2018 SOLID WASTE MANAGEMENT PLAN

PREPARED FOR
REGIONAL DISTRICT OF BULKLEY-NECHAKO

OCTOBER 2018
ISSUED FOR USE

TETRA TECH

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Via Email: Rory.McKenzie@rdbn.bc.ca

Regional District of Bulkley-Nechako
37 3rd Avenue
P.O. Box 820
Burns Lake, BC V0J 1E0

Attention: Rory McKenzie, Director of Environmental Services

Subject: Submission of Solid Waste Management Plan Update 2018

Dear Mr. McKenzie:

We are pleased to submit the Issued for Use version of the Region District of Bulkley-Nechako's Solid Waste Management Plan Update completed in 2018. It has been a pleasure working with you and your team at the RDBN.

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
BC	British Columbia
C&D	Construction and Demolition
CBSM	Community-based Social Marketing
EPR	Extended Producer Responsibility
FTE	Full Time Equivalent
HHW	Household Hazardous Waste
ICI	Industrial Commercial Institutional
OCC	Old Corrugated Cardboard
RDBN	Regional District of Bulkley-Nechako
RSWAC	Regional Solid Waste Advisory Committee
SWMP	Solid Waste Management Plan

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1.0 INTRODUCTION

In British Columbia (BC), regional districts develop solid waste management plans (SWMPs) under the provincial Environmental Management Act. SWMPs are long term visions of how each regional district would like to manage its solid waste in accordance with the pollution prevention hierarchy. These plans are renewed on a 10-year cycle to ensure that they reflect the current needs of the regional district as well as current market conditions, technologies and regulations.

In 2017, the Regional District of Bulkley-Nechako (RDBN) initiated a renewal of its 1996 SWMP to set waste management principles, targets and strategies for the next ten years. The SWMP review process considered existing solid waste management policies and programs; identified and evaluated options for reduction, diversion and residual management; and addressed financial implications including staff requirements and cost recovery.

This draft document represents an update of the RDBN's 1996 SWMP and once approved by the Province (along with any approval conditions), becomes a regulatory document for solid waste management and serves to guide the solid waste management related activities and policy development in the RDBN. In conjunction with regulations and operational certificates that may apply, this plan regulates the operation of sites and facilities that make up the region's waste management system.

1.1 Guiding Principles

A SWMP provides regional districts – and their residents and businesses – clear direction on how they will achieve their solid waste goals. The province has provided guiding principles to follow in the development of SWMP as presented in Table 1-1.

Table 1-1: Provincial Guiding Principles

No.	Provincial Guiding Principles
1	Promote zero waste approaches and support a circular economy.
2	Promote the first 3 Rs (reduce, reuse and recycle).
3	Maximize beneficial use of waste materials and manage residuals appropriately.
4	Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes.
5	Prevent organics and recyclables from going into the garbage wherever practical.
6	Collaborate with other regional districts wherever practical.
7	Develop collaborative partnerships with interested parties to achieve regional targets set in plans.
8	Level the playing field within regions for private and public solid waste management facilities.

The Regional Solid Waste Advisory Committee (RSWAC), was established by the RDBN Board to review the existing SWMP and provide input from a stakeholder and community perspective, reviewed these guiding principles and modified them as described below based on priority.

1. **Promote the first 3 Rs (reduce, reuse and recycle).**

   Elevate the importance of waste prevention by prioritizing programming and provision of services for the first 3 Rs in the 5 R pollution prevention hierarchy. Implement programs and services that consider provincial and regional targets for waste reduction and environmental protection. Encourage investments in technology and infrastructure, and ensure they occur as high up on the hierarchy as possible.

2. **Prevent organics and recyclables from going into the garbage wherever practical.**

   Maintaining a system to prevent organics and recyclables from going into the garbage will provide clean feedstock of greater economic value as well as a potential end product use to the recycling industry, while reinforcing behaviour to reduce, reuse and recycle. Innovation in separation solutions, establishment and enforcement of disposal restrictions or other creative means will influence this approach.

3. **Level the playing field within and between regions to support equitable access to waste management and diversion opportunities throughout the province.**

   Solid waste management facilities within a region should offer a similar level of service wherever practical. A consistent set of criteria should be used to evaluate the programs available at regional facilities. The region should advocate for equitable access to provincially mandated programs to ensure that rural and northern communities are receiving equivalent benefit from available programs.

4. **Promote zero waste approaches and support a circular economy.**

   Encourage a shift in thinking from waste as a residual requiring disposal, to waste as a resource that can be utilized in closed-loop systems. Zero waste approaches aim to minimize waste generation and enable the sustainable use and reuse of products and materials. At the local level, look to remove barriers or encourage opportunities that will contribute to towards the establishment of a circular economy.

5. **Develop collaborative partnerships with interested parties to achieve regional targets set in plans.**

   Strengthen partnerships with interested parties to achieve regional targets. All waste and recycling sector service providers, associations, and environmental organizations, product stewardship producers and agencies, and waste generators are key interested parties in achieving these targets. Cooperative efforts will optimize successful outcomes. Encourage a marketplace that will complement stewardship programs and drive private sector innovation and investment towards achievement of targets.

6. **Collaborate with other regional districts wherever practical.**

   Collaboration on many aspects of solid waste management (e.g., to access facilities and markets, share campaigns and programs) will support the most efficient and effective overall municipal solid waste system. Partner with neighbouring regions to advocate to senior levels of on common issues.

7. **Maximize beneficial use of waste materials and manage residuals appropriately.**

   Technology, best practices and infrastructure investments should continue to develop to recover any remaining materials and energy from the waste stream, and to manage residuals for disposal.

8. **Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes wherever practical.**

   Producer and user responsibility for the management of products can be supported through the provision of market-based incentives, disposal restrictions on industry-stewarded products, zoning to support collection facilities, and support for reuse and remanufacturing businesses. Education and behavior change strategies aimed at consumers and businesses will help foster further waste reduction, reuse and recycling. For example, user fees can be managed as incentives to increase waste reduction and diversion.

1.2 Pollution Prevention Hierarchy and Targets

This plan adopts the 5 R pollution prevention hierarchy as illustrated on Figure 1-1.

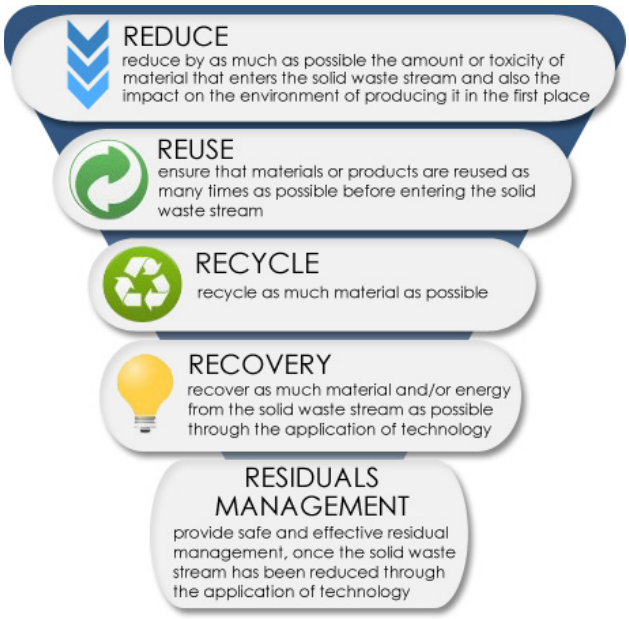

Figure 1-1: The Pollution Prevention Hierarchy

Source: (BC Ministry of Environment and Climate Change Strategy[1])

The SWMP's proposed goals, strategies and actions are laid out in Section 4.0 and are presented in the order of the hierarchy: reduce, reuse, recycle, and residual waste management. Section 5.0 provides information on plan monitoring while Section 6.0 addresses financing and cost recovery and Section 7.0 provides the anticipated implementation schedule.

The implementation of the proposed strategies and actions over a 10-year timeframe is expected to reduce the annual per person disposal rate from 600 kg per capita in 2016 to 500 kg per capita over the next 10 years, by 2028, through a phased approach. Phasing implementation will optimize existing and implement new waste reduction and diversion programs with the capacity to reduce disposal per capita. This disposal rate target will contribute to meeting the BC Ministry of Environment and Climate Change Strategy's (Ministry) target provincial average disposal rate of 350 kg per capita per year by 2020.

[1] Ministry of Environment Zero Waste & the Circular Economy (2017) http://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste

1.3 Plan Update Process

The process to review and update the SWMP was conducted in four stages as illustrated on Figure 1-2. During Stage One, the current system for managing municipal solid waste in the RDBN was assessed to identify potential gaps and opportunities. The findings of Stage One were presented in the Current Solid Waste Management System Report. Stage One also included establishment of the RSWAC which has provided input throughout the planning process.

Stage Two comprised analysis, evaluation and the development of a Draft SWMP. The options related to additional reduction and diversion as well as residual management were presented to the RSWAC in meetings and in two technical memoranda. A series of options were selected by the RSWAC for further analysis to determine costs, financial implications, and policy requirements. The RSWAC provided input on the ultimate inclusion of items within the Draft SWMP, which was approved for consultation by the RDBN Board of Directors.

In Stage Three the RDBN is consulting the public, municipal and First Nations partners, and key stakeholders to collected feedback on all elements of the Draft SWMP. Stage Four is the final update of the SWMP for submission to the Ministry for final approval.

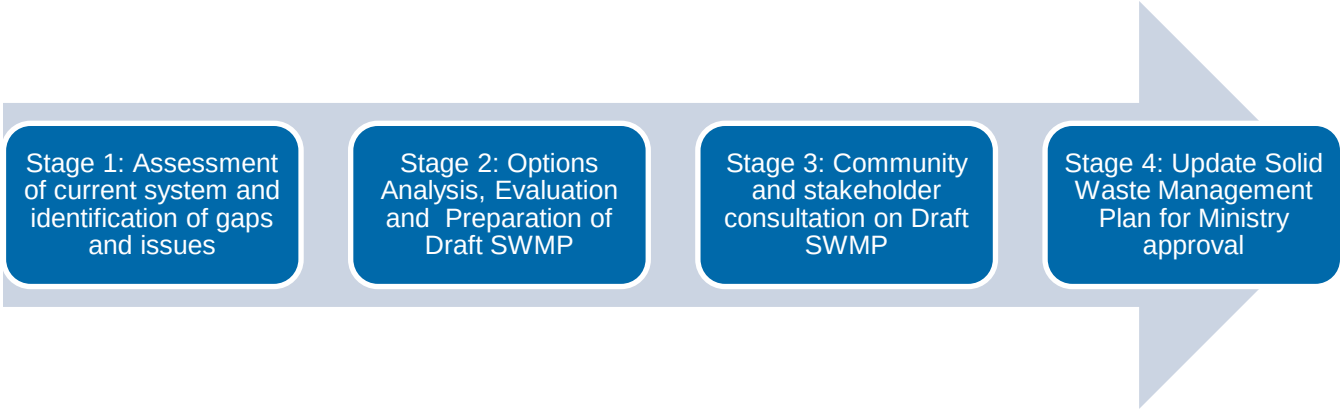

Figure 1-2: Plan Update Process

Several reports, as listed below, were prepared by the consultants to assist the RWSAC with their deliberations. These documents are available on the solid waste management page of the RDBN's website[2]. These reports, as seen in Appendix B, include:

- Current Solid Waste System Report;
- Technical Memorandum 1: Disposal Options;
- Technical Memorandum 2: Diversion Options; and
- Technical Memorandum 3: Options Costing and Financial Implications.

[2] Regional District of Bulkley-Nechako SWMP Site 2017
https://www.rdbn.bc.ca/environmentalservices/solid-waste-management/waste-watchers

2.0 PLAN AREA

The SWMP applies to the entire RDBN region and includes the Town of Smithers, the Districts of Vanderhoof, Fort St. James and Houston, the Villages of Fraser Lake, Burns Lake, Granisle, Telkwa, the unincorporated community of Fort Fraser, and Electoral Areas A (Smithers Rural), B (Burns Lake Rural), C (Fort St. James Rural), D (Fraser Lake Rural), E (Francois/Ootsa Rural), F (Vanderhoof Rural) and G (Houston Rural), as shown on Figure 2-1.

The RDBN is located in central BC. It is bounded by the Regional District of Fraser-Fort George to the east, the Cariboo Regional District to the south, the Regional District of Kitimat-Stikine to the west and Stikine and Peace River Regional Districts to the north.

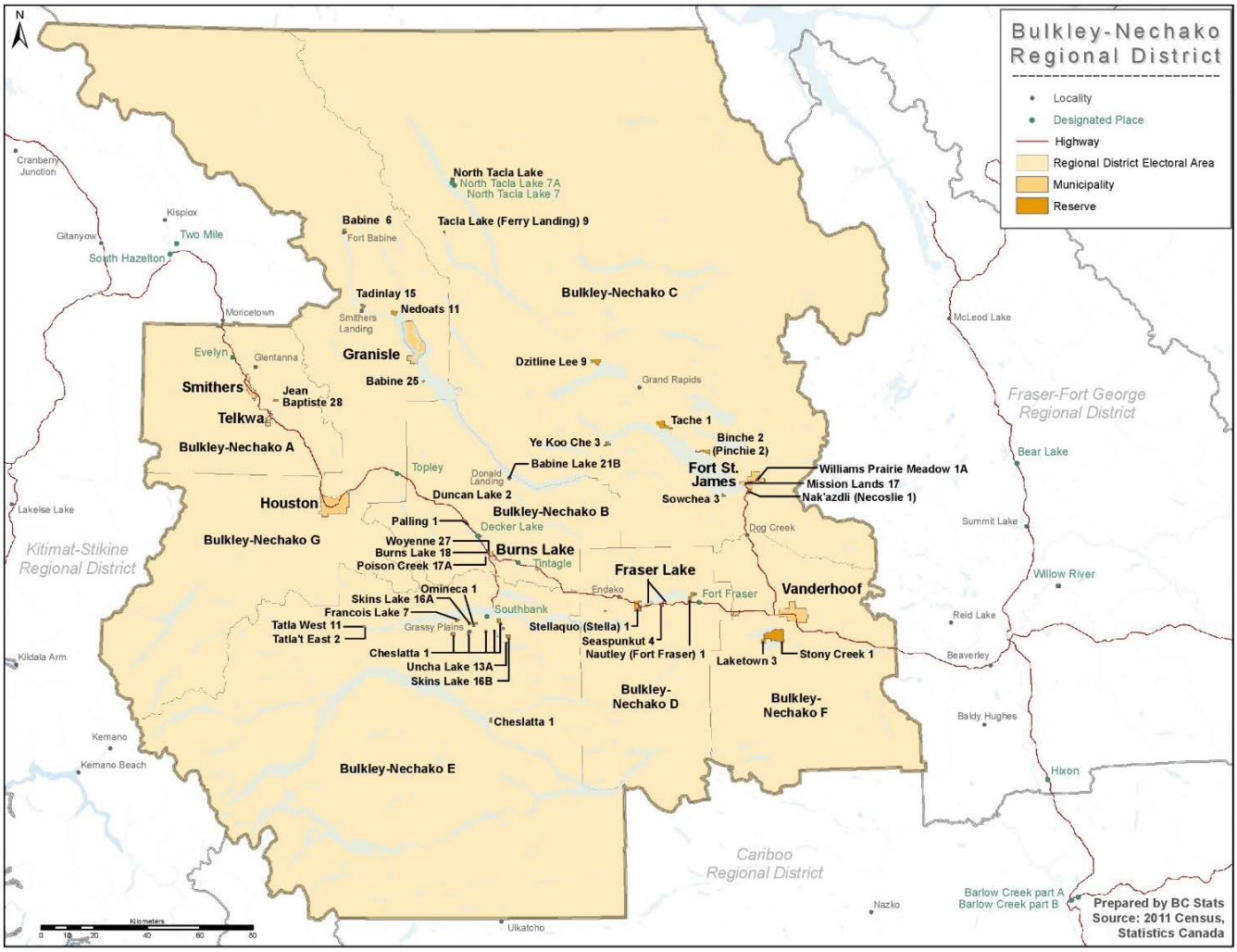

Figure 2-1: RDBN Plan Area[3]

[3] BC Statistics Census Boundary Maps 2017
https://www2.gov.bc.ca/gov/content/data/geographic-data-services/land-use/administrative-boundaries/census-boundaries

2.1 Population and Employment

The RDBN has seen an overall decrease in population since the 1996 SWMP was developed, as presented in Table 2-1. Data from Statistics Canada indicates that the Region's population has decreased slightly from 41,642 in 1996 to 37,896 in 2016, an average decrease of approximately 0.45% per year. This population decrease was most significant in rural areas.

Table 2-1: Regional Demographic Information

Demographic Measure	Reported by Statistics Canada[4]
Population, 2016	**37,896**
Population, 2011	**39,208**
Population, 2006	**38,243**
Population Change, 2011 to 2016	**-3.3%**
Population Change, 2006 to 2016	**0.9%**
Total private dwellings, 2016	**17,564**
Private dwellings occupied by usual residents, 2016	**15,101**

The population of RDBN is spread over the region's 73,000 km^2, with the majority of the population clustered along the Highway 16 corridor. The region's largest population centres are the Town of Smithers in the West and District of Vanderhoof in the East.

The Statistics Canada data does not include the First Nations population which was estimated at 2,826 based on service agreements in the 2016 census. Table 2-2 summarizes community and electoral area populations based on 2016 census data from Statistics Canada and 2017 First Nations populations living on reserve based on RDBN service agreements which estimate First Nations population.

