FINAL REPORT

Waste Management System Assessment
Lloydminster, Alberta

Presented to:

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EXECUTIVE SUMMARY

The City of Lloydminster (City) tasked Morrison Hershfield now Stantec (MHnS) to explore alternative disposal options to the current landfill, due to increasing operations and capital costs and future liability.

MHnS worked with the City to shortlist disposal options to consider and developed a weighting system to score the parameters to consider in analysing the disposal options.

Four options were considered as part of the analysis. They are as follows:

- Maintain Existing Landfill (Status Quo): Maintaining and upgrading the existing landfill
- Waste Hauling: Direct hauling and transfer hauling of waste to a neighbouring landfill
- Waste to Energy: Evaluation of technologies and a preparation of costs for a waste-to-energy system that meets the City's quantity and quality of waste.
- Sale of the Landfill: Selling the landfill to a private entity that would own and operate the landfill.

A scoring criterion was developed to rank the four options. Of the parameters considered, Risk Management, Cost and maintaining Service Levels ranked the highest. Risk management considers the landfill liability, environmental risks and stability. For Cost, the disposal, capital and operations costs, as well as the revenue generation potential were considered. Service levels provided an assessment of the changes residents could see if they were to switch to a different disposal system.

Based on the assessment of the disposal options, it was determined that maintaining the existing landfill was the best option for the City. Maintaining the landfill allows the City to maintain the same level of service to residential and to recoup some funds, through, tipping fees for the landfill closure and post-closure care. The Waste-to-Energy option was the most expensive and least favourable for the City, with the main concerns being the significant initial capital investment and the uncertainty with the quantity and quality of feedstock the City would receive. Transfer hauling to Claystone is also feasible, however, the City will lose control over tipping fees. The added disposal costs and increased equipment maintenance cost is also a factor to consider. Direct Hauling to RM Wilton was also considered, however, this option would severely impact service levels to multi-family and commercial users since they receive private collection services. The City may have to explore additional disposal options for multi-family and commercial users and also for materials that do not receive curbside collection for the single-family residential stream.

1. INTRODUCTION

The City of Lloydminster (City) is exploring potential alternatives for managing its waste due to the rising landfill operating costs, ongoing cost of capital infrastructure needed to provide landfill services, and potential future liability concerns. As part of developing the Integrated Waste Management and Facility Master Plan (Master Plan), Morrison Hershfield now Stantec (MHnS) was retained by the City to assess the various waste disposal options including, but not limited to, continuing current ownership of the landfill, transporting waste to another landfill, and waste-to-energy (WTE) technologies.

This report, which summarizes the third (3rd) of three tasks that have been completed under Phase 1 of the Master Plan, highlights the waste disposal options that may be feasible for the City based on spatial and capital considerations. The two previous reports provide information on the City's goal for the Master Plan and a review of the existing waste management system in the City of Lloydminster respectively.

1.1 Scope of Work

This report presents a comprehensive review and assessment of the existing and potential waste collection and disposal systems, focusing on waste projections, waste disposal options, and the associated costs. Existing data, supplemented by cost information provided by the City, has been used to assess hauling costs and viable energy conversion methods.

The scope of work completed includes:

- Consultations: Meetings with City staff and the City's executive committee to discuss and shortlist disposal options to consider and determine weighting for the factors to consider in the analysis of each disposal option.
- Develop Population and Waste Projections: Estimate changes in waste tonnages for the life of the landfill (up to 2060).
- Waste Feasibility Study: Review of the shortlisted disposal options.
  - Maintain Existing Landfill (Status Quo): This option involves maintaining and upgrading the existing landfill until 2060 (expected landfill life based on the 2016 Waste Management Facility Master Plan, Stantec).
  - Waste Hauling: This option involves investigating opportunity for direct hauling of waste to a neighbouring landfill as well as transfer hauling.
  - Waste-to-Energy (WTE): This option involves completing the evaluation of technologies and a preparation of costs for a system that meets the City's type and quantity of waste.
  - Sale of the Landfill: This option involves selling the landfill to a private entity that would own and operate the landfill.

A discussion of the consultations with the City, as well as a discussion of the waste disposal options are provided in more detail in the subsequent sections.

2. CONSULTATION

In June 2024, the Executive Leadership Team (ELT) was consulted on the potential disposal options and parameters to consider when assessing future options for the Master Plan. A workshop was held with ELT members as well as landfill managers, where an introduction to the plan, the overall project goals, and the potential disposal options were presented.

The purpose of this workshop was to gain feedback from ELT on the disposal options for materials that are currently being landfilled to ensure that all disposal options of interest are being analyzed. These options included continued landfilling, developing a transfer station, composting, and WTE. In these discussions, it was decided that the three (3) priority options to be assessed for the City would be Landfilling (Status Quo), Waste transfer (direct haul, transfer haul) and WTE. The City later proposed that the sale of the landfill also be evaluated as a potential fourth option.

After the discussion on disposal options, ELT members were presented with seven (7) parameters to consider when analyzing and assessing the disposal options and future diversion options for the Master Plan. This included:

- Cost: Includes Capital and Operating Cost of implementing the disposal option, landfill liability and the expected revenue generation.
- Risk Management: Associated financial liability, environmental risk, and risks associated with long-term control of assets (long-term certainty of waste management practices).
- Diversion Potential: Potential of the disposal method to divert more material from the landfill.
- Partnerships: Explore avenues to partner with neighboring municipalities. This could ultimately lead to a reduction in Operating costs due to economies of scale.
- Climate Change: Potential of the disposal method to reduce greenhouse gas emissions.
- Service Levels: Any changes in the level of service provided to residents, businesses, and industry for a given disposal option. Captures convenience, ease of use and ability to dispose any or most of the waste residents and/or businesses produce.
- Supporting Local Economy: Potential for the disposal option to create jobs and generate revenue, as well as, providing cost effective disposal options for businesses and industry.

Following the workshop and discussions with City staff and ELT, a survey was presented where ELT members were asked to prioritize these seven (7) options from most important to least important. The results for this survey are shown in Figure 1.

Overall, risk management and cost were ranked as the most important parameters to consider when reviewing options. These were followed by service levels, supporting the local economy, diversion potential, regional and private partnerships, and climate change, respectfully. These seven (7) parameters are discussed further in Section 5.

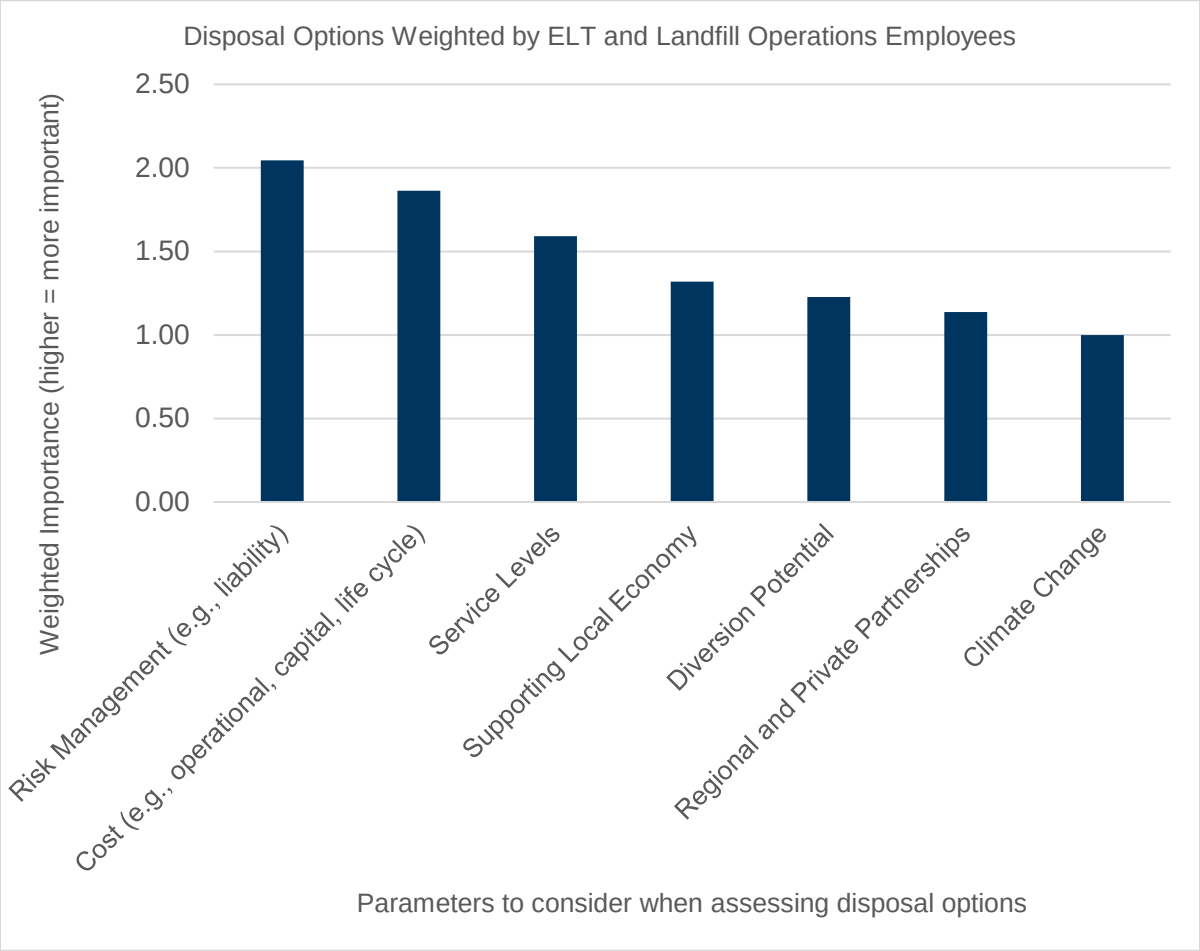

Figure 1: Ranked Parameters to Consider When Assessing Disposal & Diversion Options for the Master Plan (Highest = Most Important)

The management of biosolids and organics were also discussed and the City asked that WTE technology assessments should include these waste streams. MHnS, however, notes that WTE technologies (anaerobic compost digestors) meant to cost effectively process biosolids and organics are different from WTE technologies for mixed MSW (thermal energy systems such as pyrolysis). Some MSW WTE technologies can handle some biosolids and composts, but these "wet" wastes cause dramatic reductions in efficiency of the technology and technology providers strongly advise not to use these "wet" waste streams. Furthermore, WTE systems are not a replacement to a landfill, as landfills are still required to accept the residual waste stream from the back end of a WTE system, as well as all items that cannot be used as feedstock.

Therefore, to process as much waste as possible in a cost-effective manner, including organics and biosolids, multiple WTE technologies would need to be employed. This would be far too capital intensive, and MHnS therefore recommends only evaluating a single WTE technology which would provide a reasonably broad management capability and be the least cost intensive to compare to the other options in this Master Plan.

3. POPULATION & WASTE PROJECTIONS

The projected population was estimated based on historical population census data obtained from Statistics Canada and the assumed population growth rate. These projections provide a picture of how the City's population is expected to evolve, aiding in strategic planning and resource allocation.

The City also diligently tracks the weight of waste disposed by different sectors at the scalehouse. The three (3) sectors considered in this report include Residential, Institutional, Commercial and Industrial (ICI), and Out-of-Town. This section includes summaries of waste projections from the different sectors.

3.1 Population Projections

The City has a population of 31,685. Between 2016 and 2021, the City's population changed by -0.6%. In the same period, the Saskatchewan part of the City's population increased by an average 0.48% annually[1] This compares to the provincial average of 4.8% and the national average of 5.2%2. Looking ahead, the City planners assume a 2.2 % population growth per year, which equates to just over 700 people being added to the City every 12 months. This growth will undoubtedly impact the City's solid waste management system, necessitating a thorough review and strategic planning to accommodate future needs. Using this growth rate, MHnS calculated the projected population until 2060.

The projected population values for each year starting from the current population have been computed and are presented in Figure 2, assuming a growth rate of 2.2%. MHnS used a linear interpolation technique for calculating the current population utilizing historical data. The linear projection method is based on historical data and a constant growth rate which assumes a constant absolute increase in population each year rather than a constant percentage growth rate. Population projection for the master plan period is provided in Table 1.

[1] https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&DGUIDlist=2021A00054810039&GENDERlist=1&STATISTIClist=1&HEADERlist=0
[2] https://www12.statcan.gc.ca/census-recensement/2021/as-sa/fogs-spg/Page.cfm?lang=E&topic=1&dguid=2021S0504840

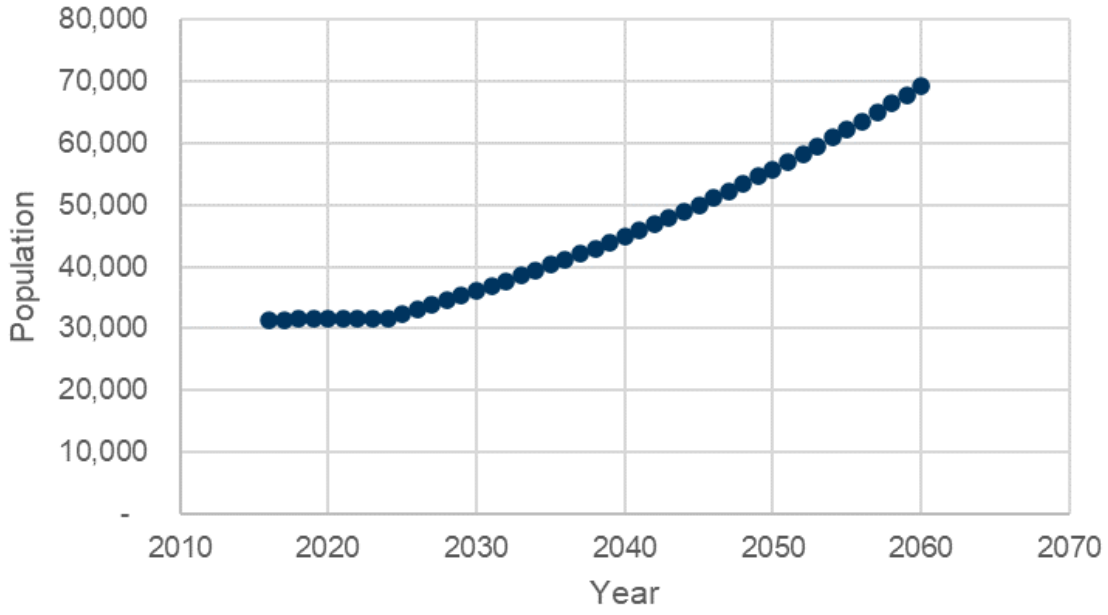

Figure 2: City's Population Trend Based on City Planners' Growth Rate (2.2%)

Table 1: Historical and Projected Population (2016 to 2060)

Year	Population	Source
2016	31,410	Federal Census
2017	31,444	Estimated (0.1% growth rate)
2018	31,478	Estimated (0.1% growth rate)
2019	31,513	Estimated (0.1% growth rate)
2020	31,547	Estimated (0.1% growth rate)
2021	31,582	Federal Census
2022	31,616	Estimated (0.1% growth rate)
2023	31,651	Estimated (0.1% growth rate)
2024	31,685	Estimated (0.1% growth rate)
2025	32,382	Predicted (2.2% growth rate)
2026	33,095	Predicted (2.2% growth rate)
2027	33,823	Predicted (2.2% growth rate)
2028	34,567	Predicted (2.2% growth rate)
2029	35,327	Predicted (2.2% growth rate)
2030	36,105	Predicted (2.2% growth rate)
2031	36,899	Predicted (2.2% growth rate)
2032	37,711	Predicted (2.2% growth rate)

Year	Population	Source
2033	38,540	Predicted (2.2% growth rate)
2034	39,388	Predicted (2.2% growth rate)
2035	40,255	Predicted (2.2% growth rate)
2036	41,140	Predicted (2.2% growth rate)
2037	42,046	Predicted (2.2% growth rate)
2038	42,971	Predicted (2.2% growth rate)
2039	43,916	Predicted (2.2% growth rate)
2040	44,882	Predicted (2.2% growth rate)
2041	45,869	Predicted (2.2% growth rate)
2042	46,879	Predicted (2.2% growth rate)
2043	47,910	Predicted (2.2% growth rate)
2044	48,964	Predicted (2.2% growth rate)
2045	50,041	Predicted (2.2% growth rate)
2046	51,142	Predicted (2.2% growth rate)
2047	52,267	Predicted (2.2% growth rate)
2048	53,417	Predicted (2.2% growth rate)
2049	54,592	Predicted (2.2% growth rate)
2050	55,793	Predicted (2.2% growth rate)
2051	57,021	Predicted (2.2% growth rate)
2052	58,275	Predicted (2.2% growth rate)
2053	59,557	Predicted (2.2% growth rate)
2054	60,867	Predicted (2.2% growth rate)
2055	62,206	Predicted (2.2% growth rate)
2056	63,575	Predicted (2.2% growth rate)
2057	64,974	Predicted (2.2% growth rate)
2058	66,403	Predicted (2.2% growth rate)
2059	67,864	Predicted (2.2% growth rate)
2060	69,357	Predicted (2.2% growth rate)

3.2 Waste Projections

The projected waste quantities for each year were estimated by multiplying the average of the historical waste collection rate by the projected population. This approach provides an estimate of the total waste that will need to be managed based on anticipated population growth and current waste generation trends.

Waste Projection data is presented under these categories:

- **Total Waste Generated** represents the total amount of waste that is generated under the various sectors and is a sum of the waste landfilled, treated, diverted, or recycled.
- **Waste Landfilled** represents the tonnages of material that is landfilled.
- **Waste Diverted** represents the material that is diverted from the landfill.
- **Waste Recycled** represents the material that is reused at the landfill.
- **Waste Treated** represents the septic waste and sump waste.

Table 2 below shows which waste categories were considered in the waste disposal analysis.

