West Coast Landfill Economic Analysis

- FINAL REPORT-

PREPARED FOR: ALBERNI-CLAYOQUOT REGIONAL DISTRICT

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Alberni-Clayoquot Regional District

- Landfill Engineering
- Solid Waste Planning
- Environmental Monitoring
- Landfill Fire Control

EXECUTIVE SUMMARY

The Alberni-Clayoquot Regional District (ACRD) retained Sperling Hansen Associates (SHA) to complete an assessment on waste management options for the West Coast Landfill (WCL). Two potential waste management scenarios were considered for the West Coast: (1) Continuing landfilling at the existing landfill and (2) Closing the landfill and developing a transfer station to haul waste to the Alberni Valley Landfill (AVL). An economic analysis and a greenhouse gas (GHG) assessment of the emissions of these two scenarios were performed.

The population of the WCL service area, including tourists and transient seasonal workers, was estimated to be 10,242 as of 2018. A moderate growth rate of 2.5% population increase per year was used for population projections.

For Scenario 1 (landfill development), it was assumed that the WCL would be developed as per the design in the WCL Design Operations and Closure Plan (DOCP) (McGill, 2012) and continue to receive waste from the WCL service area. A lifespan analysis was completed for existing conditions and considering 25% organics diversion. The lifespan analysis results showed that under existing conditions, the landfill is expected to reach capacity by 2056 and with 25% organics diversion implemented, the landfill lifespan is expected to be extended to 2064. Cost estimates were made for developing the landfill which include lateral expansion costs, leachate treatment system upgrades costs, operating costs, landfill closure costs, and post closure costs.

For Scenario 2 (transfer station), it was assumed that the WCL would be closed in 2022 and waste would be transferred via hauling from an onsite transfer station to the AVL. Three hauling options were investigated: (1) 40 m^3 Bins (2) Self-Unloading Trailers and (3) End-Dump Trailers. The haul frequency and haul cost for each option was analyzed and it was determined that the most-cost effective solution would be to haul the waste using end-dump trailers.

A transfer station conceptual design was presented, which consists of a steel transfer station building with a two-bay design. Cost estimates were made for the transfer station option which include transfer station capital costs, operating costs, landfill closure costs, and post closure costs.

In order to assess the overall cost to the ACRD of the various scenarios, a Lifecycle Cost Assessment was completed for the landfill development option as well as for the transfer station option. A Break Even Tipping fee was calculated; the Break Even Tipping fee is the tipping fee the ACRD would have to charge over the life of the analysis in order for there to be zero debt from the operation of the system after 100 years of post-closure. The 'Transfer Station Existing Conditions' option has the lowest Break Even Tipping fee of $116.13 per tonne, and hence provides the greatest value to the ACRD. However, the cost of disposing of the waste at the AVL under this scenario is assumed to cost an additional $89.64/tonne, bringing the total cost for this scenario to $205.77/tonne. With the cost of disposal at the AVL included in the analysis, the option with the lowest cost becomes the 'Landfill Development Existing Conditions' at $121.77/tonne or 'Landfill Development 25% Organics Diversion' at $122.00/tonne. SHA understand that the current tipping fee at the West Coast Landfill is $130 per tonne and therefore either of the landfill development options is capable of being funded under the current tipping fee structure.

Overall, the Lifecycle Cost Assessment shows that the 'Landfill Development Existing Conditions' provides the most economical solution for the ACRD, when the cost of landfilling the waste at the AVL under the Transfer Station option is factored into the analysis.

SHA also conducted a greenhouse gas (GHG) emission assessment for continued operation of the WCL versus hauling waste via a transfer station from the WCL to the AVL. GHG emissions from landfill gas generated from the waste when it is disposed in a landfill, along with GHG emissions from trucks hauling the waste between the two landfills were considered. The lifespan for the GHG assessment assumed landfill closure in 2064 and a post-closure period of 100 years. For the assessment, it was assumed that no active gas collection system would be installed at the WCL and that an active gas collection system would be installed at the AVL with a 75% collection efficiency when methane generation surpasses 1,000 tonnes/year. Overall, the results indicate that disposing of waste at the AVL will generate lower GHG emissions at the end of the post-closure period. This is due to the assumption that an active gas collection system would be installed at the AVL in 2064, greatly reducing the GHG emissions during the post-closure period. Also, the results show that GHG emissions from landfilling are orders of magnitude higher than those from hauling of waste between the two landfill sites. This means that control of LFG is an important measure to reduce GHG emissions associated with the waste management options presented for the West Coast Landfill. The ACRD may want to consider options for reduction of GHGs at the West Coast Landfill through the use of biocover or a passive gas collection and flaring system.

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1. INTRODUCTION

The Alberni-Clayoquot Regional District (ACRD) retained Sperling Hansen Associates (SHA) to complete an assessment on waste management options for the West Coast Landfill (WCL). The following report looks at two potential waste management scenarios for the West Coast: (1) Continuing landfilling at the existing landfill and (2) Closing the landfill and developing a transfer station to haul waste to the Alberni Valley Landfill (AVL). An assessment of the economic and GHG emissions of these options is presented in this report.

Under both scenarios, SHA included the option of 25% organics diversion from the waste stream in the event that the ACRD implements an organics diversion strategy. For this option, consideration has been made for the WCL to include an organics management facility and for the AVL Transfer Station to have upgraded infrastructure to accommodate an organics transfer area.

2. POPULATION STATISTICS AND WASTE DISPOSAL ANALYSIS

In order to determine the quantity of waste that would need to be managed, it is necessary to project future populations that would contribute to waste disposal in the intended service area. The West Coast Landfill service area consists of the District of Tofino, District of Ucluelet, First Nations Communities, and Parks Canada. As a resort community, the West Coast service area population fluctuates with the visitor and transient seasonal worker population throughout the year, with high season typically occurring from July to mid-September. The District of Tofino Liquid Waste Management Plan (Opus, 2017) was reviewed and used to determine the visitor to permanent resident ratio and population growth projections for the area. For Tofino, the visitor to permanent resident ratio was set at 0.901:1. For Ucluelet, the Chamber of Commerce suggests a 60:40 visitor split between Tofino and Ucluelet and therefore the visitor to permanent resident ratio for Ucluelet was set at 0.601:1. For the purpose of this analysis, the First Nation Communities and Parks Canada population are assumed to have a visitor to permanent resident ratio of zero.

The visitors and transient seasonal workers are assumed to reside in the area for three months per year and therefore the visitor and transient seasonal worker population was divided by four to determine the equivalent residents. Table 2-1 lists the population for each of the member municipalities, First Nations Communities, and Parks Canada based on 2018 data provided by the ACRD. A moderate growth scenario of 2.5% population increase per year is recommended for planning purposes (Opus, 2017).

Table 2-1: West Coast Landfill Service Area Population Data

Population Data	Permanent Population 2018	Visitor to Permanent Resident Ratio	Visitors 2018	Transient Seasonal Workers 2018	Equivalent Annual Population 2018	Growth Rate
District of Tofino	2,147	0.901	1,935	1,000	2,881	2.5%
District of Ucluelet	1,930	0.601	1,160	-	2,220	2.5%
First Nations Communites	1,212	-	-	-	1,212	2.5%
Parks Canada	858	-	-	-	858	2.5%
Subtotal	**6,147**	**-**	**3,095**	**1,000**	**7,171**	**2.5%**

Scale data indicates that 6,037 tonnes of waste was landfilled at the West Coast Landfill in 2018. As such, the waste disposal rate per capita is estimated to be 0.842 tonnes/person/year. The current and projected waste tonnages to be landfilled at the West Coast Landfill until landfill closure are presented in Table 1 at the end of this report. If organics diversion is implemented, it has been conservatively estimated that up to 25% of the waste stream could be diverted from the Landfill. The current and projected waste tonnages until landfill closure assuming 25% organics diversion are also presented in Table 1 for comparison purposes.

3. LANDFILL ASSESSMENT

This section assesses 'Scenario 1: Continuing landfilling at the WCL'. For this scenario, it has been assumed that the West Coast Landfill would be developed as per the design in the West Coast Landfill Design Operations and Closure Plan (DOCP) (McGill, 2012) and continue to receive waste from the West Coast Landfill service area. As per the DOCP, the landfill would continue to be constructed in a series of cells, with finished slopes of 3 horizontal to 1 vertical and a finished elevation of approximately 120 m (based on the local survey datum) that is approximately 20 m high. This section looks at the following for the landfill option: lifespan, landfill development, environmental controls, and costing.

3.1 Lifespan Analysis

A lifespan analysis was completed for the West Coast Landfill based on the following assumptions:

- Waste disposal rate set at 0.842 tonnes/person/year;
- West Coast Landfill service area population in 2018 set at 7,171;
- Population growth rate of 2.5% annually;
- Landfill waste compaction density of 0.57 tonnes/m^3 was used based on the average waste compaction density reported from 2013 to 2018 (McGill, 2019);
- Waste to cover ratio of 4.5:1 vol/vol was used as reported in the 2017 West Coast Landfill Annual Report (McGill, 2018). A waste to cover ratio was not reported for 2018.;
- Waste and soil cover placed in the landfill to settle 10% on a volume basis based on SHA experience at similar landfills; and,
- Landfill airspace remaining set at 737,154 m^3 as of December 31, 2018 (McGill, 2019).

Table 1 shows the detailed lifespan analysis. Under the existing conditions, there is approximately 36 years of capacity remaining for the landfill, with the landfill expected to reach capacity in 2056. In the event that organics diversion is implemented with 25% of the waste stream being diverted from the Landfill, the lifespan of the landfill could be extended an additional 8 years to 2064. Table 3-1 shows a summary of the lifespan analysis.

Table 3-1: Lifespan Analysis Summary

Landfill Option	Airspace Available as of Dec 31, 2018 (m^3)	Lifespan Remaining as of Jan 2020 (years)	Expected Year Capacity Reached
Existing Conditions	737,154	36	2056
25% Organics Diversion	737,154	44	2064

3.2 Landfill Development and Environmental Controls

This section provides an overview of the landfill development and environmental controls that would be required should Scenario 1 be pursued.

3.2.1 Landfill Expansion

The West Coast Landfill has been developed as a natural control site, meaning that the site relies on the underlying natural soils to act as a liner. The Landfill is underlain by marine clays of low permeability that are believed to be in excess of 15 m thick (McGill, 2019).

The Landfill Criteria for Municipal Solid Waste, Second Edition (ENV, 2016) requires that lateral expansions of existing landfills that receive more than 5,000 tonnes of waste per year and greater than 500 mm of precipitation be developed with a landfill base liner comprised of a primary HDPE geomembrane liner and secondary compacted clay liner or geosynthetic clay liner. Given that the WCL meets these requirements, it has been assumed that the expansion areas would be lined as per the requirements in the Criteria. In general, if the landfill expansion is to be pursued, the virgin expansion areas would need to be prepared by stripping away vegetation and conducting earthworks to grade the areas. The bottom liner would then be deployed by a certified lining contractor.

3.2.2 Leachate Treatment

A review of the existing leachate treatment system, comprised of a leachate lagoon and overland irrigation system, indicates that the system is prone to overflow events during and following storm events. If the landfill development option were to be pursued, the impact of the additional leachate generation from the increased waste footprint on the leachate treatment system would need to be evaluated. Given that the leachate lagoon is overflowing under current conditions, upgrades to the leachate system would be required. Upgrades may include the addition of an equalization pond, aeration pond, engineered wetland, sedimentation pond, sand filter, and/or phytoremediation area.

3.2.3 Landfill Gas

SHA completed a landfill gas (LFG) generation estimate as part of the GHG emissions assessment in Section 6 of this report. The assessment indicates that an active LFG collection system should not be required at the site under the current LFG regulations.

SHA recommends that a passive LFG collection system be installed beneath the final cover system as part of closure. If desired, the collected LFG could be passed through a flare to convert methane to carbon dioxide, significantly reducing GHG emissions from the site.

3.2.4 Operational Issues

If the landfill was to be developed until the capacity is exhausted, required cover soil would continue to be imported to site. If the current source of this material is exhausted, or if soil prices increase, then this would drive up the costs of operating the landfill. The ACRD has implemented an alternate daily cover system at the landfill made from steel plates, reducing cover soil requirements. Nevertheless, it is expected that 201,570m^3 of cover soil would be required to 2064, assuming a waste to cover ratio of 4.5:1.

As mentioned previously, uncontrolled discharge of leachate has been known to occur at the leachate storage lagoon during large storm events. Sandhill Creek is located 40 m west of the lagoon and monitoring data from 2017 reflects likely impact from leachate (Paul Evans, 2019).

3.2.5 Landfill Closure

No final cover systems have been implemented at the West Coast Landfill to date. As reported in the 2012 DOCP, a conventional geomembrane closure system has been recommended for closure of the landfill. A phased closure of the landfill should be implemented in order to reduce environmental impacts of completed landfill slopes by reducing LFG and leachate generation.

3.3 Cost Estimate

This section provides cost estimates for the landfill development and environmental controls detailed in the previous section.

3.3.1 Landfill Expansion

A conceptual cost estimate was prepared for the capital works required to complete the landfill expansion based on SHA's experience at landfills throughout BC. For this assessment, it was assumed that the landfill would be expanded with a base liner system as per the requirements in the Criteria.

As reported in the West Coast Landfill 2018 Annual Report (McGill, 2019), the current landfill footprint is approximately 6.2 hectares (Ha). Given that the final waste footprint as per the Operating Certificate (OC) is 9.1 Ha., it is expected that a landfill expansion of 2.9 Ha would be required.

The components of the landfill expansion construction would include:

- Clearing & Grubbing
- Base Layer Grade Preparation
- Landfill Base Liner - Geosynthetic Clay Liner or 0.75 m Clay
- Landfill Secondary Liner – HDPE Geomembrane
- Cushion Layer – 12 oz. Non-Woven Geotextile or 0.2 m Sand
- Drainage Layer – 0.3 m Drainage Stone
- Filter Layer – 8 oz. Non-Woven Geotextile
- Engineering @ 20%
- Contingency @ 20%

SHA based the expansion costs on real costs at similar landfills, and added a 15% surcharge for the remote location factor of the West Coast Landfill. For the landfill expansion, SHA estimates that capital costs, including engineering and contingency, would be in the order of \$1.4 million or \$48/m^2.

3.3.2 Leachate Treatment System Upgrades

SHA assumed that the leachate treatment and collection system would be upgraded as discussed in Section 3.2.2. The conceptual design for the upgraded leachate treatment system includes an equalization pond, aeration pond, sedimentation pond, sand filter, and phytoremediation area. The estimated costs for supply and install of the leachate treatment system were taken from the Forceman Ridge Waste Management Facility located near Terrace, BC. Although the Forceman Landfill receives about 2.3 times more waste per year than the West Coast Landfill, the precipitation at the West Coast Landfill is about 2.2 times higher than at Forceman and therefore the magnitude of the leachate treatment system would be similar between the two landfills. While it is likely that the components of the West Coast Landfill leachate treatment system may change during detailed design, the conceptual design from Forceman was used to provide a cost estimate for the upgrades.

For the leachate system upgrades, SHA estimates that capital costs including engineering and contingency would be in the order of \$2.6 million.

3.3.3 Closure Cost Estimate

For the purpose of this analysis, SHA has assumed that the landfill would be closed utilizing a geomembrane closure system as per the 2012 DOCP (McGill, 2012). SHA also included geotextile cushion and separation layers in the closure system as is standard practice. The components of the closure system would include (from bottom to top):

- Grading Layer – 600 mm Sand/Gravel
- Cushion Layer – 12 oz. Non-Woven Geotextile
- Barrier Layer – Geosynthetic Membrane Liner
- Cushion Layer – 12 oz. Non-Woven Geotextile
- Drainage Layer – 150 mm Gravel
- Separation Layer – 8 oz. Non-Woven Geotextile
- Subsoil Layer – 0.6 m Subsoil
- Topsoil Layer – 0.3 m Topsoil
- Vegetation Layer - Hydroseeding
- Engineering @ 20%
- Contingency @ 20%

SHA based the closure costs on real costs at similar landfills, and added a 15% surcharge for the remote location factor of the West Coast Landfill. SHA estimates that capital costs for landfill closure, including engineering and contingency, would be in the order of \$9.5 million or \$104/m^2. This closure cost includes the installation of a passive landfill gas collection system.

It should be noted that utilizing on-site and/or local materials could reduce the overall closure cost of the site and should be investigated during detailed design.

3.3.4 Post Closure Cost Estimate

The post closure period for which post-closure care would be required is determined based on the contaminating lifespan of the landfill. A contaminating lifespan assessment has not yet been completed for the West Coast Landfill. In the absence of a contaminating lifespan assessment, the contaminating lifespan is determined by the quantity of waste in place at closure. For the West Coast Landfill, it is anticipated that approximately 528,860 tonnes of waste will be in place at closure (Table 1). The Criteria states that a post-closure period of 100 years shall be used for landfills with between 100,000 and 1,000,000 tonnes of waste in place at closure. Therefore, in the absence of a contaminating lifespan assessment, the West Coast Landfill is assumed to have a post-closure period of 100 years.

Post-closure costs include maintenance of the landfill final cover, operation and maintenance of leachate management facilities, operation and maintenance of landfill gas management facilities, operation and maintenance of site infrastructure including surface water control works, roads, fences, and annual environmental monitoring and reporting.

Based on a contaminating lifespan of 100 years, SHA recommends a more thorough post-closure monitoring program for the first 30 years following final closure. SHA typically allows \$1.00 per m^2 of the waste footprint for post closure costs. Based on this unit rate and a final waste footprint of 91,000 m^2 (9.1 Ha.), the landfill would have an annual post closure cost of around \$91,000. Assuming stable trends are observed in the monitoring data, the post-closure care could be scaled back to include annual preventative monitoring such as a site inspection and conductivity sampling along with a detailed water quality sampling every 5 years. It is recommended that preventative monitoring be completed for the remaining 70 years at an estimated unit cost of \$0.50/m^2 or \$45,500 per year.

3.3.5 Operating Cost Estimate

Operating costs for the landfill were estimated using information provided by the ACRD. The following costs as reported in the 2019-2024 ACRD Financial Plan were included:

ACRD 2019-2024 Financial Plan	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Computer expense	$1,049	$2,000	$2,000	$2,000	$2,000	$2,000
Operations Contract	$442,996	$525,000	$535,500	$546,200	$557,100	$568,200
Other operating costs	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000
Professional Fees	$34,145	$50,000	$12,000	$12,000	$12,000	$12,000
Utilities	$7,084	$9,000	$9,400	$9,800	$10,200	$10,600
Environmental Monitoring	$32,005	$35,000	$36,400	$37,900	$39,400	$41,000
Total Landfill Operating Costs	**$557,279**	**$661,000**	**$635,300**	**$647,900**	**$660,700**	**$673,800**
Cost per Tonne	**$88.77**	**$104.22**	**$97.72**	**$97.23**	**$96.73**	**$96.24**

The total annual operating cost for the site in 2019 was reported to be \$557,279. A unit cost of \$88.77 per tonne of waste was calculated for the 2019 waste disposal tonnage received at the Landfill. In 2020 the unit cost has been estimated at \$104.22/tonne with subsequent year estimates based on the above table. Future operating costs at the landfill from 2025 onwards were projected using a fixed unit cost of $96.24 per tonne.

4. TRANSFER STATION ASSESSMENT

This section assesses 'Scenario 2: Closing the WCL and developing a transfer station to haul waste to the AVL'. For this scenario, it has been assumed that the West Coast Landfill would be closed in 2022 and waste would be transferred via hauling from an onsite transfer station to the AVL. This section details the following for the transfer station option: hauling options, haul frequency, haul cost analysis, transfer station conceptual design, environmental controls, and costing.

4.1 Hauling Options

The distance between the West Coast Landfill and the Alberni Valley Landfill is about 98 km on the Pacific Rim Highway. At the request of the ACRD, SHA selected hauling options that are compatible with hauling organics in the event that organics are backhauled from the Alberni Valley Landfill to the West Coast Landfill. Three hauling options were investigated as detailed below.

1. Using two (2) 40 cubic metre containers having a 76 m^3 capacity per haul (40-m^3 bins). This option is expected to average 18 tonnes of waste per haul, assuming a waste density of 0.24 tonnes/m^3.
2. Using one (1) 53' self-unloading trailer having a 113 m^3 capacity per haul (self-unloading trailer). This option is expected to average 24 tonnes of waste per haul, assuming a waste density of 0.21 tonnes/m^3.
3. Using one (1) heavy duty 39' end-dump trailer having a 75 m^3 capacity per haul (end-dump trailer). This option is expected to average 19 tonnes of waste per haul, assuming a waste density of 0.25 tonnes/m^3.

For each of the options, an additional bin/trailer would be included so that there is redundancy for potential breakdowns and a spare bin/trailer available to be filled while the other bin/trailer is being hauled.

The above-reported trailer sizes are sourced from SHA's expansive database as it includes actual data related to trailer haul capacities and trailer haul volumes. With that said there are many trailer options available and the trailers above are reported to provide a point of reference when choosing transfer station trailer(s).

4.1.1 Haul Frequency

In order to optimize the haul frequency, it is important that the municipal waste load be tamped (compacted) prior to shipment. Tamping increases the waste density, thereby maximizing the tonnage of material that can be hauled per trip. It is important to note that tamping is limited on self-unloading trailers as it risks damaging the self-unloading mechanism. As a result, the waste density achieved in the self-unloading trailer is lower than that of the 40 m^3 bins or end-dump trailer. To ensure accuracy of the haul analysis, SHA spoke with representatives from several municipalities in BC to determine the average observed haul weight for each hauling option and calculated the waste densities being achieved. The self-unloading trailer (Option 2) has the highest haul capacity and averages 24 tonnes of MSW per trip. The end-dump trailer (Option 3) can haul approximately 19 tonnes per trip and the 40 m^3 bins (Option 1) can haul about 18 tonnes per trip.

The average number of hauls per week for the three hauling options are reported in Table 2 at the end of this report. As seen in Table 2, the number of hauls required per week ranges from 5 trips for the self-unloading trailer, 6 trips for the end-dump trailer, and 7 trips for the 40 m^3 bins. SHA also considered the maximum number of hauls per week that would be required during high season, which is assumed to occur from July to September each year. During high season, the number of hauls per week increases to 8 trips for the self-unloading trailer and 10 trips for both the 40 m^3 bins and the end-dump trailer.

