transfer Station	Hour	15	\$ 160	\$ 2,460
<b>Haul Cost Subtotal</b>				<b>\$ 3,280,465</b>
<b>Miscellaneous</b>				
Roadway Maintenance	LS			\$ 50,000
Site and Building Maintenance	LS			\$ 240,000
Office Supplies	LS			\$ 23,000
Insurance	LS			\$ 100,000
Engineering and Legal Services	LS			\$ 75,000
Gas/ Diesel / Oil	LS			\$ 280,000
Water (trucking cost from Knott)	Trips	466	\$ 245.33	\$ 114,324
Utilities (power, internet, septic tank/drainfield)	LS			\$ 50,000
Code Abatement/ Enforcement	LS			\$ 200,000
Other	LS			\$ 200,000
<b>Miscellaneous Subtotal</b>				<b>\$ 1,332,324</b>
Annual Transfer To Equipment Fund (491614)				\$ 750,000
<b>Total Annual Operating Costs</b>				<b>\$ 8,416,762</b>
				(used in T11 forecast)
Annual Transfer To Cell Closure Fund (491611)				\$ 1,296,885
Annual Transfer To Post-Closure Fund (491612)				\$ 80,251
Annual Transfer To Cell Expansion Fund (491613)				\$ 1,264,646
<b>Total Annual Operating Costs Including Transfers</b>				<b>\$ 11,058,544</b>
				(for DCSW budgeting)

**Assumptions:**

1. Natural Resource Mitigation O&M Annual cost is based on Natural Resource subtask report estimates.
3. Onsite water demands can be met by exempt well water production (5,000 gpd) during the winter months of Nov-Feb.
2. Potable water demand at the landfill can be reduced by 25% below existing Knott water usage by suppressing dust with leachate (lined areas) and stormwater (unlined areas) to the extent feasible.
4. Acquisition of a new water right permit may be unfeasible near-term, so use of 8,000 gallon water trucks from Knott is assumed to supplement the exempt well production and meet landfill water demands during the months of Mar-Oct.

**Table 9R: Estimate Of Annual Operating Costs after Closure**

Item	Unit	Quantity	Unit Cost	Estimated Cost
				(2023 \$)
Environmental Compliance Technician	Person	0.40	\$ 200,693	\$ 80,277
<b>Environmental Monitoring</b>				
Groundwater Sampling and Analysis	Sample	16	\$ 2,000	\$ 32,000
Leachate Sampling and Analysis	Sample	12	\$ 2,000	\$ 24,000
Landfill Gas Sampling	Event	4	\$ 2,000	\$ 8,000
Stormwater Sampling and Analysis	Sample	4	\$ 2,000	\$ 8,000
Annual Reports	Each	1	\$ 30,000	\$ 30,000
Environmental Monitoring Subtotal				\$ 102,000
<b>Maintenance</b>				
Roadway	LS			\$ 5,000
Final Cover System	LS			\$ 25,000
Leachate Management System	LS			\$ 20,000
Landfill Gas Management System	LS			\$ 15,000
Surface Water Management System	LS			\$ 10,000
Maintenance Subtotal				\$ 75,000
<b>Miscellaneous</b>				
Financial Assurance Provision	LS			\$ 25,000
Utilities	LS			\$ 10,000
Other	LS			\$ 10,000
Miscellaneous Subtotal				\$ 45,000
<b>Annual Operating Costs after Closure</b>				<b>\$ 302,277</b>