Table 2 Waste Categories and Types Included in the Waste Projections

Waste Category	Type of Waste	Disposal Analysis
Waste Landfilled	Garbage, mixed load, asbestos, wood chips and unrecycled concrete, as defined in the City's weigh scale data.	Included - Quantity differs per disposal system considered.
Waste Diverted	Organics, asphalt, blue bag (recyclables), clean and concrete/asphalt, e-waste, cardboards and metals that are diverted from the landfill, as defined in the City's weigh scale data.	Not Included - City will continue the existing organics and recycling programs as contracted out to GFL.
Waste Recycled	Wood, clean fill and contaminated fill that is reused at the landfill, usually as alternative daily cover or for maintenance work on the site, as defined in the City's weigh scale data.	Not Included - These materials may still be reused on site for the landfilling, transfer hauling and waste-to-energy options. It is assumed that these will be disposed of at the identified neighboring landfill for the direct haul option.
Waste Treated	Septic waste and sump waste, as defined in the City's weigh scale data.	Not Included - Septic waste disposal service is currently offered at the landfill, it is not associated with landfill operations. Septic waste handling will soon transition to a key card access system located just outside the wastewater treatment facility.

Note: Waste streams that are "not included" refer to them being left out of the cost analysis for comparing the options in terms of cost per tonne of waste handled/processed/managed. This is necessary as the purpose of this exercise is to model a broad set of options to make a high-level decision. This does not mean that these waste streams are not a consideration in the analysis. These items are addressed qualitatively in the discussion sections and decision matrix.

3.2.1 Residential Waste Projections

At present, the City only provides residential curbside collection to single family, semi-detached, and duplexes dwellings. Waste from the multi-family sector is privately contracted out and collected under the ICI stream. The City's three-stream residential curbside collection program includes garbage, organics, and blue bags/recyclable material. Organic waste includes items such as food and yard waste where recyclable items include cardboard and some plastics. The City also operates the landfill where the additional separation of materials includes clean concrete/asphalt, clean fill, wood chips, metal, and e-waste/electronics.

Table 3 below presents historical (2021-2023) and projected (2024-2060) residential waste tonnages. The residential waste projection rates, based on the historical waste tonnages, for the various material streams are also provided in Table 3. Residential tonnages and collection rates pertain to the waste, recycling, and organics collected from residences through the City's curbside collection services.

Table 3: Residential Population and Waste Tonnages

Year	Population	Waste Landfilled	Waste Diverted	Waste Recycled	Total Waste Generated
2021	31,582	7,229	2,899	80	10,207
2022	31,616	6,336	2,779	11	9,126
2023	31,651	6,829	2,878	30	9,738
2024	31,685	6,875	2,884	41	9,800
2025	32,382	7,027	2,948	42	10,016
2026	33,095	7,181	3,012	43	10,236
2027	33,823	7,339	3,079	44	10,462
2028	34,567	7,501	3,146	45	10,692
2029	35,327	7,666	3,216	46	10,927
2030	36,105	7,834	3,286	47	11,167
2031	36,899	8,007	3,359	48	11,413
2032	37,711	8,183	3,433	49	11,664
2033	38,540	8,363	3,508	50	11,921
2034	39,388	8,547	3,585	51	12,183
2035	40,255	8,735	3,664	52	12,451
2036	41,140	8,927	3,745	53	12,725
2037	42,046	9,123	3,827	54	13,005
2038	42,971	9,324	3,911	56	13,291
2039	43,916	9,529	3,997	57	13,583
2040	44,882	9,739	4,085	58	13,882

Year	Population	Waste Landfilled	Waste Diverted	Waste Recycled	Total Waste Generated
2041	45,869	9,953	4,175	59	14,188
2042	46,879	10,172	4,267	61	14,500
2043	47,910	10,396	4,361	62	14,819
2044	48,964	10,625	4,457	63	15,145
2045	50,041	10,858	4,555	65	15,478
2046	51,142	11,097	4,655	66	15,819
2047	52,267	11,341	4,758	68	16,167
2048	53,417	11,591	4,862	69	16,522
2049	54,592	11,846	4,969	71	16,886
2050	55,793	12,106	5,078	72	17,257
2051	57,021	12,373	5,190	74	17,637
2052	58,275	12,645	5,304	75	18,025
2053	59,557	12,923	5,421	77	18,421
2054	60,867	13,207	5,540	79	18,827
2055	62,206	13,498	5,662	80	19,241
2056	63,575	13,795	5,787	82	19,664
2057	64,974	14,098	5,914	84	20,097
2058	66,403	14,409	6,044	86	20,539
2059	67,864	14,726	6,177	88	20,991
2060	69,357	15,050	6,313	90	21,453

Table 4: Material Generation & Collection Rates for Residential Waste

Description	Rate (Tonnes/Capita/Year)
Waste Generation Rate	0.45
Waste Landfilled Rate	0.32
Waste Treated Rate	0.00
Waste Recycled Rate	0.10
Waste Diverted Rate	0.13

3.2.2 ICI Waste Projections

The load counts from the ICI sector (including waste from City Operations) for garbage, organic, and recyclables were used as a proxy for the number of businesses/households, due to the lack of actual population data. Between 2021 and 2023, the load counts from the ICI sector in the City averaged 7,157 (City background information). The projected rate of change for ICI load

counts is 0.4% and was calculated using the average load counts of the year 2021 to 2023. Using the assumed rate of load count change of 0.4% the projected waste tonnages were calculated until 2060.

Table 5 below presents historical (2021-2023) and projected (2024-2060) ICI waste tonnages. The waste projection rates, based on the historical waste tonnages, for the various material streams are also provided in Table 6.

Table 5: ICI Waste Tonnages

Year	Waste Landfilled	Waste Diverted	Waste Recycled	Waste Treated	Total Waste Generated
2021	17,549	23,512	16,830	11,715	69,607
2022	17,403	16,788	60,106	4,991	99,289
2023	18,777	14,700	18,459	155	52,092
2024	18,037	20,742	30,786	5,564	75,129
2025	18,149	21,127	31,245	5,591	76,112
2026	18,262	21,521	31,714	5,618	77,116
2027	18,376	21,925	32,194	5,646	78,141
2028	18,492	22,338	32,685	5,673	79,188
2029	18,610	22,760	33,186	5,701	80,257
2030	18,729	23,193	33,699	5,729	81,349
2031	18,850	23,635	34,223	5,757	82,465
2032	18,972	24,088	34,758	5,786	83,605
2033	19,096	24,552	35,306	5,814	84,769
2034	19,222	25,027	35,866	5,844	85,958
2035	19,350	25,512	36,438	5,873	87,173
2036	19,479	26,010	37,024	5,902	88,415
2037	19,611	26,519	37,622	5,932	89,684
2038	19,744	27,040	38,234	5,962	90,980
2039	19,879	27,573	38,860	5,993	92,305
2040	20,016	28,119	39,500	6,023	93,659
2041	20,155	28,678	40,155	6,054	95,042
2042	20,297	29,250	40,824	6,085	96,456
2043	20,440	29,836	41,509	6,117	97,902
2044	20,586	30,435	42,210	6,149	99,379
2045	20,733	31,049	42,926	6,181	100,890
2046	20,884	31,678	43,659	6,214	102,434
2047	21,036	32,321	44,408	6,246	104,012

Year	Waste Landfilled	Waste Diverted	Waste Recycled	Waste Treated	Total Waste Generated
2048	21,191	32,980	45,175	6,279	105,626
2049	21,348	33,655	45,959	6,313	107,275
2050	21,508	34,345	46,762	6,347	108,962
2051	21,671	35,053	47,583	6,381	110,687
2052	21,836	35,777	48,423	6,416	112,450
2053	22,003	36,518	49,282	6,450	114,254
2054	22,174	37,277	50,161	6,486	116,098
2055	22,347	38,055	51,061	6,521	117,984
2056	22,524	38,851	51,981	6,557	119,913
2057	22,703	39,666	52,923	6,594	121,886
2058	22,886	40,501	53,886	6,631	123,903
2059	23,071	41,356	54,873	6,668	125,967
2060	23,260	42,231	55,882	6,706	128,078

Table 6: Material Generation & Collection Rates for ICI Waste

Description	Rate (Tonnes/Load Count/Year)
Waste Generation Rate	5.86
Waste Landfilled Rate	2.25
Waste Treated Rate	0.70
Waste Recycled Rate	2.02
Waste Diverted Rate	0.85

3.2.3 Out-of-Town Waste Projections

Like the ICI projection, the number of load counts from the Out-of-Town sector for garbage, organic, and recyclables were used as a proxy for the number of households/users, due to the lack of actual data.

Between 2021 and 2023, the number of load counts in the Out-of-Town category in averaged 962, as calculated from the provided City data. The projected rate of change (of load counts) for Out-of-Town is 1.2% and was calculated using the average load counts for 2021 to 2023. Using the assumed rate of change of 1.2%, the projected waste tonnages were calculated until 2060.

Table 7 below presents historical (2021-2023) and projected (2024-2060) Out-of-Town waste tonnages. The waste projection rates, based on the historical waste tonnages, for the various material streams are also provided in Table 8.

Table 7: Out-of-Town Waste Tonnages

Year	Waste Landfilled	Waste Diverted	Waste Recycled	Waste Treated	Total Waste Generated
2021	2,299	162	86	12	2,559
2022	1,733	461	171	-	5,821
2023	1,707	260	259	18	2,243
2024	1,990	210	166	15	2,381
2025	2,013	213	168	15	2,409
2026	2,037	215	170	15	2,437
2027	2,061	218	172	15	2,466
2028	2,085	220	174	15	2,495
2029	2,109	223	176	16	2,524
2030	2,134	225	178	16	2,553
2031	2,159	228	181	16	2,583
2032	2,184	231	183	16	2,614
2033	2,210	233	185	16	2,644
2034	2,236	236	187	17	2,675
2035	2,262	239	189	17	2,706
2036	2,288	242	191	17	2,738
2037	2,315	244	194	17	2,770
2038	2,342	247	196	17	2,803
2039	2,370	250	198	17	2,835
2040	2,397	253	200	18	2,869
2041	2,425	256	203	18	2,902
2042	2,454	259	205	18	2,936
2043	2,483	262	208	18	2,971
2044	2,512	265	210	19	3,005
2045	2,541	268	212	19	3,040
2046	2,571	271	215	19	3,076
2047	2,601	275	217	19	3,112
2048	2,631	278	220	19	3,148
2049	2,662	281	223	20	3,185
2050	2,693	284	225	20	3,223
2051	2,725	288	228	20	3,260
2052	2,757	291	231	20	3,298

Year	Waste Landfilled	Waste Diverted	Waste Recycled	Waste Treated	Total Waste Generated
2053	2,789	294	233	21	3,337
2054	2,822	298	236	21	3,376
2055	2,855	301	239	21	3,416
2056	2,888	305	241	21	3,456
2057	2,922	308	244	22	3,496
2058	2,956	312	247	22	3,537
2059	2,991	316	250	22	3,578
2060	3,026	319	253	22	3,620

Table 8: Material Generation & Collection Rates for Out-of-Town Waste

Description	Rate (Tonnes/Load Count/Year)
Waste Generation Rate	2.48
Waste Landfilled Rate	2.07
Waste Treated Rate	0.00
Waste Recycled Rate	0.17
Waste Diverted Rate	0.22

4. WASTE DISPOSAL OPTIONS

4.1 Overview of Disposal Options

The four (4) disposal options are discussed in detail in the subsequent sections. The analysis focuses on Waste Landfilled tonnages. It is assumed, for all the options considered, that the City will continue the existing organics and recycling programs as contracted out to GFL. Table 9 shows the waste streams included for each disposal option.

Table 9: Waste Streams Included for each Waste Disposal Option

Waste Disposal Option	Waste Streams Included in Analysis
Landfilling (Status Quo)	Waste Landfilled from residential curbside program, ICI waste, Out-of-Town, and City operations.
Waste Transfer (Direct Hauling)	Waste Landfilled from residential curbside collection program. ICI and Out-of-Town users will transport their waste directly to another landfill.
Waste Transfer (Transfer Hauling)	Waste Landfilled from residential curbside program. ICI waste, Out-of-Town, and City operations. The facility shall be designed to manage recycling and diversion programs currently operating at the landfill.

Waste-to-Energy (WTE)	Waste Landfilled from residential curbside program, ICI waste, Out-of-Town, and City operations. The facility shall be designed to manage recycling and diversion programs currently operating at the landfill.
Sale of the Landfill	Not Applicable

4.2 Assessment of Disposal Options

The following table demonstrates the scoring for the parameters that were used to assess the disposal options. These were evaluated based on conversations with the City, technical findings, and expertise of the consulting team.

Each option was then ranked using a low (1), medium (2), and high (3) scale based on the considerations explained in Table 10. A calculation using a coefficient was then applied. The highest priority aspect (risk management) is given a “2.8” coefficient, and the lowest priority aspect (climate change) was given a “1” coefficient was applied to each option to calculate the final assessment. The rank (e.g., low (1)) was then multiplied by the coefficient to give a final score per aspect and disposal option.

Table 10: Criteria, Conditions & Scoring Impacts for Assessment of Disposal Options

Parameter	Condition	Scoring Consideration
Risk Management		
Liability and Expenses ($ Total)	Amount of total liability – closure and post-closure costs	Lower liability and expenses are prioritized
Environmental Risks (current & Future)	Mitigating current and future environmental risks	Lower environmental risk is prioritized
Stability[3]	Secure and stable disposal option for its residents, businesses, and industry	Stability is prioritized
Cost		
Disposal Cost ($/Tonne)	Cost to operate per tonne. Includes capital and operations cost	Lower cost is prioritized
Capital Cost ($/Year) or Total $ (Life of Facility)	Capital cost of the facility on an annual average or throughout the life of the facility	Lower cost is prioritized
Operational Cost ($/Year) or Total $ (Life of Facility)	Operational cost on an annual average or throughout the life of the facility	Lower cost is prioritized
Revenue Potential	Revenue potential to offset costs	Higher revenue potential is prioritized

[3] Stability is defined as rate and ability to handle changes in material types or tonnage

Parameter	Condition	Scoring Consideration
Service Levels		
Secure Disposal	Secure and convenient disposal option for residents, business, and industry within the City	Secure disposal is prioritized
Disposal for Materials	Disposal option for a wide variety of materials	More variety of materials accepted for disposal is prioritized
Supporting Local Economy		
Cost-effective Disposal	Cost-effective disposal option for residents, business, and industry in the surrounding region	More cost-effective disposal is prioritized
Jobs	Providing local jobs	More job creation is prioritized
Diversion Potential		
	Opportunity to divert more materials from the waste stream either through reuse, recycle, or resource recovery	Higher diversion potential is prioritized
Regional & Private Partnerships		
	Opportunity for regional and private partnerships	Higher opportunity for partnerships is prioritized
Climate Change/Environment		
	Impact on climate change and the environment	Lower climate change and environmental impact is prioritized

4.3 Existing Landfill Liability

4.3.1 Background

Since the City currently operates a landfill, in accordance with Section 28 of the Waste Control Regulation (AR 192/1996), financial security must be sufficient to ensure completion of conservation and reclamation as required by Environmental Protection and Enhancement Act and its regulations.

The Public Sector Accounting Board (PSAB) Section PS 3280 outlines the requirements for estimating solid waste landfill closure and post-closure liability. The landfill liability is a sum of the closure and post-closure liability.

Landfill closure activities are defined as:

- Compaction and grading of the landfill surface area
- Final cover and vegetation

- Completing facilities or infrastructure for:
  - Surface water/stormwater management
  - Leachate monitoring
  - Landfill gas monitoring

Landfill post-closure care activities are defined as:

- Acquisition of any additional land for buffer zones
- Leachate monitoring
- Water quality monitoring
- Landfill gas monitoring
- Ongoing maintenance of various control systems, drainage systems and final cover.

4.3.2 Assumptions

The following has been assumed in the estimation of the landfill liability:

- The landfill closure date has been set to 2030 (applicable to direct and transfer haul and waste-to-energy disposal options), and 2060 (closure date if the landfill continues operating). For the 2030 closure date, it is assumed that closure of the landfill will begin after the newly built Cell Landfill 1.4 reaches its end of life.
- A 10% contingency rate has been applied to both the closure and post-closure estimates.
- Inflation Rate is the Bank of Canada's estimated inflation rate for 2024 – 2.67%.
- Discount (Interest) rate is the Bank of Canada's Overnight Repo Rate (CORRA) – 4.53%.
- Post-Closure Period is assumed to be 25 years (minimum period stated in the Standards for Landfills in Alberta). Government of Saskatchewan does not specify a minimum post-closure care period.
- Liability (closure and post-closure estimates) is calculated up to the closure year. We have assumed that the funds to cover the closure and post-closure will all be available for the first year of closure. Values after the closure year are set to zero.
- More intensive environmental monitoring will likely occur during the first 10 years after closure, with monitoring frequency decreasing thereafter. The estimates assume progressive reductions of environmental monitoring requirements 10 years after closure, and a further reduction 20 years after closure with acceptable water quality results.

4.3.3 Liability Estimates

A summary of the closure and post-closure costs, as well as the landfill liability estimate is presented in the tables below. Details of the cost analysis is provided in Appendix A.