In the event that organics diversion is implemented on the West Coast, the quantity of waste requiring hauling would be significantly reduced. As mentioned previously, it is assumed that up to 25% of organics could be diverted from the waste stream. Under this scenario, SHA calculated the average number of hauls required per week and the results are presented in Table 3 at the end of this report. The required number of hauls per week could be minimized to 4 trips using the self-unloading trailer and 5 trips using the 40 m^3 bins or end-dump trailer. In high season, the required trips increase to 5 trips for the self-unloading trailer and 7 trips for both the 40 m^3 bins and the end-dump trailer.

In summary, the self-unloading trailer (Option 2) appears to be the most efficient option with the least number of trips required per week.

4.1.2 Haul Cost Analysis

SHA completed a haul cost analysis for the Transfer Station option which estimates costs for transferring waste from the West Coast Transfer Station to the Alberni Valley Landfill. The results of the haul cost analysis are presented in Tables 2 and 3 at the end of this report, with Table 2 showing the costs under existing conditions and Table 3 showing costs under the organics diversion scenario.

SHA's haul cost analysis calculates a total haul cost on an annual and per tonne basis, which includes the costs associated with travel to and from the Alberni Valley Landfill, loading and unloading waste, and bin/trailer capital and maintenance costs. For the purpose of this analysis, the capital costs of the 40 m^3 bins and end-dump trailer are assumed to be amortized over a 10-year period. The self-unloading trailer has a shorter lifespan and therefore the capital costs have been amortized over a 7-year period. Maintenance costs for the bins and/or trailers vary significantly, with the annual maintenance cost of the self-unloading trailer reported to be $25,000 per trailer and the annual maintenance cost for the 40 m^3 bins and end-dump trailer expected to be $1,000 per bin and $3,000 per trailer respectively. It is assumed that the haul trucks would be purchased and maintained by the hauling contractor and thus capital costs associated with haul trucks were not included in the analysis.

As seen in Table 2, under existing conditions, the most cost-effective option is to haul waste using the end-dump trailer. The cost per tonne from least expensive to most expensive is $47.45/tonne (end-dump), $48.85/tonne (self-unloading), and $55.80/tonne (40 m^3 bins). The end-dump option is 7% cheaper than using the self-unloading trailer and 18% cheaper than using the 40 m^3 bins. While the end-dump trailer has a higher haul frequency than the self-unloading trailer, the rationale for the cost savings is the lower capital and maintenance costs for the trailers.

The haul cost analysis for the organics diversion scenario is presented in Table 3. As seen in Table 3, the end-dump trailer is the most cost-effective option to haul waste. The cost per tonne from least expensive to most expensive is $47.29/tonne (end-dump), $54.60/tonne (self-unloading), and $56.35/tonne (40 m^3 bins). While the cost on a per tonne basis is more expensive under the organics diversion scenario compared the existing scenario (Table 2), cost savings are realized on an annual basis since the quantity of waste being hauled is lower. For example, the total cost per year for the end-dump trailer under the existing scenario is $288,271 whereas the total cost per year for the end-dump trailer under the organics diversion scenario is $224,970 (22% decrease).

A summary of the haul cost analysis is presented in Table 4-1 below.

Table 4-1: Summary of Haul Cost Analysis

	Option 1: 40 m^3 Bins	Option 2: Self-Unloading Trailer	Option 3: End-Dump Trailer
Existing Condition – No Organics Diversion			
Avg. # of Trips per Week	7	5	6
Average number of Trips per Week (High Season)	10	8	10
Total Cost Per Tonne	**$55.80**	**$48.85**	**$45.45**
Total Cost Per Year	**$353,907**	**$309,849**	**$288,271**
25 % Organics Diversion			
Avg. # of Trips per Week	5	4	5
Avg # of Trips per Week (High Season)	7	5	7
Total Cost Per Tonne	**$56.35**	**$54.60**	**$47.29**
Total Cost Per Year	**$268,076**	**$259,736**	**$224,970**

Overall, the end-dump trailer is the most cost-effective option with a cost of $45.45 per tonne and $288,271 per year under existing conditions and $47.29 per tonne and $224,970 per year under the organics diversion scenario.

4.1.3 Haul Recommendation

The analysis concludes that the self-unloading trailer requires the least amount of haul trips per week but the end-dump trailer is the most cost-effective solution. SHA's recommendation is the end-dump trailer (Option 3) as it has the lowest overall cost and requires considerably less maintenance compared to the self-unloading trailer (Option 2). The 40 m^3 bin option is not recommended due to its high overall cost compared to the other options. It should be noted that the analysis does not account for the expected down time associated with the reported $25,000 annual cost to maintain the self-unloading trailer.

4.2 Transfer Station Conceptual Design

SHA has conceptualized a Transfer Station design for the West Coast Landfill for the analysis. The West Coast Transfer Station would be required to provide sufficient capacity for the quantities of MSW projected to be disposed of in the West Coast Landfill service area. Additionally, the facility should be designed to be compatible with residential (curbside pick-up), self-haul, and commercial loads to be dropped off, processed, and shipped. With the above constraints in mind, SHA considered several options for the Transfer Station conceptual design including an open air Z-Wall, steel building with tipping floor, and coverall building with tipping floor. Each design was evaluated based on local weather conditions, local wildlife, capacity, functionality, operations costs, and capital costs.

The preferred design adopted by SHA consists of a Steel Building with a Tipping Floor. A building is preferred over an open-air facility such as a Z-Wall, as the building would shelter the waste from precipitation, which would reduce leachate generation and ensure a minimal moisture content of the waste for hauling. A building is also preferred as it acts as a barrier to wildlife, such as bears and birds, from accessing the waste. A steel building is preferred compared to a coverall building as coveralls are prone to damage from birds, require more maintenance, and have a shorter lifespan.

A tipping floor was chosen as it is versatile and could accommodate the wide variety of car and trucks that would be dumping at the Transfer Station. A tipping floor also allows for waste to be dumped and left in place without requiring an additional bin to be stationed at the Transfer Station.

The proposed transfer station building is being considered with a one (1) or two (2) bay design. A one-bay facility could accommodate about 7 vehicles per hour and a two-bay facility could accommodate about 14 vehicles per hour. SHA reviewed 2019 scale data provided by the ACRD to determine the estimated peak traffic volume at the site. Traffic volume estimates were calculated based on data that includes the tonnage and number of loads reported per day. SHA estimates that about 5 vehicles per hour visit the site and thus the traffic volume could be accommodated with one bay. However, SHA's recommendation is for a 2-bay design as it would not only meet current needs but also meet future needs accounting for population growth. Furthermore, a two-bay facility would allow for one of the bays to be dedicated to curbside and commercial loads and the other bay to be allocated for self-haul loads. The larger tipping floor area would result in safer operations and would aid with more efficient traffic management.

The preferred design adopted by SHA consists of a two level and two bay steel structure building. SHA recommends garage doors on the two-bay access. The roof would consist of a single pitch slope that would be graded in such that all run-off and snow would be shed to the rear of the building which would eliminate all falling ice and snow onto the entryways to the building.

The transfer trailer would be parked at the bottom level and two overhead doors would enclose the bottom level. The doors would secure the building when no one is on site and this would also prevent adverse weather from disturbing the waste material in the transfer station.

Proper ventilation of the transfer building is an important part of the design and louvre panels or grillages would need to be installed. The rear portion of the concrete tipping pad would be sloped towards a drain system to properly dispose of the excess accumulated liquid material while the front would be gently sloped to allow any rain water and melting snow to drain out of the building. Fences and safety devices would be installed to ensure that the transfer station equipment would not be able to fall into the transfer bin when pushing waste materials. An example of such transfer station safety measures is shown in Photo 1 below.

Photo 1: Example of Transfer Station Safety Rails

4.3 Environmental Controls

This section provides an overview of the environmental controls that would be required should Scenario 1 be pursued.

4.3.1 Landfill Closure

As discussed in Section 3.2.5, no final cover systems have been implemented at the West Coast Landfill to date. If the Transfer Station option is to be pursued, the landfill would be required to close as soon as feasibly possible. For the purpose of this analysis, the landfill is assumed to be closed in 2023 under the Transfer Station scenario. As per Section 3.3, SHA has assumed a geomembrane closure system.

Benefits of closing the landfill early would be a reduced closure area and reduced environmental impact on the local environment. If the landfill were to be closed in 2023, approximately 62,000 m^2 of the landfill would require closure, which is about 29,000 m^2 less than if the landfill was to be built to capacity. The landfill closure system would reduce leachate generation and hence reduce the burden on the existing leachate treatment system as well as impacts to surface water and groundwater over time. Under the Transfer Station scenario, it is therefore assumed that a leachate treatment system upgrade would not be required. It is envisioned that landfill gas would be collected via passive venting and potentially run through a flare to reduce GHG emissions.

4.3.2 Impact at Alberni Valley Landfill

By transferring waste for disposal to the Alberni Valley Landfill, most of the environmental impacts related to leachate and LFG would also be transferred to that site. However, by disposing of the waste at one site instead of two, capital funding could be focused to improve environmental protection at the Alberni Valley Landfill and savings made through economies of scale of landfill operation. These cost savings could be invested into environmental infrastructure, such as phased landfill closure, leachate treatment system upgrades, biocover to reduce GHG emissions, and litter control programs.

Assuming that there would be backhaul of organics from Alberni Valley to the West Coast Landfill, the Alberni Valley Transfer Station would require upgrades to accommodate an organics transfer facility. The tonnage of waste disposed of at the AVL in 2019 was reported to be 15,972 and therefore the quantity of organics expected to be hauled is around 3,993 tonnes per year. A transfer station concept similar to the concept detailed in Section 4.2 could be constructed at the Alberni Valley Transfer station to manage the organics for transfer.

4.4 Transfer Station Cost Estimate

This section provides an overview of the costs should the Transfer Station option be pursued.

4.4.1 Capital Costs

Capital costs would include the cost for constructing the West Coast Transfer Station and in the event that organics diversion is implemented, would also include the cost for upgrading the Alberni Valley Transfer Station. SHA reviewed past costs for similar transfer stations and estimates that the capital cost for the West Coast Transfer Station would be in the order of $800,000.

4.4.2 Closure Costs

Closure costs are discussed in Section 3.3. Based on a final waste footprint of 62,000 m^2 for the Transfer Station option, the landfill would have an estimated closure cost of $6.5 million ($104//m^2). Closure costs include the cover system, passive landfill gas system, engineering and contingency.

4.4.3 Post Closure Costs

Post closure costs are discussed in Section 3.3.4. Based on a final waste footprint of 62,000 m^2 for the transfer station option, the landfill would have an annual post closure cost of around $62,000 ($1.00/m^2) for the first 30 years under the current Landfill Criteria. Assuming stable trends are observed in the monitoring data, the post-closure care could be scaled back to include annual preventative monitoring. It is recommended that preventative monitoring would be completed for the remaining 70 years at an annual cost of $31,000 ($0.50/m^2).

4.4.4 Operating Costs

In order to estimate the operating costs for the transfer station, SHA utilized numbers supplied by the ACRD, and also costs obtained from similar transfer station operations. The following assumptions were made to calculate the transfer station operating costs:

- The transfer station would operate 6 days a week (Mon-Sat) for 6 hours a day (10AM – 4PM).
- Utilities costs for the transfer station operation would be roughly equivalent to the utilities costs for current landfill operations, which is around $2,000 per year.
- Computer expenses for the transfer station operation would be equivalent to the computer expenses for current landfill operations, which is around $9,000 per year.
- Staffing would consist of one transfer station attendant and one supervisor in addition to the scale attendant.

- Equipment would consist of one loader operating 4 hours per day and a mini-hoe or hoe attachment operating 2 hours per day.

The operating costs for the transfer station are estimated to be $398,192 per year.

5. LIFECYCLE COST ASSESSMENT

In order to assess the overall cost to the ACRD of the various scenarios, a Lifecycle Cost Assessment was completed for both of the landfill development options as well as the two transfer station options. The detailed lifecycle assessments for the two landfill options can be found in Tables 4 and 5 for the existing conditions and 25% organics diversion option respectively. Tables 6 and 7 present the two transfer station options for existing conditions and 25% organic diversion respectively. A summary of the lifecycle costs is presented in Table 8.

The lifecycle cost assessment tables provide a summary of all cost estimations shown in the year that each occurs. The lifespan chosen for all scenarios was one that runs until 2167, 100 years after closure of the option with the longest lifespan, the landfill development option with 25% organics diversion, so that an apples to apples comparison could be made. The year of landfill closure is highlighted and the associated closure costs are shown in the year in which they occur. Capital costs, such as leachate system upgrades, landfill expansion, or transfer station construction are shown as well. Operating costs for each year of landfill or transfer station operation are displayed. Annual post closure costs are shown for a period of 100 years following landfill closure. The funds put aside for the landfill closure reserve fund are also shown whilst the landfill is operational. Totals for each cost category over the life of the assessment are shown at the bottom of the table. The total cost for each scenario has been calculated based on a summation of the total capital, operating, closure and post closure costs on a per tonne basis. The total cost in comparison to the revenue collected from tipping fees is shown in the far right column. Interest payment on any debt or credit has also been calculated and is accrued from year to year.

5.1 Assumptions

The following assumptions were made for the Lifecycle Cost Assessments:

- Closure Reserve Fund set at $859,858 as of end of 2019;
- Closure Reserve Sinking Fund set at $120,000 per year for 2020 and $92,000 per year thereafter;
- Closure works to be undertaken one year following landfill capacity;
- Post-Closure monitoring to begin one year following landfill closure;
- Landfill operating costs set as per the ACRD 2019-2024 Financial Plan. Landfill operating costs from 2025 onwards are projected based on fixed unit cost of $96.24 per tonne;
- Leachate treatment system upgrade works to occur in 2022, if applicable;
- Transfer station construction to occur in 2022, if applicable;

- Expansion works to be undertaken when Cells A and B have reached capacity (est. 34,395 m^3 remaining as of 2019);
- Interest earnings from closure and post-closure fund is 2.1118% annually; and
- Break even tipping fee for disposal of waste at Alberni Valley Landfill set at $89.64/tonne.

5.2 Lifecycle Costs

A summary of the Lifecycle Cost Assessment is shown in Table 8, and summarized in Table 5-1 below. The results are further described in the following section. A Break Even Tipping fee has been calculated and shown. The Break Even Tipping fee is the tipping fee the ACRD would have to charge over the life of the analysis in order for there to be zero debt from the operation of the system after 100 years of post-closure. This value incorporates all operational costs and revenues, as well as interest accrued on any debts or credits, and is the best indicator of the actual cost of the waste system to the ACRD during the analysis period.

Table 5-1: Summary of Lifecycle Cost Analysis

Disposal Option	WCL Break Even Tipping Fee ($/tonne)	AVL Break Even Tipping Fee ($/tonne)	Total Cost per Tonne incl. AVL Tipping Fee ($/tonne)
Landfill Development - Existing Conditions	$121.77	-	$121.77
Landfill Development - 25% Organics Diversion	$122.00	-	$122.00
Transfer Station - Existing Conditions	$116.13	$89.64	$205.77
Transfer Station - 25% Organics Diversion	$130.27	$89.64	$219.91

The 'Transfer Station Existing Conditions' option has the lowest Break Even Tipping fee of $116.13 per tonne, and hence would provide the greatest value to the ACRD. However, the cost of disposing of the waste at the Alberni Valley Landfill under this scenario is assumed to cost an additional $89.64/tonne, bringing the total cost for this scenario to $205.77/tonne. For the 'Transfer Station Existing Conditions' scenario to be comparable in cost to the 'Landfill Development Existing Conditions' scenario, the cost of landfilling at the AVL would have to be only $5.65/tonne. While it is expected that some economy of scale would be realized by operating a single landfill under the transfer station scenarios, , the additional landfilling costs at AVL make this option more expensive overall.

With the cost of disposal at the AVL included in the analysis, the option with the lowest cost becomes the 'Landfill Development Existing Conditions' with a break-even tipping fee of $121.77/tonne. The 'Landfill Development 25% Organics Diversion' option has a comparable but slightly higher tipping fee of $122.00/tonne. SHA understand that the current tipping fee at the West Coast Landfill is $130 per tonne and therefore either of the landfill development options is capable of being funded under the current tipping fee structure.

In summary, the Lifecycle Cost Assessment shows that operating costs far outweigh capital or closure costs for any of the options. Hence, the option with the lowest operating costs would provide the cheapest solution, which happens to be the 'Transfer Station Existing Conditions' option. Unfortunately, the cost of landfilling the transferred waste at the AVL greatly increases the overall cost for this option, making it cost prohibitive compared to the Landfill Development options.

The total operating costs, factoring in all expenditures, range from $82.60 to $96.92 per tonne, with the 'Transfer Station – Existing Conditions' option being the lowest, and the 'Landfill Development – 25% Organics Diversion' option being the highest. The Transfer Station options have the lowest capital costs compared to the Landfill Development Options. Capital costs for Transfer Station Existing Conditions and 25% Organics Diversion are expected to be $0.8 million. The Landfill Development options have the highest capital expenditures at $4 million each.

Both of the transfer station options have the lowest closure costs at $6.47 million, while the landfill options have the highest closure costs at $9.49 million. Post closure costs are also lower for the transfer station options at $4.03 million compared to $5.92 million for the landfill development options. The difference in closure and post closure costs are a reflection of the closure areas, with the transfer station option having a smaller closure area than the landfill development option.

For all of the options, if closure were to be undertaken in the year specified, the closure reserve fund would not have adequate funds to cover the closure. For the 'Landfill Development Existing Conditions' option, the closure reserve fund would be about $5.2 million less than required for closure. The 'Landfill Development 25% Organics Diversion' option would be about $4.5 million less than required. The difference is greater should the Transfer Station options be pursued. For both the Transfer Station options, the closure reserve fund would be $5.3 million less than required for closure.

Overall, the Lifecycle Cost Assessment shows that the 'Landfill Development Existing Conditions' provides the most economical solution for the ACRD, when the cost of landfilling the waste at the Alberni Valley Landfill under the Transfer Station option is factored into the analysis.

6. GREENHOUSE GAS EMISSION ASSESSMENT

The following section investigates the greenhouse gas (GHG) emissions from continued operation of the WCL versus the GHG emissions from hauling waste via a transfer station from the WCL to disposal at the AVL. GHG emissions from landfill gas generated from the waste when it is disposed in a landfill, along with GHG emissions from trucks hauling the waste between the two landfills were considered.

6.1 Scenario Definitions

The two scenarios developed for the GHG emission modelling were as follows:

- **Scenario 1: Continued Waste Disposal at West Coast Landfill – No Active LFG Collection**

  This scenario represents the option of continued operations at the West Coast Landfill with 25% reduction in waste disposal due to organics diversion. Under this scenario, there would be no active LFG collection system installed at the West Coast Landfill.

- **Scenario 2: Waste Transfer to Alberni Valley Landfill – Active LFG Collection System**

  This scenario represents the option of ceasing to landfill at the West Coast Landfill, developing a transfer station and hauling waste to the Alberni Valley Landfill for disposal. This option also considers 25% reduction in waste disposal due to organics diversion. Under this scenario, there would be an active LFG collection system installed at the Alberni Valley Landfill with a 75% collection efficiency when methane generation surpasses 1,000 tonnes/year. It should be noted that this scenario only considers GHG emissions from West Coast waste that is landfilled at the AVL. Any GHG emissions generated from AVL waste is not included in the analysis.

6.2 Overarching Assumptions

The following general assumptions have been made for all scenarios.

- Scenario lifespan considered from 2022 to 2064. This represents the time frame when the various options would be implemented, i.e. transfer station would not be built until 2022 at the earliest, and the lifespan of the West Coast Landfill, based on the remaining airspace with 25% waste reduction due to organics diversion, runs until 2064;
- Post-closure period assumed to be 100 years for both scenarios. GHG emissions from the post-closure period were therefore considered from 2064 to 2164;
- Waste disposal rates have been used as discussed in Section 2;
- Emissions from operation equipment at both landfills not factored into GHG emissions, as they are considered to be relatively equal;
- Emissions from waste tonnages disposed during the analysis period have been considered (2022 to 2164). Emissions from historical waste disposal at either site have not been considered;
- Emissions from residential traffic to the Landfill have not been considered as they are assumed to be the same under both scenarios;
- Emissions from capital works projects have not been considered;

- The GHG emissions that are presented are anthropogenic. In a landfill, the GHGs that are considered anthropogenic are those that result from the production of methane, and for waste transfer the GHGs that are considered anthropogenic are all those that result from combustion of fossil fuel;
- Methane has 21 times the Global Warming Potential of CO_2; and
- GHG emissions from NMOC's were not considered under this assessment as they are considered to be very minor and inconsequential when compared to GHG emissions from methane. They would be similar for each scenario and therefore would not influence the overall results.

6.3 LFG Modelling

6.4 Scenario 1 – Continued Waste Disposal at West Coast Landfill

Scenario 1 considers continued waste disposal at the West Coast Landfill with organics diversion. Using the waste composition analysis report by Dillon Consulting in 2019 (Dillon, 2019), and an overall 25% waste diversion target, SHA categorized the deposited and future waste for the West Coast Landfill as presented in Table 6-1 below. It was assumed that the 25% overall diversion target will be achieved through 54% diversion of food waste, yard waste, paper & cardboard, and wood waste. The diversion target is assumed to be achieved in 2022.

