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Thompson Nicola Regional District
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Residual Waste Management – TNRD Landfill Economic Analysis

SUMMARY

An economic review of five Landfills in the TNRD was conducted to explore five scenarios for the future operation of the landfills; (1) Current system of landfilling waste at Heffley Creek, Lower Nicola, Kamloops Resource Recovery Centre (KRRC), Mission Flats, and Barnhartvale, (2) cease all landfill operations at Barnhartvale, (3) cease all landfill operations at Barnhartvale and Heffley Creek, (4) convert Heffley Creek to DLC-only landfill, (5) cease landfill operations at Barnhartvale and convert Heffley Creek to DLC-only landfill. Annual costs over a ten-year period were used to evaluate each scenario. Customer service impacts were also considered. A review of other waste management options such as waste to energy was conducted. It was concluded that Scenario #5 (cease landfill operations at Barnhartvale and convert Heffley to DLC only landfill) is the most economical scenario. Further research and consultation with stakeholders should take place before any changes are implemented. In the future, the feasibility of converting the Tk’emlups Landfill into a transfer station should be assessed. SHA and the TNRD reached out to the Tk’emlups Indian Band and reviewed with them the current SWMP update process, but they are not ready at this time to undertake an assessment of their facility.

1. BACKGROUND

Currently, the TNRD has ample landfill capacity between the six active landfills in the region. Of these landfills, the TNRD operates two sites, the City of Kamloops operates three sites, and the Tk’emlups First Nation operate the sixth facility:

- | | |
|--------------------------------------|------------------------|
| 1. Heffley Creek | TNRD |
| 2. Lower Nicola | TNRD |
| 3. Mission Flats | City of Kamloops |
| 4. Kamloops Resource Recovery Centre | City of Kamloops |
| 5. Barnhartvale | City of Kamloops |
| 6. Tk’emlups | Tk’emlups First Nation |

The TNRD could benefit from consolidation of landfills as a way to streamline operations and take advantage of economies of scale.



Currently, the Heffley Creek Landfill receives both household and DLC waste from all TNRD transfer stations and Eco-Depots in the north Thompson and eastern TNRD region. The Lower Nicola Landfill site serves the City of Merritt and surrounding rural areas and accepts refuse from the TNRD transfer stations in Aspen Grove, Brookemere, Logan Lake, Upper Nicola and surrounding First Nation communities. The Mission Flats Landfill is located in the City of Kamloops and receives the majority of curbside and commercial waste generated in the City of Kamloops as well as garbage from curbside pick-up programs in Tobiano and Cherry Creek. Mission Flats receives the largest annual amount of waste in the TNRD by far. The Kamloops Resource Recovery Centre (formerly Owl Road Landfill) is located within the City of Kamloops and is designated as a DLC-only landfill, although historically the facility also received a substantial amount of commercial waste. The Barnhartvale Landfill is situated between the communities of Dallas and Barnhartvale and operates as a self-haul landfill for residents of the area. The 2016 annual tonnage, remaining airspace, and estimated lifespan for the above landfills is presented in Table 1 below.

Table 1 – Annual Tonnage and Lifespan

Landfill	Annual Tonnage	Remaining Airspace (m ³)	Remaining Lifespan (years)
Heffley Creek	9,061	1,512,111	109
Lower Nicola	6,503	1,337,701	131
KRRC (Owl Road)	6,320	618,850	50
Mission Flats	50,023	2,317,917	35
Barnhartvale	2,337	86,884	28
Tk'emlups	N/A	N/A	N/A

Due to the small amount of waste received directly from customers and the sufficient capacity available at other landfills in the Kamloops area, an evaluation of the viability of the Barnhartvale landfill was conducted. Similarly, an evaluation of the viability of the Heffley Creek landfill as a either a DLC-only or closed landfill was conducted and summarized in this report.

Five scenarios were considered for this analysis:

- 1) **Current system** – All landfills remain open with waste continuing to be landfilled at Heffley Creek, Lower Nicola, Mission Flats, KRRC, and Barnhartvale.
- 2) **Barnhartvale cease all landfill operations** – Final closure of the Barnhartvale landfill with all household waste from the site diverted by self-haul to Mission Flats Landfill and all green waste/yard waste diverted by self-haul to the Blackwell Dairy Landfill.