Table 11: Summary of Closure & Post-Closure Costs (2024 Dollars)

Description	Value
Remaining Landfill Life (until 2030)	6 Years
Post-Closure Care Periods	25 Years
Capacity Consumed (2030)	40%
Closure Cost (2024)	$10,982,871 (2024 Dollars)
Annual Post-Closure Cost (2024)	$411,593 (2024 Dollars)

Table 12: Summary of Landfill Liability Under PS3280

Description	Total (2030)	Total (2060)
Total Liability at Year End	$21,531,623	$70,006,038
Amortization on Asset	$2,750,932	$394,602
Expense Recognized for Following Year (Accretion of Liability)	$933,113	$3,033,841
Total Annual Expense for Following Year	$3,684,044	$3,428,442
Cost Per Tonne (Based on Tonnes Already Landfilled)	$28	$39

4.4 Landfilling (Status Quo)

4.4.1 Assumptions

For this option MHnS assumed that the landfill continues to operate as it currently does. Additional assumptions are as follows:

- City continues its residential collection for single-family, semi-detached and duplex dwellings
- City will maintain and upgrade the existing landfill until 2060 (expected landfill life)
- The City's curbside collection program diverts organics and recyclables from the landfill
- ICI waste is collected by private haulers and is brought to the landfill for disposal
- The proportion of recyclable materials within the ICI waste stream remains undetermined, and the diversion rate for organic waste is minimal to non-existent
- There will be no changes to current operations at the landfill or existing service levels
- There are no changes to existing capital and operating costs
- All facility upgrades will proceed as planned

4.4.2 Cost Analysis

A summary of the annual landfill cost, as well as the cost per tonne is provided in Table 13 below. Detailed cost estimates are provided in the Appendix B.

The capital projects to be completed under this option include the following:

- Design and construction of a maintenance building ~ $5,000,000
- Supply and Installation of the south weigh scale ~ $2,000,000
- Design and construction of the snow disposal area ~$550,000
- Design and construction of future landfill cells ~$3,700,000 per cell
- Equipment Purchases ~$400,000 per year. This includes:
  - 1x Loader
  - 1x Compactor
  - 1x Dozer and
  - 4x ¾ ton trucks

A 10% contingency has been applied to both the capital and operations costs. Inflation rate, as provided by the Bank of Canada, is 2.67%. Note that although the analysis in this report assumes closure in 2060 for the landfilling (status quo) option, the 2060 closure date could be extended depending on the population trend, tonnage of waste received, diversion rates, and landfill operations.

Table 13: Annual Cost of Operating the Landfill

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2024	$1,615,084	$1,270,417	$2,885,501	26,903	$107
2025	$1,658,207	$1,304,337	$2,962,544	27,189	$109
2026	$1,702,481	$1,339,163	$3,041,644	27,480	$111
2027	$1,747,937	$1,374,919	$3,122,856	27,776	$112
2028	$1,794,607	$1,411,629	$3,206,236	28,078	$114
2029	$1,842,523	$1,449,320	$3,291,843	28,385	$116
2030	$1,891,718	$1,488,017	$3,379,735	28,697	$118
2031	$1,942,227	$1,527,747	$3,469,974	29,016	$120
2032	$1,994,085	$1,568,537	$3,562,622	29,339	$121
2033	$2,047,327	$1,610,417	$3,657,744	29,669	$123
2034	$2,101,990	$1,653,415	$3,755,406	30,005	$125
2035	$2,158,113	$1,697,562	$3,855,675	30,347	$127
2036	$2,215,735	$1,742,887	$3,958,622	30,695	$129
2037	$2,274,895	$1,789,422	$4,064,317	31,049	$131
2038	$2,335,635	$1,837,199	$4,172,834	31,410	$133
2039	$2,397,996	$1,886,252	$4,284,249	31,778	$135
2040	$2,462,023	$1,936,615	$4,398,638	32,152	$137

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2041	$2,527,759	$1,988,323	$4,516,082	32,534	$139
2042	$2,595,250	$2,041,411	$4,636,661	32,923	$141
2043	$2,664,543	$2,095,917	$4,760,460	33,318	$143
2044	$2,735,686	$2,151,878	$4,887,564	33,722	$145
2045	$2,808,729	$2,209,333	$5,018,062	34,133	$147
2046	$2,883,722	$2,268,322	$5,152,045	34,552	$149
2047	$2,960,718	$2,328,886	$5,289,604	34,978	$151
2048	$3,039,769	$2,391,068	$5,430,837	35,413	$153
2049	$3,120,931	$2,454,909	$5,575,840	35,856	$156
2050	$3,204,260	$2,520,455	$5,724,715	36,308	$158
2051	$3,289,813	$2,587,751	$5,877,565	36,768	$160
2052	$3,377,651	$2,656,844	$6,034,496	37,237	$162
2053	$3,467,835	$2,727,782	$6,195,617	37,716	$164
2054	$3,560,426	$2,800,614	$6,361,040	38,203	$167
2055	$3,655,489	$2,875,390	$6,530,880	38,700	$169
2056	$3,753,091	$2,952,163	$6,705,254	39,207	$171
2057	$3,853,298	$3,030,986	$6,884,284	39,723	$173
2058	$3,956,181	$3,111,913	$7,068,095	40,250	$176
2059	$4,061,811	$3,195,001	$7,256,813	40,787	$178
2060	$4,170,262	$3,280,308	$7,450,570	41,335	$180

4.4.3 Discussion of Option

This option assumes the City continues to own and operate the existing landfill, providing a cost-effective and straightforward waste disposal solution. However, owning and operating the landfill requires substantial land space and has potential environmental impacts, including groundwater contamination and greenhouse gas emissions. These impacts can be mitigated through engineering best practices but may come with an increase in capital investment. As the City's population grows, the need for sustainable landfill management practices will become increasingly important. In general, landfilling remains the most economical waste disposal method in Canada.

Continuing with landfilling allows the City to maintain control over its waste disposal operations, including decisions regarding materials accepted, operations management, and potential new programs to divert more waste. Additionally, this option provides local job opportunities and could be made more economically viable by partnering with nearby jurisdictions to accept

waste, thereby generating additional revenue. Increased tipping fees could also help offset some of the operational costs.

In discussions with the City, it has been noted that at present, the landfill's reserve funds are low, highlighting the benefit of extending the operational lifespan of the landfill. The table below highlights the relationship between the liability (on a cost-per tonne basis) and the age of the landfill. It is observed that with continued operation of the landfill, the annual cost-per-tonne gradually decreases over the years, with the 2060 liability cost at $52/tonne compared to the 2024 rate of $102/tonne. Keeping the landfill affords the City an opportunity to build the landfill's closure and post-closure reserves, by charging the appropriate tipping fees and through the interest that is generated on the reserve funds.

Table 14: Cost per Tonne Variation with Waste Landfilled

Year	Liability (Cost Per Tonnes)[4]
2024	$102
2030	$60
2040	$47
2045	$46
2050	$47
2055	$49
2060	$52

Each of the parameters are outlined in the table below with considerations for each parameter.

Table 15: Parameters & Considerations for Landfilling as a Disposal Option

Parameter	Considerations
Risk Management	
Liability and Expenses ($ Total)	Landfill closure (2060): $54,124,025 Post-closure (2060): $15,882,013 Liability ($/ Tonne): $39
Environmental Risks (Current & Future)	Groundwater contamination, GHG emissions
Stability	Stable due to being in control of the future disposal, materials that can be accepted and quantity of materials.
Cost	
Disposal Cost ($/Tonne)	$107
Annual disposal cost including liability ($/Tonne)	$146

[4] Cost per tonne adjusted for available funds ($2,000,000 over the last 5 years)

Parameter	Considerations
Capital Investment ($/Year) or total $ (Life of Facility)	$40,955,011 $1,615,084 (annual)
Operational Cost ($/Year) or Total $ (Life of Facility)	$1,270,417
Revenue Potential	Revenue generated from tipping fees. Current estimate about $2.5M per annum
Service Levels	
Secure Disposal	Service levels will remain the same
Disposal for Materials	Continue to provide disposal for current materials with opportunity to expand programs
Supporting Local Economy	
Cost-effective Disposal	The City has greater control on whether or not this is cost effective for residents due to owning and operating the landfill
Jobs	Provides local jobs
Diversion Potential	
	Opportunity to control what materials to divert from the landfill
Regional and Private Partnerships	
	Opportunity to partner and accept material from local jurisdictions
Climate Change/Environment	
	Greater GHG emissions compared to other disposal options

4.5 Waste Transfer

4.5.1 Assumptions

In this option MHnS assumed that waste would be hauled to an offsite landfill facility. Two (2) options for waste transfer have been considered in this analysis:

- **Direct Hauling:** all the residential curbside waste and City generated waste is collected through the existing collection agreement with GFL and sent directly to the Rural Municipality (RM) Wilton landfill.
  - ICI and multi-family users, which are currently contracted to private haulers will have to haul to the RM Wilton landfill at their own expense.
  - The landfill will be closed. The City may have to provide drop-off locations for non-landfilled (divertible) materials and bulky items which would require additional capital investment.

- **Waste Transfer:** waste is brought to a transfer station where trucks/trailers are loaded by a front-end loader. Trucks would then take the loaded trailers to landfills based on the economics of travel distance vs. scale rates. Trucks and trailers can haul larger volumes/tonnages of waste, and therefore can travel further distances economically to landfills which may provide the City more favorable tipping rates or longer-term contracts with more favorable terms.

4.5.2 Disposal locations

In selection of a suitable offsite disposal site, the main consideration is given to hauling distance and the tipping fees at the receiving landfill. Table 16 presents a list of potential landfills that can be used for hauling waste along with hauling distance and expected tipping fees. Note that there have been no discussions with the landfill site owners to date. The financial analysis is presented based on the facilities publicly posted tipping fees.

Table 16: Nearby Disposal Sites and Posted Tipping Fees

Landfill	Distance (Km)	Tipping Fee (Per Tonne)
RM of Wilton	26	$125.0
North Battleford	140	$125.0
Claystone Waste Ltd.	190	$60.0

RM of Wilton is the closest landfill to the City and therefore would have the lowest hauling cost. However, hauling costs should be considered against tipping fees. A haul and tipping fee cost analysis was completed for the three (3) identified third-party landfills as shown in Table 17. Based on the analysis, Claystone Waste Ltd., is determined to be the most cost-effective option for hauling waste. However, due to the long-haul distance, this option is not deemed suitable for the direct hauling scenario. Claystone Waste Ltd. may be the more suitable option for the transfer haul option, if that is pursued. For this study, it has been assumed that all direct hauling is taken to the RM of Wilton Landfill to arrive at a conservative cost estimate, while all transfer hauling is taken to the Claystone facility.

Table 17: Waste Transfer Haul and Tipping Fee Cost Analysis

Item	Units	Lloydminster		
		RM Wilton	North Battleford	Claystone Waste Ltd. (Riley)
Hourly Rate for Driver & Truck	$ Per Hour	$50.00	$50.00	$50.00
Truck Capacity	Tonne	20	20	20
Average One-Way Haul Distance to the Receiving Landfill	Km	26	140	190

Item	Units	Lloydminster		
		RM Wilton	North Battleford	Claystone Waste Ltd. (Riley)
Fuel For Return Trip (Assuming Fuel Efficiency Of Heavy-Duty Truck Of 55lit/100km)	Liter	28.6	154	209
Fuel Cost (@ $1.40/Liter)	$	$40.04	$215.60	$292.60
Average Haul Speed to Landfill	Km/hr	80	80	80
Travel Time (To and From)	Hr	0.65	3.5	4.75
Time Loading/Unloading	Hr	0.5	0.5	0.5
Total Haul Time (With 25% Contingency)	Hr	1.4	5.0	6.6
Insurance (Assuming Leased Owner Operator, 365 Days Operation and 1-3 Trips Per Day)	$15,000 /Annum	$13.70	$41.10	$41.10
O&M Cost for Truck-Trailer (Assuming 365 Days Operation and 1-3 Trips Per Day)	$40,000 /Annum	$36.53	$109.59	$109.59
Haul Cost to Landfills	$ Per Tonne	**$8.11**	**$30.81**	**$38.57**
Tipping Fee	$ Per Tonne	$125.00	$125.00	$60.00
Haul and Tipping Fee Cost	$ Per Tonne	**$133.11**	**$155.81**	**$98.57**

4.5.3 Direct Hauling

4.5.3.1 Assumptions

For this option, all the residential curbside waste and City generated waste is collected and sent directly to the RM Wilton landfill. Landfilling operations will be shut down completely, however, the City may choose to keep the site open for managing/processing inert wastes such as concretes and asphalts as well as recyclables. Additional assumptions are as follows.

- City will close the existing landfill in 2030 after Landfill Cell 1.4 capacity is exhausted.
- Since the City only offers curbside collection service to single-family households, the cost of this option only focuses on garbage tonnages and costs associated with the residential stream and City generated waste.
- It is assumed that the residential organics, recyclables collection and disposal remain the same, as presently contracted to GFL.
- It is assumed that ICI and Out-of-Town users will transport their waste directly to the RM of Wilton facility or another landfill of their choosing and are not considered in this analysis. This assumption implies a potential burden on ICI users, likely manifesting as

an increase in their current waste disposal costs, rather than as a direct financial impact on the City.

- Disposal options for materials in the existing diverted, treated, and recycled streams are not considered in this analysis. It is assumed that GFL will continue to transport curbside organics and recyclables to Claystone Waste Ltd/Edmonton for further processing. All other materials that are not collected under the existing contract with GFL may be disposed of at the RM Wilton landfill for a fee.
- It is assumed that GFL will continue to offer the curbside garbage collection.
- To account for the additional cost of hauling residential waste to the RM of Wilton, it has been assumed that GFL will increase the existing curbside collection rate by $6/household/month.

4.5.3.2 Cost Analysis

A summary of the direct haul cost, as well as the cost per tonne is provided in Table 18 below. Detailed cost estimates are provided in Appendix B. It should be noted that these costs assume that waste is hauled directly and that the existing landfill is closed. Hence, there are no capital costs and operations costs are limited to the hauling costs and tipping fees.

A 20% contingency has been applied to both the tipping fees and the hauling fees. Inflation rate, as provided by the Bank of Canada, is 2.67%.

Table 18: Annual Cost of a Direct Haul System

Year	Annual Cost	Tonnage	Cost Per Tonne
2024	$2,121,960	8,785	$242
2025	$2,178,616	8,983	$243
2026	$2,236,785	9,186	$243
2027	$2,296,507	9,393	$244
2028	$2,357,824	9,605	$245
2029	$2,420,778	9,822	$246
2030	$2,485,412	10,044	$247
2031	$2,551,773	10,271	$248
2032	$2,619,905	10,502	$249
2033	$2,689,857	10,740	$250
2034	$2,761,676	10,982	$251
2035	$2,835,413	11,230	$252
2036	$2,911,118	11,484	$254
2037	$2,988,845	11,743	$255
2038	$3,068,647	12,008	$256

Year	Annual Cost	Tonnage	Cost Per Tonne
2039	$3,150,580	12,279	$257
2040	$3,234,701	12,556	$258
2041	$3,321,067	12,840	$259
2042	$3,409,740	13,130	$260
2043	$3,500,780	13,427	$261
2044	$3,594,251	13,730	$262
2045	$3,690,217	14,040	$263
2046	$3,788,746	14,357	$264
2047	$3,889,905	14,681	$265
2048	$3,993,766	15,013	$266
2049	$4,100,399	15,352	$267
2050	$4,209,880	15,699	$268
2051	$4,322,284	16,054	$269
2052	$4,437,689	16,417	$270
2053	$4,556,175	16,788	$271
2054	$4,677,825	17,167	$272
2055	$4,802,723	17,555	$274
2056	$4,930,956	17,952	$275
2057	$5,062,612	18,358	$276
2058	$5,197,784	18,773	$277
2059	$5,336,565	19,197	$278
2060	$5,479,051	19,631	$279

4.5.3.3 Discussion of Option

Direct hauling assumes hauling only the single-family residential portion of wastes collected under the existing contract with GFL, with waste transported directly from collection points to a nearby landfill. The uncertainty with the management of the remaining waste items currently collected by private industry is a large risk and vulnerability to current City service levels.

This option assumes that the current landfill is fully closed. The greatest limitation of this method is the number of disposal options for the City as there is only one (1) (privately managed) landfill within a reasonable hauling distance. In this case, the City would then be subject to the agreement made with that landfill owner/operator (e.g., disposal costs), which presents higher risk as there is no other competition. Hauling to other landfills would require significant hauling costs due to distance. However, this option would not require capital or operating costs for a transfer station or for owning and operating the City landfill, but it does include landfill closure

costs and an increase in fuel and maintenance for waste trucking, and waste processing of inert wastes at the closed landfill site. It should also be noted that the City loses the opportunity to generate revenue. At present, the City generates approximately $2.5 million from the landfilling operation, which would not be possible with a direct haul, no tipping fee system.

Service levels to residential users will remain the same, however, ICI and Out-of-Town users will change since haulers would now have to direct their waste to another facility, which could be more expensive, both in tipping fees and hauling costs. The City would also need to make arrangements for the materials collected under the Waste Diverted/Recycled stream to be collected and sent to another landfill. Alternatively, the City could consider providing a public drop-off location or a small waste depot for users to maintain the existing service levels, however, this would come at a significant capital cost, with little to no potential to recover costs. At that point, it may be more economical to build a waste transfer station.

The environmental impacts include GHG emissions from increased transportation, but that impact is lesser than the emissions from a landfill. The diversion opportunities must be focused on what residents and businesses can do, rather than post-collection as the City would not have control of the waste after it enters the landfill site.

There is also no opportunity for partnerships.

Each of the parameters are outlined in the table below, with considerations for each parameter.

Table 19: Parameters & Considerations for Direct Haul as a Disposal Option

Parameter	Considerations
Risk Management	
Liability and Expenses ($ Total)	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/ Tonne): $28
Environmental Risks (Current & Future)	Limited to the future of the private landfill If a close-by landfill closes, you are subject to finding a new location, which could result in higher transportation costs and tipping fees, and higher impacts on the environment
Stability	Limited to a private landfill and the materials they are willing to accept at a given cost Tipping fees could be raised (are not controlled by the City and therefore do not have long-term certainty), negatively impacting the City.
Cost	
Disposal Cost ($/Tonne)	$242 Subject to rates set by the owners of new disposal location
Annual disposal cost including liability ($/Tonne)	$270
Hauling Cost ($ Annual)	$1,206,976

Parameter	Considerations
Tipping Fee ($ Annual)	$2,069,954
Revenue Potential	No revenue generation
Service Levels	
Secure Disposal	Service levels will remain the same for single family residential but will change for multi-family and ICI.
Disposal for Materials	Reduces local jobs due to closing the landfill
Supporting Local Economy	
Cost-effective Disposal	Whether or not this is cost effective for the community is dependent on the agreement with the owner and operator. In most cases, transferring waste to a private or 3rd party facility is more expensive.
Jobs	Providing local jobs
Diversion Potential	
	Limited opportunity as the City is subject to contracts and subject to disposal options available at the Wilton Landfill
Regional and Private Partnerships	
	N/A
Climate Change/Environment	
	GHG emissions from increased transportation

4.5.4 Transfer Hauling

4.5.4.1 Assumptions

For the Transfer Haul option, waste is collected from residents and brought to the transfer station first and then it is hauled to a neighbouring landfill that is expected to be within 200 km of Lloydminster. This option allows for large volumes of waste to be collected and hauled in larger tonnages, effectively lowering the hauling costs on a per tonne basis. Additionally, this option facilitates more efficient waste hauling over longer distances. Residents would still be allowed to drop off waste at the transfer station. ICI and Out-of-Town users may also access the transfer station. Additional assumptions are as follows.