Table 6-1: Historical and Future Waste Compositions for WCL

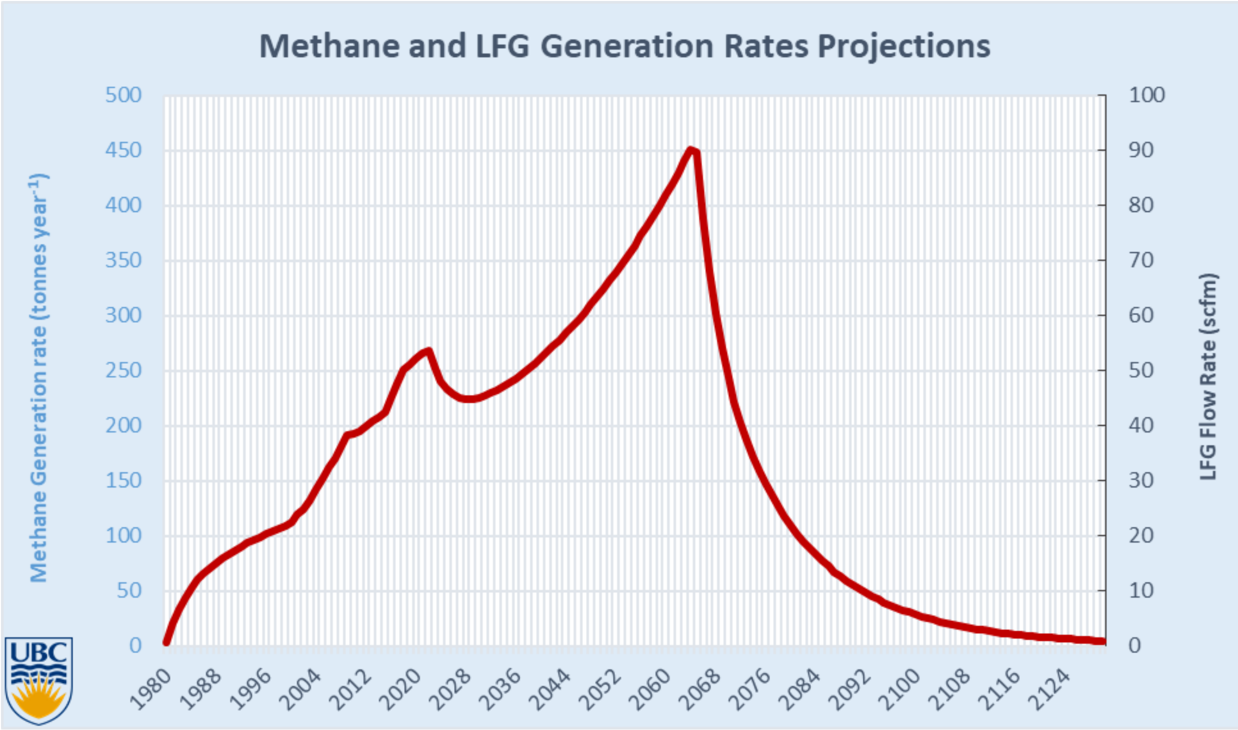
	UBCiModel - Input DOC used for West Coast LF Advanced LFG Modeling (SHA-PRJ20011a) - 25% Diversion Scenario							
	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
2019 Analysis (pre-2022)	18.9%	5.2%	13.4%	8.6%	13.7%	2.9%	37.3%	100%
25% Diversion (2022 - End)	11.5%	3.2%	8.2%	5.4%	18.2%	3.9%	49.7%	100%

The categories presented in Table 6-1 were input into the UBCiModel to estimate the LFG and hence GHG emissions from waste disposal at the WCL. Under this scenario, there would be no active LFG collection system installed at the WCL.

6.4.1 Results

Illustration of lifespan methane and LFG generation for the WCL using the UBCiModel is provided below in Figure 6-1. Full results are also provided in Appendix A.

Figure 6-1: Lifespan Methane and LFG Generation Estimate for West Coast Landfill



The model shows that LFG generation at the WCL under this scenario will peak in 2064 at a maximum LFG generation rate of 89 scfm, equivalent to approximately 445 tonnes of CH_4 per year. The UBCiModel© predicted methane generation at the WCL will not exceed the ENV LFG regulation's threshold of 1,000 tonnes CH_4 per year and therefore no active LFG collection system would be required.

As can be seen in Figure 6-1, the methane generation rate drops in 2022 as a result of reduction in waste quantity due to organics diversion. Furthermore, methane generation drops sharply in 2064 when the landfill reaches capacity and is assumed to be closed.

The methane and GHG emissions for each year during the analysis period is presented in Table 10 and a results summary is presented in Section 6.6

6.5 Scenario 2 – Waste Transfer to Alberni Valley Landfill

Scenario 2 considers transferring waste from the West Coast Landfill to the Alberni Valley Landfill for disposal. Using the waste composition analysis report by Dillon Consulting in 2019 (Dillon, 2019), and an overall 25% waste diversion target, SHA categorized the deposited and future waste for the Alberni Valley Landfill as presented in Table 6-2. It was assumed that the 25% overall diversion target will be achieved through 59% diversion of food waste, yard waste, paper & cardboard, and wood waste. The diversion target is assumed to be achieved in 2022.

Table 6-2: Historical and Future Waste Composition for the AVL

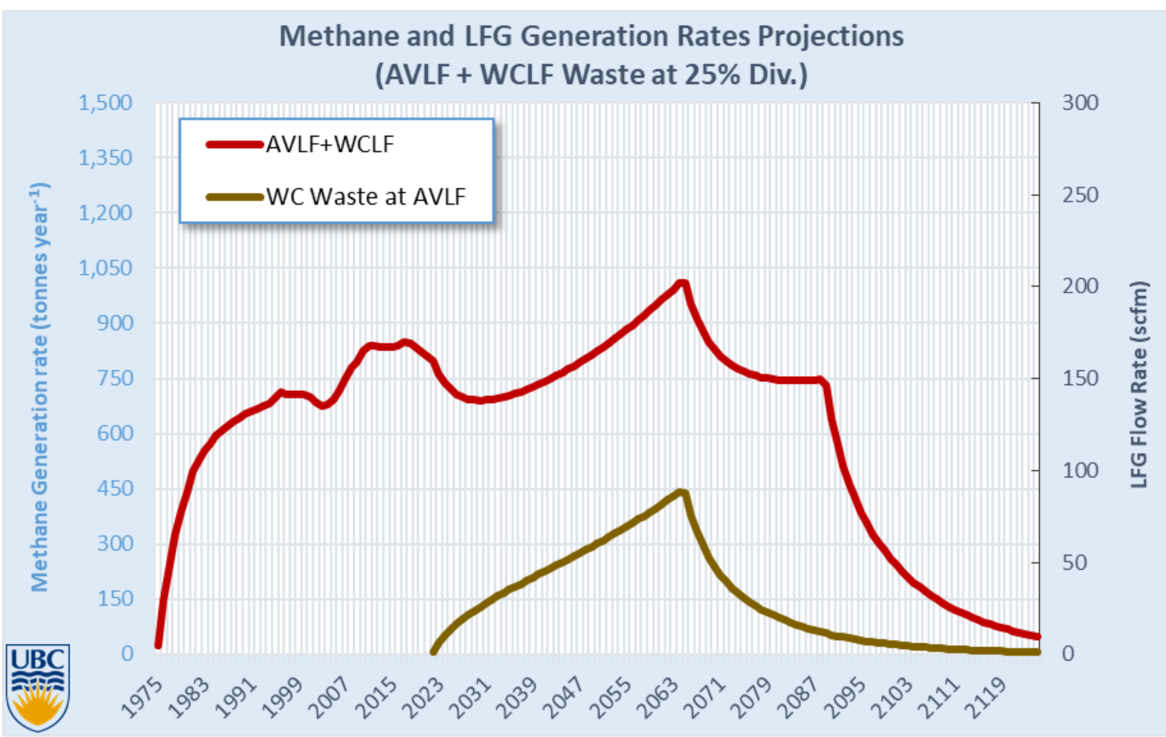
	UBCiModel - Input DOC used for Alberni Valley LF Advanced LFG Modeling (SHA-PRJ20011a) - 25% Diversion Scenario							
	Food	Garden	Paper	Wood	Textile	Nappies	Inerts	Total
2019 Analysis (pre-2022)	17.4%	3.9%	15.0%	6.7%	10.4%	2.8%	43.8%	100%
25% Diversion (2022 - End)	9.6%	2.2%	8.3%	4.0%	13.8%	3.7%	58.4%	100%
Combined AVLF & WCLF (2022)	10.2%	2.4%	8.3%	4.4%	15.1%	3.8%	55.9%	100%
Combined AVLF & WCLF (2088)	10.6%	2.7%	8.2%	4.7%	16.1%	3.8%	54.0%	100%

The categories presented in Table 6-2 were input into the UBCiModel to estimate the LFG and hence GHG emissions from waste disposal at the AVL. Under this scenario, there would be an active LFG collection system installed at the Alberni Valley Landfill with a 75% collection efficiency when methane generation reaches 1,000 tonnes/year.

6.5.1 Results

Illustration of lifespan methane and LFG generation for the AVL using the UBCiModel is provided below in Figure 6-2. Full results are also provided in Appendix A.

Figure 6-2: Lifespan Methane and LFG Generation Estimate for Alberni Valley Landfill (Assuming WCL contributes to AVL up to 2064)



The model shows that LFG generation at the AVL under this scenario will peak in 2064 at a maximum LFG generation rate of 200 scfm, equivalent to approximately 1,000 tonnes CH_4/year. The UBCiModel© predicted methane generation at the AVL will exceed the ENV LFG regulation's threshold of 1,000 tonnes CH_4 per year in 2064 and therefore an active LFG collection system would be required at this time.

As can be seen in Figure 6-2, waste from the WCL is assumed to be transferred to the AVL beginning in 2022 and terminating in 2064.

The methane and GHG emissions for each year during the analysis period is presented in Table 10 and a results summary is presented in Section 6.6

6.5.2 Waste Transfer Emissions

The other source of GHG emissions that need to be considered under Scenario 2 is from transfer of the waste from the WCL to the AVL via trucks and trailers. Analysis of the required transfer frequency was completed by SHA and discussed in Section 4.1.1. The recommended option of hauling via Heavy Duty 39' End-Dump Trailers was used for the GHG assessment.

6.5.2.1 Assumptions

To calculate GHG generation from the waste transfer the following assumptions were made:

- Haul distance from WCL to AVL is 100 km one way;
- Trucks would travel from WCL to AVL loaded with MSW, and return loaded with organics. Emissions from round trip to be counted;
- Waste to be hauled using one (1) heavy duty 39' end-dump trailer having a 75 m^3 capacity per haul and is expected to average 19 tonnes of waste per haul, assuming a waste density of 0.25 tonnes/m^3;
- Haul truck consumes average of 39 L/ 100 km loaded, assuming 2 stops and 10% time spent idling per trip;
- Diesel fuel emits approximately 0.00262 tonnes CO_{2E} / L;
- Hauling 6 trips per week during regular season and 10 trips per week during high season (July to mid-September)

6.5.2.2 Results

Based on the haul scenario, SHA developed the GHG emissions estimate presented in Table 9. The modelling shows that GHG emissions from the waste haul between the WCL and AVL for waste tonnage projected between 2022 and 2064 will range from 54.0 to 152.4 tonnes CO_{2E}/year. The total emitted over the 42-year period is projected to be 4,086 tonnes CO_{2E}.

6.6 Scenario Modelling Summary

Table 6-3 below presents the total GHG emissions estimate for the tonnage of waste under consideration if it were to be disposed of at either the WCL or AVL. For this estimate, GHG emissions were calculated by multiplying the methane generation in tonnes by methane's global warming potential (GWP) of 21.

For Scenario 2, GHG emissions from waste disposal after 2064 were calculated by dividing the methane generation in tonnes by four to account for 75% LFG collection efficiency, and then multiplying the result by methane's GWP of 21.

Table 6-3: Summary of GHG Assessment Results

	Scenario 1 - WCL Closure in 2064	Scenario 2 - WCL Transfer Waste to AVL Until 2064		
Period	Waste GHG Emissions (tonnes CO_{2E})	Waste GHG Emissions (tonnes CO_{2E})	Haul GHG Emissions (tonnes CO_{2E})	Total GHG Emissions (tonnes CO_{2E})
Landfill Operation (2022-2064)	217,308	217,308	4,086	221,394
Landfill Post Closure (2064-2164)	105,441	26,360	0	26,360
Total	**322,749**	**243,668**	**4,086**	**247,755**

The results presented above show that GHG emissions from waste disposed at the WCL under Scenario 1 will total 217,308 tonnes CO_{2E} during landfill operation and 105,441 tonnes CO_{2E} during the post closure period. The total GHG emissions at the WCL until 2164 is estimated to be 322,749 tonnes CO_{2E}.

The results show that GHG emissions from waste disposed at the AVL under Scenario 2 will total 217,308 tonnes CO_{2E} (for WCL waste only) and hauling emissions will total 4,086 tonnes CO_{2E} during landfill operation. During the post closure period, the total GHG emissions at the AVL (from WCL waste only) is estimated to be 26,360 tonnes CO_{2E}. The total GHG emissions at the AVL until 2164 is estimated to be 247,755 tonnes CO_{2E}.

Overall, the results indicate that Scenario 2 will generate 74,994 tonnes CO_{2E} less than Scenario 1 at the end of the post-closure period, which is equivalent to taking approximately 12,500 cars off the road for one year. Scenario 2 is seen to have lower overall GHG emissions due to the assumption that an active gas collection system would be installed at the AVL in 2064.

The results presented in this section show that GHG emissions from landfilling are orders of magnitude higher than those from hauling of waste between the two landfill sites. This means that control of LFG is an important measure to reduce GHG emissions associated with the waste management options presented for the West Coast Landfill. The ACRD may want to consider options for reduction of GHGs at the West Coast Landfill through the use of biocover or a passive gas collection and flaring system. Costs for these elective initiatives may be supplemented with climate change initiative funding.

7. REFERENCES

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8. STATEMENT OF LIMITATIONS

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of the Alberni-Clayoquot Regional District in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables, charts, and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by Sperling Hansen Associates to determine its accuracy and completeness. Sperling Hansen Associates has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the Alberni-Clayoquot Regional District. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Sperling Hansen Associates does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to Sperling Hansen Associates during the course of this project. Should additional new data become available in the future, Sperling Hansen Associates should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

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TABLE 1 - WEST COAST LANDFILL PROJECTED WASTE QUANTITIES AND LIFESPAN ANALYSIS

Current Scenario											Organics Diversion (25%)				
Year	**Population Growth Rate**	**Population**	**Waste Disposal Rate** (tonnes/person/year)	**Annual Waste Tonnage** (tonnes/year)	**Cumulative Waste Tonnage** (tonnes)	**Waste Compaction Density** (tonnes/m3)	**Annual Waste Volume** (m3)	**Annual Cover Volume** (m3)	**Annual Settlement @ 10%** (m3)	**Cumulative Volume starting end of 2018 incl. Settlement** (m3)	**Annual Waste Tonnage** (tonnes/year)	**Annual Waste Volume** (m3)	**Annual Cover Volume** (m3)	**Annual Settlement @ 10%** (m3)	**Cumulative Volume starting end of 2018** (m3)
2018	2.5%	7,171	0.842	6,037	143,703	0.57	10,591	2,354	-1,294	-	4,528	7,943	1,765	-971	-
2019	2.5%	7,350	0.842	6,287	149,990	0.57	11,029	2,451	-1,348	12,132	4,715	8,272	1,838	-1,011	9,099
2020	2.5%	7,534	0.842	6,343	156,332	0.57	11,127	2,473	-1,360	24,372	4,757	8,346	1,855	-1,020	18,279
2021	2.5%	7,722	0.842	6,501	162,834	0.57	11,406	2,535	-1,394	36,919	4,876	8,554	1,901	-1,046	27,689
2022	2.5%	7,915	0.842	6,664	169,497	0.57	11,691	2,598	-1,429	49,778	4,998	8,768	1,948	-1,072	37,334
2023	2.5%	8,113	0.842	6,830	176,328	0.57	11,983	2,663	-1,465	62,960	5,123	8,987	1,997	-1,098	47,220
2024	2.5%	8,316	0.842	7,001	183,329	0.57	12,283	2,729	-1,501	76,470	5,251	9,212	2,047	-1,126	57,353
2025	2.5%	8,524	0.842	7,176	190,505	0.57	12,590	2,798	-1,539	90,319	5,382	9,442	2,098	-1,154	67,739
2026	2.5%	8,737	0.842	7,355	197,860	0.57	12,904	2,868	-1,577	104,514	5,517	9,678	2,151	-1,183	78,385
2027	2.5%	8,955	0.842	7,539	205,400	0.57	13,227	2,939	-1,617	119,064	5,655	9,920	2,204	-1,212	89,298
2028	2.5%	9,179	0.842	7,728	213,127	0.57	13,558	3,013	-1,657	133,977	5,796	10,168	2,260	-1,243	100,483
2029	2.5%	9,409	0.842	7,921	221,049	0.57	13,897	3,088	-1,698	149,263	5,941	10,422	2,316	-1,274	111,947
2030	2.5%	9,644	0.842	8,119	229,168	0.57	14,244	3,165	-1,741	164,932	6,089	10,683	2,374	-1,306	123,699
2031	2.5%	9,885	0.842	8,322	237,490	0.57	14,600	3,244	-1,784	180,992	6,242	10,950	2,433	-1,338	135,744
2032	2.5%	10,132	0.842	8,530	246,020	0.57	14,965	3,326	-1,829	197,454	6,398	11,224	2,494	-1,372	148,090
2033	2.5%	10,385	0.842	8,743	254,763	0.57	15,339	3,409	-1,875	214,327	6,558	11,504	2,557	-1,406	160,745
2034	2.5%	10,645	0.842	8,962	263,725	0.57	15,723	3,494	-1,922	231,622	6,721	11,792	2,620	-1,441	173,716
2035	2.5%	10,911	0.842	9,186	272,911	0.57	16,116	3,581	-1,970	249,349	6,890	12,087	2,686	-1,477	187,012
2036	2.5%	11,184	0.842	9,416	282,327	0.57	16,519	3,671	-2,019	267,520	7,062	12,389	2,753	-1,514	200,640
2037	2.5%	11,464	0.842	9,651	291,978	0.57	16,932	3,763	-2,069	286,144	7,238	12,699	2,822	-1,552	214,608
2038	2.5%	11,750	0.842	9,892	301,870	0.57	17,355	3,857	-2,121	305,235	7,419	13,016	2,892	-1,591	228,926
2039	2.5%	12,044	0.842	10,140	312,010	0.57	17,789	3,953	-2,174	324,803	7,605	13,342	2,965	-1,631	243,602
2040	2.5%	12,345	0.842	10,393	322,403	0.57	18,234	4,052	-2,229	344,860	7,795	13,675	3,039	-1,671	258,645
2041	2.5%	12,654	0.842	10,653	333,056	0.57	18,689	4,153	-2,284	365,418	7,990	14,017	3,115	-1,713	274,063
2042	2.5%	12,970	0.842	10,919	343,975	0.57	19,157	4,257	-2,341	386,490	8,189	14,367	3,193	-1,756	289,868
2043	2.5%	13,294	0.842	11,192	355,167	0.57	19,636	4,363	-2,400	408,089	8,394	14,727	3,273	-1,800	306,067
2044	2.5%	13,627	0.842	11,472	366,640	0.57	20,126	4,473	-2,460	430,228	8,604	15,095	3,354	-1,845	322,671
2045	2.5%	13,967	0.842	11,759	378,398	0.57	20,630	4,584	-2,521	452,921	8,819	15,472	3,438	-1,891	339,691
2046	2.5%	14,316	0.842	12,053	390,451	0.57	21,145	4,699	-2,584	476,181	9,040	15,859	3,524	-1,938	357,136
2047	2.5%	14,674	0.842	12,354	402,805	0.57	21,674	4,816	-2,649	500,022	9,266	16,255	3,612	-1,987	375,017
2048	2.5%	15,041	0.842	12,663	415,468	0.57	22,216	4,937	-2,715	524,460	9,497	16,662	3,703	-2,036	393,345
2049	2.5%	15,417	0.842	12,980	428,448	0.57	22,771	5,060	-2,783	549,508	9,735	17,078	3,795	-2,087	412,131
2050	2.5%	15,803	0.842	13,304	441,752	0.57	23,340	5,187	-2,853	575,182	9,978	17,505	3,890	-2,140	431,387
2051	2.5%	16,198	0.842	13,637	455,389	0.57	23,924	5,316	-2,924	601,499	10,228	17,943	3,987	-2,193	451,124
2052	2.5%	16,603	0.842	13,978	469,366	0.57	24,522	5,449	-2,997	628,473	10,483	18,392	4,087	-2,248	471,355
2053	2.5%	17,018	0.842	14,327	483,693	0.57	25,135	5,586	-3,072	656,122	10,745	18,851	4,189	-2,304	492,091
2054	2.5%	17,443	0.842	14,685	498,379	0.57	25,764	5,725	-3,149	684,462	11,014	19,323	4,294	-2,362	513,346
2055	2.5%	17,879	0.842	15,052	513,431	0.57	26,408	5,868	-3,228	713,510	11,289	19,806	4,401	-2,421	535,133
2056	2.5%	18,326	0.842	15,429	528,860	0.57	27,068	6,015	-3,308	743,285	11,571	20,301	4,511	-2,481	557,464
2057	2.5%	18,784	0.842	15,814	544,674	0.57	27,745	6,165	-3,391	773,804	11,861	20,808	4,624	-2,543	580,353
2058	2.5%	19,254	0.842	16,210	560,884	0.57	28,438	6,320	-3,476	805,086	12,157	21,329	4,740	-2,607	603,814
2059	2.5%	19,735	0.842	16,615	577,499	0.57	29,149	6,478	-3,563	837,150	12,461	21,862	4,858	-2,672	627,862
2060	2.5%	20,229	0.842	17,030	594,529	0.57	29,878	6,640	-3,652	870,015	12,773	22,408	4,980	-2,739	652,511
2061	2.5%	20,734	0.842	17,456	611,985	0.57	30,625	6,805	-3,743	903,702	13,092	22,969	5,104	-2,807	677,777
2062	2.5%	21,253	0.842	17,893	629,878	0.57	31,390	6,976	-3,837	938,232	13,419	23,543	5,232	-2,877	703,674
2063	2.5%	21,784	0.842	18,340	648,217	0.57	32,175	7,150	-3,933	973,624	13,755	24,131	5,363	-2,949	730,218
2064	2.5%	22,329	0.842	18,798	667,016	0.57	32,980	7,329	-4,031	1,009,902	14,099	24,735	5,497	-3,023	757,426

201,570

Notes:

Landfill airspace remaining as of Dec 31, 2018 = 737,154

Anticipated Landfill Capacity Reached Under Existing Conditions

Anticipated Landfill Capacity Reached with 25% Organics Diversion

TABLE 2 - HAUL ANALYSIS: EXISTING CONDITIONS

	Option 1 - Two (2) 40 m^3 Containers	Option 2 - One (1) 53' Self-Unloading Trailer	Option 3 - One (1) 39' End-Dump Trailer
	Tamped	**Uncompacted**	**Tamped**
Equipment Specifications			
Commercial Transport Regulation Max Weight:	31 tonnes	24 tonnes	24 tonnes
Bin/Trailer Volume:	76 m^3	113 m^3	75 m^3
Calculated Waste Density	0.24 tonnes/m3	0.21 tonnes/m^3	0.25 tonnes/m3
Average Observed Haul Weight	18 tonnes	24 tonnes	19 tonnes
Average number of Trips per week	7 trips	5 trips	6 trips
Max. number of Trips per week in High Season (July-Sept)	10 trips	8 trips	10 trips
Haul Cost Analysis			
Truck + Driver Haul Cost	185.00 $/hr	185.00 $/hr	185.00 $/hr
Haul Distance (one-way)	98 km	98 km	98 km
Average Haul Speed	60 km/hr	60 km/hr	60 km/hr
Haul Time	1.63 hr	1.63 hr	1.63 hr
Load Time	0.5 hr	0.3 hr	0.3 hr
Unload Time	1 hr	0.25 hr	0.25 hr
Backhaul Time	1.63 hr	1.63 hr	1.63 hr
Bin Drop Off Time	0.50 hr	0.25 hr	0.25 hr
Total Trip Time	5.3 hr	4.1 hr	4.1 hr
Total Haul Cost per Trip	**$ 974 $/trip**	**$ 759 $/trip**	**$ 759 $/trip**
Total Haul Cost Per Tonne	**$ 54.13 $/tonne**	**$ 31.60 $/tonne**	**$ 39.92 $/tonne**
Total Haul Cost per Year	**$ 343,324 $/year**	**$ 200,453 $/year**	**$ 253,204 $/year**
Capital Cost Analysis			
Number of Bins/Trailers Required	3	2	2
Cost per Bin/Trailer	$ 20,000.00	$ 175,000.00	$ 115,000.00
Total Bin/Trailer Capital Cost	$ 60,000.00	$ 350,000.00	$ 230,000.00
Expected Lifespan	10 years	7 years	10 years
Capital Cost Ammortized over Lifespan ($/year)	$ 7,582.73 $/year	$ 59,395.51 $/year	$ 29,067.13 $/year
Annual Maintenance Cost	$ 3,000.00 $/year	$ 50,000.00 $/year	$ 6,000.00 $/year
Total Capital Cost per Year	**$10,583 $/year**	**$109,396 $/year**	**$35,067 $/year**
Overall Cost			
Total Cost per Tonne	**$ 55.80 $/tonne**	**$ 48.85 $/tonne**	**$ 45.45 $/tonne**
Total Cost per Year	**$ 353,907 $/year**	**$309,849 $/year**	**$288,271 $/year**

Assumptions:

Annual Waste Tonnage - 2020 6,343 tonnes

Assume trucks will be purchased by hauling contractor

TABLE 3 - HAUL ANALYSIS - ORGANICS DIVERSION (25%)

	Option 1 - Two (2) 40 m^3 Containers	Option 2 - One (1) 53' Self-Unloading Trailer	Option 3 - One (1) 39' End-Dump Trailer
	Tamped	**Uncompacted**	**Tamped**
Equipment Specifications			
Commercial Transport Regulation Max Weight:	31 tonnes	24 tonnes	24 tonnes
Bin/Trailer Volume:	76 m^3	113 m^3	75 m^3
Calculated Waste Density	0.24 tonnes/m3	0.21 tonnes/m^3	0.25 tonnes/m3
Average Observed Haul Weight	18 tonnes	24 tonnes	19 tonnes
Average number of Trips per week	5 trips	4 trips	5 trips
Max. number of Trips per week in High Season (July-Sept)	7 trips	5 trips	7 trips
Haul Cost Analysis			
Truck + Driver Haul Cost	185.00 $/hr	185.00 $/hr	185.00 $/hr
Haul Distance (one-way)	98 km	98 km	98 km
Average Haul Speed	60 km/hr	60 km/hr	60 km/hr
Haul Time	1.63 hr	1.63 hr	1.63 hr
Load Time	0.5 hr	0.3 hr	0.3 hr
Unload Time	1 hr	0.25 hr	0.25 hr
Backhaul Time	1.63 hr	1.63 hr	1.63 hr
Bin Drop Off Time	0.50 hr	0.25 hr	0.25 hr
Total Trip Time	5.3 hr	4.1 hr	4.1 hr
Total Haul Cost per Trip	**$ 974 $/trip**	**$ 759 $/trip**	**$ 759 $/trip**
Total Haul Cost Per Tonne	**$ 54.13 $/tonne**	**$ 31.60 $/tonne**	**$ 39.92 $/tonne**
Total Haul Cost per Year	**$ 257,493 $/year**	**$ 150,340 $/year**	**$ 189,903 $/year**
Capital Cost Analysis			
Number of Bins/Trailers Required	3	2	2
Cost per Bin/Trailer	$ 20,000.00	$ 175,000.00	$ 115,000.00
Bin/Trailer Capital Cost	$ 60,000.00	$ 350,000.00	$ 230,000.00
Expected Lifespan	10 years	7 years	10 years
Capital Cost Ammortized over Lifepan ($/year)	$ 7,582.73 $/year	$ 59,395.51 $/year	$ 29,067.13 $/year
Annual Maintenance Cost	$ 3,000.00 $/year	$ 50,000.00 $/year	$ 6,000.00 $/year
Total Capital Cost per Year	**$10,583 $/year**	**$109,396 $/year**	**$35,067 $/year**
Overall Cost			
Total Cost per Tonne	**$ 56.35 $/tonne**	**$ 54.60 $/tonne**	**$ 47.29 $/tonne**
Total Cost per Year	**$ 268,076 $/year**	**$259,736 $/year**	**$224,970 $/year**

Assumptions:

Annual Waste Tonnage - 2020 4,757 tonnes

Assume trucks will be purchased by hauling contractor

Table 4 - Cashflow Analysis: Landfill Development Existing Conditions

			EXPENSE						REQUIRED REVENUE				
Year	Total Waste Dispoal (tonnes/yr)	Cumulative Waste Disposal (tonnes)	Closure Reserve Sinking Fund ($/yr)	Closure Cost ($/yr)	Post-Closure Cost ($/yr)	Landfill Operations Cost ($/yr)	Capital Costs ($/yr)	Total Landfilling Cost ($/yr)	Tipping Fee Revenue ($/yr)	Net Revenue ($/yr)	Cumulative Net Revenue ($)	Interest ($/yr)	Notes
2018	6,037	6,037											
2019	6,287	12,324	$859,858										
2020	6,343	18,666	$120,000			$661,000		$661,000	$772,371	$971,229	$971,229	$20,510	
2021	6,501	25,168	$92,000			$635,300	$1,410,850	$2,046,150	$791,680	-$1,134,470	-$142,730	-$3,014	Landfill Expansion
2022	6,664	31,831	$92,000			$647,900	$2,593,965	$3,241,865	$811,472	-$2,338,392	-$2,484,137	-$52,460	Install Leachate System Upgrades
2023	6,830	38,662	$92,000			$660,700		$660,700	$831,759	$263,059	-$2,273,538	-$48,013	
2024	7,001	45,663	$92,000			$673,800		$673,800	$852,553	$270,753	-$2,050,797	-$43,309	
2025	7,176	52,839	$92,000			$690,645		$690,645	$873,867	$275,222	-$1,818,884	-$38,411	
2026	7,355	60,194	$92,000			$707,911		$707,911	$895,714	$279,803	-$1,577,492	-$33,313	
2027	7,539	67,734	$92,000			$725,609		$725,609	$918,106	$284,498	-$1,326,308	-$28,009	
2028	7,728	75,461	$92,000			$743,749		$743,749	$941,059	$289,310	-$1,065,007	-$22,491	
2029	7,921	83,383	$92,000			$762,343		$762,343	$964,586	$294,243	-$793,255	-$16,752	
2030	8,119	91,502	$92,000			$781,401		$781,401	$988,700	$299,299	-$510,709	-$10,785	
2031	8,322	99,824	$92,000			$800,936		$800,936	$1,013,418	$304,481	-$217,012	-$4,583	
2032	8,530	108,354	$92,000			$820,960		$820,960	$1,038,753	$309,793	$88,198	$1,863	
2033	8,743	117,097	$92,000			$841,484		$841,484	$1,064,722	$315,238	$405,299	$8,559	
2034	8,962	126,059	$92,000			$862,521		$862,521	$1,091,340	$320,819	$734,677	$15,515	
2035	9,186	135,245	$92,000			$884,084		$884,084	$1,118,624	$326,540	$1,076,732	$22,738	
2036	9,416	144,661	$92,000			$906,186		$906,186	$1,146,589	$332,403	$1,431,873	$30,238	
2037	9,651	154,312	$92,000			$928,841		$928,841	$1,175,254	$338,413	$1,800,525	$38,023	
2038	9,892	164,204	$92,000			$952,062		$952,062	$1,204,635	$344,574	$2,183,122	$46,103	
2039	10,140	174,344	$92,000			$975,863		$975,863	$1,234,751	$350,888	$2,580,113	$54,487	
2040	10,393	184,737	$92,000			$1,000,260		$1,000,260	$1,265,620	$357,360	$2,991,959	$63,184	
2041	10,653	195,390	$92,000			$1,025,266		$1,025,266	$1,297,260	$363,994	$3,419,138	$72,205	
2042	10,919	206,309	$92,000			$1,050,898		$1,050,898	$1,329,692	$370,794	$3,862,137	$81,561	
2043	11,192	217,501	$92,000			$1,077,170		$1,077,170	$1,362,934	$377,764	$4,321,461	$91,261	
2044	11,472	228,974	$92,000			$1,104,100		$1,104,100	$1,397,008	$384,908	$4,797,630	$101,316	
2045	11,759	240,732	$92,000			$1,131,702		$1,131,702	$1,431,933	$392,231	$5,291,177	$111,739	
2046	12,053	252,785	$92,000			$1,159,995		$1,159,995	$1,467,731	$399,736	$5,802,652	$122,540	
2047	12,354	265,139	$92,000			$1,188,995		$1,188,995	$1,504,424	$407,430	$6,332,622	$133,732	
2048	12,663	277,802	$92,000			$1,218,720		$1,218,720	$1,542,035	$415,315	$6,881,670	$145,327	
2049	12,980	290,782	$92,000			$1,249,188		$1,249,188	$1,580,586	$423,398	$7,450,395	$157,337	
2050	13,304	304,086	$92,000			$1,280,417		$1,280,417	$1,620,101	$431,683	$8,039,416	$169,776	
2051	13,637	317,723	$92,000			$1,312,428		$1,312,428	$1,660,603	$440,175	$8,649,368	$182,657	
2052	13,978	331,700	$92,000			$1,345,238		$1,345,238	$1,702,118	$448,880	$9,280,905	$195,994	
2053	14,327	346,027	$92,000			$1,378,869		$1,378,869	$1,744,671	$457,802	$9,934,701	$209,801	
2054	14,685	360,713	$92,000			$1,413,341		$1,413,341	$1,788,288	$466,947	$10,611,448	$224,093	
2055	15,052	375,765	$92,000			$1,448,675		$1,448,675	$1,832,995	$476,320	$11,311,861	$238,884	
2056	15,429	391,194	$92,000			$1,484,891		$1,484,891	$1,878,820	$485,928	$12,036,674	$254,190	Landfill Capacity Reached
2057				$9,491,300				$9,491,300		-$9,399,300	$2,891,564	$61,064	Landfill Closure Construction
2058					$91,000			$91,000		-$91,000	$2,861,628	$60,432	
2059					$91,000			$91,000		-$91,000	$2,831,060	$59,786	
2060					$91,000			$91,000		-$91,000	$2,799,846	$59,127	
2061					$91,000			$91,000		-$91,000	$2,767,974	$58,454	
2062					$91,000			$91,000		-$91,000	$2,735,428	$57,767	
2063					$91,000			$91,000		-$91,000	$2,702,194	$57,065	
2064					$91,000			$91,000		-$91,000	$2,668,259	$56,348	
2065					$91,000			$91,000		-$91,000	$2,633,608	$55,617	
2066					$91,000			$91,000		-$91,000	$2,598,224	$54,869	
2067					$91,000			$91,000		-$91,000	$2,562,093	$54,106	
2068					$91,000			$91,000		-$91,000	$2,525,200	$53,327	
2069					$91,000			$91,000		-$91,000	$2,487,527	$52,532	
2070					$91,000			$91,000		-$91,000	$2,449,059	$51,719	
2071					$91,000			$91,000		-$91,000	$2,409,778	$50,890	
2072					$91,000			$91,000		-$91,000	$2,369,667	$50,043	
2073					$91,000			$91,000		-$91,000	$2,328,710	$49,178	
2074					$91,000			$91,000		-$91,000	$2,286,888	$48,294	
2075					$91,000			$91,000		-$91,000	$2,244,182	$47,393	
2076					$91,000			$91,000		-$91,000	$2,200,575	$46,472	
2077					$91,000			$91,000		-$91,000	$2,156,047	$45,531	
2078					$91,000			$91,000		-$91,000	$2,110,578	$44,571	
2079					$91,000			$91,000		-$91,000	$2,064,149	$43,591	
2080					$91,000			$91,000		-$91,000	$2,016,740	$42,590	
2081					$91,000			$91,000		-$91,000	$1,968,329	$41,567	
2082					$91,000			$91,000		-$91,000	$1,918,897	$40,523	
2083					$91,000			$91,000		-$91,000	$1,868,420	$39,457	
2084					$91,000			$91,000		-$91,000	$1,816,877	$38,369	
2085					$91,000			$91,000		-$91,000	$1,764,246	$37,257	
2086					$91,000			$91,000		-$91,000	$1,710,503	$36,122	
2087					$91,000			$91,000		-$91,000	$1,655,626	$34,964	
2088					$45,500			$45,500		-$45,500	$1,645,089	$34,741	
2089					$45,500			$45,500		-$45,500	$1,634,330	$34,514	
2090					$45,500			$45,500		-$45,500	$1,623,344	$34,282	
2091					$45,500			$45,500		-$45,500	$1,612,126	$34,045	
2092					$45,500			$45,500		-$45,500	$1,600,671	$33,803	
2093					$45,500			$45,500		-$45,500	$1,588,974	$33,556	
2094					$45,500			$45,500		-$45,500	$1,577,030	$33,304	
2095					$45,500			$45,500		-$45,500	$1,564,833	$33,046	
2096					$45,500			$45,500		-$45,500	$1,552,379	$32,783	
2097					$45,500			$45,500		-$45,500	$1,539,663	$32,515	
2098					$45,500			$45,500		-$45,500	$1,526,677	$32,240	
2099					$45,500			$45,500		-$45,500	$1,513,418	$31,960	
2100					$45,500			$45,500		-$45,500	$1,499,878	$31,674	
2101					$45,500			$45,500		-$45,500	$1,486,052	$31,382	
2102					$45,500			$45,500		-$45,500	$1,471,935	$31,084	
2103					$45,500			$45,500		-$45,500	$1,457,519	$30,780	
2104					$45,500			$45,500		-$45,500	$1,442,799	$30,469	
2105					$45,500			$45,500		-$45,500	$1,427,768	$30,152	
2106					$45,500			$45,500		-$45,500	$1,412,420	$29,827	
2107					$45,500			$45,500		-$45,500	$1,396,747	$29,497	
2108					$45,500			$45,500		-$45,500	$1,380,744	$29,159	
2109					$45,500			$45,500		-$45,500	$1,364,402	$28,813	
2110					$45,500			$45,500		-$45,500	$1,347,716	$28,461	
2111					$45,500			$45,500		-$45,500	$1,330,677	$28,101	
2112					$45,500			$45,500		-$45,500	$1,313,278	$27,734	
2113					$45,500			$45,500		-$45,500	$1,295,512	$27,359	
2114					$45,500			$45,500		-$45,500	$1,277,370	$26,976	
2115					$45,500			$45,500		-$45,500	$1,258,846	$26,584	
2116					$45,500			$45,500		-$45,500	$1,239,930	$26,185	
2117					$45,500			$45,500		-$45,500	$1,220,615	$25,777	
2118					$45,500			$45,500		-$45,500	$1,200,892	$25,360	
2119					$45,500			$45,500		-$45,500	$1,180,752	$24,935	
2120					$45,500			$45,500		-$45,500	$1,160,188	$24,501	
2121					$45,500			$45,500		-$45,500	$1,139,188	$24,057	
2122					$45,500			$45,500		-$45,500	$1,117,746	$23,605	
2123					$45,500			$45,500		-$45,500	$1,095,850	$23,142	
2124					$45,500			$45,500		-$45,500	$1,073,492	$22,670	
2125					$45,500			$45,500		-$45,500	$1,050,662	$22,188	
2126					$45,500			$45,500		-$45,500	$1,027,350	$21,696	
2127					$45,500			$45,500		-$45,500	$1,003,546	$21,193	
2128					$45,500			$45,500		-$45,500	$979,239	$20,680	
2129					$45,500			$45,500		-$45,500	$954,418	$20,155	
2130					$45,500			$45,500		-$45,500	$929,074	$19,620	
2131					$45,500			$45,500		-$45,500	$903,194	$19,074	
2132					$45,500			$45,500		-$45,500	$876,768	$18,516	
2133					$45,500			$45,500		-$45,500	$849,783	$17,946	
2134					$45,500			$45,500		-$45,500	$822,229	$17,364	
2135					$45,500			$45,500		-$45,500	$794,093	$16,770	
2136					$45,500			$45,500		-$45,500	$765,362	$16,163	
2137					$45,500			$45,500		-$45,500	$736,025	$15,543	
2138					$45,500			$45,500		-$45,500	$706,069	$14,911	
2139					$45,500			$45,500		-$45,500	$675,480	$14,265	
2140					$45,500			$45,500		-$45,500	$644,244	$13,605	
2141					$45,500			$45,500		-$45,500	$612,349	$12,932	
2142					$45,500			$45,500		-$45,500	$579,781	$12,244	
2143					$45,500			$45,500		-$45,500	$546,525	$11,542	
2144					$45,500			$45,500		-$45,500	$512,566	$10,824	
2145					$45,500			$45,500		-$45,500	$477,891	$10,092	
2146					$45,500			$45,500		-$45,500	$442,483	$9,344	
2147					$45,500			$45,500		-$45,500	$406,327	$8,581	
2148					$45,500			$45,500		-$45,500	$369,408	$7,801	
2149					$45,500			$45,500		-$45,500	$331,709	$7,005	
2150					$45,500			$45,500		-$45,500	$293,214	$6,192	
2151					$45,500			$45,500		-$45,500	$253,906	$5,362	
2152					$45,500			$45,500		-$45,500	$213,768	$4,514	
2153					$45,500			$45,500		-$45,500	$172,783	$3,649	
2154					$45,500			$45,500		-$45,500	$130,931	$2,765	
2155					$45,500			$45,500		-$45,500	$88,196	$1,863	
2156					$45,500			$45,500		-$45,500	$44,559	$941	
2157					$45,500			$45,500		-$45,500	$0	$0	
	385,157		**$4,291,858**	**$9,491,300**	**$5,915,000**	**$36,533,448**	**$4,004,815**	**$55,944,563**	**$46,136,773**	**-$5,515,932**		**$5,515,932**	

	Total Cost	$/tonne	%
Total Revenues	$50,428,631	$130.93	100%
Interest Revenues	$5,515,932	$14.32	11%
Total Landfilling Cost	$55,944,563	$145.25	111%
Total Capital Cost	$4,004,815	$10.40	8%
Total Operating Expenses	$36,533,448	$94.85	72%
Total Closure Cost	$9,491,300	$24.64	19%
Total Post Closure Cost	$5,915,000	$15.36	12%