**Table 10R: Cost Estimate for Initial Development of Landfill**

Description	Year	Unit	Quantity	Unit Cost	Estimated Cost
					(2023 \$)
Pre-Development					
Site Characterization Study	2024	LS			\$ 750,000
Land Acquisition	2025	LS			\$ 5,500,000
Permitting	2025-26	LS			\$ 1,500,000
<b>Pre-Development Subtotal</b>					<b>\$ 7,750,000</b>
Capital Expenditures					
Support Facilities					
Roads (paved driveway construction)	2028-29	LF	6,336	\$ 190	\$ 1,203,840
Landfill Office	2028-29	SF	2,000	\$ 500	\$ 1,000,000
Maintenance Shop	2028-29	SF	4,000	\$ 400	\$ 1,600,000
70-foot Truck Scales	2028-29	Each	2	\$ 200,000	\$ 400,000
Utilities					
Electrical Extension & Distribution	2028-29	LS			\$ 1,000,000
Internet / Comms / Controls Systems	2028-29	LS			\$ 50,000
Water Supply, Storage, Distribution	2028-29	LS			\$ 1,090,000
Onsite Wastewater System	2028-29	LS			\$ 50,000
Initial Cell/Lagoon Construction					
Excavation	2028-29	CY	1,200,000	\$ 4	\$ 4,800,000
Embankment	2028-29	CY	700,000	\$ 2	\$ 1,400,000
Liner/Leachate Collection System	2028-29	Acre	24	\$ 221,600	\$ 5,318,400
Leachate & Stormwater Systems	2028-29	Each	1	\$ 886,500	\$ 886,500
Environmental Monitoring					
3-1100 Foot Groundwater Wells	2026	LF	3,300	\$ 200	\$ 660,000
Landfill Gas Probes	2026	LF	180	\$ 150	\$ 27,000
Natural Resource Mitigation Costs:					
Initial Mitigation Cost	2025	LS		\$ 1,500,000.00	\$ 1,500,000
<b>Capital Subtotal</b>					<b>\$ 20,985,740</b>
Engineering and Administration (15%)	2027-29				\$ 3,148,000
Contingencies (20%)	2028-29				\$ 4,197,000
<b>Total Initial Capital Cost</b>					<b>\$ 28,330,740</b>
Initial Development Cost Schedule					
2024					\$ 750,000
2025					\$ 7,750,000
2026					\$ 1,437,000
2027					\$ 1,049,333
2028					\$ 12,547,203
2029					\$ 12,547,203
<b>Total</b>					<b>\$ 36,080,740</b>



**Table 11R: Total Estimated Costs for Operation of MSW Landfill at Roth East Site**

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2024	750,000	-	-	-	750,000
2025	7,750,000	-	-	-	7,750,000
2026	1,437,000	-	-	-	1,437,000
2027	1,049,333	-	-	-	1,049,333
2028	12,547,203	-	-	-	12,547,203
2029	12,547,203	-	-	-	12,547,203
2030	-	-	-	8,416,762	8,416,762
2031	-	2,362,000	-	8,423,976	10,785,976
2032	-	-	-	8,429,004	8,429,004
2033	-	2,362,000	-	8,431,767	10,793,767
2034	-	-	-	8,431,767	8,431,767
2035	-	2,362,000	-	8,431,767	10,793,767
2036	-	-	-	8,431,767	8,431,767
2037	-	2,756,000	-	8,431,767	11,187,767
2038	-	-	-	8,431,767	8,431,767
2039	-	2,756,000	-	8,549,812	11,305,812
2040	-	-	-	8,599,775	8,599,775
2041	-	2,756,000	-	8,711,572	11,467,572
2042	-	-	-	8,824,822	8,824,822
2043	-	2,756,000	-	8,939,545	11,695,545
2044	-	-	2,272,000	9,055,759	11,327,759
2045	-	2,756,000	-	9,115,272	11,871,272
2046	-	-	2,272,000	9,224,656	11,496,656
2047	-	2,756,000	-	9,317,687	12,073,687
2048	-	-	2,272,000	9,420,181	11,692,181
2049	-	2,756,000	-	9,523,803	12,279,803
2050	-	-	2,272,000	9,628,038	11,900,038
2051	-	2,756,000	-	9,733,946	12,489,946
2052	-	-	2,651,000	9,841,020	12,492,020
2053	-	-	-	9,949,271	9,949,271
2054	-	3,149,000	-	10,058,713	13,207,713
2055	-	-	2,651,000	10,168,431	12,819,431
2056	-	-	-	10,280,283	10,280,283
2057	-	3,149,000	-	10,393,367	13,542,367
2058	-	-	2,651,000	10,507,694	13,158,694
2059	-	-	-	10,623,278	10,623,278
2060	-	3,149,000	-	10,739,154	13,888,154
2061	-	-	2,651,000	10,857,285	13,508,285
2062	-	-	-	10,976,715	10,976,715
2063	-	3,149,000	-	11,097,459	14,246,459
2064	-	-	2,651,000	11,219,531	13,870,531
2065	-	-	-	11,341,911	11,341,911
2066	-	3,149,000	-	11,466,672	14,615,672
2067	-	-	2,651,000	11,592,805	14,243,805
2068	-	-	-	11,720,326	11,720,326
2069	-	3,149,000	-	11,849,250	14,998,250
2070	-	-	2,651,000	11,978,498	14,629,498
2071	-	-	-	12,110,262	12,110,262
2072	-	3,149,000	-	12,243,028	15,392,028
2073	-	-	2,651,000	12,377,701	15,028,701
2074	-	-	-	12,513,856	12,513,856
2075	-	3,543,000	-	12,651,508	16,194,508
2076	-	-	3,029,000	12,790,675	15,819,675
2077	-	-	-	12,931,372	12,931,372
2078	-	3,543,000	-	13,073,617	16,616,617
2079	-	-	3,029,000	13,217,427	16,246,427
2080	-	-	-	13,362,819	13,362,819
2081	-	3,543,000	-	13,509,810	17,052,810
2082	-	-	3,029,000	13,658,418	16,687,418
2083	-	-	-	13,808,661	13,808,661
2084	-	3,543,000	-	13,960,556	17,503,556