- City will close the existing landfill in 2030 after Landfill Cell 1.4 capacity is exhausted.
- The transfer station will serve residential, Out-of-Town and ICI users and provide the same level of service as the existing landfill facility.
- It is assumed that the residential organics and recyclables collection and disposal remains the same, as contracted to GFL.
- The transfer station will be a grade-separated system with lock blocks and a ramp that allows users to drop waste into roll-off (RO) bins and trailers.
- Additional bins may be set up for other materials, however for this analysis, the number of RO bins is set to cater for the Waste Landfilled tonnages and materials only.

4.5.4.2 Cost Analysis

A summary of the annual transfer haul cost, as well as the cost per tonne is provided in Table 20 below. Detailed cost estimates are provided in Appendix B.

The cost of the facility has been priced for a grade separated transfer station with six (6) bays. The capital projects to be completed under this option include the following:

- Site preparation and removals ~ $360,000
- Site surfacing and fencing ~$198,000
- Supply and installation of retaining walls and lock blocks ~$480,000
- Surface water management ~$10,000
- Site electricals ~$20,000
- Waste Diversion Structures ~$65,000
- Design and construction of a maintenance building ~ $5,000,000
- Supply and Installation of the south weigh scale ~ $2,000,000
- Equipment Purchases ~$790,000 per year. This cost includes the following:
  - 1x roll-off truck
  - 6x roll-off bins with lids
  - 1x Loader

No snow disposal area is included in this option.

A 20% contingency has been applied to both the operations and capital costs. A 10% adjustment has also been made to the Capital costs to account for engineering fees. Inflation rate, as provided by the Bank of Canada, is 2.67%.

Table 20: Annual Cost of a Transfer Haul System

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2024	$850,253	$3,281,805	$4,132,058	26,903	$154
2025	$872,955	$3,369,429	$4,242,384	27,189	$156
2026	$896,263	$3,459,393	$4,355,656	27,480	$159
2027	$920,193	$3,551,759	$4,471,952	27,776	$161
2028	$944,762	$3,646,591	$4,591,353	28,078	$164
2029	$969,987	$3,743,955	$4,713,942	28,385	$166
2030	$995,886	$3,843,918	$4,839,804	28,697	$169
2031	$1,022,476	$3,946,551	$4,969,027	29,016	$171
2032	$1,049,776	$4,051,924	$5,101,700	29,339	$174
2033	$1,077,805	$4,160,110	$5,237,916	29,669	$177

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2034	$1,106,583	$4,271,185	$5,377,768	30,005	$179
2035	$1,136,129	$4,385,226	$5,521,354	30,347	$182
2036	$1,166,463	$4,502,311	$5,668,775	30,695	$185
2037	$1,197,608	$4,622,523	$5,820,131	31,049	$187
2038	$1,229,584	$4,745,944	$5,975,528	31,410	$190
2039	$1,262,414	$4,872,661	$6,135,075	31,778	$193
2040	$1,296,120	$5,002,761	$6,298,881	32,152	$196
2041	$1,330,727	$5,136,335	$6,467,062	32,534	$199
2042	$1,366,257	$5,273,475	$6,639,732	32,923	$202
2043	$1,402,736	$5,414,277	$6,817,013	33,318	$205
2044	$1,440,189	$5,558,838	$6,999,027	33,722	$208
2045	$1,478,642	$5,707,259	$7,185,901	34,133	$211
2046	$1,518,122	$5,859,643	$7,377,765	34,552	$214
2047	$1,558,656	$6,016,095	$7,574,751	34,978	$217
2048	$1,600,272	$6,176,725	$7,776,997	35,413	$220
2049	$1,642,999	$6,341,644	$7,984,643	35,856	$223
2050	$1,686,867	$6,510,965	$8,197,833	36,308	$226
2051	$1,731,907	$6,684,808	$8,416,715	36,768	$229
2052	$1,778,149	$6,863,293	$8,641,441	37,237	$232
2053	$1,825,625	$7,046,543	$8,872,168	37,716	$235
2054	$1,874,369	$7,234,685	$9,109,054	38,203	$238
2055	$1,924,415	$7,427,851	$9,352,266	38,700	$242
2056	$1,975,797	$7,626,175	$9,601,972	39,207	$245
2057	$2,028,551	$7,829,794	$9,858,344	39,723	$248
2058	$2,082,713	$8,038,849	$10,121,562	40,250	$251
2059	$2,138,321	$8,253,487	$10,391,808	40,787	$255
2060	$2,195,415	$8,473,855	$10,669,269	41,335	$258

4.5.4.3 Discussion of Option

Moving to a transfer station would involve closing the landfill, consolidating waste at a transfer station, and transporting it to the final disposal site in larger volumes. The benefit to hauling with

a tandem truck and not direct hauling, is that the economy of hauling allows flexibility in hauling distances which would allow the City to negotiate with more than one landfill operator.

This method is effective in managing large volumes of waste, reducing the number of trips needed and thereby lowering transportation costs and environmental impact. As noted earlier, if this option is pursued, transporting waste to the Claystone Waste Ltd. facility may be a more cost-effective option than direct hauling to the RM of Wilton. However, a transfer station with trucks and dumping or walking floor trailers would necessitate a more significant capital and operations investment.

In terms of service levels, the City will be able to maintain the same levels of service as currently offered with the landfill. ICI and out-of-town users can still dispose of garbage at the facility as they currently do, with the existing material collection points (white goods, concrete etc.) maintained as they currently are on site. They may be additional cost incurred in disposing of the various types of materials at the new landfill, which the City would have to factor into its decision-making process.

The environmental impacts include increased GHG emissions from increased transportation, but lesser impact than operating a landfill. There are significant diversion opportunities through sorting and managing waste at the transfer station before hauling to the landfill.

There may be opportunities for partnerships.

Each of the parameters are outlined in Table 21 with considerations for each parameter.

Table 21: Parameters & Considerations for Transfer Station as a Disposal Option

Parameter	Considerations
Risk Management	
Liability and Expenses ($ Total)	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/ Tonne): $28
Environmental Risks (Current & Future)	Limited to the future of the private landfill. If a close-by landfill closes, you are subject to finding a new location, which could result in higher transportation costs and large impacts on the environment.
Stability	Stable due to being in control of the future disposal, materials that can be accepted and quantity of materials. Even though the City manages the waste quantities, quality and tipping fees, these are somewhat influenced by the requirements and fees of the accepting landfill. Tipping fees could be raised at the landfill negatively impacting the City. The City will need to raise fees at the transfer station to accommodate the price increases.
Cost	
Disposal Cost ($/Tonne)	$154

Parameter	Considerations
	Subject to owners of new disposal location
Annual disposal cost including liability ($/Tonne)	$182
Capital Investment ($/Year) or Total $ (Life of Facility)	$850,253 $11,346,225
Operational Cost ($/Year) or Total $ (Life of Facility)	$3,281,805
Revenue Potential	Possible revenue generation from tipping fees. This value could match the $2.5M currently generated at the landfill if the same level of service is maintained.
Service Levels	
Secure Disposal	Service levels will remain the same
Disposal for Materials	Material accepted are subject to what is accepted at the private landfill and other contracts the City can make
Supporting Local Economy	
Cost-effective Disposal	Whether or not this is cost effective for the community is dependent on the agreement with the owner and operator of the landfill plus the costs for the transfer station
Jobs	This provides fewer jobs than operating a landfill, but provides some local jobs at the transfer station
Diversion Potential	
	High diversion potential due to the ability to sort material at the transfer station, but this is still subject to finding markets for the materials
Regional and Private Partnerships	
	Limited opportunity for partnerships
Climate Change/Environment	
	Lower GHG emissions from transportation compared to direct haul and landfilling

4.6 Waste-To-Energy

4.6.1 Background

For the WTE option, the primary thermal technologies were evaluated for the Waste Landfilled tonnages, waste quality, and the spatial requirements. Thermal processes reduce waste volume and mass by 90% and 75% respectively and release energy in the form of heat, syngas, char or

oils[5]. Anaerobic digestion was not selected as one of the technologies for consideration due to high start-up costs and the assumption that organics will continue to be managed by GFL.

A summary of the technologies considered, and their pros and cons are presented in the Table 22.

Table 22: Comparison of Waste-To-Energy Technologies for Municipal Solid Waste (Residual Waste)

	Combustion	Gasification	Pyrolysis
Technologies	▪ Moving Grate (Mass Burn) ▪ Fluidized Bed ▪ Rotary Kiln Incinerator ▪ Controlled Air Staged	▪ Fixed Bed ▪ High Temperature ▪ Fluidized Bed ▪ Plasma	▪ Rotary Kiln ▪ Fluidized Bed ▪ Fixed Bed ▪ Entrained Flow Reactor
Pilot Case Studies	▪ Durham-York ▪ Metro Vancouver ▪ Enwave/PEI ▪ Emerald Energy	▪ Enerkem	▪ Fogdog Energy ▪ Sustane (Chester Facility)
Feedstock Considerations	▪ Reduced Pre-Processing Requirements ▪ Mass Burn Can Process Variable Feedstock with up to 40% Moisture Content ▪ Diverting Organics Waste Reduces the Moisture Content in Residual Waste, Improving the Combustion Efficiency ▪ Wood products will be needed to maintain feedstock quantity.	▪ Often Required Homogenous (or Material Specific) Waste Material Streams, including Refuse Derived Fuels ▪ Higher Pre-Processing Requirements Compared to Combustion ▪ Drying Process may Be Required to Further Reduce Moisture Content to <25% ▪ Emerging Technology – Generally in Conceptual, Study and Pilot Phases and not Yet Commercialized for Municipal Solid Waste	
Beneficial End Products & Energy Output	▪ Metal Recovery (From Incinerator Ash) ▪ Electricity ▪ Steam	▪ Synthetic Gas (Syngas) ▪ Power Generation ▪ Fuel	▪ Pyrolysis Oil (Heavy Organics) ▪ Fuel Oil ▪ Lighter Fuels (Distilled)

[5] https://renewablesroadmap.iclei.org/resource/applications-series-waste-to-energy. Accessed 2024-08-18

	Combustion	Gasification	Pyrolysis
			▪ Chemicals (Distilled) ▪ Syngas ▪ Char (Low Carbon Residue)
Capital Cost Range (Per Tonne)	▪ $1,600-$2,400	▪ $1,110-$4,380	▪ $640-$1,900
Operating Cost Range (per Tonne)	▪ $90-$120	▪ No Data Available	▪ No Data Available

Based on the feedstock quality, total operations and capital cost, and energy output, a combustion system could be the most viable option for the City. It requires the least amount of pre-processing, it is a proven group of technologies, is lower in total cost (operations and capital) and produces the required energy output. A combustion system has also been implemented in other parts of Canada including the Enwave/PEI facility, Durham-York region, Metro Vancouver and more recently, the City of Edmonton-Varme facility.

Combustion residues typically consist of different types of ash which must be sent to a landfill. The amount of ash generated can range from 15 to 25 percent by weight of the municipal solid waste that is processed.

4.6.2 Assumptions

For this analysis, it has been assumed that:

- The facility would manage the City's landfilled waste from the residential, ICI and out-of-town streams.
- The WTE facility will serve residential, out-of-town and ICI users and provide the same level of service as the existing landfill facility, with collection points set up for collection of recyclable and diverted materials.
- It is assumed that the residential organics and recyclable collection and disposal remains the same, as contracted to GFL.
- Biosolids and organics are excluded from the current analysis due to their high moisture levels and therefore much higher cost for pre-processing for a WTE system use. These materials are more suited to a composting program, provided they meet the requirements to make high-grade compost for agriculture uses.
- The facility will have a designated sorting/pre-processing area to process incoming waste material into WTE and non-WTE streams.
- Ash and residuals from the back end of the WTE process as well as waste materials not permitted to be used in the WTE system will be disposed of as garbage at the nearest landfill.
- A storage building may be required to temporarily store WTE feedstock during system downtimes.

- The capital cost of the facility is estimated to be $2,400 per tonne (similar estimate as the City of Edmonton-Varme facility).

4.6.3 Cost Analysis

A summary of the annual waste-to-energy facility cost, as well as the cost per tonne is provided in Table 23 below. Detailed cost estimates are provided in Appendix B.

The capital projects to be completed under this option include the following:

- Cost of the facility ~ $77,480,000 (Based on a $ per tonne of installed annual capacity)
- Site preparation and other site works ~$1,549,600
- Permits and Approvals ~$774,800
- Design and construction of a maintenance building ~ $5,000,000
- Supply and Installation of the south weigh scale ~ $2,000,000
- Equipment Purchases ~$500,000. This cost includes the following:
  - 1x Loader
  - 4x ¾ ton trucks

No snow disposal area is included in this option.

A 40% contingency has been applied to both the operations and capital costs. A 10% adjustment has also been made to the Capital costs to account for engineering fees. Inflation rate, as provided by the Bank of Canada, is 2.67%.

Table 23: Annual Cost of a Waste-To-Energy Facility

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2024	$6,948,252	$3,866,983	$10,815,234	26,903	$402
2025	$7,133,770	$3,970,231	$11,104,001	27,189	$408
2026	$7,324,242	$4,076,236	$11,400,478	27,480	$415
2027	$7,519,799	$4,185,072	$11,704,871	27,776	$421
2028	$7,720,577	$4,296,813	$12,017,391	28,078	$428
2029	$7,926,717	$4,411,538	$12,338,255	28,385	$435
2030	$8,138,360	$4,529,326	$12,667,686	28,697	$441
2031	$8,355,654	$4,650,259	$13,005,914	29,016	$448
2032	$8,578,750	$4,774,421	$13,353,171	29,339	$455
2033	$8,807,803	$4,901,898	$13,709,701	29,669	$462
2034	$9,042,971	$5,032,779	$14,075,750	30,005	$469
2035	$9,284,419	$5,167,154	$14,451,573	30,347	$476

Year	Capital Cost (Annualized)	Annual Operations Cost	Total Annual Cost	Tonnage	Cost Per Tonne
2036	$9,532,313	$5,305,117	$14,837,430	30,695	$483
2037	$9,786,825	$5,446,764	$15,233,589	31,049	$491
2038	$10,048,134	$5,592,192	$15,640,326	31,410	$498
2039	$10,316,419	$5,741,504	$16,057,923	31,778	$505
2040	$10,591,867	$5,894,802	$16,486,669	32,152	$513
2041	$10,874,670	$6,052,193	$16,926,863	32,534	$520
2042	$11,165,024	$6,213,787	$17,378,810	32,923	$528
2043	$11,463,130	$6,379,695	$17,842,825	33,318	$536
2044	$11,769,196	$6,550,033	$18,319,228	33,722	$543
2045	$12,083,433	$6,724,918	$18,808,351	34,133	$551
2046	$12,406,061	$6,904,474	$19,310,534	34,552	$559
2047	$12,737,303	$7,088,823	$19,826,126	34,978	$567
2048	$13,077,388	$7,278,095	$20,355,483	35,413	$575
2049	$13,426,555	$7,472,420	$20,898,975	35,856	$583
2050	$13,785,044	$7,671,933	$21,456,977	36,308	$591
2051	$14,153,104	$7,876,774	$22,029,879	36,768	$599
2052	$14,530,992	$8,087,084	$22,618,076	37,237	$607
2053	$14,918,970	$8,303,009	$23,221,979	37,716	$616
2054	$15,317,306	$8,524,699	$23,842,006	38,203	$624
2055	$15,726,278	$8,752,309	$24,478,587	38,700	$633
2056	$16,146,170	$8,985,996	$25,132,166	39,207	$641
2057	$16,577,273	$9,225,922	$25,803,194	39,723	$650
2058	$17,019,886	$9,472,254	$26,492,140	40,250	$658
2059	$17,474,317	$9,725,163	$27,199,480	40,787	$667
2060	$17,940,881	$9,984,825	$27,925,706	41,335	$676

4.6.4 Discussion of Option

For this assessment, it has been assumed that the City will continue its current organics and recyclables program with GFL. As noted previously, there are feedstock quantity, quality and cost limitations that would need to be considered in the implementation of this system. While this option would help extend the life of the landfill, and slightly reduce the environmental liability, it comes with significant capital and operations cost. Some WTE systems also come with minimum tonnage requirements for economic viability.

Compared to the other disposal options, environmental impacts could potentially be lower, however, the City will still require disposal services for the ash produced from the combustion process.

The operation costs are dependent on the tonnages received at the facility. If the City does not produce enough material to make a WTE facility cost effective, they would have to source additional material. There is opportunity for partnerships to accept materials to reach optimum capacity of the WTE facility. As well, a new facility would support the local economy through job creation.

Each of the parameters are outlined in the table below with considerations for each parameter.