Table 2-2: Populations of Regional Electoral Areas and Municipalities

Community	Population 2016[5]	Estimated First Nations Population[6]
Town of Smithers	5,401	-
District of Vanderhoof	4,439	-
District of Houston	2,993	-
Village of Burns Lake	2,727*	-
District of Fort St. James	1,598	-
Village of Telkwa	1,327	-
Village of Fraser Lake	988	-
Village of Granisle	303	-
Unincorporated Community of Fort Fraser	275	-
Electoral Area A (Smithers Rural)	5,256	-
Electoral Area B (Burns Lake Rural)	1,938	15
Electoral Area C (Fort St. James Rural)	1,415	1,435
Electoral Area D (Fraser Lake Rural)	1,472	409
Electoral Area E (Francois/Ootsa Rural)	1,593	142
Electoral Area F (Vanderhoof Rural)	3,665	331
Electoral Area G (Houston Rural)	903	-
Subtotal	35,345	2,826
Total	**38,171**	

*Note – Town of Burns Lake Population includes First Nations populations for Lake Babine Nation and Burns Lake Band who are serviced by the Town of Burns Lake through service agreements.

[4] Statistics Canada 2016 Census Profile – RDBN http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

[5] Population estimates based on Statistics Canada 2016 Census Profiles http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1

[6] First Nations populations estimated based on existing service agreements with the RDBN.

2.2 Economic and Housing Data

RDBN has a varied economy located within 8 unique municipalities, 7 electoral areas, and 13 First Nations. Income distribution in the region is similar to the province as a whole with proportionally more middle and higher income individuals than average. Manufacturing and resource management (e.g., agriculture/forestry/fishing/hunting) were the leading sources of employment in 2011; both of these industries employed a greater proportion of the labour force than anywhere else in Northern BC.

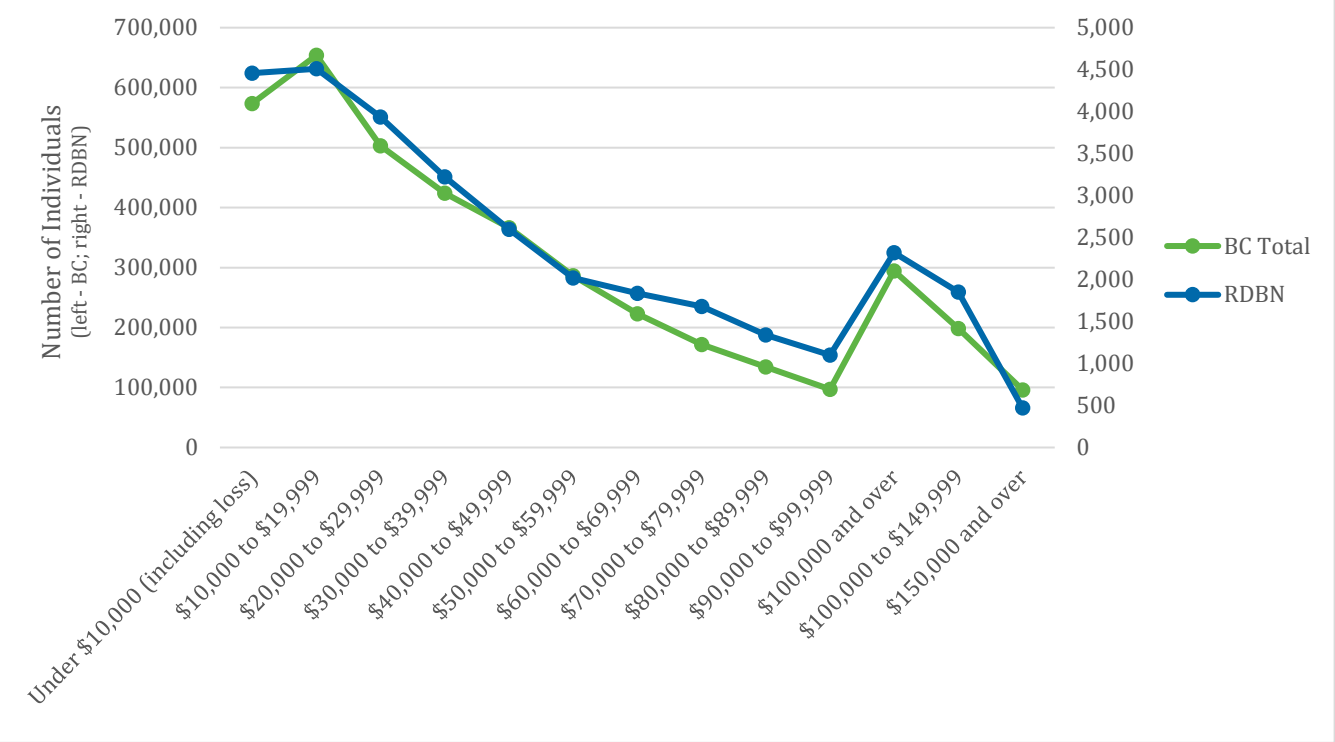

Figure 2-2: Individual Income (Before Tax) in 2015 (Statistics Canada 2016)

The most recent census data indicates that in 2016, there were 15,105 occupied private dwellings in the RDBN. For the purposes of the solid waste management planning, over 95% of the region's housing stock is considered to be single-family with only 6% of dwellings considered to be multi-family (apartments). This distinction is important with respect to access to curbside collection services, which is discussed in Section 3.2.1.

Table 2-3: Occupied Dwelling Types in the RDBN (Statistics Canada 2016)

Occupied Dwelling Type	Number	Proportion
Single Detached House	11,745	78%
Semi-Detached, Row House, Duplex	935	6%
Apartments	935	6%
Movable Dwelling (mobile homes and other movable dwellings)	1,490	10%
Total	**15,105**	**100%**

* Based on Statistics Canada 2016 Census Profiles, which exclude First Nations populations.

3.0 SOLID WASTE MANAGEMENT SYSTEM IN THE RDBN

This section provides a summary of the implementation status of the 1996 SWMP as well as an overview of the current solid waste management system, including data on the quantity and composition of solid waste disposed. This information was used to determine the options available to the RDBN to improve the existing system and is the baseline from which the 2018 SWMP was developed.

3.1 Plan History and Implementation Status

The RDBN's original 1996 SWMP transformed solid waste management in RDBN from many small disposal sites to two sub-regional landfills and one small modified landfill supported by a series of local transfer stations. In 2008, the RDBN commissioned a Stage 1 report to assess the solid waste management system. At that time they decided to continue work on implementing the original SWMP instead of completing Stage 2 and Stage 3 of a full SWMP update. The completion of key items from the 1996 SWMP were in progress and no additional options could be accommodated by available resources.

The overall goal of the 1996 SWMP is to provide for the most environmentally safe and economically feasible method of managing solid waste in the region. The 1996 SWMP developed the following objectives to meet this goal:

- That the weight of solid waste per capita requiring disposal be reduced (using the volumes in 1990 as our standard) by using the most environmentally and economically efficient methods acceptable to the taxpayer and that the suggested reduction of 30% by 1998 and 50% by the year 2000 be used as a method of judging our efforts;
- That this reduction be achieved through sequential strategies of reduction, reuse, recycling and composting;
- That the SWMP identify problems with the present disposal system and supply possible solutions; and
- That the SWMP be funded through an appropriate mix of user-pay and taxation mechanisms.

A number of the strategies and policies identified in the 1996 SWMP have been completed or are currently being carried out. Table 3-1 summarizes the strategies and policies identified in the 1996 SWMP and implementation progress at the time of writing.

Table 3-1: Summary of 1996 SWMP Completion Status

Strategy	Status	Notes
Reduction and Reuse Programs – 12.5% Diversion Anticipated *Objective: To reduce and reuse the amount of waste generated as much as is practically possible.*		
Education/media campaign.	Partially complete	Some education and outreach programs are in place. All major solid waste facilities are listed on the RDBN website and regional recycling brochures.
Tipping fees and variable rate charges.	Cancelled	Tipping fee changes have been considered but not changed. RDBN staff completed studies in 1999 and 2004 to assess options for tipping fees. Implementation of tipping fees was discussed in Inter-Municipal, RDBN Board, and APC meetings in 1998 and 1999. The RDBN Board has deferred implementation of tipping fees for municipal solid waste but has approved fees for specific materials. Materials with tipping fees include special materials (construction and demolition), specified materials (specified risk materials, asbestos, appliances containing ozone depleting substances), and contaminated soils.
Tag-bag charges.	Cancelled	RDBN does not charge for residential waste dropped-off at regional facilities. Bag tagging was considered as an option in the 1999 User-Pay Implementation System study completed by RDBN staff. Some municipalities (Burns Lake, Telkwa, and Smithers) have instituted variable rates for garbage collection and limits on disposal where cart-based collection is in place.
Waste reduction plans/waste audit manuals.	Not complete	No audit guides have been provided by RDBN to institutions or businesses to support diversion.
Reuse facilities at landfills and transfer stations.	Complete	Reuse sheds have been developed at all public landfills and transfer stations.
Political initiatives.	Complete	RDBN has contributed to lobbying and communication with senior levels of government.
Community group initiatives.	Complete	RDBN has provided information and grants to non-profit groups to promote waste reduction.
Recycling – 8% to 14% Diversion Anticipated *Objective: To support recycling as a viable method of reducing solid waste going to landfills provided that it is economically viable.*		
Residential recycling (sub-regional or region-wide).	Complete	Limited recyclable materials are accepted at RDBN-operated public solid waste facilities (landfill and transfer stations) including metals, propane tanks, and limited household recycling (mixed paper, mixed containers). The compactor units envisioned for drop-off depots have not been installed. Curbside recycling for the residential sector is available in Smithers, Telkwa, and Fort St. James. Private depots exist in most communities supported by extended producer responsibility (EPR) organizations (Encorp, Product Care, Recycle BC, etc.).
Commercial recycling.	Complete	Cardboard recycling was stimulated through the 2016 cardboard ban from landfills and transfer station tipping floors. RDBN provides commercial recycling bins at a number of locations in the region.
Ferrous metals and white goods recycling.	Complete	RDBN stockpiles these materials separately from the garbage stream for future recycling at all solid waste facilities it operates.
Composting – 1% Diversion Anticipated *Objective: To encourage composting as a method for waste reduction.*		
Backyard composting.	Complete	RDBN sells subsidized backyard composters to the community.
Centralized yard waste composting.	Complete	RDBN is working with local community gardens to support composting. Yard waste is collected for composting at all transfer stations. Food waste is not targeted as key material stream within this program.

Strategy	Status	Notes
Residuals Management *Objective: To operate all regional landfills in accordance with BC Environment's Landfill Criteria for Municipal Solid Waste, June 1993.*		
Closure of landfills** and replacement with transfer stations.	Partially complete	Closure operations have been completed but must be reviewed by the Ministry of Environment and Climate Change Strategy (Ministry). The RDBN will work with the Ministry to assess abandonment of historical disposal site permits.
Operation of two sub-regional engineered landfills and Manson Creek Landfill to meet Landfill Criteria.	Complete	Operations are underway at the RDBN's three remaining landfills.
Development of a transfer station network to replace closed landfills.	Complete	Transfer stations have been developed on many historical landfill locations.
Problem Wastes *Objective: To manage all problem wastes in an environmentally safe yet economic manner.*		
Household hazardous waste (HHW) program support and lobbying.	Partially Complete	Regeneration (Product Care Association) currently manages most typical HHW products and supports several depots in the region.
Investigate alternative methods for managing wood waste.	Deferred	RDBN has considered alternative methods but has not identified any long-term economically feasibility management technique.
Accept animal carcasses at landfill sites.	Complete	Procedures are in place to manage landfill disposal of specified risk material from local slaughter houses and hunting. A fee is in place for disposing of animal carcasses from outside of the region.
Ban tires for landfill sites and transfer stations.	Complete	Tires are not disposed in the landfill or accepted at transfer stations. Local tire shops are responsible for collecting and recycling tires.
Financing		
Financing the system through user-pay (70%) and taxation (30%).	Cancelled	Currently the majority of the system is financed through taxation.
Administration *Objective: To coordinate policies of this plan with other interested stakeholders.*		
RDBN is responsible for reduction, reuse, recycling, and composting, waste transfer and disposal.	N/A	RDBN manages solid waste in the region and provides oversight of recycling, which is offered by a mixture of public and private entities.
A permanent Plan Monitoring Advisory Committee should ensure that the plan is implemented.	Partially Complete	The board's solid waste committee monitored progress on the plan initially, but the committee was not maintained long term.
The plan should be subject to annual reviews and a major review every five years.	Partially Complete	Internal annual reviews of the plan have occurred but only one addendum was officially completed. A major review has not occurred since plan creation in 1996.
RDBN will encourage communication among all stakeholders affected by the plans.	Partially Complete	Some amount of communication occurs between RDBN and stakeholders, but no consistent forum has been created to foster regular stakeholder communication.
Staffing may include a waste management coordinator/planner and a field services supervisor.	Complete	Historically staffing levels in the Environmental Services department have included sufficient resources to support ongoing operations.

** Inactive landfills closed following the 1996 SWMP include Vanderhoof Landfill, Fort St. James Landfill (Photo 2-1 and Photo 2-2), Fraser Lake Landfill, Fort Fraser Landfill, Ootsa Lake Landfill, Burns Lake Landfill, Granisle Landfill, Smithers Landing Landfill, Old Smithers Landfill, Smithers/Telkwa Landfill, Endako Landfill, Cluculz Lake Landfill, Francois Lake, Grassy Plains Landfill, Southbank Landfill, Tatalrose Landfill, Topley Landing Landfill, Topley Landfill, Perow Landfill, Palling Landfill and Houston Landfill.

3.2 Current Solid Waste Management System

Figure 3-1 outlines the key components of the RDBN current system for managing municipal solid waste, from those initiatives that prevent the creation of waste to collection to diversion, and then finally disposal. Waste generators are also included in this figure as a key component of the system since these are the sources of the solid waste that must be managed through collection, diversion and disposal.

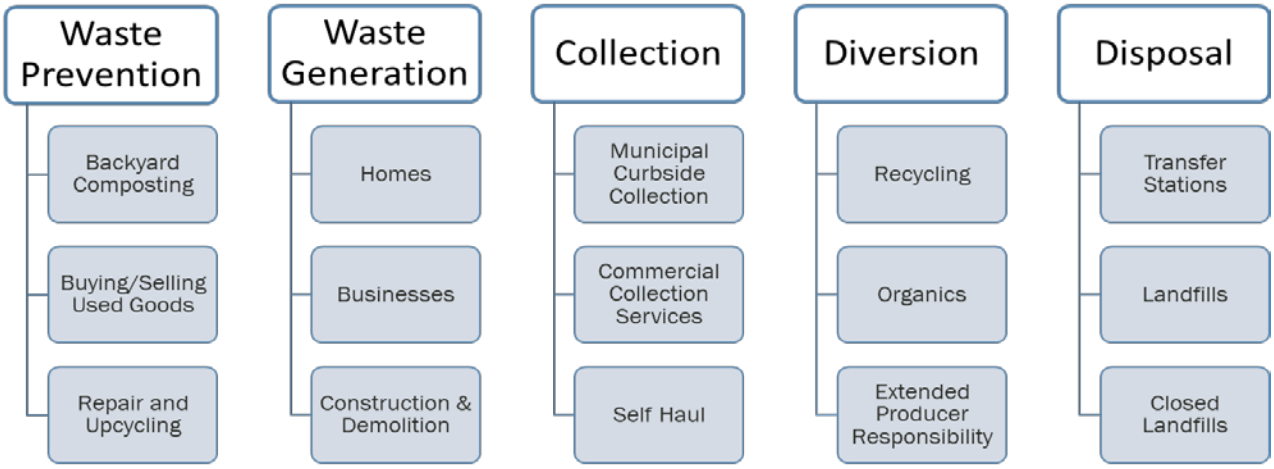

Figure 3-1: Components of the Current Solid Waste Management System

3.2.1 Collection Services

As indicated on Figure 3-1, residential, business and construction demolition waste are collected by municipalities, private commercial collection haulers or self-hauled to public and private diversion and disposal facilities in the RDBN. Due to the distance between communities, waste management collection services and facilities can be divided into distinct waste sheds These waste sheds can be delineated by the waste generating area, such as the Town of Smithers and the adjacent rural community such as Electoral A (Smithers Rural) as well as the facility to which waste is delivered such as the Smithers Telkwa Transfer Station.

Table 3-2 presents the availability of curbside collection programs in each municipality and electoral area in RDBN as well as the adjacent transfer station or disposal facility. Most municipalities in the region provide curbside collection of garbage with some providing curbside recycling though Recycle BC. Private haulers offer curbside collection by subscription in many areas where it is not offered by municipal governments however the majority of rural electoral area residents do not have curbside collection of garbage or recyclables and must self-haul their waste to the nearest transfer station or private recycling facility if available.

Municipally and privately collected garbage is unloaded at the local landfill or transfer station for no fee. Material collected curbside is taken to transfer stations where it is consolidated into trailers with the garbage dropped off by residents and hauled to one of the RDBN's sub-regional landfill facilities: Knockholt and Clearview Landfills.