Break Even Tipping Fee: 121.77

Table 5 - Cashflow Analysis: Landfill Development Organics Diversion 25%

			EXPENSE						REQUIRED REVENUE				
Year	Total Waste Dispoal (tonnes/yr)	Cumulative Waste Disposal (tonnes)	Closure Reserve Sinking Fund ($/yr)	Closure Cost ($/yr)	Post-Closure Cost ($/yr)	Landfill Operations Cost ($/yr)	Capital Costs ($/yr)	Total Landfilling Cost ($/yr)	Tipping Fee Revenue ($/yr)	Net Revenue ($/yr)	Cumulative Net Revenue ($)	Interest ($/yr)	Notes
2018	6,037	6,037											
2019	6,287	12,324	$859,858										
2020	4,757	17,081	$120,000			$661,000		$661,000	$580,330	$779,188	$779,188	$16,455	
2021	4,876	21,957	$92,000			$635,300	$1,410,850	$2,046,150	$594,839	-$1,331,311	-$535,668	-$11,312	Landfill Expansion
2022	4,998	26,954	$92,000			$647,900	$2,593,965	$3,241,865	$609,710	-$2,540,155	-$3,087,136	-$65,194	Install Leachate System Upgrades
2023	5,123	32,077	$92,000			$660,700		$660,700	$624,952	$56,252	-$3,096,077	-$65,383	
2024	5,251	37,328	$92,000			$673,800		$673,800	$640,576	$58,776	-$3,102,684	-$65,522	
2025	5,382	42,710	$92,000			$517,984		$517,984	$656,591	$230,607	-$2,937,600	-$62,036	
2026	5,517	48,227	$92,000			$530,933		$530,933	$673,005	$234,072	-$2,765,564	-$58,403	
2027	5,655	53,881	$92,000			$544,207		$544,207	$689,830	$237,624	-$2,586,344	-$54,618	
2028	5,796	59,677	$92,000			$557,812		$557,812	$707,076	$241,264	-$2,399,698	-$50,677	
2029	5,941	65,618	$92,000			$571,757		$571,757	$724,753	$244,996	-$2,205,378	-$46,573	
2030	6,089	71,707	$92,000			$586,051		$586,051	$742,872	$248,821	-$2,003,131	-$42,302	
2031	6,242	77,949	$92,000			$600,702		$600,702	$761,444	$252,741	-$1,792,692	-$37,858	
2032	6,398	84,346	$92,000			$615,720		$615,720	$780,480	$256,760	-$1,573,790	-$33,235	
2033	6,558	90,904	$92,000			$631,113		$631,113	$799,992	$260,879	-$1,346,146	-$28,428	
2034	6,721	97,625	$92,000			$646,891		$646,891	$819,992	$265,101	-$1,109,473	-$23,430	
2035	6,890	104,515	$92,000			$663,063		$663,063	$840,491	$269,428	-$863,474	-$18,235	
2036	7,062	111,577	$92,000			$679,640		$679,640	$861,504	$273,864	-$607,845	-$12,836	
2037	7,238	118,815	$92,000			$696,631		$696,631	$883,041	$278,411	-$342,271	-$7,228	
2038	7,419	126,234	$92,000			$714,046		$714,046	$905,117	$283,071	-$66,428	-$1,403	
2039	7,605	133,839	$92,000			$731,897		$731,897	$927,745	$287,848	$220,017	$4,646	
2040	7,795	141,634	$92,000			$750,195		$750,195	$950,939	$292,744	$517,407	$10,927	
2041	7,990	149,623	$92,000			$768,950		$768,950	$974,712	$297,763	$826,096	$17,446	
2042	8,189	157,813	$92,000			$788,174		$788,174	$999,080	$302,907	$1,146,448	$24,211	
2043	8,394	166,207	$92,000			$807,878		$807,878	$1,024,057	$308,179	$1,478,838	$31,230	
2044	8,604	174,811	$92,000			$828,075		$828,075	$1,049,659	$313,584	$1,823,652	$38,512	
2045	8,819	183,630	$92,000			$848,777		$848,777	$1,075,900	$319,123	$2,181,288	$46,064	
2046	9,040	192,670	$92,000			$869,996		$869,996	$1,102,798	$324,801	$2,552,153	$53,896	
2047	9,266	201,935	$92,000			$891,746		$891,746	$1,130,367	$330,621	$2,936,671	$62,017	
2048	9,497	211,433	$92,000			$914,040		$914,040	$1,158,627	$336,587	$3,335,275	$70,434	
2049	9,735	221,167	$92,000			$936,891		$936,891	$1,187,592	$342,702	$3,748,411	$79,159	
2050	9,978	231,145	$92,000			$960,313		$960,313	$1,217,282	$348,969	$4,176,539	$88,200	
2051	10,228	241,373	$92,000			$984,321		$984,321	$1,247,714	$355,393	$4,620,133	$97,568	
2052	10,483	251,856	$92,000			$1,008,929		$1,008,929	$1,278,907	$361,978	$5,079,679	$107,273	
2053	10,745	262,601	$92,000			$1,034,152		$1,034,152	$1,310,880	$368,728	$5,555,679	$117,325	
2054	11,014	273,615	$92,000			$1,060,006		$1,060,006	$1,343,652	$375,646	$6,048,650	$127,735	
2055	11,289	284,905	$92,000			$1,086,506		$1,086,506	$1,377,243	$382,737	$6,559,123	$138,516	
2056	11,571	296,476	$92,000			$1,113,669		$1,113,669	$1,411,674	$390,006	$7,087,644	$149,677	
2057	11,861	308,337	$92,000			$1,141,510		$1,141,510	$1,446,966	$397,456	$7,634,776	$161,231	
2058	12,157	320,494	$92,000			$1,170,048		$1,170,048	$1,483,140	$405,092	$8,201,100	$173,191	
2059	12,461	332,955	$92,000			$1,199,299		$1,199,299	$1,520,219	$412,919	$8,787,210	$185,568	
2060	12,773	345,728	$92,000			$1,229,282		$1,229,282	$1,558,224	$420,942	$9,393,720	$198,377	
2061	13,092	358,820	$92,000			$1,260,014		$1,260,014	$1,597,180	$429,166	$10,021,263	$211,629	
2062	13,419	372,240	$92,000			$1,291,514		$1,291,514	$1,637,109	$437,595	$10,670,487	$225,339	
2063	13,755	385,995	$92,000			$1,323,802		$1,323,802	$1,678,037	$446,235	$11,342,061	$239,522	
2064	14,099	400,093	$92,000			$1,356,897		$1,356,897	$1,719,988	$455,091	$12,036,674	$254,190	Landfill Capacity Reached
2065				$9,491,300				$9,491,300		-$9,399,300	$2,891,564	$61,064	Landfill Closure Construction
2066					$91,000			$91,000		-$91,000	$2,861,628	$60,432	
2067					$91,000			$91,000		-$91,000	$2,831,060	$59,786	
2068					$91,000			$91,000		-$91,000	$2,799,846	$59,127	
2069					$91,000			$91,000		-$91,000	$2,767,974	$58,454	
2070					$91,000			$91,000		-$91,000	$2,735,428	$57,767	
2071					$91,000			$91,000		-$91,000	$2,702,194	$57,065	
2072					$91,000			$91,000		-$91,000	$2,668,259	$56,348	
2073					$91,000			$91,000		-$91,000	$2,633,608	$55,617	
2074					$91,000			$91,000		-$91,000	$2,598,224	$54,869	
2075					$91,000			$91,000		-$91,000	$2,562,093	$54,106	
2076					$91,000			$91,000		-$91,000	$2,525,200	$53,327	
2077					$91,000			$91,000		-$91,000	$2,487,527	$52,532	
2078					$91,000			$91,000		-$91,000	$2,449,059	$51,719	
2079					$91,000			$91,000		-$91,000	$2,409,778	$50,890	
2080					$91,000			$91,000		-$91,000	$2,369,667	$50,043	
2081					$91,000			$91,000		-$91,000	$2,328,710	$49,178	
2082					$91,000			$91,000		-$91,000	$2,286,888	$48,294	
2083					$91,000			$91,000		-$91,000	$2,244,182	$47,393	
2084					$91,000			$91,000		-$91,000	$2,200,575	$46,472	
2085					$91,000			$91,000		-$91,000	$2,156,047	$45,531	
2086					$91,000			$91,000		-$91,000	$2,110,578	$44,571	
2087					$91,000			$91,000		-$91,000	$2,064,149	$43,591	
2088					$91,000			$91,000		-$91,000	$2,016,740	$42,590	
2089					$91,000			$91,000		-$91,000	$1,968,329	$41,567	
2090					$91,000			$91,000		-$91,000	$1,918,897	$40,523	
2091					$91,000			$91,000		-$91,000	$1,868,420	$39,457	
2092					$91,000			$91,000		-$91,000	$1,816,877	$38,369	
2093					$91,000			$91,000		-$91,000	$1,764,246	$37,257	
2094					$91,000			$91,000		-$91,000	$1,710,503	$36,122	
2095					$91,000			$91,000		-$91,000	$1,655,626	$34,964	
2096					$45,500			$45,500		-$45,500	$1,645,089	$34,741	
2097					$45,500			$45,500		-$45,500	$1,634,330	$34,514	
2098					$45,500			$45,500		-$45,500	$1,623,344	$34,282	
2099					$45,500			$45,500		-$45,500	$1,612,126	$34,045	
2100					$45,500			$45,500		-$45,500	$1,600,671	$33,803	
2101					$45,500			$45,500		-$45,500	$1,588,974	$33,556	
2102					$45,500			$45,500		-$45,500	$1,577,030	$33,304	
2103					$45,500			$45,500		-$45,500	$1,564,833	$33,046	
2104					$45,500			$45,500		-$45,500	$1,552,379	$32,783	
2105					$45,500			$45,500		-$45,500	$1,539,663	$32,515	
2106					$45,500			$45,500		-$45,500	$1,526,677	$32,240	
2107					$45,500			$45,500		-$45,500	$1,513,418	$31,960	
2108					$45,500			$45,500		-$45,500	$1,499,878	$31,674	
2109					$45,500			$45,500		-$45,500	$1,486,052	$31,382	
2110					$45,500			$45,500		-$45,500	$1,471,935	$31,084	
2111					$45,500			$45,500		-$45,500	$1,457,519	$30,780	
2112					$45,500			$45,500		-$45,500	$1,442,799	$30,469	
2113					$45,500			$45,500		-$45,500	$1,427,768	$30,152	
2114					$45,500			$45,500		-$45,500	$1,412,420	$29,827	
2115					$45,500			$45,500		-$45,500	$1,396,747	$29,497	
2116					$45,500			$45,500		-$45,500	$1,380,744	$29,159	
2117					$45,500			$45,500		-$45,500	$1,364,402	$28,813	
2118					$45,500			$45,500		-$45,500	$1,347,716	$28,461	
2119					$45,500			$45,500		-$45,500	$1,330,677	$28,101	
2120					$45,500			$45,500		-$45,500	$1,313,278	$27,734	
2121					$45,500			$45,500		-$45,500	$1,295,512	$27,359	
2122					$45,500			$45,500		-$45,500	$1,277,370	$26,976	
2123					$45,500			$45,500		-$45,500	$1,258,846	$26,584	
2124					$45,500			$45,500		-$45,500	$1,239,930	$26,185	
2125					$45,500			$45,500		-$45,500	$1,220,615	$25,777	
2126					$45,500			$45,500		-$45,500	$1,200,892	$25,360	
2127					$45,500			$45,500		-$45,500	$1,180,752	$24,935	
2128					$45,500			$45,500		-$45,500	$1,160,188	$24,501	
2129					$45,500			$45,500		-$45,500	$1,139,188	$24,057	
2130					$45,500			$45,500		-$45,500	$1,117,746	$23,605	
2131					$45,500			$45,500		-$45,500	$1,095,850	$23,142	
2132					$45,500			$45,500		-$45,500	$1,073,492	$22,670	
2133					$45,500			$45,500		-$45,500	$1,050,662	$22,188	
2134					$45,500			$45,500		-$45,500	$1,027,350	$21,696	
2135					$45,500			$45,500		-$45,500	$1,003,546	$21,193	
2136					$45,500			$45,500		-$45,500	$979,239	$20,680	
2137					$45,500			$45,500		-$45,500	$954,418	$20,155	
2138					$45,500			$45,500		-$45,500	$929,074	$19,620	
2139					$45,500			$45,500		-$45,500	$903,194	$19,074	
2140					$45,500			$45,500		-$45,500	$876,768	$18,516	
2141					$45,500			$45,500		-$45,500	$849,783	$17,946	
2142					$45,500			$45,500		-$45,500	$822,229	$17,364	
2143					$45,500			$45,500		-$45,500	$794,093	$16,770	
2144					$45,500			$45,500		-$45,500	$765,362	$16,163	
2145					$45,500			$45,500		-$45,500	$736,025	$15,543	
2146					$45,500			$45,500		-$45,500	$706,069	$14,911	
2147					$45,500			$45,500		-$45,500	$675,480	$14,265	
2148					$45,500			$45,500		-$45,500	$644,244	$13,605	
2149					$45,500			$45,500		-$45,500	$612,349	$12,932	
2150					$45,500			$45,500		-$45,500	$579,781	$12,244	
2151					$45,500			$45,500		-$45,500	$546,525	$11,542	
2152					$45,500			$45,500		-$45,500	$512,566	$10,824	
2153					$45,500			$45,500		-$45,500	$477,891	$10,092	
2154					$45,500			$45,500		-$45,500	$442,483	$9,344	
2155					$45,500			$45,500		-$45,500	$406,327	$8,581	
2156					$45,500			$45,500		-$45,500	$369,408	$7,801	
2157					$45,500			$45,500		-$45,500	$331,709	$7,005	
2158					$45,500			$45,500		-$45,500	$293,214	$6,192	
2159					$45,500			$45,500		-$45,500	$253,906	$5,362	
2160					$45,500			$45,500		-$45,500	$213,768	$4,514	
2161					$45,500			$45,500		-$45,500	$172,783	$3,649	
2162					$45,500			$45,500		-$45,500	$130,931	$2,765	
2163					$45,500			$45,500		-$45,500	$88,196	$1,863	
2164					$45,500			$45,500		-$45,500	$44,559	$941	
2165					$45,500			$45,500		-$45,500	$0	$0	
	394,056		$5,027,858	$9,491,300	$5,915,000	$38,192,127	$4,004,815	$57,603,242	$47,306,286	-$5,269,098		$5,269,098	

	Total Cost	$/tonne	%
Total Revenues	$52,334,144	$132.81	100%
Interest Revenues	$5,269,098	$13.37	10%
Total Landfilling Cost	$57,603,242	$146.18	110%
Total Capital Cost	$4,004,815	$10.16	8%
Total Operating Expenses	$38,192,127	$96.92	73%
Total Closure Cost	$9,491,300	$24.09	18%
Total Post Closure Cost	$5,915,000	$15.01	11%

Break Even Tipping Fee: 122.00

Table 6 - Cashflow Analysis- Transfer Station Existing Conditions

			EXPENSE								REQUIRED REVENUE				
Year	Total Waste Dispoal (tonnes/yr)	Cumulative Waste Disposal (tonnes)	Closure Reserve Sinking Fund ($/yr)	Closure Cost ($/yr)	Post-Closure Cost ($/yr)	Landfill Operations Cost ($/yr)	Transfer Station Operations Cost ($/yr)	Haul Cost ($/yr)	Capital Costs ($/yr)	Total Cost ($/yr)	Tipping Fee Revenue ($/yr)	Net Revenue ($/yr)	Cumulative Net Revenue ($)	Interest ($/yr)	Notes
2018	6,037	6,037													
2019	6,287	12,324	$859,858												
2020	6,343	18,666	$120,000			$661,000				$661,000	$736,551	$935,409	$935,409	$19,754	
2021	6,501	25,168	$92,000			$635,300				$635,300	$754,965	$239,665	$1,194,828	$25,232	
2022	6,664	31,831	$92,000			$647,900			$800,000	$1,447,900	$773,839	-$582,061	$637,999	$13,473	WCL Transfer Station Construction
2023	6,830	38,662		$6,466,600			$398,192	$310,437		$7,175,229	$793,185	-$6,290,044	-$5,638,571	-$119,075	Landfill Closure Construction
2024	7,001	45,663			$62,000		$398,192	$318,198		$778,390	$813,015	$34,625	-$5,723,022	-$120,859	
2025	7,176	52,839			$62,000		$398,192	$326,153		$786,345	$833,340	$46,995	-$5,796,885	-$122,419	
2026	7,355	60,194			$62,000		$398,192	$334,306		$794,498	$854,173	$59,675	-$5,859,629	-$123,744	
2027	7,539	67,734			$62,000		$398,192	$342,664		$802,856	$875,528	$72,672	-$5,910,701	-$124,822	
2028	7,728	75,461			$62,000		$398,192	$351,231		$811,423	$897,416	$85,993	-$5,949,530	-$125,642	
2029	7,921	83,383			$62,000		$398,192	$360,011		$820,203	$919,851	$99,648	-$5,975,524	-$126,191	
2030	8,119	91,502			$62,000		$398,192	$369,012		$829,204	$942,848	$113,644	-$5,988,071	-$126,456	
2031	8,322	99,824			$62,000		$398,192	$378,237		$838,429	$966,419	$127,990	-$5,986,538	-$126,424	
2032	8,530	108,354			$62,000		$398,192	$387,693		$847,885	$990,579	$142,694	-$5,970,267	-$126,080	
2033	8,743	117,097			$62,000		$398,192	$397,385		$857,577	$1,015,344	$157,767	-$5,938,580	-$125,411	
2034	8,962	126,059			$62,000		$398,192	$407,320		$867,512	$1,040,727	$173,215	-$5,890,776	-$124,401	
2035	9,186	135,245			$62,000		$398,192	$417,503		$877,695	$1,066,745	$189,051	-$5,826,127	-$123,036	
2036	9,416	144,661			$62,000		$398,192	$427,940		$888,132	$1,093,414	$205,282	-$5,743,881	-$121,299	
2037	9,651	154,312			$62,000		$398,192	$438,639		$898,831	$1,120,749	$221,919	-$5,643,262	-$119,174	
2038	9,892	164,204			$62,000		$398,192	$449,605		$909,797	$1,148,768	$238,971	-$5,523,465	-$116,645	
2039	10,140	174,344			$62,000		$398,192	$460,845		$921,037	$1,177,487	$256,450	-$5,383,659	-$113,692	
2040	10,393	184,737			$62,000		$398,192	$472,366		$932,558	$1,206,925	$274,366	-$5,222,985	-$110,299	
2041	10,653	195,390			$62,000		$398,192	$484,175		$944,367	$1,237,098	$292,730	-$5,040,553	-$106,446	
2042	10,919	206,309			$62,000		$398,192	$496,280		$956,472	$1,268,025	$311,554	-$4,835,446	-$102,115	
2043	11,192	217,501			$62,000		$398,192	$508,687		$968,879	$1,299,726	$330,847	-$4,606,714	-$97,285	
2044	11,472	228,974			$62,000		$398,192	$521,404		$981,596	$1,332,219	$350,623	-$4,353,375	-$91,935	
2045	11,759	240,732			$62,000		$398,192	$534,439		$994,631	$1,365,524	$370,893	-$4,074,416	-$86,044	
2046	12,053	252,785			$62,000		$398,192	$547,800		$1,007,992	$1,399,663	$391,671	-$3,768,789	-$79,589	
2047	12,354	265,139			$62,000		$398,192	$561,495		$1,021,687	$1,434,654	$412,967	-$3,435,411	-$72,549	
2048	12,663	277,802			$62,000		$398,192	$575,532		$1,035,724	$1,470,520	$434,796	-$3,073,164	-$64,899	
2049	12,980	290,782			$62,000		$398,192	$589,921		$1,050,113	$1,507,283	$457,171	-$2,680,892	-$56,615	
2050	13,304	304,086			$62,000		$398,192	$604,669		$1,064,861	$1,544,966	$480,105	-$2,257,403	-$47,672	
2051	13,637	317,723			$62,000		$398,192	$619,785		$1,079,977	$1,583,590	$503,612	-$1,801,462	-$38,043	
2052	13,978	331,700			$62,000		$398,192	$635,280		$1,095,472	$1,623,179	$527,707	-$1,311,798	-$27,703	
2053	14,327	346,027			$62,000		$398,192	$651,162		$1,111,354	$1,663,759	$552,405	-$787,095	-$16,622	
2054	14,685	360,713			$31,000		$398,192	$667,441		$1,096,633	$1,705,353	$608,720	-$194,997	-$4,118	
2055	15,052	375,765			$31,000		$398,192	$684,127		$1,113,319	$1,747,987	$634,668	$435,552	$9,198	
2056	15,429	391,194			$31,000		$398,192	$701,230		$1,130,422	$1,791,686	$661,264	$1,106,015	$23,357	Year when landfill would have closed in Scenario 1
2057					$31,000					$31,000		-$31,000	$1,098,371	$23,195	
2058					$31,000					$31,000		-$31,000	$1,090,567	$23,031	
2059					$31,000					$31,000		-$31,000	$1,082,597	$22,862	
2060					$31,000					$31,000		-$31,000	$1,074,460	$22,690	
2061					$31,000					$31,000		-$31,000	$1,066,150	$22,515	
2062					$31,000					$31,000		-$31,000	$1,057,665	$22,336	
2063					$31,000					$31,000		-$31,000	$1,049,001	$22,153	
2064					$31,000					$31,000		-$31,000	$1,040,154	$21,966	
2065					$31,000					$31,000		-$31,000	$1,031,120	$21,775	
2066					$31,000					$31,000		-$31,000	$1,021,895	$21,580	
2067					$31,000					$31,000		-$31,000	$1,012,475	$21,381	
2068					$31,000					$31,000		-$31,000	$1,002,857	$21,178	
2069					$31,000					$31,000		-$31,000	$993,035	$20,971	
2070					$31,000					$31,000		-$31,000	$983,006	$20,759	
2071					$31,000					$31,000		-$31,000	$972,765	$20,543	
2072					$31,000					$31,000		-$31,000	$962,308	$20,322	
2073					$31,000					$31,000		-$31,000	$951,630	$20,097	
2074					$31,000					$31,000		-$31,000	$940,726	$19,866	
2075					$31,000					$31,000		-$31,000	$929,593	$19,631	
2076					$31,000					$31,000		-$31,000	$918,224	$19,391	
2077					$31,000					$31,000		-$31,000	$906,615	$19,146	
2078					$31,000					$31,000		-$31,000	$894,761	$18,896	
2079					$31,000					$31,000		-$31,000	$882,656	$18,640	
2080					$31,000					$31,000		-$31,000	$870,296	$18,379	
2081					$31,000					$31,000		-$31,000	$857,675	$18,112	
2082					$31,000					$31,000		-$31,000	$844,788	$17,840	
2083					$31,000					$31,000		-$31,000	$831,628	$17,562	
2084					$31,000					$31,000		-$31,000	$818,190	$17,279	
2085					$31,000					$31,000		-$31,000	$804,469	$16,989	
2086					$31,000					$31,000		-$31,000	$790,457	$16,693	
2087					$31,000					$31,000		-$31,000	$776,150	$16,391	
2088					$31,000					$31,000		-$31,000	$761,541	$16,082	
2089					$31,000					$31,000		-$31,000	$746,623	$15,767	
2090					$31,000					$31,000		-$31,000	$731,390	$15,446	
2091					$31,000					$31,000		-$31,000	$715,836	$15,117	
2092					$31,000					$31,000		-$31,000	$699,953	$14,782	
2093					$31,000					$31,000		-$31,000	$683,735	$14,439	
2094					$31,000					$31,000		-$31,000	$667,174	$14,089	
2095					$31,000					$31,000		-$31,000	$650,263	$13,732	
2096					$31,000					$31,000		-$31,000	$632,995	$13,368	
2097					$31,000					$31,000		-$31,000	$615,363	$12,995	
2098					$31,000					$31,000		-$31,000	$597,358	$12,615	
2099					$31,000					$31,000		-$31,000	$578,973	$12,227	
2100					$31,000					$31,000		-$31,000	$560,200	$11,830	
2101					$31,000					$31,000		-$31,000	$541,030	$11,425	
2102					$31,000					$31,000		-$31,000	$521,456	$11,012	
2103					$31,000					$31,000		-$31,000	$501,468	$10,590	
2104					$31,000					$31,000		-$31,000	$481,058	$10,159	
2105					$31,000					$31,000		-$31,000	$460,217	$9,719	
2106					$31,000					$31,000		-$31,000	$438,936	$9,269	
2107					$31,000					$31,000		-$31,000	$417,205	$8,811	
2108					$31,000					$31,000		-$31,000	$395,016	$8,342	
2109					$31,000					$31,000		-$31,000	$372,358	$7,863	
2110					$31,000					$31,000		-$31,000	$349,221	$7,375	
2111					$31,000					$31,000		-$31,000	$325,596	$6,876	
2112					$31,000					$31,000		-$31,000	$301,472	$6,366	
2113					$31,000					$31,000		-$31,000	$276,838	$5,846	
2114					$31,000					$31,000		-$31,000	$251,685	$5,315	
2115					$31,000					$31,000		-$31,000	$226,000	$4,773	
2116					$31,000					$31,000		-$31,000	$199,772	$4,219	
2117					$31,000					$31,000		-$31,000	$172,991	$3,653	
2118					$31,000					$31,000		-$31,000	$145,644	$3,076	
2119					$31,000					$31,000		-$31,000	$117,720	$2,486	
2120					$31,000					$31,000		-$31,000	$89,206	$1,884	
2121					$31,000					$31,000		-$31,000	$60,090	$1,269	
2122					$31,000					$31,000		-$31,000	$30,359	$641	
2123					$31,000					$31,000		-$31,000	$0	$0	
	385,157		**$1,163,858**	**$6,466,600**	**$4,030,000**	**$1,944,200**	**$13,538,528**	**$16,332,970**	**$800,000**	**$43,112,298**	**$43,997,100**	**$2,048,661**		**-$2,048,661**	