Table 24: Parameters & Conditions for WTE as a Disposal Option

Parameter	Considerations
Risk Management	
Liability and Expenses ($ Total)	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28
Environmental Risks (Current & Future)	Lower compared to other options but disposal means for ash by-product required
Stability	Secure option for disposal. WTE facilities typically requires a specific quantity of materials to be cost-effective. This makes this option less stable as it becomes ineffective without enough materials while also not being able to surpass capacity.
Cost	
Disposal Cost ($/Tonne)	$402
Annual disposal cost including liability ($/Tonne)	$430
Capital Investment ($/Year) or Total $ (Life of Facility)	$6,948,252 $134,499,032
Operational Cost ($/Year) or Total $ (Life of Facility)	$3,866,983
Revenue Potential	Possible revenue generation from tipping fees. This value could match the $2.5M currently generated at the landfill if the same level of service is maintained. Potential to generate additional revenue from selling energy to grid. This is dependent on the current energy sale rate

Parameter	Considerations
Service Levels	
Secure Disposal	Service levels would remain the same.
Disposal for Materials	This option would require transporting material not accepted at the WTE facility to a landfill as WTE technology has been made for specific material types.
Supporting Local Economy	
Cost-effective Disposal	WTE can be cost effective for the community if the facility has enough materials to process
Jobs	Provides local jobs at the facility
Diversion Potential	
	Increased diversion as very little is landfilled
Regional and Private Partnerships	
	Opportunity to partner with local jurisdictions to accept waste to achieve efficient processing and make the WTE facility cost-effective
Climate Change/Environment	
	May lower climate change and environmental impact for the specific material type that is accepted

4.7 Sale of the Landfill

4.7.1 Background

The City asked MHnS to analyze the sale of the landfill to interested private waste management companies. To help with the analysis of this potential option, MHnS reached out to several industry contacts to explore some of the considerations and attempt to retain some financial information to estimate a potential sale price. The consensus from these communications and requests for information is summarized below:

- All companies that were approached expressed interest in a potential purchase of the landfill.
- None of the interested third parties would divulge any assumptions or estimates regarding purchase prices or terms.
- All parties asked that to initiate such an endeavor, they receive an invite via EOI (expression of interest) or RFP.

4.7.2 Assumptions

In the instance of selling the landfill, MHnS has assumed the following:

- The City would direct haul all wastes currently managed by City operations/equipment. These tonnes include single family residential collections, “not specified” loads

(contributing approximately 13 tonnes in 2024), and “City Operations” tonnes (refer to the landfilled waste table appended to the report).

- Multi-Family residents that are currently picked up by private waste management companies would be unchanged. However, it would be anticipated that service level to these residents would be impacted as costs would likely change under new landfill ownership.
- The City would need to provide household hazardous waste (HHW) drop-off sites, or make arrangements with the new landfill owners to continue any HHW collection programs. The additional cost associated with this has not been included in the evaluation of the direct haul options.
- The benefit of this option is principally the shedding of liability and capital investments. This option is similar to direct haul, as the City would be direct hauling to a private landfill. However, there is a risk, as stated above, that the City would lose control over costs and be “at the whim” of market conditions, i.e. there would be no long-term certainty on costs, depending on the landfill options available and potential agreements/contract terms.
- Although the landfill would be privately owned and operated, the environmental impacts remain unchanged. The diversion opportunities must be focused on waste generation through residents and businesses, rather than post-collection as the City would not have control of the waste after it enters the landfill site.

4.7.3 Discussion of Option

The terms of the sale will depend on the contract the City enters with the potential buyer and the amount of landfill liability they are willing to accept as part of the agreement. Since it is assumed that the new owner will take on both the landfill liability and the responsibility of operating the landfill, the associated costs will also fall on the new owner. However, the City may lose control over certain aspects, such as tipping fees and service levels, which will be determined by the new owner. If the terms are not favorable to residents, this could have social and political implications.

MHnS is not able to provide additional information on the potential valuation or sale, as there are too many factors at play. Providing a lump sum figure at this stage could be misleading and result in a decision that would not be in the best interest of the City and its taxpayers.

As such, while this option remains viable, significant analysis and industry discussion are required.

Each of the parameters are outlined in Table 25 with considerations for each parameter.

Table 25: Parameters & Considerations for Selling the Landfill as a Disposal Option

Parameter	Considerations
Risk Management	
Liability and Expenses ($ Total)	Dependent on buyer.
Environmental Risks (Current & Future)	Limited to the future of the privately owned landfill If the landfill closes, the City is subject to finding a new location, which could result in higher transportation costs and large impacts on the environment
Stability	Limited to a private landfill and the materials they are willing to accept at a given cost The landfill owner could change the cost per tonne to landfill materials and the City would end up paying higher disposal costs
Cost	
Disposal Cost ($/Tonne)	Dependent on buyer.
Capital Investment ($/Year) or Total $ (Life of Facility)	Dependent on buyer.
Operational Cost ($/Year) or Total $ (Life of Facility)	Dependent on buyer.
Revenue Potential	Dependent on buyer.
Service Levels	
Secure Disposal	Secure Disposal
Disposal for Materials	Disposal for Materials
Supporting Local Economy	
Cost-effective Disposal	Cost-effective Disposal
Jobs	Jobs
Diversion Potential	
	Limited opportunity as the City is subject to contracts
Regional and Private Partnerships	
	N/A
Climate Change/Environment	
	GHG emissions from increased transportation and/or landfill operations

4.8 Summary of Options

Each of the options were scored following the assessment of parameters and considerations. Options that align with the priorities outlined in Table 5 were scored better, with a lower number corresponding with higher priority. A weighting coefficient was then applied to each of the parameters based on the ranking provided by ELT members and Landfill Management shown in

Section 2. The parameters are also listed below in order of importance. For example, Risk Management was ranked as most important and therefore was given the best weighting. The scores were then multiplied by the weighting and added up to give each disposal option a final rank.

Table 26: Summary of Disposal Options and Assessment of Parameters

Parameter	Landfilling	Direct Haul	Transfer Station	Waste-To-Energy
Risk Management				
Liability and Expenses ($ Total)	Landfill closure (2060): $54,124,025 Post-closure (2060): $15,882,013 Liability ($/Tonne): $39	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28
Environmental Risks (Current & Future)	Groundwater contamination, GHG emissions	Limited to the future of the private landfill. If a close-by landfill closes, you are subject to finding a new location, which could result in higher transportation costs and large impacts on the environment.	Limited to the future of the private landfill. If a close-by landfill closes, you are subject to finding a new location, which could result in higher transportation costs and large impacts on the environment.	Lower compared to other options but disposal means for ash by-product required.
Stability	Stable due to being in control of the future disposal, materials that can be accepted and quantity of materials.	Limited to a private landfill and the materials they are willing to accept at a given cost. The landfill could change the cost per tonne to landfill materials and the City.	Limited to a private landfill and the materials they are willing to accept at a given cost. The landfill could change the cost per tonne to landfill materials and the City.	Secure option for disposal. WTE facilities typically require a specific quantity of materials to be cost-effective. This makes this option less stable as it becomes ineffective without enough materials while also not being able to surpass capacity.
Cost				
Disposal Cost ($/Tonne)	$107	$242 Subject to owners of new disposal location	$154 Subject to owners of new disposal location	$402
Annual disposal cost including liability ($/Tonne)	$146	$270	$182	$430

Parameter	Landfilling	Direct Haul	Transfer Station	Waste-To-Energy
Capital Investment ($/Year) or Total $ (Life of Facility)	$1,615,084 (annual) $40,955,011	$-	$850,253 $11,821,425	$6,948,252 $134,499,032
Operational Cost ($/Year) or Total $ (Life of Facility)	$1,270,417	$2,121,960	$3,281,805	$3,866,983
Revenue Potential	Revenue generated from tipping fees	No revenue generation	Possible revenue generation from tipping fees	Dependent on being able to sell to grid and price offered for energy. Potential to also generate revenue from tipping fees
Service Levels				
Secure Disposal	Service levels will remain the same	Service levels to residential users will remain the same, however, service to ICI and out-of-town users will change	Service levels will remain the same	Service levels would remain the same.
Disposal for Materials	Continue to provide disposal for current materials with opportunity to expand programs	Reduces local jobs due to closing the landfill	Material accepted are subject to what is accepted at the private landfill and other contracts the City can make	This option would require transporting material not accepted at the WTE facility to a landfill as WTE technology has been made for specific material types.
Supporting Local Economy				
Cost-effective Disposal	The City has greater control on whether this is cost effective for residents due to owning and operating the landfill	Whether or not this is cost effective for the community is dependent on the agreement with the owner and operator	Whether or not this is cost effective for the community is dependent on the agreement with the owner and operator of the landfill plus the costs for the transfer station	WTE can be cost effective for the community if the facility has enough materials to process

Parameter	Landfilling	Direct Haul	Transfer Station	Waste-To-Energy
Jobs	Provides local jobs	Providing local jobs	This provides fewer jobs than operating a landfill, but provides some local jobs at the transfer station	Provides local jobs at the facility
Diversion Potential				
	Opportunity to control what materials to divert from the landfill	Limited opportunity as the City is subject to contracts	High diversion potential due to the ability to sort material at the transfer station, but this is still subject to finding markets for the materials	Increased diversion as very little is landfilled
Regional & Private Partnerships				
	Opportunity to partner and accept material from local jurisdictions	N/A	Limited opportunity for partnerships	Opportunity to partner with local jurisdictions to accept waste to achieve efficient processing and make the WTE facility cost-effective
Climate Change/Environment				
	Greater GHG emissions compared to other disposal options	GHG emissions from increased transportation	Lower GHG emissions from transportation compared to direct haul and landfilling	May lower climate change and environmental impact for the specific material type that is accepted
	Landfill closure (2060): $54,124,025 Post-closure (2060): $15,882,013 Liability ($/Tonne): $39	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28	Landfill closure (2030): $14,327,208 Post-closure (2030): $7,204,414 Liability ($/Tonne): $28

The lowest score demonstrates the best option moving forward. The scores for each disposal option and aspect are shown in Table 5.

Table 27: Final Scoring Per Aspect & Disposal Option[6]

Parameter	Landfilling	Direct Haul	Transfer Station	Waste-To-Energy
Risk Management				
Liability and Expenses ($ Total)	2	2	2	4
Environmental Risks (Current & Future)	3	2	2	3
Stability	1	3	3	3
Cost				
Disposal Cost ($/Tonne)	2	3	3	2
Capital Investment ($/Year) or Total $ (Life of Facility)	3	1	3	4
Operational Cost ($/Year) or Total $ (Life of Facility)	3	1	2	4
Revenue Potential	1	4	1	1
Service Levels				
Secure Disposal	1	2	2	3
Disposal for Materials	1	2	2	2
Supporting Local Economy				
Cost-effective Disposal	1	3	2	4
Jobs	1	2	2	2
Diversion Potential				
	2	3	2	4

[6] 1 = Good option based on proprieties and 4 = poor option based on priorities

Parameter	Landfilling	Direct Haul	Transfer Station	Waste-To-Energy
Regional & Private Partnerships				
	1	2	1	2
Climate Change/Environment				
	2	2	2	2
Final Score[7]	53	65	62	83

This ranking system found landfilling to be the best disposal option for the City moving forward.

[7] The lowest score is the best option.

5. CONCLUSION & RECOMMENDATIONS

Based on the analysis of the waste disposal options considered and the scoring matrix developed by the City and MHnS, keeping the existing landfill is the recommended option for the City. There is the increasing cost of liability and potential environmental issues with operating the landfill, however, the issue with liability remains with every option analyzed.

Operating the landfill also affords the City greater control over service levels, diversion targets, tipping fees, and the potential to explore partnerships that would further reduce the cost of operating the landfill due to the economies of scale. Typically, unless a community is not able to manage the landfill in accordance with the regulations, or if the cost per tonne is unreasonable, it is recommended that communities retain ownership and manage their existing airspace wisely as this minimizes costs and provides long term security for disposal. Communities that are forced to look at other options, for example after running out of airspace, typically see costs go up.

5.1 Disposal Options for Materials not Collected

This analysis focused on the “Waste Landfilled” stream which is mainly garbage. It was assumed that the City will continue the existing contracts with GFL to manage organics and recycling. However, it should be noted that aside from the Direct Haul system, the City has the option to set up collection points for all the other material types currently managed at the landfill. The City will be able to collect e-waste, construction and demolition waste, and other diverted and/or recycled material and manage them on the property, with arrangements in place to transport them to another facility for disposal or reused on site.

If the City would like to set up such collection points for the Direct Haul system, a small drop-off area may be considered on the existing facility grounds to collect these materials, while the bulky items are sent directly to the identified landfill.

5.2 Social and Political Implications of Closing the Landfill

The social and political implications of closing the landfill are important to consider. If the landfill is closed and another disposal option is pursued, it is assumed that the City will continue to only service single-family residences as they currently do. The ICI sector and Out-of-Town waste generators would not have the convenience of a nearby landfill. ICI haulers would then be required to travel a longer distance for landfilling material, which could result in significantly increase disposal costs for the ICI sector in Lloydminster. The ICI sector could experience increased disposal costs with the City having no control on what private haulers are charging for this increase in distance and a potential increase in tipping fees. There is the indirect effect of this on residents and potential social and political implications. Typically, if residents or businesses experience a significant change in their services, for example if services are removed or if costs go up, the City will hear about it and they will consider the City responsible for those changes or increased costs. This also has obvious political implications.

5.3 Landfill Liability

In Section 4.4.3, the long-term benefit of keeping the existing landfill was highlighted. It is noted that with inflation, the cost of closing the landfill in 2060 compared to 2024 or 2030 is significantly higher. However, the cost of operating the landfill ultimately begins to reduce above a certain Waste Landfilled tonnage. In our calculations, the liability increases by $15 over the 36-year period. The City can adjust the tipping rates accordingly (roughly $0.5 per year) to account for the difference.

At present, the City would require approximately $20,000,000 to close the landfill in 2030. Continuous operation of the landfill, beyond this date will allow the City to build up reserve funds needed to close the landfill as shown in Table 14.

While liability of the landfill is a concern, operations of a landfill also provide opportunities for revenue generation which have are not addressed in the cost per tonne calculations. Operations costs can also be addressed by increasing operational efficiencies, which are also not reflected in the cost per tonne calculations for liability. Some of these opportunities are as follows:

- Management strategies for energy/fuel conservation.
- Advancement in technology in operations equipment.
- Increases in compaction/density of placed waste resulting in increased life-span and deferred capital expenses for expansion (reduced annualized cost for expansion).
- Revenue generation from additional on-site recycling or recovered materials programs.
    - An example of this is the potential for capturing recyclable ferrous and rare earth metals that are commonly found in construction waste. There are currently several field studies in Alberta using powered mobile equipment for processing these waste streams in the field for recovering many tonnes of metals for recycling and revenue generation.

Therefore, MHnS should emphasize that the cost presented for the landfill has greater potential for cost savings than other options presented herein. All other options should be conservative (optimistic) as they do not, or may not, include detailed quantitative considerations for every waste material.

5.4 Municipally Operated Versus Contracted Operations

Discussions with several landfill and transfer station operators show a mixed approach to how their facilities are managed. Some municipalities contract out the operation of their facilities while others operate them in-house. The draw to contract out services usually revolves around:

- Staff Retention: It is difficult to keep staff in the solid waste business.
- Equipment and Maintenance Cost: High upfront cost of purchasing equipment and the annual cost of maintenance.
- Staff Resources: Managing in-house means that staff must be salaried and have benefits.

Municipalities are usually willing to contract out the operation of these facilities if they can include sufficient controls within the contract that would allow for appropriate municipal control and oversight, together with the flexibility to make appropriate adjustments during the life of the contract. This includes adding an insurance clause to the contract, so that any repair costs incurred due to the contractor's negligence are borne by the contractor. In addition, requirements in the contract to meet certain operations targets can be included.

Haulage is a core part of the transfer station operation. For this reason, there is a large cost associated with hauling. Since most municipalities are not in the transportation business or have the capital to manage one, most municipalities contract out the transportation (haulage) portion of the work. Further to this point, a study[8] across municipalities in Ontario determined that there is a best practice in contracting the Transfer Station operations and haulage to a single operator. There are issues with contracting out the haulage portion of the operation separately from the Transfer Station operations. These issues include:

- Occasionally there may be a lack of control over trailers.
- Scheduling Problems: Trailers/bins may not be available when needed or may arrive or be hauled away at times that interfere with normal operations.
- Breakdown of equipment and ensuring there is adequate back-up.
- Loading of Trailers: There can be issues if there is a different contractor loading the trailers from the one doing the hauling (differing priorities).
- Communication between contractors that 'share' the use of the same facility.

Some facilities choose to have the attendant and scale staff be municipal employees while the hauling is contracted out. The customer interaction and maintenance of the facility would be better managed if the attendant is a municipally hired employee. This would be a consideration for the transfer station options but having this separation may also present more challenges, as the loading of the bins/trailers is best coordinated under one management entity (municipal or contracted).

Generally, municipalities have a consistent approach in managing how they deliver services, including waste management, as to whether the services are contracted or municipally operated. Ultimately, the decision to contract out services or manage them in-house will come down to the following factors:

- Capital Costs: there is a large upfront capital investment associated with operating a waste management facility.
- Operating Cost: large staffing requirement.
- Level of Service: control of how the facility is operated. Better if run in-house.
- Customer Service: better customer interaction if managed in-house.

[8] Transfer Station and Disposal Operations Review (City of Hamilton, 2008)

6. CLOSURE

The City of Lloydminster retained Morrison Hershfield now Stantec to conduct the work described in this report, and this report has been prepared solely for this purpose.

This document, the information it contains, the information and basis on which it relies, and factors associated with implementation of suggestions contained in this report are subject to changes that are beyond the control of the author. The information provided by others is believed to be accurate and may not have been verified.

Morrison Hershfield now Stantec does not accept responsibility for the use of this report for any purpose other than that stated above and does not accept responsibility to any third party for the use, in whole or in part, of the contents of this document. This report should be understood in its entirety, since sections taken out of context could lead to misinterpretation.

We trust the information presented in this report meets Client's requirements. If you have any questions or need addition details, please do not hesitate to contact one of the undersigned.