Table 3-2: Collection Services Available by Municipality and Electoral Area

Community Waste Shed	Total Households (StatsCan 2016)	Residential Curbside Collection Availability	
		Garbage	Recycling
Smithers-Telkwa Waste Shed			
Town of Smithers	2,389	Curbside	Curbside
Electoral Area A (Smithers Rural)	2,213	Self-Haul	Self-Haul
Village of Telkwa	539	Curbside	Curbside
Smithers/Telwa Transfer Station			
Knockholt Waste Shed			
District of Houston	1,402	Curbside	Self-Haul
Electoral Area G (Houston Rural)	450	Self-Haul	Self-Haul
Knockholt Landfill			
Granisle Waste Shed			
Village of Granisle	284	Curbside	Self-Haul
Granilse Transfer Station			
Takla Landing Waste Shed			
Takla Landing	93	Curbside	Self-Haul
Takla Landfill Transfer Station			
Burns Lake Waste Shed			
Village of Burns Lake	903*	Curbside	Self-Haul
Electoral Area B (Burns Lake Rural)	896	Self-Haul	Self-Haul
Burns Lake Transfer Station			
Southside Waste Shed			
Electoral Area E (Francois/Ootsa Rural)	840	Self-Haul	Self-Haul
Southside Transfer Station			
Fraser Lake Waste Shed			
Village of Fraser Lake	551	Curbside	Self-Haul
Fort Fraser	158	Self-Haul	Self-Haul
Electoral Area D (Fraser Lake Rural)	854	Self-Haul	Self-Haul
Area D Transfer Station			
Fort St. James Waste Shed			
District of Fort St. James	761	Curbside	Curbside
Electoral Area C (Fort St. James Rural)	854	Self-Haul	Self-Haul
Fort St. James Transfer Station			
Vanderhoof Waste Shed			
District of Vanderhoof	1,831	Curbside	Self-Haul
Electoral Area F (Vanderhoof Rural)	1,902	Self-Haul	Self-Haul
Vanderhoof Transfer Station			

* Note: Includes household collection by the Village of Burns Lake of the Lake Babine First Nation and the Burns Lake Band.

3.2.2 Facilities

The solid waste management system in RDBN includes a number of public and private facilities. Figure 3-2 shows all facilities managed by RDBN. RDBN operates the majority of solid waste transfer and disposal facilities in the region. Many of the RDBN facilities include diversion and reuse services, including yard waste composting, scrap metals recycling, reuse sheds, and some household recyclable collections. The Takla First Nation also operates a small transfer station in the community of Takla Landing that currently only accepts garbage for transfer to landfill. A number of private recycling facilities are operating in the region with varying levels of financial support from RDBN and EPR organizations. With the exception of the Manson Creek Landfill, all solid waste transfer and disposal facilities are staffed during operating hours.

The RDBN operates seven transfer stations in the region that are used by both residents and private haulers. Garbage is consolidated and transported for disposal at Knockholt or Clearview Landfill. In most instances, garbage is hauled directly from the transfer station to one of the region's two sub-regional landfills (Knockholt and Clearview sub-regional landfills). However, in order to increase transfer efficiency, garbage from small transfer stations is hauled to larger transfer facilities for consolidation and long-haul transfer to landfill (e.g., garbage from Southside Transfer Station and Granisle Transfer Station is hauled to Burns Lake Transfer Station and subsequently to Knockholt Landfill).

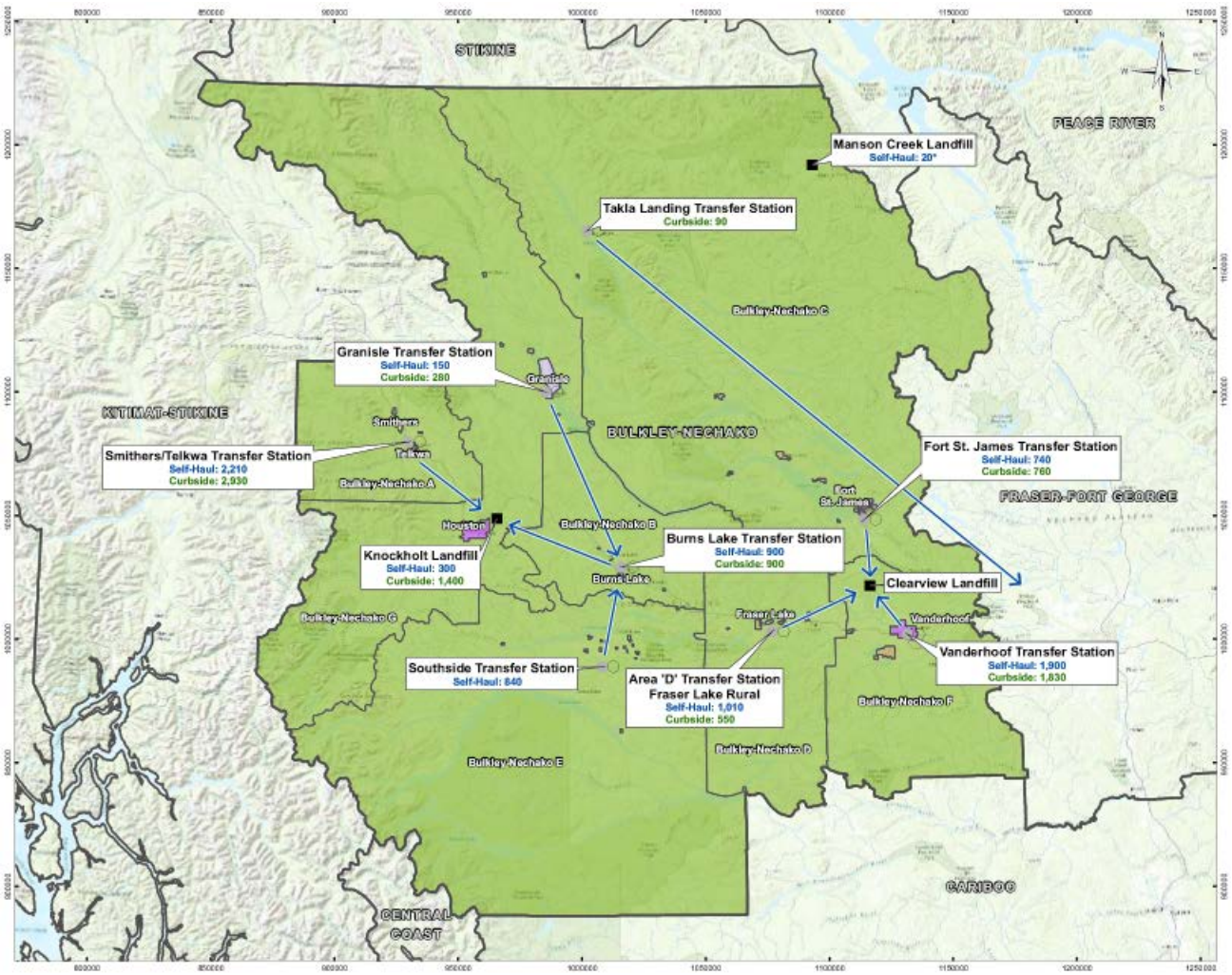

Figure 3-2: Summary of Solid Waste Facilities and Waste Sheds

The Region operates two engineered sub-regional landfills. A third small landfill (Manson Creek) exists in the northwest corner of Area C to serve local populations. RDBN conducts regular environmental monitoring of active and closed landfills to confirm that no contaminants are migrating off site onto adjacent properties.

3.3 System Participants

Table 3-3 provides a list of the various organizations that contribute to municipal solid waste management in the RDBN.

Table 3-3: Municipal Solid Waste Management Participants

Who	Roles in Solid Waste Management
Federal Government	▪ Regulates waste management facilities under federal jurisdiction.
Provincial Government	▪ Approves SWMPs as regulated through the Environment Management Act. ▪ Regulates Product Stewardship programs through the Recycling Regulation. ▪ Authorizes discharges to the environment through permits and operational certificates. ▪ Responsible for enforcement of Provincial regulations and the conditions set out in discharge permits and operational certificates. ▪ Various Ministries have several other regulatory authorities related to waste management.
RDBN	▪ Develops plans to provide big picture oversight of waste management in the region. ▪ Owns and operates waste management facilities. ▪ Through regional plans and plan implementation (including bylaws), works to meet regional waste disposal goals and targets and ensures that the communities have access to RDBN facilities and services. ▪ Collaborates and cooperates with local organizations, businesses and agencies to implement plans and new programs. ▪ Ensures that legislative and policy requirements are followed, including monitoring and reporting. ▪ Supports the provision of Product Stewardship programs in the RDBN. ▪ Provides waste management related education and promotion of programs.
Product Stewardship Producers and Agencies	▪ Ensures reasonable and free consumer access to collection facilities. ▪ Collects and processes stewarded products. ▪ Coordinates local government delivery as a service provider where applicable. ▪ Provides and/or funds education and marketing. ▪ Provides deposit refunds to consumers (where applicable). ▪ Monitors and reports on key performance indicators such as recovery rates to the Province on a regional district basis (when possible).
First Nations Communities	▪ Provides waste management services to residents and businesses.
Non-Profit Sector	▪ Applies for waste reduction funding through available grants and government support. ▪ Engages in and promotes upcycling, reuse, and recycling.
Residents and Businesses	▪ Responsible for carrying out proper waste reduction, recycling and disposal activities. ▪ Collaborates and cooperates with local government initiatives.

3.4 System Performance

3.4.1 Waste Disposal

Figure 3-3 presents the total annual municipal solid waste disposed in RDBN landfills. Municipal solid waste is made up of refuse from residential and industrial, commercial and institutional (ICI) sources, as well as construction and demolition (C&D)/wood waste generated from construction, demolition, and land clearing projects.[7] The overall quantity of waste disposed over the past five years has been fairly consistent. The most significant variations are the quantities of C&D waste, as shown on Figure 3-3. It is common for C&D waste quantities to vary annually due to varying levels of construction or demolition activities.

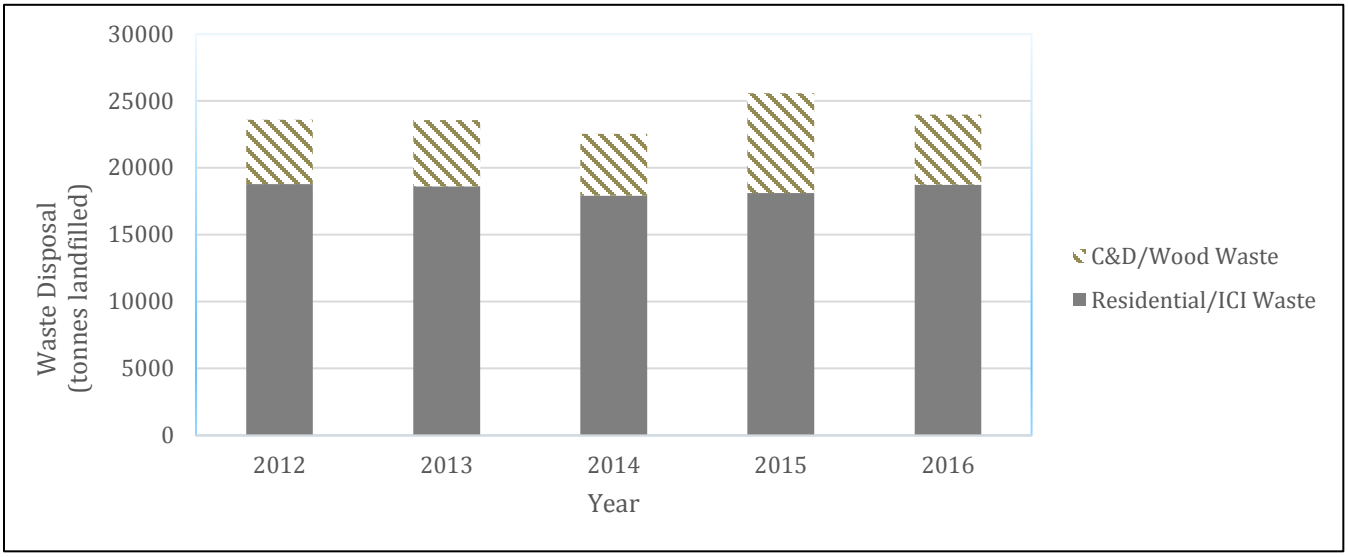

Figure 3-3: RDBN Waste Disposal (tonnes landfilled) 2012-2016

In 2016, a total of just over 23,100 tonnes of municipal solid waste was disposed in the region's three landfills including 8,400 tonnes at the Clearview Sub-Regional Landfill, 15,800 tonnes at the Knockholt Sub-Regional Landfill, and an estimated 40 tonnes at the Manson Creek Landfill. Based on the Ministry's municipal solid waste disposal calculator, the 2016 per capita disposal rate in the RDBN was 600 kg per capita. This is higher than the 2016 provincial average disposal rate of roughly 472 kg per capita and above the provincial average target disposal rate of 350 kg per capita per year by 2020.

3.4.2 Waste Composition

Figure 3-4 shows the waste composition from a study in 2008 that was adjusted for 2016. The largest (by weight) component of what is landfilled is organic waste (37%), which includes food waste, yard waste and compostable paper products like paper toweling and tissues. The next largest component is paper (20%) such as cardboard, newspaper, office paper and magazines. The third largest is plastic (13%), including plastic containers, film plastic (e.g., bags) and rigid plastic items (chairs, toys, etc.).

[7] RDBN landfills also receive a small volume of Specified Risk Material from deceased cattle (roughly 150 tonnes per year). This type of waste is not considered municipal solid waste and has not been included in the annual solid waste disposal data.

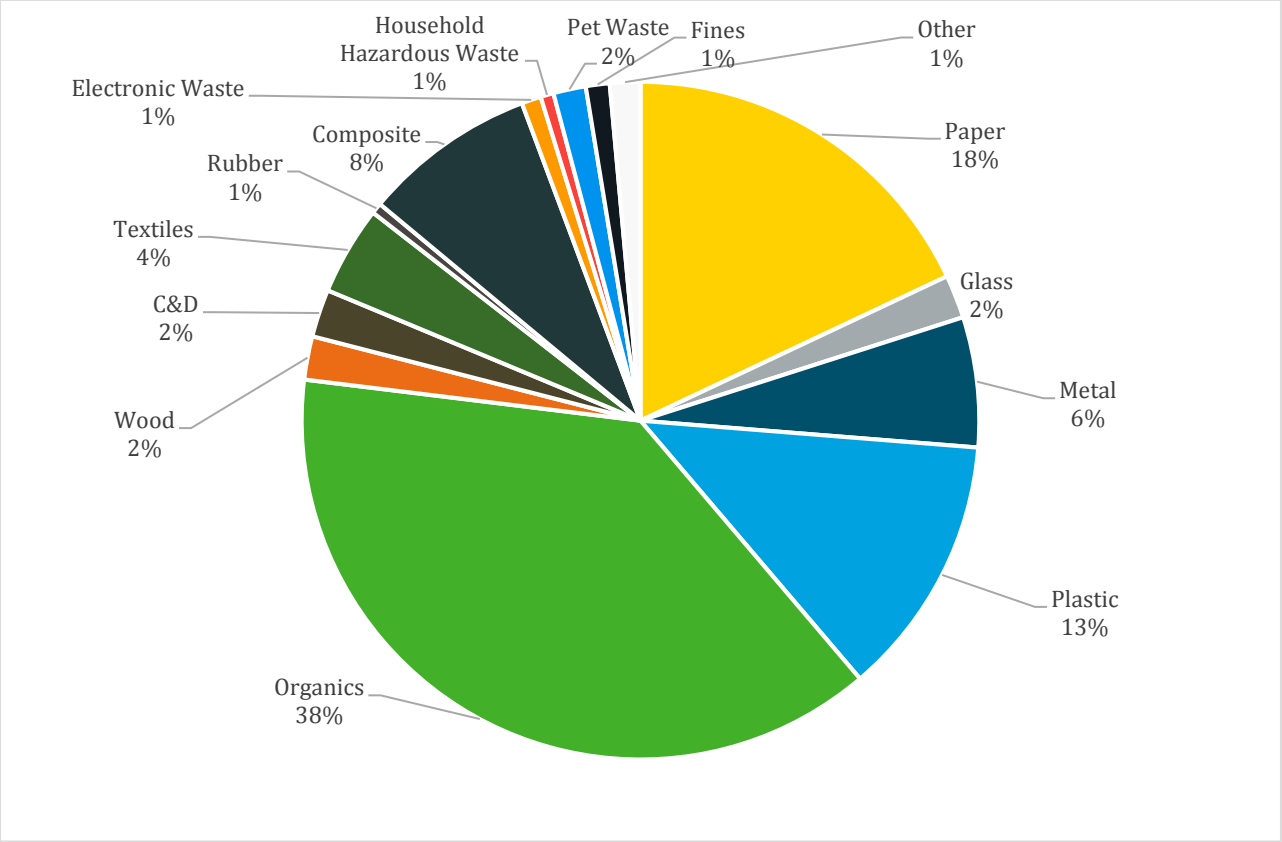

Figure 3-4: Adjusted 2016 Waste Composition

3.5 Key Issues

Establishing sustainable waste diversion and disposal systems is challenging for regional districts located in northern BC. Harsh climates, low population density, long distance to recycling markets and low cost and abundant disposal capacity often hinder effective waste diversion efforts.

Within this context, the planning process identified the following key issues to be addressed in the updated SWMP.

1. Although the RDBN supports a range of reduction and reuse initiatives, there are currently no programs aimed at reducing the generation of food waste.

2. Only 50% of households in the RDBN receive curbside garbage collection and even less have access to curbside recycling. This limited access to packaging and paper recycling programs (Recycle BC) should be expanded to maximize the financial and logistical support offered under this provincial EPR program.

3. Recycle BC only deals with residential packaging and paper recycling programs. The ICI sector also produces these materials and diversion needs to be supported in this sector.

4. Roughly 38% of the current waste stream is compostable organics. Although organics diversion is currently occurring on a small scale at all of the region's public access facilities, opportunities exist to expand the amount and type of materials processed through small composting sites.

5. Wood waste is collected separately at all facilities and there is an opportunity to divert this and other construction demolition waste materials if markets are available.

6. EPR requirements have expanded since the original SWMP. The Ministry is likely to continue to add materials to the EPR system. As products are added, services in the region could expand to take advantage of additional support available. However, there is currently no framework for making decisions regarding participation in EPR programs.

7. There is currently limited public education and communication on proper handling and collection locations for HHW.

8. Although agricultural plastics are not considered to be municipal solid waste under the Environmental Management Act and therefore outside the scope of the SWMP, diversion and disposal of this material is a significant issue in the RDBN due to the additional handling costs and lack of alternatives to disposal.