Year	Capital Costs			Annual Operating Costs	Total Estimated Costs
	Initial Development	Lateral Expansion	Closure		
2085	-	-	3,029,000	14,114,122	17,143,122
2086	-	-	-	14,269,377	14,269,377
2087	-	3,543,000	-	14,426,340	17,969,340
2088	-	-	3,029,000	14,585,030	17,614,030
2089	-	-	-	14,745,465	14,745,465
2090	-	3,937,000	-	14,907,666	18,844,666
2091	-	-	3,029,000	15,071,650	18,100,650
2092	-	-	-	15,237,438	15,237,438
2093	-	3,937,000	-	15,405,050	19,342,050
2094	-	-	3,029,000	15,574,505	18,603,505
2095	-	-	-	15,745,825	15,745,825
2096	-	3,937,000	-	15,919,029	19,856,029
2097	-	-	3,408,000	16,094,138	19,502,138
2098	-	-	-	16,271,174	16,271,174
2099	-	3,937,000	-	16,450,157	20,387,157
2100	-	-	3,408,000	16,631,109	20,039,109
2101	-	-	-	16,814,051	16,814,051
2102	-	3,937,000	-	16,999,005	20,936,005
2103	-	-	3,408,000	17,185,994	20,593,994
2104	-	-	-	17,375,040	17,375,040
2105	-	3,937,000	-	17,566,166	21,503,166
2106	-	-	3,408,000	17,759,394	21,167,394
2107	-	-	-	17,954,747	17,954,747
2108	-	3,937,000	-	18,152,249	22,089,249
2109	-	-	3,408,000	18,351,924	21,759,924
2110	-	-	-	18,553,795	18,553,795
2111	-	3,937,000	-	18,757,887	22,694,887
2112	-	-	3,787,000	18,964,223	22,751,223
2113	-	-	-	19,172,830	19,172,830
2114	-	3,937,000	-	19,383,731	23,320,731
2115	-	-	3,787,000	19,596,952	23,383,952
2116	-	-	-	19,812,519	19,812,519
2117	-	4,724,000	-	20,030,456	24,754,456
2118	-	-	3,787,000	20,250,791	24,037,791
2119	-	-	-	20,473,550	20,473,550
2120	-	4,724,000	-	20,698,759	25,422,759
2121	-	-	3,787,000	20,926,445	24,713,445
2122	-	-	-	21,156,636	21,156,636
2123	-	4,724,000	-	21,389,359	26,113,359
2124	-	-	3,787,000	21,624,642	25,411,642
2125	-	-	-	21,862,513	21,862,513
2126	-	4,724,000	-	22,103,001	26,827,001
2127	-	-	3,787,000	22,346,134	26,133,134
2128	-	-	-	22,591,941	22,591,941
2129	-	4,724,000	-	22,840,453	27,564,453
2130	-	-	3,787,000	23,091,698	26,878,698
2131	-	-	-	23,345,706	23,345,706
2132	-	4,724,000	-	23,602,509	28,326,509
2133	-	-	3,787,000	23,862,137	27,649,137
2134	-	-	-	24,124,620	24,124,620
2135	-	5,118,000	-	24,389,991	29,507,991
2136	-	-	3,787,000	24,658,281	28,445,281
2137	-	-	-	24,929,522	24,929,522
2138	-	5,118,000	-	25,203,747	30,321,747
2139	-	-	4,544,000	25,480,988	30,024,988
2140	-	-	-	25,761,279	25,761,279
2141	-	-	-	26,044,653	26,044,653
2142	-	-	39,382,000	26,331,144	65,713,144
Subtotal	36,080,740	142,905,000	146,548,000	1,720,346,129	2,045,879,869
Post-Closure Operations (2143-2172) =				9,068,316	9,068,316
<b>Totals</b>				<b>1,729,414,445</b>	<b>2,054,948,185</b>
				<b>Avg. Cost per Ton</b>	<b>\$44.36</b>
(2030-59 Total Costs + Initial Capital Costs Financed with 30-yr Bond @ 4.75%)				<b>30-yr Cost per Ton</b>	<b>\$53.23</b>