- 3) **Barnhartvale and Heffley Creek cease all landfill operations** – Final closure of the Barnhartvale landfill with all household waste from the site diverted by self-haul to Mission Flats Landfill and all green waste/yard waste diverted by self-haul to the Blackwell Dairy Landfill. Final closure of the Heffley Creek landfill with all household garbage from north and east TNRD facilities hauled to Mission Flats Landfill and all DLC waste to KRRC.
- 4) **Heffley Creek DLC landfill only** - operate the Heffley Creek Landfill as DLC only and haul all household garbage from north and east TNRD facilities to Mission Flats Landfill.
- 5) **Barnhartvale cease all landfill operations and Heffley Creek become a DLC landfill only** - Final closure of the Barnhartvale landfill with all household waste from the site diverted by self-haul to Mission Flats Landfill and all green waste/yard waste diverted by self-haul to the Blackwell Dairy Landfill. Operate the Heffley Creek Landfill as DLC only and haul all household garbage from north and east TNRD facilities to Mission Flats Landfill.

2. DISCUSSION

Sperling Hansen Associates (SHA) conducted a costing review of the Heffley Creek, Lower Nicola, Mission Flats, KRRC, and Barnhartvale landfills including all operational considerations of the five scenarios. Much of the data used in this report was provided by TNRD and City of Kamloops staff. Otherwise, assumptions were made based on data derived from SHA's Heffley Creek and Lower Nicola 2016 Costing Review and SHA's Design & Operations Plan for Mission Flats Landfill (2007).

Annual Landfill Costs

Annual costs were evaluated for all five scenarios for a ten-year period from 2018 to 2028. This includes *Landfill Operations*, *Capital Works*, *Closure*, and *Post-Closure Costs*. *Landfill Operations* looks at the associated costs of operating the landfills under the different scenarios. This includes contractor costs, engineering, maintenance work, and monitoring costs. *Closure* looks at the costs associated with closing a landfill including the final cover system and landfill gas system. *Post-Closure* looks at the associated costs a landfill incurs after final closure is complete, including environmental controls, maintenance, monitoring and reporting, and administration. Hauling costs were excluded from this analysis as the hauling costs from North Thompson and South Thompson to Kamloops versus Heffley Creek are very similar distances. The annual operations, capital, closure and post-closure costs for each landfill are presented in Table 2 below.



Table 2 – Annual Landfill Costs

Landfill	Annual Operations Cost	Operations Cost (\$/tonne)	Annual Capital Cost	Capital Cost (\$/tonne)	Total Closure Cost	Closure Cost (\$/tonne)	Annual Post Closure Cost
Heffley Creek	\$ 901,526	\$ 99.5	\$ 26,420	\$ 2.9	\$ 3,139,914	\$ 2.2	\$ 91,140
Lower Nicola	\$ 855,606	\$ 131.6	\$ 14,456	\$ 2.2	\$ 4,683,340	\$ 3.8	\$ 98,066
KRRC (Owl Road)	\$ 839,695	\$ 132.9	\$ 63,000	\$ 10.0	\$ 4,050,000	\$ 12.8	\$ 66,500
Mission Flats	\$ 1,284,424	\$ 25.7	\$ 710,327	\$ 14.2	\$ 20,310,000	\$ 11.8	\$ 220,000
Barnhartvale	\$ 198,341	\$ 84.9	\$ 24,118	\$ 10.3	\$ 1,000,000	\$ 15.3	\$ 14,000

For the five different scenarios, annual costs were evaluated across a 10 year period. Tables 3a to 3e at the end of this report show the annual costs for each landfill from 2018 to 2028 for every scenario.

In order to assess the scenarios to determine the most economical option, costs incurred over 10 years were summed and compared for every landfill and scenario. Table 4 below presents a summary of the cumulative 10-year costs incurred by each landfill for all five scenarios.