9. No staff resources are currently focused on supporting and implementing residential and ICI waste reduction programs as well as programing and behavior change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce and reuse initiatives.

10. The solid waste management system in the RDBN is primarily funded through taxation versus tipping fees which minimizes financial incentive for residents, business, and most municipalities to dispose of materials rather than recycle them. Implementing the options and actions identified in the SWMP will result in increases to operating costs which will need to be recovered through increases in taxation or tipping fees. Reassessing the feasibility of implementing tipping fees at all facilities may better support the solid waste management system, diversify revenue sources, and support the RDBN's strategic priorities.

11. The region's disposal facilities operate based on Operational Certificates issued prior to the most recent landfill guidelines. Future updates to Operational Certificates and the increasing size of landfills may require additions and improvements to environmental controls and protection.

12. Expansion of oil and gas and mining industries create an influx of workers all of whom generate a disproportionate amount of waste compared to their relative tax contribution in the region. The industries and camps that support them are not paying their "fair share" of the RDBN's costs for solid waste management under current financial policies.

4.0 GOALS AND STRATEGIES

The following goals, strategies and actions are recommended to address the region's key issues and work toward the disposal rate target of 500 kg per person. The strategies are divided into two sections: reduce, reuse and recycle which were addressed in detail in Technical Memorandum No. 2 Diversion Options and Technical Memorandum No. 3 Options Costing and Financial Implications; and residual management which were addressed in detail in Technical Memorandum No. 1 Disposal Options and Technical Memorandum No. 3.

For each strategy, a table is included that describes the costs associated with the proposed program. While the RDBN is ultimately responsible for these costs, they may be recovered through implementation of tipping fees, or increased taxation as further addressed in Section 4.3 and Section 6.0.

4.1 Reduce, Reuse, and Recycle Strategies

4.1.1 Strategy 1: Increase Reduction and Reuse

Issue: Although the RDBN supports a range of reduction and reuse initiatives, there are currently no programs aimed at reducing the generation of food waste.

A. Promote ideas from “Love Food Hate Waste”-style campaigns in regional promotion and education.

B. Encourage and promote food donation for businesses and restaurants to food banks and farms.

C. Continue to promote existing programs at public access facilities and operated by private sector and non-profit organizations in the region.

Actions	Estimated Capital Cost	Estimated Operating Cost
Promote ideas from “Love Food Hate Waste”-style campaigns in regional promotion and education. Encourage and promote food donation for businesses and restaurants to food banks and farms.	-	0.1 FTE[1] (New)

[1] Full time equivalent (FTE)

4.1.2 Strategy 2: Expand Access to Residential Recycling

Issue: Only 50% of households in the RDBN receive curbside garbage collection and even fewer have access to curbside recycling. Access to packaging and paper recycling programs (through Recycle BC) should be expanded to maximize the financial and logistical support offered under this provincial EPR program by increasing the access to services where it is not being provided by existing operators.

A. Lobby the Province to reduce or eliminate the proposed Recycle BC population cut-off for curbside service.

B. Host Recycle BC depots at all RDBN public drop-off facilities (where practical). Provide infrastructure and staff as necessary to meet the standards set out in agreements with Recycle BC.

C. Assess the need for consolidation capacity in the region and provide infrastructure if required based on the tonnage of materials collected, capacity of existing consolidation services, and business analysis for operations.

D. Support the expansion of multi-family recycling by encouraging expansion and communication by collection providers (where practical).

E. Where in line with the region’s goals, provide a standard level of support for local non-profit recycling organizations to deliver public education, public communication, recycling coordination and local reduction, reuse, and recycling initiatives at a rate of $2.50 per serviced population.

Actions	Estimated Capital Cost	Estimated Operating Cost
Lobby the Province to reduce the proposed Recycle BC population cut-off for curbside service.	-	Current Staff
Host Recycle BC depots at all RDBN public drop-off facilities (where practical).	System (at full depot implementation – year three)	Subsidy to local organizations for communications and education: ▪ -$212,200/year
	Smithers-Telkwa Transfer Station: ▪ $30,000 (previously purchased) (year one)	Full-time staff for re-use shed and Recycle BC depot: ▪ $51,250/year (additional)
	Granisle Transfer Station: ▪ $15,000 (year three)	Recycling Coordinator to support education and resident engagement: ▪ $15,000/year
	Burns Lake Transfer Station: ▪ $30,000 (year two)	Full-time staff for re-use shed and Recycle BC depot: ▪ $51,250/year (additional)
	Fort St. James Transfer Station: ▪ $15,000 (year two)	Part-time staff to supervise depot: ▪ $30,000/year (additional)
	Area D Transfer Station – Fraser Lake Rural: ▪ $15,000 (year two)	Part-time staff to supervise depot: ▪ $30,000/year (additional)
	Southside Transfer Station: ▪ $15,000 (year three)	Recycling Coordinator to support education and resident engagement: ▪ $15,000/year
	Vanderhoof Transfer Station: ▪ $25,000 (previously purchased) (year one)	Full-time staff for re-use shed and Recycle BC depot: ▪ $51,250/year (additional)
	Public Drop-Off at Knockholt Landfill*: ▪ $15,000 (year two)	Part-time staff to supervise depot: ▪ $30,000/year (additional)
Assess the need to consolidation capacity in the region and provide infrastructure for the eastern portion or western portion of the region if required.	Consolidation Centre: ▪ $500,000 (eastern sub-region year four, western sub-region year five if required)	Part-time staff to operate Consolidation Centre: ▪ $30,000/year/center (additional) Consolidation Center operating and maintenance costs: ▪ $50,000/year/center (additional)
Support the expansion of multi-family recycling by collection providers (where practical).		Current Staff (in partnership with municipal and private collection providers)

4.1.3 Strategy 3: Increase Industrial Commercial Institution (ICI) Sector Recycling

Issue: Recycle BC only deals with residential packaging and paper recycling programs. The ICI sector, estimated to generate approximately 40% of total materials in the region, also generates these materials and diversion needs to be supported in this sector.

A. Develop, support, and collaborate with existing private and non-profit service providers to educate businesses on recycling options. Build on existing relationships to encourage consistent signage and messaging throughout the region. Work with private and non-profit service providers to promote the use of existing services.

B. Implement disposal restrictions on other readily divertible materials. Expand disposal restrictions to additional materials as access to recycling expands throughout the region.

C. Advocate for ICI packaging and printed paper (PPP) to be included in EPR legislation in the north.

D. Increase access to recycling for small load ICI old corrugated cardboard (OCC). Support or facilitate access to recycling services by promoting use of shared bins or hosting bins on a cost-recovery basis at regional solid waste facilities (as required).

Actions	Estimated Capital Cost	Estimated Operating Cost
Collaborate with the private and non-profit sector to educate businesses on recycling options. Implement disposal restrictions on readily divertible materials. Advocate ICI to be included in EPR legislation in the north. Increase access to recycling for small load ICI OCC.	-	0.25 FTE (New)

4.1.4 Strategy 4: Increase Organics Diversion

Issue: Approximately 38% of the current waste stream is compostable organics (i.e., food scraps, food-soiled paper, yard and garden debris). Although organics diversion for yard and garden debris is currently occurring on a small scale at all of the region's public access facilities, opportunities exist to expand the amount and type of materials processed through small composting sites.

A. Improve the backyard composting program to actively support source reduction. Expand the program to provide greater access to composter subsidies.

B. Develop an organics diversion strategy to provide clear direction with respect to policy, collection, processing, and transfer operations to provide cost-effective diversion.

   a. Collaborate with municipalities to identify options to collect organics (i.e., food scraps, food-soiled paper, yard and garden debris) and implementation schedule.

   b. Consider the quantity of specified risk materials from animal slaughter fatalities that could be processed in place of being disposed in the landfill.

   c. Develop the approach to implement processing infrastructure.

C. Implement the processing infrastructure necessary to process all organics collected in the region.

Actions	Estimated Capital Cost	Estimated Operating Cost
Improve backyard composting program.	-	Increase program budget by 20%: ▪ $2,500/year (additional) beginning in year one
Develop an organics diversion strategy.		▪ $25,000 to create a strategy (in year six)
Develop regional composting facilities.	Vanderhoof Transfer Station: ▪ $476,000 (year nine)	Vanderhoof Transfer Station: ▪ $95,692
	Smithers-Telkwa Transfer Station: ▪ $515,200 (year seven)	Smithers-Telkwa Transfer Station: ▪ $111,200
	Regional Compost Facility: ▪ $621,400 (as required in future)	Regional Compost Facility: ▪ $165,000

4.1.5 Strategy 5: Increase Construction and Demolition (C&D) Waste Diversion

Issue: Wood waste is collected separately at all facilities and there may be an opportunity to divert this and other construction demolition waste materials if markets are available.

A. Work with local partners to identify potential processors and markets for higher value materials that could be managed by methods other than disposal in landfills or burn pads (for wood waste). Make materials available to the private sector for processing if financially neutral or positive for the RDBN.

B. Lobby the Province to include C&D materials into BC's EPR system.

C. Provide opportunities at transfer and disposal facilities for sorting and salvaging of C&D materials by customers where safe, practical and economical.

Actions	Estimated Capital Cost	Estimated Operating Cost
Work with local partners to identify potential processors and markets for high value materials. Lobby the Province to include C&D materials into BC's EPR system. Provide opportunities for reuse where safe, practical, and economical.	-	0.1 FTE (New)

4.1.6 Strategy 6: Support Expansion of Extended Producer Responsibility Programs

Issue: There is currently no framework for making decisions regarding participation in EPR programs.

A. Establish a policy framework for making decisions regarding participation in current and future EPR programs and partnerships with local organizations to provide collection services.

Actions	Estimated Capital Cost	Estimated Operating Cost
Establish a policy framework for making decisions regarding participation in current and future EPR programs.	-	Current Staff

4.1.7 Strategy 7: Support Household Hazardous Waste (HHW) Diversion

Issue: There is currently limited public promotion and education on proper handling and collection locations for HHW.

A. Increase public education and communication on proper handling and collection locations for HHW to improve use of existing programs.

Actions	Estimated Capital Cost	Estimated Operating Cost
Increase public education and communication on proper handling and collection locations for HHW.	-	Current Staff

4.1.8 Strategy 8: Support Recycling and Diversion of Agricultural Plastics

Issue: Diversion and disposal of Agricultural Plastics is a significant issue in the RDBN due to the additional handling costs and lack of alternatives to disposal.

A. Work with local partners to encourage alternative management of agricultural plastics. Provide information as requested to support and participate in pilot programs to manage these materials.

B. Lobby the Ministry to create an EPR program for agricultural plastics.

Actions	Estimated Capital Cost	Estimated Operating Cost
Work with local partners to encourage alternative management of agricultural plastics. Lobby the Ministry to create an EPR program for agricultural plastics.	-	Current Staff

4.1.9 Strategy 9: Expand Regional Education and Behaviour Change Programs

Issue: No staff resources are currently focused on supporting and implementing residential and ICI waste reduction programs as well as programing and behavior change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce, reuse, and recycling/composting initiatives.

A. Apply community based social marketing (CBSM) as an approach to develop new – and build on – existing waste reduction and diversion programs and campaigns.

B. If available, use Recycle BC education and administration top-ups to support regional recycling education and promotions.

C. Expand regional coordination of diversion, education, and behaviour change programs. Increase staff allocation to planning, program, and policy development.

Actions	Estimated Capital Cost	Estimated Operating Cost
Apply CBSM as a method to develop new and/or build on existing waste reduction and diversion programs and campaigns.	-	Current Staff
If available, use Recycle BC education and administration top-ups to support regional recycling education and promotions.		When all facilities are in operation: ▪ -$42,000 (i.e., net revenue by year three)

4.2 Residual Waste Management Strategies

Issue: The region's disposal facilities operate based on Operational Certificates issued prior to the most recent landfill guidelines. Future updates to Operational Certificates and the increasing size of landfills may require additions and improvements to environmental controls and protection.

4.2.1 Strategy 1: Continue to Operate the Clearview Sub-Regional Landfill

A. The landfill's Operational Certificate was issued in 2005, prior to the release of the updated landfill guidelines (2016). Therefore, the landfill's operation is not required to meet the 2016 guidelines; however, future Operational Certificate updates may adjust requirements to the 2016 guidelines.

- Complete a study to confirm compliance and conformance with the 2016 landfill guidelines.

B. Leachate break-outs have been identified in Phase 1 and Phase 2 and stormwater runoff has not been diverted from contact water.

- Complete a leachate management plan.
- Installation of leachate treatment pond if required.

C. Landfill gas generation assessments are required based on the municipal solid waste landfilled at the site.

- LFG generation assessment studies every five years as required by the Ministry.
- Consider alternative cover systems such as biocovers to minimize greenhouse gas production.

4.2.2 Strategy 2: Continue to Operate the Knockholt Sub-Regional Landfill

A. The landfill's Operational Certificate was issued in 2003, prior to the release of the updated landfill guidelines (2016). Therefore, the landfill's operation is not required to meet the 2016 guidelines; however, future Operational Certificate updates may adjust requirements to the 2016 guidelines.

- Complete a study to confirm compliance and conformance with the 2016 landfill guidelines.
- Budget additional funds to support landfill design and planning.

B. The performance and capacity of the leachate treatment ponds has not been assessed and compared to projected leachate generation as the landfilling area expands.

- Study to assess the performance and capacity of existing leachate treatment ponds.
- Leachate treatment pond improvements (if required).

C. Landfill gas generation assessments are required based on the municipal solid waste landfilled at the site.

- Landfill gas generation assessment studies every five years as required by the Ministry.
- Consider alternative cover systems such as biocovers to minimize greenhouse gas production.

4.2.3 Strategy 3: Continue to Operate the Manson Creek Landfill:

A. There is no design and operations plan for this facility and the lifespan of this site is unknown.

- Budget additional funds to periodically assess landfill operation and management.
- Budget additional funds for site maintenance (if required).

4.2.4 Strategy 4: Finalize Closure of Historical Landfills/Dumps

A. The RDBN has completed closure works including clean-up and cover as needed at each site. However, the region has not received approval of closure works from the ministry.

- The RDBN is currently engaging Ministry staff to confirm closure of the facilities and assess the potential to abandon previous permits for these historical facilities.

Table 4-1: Anticipated Costs of Residual Waste Management Strategies

Actions	Estimated Capital Cost	Estimated Operating Cost
Continue operating disposal sites according to Ministry requirements. (Clearview Sub-Regional Landfill)	Leachate management improvements: ▪ $100,000 (year six)	Landfill compliance and conformance review: ▪ $6,000 (year two) Leachate management plan: ▪ $25,000 (year three)
Continue operating disposal sites according to Ministry requirements. (Knockholt Sub-Regional Landfill)	Development of Phase 3B: ▪ $382,000 (year six) Development of Phase 3C: ▪ $704,000 (year 10) Leachate treatment pond improvements: ▪ $250,000 (year seven)	Additional landfill design and planning: ▪ $5,000 per year (beginning year two) Landfill gas generation assessment study: ▪ $5,000 (year three) Landfill compliance and conformance review: ▪ $6,000 (year four) Leachate pond performance and capacity study: ▪ $15,000 (year five)
Continue operating disposal sites according to Ministry requirements. (Manson Creek Landfill)	-	Landfill operation and management review: ▪ $5,000 (year five) Additional landfill site maintenance: ▪ $10,000 (year five)

4.3 Supporting Policies and Bylaws

4.3.1 Assess Cost Recovery Through User Fees

Issue: The solid waste management system in the RDBN is primarily funded through taxation versus tipping fees which minimizes financial incentive for residents, business, and most municipalities to dispose of materials rather than recycle them. As the cost of sustainable solid waste management increases, most northern regional districts have adopted bylaws to apply user fees in varying degrees to increase this funding source and balance the ratio of

taxation versus tipping fees. Implementing the options and actions identified in the SWMP will result in increases to operating costs which will need to be recovered through increases in taxation or tipping fees. Reassessing the feasibility of implementing tipping fees at all facilities may better support the solid waste management system, diversify revenue sources, and support the RDBN's strategic priorities.

A. Develop a strategy to increase cost recovery from municipal solid waste and other materials in the RDBN.

   a. Update previous studies on cost recovery through user fees with particular emphasis on the successful cost recovery policies and systems implemented in neighbouring regional districts.

   b. Conduct consultation to confirm public and stakeholder support for implementation of user fees.

   c. Implement user fees to fund a portion of the RDBN's operational costs.

Actions	Estimated Capital Cost	Estimated Operating Cost
Develop a strategy to increase cost recovery from municipal solid waste and other materials in the RDBN.	-	Cost recovery strategy: ▪ $20,000 (in year one)

4.3.2 Update Current Facility Regulation and User Fee Bylaw

Issue: If the Board approves a cost recovery strategy that includes tipping fees, the current solid waste management facility regulation and user fee bylaw will need to be amended to reflect additional fees and charges as well as achieve the targets laid out in this plan.

A. Based on the cost recovery strategy approved by the Board, update the bylaw to implement additional user fees at all facilities.

B. Expand the current list of regulated recyclable materials to include residential paper and packaging collected by Recycle BC at RDBN transfer stations.

Actions	Estimated Capital Cost	Estimated Operating Cost
Update the current Facility Regulation and User Fee Bylaw as required.	-	Current Staff

4.3.3 Implement Disposal Charges for Camp Waste and Other Industries

Issue: Camps and other industries that support them are not paying their "fair share" of the RDBN's costs for solid waste management under current financial policies.

A. Develop a policy to require that all materials from specified industries are delivered to scaled facilities and charge a weight-based tipping fee for all landfilled waste or set an annual per head or per bed cost for all facilities being constructed in the region and assess this as a solid waste disposal fee with other regional fees and taxes.