**Table 12R: Total Estimated Costs for Operation of MSW Landfill at Roth East Site**

(assuming \$7M acquisition cost and \$7.6M GSG fee-in-lieu mitigation cost)

Year	gCapital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2024	750,000	-	-	-	750,000
2025	9,148,000	-	-	-	9,148,000
2026	1,437,000	-	-	-	1,437,000
2027	1,049,333	-	-	-	1,049,333
2028	19,182,072	-	-	-	19,182,072
2029	12,547,203	-	-	-	12,547,203
2030	-	-	-	8,416,762	8,416,762
2031	-	2,362,000	-	8,423,976	10,785,976
2032	-	-	-	8,429,004	8,429,004
2033	-	2,362,000	-	8,431,767	10,793,767
2034	-	-	-	8,431,767	8,431,767
2035	-	2,362,000	-	8,431,767	10,793,767
2036	-	-	-	8,431,767	8,431,767
2037	-	2,756,000	-	8,431,767	11,187,767
2038	-	-	-	8,431,767	8,431,767
2039	-	2,756,000	-	8,549,812	11,305,812
2040	-	-	-	8,599,775	8,599,775
2041	-	2,756,000	-	8,711,572	11,467,572
2042	-	-	-	8,824,822	8,824,822
2043	-	2,756,000	-	8,939,545	11,695,545
2044	-	-	2,272,000	9,055,759	11,327,759
2045	-	2,756,000	-	9,115,272	11,871,272
2046	-	-	2,272,000	9,224,656	11,496,656
2047	-	2,756,000	-	9,317,687	12,073,687
2048	-	-	2,272,000	9,420,181	11,692,181
2049	-	2,756,000	-	9,523,803	12,279,803
2050	-	-	2,272,000	9,628,038	11,900,038
2051	-	2,756,000	-	9,733,946	12,489,946
2052	-	-	2,651,000	9,841,020	12,492,020
2053	-	-	-	9,949,271	9,949,271
2054	-	3,149,000	-	10,058,713	13,207,713
2055	-	-	2,651,000	10,168,431	12,819,431
2056	-	-	-	10,280,283	10,280,283
2057	-	3,149,000	-	10,393,367	13,542,367
2058	-	-	2,651,000	10,507,694	13,158,694
2059	-	-	-	10,623,278	10,623,278
2060	-	3,149,000	-	10,739,154	13,888,154
2061	-	-	2,651,000	10,857,285	13,508,285
2062	-	-	-	10,976,715	10,976,715
2063	-	3,149,000	-	11,097,459	14,246,459
2064	-	-	2,651,000	11,219,531	13,870,531
2065	-	-	-	11,341,911	11,341,911
2066	-	3,149,000	-	11,466,672	14,615,672
2067	-	-	2,651,000	11,592,805	14,243,805
2068	-	-	-	11,720,326	11,720,326
2069	-	3,149,000	-	11,849,250	14,998,250
2070	-	-	2,651,000	11,978,498	14,629,498
2071	-	-	-	12,110,262	12,110,262
2072	-	3,149,000	-	12,243,028	15,392,028
2073	-	-	2,651,000	12,377,701	15,028,701
2074	-	-	-	12,513,856	12,513,856
2075	-	3,543,000	-	12,651,508	16,194,508
2076	-	-	3,029,000	12,790,675	15,819,675
2077	-	-	-	12,931,372	12,931,372
2078	-	3,543,000	-	13,073,617	16,616,617
2079	-	-	3,029,000	13,217,427	16,246,427
2080	-	-	-	13,362,819	13,362,819
2081	-	3,543,000	-	13,509,810	17,052,810
2082	-	-	3,029,000	13,658,418	16,687,418
2083	-	-	-	13,808,661	13,808,661
2084	-	3,543,000	-	13,960,556	17,503,5