	Total Cost	$/tonne	%
Total Revenues	$45,160,958	$117.25	100%
Interest Revenues	-$2,048,661	-$5.32	-5%
Total Cost	$43,112,298	$111.93	95%
Total Capital Cost	$800,000	$2.08	2%
Total Haul Cost	$16,332,970	$42.41	36%
Total Transfer Station Operating Expenses	$13,538,528	$35.15	30%
Total Landfill Operating Expenses	$1,944,200	$5.05	4%
Total Closure Cost	$6,466,600	$16.79	14%
Total Post Closure Cost	$4,030,000	$10.46	9%

Break Even Tipping Fee: 116.13

Table 7 - Cashflow Analysis- Transfer Station 25% Organics Diversion

			EXPENSE								REQUIRED REVENUE				
Year	Total Waste Dispoal (tonnes/yr)	Cumulative Waste Disposal (tonnes)	Closure Reserve Sinking Fund ($/yr)	Closure Cost ($/yr)	Post-Closure Cost ($/yr)	Landfill Operations Cost ($/yr)	Transfer Station Operations Cost ($/yr)	Haul Cost ($/yr)	Capital Costs ($/yr)	Total Cost ($/yr)	Tipping Fee Revenue ($/yr)	Net Revenue ($/yr)	Cumulative Net Revenue ($)	Interest ($/yr)	Notes
2018	6,037	144,000													
2019	6,287	150,287	$859,858												
2020	4,757	155,044	$120,000			$661,000				$661,000	$619,686	$818,544	$818,544	$17,286	
2021	4,876	159,920	$92,000			$635,300				$635,300	$635,178	$119,878	$955,707	$20,183	
2022	4,998	164,917	$92,000			$647,900			$800,000	$1,447,900	$651,057	-$704,843	$271,047	$5,724	WCL Transfer Station Construction
2023	5,123	170,040		$6,466,600			$398,192	$242,268		$7,107,060	$667,334	-$6,347,727	-$6,070,956	-$128,206	Landfill Closure Construction
2024	5,251	175,291			$62,000		$398,192	$248,325		$708,517	$684,017	-$24,500	-$6,223,662	-$131,431	
2025	5,382	180,673			$62,000		$398,192	$254,533		$714,725	$701,117	-$13,608	-$6,368,702	-$134,494	
2026	5,517	186,190			$62,000		$398,192	$260,897		$721,089	$718,645	-$2,443	-$6,505,639	-$137,386	
2027	5,655	191,844			$62,000		$398,192	$267,419		$727,611	$736,611	$9,000	-$6,634,025	-$140,097	
2028	5,796	197,640			$62,000		$398,192	$274,104		$734,296	$755,027	$20,730	-$6,753,392	-$142,618	
2029	5,941	203,581			$62,000		$398,192	$280,957		$741,149	$773,902	$32,753	-$6,863,257	-$144,938	
2030	6,089	209,670			$62,000		$398,192	$287,981		$748,173	$793,250	$45,077	-$6,963,118	-$147,047	
2031	6,242	215,912			$62,000		$398,192	$295,180		$755,372	$813,081	$57,709	-$7,052,457	-$148,934	
2032	6,398	222,309			$62,000		$398,192	$302,560		$762,752	$833,408	$70,656	-$7,130,734	-$150,587	
2033	6,558	228,867			$62,000		$398,192	$310,124		$770,316	$854,243	$83,927	-$7,197,394	-$151,995	
2034	6,721	235,588			$62,000		$398,192	$317,877		$778,069	$875,599	$97,530	-$7,251,858	-$153,145	
2035	6,890	242,478			$62,000		$398,192	$325,824		$786,016	$897,489	$111,473	-$7,293,529	-$154,025	
2036	7,062	249,540			$62,000		$398,192	$333,970		$794,162	$919,927	$125,765	-$7,321,789	-$154,622	
2037	7,238	256,778			$62,000		$398,192	$342,319		$802,511	$942,925	$140,414	-$7,335,996	-$154,922	
2038	7,419	264,197			$62,000		$398,192	$350,877		$811,069	$966,498	$155,429	-$7,335,489	-$154,911	
2039	7,605	271,802			$62,000		$398,192	$359,649		$819,841	$990,660	$170,820	-$7,319,580	-$154,575	
2040	7,795	279,597			$62,000		$398,192	$368,640		$828,832	$1,015,427	$186,595	-$7,287,560	-$153,899	
2041	7,990	287,586			$62,000		$398,192	$377,856		$838,048	$1,040,813	$202,765	-$7,238,694	-$152,867	
2042	8,189	295,776			$62,000		$398,192	$387,302		$847,494	$1,066,833	$219,339	-$7,172,222	-$151,463	
2043	8,394	304,170			$62,000		$398,192	$396,985		$857,177	$1,093,504	$236,327	-$7,087,359	-$149,671	
2044	8,604	312,774			$62,000		$398,192	$406,910		$867,102	$1,120,841	$253,740	-$6,983,290	-$147,473	
2045	8,819	321,593			$62,000		$398,192	$417,082		$877,274	$1,148,862	$271,588	-$6,859,175	-$144,852	
2046	9,040	330,633			$62,000		$398,192	$427,509		$887,701	$1,177,584	$289,883	-$6,714,144	-$141,789	
2047	9,266	339,898			$62,000		$398,192	$438,197		$898,389	$1,207,024	$308,634	-$6,547,299	-$138,266	
2048	9,497	349,396			$62,000		$398,192	$449,152		$909,344	$1,237,199	$327,855	-$6,357,710	-$134,262	
2049	9,735	359,130			$62,000		$398,192	$460,381		$920,573	$1,268,129	$347,556	-$6,144,416	-$129,758	
2050	9,978	369,108			$62,000		$398,192	$471,890		$932,082	$1,299,832	$367,750	-$5,906,423	-$124,732	
2051	10,228	379,336			$62,000		$398,192	$483,688		$943,880	$1,332,328	$388,449	-$5,642,707	-$119,163	
2052	10,483	389,819			$62,000		$398,192	$495,780		$955,972	$1,365,636	$409,665	-$5,352,205	-$113,028	
2053	10,745	400,564			$62,000		$398,192	$508,174		$968,366	$1,399,777	$431,411	-$5,033,822	-$106,304	
2054	11,014	411,578			$31,000		$398,192	$520,879		$950,071	$1,434,772	$484,701	-$4,655,425	-$98,313	
2055	11,289	422,868			$31,000		$398,192	$533,901		$963,093	$1,470,641	$507,548	-$4,246,190	-$89,671	
2056	11,571	434,439			$31,000		$398,192	$547,248		$976,440	$1,507,407	$530,967	-$3,804,894	-$80,352	
2057	11,861	446,300			$31,000		$398,192	$560,929		$990,121	$1,545,092	$554,971	-$3,330,275	-$70,329	
2058	12,157	458,457			$31,000		$398,192	$574,953		$1,004,145	$1,583,719	$579,575	-$2,821,029	-$59,574	
2059	12,461	470,918			$31,000		$398,192	$589,326		$1,018,518	$1,623,312	$604,794	-$2,275,809	-$48,061	
2060	12,773	483,691			$31,000		$398,192	$604,060		$1,033,252	$1,663,895	$630,644	-$1,693,226	-$35,758	
2061	13,092	496,783			$31,000		$398,192	$619,161		$1,048,353	$1,705,493	$657,140	-$1,071,844	-$22,635	
2062	13,419	510,203			$31,000		$398,192	$634,640		$1,063,832	$1,748,130	$684,298	-$410,181	-$8,662	
2063	13,755	523,958			$31,000		$398,192	$650,506		$1,079,698	$1,791,833	$712,135	$293,292	$6,194	
2064	14,099	538,056			$31,000		$398,192	$666,769		$1,095,961	$1,836,629	$740,668	$1,040,154	$21,966	Year when landfill would have closed in Scenario 2
2065					$31,000					$31,000		-$31,000	$1,031,120	$21,775	
2066					$31,000					$31,000		-$31,000	$1,021,895	$21,580	
2067					$31,000					$31,000		-$31,000	$1,012,475	$21,381	
2068					$31,000					$31,000		-$31,000	$1,002,857	$21,178	
2069					$31,000					$31,000		-$31,000	$993,035	$20,971	
2070					$31,000					$31,000		-$31,000	$983,006	$20,759	
2071					$31,000					$31,000		-$31,000	$972,765	$20,543	
2072					$31,000					$31,000		-$31,000	$962,308	$20,322	
2073					$31,000					$31,000		-$31,000	$951,630	$20,097	
2074					$31,000					$31,000		-$31,000	$940,726	$19,866	
2075					$31,000					$31,000		-$31,000	$929,593	$19,631	
2076					$31,000					$31,000		-$31,000	$918,224	$19,391	
2077					$31,000					$31,000		-$31,000	$906,615	$19,146	
2078					$31,000					$31,000		-$31,000	$894,761	$18,896	
2079					$31,000					$31,000		-$31,000	$882,656	$18,640	
2080					$31,000					$31,000		-$31,000	$870,296	$18,379	
2081					$31,000					$31,000		-$31,000	$857,675	$18,112	
2082					$31,000					$31,000		-$31,000	$844,788	$17,840	
2083					$31,000					$31,000		-$31,000	$831,628	$17,562	
2084					$31,000					$31,000		-$31,000	$818,190	$17,279	
2085					$31,000					$31,000		-$31,000	$804,469	$16,989	
2086					$31,000					$31,000		-$31,000	$790,457	$16,693	
2087					$31,000					$31,000		-$31,000	$776,150	$16,391	
2088					$31,000					$31,000		-$31,000	$761,541	$16,082	
2089					$31,000					$31,000		-$31,000	$746,623	$15,767	
2090					$31,000					$31,000		-$31,000	$731,390	$15,446	
2091					$31,000					$31,000		-$31,000	$715,836	$15,117	
2092					$31,000					$31,000		-$31,000	$699,953	$14,782	
2093					$31,000					$31,000		-$31,000	$683,735	$14,439	
2094					$31,000					$31,000		-$31,000	$667,174	$14,089	
2095					$31,000					$31,000		-$31,000	$650,263	$13,732	
2096					$31,000					$31,000		-$31,000	$632,995	$13,368	
2097					$31,000					$31,000		-$31,000	$615,363	$12,995	
2098					$31,000					$31,000		-$31,000	$597,358	$12,615	
2099					$31,000					$31,000		-$31,000	$578,973	$12,227	
2100					$31,000					$31,000		-$31,000	$560,200	$11,830	
2101					$31,000					$31,000		-$31,000	$541,030	$11,425	
2102					$31,000					$31,000		-$31,000	$521,456	$11,012	
2103					$31,000					$31,000		-$31,000	$501,468	$10,590	
2104					$31,000					$31,000		-$31,000	$481,058	$10,159	
2105					$31,000					$31,000		-$31,000	$460,217	$9,719	
2106					$31,000					$31,000		-$31,000	$438,936	$9,269	
2107					$31,000					$31,000		-$31,000	$417,205	$8,811	
2108					$31,000					$31,000		-$31,000	$395,016	$8,342	
2109					$31,000					$31,000		-$31,000	$372,358	$7,863	
2110					$31,000					$31,000		-$31,000	$349,221	$7,375	
2111					$31,000					$31,000		-$31,000	$325,596	$6,876	
2112					$31,000					$31,000		-$31,000	$301,472	$6,366	
2113					$31,000					$31,000		-$31,000	$276,838	$5,846	
2114					$31,000					$31,000		-$31,000	$251,685	$5,315	
2115					$31,000					$31,000		-$31,000	$226,000	$4,773	
2116					$31,000					$31,000		-$31,000	$199,772	$4,219	
2117					$31,000					$31,000		-$31,000	$172,991	$3,653	
2118					$31,000					$31,000		-$31,000	$145,644	$3,076	
2119					$31,000					$31,000		-$31,000	$117,720	$2,486	
2120					$31,000					$31,000		-$31,000	$89,206	$1,884	
2121					$31,000					$31,000		-$31,000	$60,090	$1,269	
2122					$31,000					$31,000		-$31,000	$30,359	$641	
2123					$31,000					$31,000		-$31,000	$0	$0	
	394,056		**$1,163,858**	**$6,466,600**	**$4,030,000**	**$1,944,200**	**$16,724,064**	**$17,646,782**	**$800,000**	**$47,611,646**	**$50,514,369**	**$4,066,581**		**-$4,066,581**	

	Total Cost	$/tonne	%
Total Revenues	$51,678,227	$131.14	100%
Interest Revenues	-$4,066,581	-$10.32	-8%
Total Cost	$47,611,646	$120.82	92%
Total Capital Cost	$800,000	$2.03	2%
Total Haul Cost	$17,646,782	$44.78	34%
Total Transfer Station Operating Expenses	$16,724,064	$42.44	32%
Total Landfill Operating Expenses	$1,944,200	$4.93	4%
Total Closure Cost	$6,466,600	$16.41	13%
Total Post Closure Cost	$4,030,000	$10.23	8%

Break Even Tipping Fee: 130.27

Table 8: Lifecycle Cost Assessment Summary

Disposal Option	Landfill Development - Existing Conditions	Landfill Development - 25% Organics Diversion	Transfer Station - Existing Conditions	Transfer Station - 25% Organics Diversion
Revenue[1] ($Millions)	55.94	57.60	43.11	47.61
Closure Reserve Fund ($Millions)	4.29	5.03	1.16	1.16
Closure Costs ($Millions)	9.49	9.49	6.47	6.47
Capital Costs ($Millions)	4.00	4.00	0.80	0.80
Landfill Operating Expenses ($Millions)	36.53	38.19	1.94	1.94
Transfer Station Operating Expenses ($Millions)	-	-	13.54	16.72
Haul Costs ($Millions)	-	-	16.33	17.65
Post Closure Cost ($Millions)	5.92	5.92	4.03	4.03
Total Cost ($Millions)	55.94	57.60	43.11	47.61
Operating Cost per Tonne ($/tonne)	$94.85	$96.92	$82.60	$92.16
Break Even Tipping Fee ($/tonne)	$121.77	$122.00	$116.13	$130.27
AVL Tipping Fee ($/tonne)	-	-	$89.64	$89.64
Total Cost per Tonne ($/tonne)	$121.77	$122.00	$205.77	$219.91

1. Includes interest from closure reserve fund

Table 9 - Haul Analysis GHG Emissions
Transfer Station Scenario (25% Organics Diversion)

Year	Waste Requiring Transfer (tonnes/yr)	Round Trips per Year	Haul Distance Round Trip (km/yr)	Fuel Usage (L/year)	Total GHG Emissions (tonnes CO_{2E}/yr)
2020	4,757	250	50,073	19,620	51.4
2021	4,876	257	51,325	20,111	52.7
2022	4,998	263	52,608	20,614	54.0
2023	5,123	270	53,924	21,129	55.4
2024	5,251	276	55,272	21,657	56.7
2025	5,382	283	56,653	22,199	58.2
2026	5,517	290	58,070	22,754	59.6
2027	5,655	298	59,521	23,322	61.1
2028	5,796	305	61,010	23,906	62.6
2029	5,941	313	62,535	24,503	64.2
2030	6,089	320	64,098	25,116	65.8
2031	6,242	329	65,701	25,744	67.4
2032	6,398	337	67,343	26,387	69.1
2033	6,558	345	69,027	27,047	70.9
2034	6,721	354	70,752	27,723	72.6
2035	6,890	363	72,521	28,416	74.5
2036	7,062	372	74,334	29,127	76.3
2037	7,238	381	76,193	29,855	78.2
2038	7,419	390	78,097	30,601	80.2
2039	7,605	400	80,050	31,366	82.2
2040	7,795	410	82,051	32,150	84.2
2041	7,990	421	84,102	32,954	86.3
2042	8,189	431	86,205	33,778	88.5
2043	8,394	442	88,360	34,622	90.7
2044	8,604	453	90,569	35,488	93.0
2045	8,819	464	92,833	36,375	95.3
2046	9,040	476	95,154	37,285	97.7
2047	9,266	488	97,533	38,217	100.1
2048	9,497	500	99,971	39,172	102.6
2049	9,735	512	102,470	40,151	105.2
2050	9,978	525	105,032	41,155	107.8
2051	10,228	538	107,658	42,184	110.5
2052	10,483	552	110,349	43,239	113.3
2053	10,745	566	113,108	44,320	116.1
2054	11,014	580	115,936	45,428	119.0
2055	11,289	594	118,834	46,563	122.0
2056	11,571	609	121,805	47,727	125.0
2057	11,861	624	124,850	48,921	128.2
2058	12,157	640	127,972	50,144	131.4
2059	12,461	656	131,171	51,397	134.7
2060	12,773	672	134,450	52,682	138.0
2061	13,092	689	137,811	53,999	141.5
2062	13,419	706	141,257	55,349	145.0
2063	13,755	724	144,788	56,733	148.6
2064	14,099	742	148,408	58,151	152.4
Total	**378,137**	**19,902**	**3,980,386**	**1,559,648**	**4086.3**

Assumptions

Capacity per Haul	19	tonnes
One way trip distance	100	km
Fuel Efficiency	39.18	L/100 km
GHG Emissions	0.00262	tonnes CO_{2E}/L

Table 10 - GHG Assessment Results Summary

	Scenario 1 - WCL Closure in 2064		**Scenario 2 - AVL + WCL Waste Until 2064**			
Year	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Haul GHG Emissions (tonnes CO_{2E})	Total GHG Emissions (tonnes CO_{2E})
2022	5	105	5	105	54	159
2023	30	630	30	630	55	685
2024	50	1,050	50	1,050	57	1,107
2025	67	1,407	67	1,407	58	1,465
2026	83	1,743	83	1,743	60	1,803
2027	96	2,016	96	2,016	61	2,077
2028	108	2,268	108	2,268	63	2,331
2029	119	2,499	119	2,499	64	2,563
2030	130	2,730	130	2,730	66	2,796
2031	140	2,940	140	2,940	67	3,007
2032	149	3,129	149	3,129	69	3,198
2033	158	3,318	158	3,318	71	3,389
2034	167	3,507	167	3,507	73	3,580
2035	176	3,696	176	3,696	74	3,770
2036	184	3,864	184	3,864	76	3,940
2037	193	4,053	193	4,053	78	4,131
2038	201	4,221	201	4,221	80	4,301
2039	209	4,389	209	4,389	82	4,471
2040	217	4,557	217	4,557	84	4,641
2041	226	4,746	226	4,746	86	4,832
2042	234	4,914	234	4,914	88	5,002
2043	242	5,082	242	5,082	91	5,173
2044	250	5,250	250	5,250	93	5,343
2045	259	5,439	259	5,439	95	5,534
2046	267	5,607	267	5,607	98	5,705
2047	276	5,796	276	5,796	100	5,896
2048	284	5,964	284	5,964	103	6,067
2049	293	6,153	293	6,153	105	6,258
2050	302	6,342	302	6,342	108	6,450
2051	311	6,531	311	6,531	111	6,642
2052	320	6,720	320	6,720	113	6,833
2053	329	6,909	329	6,909	116	7,025
2054	338	7,098	338	7,098	119	7,217
2055	348	7,308	348	7,308	122	7,430
2056	357	7,497	357	7,497	125	7,622
2057	367	7,707	367	7,707	128	7,835
2058	377	7,917	377	7,917	131	8,048
2059	387	8,127	387	8,127	135	8,262
2060	398	8,358	398	8,358	138	8,496
2061	409	8,589	409	8,589	141	8,730
2062	419	8,799	419	8,799	145	8,944
2063	431	9,051	431	9,051	149	9,200
2064	442	9,282	442	9,282	152	9,434
Sub Total	**10,348**	**217,308**	**10,348**	**217,308**	**4,086**	**221,394**
	Landfill Closure		Active LFG System Installed with 75% Collection Efficiency			
2065	440	9,240	110	2,310	0	2,310
2066	380	7,980	95	1,995	0	1,995
2067	333	6,993	83	1,748	0	1,748
2068	295	6,195	74	1,549	0	1,549
2069	264	5,544	66	1,386	0	1,386
2070	238	4,998	60	1,250	0	1,250
2071	216	4,536	54	1,134	0	1,134
2072	197	4,137	49	1,034	0	1,034
2073	181	3,801	45	950	0	950
2074	167	3,507	42	877	0	877
2075	154	3,234	39	809	0	809
2076	143	3,003	36	751	0	751
2077	132	2,772	33	693	0	693
2078	123	2,583	31	646	0	646
2079	114	2,394	29	599	0	599