Actions	Estimated Capital Cost	Estimated Operating Cost
Implement disposal charges for camp waste and other industries not already paying into the system.	-	Current Staff No revenues have been projected.

4.3.4 Mitigate Illegal Dumping

Issue: As cost-recovery and user fees are implemented, the issue of illegal dumping may arise short-term during transitions.

A. Collaborate with local governments, First Nations, and private sector stakeholders to identify and address illegal dumping issues.
   a. Assess the nature and extent of illegal dumping in the RDBN including mapping common problem sites.
   b. Conduct a regional education campaign to discourage illegal dumping and encourage public reporting of illegal dumping.
   c. Develop an "observe, record, report" program.
   d. Following implementation of tipping fees, provide funding to waive tipping fees for clean-up events.

Actions	Estimated Capital Cost	Estimated Operating Cost
Collaborate with local governments, First Nations, and private sector stakeholders to identify and address illegal dumping issues.	-	0.5 FTE (New) No funding to waive tipping fees have been assumed as tipping fees for municipal solid waste are not in place.

4.4 Resulting Diversion Potential

The recommended actions have the potential to reduce the amount of solid waste disposed in the RDBN by approximately 100 kg per capita per year, as shown in Table 4-2. This means the disposal rate would be 500 kg per capita per year, meeting the Provincial and RDBN's disposal rate target.

Table 4-2: Diversion Potential with Programs Implemented

	Sector Contribution to Landfill	Material Contribution to Landfill	Diversion Potential out of Landfill (%)	Diversion Potential out of Landfill (kg/capita)
Residential	**60%**			
PPP		38.8%	12%	16
HHW and Electronics		1.6%	5%	0
Other Recyclable		4.2%	5%	1
Compostable		38.2%	34%	47
Building Material		4.3%	30%	5
			Residential Diversion Potential	**68**
ICI	**40%**			
PPP		38.8%	10%	9
HHW and Electronics		1.6%	5%	0
Other Recyclable		4.2%	5%	1
Compostable		38.2%	20%	18
Building Material		4.3%	30%	3
			ICI Diversion Potential	**31**
			Potential Additional Diversion from Landfill	100
			Estimated Annual Disposal (assuming 600 kg/capita)	**500 kg**

Table 4-3 provides a list of items that are included in the material groupings listed above.

Table 4-3: Category Items

Category	Included Items
EPR-PPP (SF RES)	Packaging and Printed Paper Materials (Residential Managed by Recyclable BC)
PPP (ICI)	Packaging and Printed Paper Materials
HHW and Electronic	Electronics, Batteries, Used Oil, and Containers, Etc.
Other Recyclable	Textiles and Plastic Film
Compostable	Compostable Food and Compostable Paper
Building Materials	Drywall, Masonry, Clean Wood, and Metals

5.0 PLAN MONITORING AND MEASUREMENT

The long-term achievement of the goals identified in the SWMP is ultimately dependent on plan implementation. Progress will be supported through regular monitoring and measurement of success. The following sections identify the monitoring and measurement programs to be enacted to support implementation of the SWMP.

5.1 Regional Solid Waste Advisory Committee

The RSWAC will monitor the implementation of the SWMP and make recommendations to increase its effectiveness. A description of the RSWAC tasks and make up are included in the preliminary terms of reference which can be found in Appendix C.

5.2 Annual Reporting

RDBN will compile data from RDBN sites on all residual disposal activities in the regional district and provide annual information to the Ministry's online disposal calculator.

5.3 Five-Year Effectiveness Review

Five years into the implementation of this Plan, RDBN will carry out a review of the SWMP's implementation and effectiveness, as prescribed by the Ministry. This review should result in a report that is made publicly available but does not need to be submitted to the Ministry for approval. This review may include:

- Overview of all programs or actions undertaken in the first five years to support the SWMP goals and targets, including status and implementation costs for each.
- Description and forecasted budget for programs or actions not yet started and status, including explanations for delays or cancellations of plan components.
- Five-year trend information for waste disposal per person.
- Five-year trend of greenhouse gases emitted and avoided, if available.
- Any significant changes that might impact the solid waste management system over the next five years.

Actions	Estimated Capital Cost	Estimated Operating Cost
Effectiveness Review Implementation	-	$10,000 to be allocated in year five

5.4 Waste Composition Studies

In advance of the five-year review noted, a multi-season waste composition study on the residual waste management stream is proposed for year four, and – if appropriate – in advance of the next SWMP update to assess the success of current waste diversion programs and policies and identify opportunities for additional diversion.

Actions	Estimated Capital Cost	Estimated Operating Cost
Waste Composition Studies	-	$25,000 to be allocated in year four

5.5 Plan Flexibility and Risk

The SWMP lays out the high-level goals, costs, and timelines for solid waste program implementation in the RDBN. A number of factors may affect the cost and timeline to implement each strategy including external changes to priorities, partner programs, and regulations and internal variations in priorities and availability of budget and staff time to implement programs. The SWMP is intended to be flexible when warranted to implement plan components, directly or through private firms and/or non-profit organizations. While the SWMP provides flexibility in implementation depending on internal and external factors the following risks should be considered:

- Achieving the identified disposal target is dependent on successful implementation of all strategies identified in Section 4;
- Costs provided are conceptual level estimates and may differ from the actual costs to implement programs depending on the details of program or infrastructure design and timing of implementation. As a result, major programs and infrastructure may undergo further assessment prior to implementation;
- The success of most items is dependent on allocation of staff to adequately design, implement, and assess programs;
- The success of reduce, reuse, and recycle strategies will be affected by the effectiveness education and behaviour change programs;
- Several items are dependent on partnerships with local, regional, or provincial organizations which may experience changes in priority throughout the SWMP timeframe;
  - Implementation of organics diversion depends on municipalities to collect materials from residents;
  - Increasing access to ICI recycling depends on private sector and other collection providers to continue and expand services available in the future; and
  - Increasing C&D waste diversion depends on the private sector to provide alternatives to disposal for these materials.
- The Ministry may require changes to the operation of regional disposal facilities through orders and updates to Permits and Operational Certificates which would impact the timelines and priorities for investment at disposal facilities.

As the preparation of this SWMP was completed to meet requirements from the Ministry, the RDBN will seek guidance and the direction Ministry officials to assess the appropriate level of flexibility in plan implementation as needed.

6.0 FINANCE AND ADMINISTRATION

The strategies, actions and costs associated with improving the solid waste management system have been discussed in previous sections. This section of the Draft SWMP presents a summation of the estimated staffing needs (in FTEs) and costs (in 2018 dollars) to the RDBN for the proposed solid waste management system and addresses options for how the implementation of the SWMP will be financed.

6.1 Staffing

A total of five senior management, management, and office staff are budgeted for the Environmental Services department in the region. Due to staff changes, the department has four of its five budgeted positions currently filled.

Based on existing needs and proposed programs for residual waste management, one FTE is required to fill the vacant position to support ongoing facility operations and management. Additional focus is required to plan and implement the reduce, reuse, and recycle strategies, regional education and behaviour change programs, policy changes, and illegal dumping mitigation identified in the Draft SWMP. Implementation of the contemplated programs will require an additional one FTE as the region takes on a greater role in waste diversion, education, and behaviour change.

Role	FTEs Required	Estimated Budget Implication
Facility Operations and Management Support	1	To be updated with staff input.
Coordination and Implementation of Reduction, Reuse, and Recycling Strategies and Supporting Programs and Policies	1	To be updated with staff input.

6.2 Expenditures

Table 6-1 provides the costs associated with the strategies and actions identified in the previous sections with respect to their implications to the Board's approved Financial Plan for 2018-2022. As shown, implementing the strategies and actions identified in the Draft SWMP result in increased expenditures from year two through year five. Proposed capital costs (estimated to range from $45,000 in year two to a high of $515,000 in year four) will be recovered through grant funding and borrowing. Proposed operating costs (estimated to range from $160,000 in year two to a high of $740,000 in year four) will be recovered through increases in taxation or user fees. As discussed in Section 4.3.1, a cost recovery strategy will be developed in year one to assess the potential for increasing the portion of the system funded through user fees. Additionally, the RDBN's auditors have instructed that the annual contribution to capital and closure reserves for the region's landfills be increased to approximately $600,000 per year to allow sufficient funds to cover the existing liability. The additional reserve funding requirements identified since the Board's approval of the Financial Plan for 2018-2022 is itemized at the bottom of Table 6-1.

Table 6-2 provides the ten-year capital plan reflecting the infrastructure development and equipment costs needed to implement the strategies and actions identified in the Draft SWMP. The Draft SWMP assumes that capital costs will be paid primarily through grants and borrowing. Therefore, the borrowing limit under the Draft SWMP will be $1 Million CAD (in 2018 dollars) as required to fund the anticipated costs summarized in Table 6-2.

Table 6-1: Five-Year Financial Plan

	2018	2019	2020	2021	2022
REVENUE					
Taxation	$ 3,144,752	$ 3,383,962	$ 3,428,064	$ 3,008,737	$ 3,011,903
Recycling	$ 240,000	$ 140,000	$ 140,000	$ 140,000	$ 140,000
Tipping Fees	$ 206,000	$ 206,000	$ 206,000	$ 206,000	$ 206,000
Transfer from Reserves	$ 1,043,700	$ 783,700	$ 741,700	$ 693,700	$ 693,700
Prior Year's Surplus	$ 1,171,798	$ -	$ -	$ -	$ -
Grants	$ 390,395	$ 390,395	$ 390,395	$ 390,395	$ 390,395
Other	$ 95,000	$ 5,000	$ 220,000	$ 5,000	$ 5,000
TOTAL OPERATING REVENUE	**$ 6,291,645**	**$ 4,909,057**	**$ 5,126,159**	**$ 4,443,832**	**$ 4,446,998**
EXPENDITURES					
Existing Operating Expenditures					
Administration	$ 2,249,988	$ 1,764,351	$ 1,776,830	$ 1,382,498	$ 1,393,608
Transfer Station Ops	$ 1,683,821	$ 1,658,334	$ 1,681,933	$ 1,704,256	$ 1,726,842
Landfill Ops	$ 663,943	$ 651,618	$ 664,645	$ 667,328	$ 680,668
Recycling	$ 525,959	$ 417,944	$ 417,944	$ 417,944	$ 417,944
Contribution to Reserves	$ 239,233	$ 234,233	$ 529,233	$ 594,233	$ 969,233
Post-Closure	$ 93,700	$ 93,700	$ 43,700	$ 43,700	$ 43,700
Closure	$ 30,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
Total Annual Existing Operating Expenditures	$ 5,486,644	$ 4,835,180	$ 5,129,285	$ 4,824,959	$ 5,246,995
Existing Capital Expenditures					
Capital Expenditures	$ 805,000	$ 105,000	$ 323,000	$ -	$ -
Total Annual Existing Capital Expenditures	$ 805,000	$ 105,000	$ 323,000	$ -	$ -
Total Annual Existing Expenditures	**$ 6,291,644**	**$ 4,940,180**	**$ 5,452,285**	**$ 4,824,959**	**$ 5,246,995**
Surplus	$ 1	$ (31,123)	$ (326,126)	$ (381,127)	$ (799,997)
PROPOSED Operating Expenditures					
REDUCE/REUSE/RECYCLE					
Increase Reduction and Reuse	$ -	$ -	$ -	$ -	$ -
Expand Access to Residential Recycling	$ (16,300)	$ 6,100	$ (3,800)	$ 75,700	$ 75,700
Increase ICI Sector Recycling	$ 3,000	$ 8,500	$ 8,500	$ 8,500	$ 8,500
Increase Organics Diversion	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500
Expand Regional Education and Behaviour Change Programs	$ (19,300)	$ (27,100)	$ (41,800)	$ (41,800)	$ (41,800)
RESIDUAL MANAGEMENT					
Continue facility operation and upgrades as needed.	$ -	$ 11,000	$ 35,000	$ 11,000	$ 35,000
POLICIES AND BYLAWS					
Assess Cost Recovery Through User Fees	$ 20,000				
STAFF					
Additional Staffing Costs (2 FTE)	$ 10,100	$ 130,000	$ 130,000	$ 130,000	$ 130,000
PLAN MONITORING					
Waste Composition Study	$ -	$ -	$ -	$ 25,000	$ -
5-year Effectiveness Review	$ -	$ -	$ -	$ -	$ 10,000
Total Annual Proposed Operating Expenditures	**$ -**	**$ 131,000**	**$ 130,400**	**$ 210,900**	**$ 219,900**
PROPOSED Capital Expenditures					
DIVERSION					
Expand Access to Residential Recycling (Capital)	$ -	$ 45,000	$ 60,000	$ 500,000	$ 500,000
Increase Organics Diversion (Capital)	$ -	$ -	$ -		$ -
DISPOSAL					
Continue Facility Operation and Upgrades (Capital)	$ -	$ -	$ -	$ -	$ -
Total Annual Proposed Capital Expenditures	**$ -**	**$ 45,000**	**$ 60,000**	**$ 500,000**	**$ 500,000**
Total Annual Proposed Expenditures	**$ -**	**$ 176,000**	**$ 190,400**	**$ 710,900**	**$ 719,900**
TOTAL OPERATING EXPENDITURES	**$ 5,486,644**	**$ 4,966,180**	**$ 5,259,685**	**$ 5,035,859**	**$ 5,466,895**
TOTAL CAPITAL EXPENDITURES	**$ 805,000**	**$ 150,000**	**$ 383,000**	**$ 500,000**	**$ 500,000**
TOTAL ANNUAL EXPENDITURES	**$ 6,291,644**	**$ 5,116,180**	**$ 5,642,685**	**$ 5,535,859**	**$ 5,966,895**
Operating Funding Required	**$ -**	**$ 131,000**	**$ 130,400**	**$ 210,900**	**$ 219,900**
Capital Funding Required	**$ -**	**$ 45,000**	**$ 60,000**	**$ 500,000**	**$ 500,000**
Reserve Funding Required		**$ 75,000**	**$ 370,000**	**$ 425,000**	**$ 800,000**

Note: This table assumes only costs to RDBN. Costs for individual jurisdictions will depend on how the SWMP is implemented.

Table 6-2: Ten-Year Capital Plan

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
PROPOSED Capital Expenditures										
DIVERSION										
Expand Access to Residential Recycling (Capital)	$ -	$ 45,000	$ 60,000	$ 500,000	$ 500,000		$ -	$ -		$ -
Increase Organics Diversion (Capital)	$ -	$ -	$ -		$ -	$ -	$ 515,000	$ -	$ 476,000	$ -
DISPOSAL										
Continue Facility Operation and Upgrades (Capital)	$ -	$ -	$ -	$ -	$ -	$ 482,000	$ 250,000	$ -	$ -	$ -
Total Annual Proposed Capital Expenditures	**$ -**	**$ 45,000**	**$ 60,000**	**$ 500,000**	**$ 500,000**	**$ 482,000**	**$ 765,000**	**$ -**	**$ 476,000**	**$ -**

7.0 PLAN SCHEDULE

7.1 Plan Implementation Schedule

Table 7-1 provides the planned implementation schedule for the SWMP from 2018 to 2027.

Table 7-1: Implementation Schedule

Proposed Implementation Schedule	2018 – Year 1	2019 – Year 2	2020 – Year 3	2021 – Year 4	2022 – Year 5	2023 – Year 6	2024 – Year 7	2025 – Year 8	2026 – Year 9	2027 – Year 10
REDUCE/REUSE/RECYCLE										
Increase Reduction and Reuse	■									
Expand Access to Residential Recycling	■	■	■	■	■					
Increase ICI Sector Recycling		■	■							
Increase Organics Diversion	■						■		■	
Increase C&D Waste Diversion		■	■	■						
Support Expansion of EPR Programs		■	■	■						
Support HHW Diversion		■								
Support Recycling and Diversion of Agricultural Plastics			■	■	■					
Expand Regional Education and Behaviour Change Programs			■	■	■					
RESIDUAL MANAGEMENT										
Continue to Operate the Clearview Sub-Regional Landfill	■	■	■	■	■	■	■	■	■	■
Continue to Operate the Knockholt Sub-Regional Landfill	■	■	■	■	■	■	■	■	■	■
Continue to Operate the Manson Creek Landfill	■	■	■	■	■	■	■	■	■	■
Work to Finalize Closure of Historical Landfills/Dumps	■	■	■							
POLICIES AND BYLAWS										
Assess Cost Recovery	■									
Update Facility Regulation and User Fee Bylaw		■								
Implement Disposal Charges for Camp Waste and Others		■								
Mitigate Illegal Dumping		■	■	■						
STAFF										
Additional Staff – Operations Assistant/Foreman (1 FTE)	■									
Additional Staff – Diversion Coordinator (1 FTE)		■								
PLAN MONITORING AND EFFECTIVENESS										
RSWAC	■	■	■	■	■	■	■	■	■	■
Annual Reporting	■	■	■	■	■	■	■	■	■	■
Five Year Effectiveness Review					■					
Waste Composition Study				■						

8.0 PLAN APPROVAL

The RDBN Board of Directors unanimously passed a motion (2018-13-20) to approve and submit the SWMP to the Ministry of Environment and Climate Change Strategy on September 6, 2018.

Submit the 2018 Solid Waste Management Plan for Approval by the Ministry of Environment and Climate Change *2018-13-20*	*Moved by Director Fisher* *Seconded by Director Bachrach* *1. "That the Regional District of Bulkley-Nechako Board of Directors receive the Director of Environmental Services' August 3, 2018 memo titled "Submit the 2018 Solid Waste Management Plan for Acceptance by the Ministry of Environment and Climate Change."* *2. That the Regional District of Bulkley-Nechako Board of Directors approve adoption of the 2018 Solid Waste Management Plan for Acceptance by the Ministry of Environment and Climate Change Strategy as amended to include Statistics Canada population information for First Nations populations in the Burns Lake Area.* *3. That the Regional District of Bulkley-Nechako Board of Directors direct staff to submit the 2018 Solid Waste Management Plan to the Ministry of Environment and Climate Change Strategy for approval as amended."*

This plan is based on the current understanding of solid waste management challenges and opportunities for the RDBN. The approved plan is a "living document" that may be amended by the RDBN Board of Directors to reflect new considerations, technologies, or approaches as needed.