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Appendix A – Landfill Liability

Appendix A: PS 3280 Landfill Liability Calculations

MORRISON HERSHFIELD now Stantec

Existing Landfill - Closure & Post Closure	Assumptions/Cost Reference	Unit	Quantity	Rate ($ / unit)	Cost ($)
CLOSURE COSTS					
PLANNING AND DESIGN					
1 **Engineering**					
a. Final Closure Design and Reporting		LS	1	$50,000.00	$50,000.00
b. Tendering and Regulatory Support		LS	1	$10,000.00	$10,000.00
c. Construction Supervision and QA/QC		LS	1	$100,000.00	$100,000.00
d. Erosion and Sediment Control Design		LS	1	$10,000.00	$10,000.00
e. Landscaping Detailed Design		LS	1	$10,000.00	$10,000.00
f. Site Survey		LS	1	$10,000.00	$10,000.00
CONSTRUCTION					
2 **Site Works**			0		
Landfill Extents					
a. Mobilization / Demobilization		LS	1	$300,000.00	$300,000.00
b. Foundation Layer Placement	2020 Closure Plan - 404,864 m2 + Cell 1-4 (30,000 m2)	m2	434,864	$7.00	$3,044,048.00
c. Compacted Clay - On-site stockpile - 600 mm thick		m3	260,918	$12.00	$3,131,020.80
d. Subsoil - On Site stockpile - 350 mm thick		m3	152,202	$7.50	$1,141,518.00
e. Topsoil - On Site stockpile - 200 mm subsoil		m3	86,973	$7.50	$652,296.00
f. Hydroseeding		m2	434,864	$1.50	$652,296.00
Buffer Areas					
h. Buffer area regrading	Assumed 20% of landfill area	m2	86,973	$2.00	$173,945.60
a. Topsoil - On-site Stockpile -Buffer Areas, 150mm		m3	13,046	$7.50	$97,844.40
b. Buffer area reseeding		m2	86,973	$1.50	$130,459.20
c. Landscaping as per closure plan design		LS	1	$50,000.00	$50,000.00
d. Landscaping maintenance for warranty period (1 year)		LS	1	$10,000.00	$10,000.00
3 **Miscellaneous**					
e. Erosion and Sediment Control		LS	1	$50,000.00	$50,000.00
h. Demolition - shop building		LS	1	$50,000.00	$50,000.00
d. Demolition - shop foundation		LS	1	$20,000.00	$20,000.00
a. Access road to top of landfill	Assume 200m, 6m wide	m2	1,200	$30.00	$36,000.00
f. Access road along landfill perimeter	Assume 1000m, 6m wide	m2	6,000	$30.00	$180,000.00
g. Slope drainage channels with rip rap	assume 1000m	LM	1,000	$75.00	$75,000.00
				Subtotal	**$9,304,428.00**
				Contingency (10%)	**$988,442.80**
				Total	**$10,962,870.80**
POST-CLOSURE COSTS					
1 **Landfill Surface Care**					
a. Settlement filling	assumed 2% of closure area	m2	8,697	$ 2.00	$ 17,394.56
b. Erosion repairs	assumed 2% of closure area	m2	8,697	$ 2.00	$ 17,394.56
c. Clay maintenance	assumed 2% of closure area	m2	8,697	$12.00	$ 104,367.36
d. Topsoil maintenance	assumed 2% of closure area	m2	8,697	$7.50	$ 65,229.60
e. Seeding maintenance	assumed 2% of closure area	m2	8,697	$ 2.00	$ 17,394.56
f. Mowing	assumed 2% of closure area	m2	8,697	$ 2.00	$ 17,394.56
g. EOA documentation		LS	1	$ 5,000.00	$ 5,000.00
h. Engineering plans and specs.		LS	1	$ 5,000.00	$ 5,000.00
2 **Other Site Costs**					
a. Drainage way maintenance		LS	1	$ 10,000.00	$ 10,000.00
b. Fence maintenance and security		LS	1	$ 5,000.00	$ 5,000.00
c. Site management and administration		LS	1	$ 10,000.00	$ 10,000.00
3 **Leachate Management**					
a. Leachate C & M		LS	1	$ 10,000.00	$ 10,000.00
b. Leachate disposal	Assumed fees - connected to City WWTP	LS	1	$ -	$ -
c. Leachate Collection System: Mice (5 Year Clean)		LS	1	$ 20,000.00	$ 20,000.00
4 **Environmental Monitoring**					
a. Gas testing	New Regulation	LS	1	$ 20,000.00	$ 20,000.00
b. Environmental Monitoring: (Groundwater, Surface Water, Leachate and LFG samples) including Reporting		LS	1	$ 50,000.00	$ 50,000.00
				Subtotal	**$ 374,175.00**
				Contingency (10%)	**$ 37,417.50**
				Total	**$ 411,592.72**

LIABILITY CALCULATION USING PS 3279

Assumptions

Current Year	2024
Landfill Closure Date	2039
Remaining Life (Years)	6
Closure Cost (2024 Dollars)	$10,982,871
Annual Post-Closure Costs (2024 Dollars)	$411,593
Inflation Rate	2.67%
Discount Rate (Interest Rate)	4.53%

Post-Closure Costs		
Years 1-10	Years 11-20	Years 21-25
$411,593	$246,956	$164,637

Post-closure costs from years 1-10, years 11-20 (40% decrease), and years 21-25 (60% decrease)

Landfill Data					Closure Costs		Post-Closure Costs			Liability and Expenses		
Liability Operating Year	Number of Years from Current Year	Year	Cumulative Tonnes	Cumulative Airspace (m3)	Capacity Used	Inflated Closure Cost	Present Value Closure Cost	Inflated Post-Closure Cost (Year 1-10)	Inflated Post-Closure Cost (Year 11-20)	Inflated Post-Closure Cost (Year 21-25)	Present Value Post-Closure Cost	Present Value Liability	Total Liability	Annual Expense
0	0	2024	607,439	1,214,878	28%	$10,982,871	$ 10,982,871	$411,593	$246,956	$164,637	$0	$ 16,505,590	$ 4,621,565	$ -
1	1	2025	634,828	1,269,255	30%	$11,276,113	$ 11,480,395	$422,582	$253,549	$169,033	$0	$ 17,253,293	$ 5,175,988	$ 554,423
2	2	2026	662,108	1,324,215	32%	$11,577,186	$ 12,000,457	$433,903	$260,319	$173,546	$0	$ 18,034,868	$ 5,771,158	$ 595,170
3	3	2027	689,884	1,379,768	34%	$11,886,297	$ 12,544,077	$445,449	$267,270	$178,180	$0	$ 18,851,847	$ 6,409,628	$ 638,470
4	4	2028	717,982	1,435,924	36%	$12,203,661	$ 13,112,324	$457,343	$274,406	$182,937	$0	$ 19,705,836	$ 7,094,101	$ 684,473
5	5	2029	746,347	1,492,694	38%	$12,529,498	$ 13,706,312	$469,594	$281,732	$187,822	$0	$ 20,598,510	$ 7,827,434	$ 733,333
6	6	2030	775,044	1,550,089	40%	$12,864,036	$ 14,327,208	$482,091	$289,255	$192,836	$7,204,414	$ 21,531,623	$ 8,612,649	$ 785,215
7	7	2031	804,080	1,608,120	42%	$0	$ 14,976,231	$494,953	$296,976	$197,985	$0	$ 22,507,005	$ 9,452,942	$ 840,293
8	8	2032	833,399	1,666,799	44%	$0	$ 15,654,654	$508,178	$304,907	$203,271	$0	$ 23,526,573	$ 10,351,692	$ 898,750
9	9	2033	863,068	1,726,137	46%	$0	$ 16,363,810	$521,767	$313,048	$208,699	$0	$ 24,592,326	$ 11,312,476	$ 960,784
10	10	2034	893,073	1,786,146	48%	$0	$ 17,105,091	$535,677	$321,406	$214,271	$0	$ 25,706,359	$ 12,339,052	$ 1,026,576
11	11	2035	923,420	1,846,839	50%	$0	$ 17,879,951	$549,980	$329,988	$219,992	$0	$ 26,870,857	$ 13,435,428	$ 1,096,376
12	12	2036	954,114	1,908,228	52%	$0	$ 18,689,813	$564,664	$338,799	$225,866	$0	$ 28,088,107	$ 14,603,815	$ 1,170,387
13	13	2037	985,164	1,970,327	54%	$0	$ 19,536,566	$579,741	$347,845	$231,896	$0	$ 29,360,498	$ 15,854,669	$ 1,248,853
14	14	2038	1,016,574	2,033,148	56%	$0	$ 20,421,572	$595,220	$357,132	$238,088	$0	$ 30,690,528	$ 17,186,696	$ 1,332,027
15	15	2039	1,048,352	2,096,704	58%	$0	$ 21,346,670	$611,112	$366,667	$244,445	$0	$ 32,080,809	$ 18,606,869	$ 1,420,174
16	16	2040	1,080,504	2,161,008	60%	$0	$ 22,313,674	$627,429	$376,457	$250,972	$0	$ 33,534,070	$ 20,120,442	$ 1,513,573
17	17	2041	1,113,038	2,226,076	62%	$0	$ 23,324,483	$644,181	$386,509	$257,673	$0	$ 35,053,163	$ 21,732,961	$ 1,612,519
18	18	2042	1,145,961	2,291,921	64%	$0	$ 24,381,082	$661,381	$396,829	$264,552	$0	$ 36,641,072	$ 23,450,286	$ 1,717,325
19	19	2043	1,179,276	2,358,558	66%	$0	$ 25,485,540	$679,040	$407,424	$271,616	$0	$ 38,300,912	$ 25,278,602	$ 1,828,316
20	20	2044	1,213,001	2,426,002	68%	$0	$ 26,640,041	$697,170	$418,302	$278,868	$0	$ 40,035,943	$ 27,224,442	$ 1,945,840
21	21	2045	1,247,134	2,494,268	70%	$0	$ 27,846,834	$715,785	$429,471	$286,314	$0	$ 41,849,572	$ 29,294,700	$ 2,070,259
22	22	2046	1,281,685	2,563,371	72%	$0	$ 29,109,298	$734,896	$440,938	$293,959	$0	$ 43,745,357	$ 31,498,657	$ 2,201,957
23	23	2047	1,316,664	2,633,327	74%	$0	$ 30,428,992	$754,518	$452,711	$301,807	$0	$ 45,727,022	$ 33,837,998	$ 2,341,339
24	24	2048	1,352,077	2,704,153	76%	$0	$ 31,805,241	$774,664	$464,798	$309,865	$0	$ 47,798,456	$ 36,326,827	$ 2,488,830
25	25	2049	1,387,933	2,775,866	78%	$0	$ 33,246,018	$795,347	$477,208	$318,139	$0	$ 49,963,726	$ 38,971,706	$ 2,644,880
26	26	2050	1,424,241	2,848,481	80%	$0	$ 34,752,063	$816,583	$489,950	$326,633	$0	$ 52,227,083	$ 41,781,666	$ 2,809,960
27	27	2051	1,461,009	2,922,017	82%	$0	$ 36,326,331	$838,386	$503,031	$335,354	$0	$ 54,592,970	$ 44,768,235	$ 2,986,569
28	28	2052	1,498,246	2,996,492	84%	$0	$ 37,971,914	$860,771	$516,462	$344,308	$0	$ 57,066,031	$ 47,935,465	$ 3,189,231
29	29	2053	1,535,961	3,071,923	86%	$0	$ 39,692,041	$883,753	$530,252	$353,501	$0	$ 59,651,122	$ 51,296,965	$ 3,364,499
30	30	2054	1,574,164	3,148,329	88%	$0	$ 41,490,091	$907,349	$544,410	$362,940	$0	$ 62,353,318	$ 54,870,920	$ 3,573,955
31	31	2055	1,612,865	3,225,729	90%	$0	$ 43,369,592	$931,574	$558,945	$372,630	$0	$ 65,177,924	$ 58,680,131	$ 3,809,211
32	32	2056	1,652,071	3,304,143	92%	$0	$ 45,334,235	$956,449	$573,869	$382,579	$0	-	-	$ 58,680,131
33	33	2057	1,691,795	3,383,590	94%	$0	$ 47,387,875	$981,986	$589,192	$392,794	$0	-	-	$ -
34	34	2058	1,732,045	3,464,090	96%	$0	$ 49,534,546	$1,008,205	$604,923	$403,282	$0	-	-	$ -
35	35	2059	1,772,833	3,545,665	98%	$0	$ 51,778,481	$1,035,124	$621,074	$414,050	$0	-	-	$ -
36	36	2060	1,814,168	3,628,336	100%	$0	$ 54,124,025	$1,062,762	$637,657	$425,105	$0	$ 67,216,182	$ 67,216,182	$ 67,216,182
37	37	2061			100%	$0	$ 56,573,844	$1,091,137	$654,682	$436,455	$0	$ 69,449,075	$ -	$ -
38	38	2062			100%	$0	$ 59,138,729	$1,120,271	$672,163	$448,108	$0	$ 71,737,918	$ -	$ -
39	39	2063			100%	$0	$ 61,817,714	$1,150,182	$690,109	$460,073	$0	$ 74,084,941	$ -	$ -
40	40	2064			100%	$0	$ 64,618,056	$1,180,892	$708,535	$472,357	$0	$ 76,492,089	$ -	$ -
41	41	2065			100%	$0	$ 67,545,354	$1,212,422	$727,453	$484,969	$0	$ 78,960,038	$ -	$ -
42	42	2066			100%	$0	$ 70,605,954	$1,244,793	$746,876	$497,917	$0	$ 81,503,041	$ -	$ -
43	43	2067			100%	$0	$ 73,803,405	$1,278,029	$766,818	$511,212	$0	$ 84,111,956	$ -	$ -
44	44	2068			100%	$0	$ 77,146,760	$1,312,153	$787,292	$524,861	$0	$ 86,793,128	$ -	$ -
45	45	2069			100%	$0	$ 80,641,506	$1,347,187	$808,312	$538,875	$0	$ 89,560,497	$ -	$ -
46	46	2070			100%	$0	$ 84,294,589	$1,383,157	$829,894	$553,263	$0	$ 92,387,392	$ -	$ -
47	47	2071			100%	$0	$ 88,113,113	$1,420,087	$852,052	$568,035	$0	$ 95,307,541	$ -	$ -
48	48	2072			100%	$0	$ 92,104,837	$1,458,004	$874,802	$583,202	$0	$ 98,314,873	$ -	$ -
49	49	2073			100%	$0	$ 96,276,977	$1,496,933	$898,160	$598,773	$0	$ 101,412,727	$ -	$ -
50	50	2074			100%	$0	$ 100,638,324	$1,536,901	$922,140	$614,760	$0	$ 104,605,824	$ -	$ -
51	51	2075			100%	$0	$ 105,197,246	$1,577,936	$946,762	$631,174	$0	$ 107,896,268	$ -	$ -
52	52	2076			100%	$0	$ 109,962,675	$1,620,067	$972,040	$648,027	$0	$ 111,294,559	$ -	$ -
53	53	2077			100%	$0	$ 114,943,984	$1,663,323	$997,994	$665,329	$0	$ 114,790,403	$ -	$ -
54	54	2078			100%	$0	$ 120,150,946	$1,707,733	$1,024,640	$683,093	$0	$ 118,402,716	$ -	$ -
55	55	2079			100%	$0	$ 125,593,784	$1,753,330	$1,051,998	$701,332	$0	$ 122,134,638	$ -	$ -
56	56	2080			100%	$0	$ 131,283,183	$1,800,144	$1,080,086	$720,057	$0	$ 125,997,543	$ -	$ -
57	57	2081			100%	$0	$ 137,230,311	$1,848,207	$1,108,924	$739,283	$0	$ 129,995,247	$ -	$ -
58	58	2082			100%	$0	$ 143,446,844	$1,897,555	$1,138,533	$759,022	$0	$ 134,132,021	$ -	$ -
59	59	2083			100%	$0	$ 149,944,986	$1,948,219	$1,168,932	$779,288	$0	$ 138,411,202	$ -	$ -
60	60	2084			100%	$0	$ 156,737,494	$2,000,237	$1,200,142	$800,095	$0	$ 142,836,095	$ -	$ -
61	61	2085			100%	$0	$ 163,837,702	$2,053,643	$1,232,186	$821,457	$0	$ 147,410,033	$ -	$ -
62	62	2086			100%	$0	$ 171,259,550	$2,108,475	$1,265,085	$843,390	$0	$ 152,136,397	$ -	$ -
63	63	2087			100%	$0	$ 179,017,608	$2,164,772	$1,298,863	$865,909	$0	$ 157,019,525	$ -	$ -
64	64	2088			100%	$0	$ 187,127,106	$2,222,571	$1,333,543	$889,028	$0	$ 162,063,828	$ -	$ -
65	65	2089			100%	$0	$ 195,603,963	$2,281,914	$1,369,148	$912,765	$0	$ 167,273,805	$ -	$ -
66	66	2090			100%	$0	$ 204,464,823	$2,342,841	$1,405,704	$937,136	$0	$ 172,654,157	$ -	$ -
67	67	2091			100%	$0	$ 213,727,079	$2,405,395	$1,443,237	$962,158	$0	$ 178,209,779	$ -	$ -
68	68	2092			100%	$0	$ 223,408,916	$2,469,619	$1,481,771	$987,847	$0	$ 183,945,772	$ -	$ -
69	69	2093			100%	$0	$ 233,529,340	$2,535,558	$1,521,335	$1,014,223	$0	$ 189,867,450	$ -	$ -
70	70	2094			100%	$0	$ 244,108,219	$2,603,257	$1,561,954	$1,041,303	$0	$ 195,980,354	$ -	$ -
71	71	2095			100%	$0	$ 255,166,321	$2,672,764	$1,603,658	$1,069,106	$0	$ 202,290,268	$ -	$ -
72	72	2096			100%	$0	$ 266,725,356	$2,744,127	$1,646,476	$1,097,651	$0	$ 208,803,227	$ -	$ -
73	73	2097			100%	$0	$ 278,808,014	$2,817,395	$1,690,437	$1,126,958	$0	$ 215,525,558	$ -	$ -
74	74	2098			100%	$0	$ 291,438,018	$2,892,619	$1,735,572	$1,157,048	$0	$ 222,463,879	$ -	$ -
75	75	2099			100%	$0	$ 304,640,160	$2,969,852	$1,781,911	$1,187,941	$0	$ 229,625,141	$ -	$ -
76	76	2100			100%	$0	$ 318,440,359	$3,049,147	$1,829,488	$1,219,659	$0	$ 237,016,619	$ -	$ -