	Scenario 1 - WCL Closure in 2064		Scenario 2 - AVL + WCL Waste Until 2064			
Year	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Haul GHG Emissions (tonnes CO_{2E})	Total GHG Emissions (tonnes CO_{2E})
2080	106	2,226	27	557	0	557
2081	99	2,079	25	520	0	520
2082	92	1,932	23	483	0	483
2083	86	1,806	22	452	0	452
2084	80	1,680	20	420	0	420
2085	75	1,575	19	394	0	394
2086	70	1,470	18	368	0	368
2087	65	1,365	16	341	0	341
2088	61	1,281	15	320	0	320
2089	57	1,197	14	299	0	299
2090	53	1,113	13	278	0	278
2091	50	1,050	13	263	0	263
2092	47	987	12	247	0	247
2093	44	924	11	231	0	231
2094	41	861	10	215	0	215
2095	38	798	10	200	0	200
2096	36	756	9	189	0	189
2097	33	693	8	173	0	173
2098	31	651	8	163	0	163
2099	29	609	7	152	0	152
2100	28	588	7	147	0	147
2101	26	546	7	137	0	137
2102	24	504	6	126	0	126
2103	23	483	6	121	0	121
2104	21	441	5	110	0	110
2105	20	420	5	105	0	105
2106	19	399	5	100	0	100
2107	18	378	5	95	0	95
2108	16	336	4	84	0	84
2109	15	315	4	79	0	79
2110	15	315	4	79	0	79
2111	14	294	4	74	0	74
2112	13	273	3	68	0	68
2113	12	252	3	63	0	63
2114	11	231	3	58	0	58
2115	11	231	3	58	0	58
2116	10	210	3	53	0	53
2117	9	189	2	47	0	47
2118	9	189	2	47	0	47
2119	8	168	2	42	0	42
2120	8	168	2	42	0	42
2121	7	147	2	37	0	37
2122	7	147	2	37	0	37
2123	7	147	2	37	0	37
2124	6	126	2	32	0	32
2125	6	126	2	32	0	32
2126	5	105	1	26	0	26
2127	5	105	1	26	0	26
2128	5	105	1	26	0	26
2129	5	105	1	26	0	26
2130	4	84	1	21	0	21
2131	4	84	1	21	0	21
2132	4	84	1	21	0	21
2133	4	84	1	21	0	21
2134	3	63	1	16	0	16
2135	3	63	1	16	0	16
2136	3	63	1	16	0	16
2137	3	63	1	16	0	16
2138	3	63	1	16	0	16
2139	3	63	1	16	0	16
2140	2	42	1	11	0	11

	Scenario 1 - WCL Closure in 2064		Scenario 2 - AVL + WCL Waste Until 2064			
Year	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Total CH_4 WCL Waste Only (tonnes)	Total Waste GHG Emissions (tonnes CO_{2E})	Haul GHG Emissions (tonnes CO_{2E})	Total GHG Emissions (tonnes CO_{2E})
2141	2	42	1	11	0	11
2142	2	42	1	11	0	11
2143	2	42	1	11	0	11
2144	2	42	1	11	0	11
2145	2	42	1	11	0	11
2146	2	42	1	11	0	11
2147	2	42	1	11	0	11
2148	2	42	1	11	0	11
2149	1	21	0	5	0	5
2150	1	21	0	5	0	5
2151	1	21	0	5	0	5
2152	1	21	0	5	0	5
2153	1	21	0	5	0	5
2154	1	21	0	5	0	5
2155	1	21	0	5	0	5
2156	1	21	0	5	0	5
2157	1	21	0	5	0	5
2158	1	21	0	5	0	5
2159	1	21	0	5	0	5
2160	1	21	0	5	0	5
2161	1	21	0	5	0	5
2162	1	21	0	5	0	5
2163	1	21	0	5	0	5
2164	1	21	0	5	0	5
Sub Total	**5,021**	**105,441**	**1,255**	**26,360**	**0**	**26,360**
	End of 100 Year Post Closure Period		End of 100 Year Post Closure Period			
Total	**15,369**	**322,749**	**11,603**	**243,668**	**4,086**	**247,755**

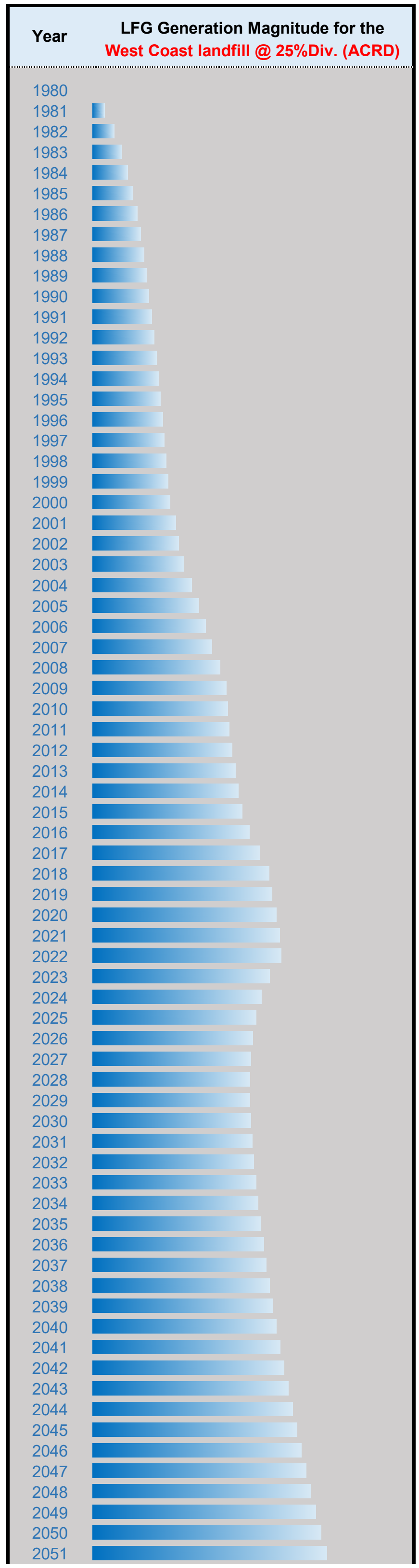
APPENDIX A
LFG Generation Results

Methane Generation Estimates from the West Coast landfill @ 25%Div. (ACRD)

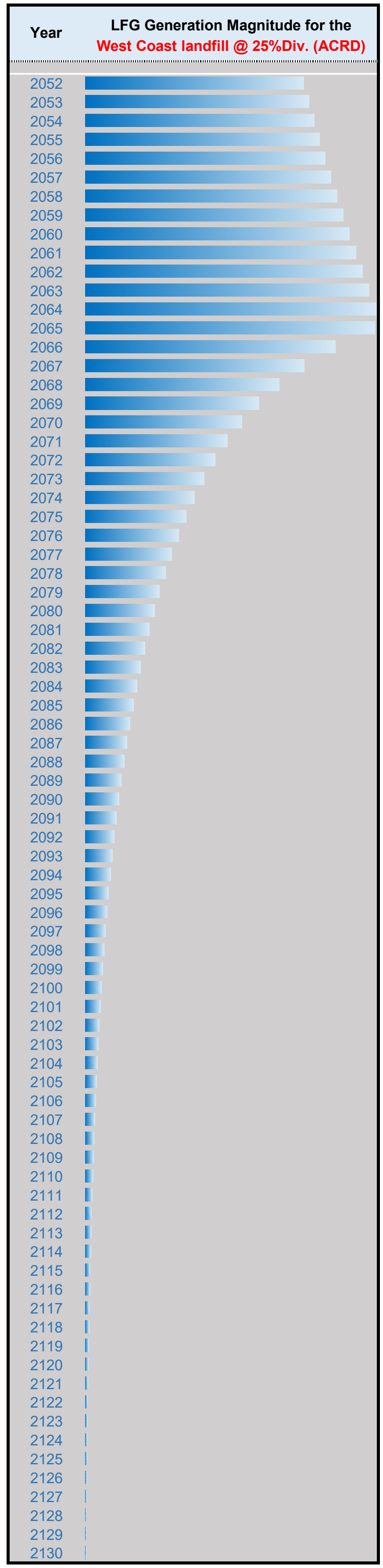
Actual CH_4 Yields

L_o (m^3/tonne)	127	158	143	71	114	103	64.7

Year	Methane generation estimates for the West Coast landfill @ 25%Div. (ACRD)							Methane Generation Potential	Total LFG Flow Rate Estimated
	Food (tonnes)	Garden (tonnes)	Paper (tonnes)	Wood (tonnes)	Textile (tonnes)	Nappies (tonnes)	Total (tonnes)	(L_o, m^3/tonne)	(scfm)
1980	2	0	0	0	0	0	3	76.3	1
1981	13	2	2	0	2	0	20	76.3	4
1982	21	3	4	1	4	1	34	76.3	7
1983	26	5	6	1	5	1	44	76.3	9
1984	30	6	8	2	6	1	53	76.3	11
1985	33	7	9	2	8	1	60	76.3	12
1986	35	8	11	2	9	2	66	76.3	13
1987	36	8	12	3	10	2	71	76.3	14
1988	37	9	14	3	11	2	76	76.3	15
1989	38	10	15	3	12	2	79	76.3	16
1990	38	10	16	3	13	2	83	76.3	16
1991	39	11	17	4	14	3	87	76.3	17
1992	40	11	18	4	15	3	90	76.3	18
1993	40	11	19	4	16	3	93	76.3	19
1994	40	12	20	4	16	3	96	76.3	19
1995	41	12	21	5	17	3	99	76.3	20
1996	41	12	22	5	18	3	102	76.3	20
1997	42	13	23	5	18	4	105	76.3	21
1998	42	13	24	5	19	4	107	76.3	21
1999	43	13	24	6	20	4	109	76.3	22
2000	44	14	25	6	20	4	112	76.3	22
2001	47	14	26	6	21	4	120	76.3	24
2002	49	15	27	7	22	4	124	76.3	25
2003	53	16	29	7	24	4	132	76.3	26
2004	58	17	31	7	25	5	143	76.3	28
2005	62	18	33	8	27	5	152	76.3	30
2006	67	19	35	8	28	5	162	76.3	32
2007	70	20	37	9	30	6	171	76.3	34
2008	75	21	39	9	32	6	182	76.3	36
2009	79	22	41	10	33	6	191	76.3	38
2010	77	23	42	10	34	7	193	76.3	38
2011	77	23	43	11	35	7	195	76.3	39
2012	77	23	45	11	36	7	199	76.3	39
2013	78	24	46	11	37	7	204	76.3	41
2014	79	24	47	12	38	7	208	76.3	41
2015	80	25	49	12	39	8	213	76.3	42
2016	86	26	51	13	41	8	224	76.3	44
2017	93	28	53	13	43	8	238	76.3	47
2018	99	29	56	14	45	9	251	76.3	50
2019	99	30	57	14	47	9	256	76.3	51
2020	100	30	59	15	48	9	261	76.3	52
2021	101	31	60	15	49	9	266	76.3	53
2022	99	31	62	16	51	10	268	60.0	53
2023	85	29	60	16	52	10	252	60.0	50
2024	75	28	59	15	53	10	240	60.0	48
2025	68	26	58	15	55	10	233	60.0	46
2026	64	25	57	15	56	11	228	60.0	45
2027	61	25	56	15	58	11	226	60.0	45
2028	60	24	55	15	59	11	225	60.0	45
2029	59	23	54	15	61	12	225	60.0	45
2030	59	23	54	15	62	12	226	60.0	45
2031	60	23	54	15	64	12	227	60.0	45
2032	60	22	53	15	66	13	230	60.0	46
2033	61	22	53	15	67	13	233	60.0	46
2034	63	22	53	16	69	13	236	60.0	47
2035	64	22	53	16	71	14	239	60.0	47
2036	65	23	53	16	73	14	243	60.0	48
2037	67	23	53	16	75	14	247	60.0	49
2038	68	23	54	16	76	15	252	60.0	50
2039	70	23	54	16	78	15	257	60.0	51
2040	72	24	55	16	80	15	262	60.0	52
2041	73	24	55	16	82	16	267	60.0	53
2042	75	24	56	17	84	16	272	60.0	54
2043	77	25	56	17	87	17	278	60.0	55
2044	79	25	57	17	89	17	284	60.0	56
2045	81	26	58	17	91	17	290	60.0	58
2046	83	26	59	18	93	18	297	60.0	59
2047	85	27	59	18	96	18	303	60.0	60
2048	87	27	60	18	98	19	310	60.0	61
2049	89	28	61	18	101	19	317	60.0	63
2050	92	29	63	19	103	20	324	60.0	64
2051	94	29	64	19	106	20	332	60.0	66

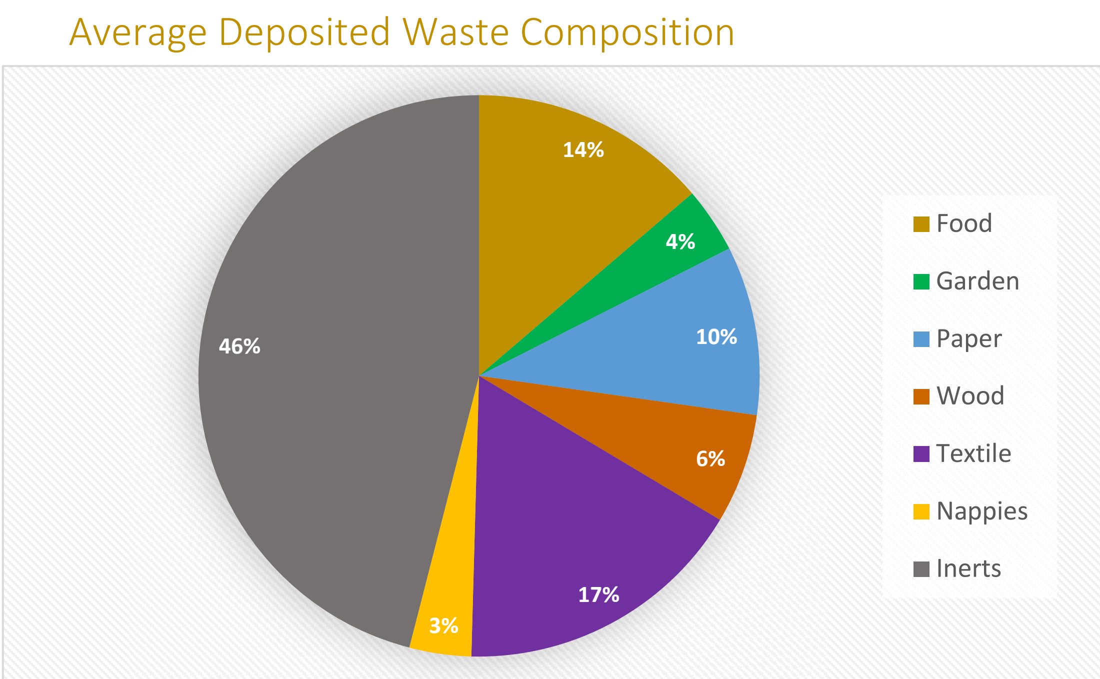


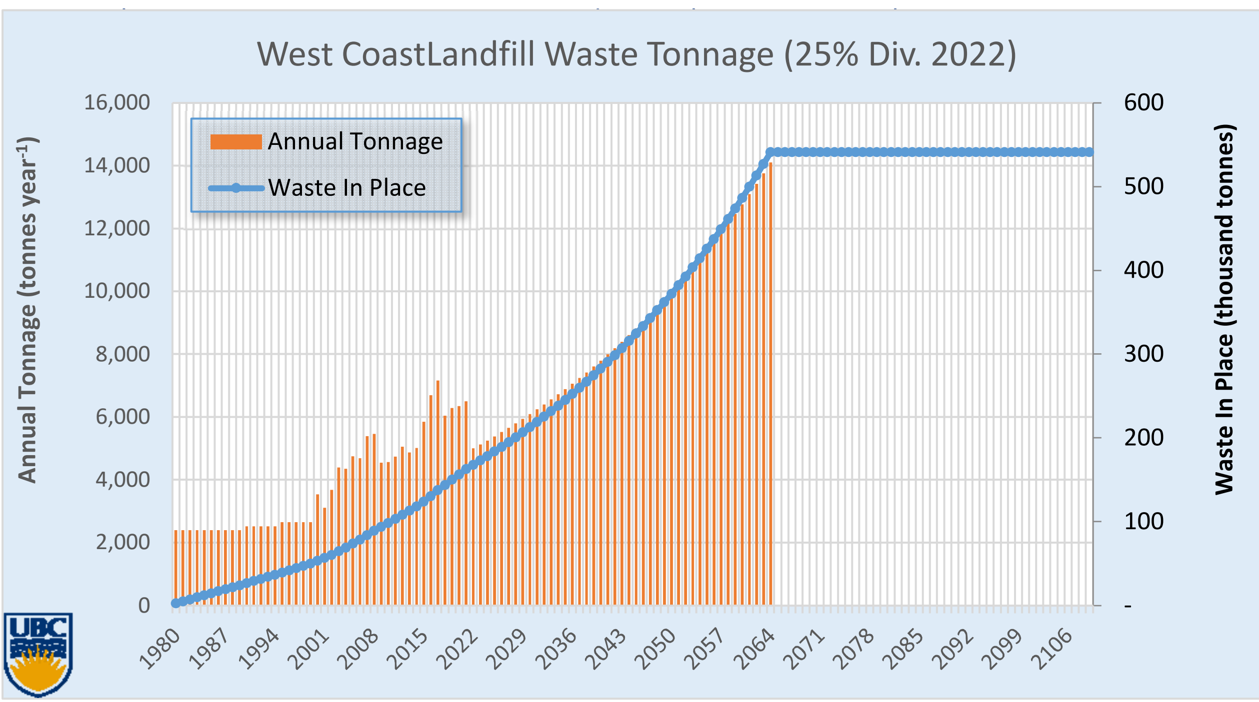
Year	Methane generation estimates for the West Coast landfill @ 25%Div. (ACRD)							Methane Generation Potential	Total LFG Flow Rate Estimated
	Food (tonnes)	Garden (tonnes)	Paper (tonnes)	Wood (tonnes)	Textile (tonnes)	Nappies (tonnes)	Total (tonnes)	(L_o, m^3/tonne)	(scfm)
2052	96	30	65	19	108	21	340	60.0	67
2053	99	31	66	20	111	21	347	60.0	69
2054	101	32	67	20	114	22	356	60.0	71
2055	104	32	69	20	117	22	364	60.0	72
2056	106	33	70	21	120	23	373	60.0	74
2057	109	34	72	21	123	23	382	60.0	76
2058	112	35	73	21	126	24	391	60.0	78
2059	114	36	75	22	129	25	400	60.0	79
2060	117	36	76	22	132	25	410	60.0	81
2061	120	37	78	23	135	26	420	60.0	83
2062	123	38	80	23	139	26	430	60.0	85
2063	126	39	82	24	142	27	440	60.0	87
2064	129	40	84	24	146	28	451	60.0	89
2065	125	40	84	24	147	28	449		89
2066	88	35	79	23	137	26	388		77
2067	62	30	73	23	128	24	340		67
2068	44	26	68	22	119	23	302		60
2069	31	23	64	21	111	21	271		54
2070	22	20	59	20	104	20	244		48
2071	15	17	55	19	97	18	222		44
2072	11	15	52	18	90	17	203		40
2073	8	13	48	18	84	16	187		37
2074	5	11	45	17	78	15	172		34
2075	4	10	42	16	73	14	159		32
2076	3	9	39	16	68	13	147		29
2077	2	7	36	15	64	12	136		27
2078	1	6	34	15	59	11	127		25
2079	1	6	32	14	55	11	118		23
2080	1	5	29	13	51	10	110		22
2081	0	4	27	13	48	9	102		20
2082	0	4	26	12	45	9	95		19
2083	0	3	24	12	42	8	89		18
2084	0	3	22	11	39	7	83		16
2085	0	2	21	11	36	7	78		15
2086	0	2	19	11	34	6	72		14
2087	0	2	18	10	32	6	68		13
2088	0	2	17	10	29	6	63		13
2089	0	1	16	9	27	5	59		12
2090	0	1	15	9	26	5	55		11
2091	0	1	14	9	24	5	52		10
2092	0	1	13	8	22	4	48		10
2093	0	1	12	8	21	4	45		9
2094	0	1	11	8	19	4	42		8
2095	0	1	10	7	18	3	40		8
2096	0	1	10	7	17	3	37		7
2097	0	0	9	7	16	3	35		7
2098	0	0	8	7	15	3	33		6
2099	0	0	8	6	14	3	31		6
2100	0	0	7	6	13	2	29		6
2101	0	0	7	6	12	2	27		5
2102	0	0	6	6	11	2	25		5
2103	0	0	6	5	10	2	24		5
2104	0	0	5	5	10	2	22		4
2105	0	0	5	5	9	2	21		4
2106	0	0	5	5	8	2	20		4
2107	0	0	4	5	8	1	18		4
2108	0	0	4	4	7	1	17		3
2109	0	0	4	4	7	1	16		3
2110	0	0	4	4	6	1	15		3
2111	0	0	3	4	6	1	14		3
2112	0	0	3	4	5	1	13		3
2113	0	0	3	4	5	1	13		3
2114	0	0	3	3	5	1	12		2
2115	0	0	3	3	4	1	11		2
2116	0	0	2	3	4	1	11		2
2117	0	0	2	3	4	1	10		2
2118	0	0	2	3	4	1	9		2
2119	0	0	2	3	3	1	9		2
2120	0	0	2	3	3	1	8		2
2121	0	0	2	3	3	1	8		2
2122	0	0	2	3	3	1	7		1
2123	0	0	1	2	3	0	7		1
2124	0	0	1	2	2	0	6		1
2125	0	0	1	2	2	0	6		1
2126	0	0	1	2	2	0	6		1
2127	0	0	1	2	2	0	5		1
2128	0	0	1	2	2	0	5		1
2129	0	0	1	2	2	0	5		1
2130	0	0	1	2	2	0	5		1



West Coast landfill @ 25%Div. (ACRD)