Year	Capital Costs			Annual Operating Costs (2023 \$)	Total Estimated Costs (2023 \$)
	Initial Development (2023 \$)	Lateral Expansion (2023 \$)	Closure (2023 \$)		
2085	-	-	3,029,000	14,114,122	17,143,122
2086	-	-	-	14,269,377	14,269,377
2087	-	3,543,000	-	14,426,340	17,969,340
2088	-	-	3,029,000	14,585,030	17,614,030
2089	-	-	-	14,745,465	14,745,465
2090	-	3,937,000	-	14,907,666	18,844,666
2091	-	-	3,029,000	15,071,650	18,100,650
2092	-	-	-	15,237,438	15,237,438
2093	-	3,937,000	-	15,405,050	19,342,050
2094	-	-	3,029,000	15,574,505	18,603,505
2095	-	-	-	15,745,825	15,745,825
2096	-	3,937,000	-	15,919,029	19,856,029
2097	-	-	3,408,000	16,094,138	19,502,138
2098	-	-	-	16,271,174	16,271,174
2099	-	3,937,000	-	16,450,157	20,387,157
2100	-	-	3,408,000	16,631,109	20,039,109
2101	-	-	-	16,814,051	16,814,051
2102	-	3,937,000	-	16,999,005	20,936,005
2103	-	-	3,408,000	17,185,994	20,593,994
2104	-	-	-	17,375,040	17,375,040
2105	-	3,937,000	-	17,566,166	21,503,166
2106	-	-	3,408,000	17,759,394	21,167,394
2107	-	-	-	17,954,747	17,954,747
2108	-	3,937,000	-	18,152,249	22,089,249
2109	-	-	3,408,000	18,351,924	21,759,924
2110	-	-	-	18,553,795	18,553,795
2111	-	3,937,000	-	18,757,887	22,694,887
2112	-	-	3,787,000	18,964,223	22,751,223
2113	-	-	-	19,172,830	19,172,830
2114	-	3,937,000	-	19,383,731	23,320,731
2115	-	-	3,787,000	19,596,952	23,383,952
2116	-	-	-	19,812,519	19,812,519
2117	-	4,724,000	-	20,030,456	24,754,456
2118	-	-	3,787,000	20,250,791	24,037,791
2119	-	-	-	20,473,550	20,473,550
2120	-	4,724,000	-	20,698,759	25,422,759
2121	-	-	3,787,000	20,926,445	24,713,445
2122	-	-	-	21,156,636	21,156,636
2123	-	4,724,000	-	21,389,359	26,113,359
2124	-	-	3,787,000	21,624,642	25,411,642
2125	-	-	-	21,862,513	21,862,513
2126	-	4,724,000	-	22,103,001	26,827,001
2127	-	-	3,787,000	22,346,134	26,133,134
2128	-	-	-	22,591,941	22,591,941
2129	-	4,724,000	-	22,840,453	27,564,453
2130	-	-	3,787,000	23,091,698	26,878,698
2131	-	-	-	23,345,706	23,345,706
2132	-	4,724,000	-	23,602,509	28,326,509
2133	-	-	3,787,000	23,862,137	27,649,137
2134	-	-	-	24,124,620	24,124,620
2135	-	5,118,000	-	24,389,991	29,507,991
2136	-	-	3,787,000	24,658,281	28,445,281
2137	-	-	-	24,929,522	24,929,522
2138	-	5,118,000	-	25,203,747	30,321,747
2139	-	-	4,544,000	25,480,988	30,024,988
2140	-	-	-	25,761,279	25,761,279
2141	-	-	-	26,044,653	26,044,653
2142	-	-	39,382,000	26,331,144	65,713,144
Subtotal	44,113,609	142,905,000	146,548,000	1,720,346,129	2,053,912,738
Post-Closure Operations (2143-2172) =				9,068,316	9,068,316
<b>Totals</b>				<b>1,729,414,445</b>	<b>2,062,981,054</b>
				<b>Avg. Cost per Ton</b>	<b>\$44.54</b>
(2030-59 Total Costs + Initial Capital Costs Financed with 30-yr Bond @ 4.75%)				<b>30-yr Cost per Ton</b>	<b>\$55.27</b>