Table 4 – Cumulative costs for a 10-year period from 2018 to 2028

	Heffley Creek 10-Year Cost	Lower Nicola 10-Year Cost	KRRC 10-Year Cost	Mission Flats 10-Year Cost	Barnhartvale 10-Year Cost	TNRD System 10-year Cost
Scenario 1 - All Landfills Open	\$ 10,207,415	\$ 9,570,691	\$ 9,929,645	\$ 21,942,257	\$ 2,447,047	\$ 54,097,055
Scenario 2 - Close Barnhartvale	\$ 10,207,415	\$ 9,570,691	\$ 9,929,645	\$ 22,454,811	\$ 1,140,000	\$ 53,302,562
Scenario 3 - Close Barnhartvale and Heffley Creek	\$ 4,051,314	\$ 9,570,691	\$ 12,919,238	\$ 25,594,704	\$ 1,140,000	\$ 53,275,947
Scenario 4 - Heffley Creek becomes a DLC-only Landfill	\$ 2,143,557	\$ 9,570,691	\$ 9,929,645	\$ 25,082,149	\$ 2,447,047	\$ 49,173,089
Scenario 5 - Close Barnhartvale and Heffley Creek becomes a DLC-only landfill	\$ 2,143,557	\$ 9,570,691	\$ 9,929,645	\$ 25,082,149	\$ 1,140,000	\$ 47,866,042

As seen in Table 4, TNRD system costs in scenario 1 are the highest of the five scenarios. Scenario 2 sees cost savings of close to one million dollars across the entire system compared to Scenario 1. Costs for Scenario 3 are only slightly lower than Scenario 2. Converting Heffley Creek into a DLC-only landfill in Scenario 4 sees cost savings close to five million dollars compared to the current scenario. Scenario 5 sees the highest cost savings of over 6 million dollars for the entire TNRD system compared to the current scenario.



It is evident that Scenario 5, closing Barnhartvale and operating Heffley Creek as a DLC-only landfill, is the most economical option for the City of Kamloops and the TNRD. This is mainly due to the fact that Barnhartvale and Heffley Creek have high operating costs per tonne compared to Mission Flats. By diverting household garbage from these sites to Mission Flats, cost savings can be realized by taking advantage of Mission Flat's low operating costs per tonne thanks to economies of scale.

While this scenario is the most economical for the entire TNRD system, one must consider the fees the TNRD would incur by paying tipping fees for garbage disposed of at Mission Flats. If the TNRD were to pay the posted tipping fee of \$80 per tonne for Scenario 5, total annual tipping fees would be \$572,655, which is equal to \$5.7 million over a 10-year period. Even with tipping fees included in Scenario 5, the TNRD sees 10-year cost savings of \$2.3 million dollars compared to the current scenario. Evidently, this scenario is beneficial for both parties, as the City of Kamloops will have increased tipping fee revenues and the TNRD achieves significant cost savings in their residual waste management system. Furthermore, the City of Kamloops could see future reduced operating costs due to increased economies of scale. Further cost savings could be achieved by negotiation of a reduced tipping fee between the TNRD and the City of Kamloops.

Customer Service Considerations

Ceasing all operations at Barnhartvale would result in possible upset for the Barnhartvale and Dallas communities. It is likely that complaints would come from residents arguing that they have to drive further to dispose of waste at either Blackwell Dairy or Mission Flats. However, Barnhartvale currently receives curbside garbage collection service and therefore, complaints would only come from "self-hauler" residential customers.

Converting Heffley Creek to a DLC-only landfill would not be noticed by the majority of customers. The Heffley Creek Eco-Depot receives household waste, the majority of which is from "self-hauler" residential customers from the Heffley Creek, Vinsula, and Raleigh areas. These customers already dump into the bins at the Eco-Depot and do not enter the landfill. This would be easily managed with the bin capacity at the current site. The amount of household garbage received at Heffley Creek is comparable to the amount received at the Sun Peaks transfer station which has only 3 roll off bins, the Heffley Creek Eco-Depot has capacity for 7 bins. The Heffley Eco-Depot is also designed to accommodate self-dumping trailers and small dump boxes. The only loads diverted to Mission Flats would be large garbage compactors of household waste. The Sun Peaks Grand hotel is the only customer with this type of bin which we could not accommodate currently at the Eco-Depot. There are a few other commercial customers who currently dump at the active landfill face who might complain of slower unloading time at the Eco-depot, however staff are confident that the TNRD could accept their material at the Eco-Depot without issue. At present time, Heffley occasionally receives insurance claim loads of spoiled product from transport truck accidents (brought in by tow truck companies). These loads would likely also need to be diverted to Kamloops facilities.