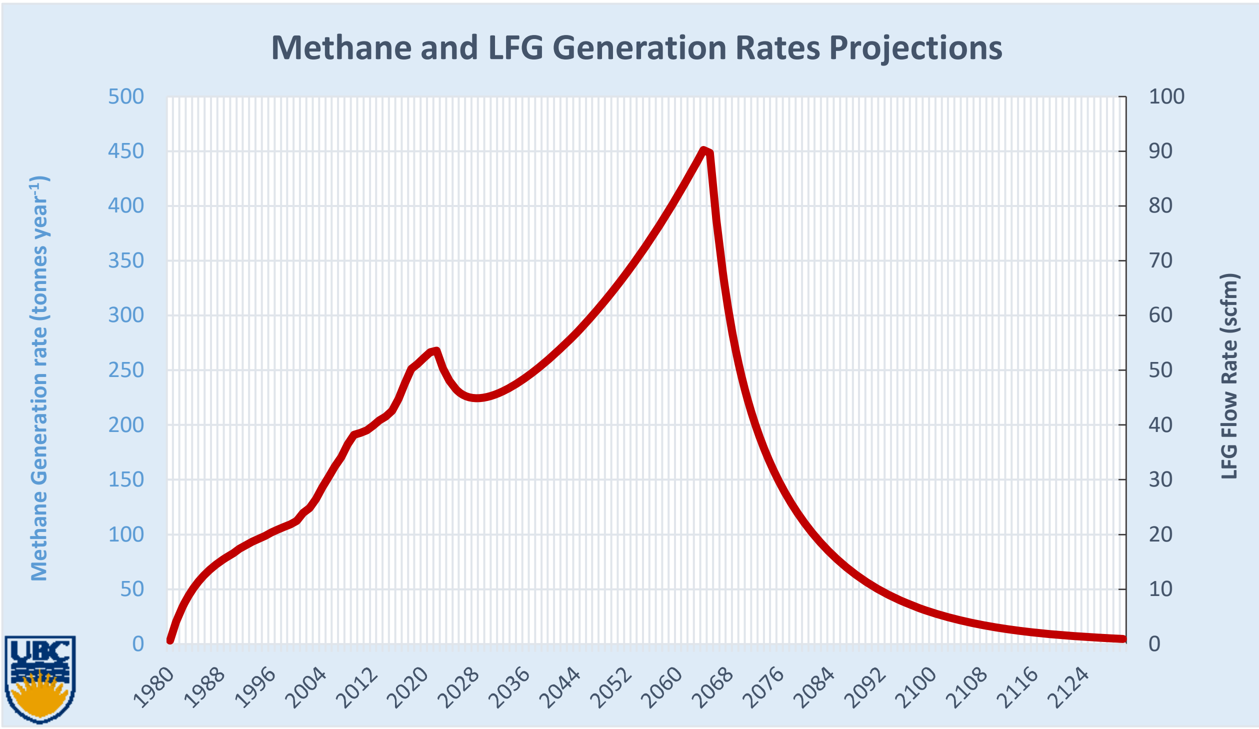
Landfill Gas Generation Analysis **GRAPHICAL RESULTS**

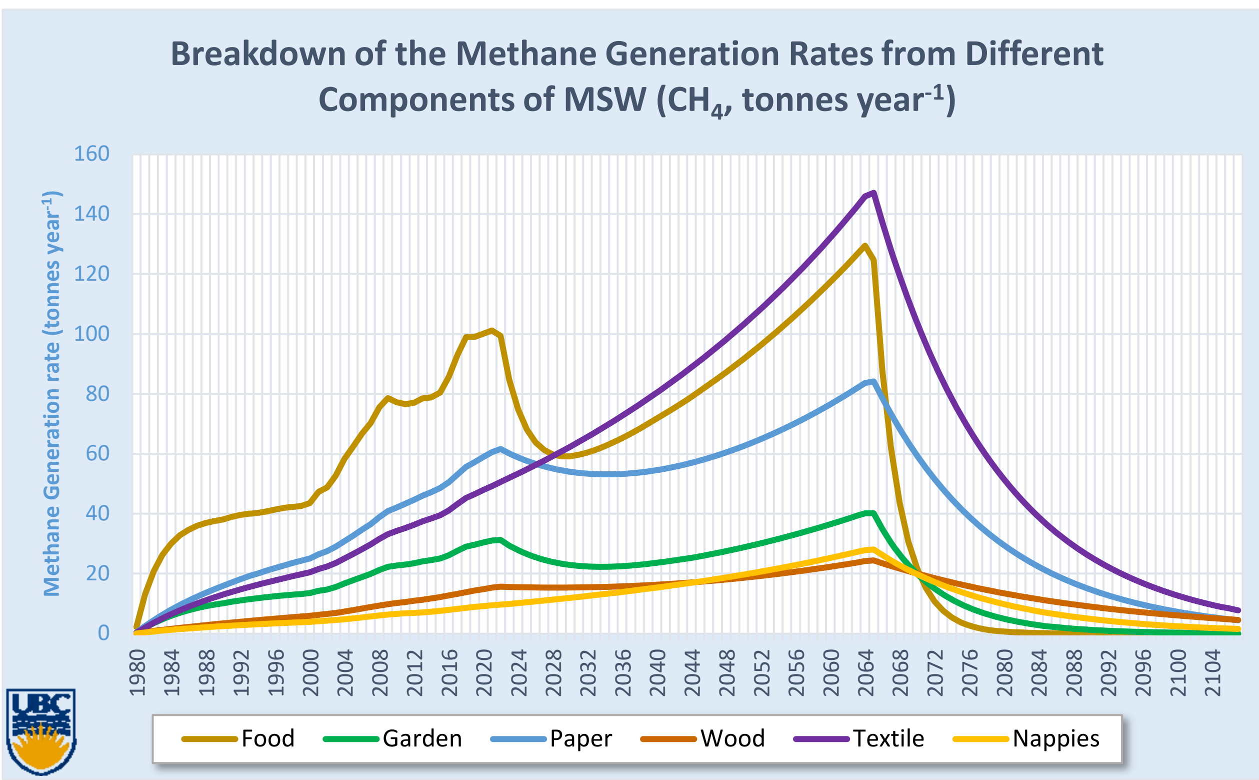




West Coast landfill @ 25%Div. (ACRD)

Landfill Gas Generation Analysis **GRAPHICAL RESULTS**





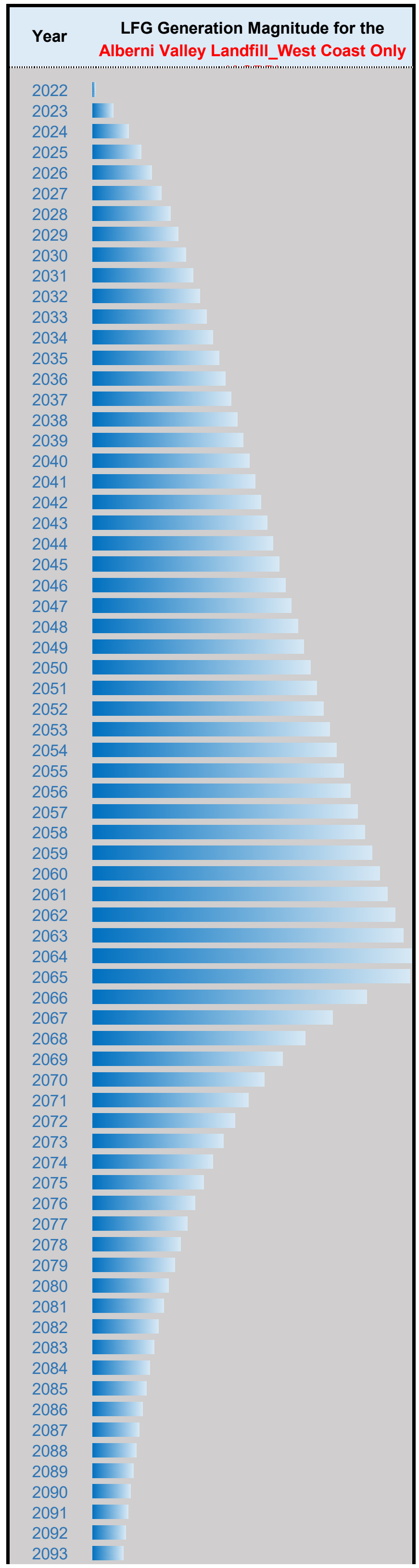
Methane Generation Estimates from the Alberni Valley Landfill_West Coast Only (ACRD)

Actual CH_4 Yields

L_o (m^3/tonne)	127	158	143	72	114	103	60.0

Methane generation estimates for the Alberni Valley Landfill_West Coast Only (ACRD

Year	Food (tonnes)	Garden (tonnes)	Paper (tonnes)	Wood (tonnes)	Textile (tonnes)	Nappies (tonnes)	Total (tonnes)	Methane Generation Potential (L_o, m^3/tonne)	Total LFG Flow Rate Estimated (scfm)
2022	3	0	0	0	1	0	5	60.0	1
2023	17	3	3	1	6	1	30	60.0	6
2024	27	4	6	1	10	2	50	60.0	10
2025	34	6	8	2	14	3	67	60.0	13
2026	40	8	10	2	19	4	83	60.0	16
2027	44	9	13	3	23	4	96	60.0	19
2028	48	11	15	3	27	5	108	60.0	21
2029	51	12	17	4	30	6	119	60.0	24
2030	53	13	19	4	34	6	130	60.0	26
2031	55	14	21	5	37	7	140	60.0	28
2032	57	15	23	5	41	8	149	60.0	30
2033	59	16	25	5	44	8	158	60.0	31
2034	61	17	27	6	48	9	167	60.0	33
2035	63	17	29	6	51	10	176	60.0	35
2036	65	18	30	7	54	10	184	60.0	37
2037	66	19	32	7	57	11	193	60.0	38
2038	68	20	34	8	60	11	201	60.0	40
2039	70	20	35	8	63	12	209	60.0	41
2040	72	21	37	9	66	13	217	60.0	43
2041	73	22	39	9	69	13	226	60.0	45
2042	75	22	41	10	72	14	234	60.0	46
2043	77	23	42	10	75	14	242	60.0	48
2044	79	24	44	11	78	15	250	60.0	50
2045	81	25	46	11	81	15	259	60.0	51
2046	83	25	47	12	84	16	267	60.0	53
2047	85	26	49	12	87	17	276	60.0	55
2048	87	27	51	13	90	17	284	60.0	56
2049	89	27	52	13	93	18	293	60.0	58
2050	92	28	54	14	96	18	302	60.0	60
2051	94	29	56	14	99	19	311	60.0	62
2052	96	30	57	15	102	20	320	60.0	63
2053	99	30	59	15	105	20	329	60.0	65
2054	101	31	61	16	109	21	338	60.0	67
2055	104	32	63	16	112	21	348	60.0	69
2056	106	33	65	17	115	22	357	60.0	71
2057	109	34	66	17	118	23	367	60.0	73
2058	112	35	68	18	122	23	377	60.0	75
2059	114	35	70	18	125	24	387	60.0	77
2060	117	36	72	19	129	25	398	60.0	79
2061	120	37	74	19	132	25	409	60.0	81
2062	123	38	76	20	136	26	419	60.0	83
2063	126	39	78	21	139	27	431	60.0	85
2064	129	40	80	21	143	27	442	60.0	88
2065	125	40	81	22	145	28	440		87
2066	88	35	76	21	135	26	380		75
2067	62	30	71	20	126	24	333		66
2068	44	26	66	19	117	22	295		58
2069	31	23	61	18	109	21	264		52
2070	22	20	57	18	102	19	238		47
2071	15	17	53	17	95	18	216		43
2072	11	15	50	16	89	17	197		39
2073	8	13	46	16	83	16	181		36
2074	5	11	43	15	77	15	167		33
2075	4	10	40	15	72	14	154		31
2076	3	9	38	14	67	13	143		28
2077	2	7	35	13	62	12	132		26
2078	1	6	33	13	58	11	123		24
2079	1	6	30	12	54	10	114		23
2080	1	5	28	12	51	10	106		21
2081	0	4	27	11	47	9	99		20
2082	0	4	25	11	44	8	92		18
2083	0	3	23	11	41	8	86		17
2084	0	3	21	10	38	7	80		16
2085	0	2	20	10	36	7	75		15
2086	0	2	19	9	33	6	70		14
2087	0	2	17	9	31	6	65		13
2088	0	2	16	9	29	6	61		12
2089	0	1	15	8	27	5	57		11
2090	0	1	14	8	25	5	53		11
2091	0	1	13	8	23	4	50		10
2092	0	1	12	7	22	4	47		9
2093	0	1	11	7	20	4	44		9



Year	Methane generation estimates for the Alberni Valley Landfill_West Coast Only (ACRD							Methane Generation Potential	Total LFG Flow Rate Estimated
	Food	Garden	Paper	Wood	Textile	Nappies	Total		
	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(L_o, m^3/tonne)	(scfm)
2094	0	1	11	7	19	4	41		8
2095	0	1	10	7	18	3	38		8
2096	0	1	9	6	17	3	36		7
2097	0	0	9	6	15	3	33		7
2098	0	0	8	6	14	3	31		6
2099	0	0	8	6	13	3	29		6
2100	0	0	7	5	12	2	28		5
2101	0	0	7	5	12	2	26		5
2102	0	0	6	5	11	2	24		5
2103	0	0	6	5	10	2	23		4
2104	0	0	5	5	9	2	21		4
2105	0	0	5	4	9	2	20		4
2106	0	0	5	4	8	2	19		4
2107	0	0	4	4	8	1	18		3
2108	0	0	4	4	7	1	16		3
2109	0	0	4	4	7	1	15		3
2110	0	0	3	4	6	1	15		3
2111	0	0	3	3	6	1	14		3
2112	0	0	3	3	5	1	13		3
2113	0	0	3	3	5	1	12		2
2114	0	0	3	3	5	1	11		2
2115	0	0	2	3	4	1	11		2
2116	0	0	2	3	4	1	10		2
2117	0	0	2	3	4	1	9		2
2118	0	0	2	3	4	1	9		2
2119	0	0	2	2	3	1	8		2
2120	0	0	2	2	3	1	8		2
2121	0	0	2	2	3	1	7		1
2122	0	0	2	2	3	1	7		1
2123	0	0	1	2	2	0	7		1
2124	0	0	1	2	2	0	6		1
2125	0	0	1	2	2	0	6		1
2126	0	0	1	2	2	0	5		1
2127	0	0	1	2	2	0	5		1
2128	0	0	1	2	2	0	5		1
2129	0	0	1	2	2	0	5		1
2130	0	0	1	2	2	0	4		1
2131	0	0	1	2	1	0	4		1
2132	0	0	1	1	1	0	4		1
2133	0	0	1	1	1	0	4		1
2134	0	0	1	1	1	0	3		1
2135	0	0	1	1	1	0	3		1
2136	0	0	1	1	1	0	3		1
2137	0	0	1	1	1	0	3		1
2138	0	0	0	1	1	0	3		1
2139	0	0	0	1	1	0	3		1
2140	0	0	0	1	1	0	2		0
2141	0	0	0	1	1	0	2		0
2142	0	0	0	1	1	0	2		0
2143	0	0	0	1	1	0	2		0
2144	0	0	0	1	1	0	2		0
2145	0	0	0	1	1	0	2		0
2146	0	0	0	1	0	0	2		0
2147	0	0	0	1	0	0	2		0
2148	0	0	0	1	0	0	2		0
2149	0	0	0	1	0	0	1		0
2150	0	0	0	1	0	0	1		0
2151	0	0	0	1	0	0	1		0
2152	0	0	0	1	0	0	1		0
2153	0	0	0	1	0	0	1		0
2154	0	0	0	1	0	0	1		0
2155	0	0	0	1	0	0	1		0
2156	0	0	0	1	0	0	1		0
2157	0	0	0	1	0	0	1		0
2158	0	0	0	1	0	0	1		0
2159	0	0	0	1	0	0	1		0
2160	0	0	0	0	0	0	1		0
2161	0	0	0	0	0	0	1		0
2162	0	0	0	0	0	0	1		0
2163	0	0	0	0	0	0	1		0
2164	0	0	0	0	0	0	1		0
2165	0	0	0	0	0	0	1		0
2166	0	0	0	0	0	0	1		0
2167	0	0	0	0	0	0	1		0
2168	0	0	0	0	0	0	1		0
2169	0	0	0	0	0	0	1		0
2170	0	0	0	0	0	0	0		0
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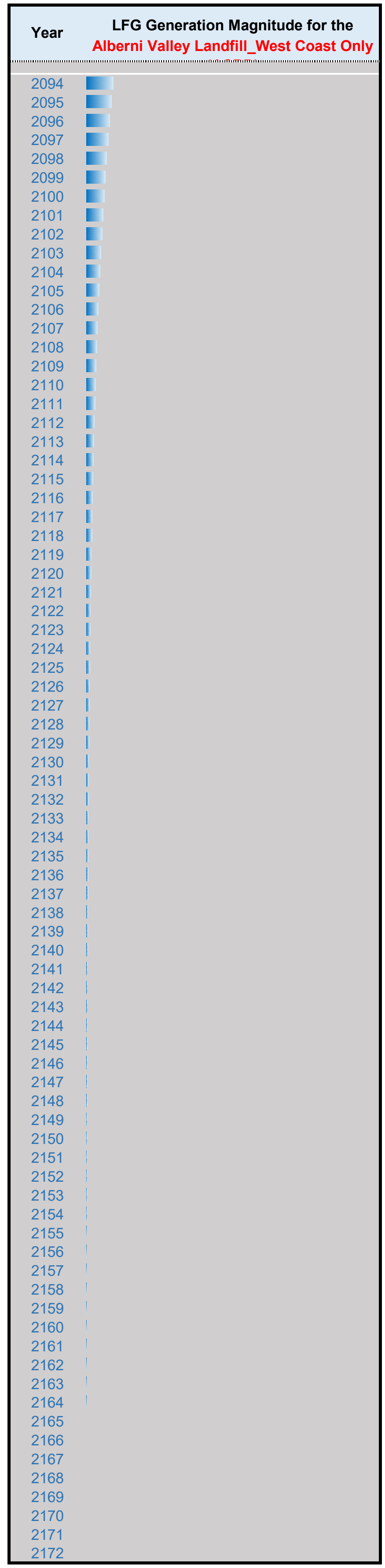
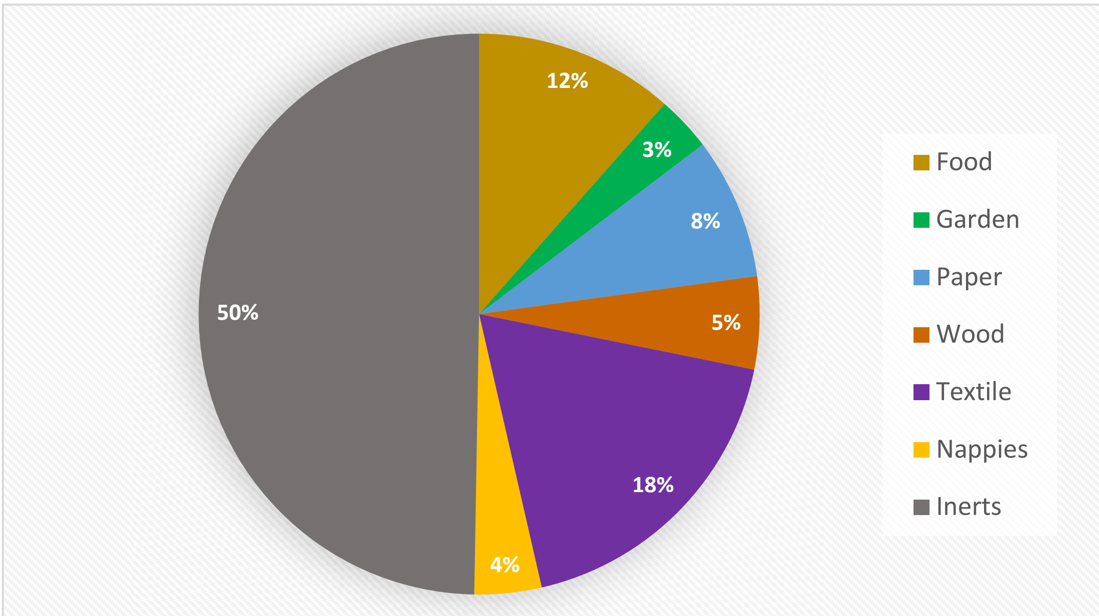
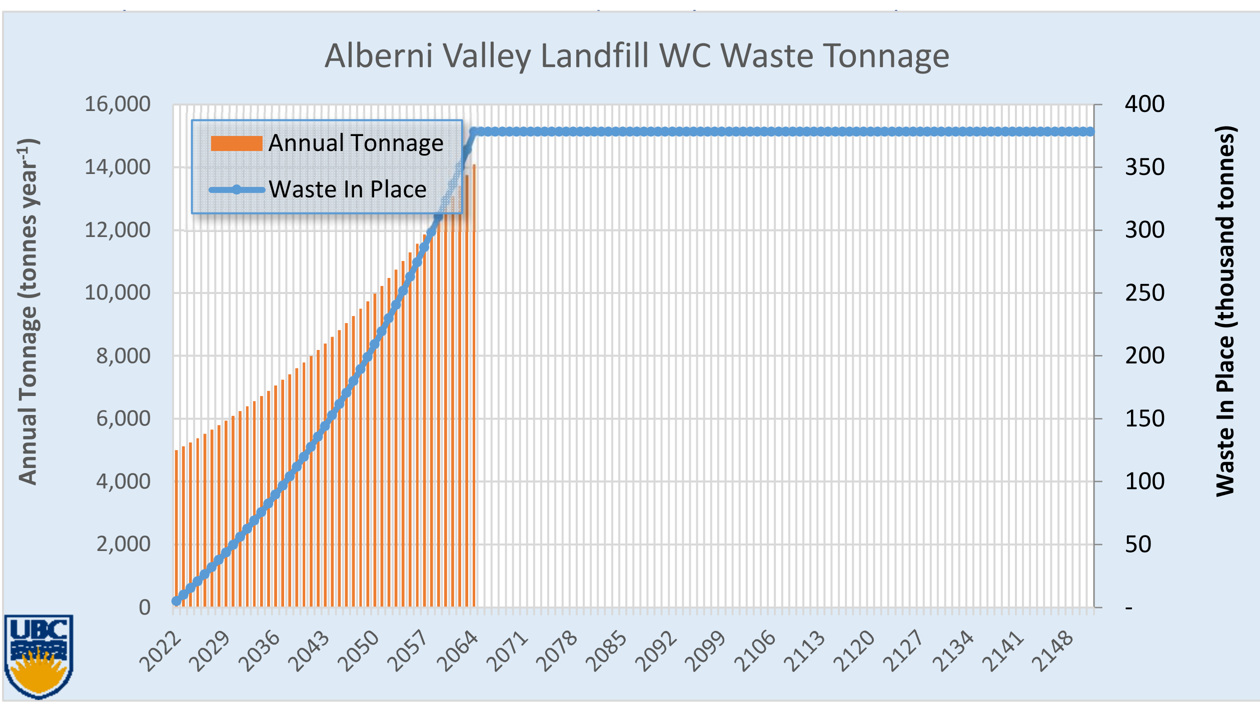


Alberni Valley Landfill_West Coast Only (ACRI

Landfill Gas Generation Analysis **GRAPHICAL RESULTS**

Average Deposited Waste Composition





Alberni Valley Landfill_West Coast Only (ACRD

Landfill Gas Generation Analysis **GRAPHICAL RESULTS**