APPENDIX A

SWMP TECHNICAL MEMORANDA

Current Solid Waste System Report

Technical Memorandum 1: Disposal Options

Technical Memorandum 2: Reduce, Reuse and Recycle

Technical Memorandum 3: Options Costing and Financial Implications

CURRENT SOLID WASTE SYSTEM REPORT

Current Solid Waste Management System Report

PRESENTED TO

Regional District of Bulkley-Nechako

MAY 2018
ISSUED FOR USE
FILE: SWM.SWOP03664-01
REVISION 1

In assocation with:

Maura Walker & Associates
ENVIRONMENTAL CONSULTANTS

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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech), Maura Walker Environmental Consultants, and Carey McIver and Associates Ltd. (the Consulting Team) have been retained by the Regional District of Bulkley-Nechako (RDBN) to update its Regional Solid Waste Management Plan (SWMP).

The proposed 2017 SWMP update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDBN's waste management principles, targets and strategies for the next ten years.

The process to review and update the SWMP will be conducted in three stages:

- Stage 1 – the solid waste management system is assessed;
- Stage 2 – options to improve the system are developed and assessed; and
- Stage 3 – the draft plan is presented to the public for feedback and approved by the RDBN Board of Directors (the Board).

The draft plan will ultimately be submitted to the Ministry of Environment and Climate Change for approval. This current system assessment report outlines the existing solid waste management system in the RDBN. This information includes a summary of the current system, as well as an overview of the anticipated developments and trends that have been identified by the research including provincial goals and targets.

Section 2 of this report provides an overview of the 1996 SWMP which saw major changes in the management of solid waste in the region. The 1996 SWMP provided the basis for the current system of managing solid waste with the elimination of small historical landfills in favor of semi-regional engineered landfills. The majority of initiatives identified in the plan have been implemented or addressed by the Board since the plan was approved.

Section 3 of this report summarizes the current system for managing solid waste in the RDBN. This includes the sources where waste is generated, collection and depot programs that service the sources where waste is generated, the collection infrastructure for garbage and recycling, and a summary of the recycling and disposal facilities that are operated by the RDBN.

Section 4 of this report provides a summary of the RDBN's revenues and expenses related to managing solid waste.

Based on the inputs above, a review of previous RDBN solid waste planning documents, Ministry guidelines, overall trends in waste management and recycling (Section 5), and the current system reporting, a list of gaps and opportunities has been identified in Section 6. The list along with the provincial goals and targets identified in Section 7 provides the basis for the RDBN's SWMP update.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
CBSM	community-based social marketing
CESA	Canadian Electric Stewardship Association
DOCP	Design, Operations, and Closure Plans
EMA	Environmental Management Act
EOW	Every-other-week (collection)
EPR	Extended Producer Responsibility
EPRA	Electronics Products Recycling Association
ICI	Industrial, Commercial and Institutional (does not include heavy industry)
MARR	Major Appliance Recycling Roundtable
Ministry	BC Ministry of Environment and Climate Change
OC	Operational Certificate
OPEI	Outdoor Power Equipment Institute
RDBN	Regional District of Bulkley-Nechako
SWMP	Solid Waste Management Plan
WTE	Waste-to-energy

KEY DEFINITIONS

Term/Key Word	Descriptions
Advisory Committee	An advisory committee established to support the development of the solid waste management plan. Can include both a public and a technical advisory committee, or a single advisory committee to fulfil the role of both the public and technical advisory committees where a single committee better reflects the demographic or geographic nature of the regional district.
MATERIALS	
Waste or Waste Material	Also known as *solid waste*. A solid matter (object) discarded by its user. All items collected for disposal and/or further processing, including solid waste bound for disposal (landfill or other), recyclables, and organics.
Disposal or Landfill Material i.e., garbage	Material that is sent to landfill or other end disposal. Reframed from 'garbage' or 'refuse' since waste characterization studies generally show up to 90% of this stream can be recycled or composted.
Organic Material	Also known as *organics*. Decomposable, compostable matter that can be safely managed through an organics processing facility (e.g., composting and anaerobic digestion) to produce energy and/or compost, a soil amendment. Examples include: food scraps, food-soiled paper, and leaf and yard debris.
Source Separated Organics (SSO)	Organic material that is sorted (separated), at its point of generation, from all other material streams. This includes all compostable materials that are collected in designated containers bound for organics processing.
Recyclable Material	Also known as *recyclables*. Material that can be reprocessed to create a new product; such materials include: beverage containers, paper, cardboard, glass, light metals, and plastics.

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Regional District of Bulkley-Nechako and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Regional District of Bulkley-Nechako, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech), Maura Walker Environmental Consultants, and Carey McIver and Associates Ltd. (the Consulting Team) have been retained by the Regional District of Bulkley-Nechako (RDBN) to update its Regional Solid Waste Management Plan (SWMP).

In 1989, the Waste Management Act [now the Environmental Management Act (EMA)] was amended to require all regional districts to prepare and submit solid waste management plans to the British Columbia Ministry of Environment (Ministry) for approval by the year 1995. The purpose of the SWMP is to provide the RDBN with a guiding document that will direct the Region's solid waste management activities over the next 5 to 10 years. The intention of the SWMP is a planning document that outlines a framework for managing solid waste in their region, keeping in mind local circumstances, community goals, disposal capacity, environmental protection, community support, operational capacity and financial sustainability.

Significant changes have occurred both within the RDBN's solid waste management programs and larger provincial regulations which significantly influence the regional solid waste management system. The RDBN's current waste management plan was prepared in 1996 and requires updating. The process to update the plan will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDBN's waste management principles, targets and strategies for the next ten years.

The process to review and update the SWMP will be conducted in three stages:

- Stage 1 – the solid waste management system is assessed;
- Stage 2 – options to improve the system are developed and assessed; and
- Stage 3 – the draft plan is presented to the public for feedback and approved by the RDBN Board of Directors (the Board).

This current system assessment report outlines the existing solid waste management system in the RDBN. This information includes a summary of the current system, as well as an overview of the anticipated developments and trends that have been identified by the research, including provincial goals and targets.

1.1 Guiding Principles

In May 2016, the Ministry released new Guidelines for the Development of SWMPs. These guidelines will be used to assist with the update of the RDBN SWMP.

According to the Ministry's guidelines, the SWMP should be founded on locally-relevant guiding principles, which are clearly stated in the plan. These principles will be developed in consultation with an advisory committee and also factor in provincial guiding principles as listed below. If the provincial guiding principles are modified or not included, a clear rationale for these decisions should be provided to the Ministry.

1. **Promote zero waste approaches and support a circular economy.**

   Encourage a shift in thinking from waste as a residual requiring disposal, to waste as a resource that can be utilized in closed-loop systems. Zero waste approaches aim to minimize waste generation and enable the sustainable use and reuse of products and materials. At the local level, look to remove barriers or encourage opportunities that will contribute to towards the establishment of a circular economy.

2. **Promote the first 3 Rs (reduce, reuse and recycle)**.

   Elevate the importance of waste prevention by prioritizing programming and provision of services for the first 3 Rs in the 5 R waste management hierarchy (see Figure 1-1). Encourage investments in technology and infrastructure, and ensure they occur as high up on the hierarchy as possible.

Source: (BC Ministry of Environment, n.d.[1])

Figure 1-1: The Pollution Prevention Hierarchy

3. **Maximize beneficial use of waste materials and manage residuals appropriately.**

   Technology, best practices and infrastructure investments should continue to develop to recover any remaining materials and energy from the waste stream, and to manage residuals for disposal.

4. **Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes.**

   Producer and user responsibility for the management of products can be supported through the provision of market-based incentives, disposal restrictions on industry-stewarded products, zoning to support collection facilities, and support for reuse and remanufacturing businesses. Education and behaviour change strategies aimed at consumers and businesses will help foster further waste reduction, reuse and recycling. For example, user fees can be managed as incentives to increase waste reduction and diversion.

5. **Prevent organics and recyclables from going into the garbage wherever practical.**

   Maintaining a system to prevent organics and recyclables from going into the garbage will provide clean feedstock of greater economic value as well as a potential end product use to the recycling industry, while reinforcing behaviour to reduce, reuse and recycle. Innovation in separation solutions, establishment and enforcement of disposal restrictions or other creative means will influence this approach.

6. **Collaborate with other regional districts wherever practical.**

   Collaboration on many aspects of solid waste management (e.g., to access facilities and markets, share campaigns and programs) will support the most efficient and effective overall municipal solid waste system.

[1] http://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste

7. **Develop collaborative partnerships with interested parties to achieve regional targets set in plans.**

   Strengthen partnerships with interested parties to achieve regional targets. All waste and recycling service providers, industry product stewards and waste generators are key interested parties in achieving these targets. Cooperative efforts will optimize successful outcomes. Encourage a marketplace that will complement stewardship programs and drive private sector innovation and investment towards achievement of targets.

8. **Level the playing field within regions for private and public solid waste management facilities.**

   Solid waste management facilities within a given region should be subject to similar requirements. A consistent set of criteria should be used to evaluate the waste management solutions proposed by private sector and by a regional district or municipality

2.0 BACKGROUND

The RDBN has made significant headway on managing solid waste more responsibly since the first SWMP was established in 1996. This section summarizes the history of solid waste management planning in the RDBN and the implementation status of the 1996 plan.

2.1 Plan History

The RDBN's original 1996 SWMP transformed solid waste management in RDBN from many small disposal sites to two sub-regional landfills and one small modified landfill supported by a series of local transfer stations. In 2008, the RDBN commissioned a Stage 1 report to assess the solid waste management system. At that time they decided to continue work on implementing the original SWMP instead of completing Stage 2 and Stage 3 of a full SWMP update since the completion of key items from the 1996 SWMP were in progress and no additional options could be accommodated by available resources.

The 1996 SWMP defined the following goal and objectives for solid waste in RDBN:

- Plan Goal – The overall goal of the plan is to provide for the most environmentally safe and economically feasible method of managing our solid waste.
- Plan Objectives – Regional objectives are to be reflected in the specific policies or strategies of the plan. During Stage 1, the planning process developed specific objectives as follows:
  - That the weight of solid waste per capita requiring disposal be reduced (using the volumes in 1990 as our standard) by using the most environmentally and economically efficient methods acceptable to the taxpayer and that the suggested reduction of 30% by 1998 and 50% by the year 2000 be used as a method of judging our efforts;
  - That this reduction be achieved through sequential strategies of reduction, reuse, recycling and composting;
  - That the SWMP identify problems with the present disposal system and supply possible solutions; and
  - That the SWMP be funded through an appropriate mix of user-pay and taxation mechanisms.

A number of the initiatives identified in the 1996 SWMP have been completed or are currently being carried out. Table 2-1 summarizes the options identified in the plan and implementation progress at the time of writing.

Table 2-1: Summary of 1996 SWMP Completion Status

Option	Status	Notes
Reduction and Reuse Programs – 12.5% Diversion Anticipated *Objective: To reduce and reuse the amount of waste generated as much as is practically possible.*		
Education/media campaign.	Partially complete	Some education and outreach programs are in place. All major solid waste facilities are listed on the RDBN website and regional recycling brochures.
Tipping fees and variable rate charges.	Complete*	Tipping fee changes have been considered but not changed. RDBN staff completed studies in 1999 and 2004 to assess options for tipping fees. Implementation of tipping fees was discussed in Inter-Municipal, RDBN Board, and APC meetings in 1998 and 1999. The RDBN Board has deferred implementation of tipping fees for municipal solid waste but has approved fees for specific materials. Materials with tipping fees include special materials (construction and demolition), specified materials (specified risk materials, asbestos, appliances containing ozone depleting substances), and contaminated soils.
Tag-bag charges.	Complete*	RDBN does not charge for residential waste dropped-off at regional facilities. Bag tagging was considered as an option in the 1999 User-Pay Implementation System study completed by RDBN staff. Some municipalities (Burns Lake, Telkwa, and Smithers) have instituted variable rates for garbage collection and limits on disposal where cart-based collection is in place.
Waste reduction plans/waste audit manuals.	Not complete	No audit guides have been provided by RDBN to institutions or businesses to support diversion.
Reuse facilities at landfills and transfer stations.	Complete	Reuse sheds have been developed at all public landfills and transfer stations.
Political initiatives.	Complete	RDBN has contributed to lobbying and communication with senior levels of government.
Community group initiatives.	Complete	RDBN has provided information and grants to non-profit groups to promote waste reduction.
Recycling – 8% to 14% Diversion Anticipated *Objective: To support recycling as a viable method of reducing solid waste going to landfills provided that it is economically viable.*		
Residential recycling (sub-regional or region-wide).	Complete	Limited recyclable materials are accepted at RDBN-operated public solid waste facilities (landfill and transfer stations) including metals, propane tanks, and limited household recycling (mixed paper, mixed containers). The compactor units envisioned for drop-off depots have not been installed. Curbside recycling for the residential sector is available in Smithers, Telkwa, and Fort St. James. Private depots exist in most communities supported by extended producer responsibility (EPR) organizations (Encorp, Product Care, Recycle BC, etc.).
Commercial recycling.	Complete	Cardboard recycling was stimulated through the 2016 cardboard ban from landfills and transfer station tipping floors. RDBN provides commercial recycling bins at a number of locations in the region.
Ferrous metals and white goods recycling.	Complete	RDBN stockpiles these materials separately from the garbage stream for future recycling at all solid waste facilities it operates.
Composting – 1% Diversion Anticipated *Objective: To encourage composting as a method for waste reduction.*		
Backyard composting.	Complete	RDBN sells subsidized backyard composters to the community.
Centralized yard waste composting.	Complete	RDBN is working with local community gardens to support composting. Yard waste is collected for composting at all transfer stations. Food waste is not targeted as key material stream within this program.

Option	Status	Notes
Residuals Management *Objective: To operate all regional landfills in accordance with BC Environment's Landfill Criteria for Municipal Solid Waste, June 1993.*		
Closure of landfills** and replacement with transfer stations.	Partially complete	Closure operations have been completed but must be reviewed by the Ministry of Environment and Climate Change Strategy (Ministry). The RDBN will work with the Ministry to assess abandonment of historical disposal site permits.
Operation of two sub-regional engineered landfills and Manson Creek Landfill to meet Landfill Criteria.	Complete	Operations are underway at the RDBN's three remaining landfills.
Development of a transfer station network to replace closed landfills.	Complete	Transfer stations have been developed on many historical landfill locations.
Problem Wastes *Objective: To manage all problem wastes in an environmentally safe yet economic manner.*		
Household Hazardous Waste program support and lobbying.	Partially Complete	Regeneration (Product Care Association) currently manages most typical household hazardous waste products and supports several depots in the region.
Investigate alternative methods for managing wood waste.	Complete*	RDBN has considered alternative methods but has not identified any long-term economically feasibility management technique.
Accept animal carcasses at landfill sites for a fee.	Complete	Procedures are in place to manage landfill disposal of specified risk material from local slaughter houses and hunting.
Ban tires for landfill sites and transfer stations.	Complete	Tires are not disposed in the landfill or accepted at transfer stations. Local tire shops are responsible for collecting and recycling tires.
Financing		
Financing the system through user-pay (70%) and taxation (30%).	Complete*	Currently the majority of the system is financed through taxation.
Administration *Objective: To coordinate policies of this plan with other interested stakeholders.*		
RDBN is responsible for reduction, reuse, recycling, and composting, waste transfer and disposal.	N/A	RDBN manages solid waste in the region provides oversight of recycling, which is offered by a mixture of public and private entities.
A permanent Plan Monitoring Advisory Committee should ensure that the plan is implemented.	N/A	The board's solid waste committee monitored progress on the plan initially but was not maintained long term.
The plan should be subject to annual reviews and a major review every five years.	Partially Complete	Internal annual reviews of the plan have occurred but only one addendum was officially completed. A major review has not occurred since plan creation in 1996.
RDBN will encourage communication among all stakeholders affected by the plans.	Partially Complete	Some amount of communication occurs between RDBN and stakeholders but no consistent forum has been created to foster regular stakeholder communication.
Staffing may include a waste management coordinator/planner and a field services supervisor.	Complete	Historically staffing levels in the Environmental Services department have included sufficient resources to support ongoing operations.

* Topic has been addressed by the Board but implementation has been deferred or cancelled.

** Inactive landfills closed following the 1996 SWMP include Vanderhoof Landfill, Fort St. James Landfill (Photo 2-1 and Photo 2-2), Fraser Lake Landfill, Fort Fraser Landfill, Ootsa Lake Landfill, Burns Lake Landfill, Granisle Landfill, Smithers Landing Landfill, Old Smithers Landfill, Smithers/Telkwa Landfill, Endako Landfill, Cluculz Lake Landfill, Francois Lake, Grassy Plains Landfill, Southbank Landfill, Tatalrose Landfill, Topley Landing Landfill, Topley Landfill, Perow Landfill, Palling Landfill and Houston Landfill.

Photo 2-1: Historical Fort St. James Landfill Prior to Closure (photo by RDBN 2009)

Photo 2-2: Closure of Historical Fort St. James Landfill (photo by RDBN 2010)

2.2 Plan Area

The 1996 SWMP covered the entire territory of RDBN. RDBN includes the Town of Smithers, the Districts of Vanderhoof, Fort St. James and Houston, the Villages of Fraser Lake, Burns Lake, Granisle, Telkwa, the unincorporated community of Fort Fraser, and Electoral Areas A, B, C, D, E, F and G, as shown on Figure 2-1.