LIABILITY CALCULATION UNDER PS 3280

Assumptions

Current Year	2024
Landfill Closure Date	2039
Remaining Life (Years)	6
Closure Cost (2024 Dollars)	$10,982,871
Annual Post-Closure Costs (2024 Dollars)	$411,593
Inflation Rate	2.67%
Discount Rate (Interest Rate)	4.53%

	Landfill Data			Liability and Expenses				
Costtonne	Liability Operating Year	Number of Years from Current Year	Year	Present Value Liability	Amortization on Asset	Accretion of Liability	Total Expense Recognized	Tangible Capital Asset Recognized
27.17	0	0	2024	$ 16,505,590	$ 2,750,932			
27.19	1	1	2025	$ 17,253,293	$ 2,750,932	$ 747,703	$ 3,498,635	$ 13,754,659
27.24	2	2	2026	$ 18,034,868	$ 2,750,932	$ 781,574	$ 3,532,506	$ 11,003,727
27.33	3	3	2027	$ 18,851,847	$ 2,750,932	$ 816,980	$ 3,567,911	$ 8,252,795
27.45	4	4	2028	$ 19,705,836	$ 2,750,932	$ 853,989	$ 3,604,920	$ 5,501,863
27.58	5	5	2029	$ 20,598,510	$ 2,750,932	$ 892,674	$ 3,643,606	$ 2,750,932
27.78	6	6	2030	$ 21,531,623	$ 2,750,932	$ 933,113	$ 3,684,044	$ -
27.99	7	7	2031	$ 22,507,005	$ -	$ 975,383	$ 975,383	$ -
28.23	8	8	2032	$ 23,526,573	$ -	$ 1,019,567	$ 1,019,567	$ -
28.49	9	9	2033	$ 24,592,326	$ -	$ 1,065,754	$ 1,065,754	$ -
28.78	10	10	2034	$ 25,706,359	$ -	$ 1,114,032	$ 1,114,032	$ -
29.10	11	11	2035	$ 26,870,857	$ -	$ 1,164,498	$ 1,164,498	$ -
29.44	12	12	2036	$ 28,088,107	$ -	$ 1,217,250	$ 1,217,250	$ -
29.80	13	13	2037	$ 29,360,498	$ -	$ 1,272,391	$ 1,272,391	$ -
30.19	14	14	2038	$ 30,690,528	$ -	$ 1,330,031	$ 1,330,031	$ -
30.60	15	15	2039	$ 32,080,809	$ -	$ 1,390,281	$ 1,390,281	$ -
31.04	16	16	2040	$ 33,534,070	$ -	$ 1,453,261	$ 1,453,261	$ -
31.49	17	17	2041	$ 35,053,163	$ -	$ 1,519,093	$ 1,519,093	$ -
31.97	18	18	2042	$ 36,641,072	$ -	$ 1,587,908	$ 1,587,908	$ -
32.48	19	19	2043	$ 38,300,912	$ -	$ 1,659,841	$ 1,659,841	$ -
33.01	20	20	2044	$ 40,035,943	$ -	$ 1,735,031	$ 1,735,031	$ -
33.56	21	21	2045	$ 41,849,572	$ -	$ 1,813,628	$ 1,813,628	$ -
34.13	22	22	2046	$ 43,745,357	$ -	$ 1,895,786	$ 1,895,786	$ -
34.73	23	23	2047	$ 45,727,022	$ -	$ 1,981,665	$ 1,981,665	$ -
35.35	24	24	2048	$ 47,798,456	$ -	$ 2,071,434	$ 2,071,434	$ -
36.00	25	25	2049	$ 49,963,726	$ -	$ 2,165,270	$ 2,165,270	$ -
36.67	26	26	2050	$ 52,227,083	$ -	$ 2,263,357	$ 2,263,357	$ -
37.37	27	27	2051	$ 54,592,970	$ -	$ 2,365,887	$ 2,365,887	$ -
38.09	28	28	2052	$ 57,066,031	$ -	$ 2,473,062	$ 2,473,062	$ -
38.84	29	29	2053	$ 59,651,122	$ -	$ 2,585,091	$ 2,585,091	$ -
39.61	30	30	2054	$ 62,353,318	$ -	$ 2,702,196	$ 2,702,196	$ -
40.41	31	31	2055	$ 65,177,924	$ -	$ 2,824,605	$ 2,824,605	$ -
-	32	32	2056	$ -	$ -	$ 65,177,924	$ 65,177,924	$ -
-	33	33	2057	$ -	$ -	$ -	$ -	$ -
-	34	34	2058	$ -	$ -	$ -	$ -	$ -
-	35	35	2059	$ -	$ -	$ -	$ -	$ -
-	36	36	2060	$ -	$ -	$ -	$ -	$ -

Appendix B – Cost Estimates

MORRISON HERSHFIELD now Stantec

Existing Landfill - Capital and Operations Cost	Assumptions/Cost Reference	Unit	Quantity	Rate ($ / unit)	Cost ($)	Life	Annual Cost	
CAPITAL COST								
Maintenance Building		LS	1	$32,625	$32,625	20	$ 1,631	
Maintenance Building Entrance and PDO - Design and Construction		LS	1	$5,000,000	$5,000,000	20	$ 250,000	
South Entrance Weigh Scale and Earthworks		LS	1	$2,000,000	$2,000,000	10	$ 200,000	
Snow Disposal Area - Design and Construction		LS	1	$550,000	$0	10	$ -	Not included as directed by City
Future landfill cells - Design and Construction	Roughly 6 years per cell (3 additional cells required after 1.4)	LS	6	$3,700,000	$22,200,000	38	$ 616,667	
Equipment Purchases		LS	1		$7,999,203	20	$ 399,960	
Loader						6	$ -	
Compactor						6	$ -	
Dozer						8	$ -	
3/4 Ton Truck	4 trucks					10	$ -	
				Subtotal	**$37,231,828**		**$1,468,258**	
				Contingency (10%)	**$3,723,183**		**$146,826**	
				Total	**$40,955,011**		**$1,615,084**	

Unit Number	Unit Description=O2:W3O2:Y3	# of Units	Starting Hrs	Approx Maintenance $/5000 Hrs	Hrs/Year	Kms/Hrs/Replacement	Total Maintenance	# Years Before Next Replacement	Replacement Frequency (Years/Replacement)	Replacements	Replacement Cost /Unit	Replacement Cost/20 Years	Residual Asset Value (Trade/Sale Value)
17-54	Bomag Compactor (17-54)	1	7978	50000	1430	10000	$ 100,000.00	1.4	7.0	3.7	$ 1,200,000.00	$ 4,389,360.00	$ 420,000.00
17-50	644K Volvo Loader	1	2131	25000	1300	10000	$ 50,000.00	6.1	7.7	2.8	$ 300,000.00	$ 843,930.00	$ 105,000.00
17-55	850K JD Dozer	1	10467	50000	850	10000	$ 100,000.00	0.0	11.8	2.7	$ 1,100,000.00	$ 2,970,000.00	$ 385,000.00
23-66	Ford Truck	1	4866	3500	1025	7500	$ 5,250.00	2.6	7.3	3.4	$ 50,000.00	$ 169,106.67	$ 17,500.00
23-69	Ford Truck	1	4323	3500	940	7500	$ 5,250.00	3.4	8.0	3.1	$ 50,000.00	$ 154,153.33	$ 17,500.00
23-70	Ford Truck	1	3778	3500	785	7500	$ 5,250.00	4.7	9.6	2.6	$ 50,000.00	$ 129,853.33	$ 17,500.00
90-53	Ford Truck	1	11202	3500	240	18000	$ 12,600.00	28.3	75.0	0.9	$ 50,000.00	$ 44,450.00	$ 17,500.00
											Subtotal	$ 8,700,853.33	$ 7,720,853.33
											Total (w/Maintenance)	$ 8,979,203.33	**$ 7,999,203.33**
												Total Equipment Annualized Cost	**$ 399,960.17**

Unit Number	Unit Description	# of Units	2021 Hrs	2022 Hrs	2023 Hrs	2024 Hrs	Avg Yearly Hrs
17-54	Bomag Compactor (17-54)	1	3695	5015	6583	7978	1428
17-50	644K Volvo Loader	1	10409	11710	844	2131	1294
17-55	850K JD Dozer	1	7916	8763	9605	10467	850
23-66	Ford Truck	1	1795	3567	4345	4866	1024
23-69	Ford Truck	1	1510	2571	3481	4323	938
23-70	Ford Truck	1		2212	2937	3778	783
90-53	Ford Truck	1			10964	11202	238

OPERATIONS COST					
Staffing and Labour					
Site Supervisor (full time)	2080 hrs a year, 1 person	hr	2,080	$50.18	$104,374.40
Scalehouse attendant (full time)	1626 hrs, 2 people	hr	3,252	$27.12	$88,194.24
Senior Equipment Operator	2080 hrs a year, 3 people	hr	6,240	$38.70	$241,488.00
Municipal Worker	2080 hrs a year, 3 people	hr	6,240	$30.71	$191,630.40
Municipal Worker (Seasonal)	880 hrs a year, 2 people	hr	1,760	$26.87	$47,291.20
Manager	693 hrs a year, 1 person	hr	693	$56.58	$39,209.94
Benefits	**19% of Salary - From City Financials**				
Site Supervisor		hr	2,080	$5.02	$10,437.44
Scalehouse attendant		hr	3,252	$2.71	$8,819.42
Senior Equipment Operator		hr	6,240	$7.35	$45,882.72
Municipal Worker		hr	6,240	$5.83	$36,409.78
Municipal Worker (Seasonal)		hr	1,760	$5.11	$8,995.33
Manager		hr	693	$10.75	$7,449.89
Building and Equipment	**From City Financials**				
Scalehouse maintenance	At 5% of equipment replacement cost	LS	1	$10,000.00	$10,000.00
Roads and site works maintenance		LS	1	$10,000.00	$10,000.00
Mechanical/electrical		LS	1	$10,000.00	$10,000.00
Equipment maintenance	At 5% of equipment replacement cost	LS	1	$19,998.01	$19,998.01
Safety gear	From City Financials	LS	1	$3,000.00	$3,000.00
Tools and supplies	From City Financials (Goods and Material)	LS	1	$75,000.00	$75,000.00
Utilities					
Diesel fuel - site equipment	40L/100km, 30km each way, Diesel at $1.6/L	LS	1	$9,984.00	$9,984.00
Contribution to other on-site utilities (Hydro, gas etc.)	From City Financials	LS	1	$32,000.00	$32,000.00
Administration and Consulting					
Administration, legal, accounting, insurance	City Financial (Contracted and General Services)	LS	1	$72,001.50	$72,001.50
Approvals, reporting, consulting	City Financial (Contracted and General Services)	LS	1	$72,001.50	$72,001.50
Bank Charges	City Financials	LS	1	$10,767.00	$10,767.00
				Subtotal	**$1,154,924.70**
				Contingency	**$115,492.48**
				Total	**$1,270,417.24**

Year	Capital	Operations	Annual Cost	Tonnage	Cost per tonne
2024	$ 1,615,084	$ 1,270,417	$ -	26,903	$ -
2025	$ 1,658,207	$ 1,304,337	$ -	27,189	$ -
2026	$ 1,702,481	$ 1,339,163	$ -	27,480	$ -
2027	$ 1,747,937	$ 1,374,919	$ -	27,776	$ -
2028	$ 1,794,607	$ 1,411,629	$ -	28,078	$ -
2029	$ 1,842,523	$ 1,449,320	$ -	28,385	$ -
2030	$ 1,891,718	$ 1,488,017	$ -	28,697	$ -
2031	$ 1,942,227	$ 1,527,747	$ -	29,016	$ -
2032	$ 1,994,085	$ 1,568,537	$ -	29,339	$ -
2033	$ 2,047,327	$ 1,610,417	$ -	29,669	$ -
2034	$ 2,101,999	$ 1,653,419	$ -	30,005	$ -
2035	$ 2,158,113	$ 1,697,582	$ -	30,347	$ -
2036	$ 2,215,735	$ 1,742,897	$ -	30,695	$ -
2037	$ 2,274,895	$ 1,789,422	$ -	31,049	$ -
2038	$ 2,335,635	$ 1,837,199	$ -	31,410	$ -
2039	$ 2,397,996	$ 1,886,252	$ -	31,778	$ -
2040	$ 2,462,023	$ 1,936,615	$ -	32,152	$ -
2041	$ 2,527,759	$ 1,988,323	$ -	32,534	$ -
2042	$ 2,595,255	$ 2,041,411	$ -	32,923	$ -
2043	$ 2,664,543	$ 2,095,917	$ -	33,318	$ -
2044	$ 2,735,686	$ 2,151,878	$ -	33,722	$ -
2045	$ 2,808,729	$ 2,209,333	$ -	34,133	$ -
2046	$ 2,883,722	$ 2,268,322	$ -	34,552	$ -
2047	$ 2,960,718	$ 2,328,886	$ -	34,978	$ -
2048	$ 3,039,769	$ 2,391,068	$ -	35,413	$ -
2049	$ 3,120,933	$ 2,454,909	$ -	35,858	$ -
2050	$ 3,204,269	$ 2,520,459	$ -	36,308	$ -
2051	$ 3,289,815	$ 2,587,751	$ -	36,768	$ -
2052	$ 3,377,651	$ 2,656,844	$ -	37,237	$ -
2053	$ 3,467,835	$ 2,727,760	$ -	37,716	$ -
2054	$ 3,560,426	$ 2,800,614	$ -	38,203	$ -
2055	$ 3,655,469	$ 2,875,390	$ -	38,700	$ -
2056	$ 3,753,091	$ 2,952,163	$ -	39,207	$ -
2057	$ 3,853,298	$ 3,030,986	$ -	39,723	$ -
2058	$ 3,956,181	$ 3,111,913	$ -	40,250	$ -
2059	$ 4,061,815	$ 3,195,001	$ -	40,787	$ -
2060	$ 4,170,262	$ 3,280,308	$ -	41,335	$ -

2045	$4,345,480	$2,209,333	$6,554,813	$34,133	$192
2046	$4,461,504	$2,268,322	$6,729,826	$34,552	$195
2047	$4,580,626	$2,328,886	$6,909,512	$34,978	$198
2048	$4,702,929	$2,391,068	$7,093,998	$35,413	$200
2049	$4,828,497	$2,454,909	$7,283,406	$35,858	$203
2050	$4,957,418	$2,520,459	$7,477,873	$36,308	$206
2051	$5,089,781	$2,587,751	$7,677,532	$36,768	$209
2052	$5,225,678	$2,656,844	$7,882,522	$37,237	$212
2053	$5,365,204	$2,727,760	$8,092,998	$37,716	$215
2054	$5,508,454	$2,800,614	$8,309,068	$38,203	$217
2055	$5,655,530	$2,875,390	$8,530,921	$38,700	$220
2056	$5,806,533	$2,952,163	$8,758,698	$39,207	$223
2057	$5,961,567	$3,030,986	$8,992,553	$39,723	$226
2058	$6,120,741	$3,111,913	$9,232,654	$40,250	$229
2059	$6,284,165	$3,195,001	$9,479,166	$40,787	$232
2060	$6,451,952	$3,280,308	$9,732,260	$41,335	$235

Appendix B2 - Direct Haul

Select Facility	Wilton

DIRECT HAUL - ALL HAULED - NO WTS REQUIRED

Direct Haul_No WTS - Operations Cost	Assumptions/Cost Reference	Service Provider: City of Lloydminster Unit	Quantity	Rate ($ / unit)	Cost ($)	Private Contractor Unit	Quantity	Rate ($ / unit)	Cost ($)
Hauling (including tipping costs)									
GFL Rate (adjusted by 50%)	$6/hh to Wilton, $9/hh to Claystone	LS	9,004	$6.00	$648,320	LS	1		
Tipping Fee									
General Waste (Non Rate Payer)	$/tonne - general waste. Includes entrance fee where applicable	Rate	8,785	$125.00	$1,119,979.69				
				Subtotal	$1,768,300				
				Contingency (20%)	$353,660				
				Total	**$2,121,960**				

No capital cost. All the material is hauled. Landfill site is completely closed. Only pay for tipping waste.