The Cache Creek Factor

So far this review only considered the Mission Flats Landfill as an alternative to Heffley Creek and Barnhartvale. However, the MOE issued an operational certificate for the proposed extension at the Cache Creek landfill on December 15th 2016 and if the landfill opens, it will provide another option for TNRD waste. Belcorp Environmental Services, which operates the site, will decide when the extension will be built. Hauling costs from all north and eastern TNRD sites to Cache Creek would be considerably higher than hauling to Mission Flats. However, it should be noted the historic tipping fee the TNRD paid Wastech under the comprehensive agreement was \$40/tonne, half of the TNRD and City of Kamloops fees. The low tipping fee was realized because the Cache Creek Landfill experienced large economies of scale by co-disposing the TNRD waste with several hundred thousand tonnes of MSW from Metro Vancouver. Once the extension opens, Belcorp may be open to a reduced fee for TNRD waste but the discount will depend on the global tonnage of MSW that Belcorp will be able to secure from Metro Vancouver or other regional districts. Due to major expansion in organics waste diversion and stewardship diversion programs, there is adequate capacity in the Metro Vancouver system without waste export. Construction of the Cache Creek extension is anticipated to begin in spring 2017 and if that is the case, the extension could be open by mid- to late- summer 2017. Since details regarding the landfill's opening date and client(s) are still unclear, sufficient data to conduct an assessment of this option was not available.

Waste to Energy

Three alternate energy production technologies, namely pyrolysis, gasification, and anaerobic digestion, can be used to deal with residual waste. Anaerobic digestion is the biological conversion of refuse using heat and bugs in a controlled atmosphere (similar to the digestion of sewage sludge at a waste water treatment plant). Pyrolysis and gasification, similar to incineration, are thermal conversion processes (i.e. heat is used to convert solids to gases); however, the main difference between these thermal technologies is the amount of oxygen present when the refuse is converted. With pyrolysis, there is a total lack of oxygen, whereas with gasification, an oxygen starved rather than an oxygen void atmosphere is maintained. Both technologies produce syngas, which is usually used for electrical power generation or for on-site heat generation.

When considering waste to energy technologies, an accurate cost estimate for this system must be compared to the current costs of solid waste management. This mainly includes capital and operating costs of the technology. Generally, capital costs for gasification and pyrolysis technologies are quite high and usually some sort of pre-processing of solid waste is required before it can be fed into the system. Other things to consider are the characteristics of the feedstock and air quality emissions. Generally, the high capital costs and feedstock pre-processing required make the technology considerably more expensive than those of landfilling, especially at the relatively small scale of the TNRD/Kamloops system. Therefore, in order for a



waste to energy facility to be viable, the revenue generated from energy sales derived from the process must be sufficient to finance the operations. If waste to energy as a residual waste management option is to be considered, a thorough review of site specific technologies for the TNRD would have to be performed.

3. CONCLUSION

Based on the data, it is evident Scenario #1, the current system of operating the TNRD landfills for all waste types, is the most costly option for the TNRD. The current landfill operations contract expires September 2017 and as the TNRD undertakes the Solid Waste Management Plan Review, this is an excellent opportunity to consider changes in how the TNRD Landfills operate. Scenario #5 of closing Barnhartvale and operating Heffley as a DLC only landfill has three clear advantages:

1. **Lowest cost** - The 10-year costs of scenario #5 are estimated at 6 million dollars less than the current scenario.
2. **Maintain current level of service** - Operating a DLC only landfill at Heffley Creek will have a very minimal impact to the service currently provided to TNRD residents and businesses. The vast majority of customers to the Heffley Creek Eco-depot will likely not even notice the change if household garbage is trucked off site.
3. **Potential for revenue generation** – The City of Kamloops would see increased revenue at Mission Flats landfill and future improvements to the economy of scale.

However, further research and consultation with stakeholders will need to be conducted before Scenario 5 could be implemented. Stakeholder consultation could include further discussions with the City of Kamloops as well as Belcorp Environmental Services regarding tipping fees and operational considerations. Staff should also discuss potential impacts with large commercial garbage customers such as the Sun Peaks Grand Hotel. Lastly, a feasibility study of converting the Tk'emlups Landfill to an Eco-Depot style transfer station should be undertaken.

Sincerely,
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