Figure 2-1: RDBN Plan Area[2]

[2] RDBN Map available via RDBN website https://www.rdbn.bc.ca/

2.3 Demographic Information

The RDBN has seen an overall decrease in population since the 1996 SWMP was developed, as presented in Table 2-2. Data from Statistics Canada indicates that the Region's population has decreased slightly from 41,642 in 1996 to 37,896 in 2016, an average decrease of approximately 0.45% per year. This population decrease was most significant in rural areas.

Table 2-2: Regional Demographic Information

Demographic Measure	Reported by Statistics Canada[1]
Population, 2016	**37,896**
Population, 2011	**39,208**
Population, 2006	**38,243**
Population Change, 2011 to 2016	**-3.3%**
Population Change, 2006 to 2016	**0.9%**
Total private dwellings, 2016	**17,564**
Private dwellings occupied by usual residents, 2016	**15,101**

[1] Statistics Canada 2016 Census Profile – Regional District Bulkley-Nechako http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

The population of RDBN is spread over the region's 73,000 square kilometres, with the majority of the population clustered along the Highway 16 corridor. The region's largest population centers are Smithers in the West and Vanderhoof in the East.

The Statistics Canada data does not include the First Nations population which was estimated at 2,826 in the 2016 census. Table 2-3 summarizes community and electoral area populations based on 2016 census data from Statistics Canada and 2017 First Nations populations living on reserve based on RDBN service agreements which estimate First Nations population.

Table 2-3: Populations of Regional Electoral Areas and Municipalities

Community	Population 2016[1]	Estimated First Nations Population[2]
Electoral Area A (Smithers Rural)	5,256	45
Electoral Area B (Burns Lake Rural)	1,938	1,671
Electoral Area C (Fort St. James Rural)	1,415	1,854
Electoral Area D (Fraser Lake Rural)	1,472	599
Electoral Area E (Francois/Ootsa Rural)	1,593	192
Electoral Area F (Vanderhoof Rural)	3,665	495
Electoral Area G (Houston Rural)	903	-
Town of Smithers	5,401	-
Village of Telkwa	1,327	-
District of Houston	2,993	-
Village of Granisle	303	-
Village of Burns Lake	1,779	-
Village of Fraser Lake	988	-
District of Vanderhoof	4,439	-
District of Fort St. James	1,598	-
Unincorporated Community of Fort Fraser	275	-

[1] Population estimates based on Statistics Canada 2016 Census Profiles http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1

[2] First nation populations living on reserve in 2017 estimated based on existing service agreements between the region and first nations.

2.3.1 Economic Information

RDBN has a varied economy located within 8 unique municipalities, 7 electoral areas, and 13 First Nations. Income distribution in the region is similar to the province as a whole with proportionally more middle and higher income individuals than average. Manufacturing and agriculture/forestry/fishing/hunting were the leading sources of employment in 2011; both of these industries employed a greater proportion of the labour force than anywhere else in Northern British Columbia.

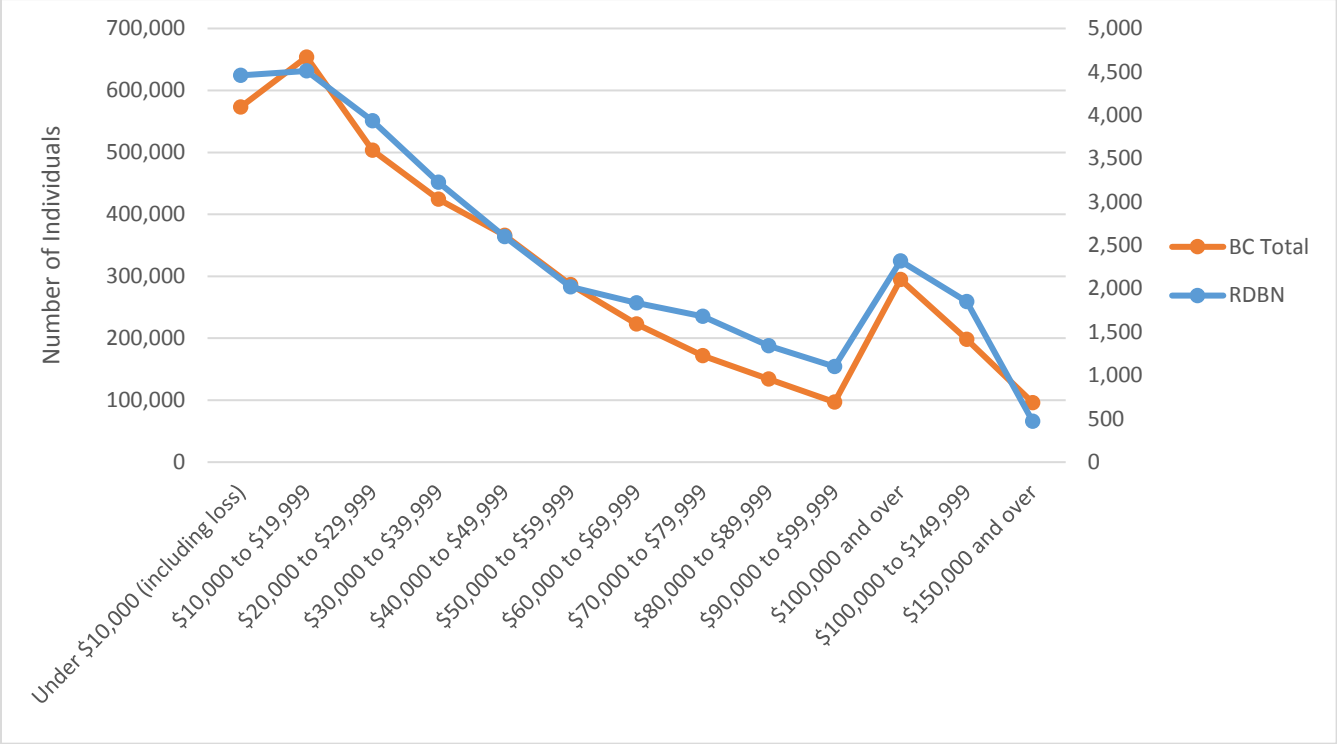

Figure 2-2: Individual Income (Before Tax) in 2015 (Statistics Canada 2016)

2.4 System Data

This section provides general data associated with the performance of the existing system, including the quantity of waste disposed and the types of waste disposed.

2.4.1 Disposal Data

Figure 2-3 presents the total annual municipal solid waste disposed in RDBN landfills. Municipal solid waste is made up of refuse from residential and industrial, commercial and institutional (ICI) sources, as well as construction and demolition (C&D)/wood waste generated from construction, demolition, and land clearing projects.[3] The overall quantity of waste disposed over the past five years has been fairly consistent. The most significant variations are the quantities of C&D waste, as shown in orange on Figure 2-3. It is common for C&D waste quantities to vary annually due to varying levels of construction or demolition activities.

[3] RDBN landfills also receive a small volume of Specified Risk Material from deceased cattle (roughly 150 tonnes per year). This type of waste is not considered municipal solid waste and has not been included in the annual solid waste disposal data.

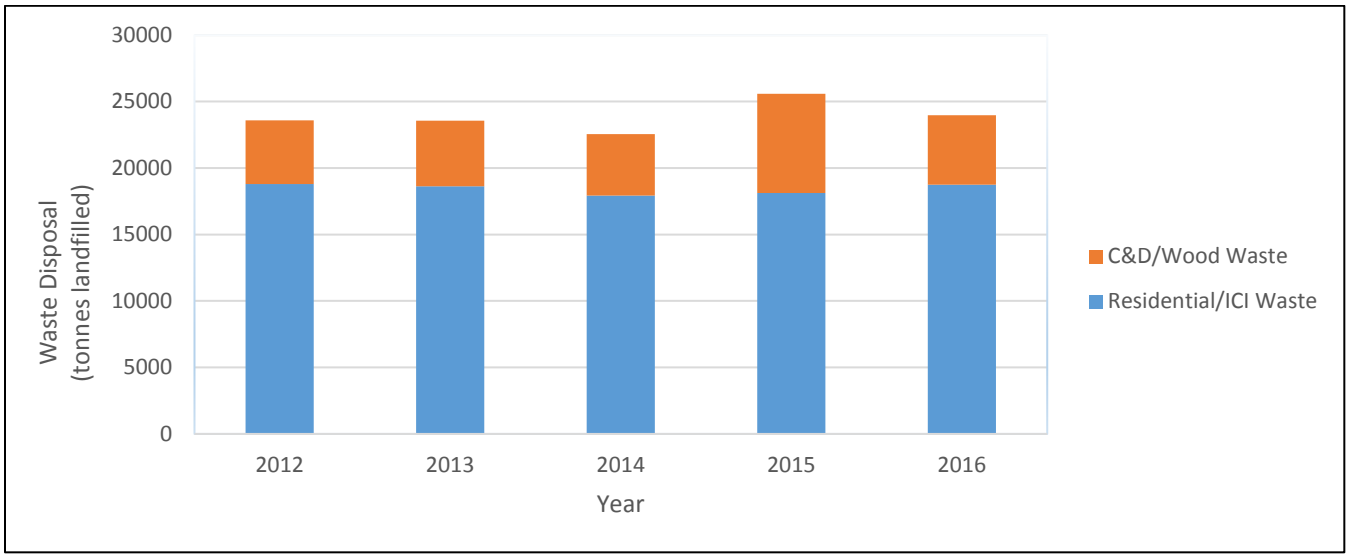

Figure 2-3: RDBN Waste Disposal (tonnes landfilled) 2012-2016

The Ministry requests that all British Columbia regional districts report the waste disposed annually; the Ministry then reports on the quantity of waste disposed by each regional district on a per capita basis.

As shown on Figure 2-4, the average disposal rate in British Columbia in 2015 was 497 kg per capita, with the highest per capita disposal rates found in northern British Columbia. These higher disposal rates in the north are due to a number of factors:

- Lack of waste diversion opportunities;
- Low cost of waste disposal (and lots of landfill capacity); and
- Growth of oil and gas industrial activity in British Columbia's north, and the associated personnel creating waste which is disposed in local landfills.

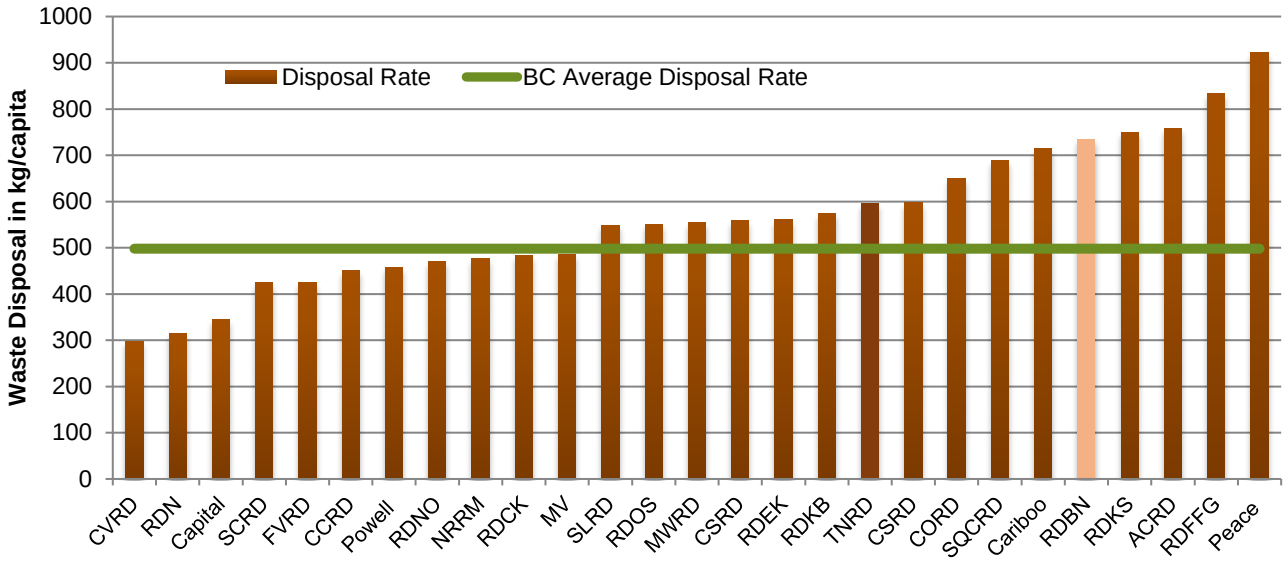

Figure 2-4: 2015 Disposal Rate by Regional District

For comparative purposes, the per capita disposal rate for RDBN and neighbouring regional districts in provided in Table 2-4.

Table 2-4: Comparison of Per Capita Disposal Rate

Regional District	2015 per Capita Disposal Rate (kg)[1]
Bulkley-Nechako	777
Fraser-Fort George	833
Kitimat-Stikine	750 (estimated)
Peace River	922
Cariboo	714

[1] Data source: http://www.env.gov.bc.ca/soe/indicators/sustainability/municipal-solid-waste.html
At the time of writing, 2015 is the most recent year that disposal data is published.

2.4.2 Waste Composition

In 2008, RDBN conducted a waste composition study to determine the types of products and materials that are being landfilled[4]. This type of information assists in identifying potential opportunities to reduce the amount of waste being landfilled. Figure 2-5 presents the results of this study. The largest (by weight) component of what is landfilled is organic waste (37%), which includes food waste, yard waste and compostable paper products like paper toweling and tissues. The next largest component is paper (20%) such as cardboard, newspaper, office paper and magazines. The third largest is plastic (13%), including plastic containers, film plastic (e.g., bags) and rigid plastic items (chairs, toys, etc.). Since this study was undertaken, RDBN has banned cardboard and metal from disposal as garbage and, as a result, as shown in Photo 2-3, it is likely that the proportion of paper and metal in the waste stream is currently less than shown on Figure 2-5.

Photo 2-3: Garbage Disposed at Clearview Landfill
(photo by Tetra Tech 2017)

[4] Gartner Lee Limited. *RDBN Waste Composition Study Memorandum*. 2008.

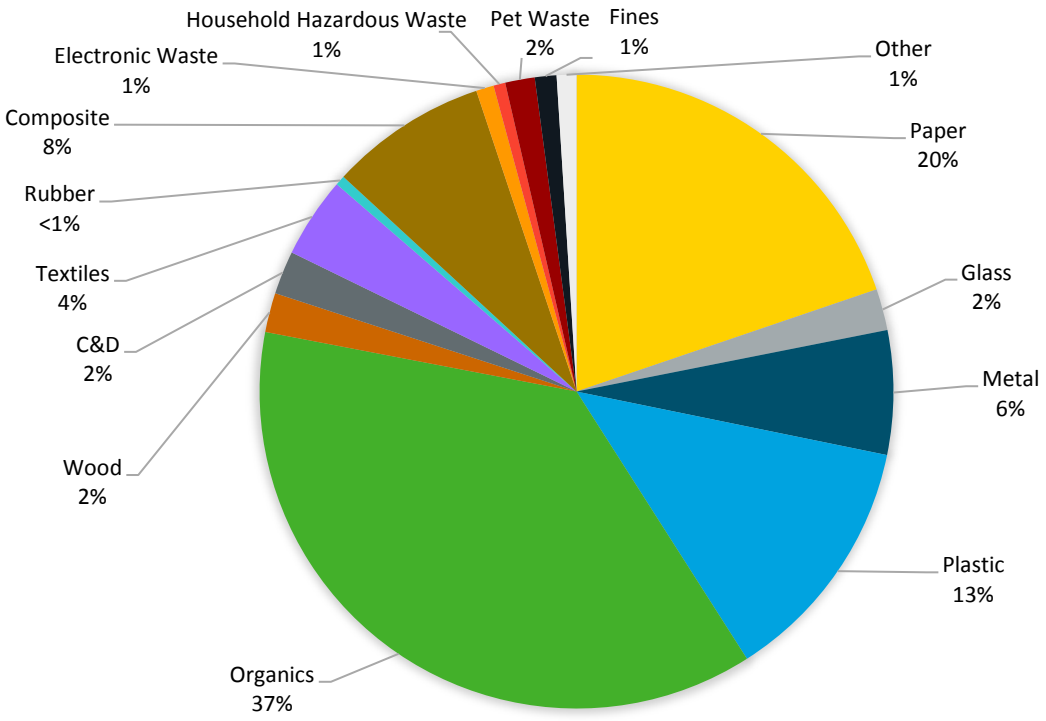

Figure 2-5: RDBN Waste Composition, By Weight (2008)

2.5 Facility and Services Summary

The solid waste management system in RDBN includes a number of public and private facilities. RDBN operates the majority of solid waste transfer and disposal facilities in the region. Many of the RDBN facilities include diversion and reuse services, including yard waste composting, scrap metals recycling, reuse sheds, and some household recyclable collections. The Takla First Nation also operates a small transfer station in the community of Takla Landing that currently only accepts garbage for transfer to landfill. A number of private recycling facilities are operating in the region with varying levels of financial support from RDBN and EPR organizations. With the exception of the Manson Creek Landfill, all solid waste transfer and disposal facilities are staffed during operating hours. The facilities and services offered are described in the following sections.

2.5.1 Collection Operations

Collection of solid waste in the region is managed by individual municipalities and businesses. The larger municipalities in the region provide curbside collection of garbage with a number mandating a minimum “non-subscription” fee to cover base administrative costs even when residents choose to opt out of collection. Private haulers offer curbside collection by subscription in many areas where it is not offered by municipal governments.

Table 2-5 presents the availability of curbside collection programs in each municipality in RDBN.