Tipping fees

Using 2044 quantities

$2,121,959.56 Annual

https://static1.squarespace.com/static/627d46d5c16cc31ef72b7650/t/65a444aae72c915e91be1fbf/1705264299196/Loraas+Wilton+Landfill+Rates+2024.pdf

Year	Annual Cost	Tonnage	Cost per tonne
2024	$ 2,121,960	8,785	$ 242
2025	$ 2,178,616	8,983	$ 243
2026	$ 2,236,785	9,186	$ 243
2027	$ 2,296,507	9,393	$ 244
2028	$ 2,357,824	9,605	$ 245
2029	$ 2,420,778	9,822	$ 246
2030	$ 2,485,412	10,044	$ 247
2031	$ 2,551,773	10,271	$ 248
2032	$ 2,619,905	10,502	$ 249
2033	$ 2,689,857	10,740	$ 250
2034	$ 2,761,676	10,982	$ 251
2035	$ 2,835,413	11,230	$ 252
2036	$ 2,911,118	11,484	$ 254
2037	$ 2,988,845	11,743	$ 255
2038	$ 3,068,647	12,008	$ 256
2039	$ 3,150,580	12,279	$ 257
2040	$ 3,234,701	12,556	$ 258
2041	$ 3,321,067	12,840	$ 259
2042	$ 3,409,740	13,130	$ 260
2043	$ 3,500,780	13,427	$ 261
2044	$ 3,594,251	13,730	$ 262
2045	$ 3,690,217	14,040	$ 263
2046	$ 3,788,746	14,357	$ 264
2047	$ 3,889,905	14,681	$ 265
2048	$ 3,993,766	15,013	$ 266
2049	$ 4,100,399	15,352	$ 267
2050	$ 4,209,880	15,699	$ 268
2051	$ 4,322,284	16,054	$ 269
2052	$ 4,437,689	16,417	$ 270
2053	$ 4,556,175	16,788	$ 271
2054	$ 4,677,825	17,167	$ 272
2055	$ 4,802,723	17,555	$ 274
2056	$ 4,930,956	17,952	$ 275
2057	$ 5,062,612	18,358	$ 276
2058	$ 5,197,784	18,773	$ 277
2059	$ 5,336,565	19,197	$ 278
2060	$ 5,479,051	19,631	$ 279

Asset Facility: Claystone

Transfer Haul_Large WTS (Grade Separated) - Capital and Operations Cost	Assumptions/Cost Reference	Service Provider: City of Lloydminster Unit	Quantity	Rate ($ / unit)	Cost ($)	Life	Annual Cost	Service Provider: Private Contractor Unit	Quantity	Rate ($ / unit)	Cost ($)
CAPITAL COST											
Site Preparation and Removals											
Mobilization and demobilization, temporary facilities, general requirements		LS	1	$ 200,000	$200,000.00	20	$10,000.00	LS	1		$0.00
Clearing and Grubbing		m2	10,000	$ 1.75	$15,000.00	20	$750.00	LS	1		$0.00
Site fill (Reused onsite soils)		m3	10,000	$ 7.5	$75,000.00	20	$3,750.00	LS	1		$0.00
Excavation for concrete slabs & retaining wall		LS	1	$ 20,000	$20,000.00	20	$1,000.00	LS	1		$0.00
Structural backfill for behind retaining wall		LS	1	$ 50,000	$50,000.00	20	$2,500.00	LS	1		$0.00
Surfacing and Fencing											
Gravel Driving Surface (including Subbase, Base and Surfacing aggregate)		m2	1,200	$ 65	$78,000.00	3	$26,000.00	LS	1		$0.00
Fencing		LM	800	$ 150	$120,000.00	10	$12,000.00	LS	1		$0.00
Retaining Walls and Lock Blocks											
Supply and install of lock block retaining wall		Bay	6	$ 40,000	$240,000.00	20	$12,000.00	LS	1		$0.00
MSE Wall Drainage		LS	1	$ 20,000	$20,000.00	20	$1,000.00	LS	1		$0.00
Guard Rails		LS	1	$ 50,000	$50,000.00	10	$5,000.00	LS	1		$0.00
Supply and install of concrete bin slabs		Ea.	6	$ 15,000	$90,000.00	10	$9,000.00	LS	1		$0.00
Supply and install of concrete top of wall slabs		Ea.	6	$ 5,000	$30,000.00	10	$3,000.00	LS	1		$0.00
Supply and install non-bin lock block retaining wall		LS	1	$ 50,000	$50,000.00	20	$2,500.00	LS	1		$0.00
Surface Water Management											
Storm ditching and culverts		LS	1	$ 10,000	$10,000.00	10	$1,000.00	LS	1		$0.00
Site Electrical											
Supply and install Lighting		LS	1	$ 20,000	$20,000.00	20	$1,000.00	LS	1		$0.00
Miscellaneous - Diversion Structures											
Relocate existing structures		LS	1	$ 20,000	$20,000.00	20	$1,000.00	LS	1		$0.00
Ungrade layden for white goods and tires (with concrete pad)		LS	1	$ 45,000	$45,000.00	20	$2,250.00	LS	1		$0.00
Miscellaneous - Equipment											
Roll-off Bins with Lids		Ea.	6	$ 15,000	$90,000.00	8	$11,250.00	LS	1		$0.00
Roll-off Truck		LS	1	$ 400,000	$400,000.00	8	$50,000.00	LS	1		$0.00
Loader		LS	1	$ 300,000	$300,000.00	8	$37,500.00	LS	1		$0.00
Miscellaneous - Buildings											
Maintenance Building		LS	1	$ 32,625	$32,625.00	20	$1,631.25	LS	1		$0.00
Maintenance Building Entrance and PDO - Design and Construction		LS	1	$ 5,000,000	$5,000,000.00	20	$250,000.00	LS	1		$0.00
South Entrance Weigh Scale and Earthworks		LS	1	$ 2,000,000	$2,000,000.00	10	$200,000.00	LS	1		$0.00
				Subtotal	$8,955,625.00		$644,131.25				
				Engineering (10%)	$895,562.50		$64,413.13				
				Contingency (20%)	$1,970,237.50		$141,708.63				
				Total	**$11,821,425.00**		**$850,253.25**				

OPERATIONS COST						
Staffing and Labour						
Site Supervisor (full time)		hr	2,080	$ 50.18	$104,374.40	
Scalehouse attendant (full time)		hr	3,252	$ 27.13	$88,194.24	
Municipal Worker	1 worker loader	hr	3,120	$ 30.71	$95,815.20	
Municipal Worker (Seasonal)		hr	880	$ 28.87	$25,645.60	
Manager		hr	693	$ 56.54	$39,209.94	
Benefits						
Site Supervisor (full time)		hr	2,080	$ 5.02	$10,437.44	
Scalehouse attendant (full time)		hr	3,252	$ 2.71	$8,819.42	
Municipal Worker		hr	3,120	$ 5.63	$16,204.89	
Municipal Worker (Seasonal)		hr	880	$ 5.13	$4,492.68	
Manager		hr	693	$ 10.73	$7,449.89	
Building and Equipment						
Scalehouse maintenance		LS	1	$ 10,000	$10,000.00	
Roads and site works maintenance		LS	1	$ 10,000	$10,000.00	
Mechanical/Electrical		LS	1	$ 10,000	$10,000.00	
Equipment maintenance	At 5% of equipment replacement cost	LS	1	$ 35,000	$35,000.00	
Safety gear		LS	1	$ 3,000	$3,000.00	
Tires and supplies		LS	1	$ 75,000	$75,000.00	
Hauling (including Tipping Costs)						
Driver salary	$30/hr + 15 mins per bin to load unload	LS	1	$ 74,880	$74,880.00	
Fuel	40L/100km Diesel at $1.60L	LS	1	$ 316,160	$316,160.00	
Tipping Fee	Tipping fee plus entrance fee where applicable	LS	1	$ 1,614,167	$1,614,166.65	
Utilities						
Diesel fuel - loader (8 hrs/day x 208 days/yr 7.5 L/hr x $1.60/L x 50% utility)		LS	1	$ 9,984	$9,984.00	
Contribution to other on-site utilities (Hydro, gas etc.)		LS	1	$ 32,000	$32,000.00	
Administration and Consulting						
Administration, legal, accounting, insurance		LS	1	$ 72,002	$72,001.92	
Approvals, reporting, consulting		LS	1	$ 72,002	$72,001.92	
				Subtotal	**$2,734,837.93**	
				Contigency (20%)	**$546,967.61**	
				Total	**$3,281,805.54**	

$4,132,058.54 Annual

Year	Capital Cost	Operations Cost	Annual Cost	Tonnage	Cost per Tonne
2024	$ 850,253	$ 3,281,805	$ 4,132,058	26,903	$ 154
2025	$ 872,853	$ 3,369,429	$ 4,242,284	27,189	$ 156
2026	$ 896,253	$ 3,459,393	$ 4,355,656	27,480	$ 159
2027	$ 920,103	$ 3,551,759	$ 4,471,862	27,776	$ 161
2028	$ 944,762	$ 3,646,591	$ 4,591,353	28,076	$ 164
2029	$ 969,987	$ 3,743,953	$ 4,713,940	28,380	$ 166
2030	$ 995,886	$ 3,843,918	$ 4,839,804	28,687	$ 169
2031	$ 1,022,470	$ 3,946,551	$ 4,969,021	29,018	$ 171
2032	$ 1,049,778	$ 4,051,924	$ 5,101,700	29,339	$ 174
2033	$ 1,077,865	$ 4,160,110	$ 5,237,976	29,665	$ 177
2034	$ 1,105,553	$ 4,271,185	$ 5,377,738	30,003	$ 179
2035	$ 1,136,129	$ 4,385,226	$ 5,521,354	30,347	$ 182
2036	$ 1,166,463	$ 4,502,311	$ 5,668,773	30,695	$ 185
2037	$ 1,197,608	$ 4,622,523	$ 5,820,131	31,049	$ 187
2038	$ 1,229,584	$ 4,745,944	$ 5,975,528	31,410	$ 190
2039	$ 1,262,414	$ 4,872,661	$ 6,135,075	31,776	$ 193
2040	$ 1,296,120	$ 5,002,761	$ 6,298,881	32,152	$ 196
2041	$ 1,330,727	$ 5,136,305	$ 6,467,062	32,534	$ 199
2042	$ 1,366,257	$ 5,273,470	$ 6,639,732	32,923	$ 202
2043	$ 1,402,736	$ 5,414,277	$ 6,817,013	33,318	$ 205
2044	$ 1,440,189	$ 5,558,830	$ 6,999,027	33,722	$ 208
2045	$1,478,642	$5,707,209	$7,185,851	34,133	$211
2046	$1,518,122	$5,859,643	$7,377,765	34,552	$214
2047	$1,558,656	$6,016,095	$7,574,751	34,978	$217
2048	$1,600,272	$6,176,725	$7,776,997	35,413	$220
2049	$1,642,995	$6,341,644	$7,984,640	35,856	$223
2050	$1,686,867	$6,510,960	$8,197,835	36,308	$226
2051	$1,731,907	$6,684,808	$8,416,715	36,769	$229
2052	$1,778,148	$6,863,293	$8,641,441	37,237	$232
2053	$1,825,625	$7,046,540	$8,872,166	37,716	$235
2054	$1,874,369	$7,234,695	$9,109,054	38,203	$238
2055	$1,924,415	$7,427,861	$9,352,286	38,700	$242
2056	$1,975,797	$7,626,175	$9,601,972	39,207	$245
2057	$2,028,551	$7,829,794	$9,858,344	39,725	$248
2058	$2,082,713	$8,038,849	$10,121,562	40,255	$251
2059	$2,138,321	$8,253,487	$10,391,808	40,797	$255
2060	$2,195,415	$8,473,800	$10,669,269	41,350	$258

Appendix B4 - Waste to Energy

Waste to Energy - Capital and Operations Cost	Assumptions/Cost Reference	Unit	Quantity	Rate ($ / unit)	Cost ($)	Life	Annual Cost
CAPITAL COST							
Cost of Facility	$ per tonne of installed annual capacity	LS	32,283	$2,400	$77,480,009	20	$3,874,000
Site Work	% of facility cost	%	2%	$77,480,009	$1,549,600	20	$77,480
Permits and Approvals		%	1%	$77,480,009	$774,800	20	$38,740
Equipment Purchases							
Loader		LS	1	$300,000	$300,000	6	$50,000
3/4 Ton Truck	4 trucks	LS	4	$50,000.00	$200,000	10	$20,000
Scale and Maintenance Building							
Maintenance Building		LS	1	$32,625	$32,625	20	$1,631
Maintenance Building Entrance and PDO - Design and Construction		LS	1	$5,000,000	$5,000,000	20	$250,000
South Entrance Weigh Scale and Earthworks		LS	1	$2,000,000	$2,000,000	10	$200,000
				Subtotal	$87,337,034		$4,511,852
				Engineering (10%)	$8,733,703		$451,185
				Contingency (20%)	$38,428,295		$1,985,215
				Total	**$134,499,032**		**$6,948,252**

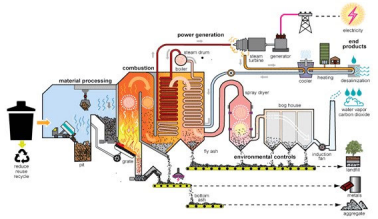
OPERATIONS COST						
Staffing and Labour						
Site Supervisor (full time)		hr	2080	$ 50.18	$104,374.40	
Scalehouse attendant (full time)		hr	3252	$ 27.12	$88,194.24	
Senior Equipment Operator		hr	6240	$ 38.70	$241,488.00	
Municipal Worker		hr	6240	$ 30.71	$191,630.40	
Municipal Worker (Seasonal)		hr	1760	$ 26.87	$47,291.20	
Manager		hr	693	$ 56.58	$39,209.94	
Benefits						
Site Supervisor (full time)		hr	2080	$ 5.02	$10,437.44	
Scalehouse attendant (full time)		hr	3252	$ 2.71	$8,819.42	
Senior Equipment Operator		hr	6240	$ 7.35	$45,882.72	
Municipal Worker		hr	6240	$ 5.83	$36,409.78	
Municipal Worker (Seasonal)		hr	1760	$ 5.11	$8,985.33	
Manager		hr	693	$ 10.75	$7,449.89	
Building and Equipment						
Scalehouse maintenance	5% of equipment cost	LS	1	$ 10,000.00	$10,000.00	
Roads and site works maintenance		LS	1	$ 10,000.00	$10,000.00	
Mechanical/Electrical		LS	1	$ 10,000.00	$10,000.00	
Equipment maintenance	5% of equipment cost	LS	1	$ 17,500.00	$17,500.00	
Safety gear		LS	1	$ 3,000.00	$3,000.00	
Tools and supplies		LS	1	$ 75,000.00	$75,000.00	
Miscellaneous						
Energy Usage/Utilities	City estimate *10 (higher energy usage)	LS	1	$320,000.00	$320,000.00	
Bottom Ash Disposal		tonnes	6,780	$125.00	$847,437.60	
Fly Ash Disposal		tonnes	1,937	$125.00	$242,125.03	
Cost of additional feedstock supply	assume 10% of incoming tonnage	tonnes	3,228	$75.00	$242,125.03	
Administration and Consulting	City estimate	LS	1	$154,770.00	$154,770.00	
				Subtotal	$2,762,130.41	
				Contingency (40%)	$1,104,852.16	
				Total	**$3,866,982.57**	

Combustion System with Heat Recovery		
Waste Tonnage =	32,283	tonnes/yr
Heating Value =	12000	kJ/kg
Tipping Fee =	$ 125.00	$/tonne
Wood as additional fuel =	$ 75.00	$/tonne
Combustion (MSW)		
	20%	% bottom ash
	5%	% fly ash
Combustion (Wood)		
	1%	% bottom ash
	1%	% fly ash
Ash Disposal	$ 125.00	$/tonne
Interest Rate	5%	%
Carbon credits		$/tonne

https://static1.squarespace.com/static/627d46d5c16cc31ef72b7650/t/63bef840fd42a518e9def900/1673459776263/Loraas+Wilton+Landfill+Rates+2023.pdf

https://www.igniss.com/calorific-value-waste

Using RM Wilton rate - Adjust



Generated from collecting material
Using 2030 GFL Processing fee

$10,815,234.16 Annual

Year	Capital	Operations	Annual Cost	Tonnage	Cost per tonne
2024	$6,948,252	$3,866,983	$10,815,234	26,903	$402
2025	$7,133,770	$3,970,231	$11,104,001	27,189	$408
2026	$7,324,242	$4,076,236	$11,400,478	27,480	$415
2027	$7,519,799	$4,185,072	$11,704,871	27,776	$421
2028	$7,720,577	$4,296,813	$12,017,391	28,078	$428
2029	$7,926,717	$4,411,538	$12,338,255	28,385	$435
2030	$8,138,360	$4,529,326	$12,667,686	28,697	$441
2031	$8,355,654	$4,650,259	$13,005,914	29,016	$448
2032	$8,578,750	$4,774,421	$13,353,171	29,339	$455
2033	$8,807,803	$4,901,898	$13,709,701	29,669	$462
2034	$9,042,971	$5,032,779	$14,075,750	30,005	$469
2035	$9,284,419	$5,167,154	$14,451,573	30,347	$476
2036	$9,532,313	$5,305,117	$14,837,430	30,695	$483
2037	$9,786,825	$5,446,764	$15,233,589	31,049	$491
2038	$10,048,134	$5,592,192	$15,640,326	31,410	$498
2039	$10,316,419	$5,741,504	$16,057,923	31,778	$505
2040	$10,591,867	$5,894,802	$16,486,669	32,152	$513
2041	$10,874,670	$6,052,193	$16,926,863	32,534	$520
2042	$11,165,024	$6,213,787	$17,378,810	32,923	$528
2043	$11,463,130	$6,379,695	$17,842,825	33,318	$536
2044	$11,769,196	$6,550,033	$18,319,228	33,722	$543
2045	$12,083,433	$6,724,918	$18,808,351	34,133	$551
2046	$12,406,061	$6,904,474	$19,310,534	34,552	$559
2047	$12,737,303	$7,088,823	$19,826,126	34,978	$567
2048	$13,077,388	$7,278,095	$20,355,483	35,413	$575
2049	$13,426,555	$7,472,420	$20,898,975	35,856	$583
2050	$13,785,044	$7,671,933	$21,456,977	36,308	$591
2051	$14,153,104	$7,876,774	$22,029,879	36,768	$599
2052	$14,530,992	$8,087,084	$22,618,076	37,237	$607
2053	$14,918,970	$8,303,009	$23,221,979	37,716	$616
2054	$15,317,306	$8,524,699	$23,842,006	38,203	$624
2055	$15,726,278	$8,752,309	$24,478,587	38,700	$633
2056	$16,146,170	$8,985,996	$25,132,166	39,207	$641
2057	$16,577,273	$9,225,922	$25,803,194	39,723	$650
2058	$17,019,886	$9,472,254	$26,492,140	40,250	$658
2059	$17,474,317	$9,725,163	$27,199,480	40,787	$667
2060	$17,940,881	$9,984,825	$27,925,706	41,335	$676