Table 2-5: Curbside Collection Programs by Municipality

Municipality	Total Households (StatsCan 2016)	Curbside Collection Availability	
		Garbage	Recycling
Town of Smithers	2,389	EOW*	EOW*
Village of Telkwa	539	Weekly	EOW*
District of Houston	1,402	Weekly	N/A
Village of Granisle	284	Weekly	N/A
Village of Burns Lake	748	Weekly – Residential Twice Weekly – ICI	N/A
Village of Fraser Lake	551	Weekly	N/A
District of Fort St. James	761	Weekly	EOW*
District of Vanderhoof	1,831	Weekly	N/A
Electoral Areas	7,892	N/A	N/A

* EOW – Every Other Week

** N/A – Collection is not managed provided by government but is available by subscription with private haulers in most non-remote areas.

Municipally and privately collected garbage is unloaded at the local landfill or transfer station for no fee. Material collected curbside is taken to transfer stations where it is consolidated into trailers with the garbage dropped off by residents, and hauled to one of the RDBN's sub-regional landfill facilities: Knockholt and Clearview Landfills.

2.5.2 Transfer Stations

The RDBN operates seven transfer stations in the region that are used by both residents and private haulers. Garbage is consolidated and transported for disposal at Knockholt or Clearview Landfill. Photo 2-4 to Photo 2-7 show facilities at three of the RDBN's transfer stations.

Table 2-6: Summary of RDBN Transfer Stations

Transfer Station	Facility Type	Communities/Areas Serviced
Smithers/Telkwa Transfer Station	Building/Tipping Floor	Area A, Smithers, Telkwa
Granisle Transfer Station	Transtor Bin (1 X 50 yard^3)	Granisle
Burns Lake Transfer Station	Building/Tipping Floor	Area B, Burns Lake
Fort St. James Transfer Station	Building/Tipping Floor	Area C, Fort St. James
Area D Transfer Station – Fraser Lake Rural	Transtor Bin (3 X 50 yard^3)	Area D, Fraser Lake, Fort Fraser
Southside Transfer Station	Transtor Bin (2 x 40 yard^3)	Area E
Vanderhoof Transfer Station	Building/Tipping Floor	Area F, Vanderhoof

Photo 2-4: Vanderhoof Transfer Station Building
(photo by Tetra Tech 2017)

Photo 2-5: Vanderhoof Transfer Station Signage
(photo by Tetra Tech 2017)

Photo 2-6: Smithers Transfer Station Trailer
(photo by Tetra Tech 2017)

Photo 2-7: Area D (Fraser Lake) Transfer Station Bins
(photo by Tetra Tech 2017)

In most instances, garbage is hauled directly from the transfer station to one of the region's two sub-regional landfills (Knockholt and Clearview Landfills). However, in order to increase transfer efficiency, garbage from small transfer stations is hauled to larger transfer facilities for consolidation and long-haul transfer to landfill (e.g., garbage from Southside Transfer Station and Granisle Transfer Station is hauled to Burns Lake Transfer Station and subsequently to Knockholt Landfill).

2.5.3 Landfills

The Region operates two engineered sub-regional landfills. A third small landfill (Manson Creek) exists in the northwest corner of Area C to serve local populations. These landfills are summarized in Table 2-7.

Table 2-7: Summary of RDBN Landfills

Landfill and Location	Communities/Areas Serviced
Knockholt Landfill Located approximately 12 km southeast of Houston, on Aitken Road on lands legally described as District Lot 8044, Range 5.	**Western Region** Burns Lake, Granisle, Houston, Telkwa, Smithers, Electoral Area A, Electoral Area B, Electoral Area E, Electoral Area G
Clearview Landfill Located approximately 22 km north of the intersection of Highway 16 and Highway 27. The legal description of the property is unsurveyed Crown land in the vicinity of Clear Creek, North of Section 36, Township 18, Range 5.	**Eastern Region** Vanderhoof, Fort St. James, Fraser Lake, Electoral Area C, Electoral Area D, Electoral Area F
Manson Creek Landfill Located approximately 6 km north-northwest of Manson Creek, British Columbia at km 65.5 on the Finlay-Manson Forest Service Road. Landfill is operated on unsurveyed Crown Land at a site located at the following coordinates, Latitude 55o 42' 45" northerly and Longitude 124o 30' 45" westerly.	**Northeast** Manson Creek

RDBN conducts regular environmental monitoring of active and closed landfills to confirm that no contaminants are migrating off site onto adjacent properties. Groundwater is monitored at locations hydraulically up-gradient and down-gradient of landfill areas and surface water in adjacent streams is sampled upstream and downstream of the facility. Active landfills are monitored quarterly while historical landfills are monitored twice per year, except the Manson Creek Landfill, which is monitored annually.

2.5.3.1 Knockholt (Western Sub-region) Landfill

The Knockholt sub-regional landfill is the largest and most sophisticated of the RDBN's landfills. Table 2-8 summarizes the materials received at the Knockholt landfill over the past five years.

Table 2-8: Solid Waste Materials Received at the Knockholt Landfill

Solid Waste Material Received	2012 Tonnage (tonnes)	2013 Tonnage (tonnes)	2014 Tonnage (tonnes)	2015 Tonnage (tonnes)	2016 Tonnage (tonnes)
Garbage	11,507	11,458	11,034	11,125	11,813
C&D Waste	2,102	1,904	2,037	3,905	1,741
Wood Waste	1,095	1,279	1,165	2,629	2,189
Specified Risk Material	8	7	1	30	8
Total Material Received	**14,712**	**14,648**	**14,759**	**17,689**	**15,751**

The permitted area of the Knockholt landfill is 33 hectares comprising four phases:

- Phase 1: Previous landfilling area. Constructed with a native clay liner with a leachate toe drain. Partial closure has been completed in this area to minimize infiltration and shape slopes.
- Phase 2: Current landfilling area. Constructed with a native clay liner, stone drains, central leachate collection pipe, and a leachate tie drain.
- Phase 3 and Phase 4: Future landfilling areas. Will be constructed with an engineered liner and leachate collection system.

The facility was converted from a local disposal site to an engineered sub-regional landfill in 1998 as part of the region's first SWMP (1996). Surface water is controlled with a perimeter berm and culverts that drain to a natural surface water pond area north of the existing landfilling area. An engineered wetland was constructed in 2007 to treat leachate generated by the landfill. Leachate is siphoned from a lined storage lagoon to a constructed wetland for treatment where it is eventually released northeast of the active fill area to natural areas down-gradient of the site. Landfill operations are shown in Photo 2-8 with the leachate pond shown in Photo 2-9.

Photo 2-8: Knockholt Landfill Active Face
(photo by Tetra Tech 2017)

Photo 2-9: Knockholt Landfill Leachate Pond
(photo by Tetra Tech 2017)

In addition to landfilling, the operating certificate allows composting of organic waste, including untreated wood waste and air-curtain burning of selected combustibles.

Quarterly groundwater and surface water monitoring is conducted at the site to ensure that no contaminates are migrating off site. The Ministry has identified the need to update the groundwater monitoring plan to provide coverage for the newly constructed landfill cell (Phase 3a) opened in 2017.

2.5.3.2 Clearview (Eastern Sub-region) Landfill

Clearview is the smaller of the sub-regional landfills. It was built to replace a number of smaller sites following the 1996 SWMP. Table 2-9 summarizes the materials received at the Clearview Landfill over the past five years.

Table 2-9: Solid Waste Materials Received at the Clearview Sub-regional Landfill

Solid Waste Material Received	2012 Tonnage (tonnes)	2013 Tonnage (tonnes)	2014 Tonnage (tonnes)	2015 Tonnage (tonnes)	2016 Tonnage (tonnes)
Municipal Solid Waste Generation	7,283	7,161	6,906	6,991	6,929
C&D Generation	1,611	1,769	1,403	928	1,298
Specified Risk Material Generation	157	156	156	132	156
Total Landfilled	**9,051**	**9,086**	**8,465**	**8,051**	**8,383**

Siting for an eastern sub-regional landfill began in 1999, with construction completed in 2007. The detailed siting study and public consultations identified the Clearview sub-regional landfill site to the west of Highway 27 as the preferred location for the landfill facility. Due to its proximity to two nearby transfer stations, the Clearview sub-regional landfill is not open to residential drop-off and does not handle any recyclable materials other than segregated wood loads. Landfill operations are shown in Photo 2-10 and Photo 2-11.

The facility was originally designed to allow for over 100 years of airspace using conservative calculations as identified in the 2003 Design, Operations & Closure Plan (Gartner Lee Limited 2003). Subsequent design updates identified additional site capacity through design change. According to the 2013 XCG design report, the landfill's Phase 1 development area has sufficient airspace to last until 2027 based upon conservative estimates, which is approximately 12 years longer than the original Design, Operations & Closure Plan estimate of 2015.

The permitted area of the Clearview landfill includes four phases within the existing fence line with additional "future landfill" space to the west of the fence line.

Photo 2-10: Clearview Landfill Active Face
(photo by Tetra Tech 2017)

Photo 2-11: Clearview Landfill Wood Burning Area
(photo by Tetra Tech 2017)

Surface water is controlled via perimeter ditching along the access road surrounding the Phase 1 development area of the landfill. Surface water is conveyed through ditches and culverts to a constructed stormwater management pond at the northeast corner of the fenced site. Leachate is contained within temporary berms and is expected to infiltrate through the natural soils underlying the site. Various leachate breakouts have been noted in Phase 1 in previous years. The majority of these breakouts have been mitigated by removing large debris placed at the surface of the waste mass directly adjacent to the cover material. The number and severity of leachate breakouts will continue to be monitored.

Excess water that comes into contact with the active face of the landfill (contact water) flows into a low ponding area at the north edge of Phase 1 (contact water pond), where it eventually infiltrates the underlying soil and is expected to be naturally attenuated. Significant accumulation of liquid in this area previously required controlled discharges in spring. RDBN staff are working with MOE and consultants to manage and mitigate issues.

A leachate collection and treatment system may be required if issues persist with leachate breakouts and contact water pond capacity. To further mitigate leachate production and erosion in future, RDBN will complete partial closure of Phase 1 in 2018. The constructed final cover will include compacted clay and topsoil seeded with low maintenance vegetation suitable for local conditions.

Quarterly groundwater and surface water monitoring is conducted at the site to ensure that no contaminates are migrating off site.

2.5.3.3 Manson Creek Landfill

The Manson Creek Landfill is a natural attenuation landfill located on unsurveyed crown land at km 65.5 on the Finlay-Manson Service Road. The site has been operated by a local contractor as an unattended trench landfill since 1987. The site is fully secured with a perimeter electrified fence to limit animal attraction. Garbage is

compacted and covered at least once per month from June to October. Wood and scrap metals are collected on site in separate piles.

3.0 CURRENT SOLID WASTE SYSTEM

Figure 3-1 outlines the key components of RDBN's solid waste management system, including waste prevention, waste generation, collection, recycling and disposal. This section of the report describes the associated services, programs, infrastructure and policies that are associated with these system components.

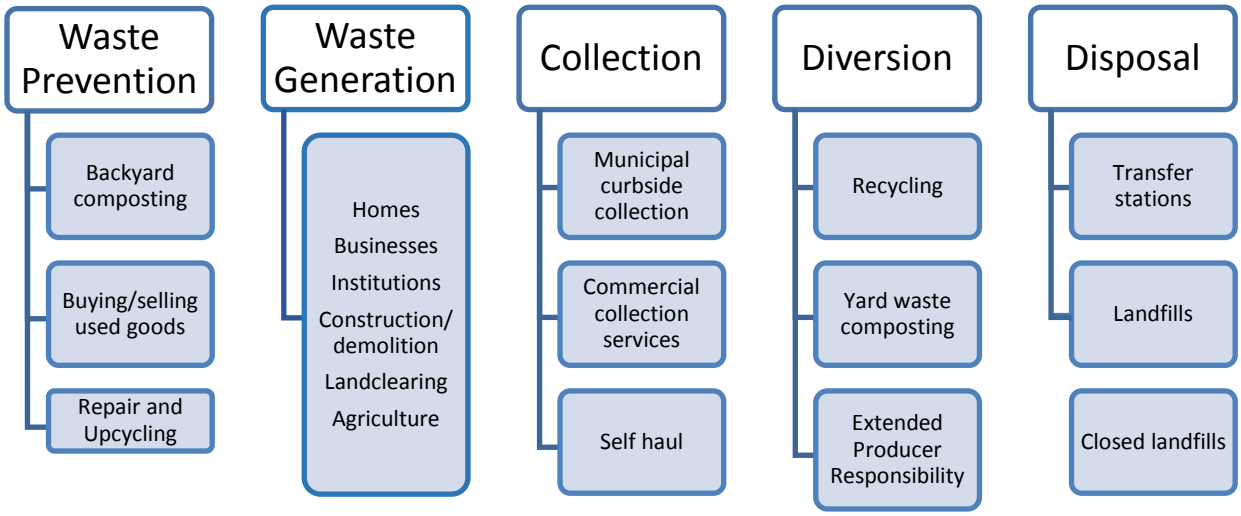

Figure 3-1: Components of the Waste Management System

3.1 Waste Prevention

Initiatives that reduce the amount of waste produced, or that encourage items to be reused rather than discarded, serve to decrease the amount of waste that needs to be collected and managed through waste diversion and disposal services.

Backyard composting is a means of waste reduction used by many communities to reduce the quantity of organic waste disposed. RDBN promotes backyard composting by offering a $30 rebate on home composters purchased at participating retailers and providing "how to" information on their website.

At most RDBN waste management facilities there are opportunities for reuse (Photo 3-1 and Photo 3-2):

- Bikes and lawn mowers that are dropped off at the site are set aside so that they can be taken for salvage or repair;
- Reusable windows and doors are set aside so that they can be reused or repurposed; and
- The wood waste stockpile is made available for salvage.

Photo 3-1: Vanderhoof Transfer Station Salvage Areas (photo by Tetra Tech 2017)

Photo 3-2: Vanderhoof Transfer Station Salvage Areas (photo by Tetra Tech 2017)

In addition, there are staffed Reuse Sheds at eight of the RDBN's waste management facilities. Four of these sites have an additional attendant dedicated to managing the reuse sheds:

- Smithers/Telkwa Transfer Station
- Granisle Transfer Station
- Southside Transfer Station
- Burns Lake Transfer Station
- Vanderhoof Transfer Station
- Fort St. James Transfer Station
- Area "D" (Fraser Lake Rural) Transfer Station
- Knockholt Landfill

The Reuse Sheds generally take reusable household goods such as dishware, clothing, books and sporting goods. There is no cost to customers to drop off or take away items from the sheds.

In the broader community, reuse of goods is prevalent. Examples of reuse include:

- A toy library located in a church basement in Vanderhoof;
- "Man Sheds" where volunteers receive non-working machinery with an aim to repair it and extends it's useful life;
- Thrift stores are operated in most communities; and
- On-line services and garage sales to buy/sell/giveaway used goods (e.g., Craigslist, Kijiji, and Facebook).

Photo 3-3: Smithers/Telkwa Transfer Station Reuse Shed
(photo by Tetra Tech 2017)

3.2 Diversion: Recycling

3.2.1 Residential Recycling

There are a range of recycling services available to RDBN residents, although the availability of services varies across the region.

Municipal curbside recycling programs are currently provided to residents in the municipalities of Smithers, Telkwa and Fort St. James (by Nak'azdli First Nation Band), as well as to residents on the Nak'azdli First Nation reserve lands near Fort St. James. These three curbside collection programs are funded in part by Recycle BC as part of an EPR program for residential recyclable materials. Recycle BC also funds the collection of residential recyclables at the Burns Lake Return It Depot, Smithers Bottle Depot and Nak'azdli Recycling Depot. For additional details on the Recycle BC program, refer to Section 3.2.3 on EPR.

Photo 3-4: Baled Recyclables at the Smithers and Area Recycling Society Facility
(photo by Tetra Tech 2017)

3.2.2 Industrial, Commercial and Institutional (ICI) Recycling

Cardboard is a large component of waste generated by the ICI sector. This bulky material has established recycling markets and consequently, in 2016, RDBN banned its disposal as garbage as a means of ensuring that this material is recycled rather than landfilled.

Businesses and institutions (schools, hospitals, etc.) in RDBN may engage in recycling in one or all of the following manners:

Photo 3-5: ICI Recycling Bins Provided at the Burns Lake Bottle Depot
(photo by Tetra Tech 2017)

- Hire a collection service to collect recyclable materials. Private and non-profit collection services for cardboard are available to most communities along the Highway 16 corridor, as well as in the communities of Fraser Lake and Fort St. James.
- Self-haul their recyclable materials to a recycling facility. There are drop off locations for ICI cardboard and paper in Vanderhoof, Smithers, Burns Lake (Photo 3-5) and Fort St. James.
- Back haul their recyclable materials to the Lower Mainland (an approach that is typically done by only large generators that have their own on-site baler for materials such as cardboard and pallet wrap).

3.2.3 Extended Producer Responsibility

EPR is a provincial policy tool that aims to shift the responsibility for end-of-life management of products (physically and economically) to the producer and away from local governments. This policy is intended to create an incentive for producers to include environmental considerations in design of products.

EPR programs in British Columbia are mandated by Recycling Regulation 449/2004, under the EMA. The regulation requires producers of the designated products to develop a program for their end-of-life collection and recovery of materials and to consult stakeholders (including local governments) when developing their plans.

The range of products managed through EPR programs has expanded significantly in the last decade. Material collection at the Burns Lake Recycle Depot is shown in Photo 3-6 and Photo 3-7.

Photo 3-6: Burns Lake Recycle Depot Electronics Recycling (photo by Tetra Tech 2017)

Photo 3-7: Burns Lake Recycle Depot RecycleBC Materials Collection (photo by Tetra Tech 2017)

Table 3-1 provides a list of the products currently covered by British Columbia's EPR programs and the number of collection sites available in the RDBN. As shown, the regional district is reasonably serviced with take back locations for products regulated under the Recycling Regulation, with the exception of a take back location for outdoor power equipment (no known sites) and the limited sites available for residential packaging and printed paper (i.e., household recyclable materials).

Table 3-1: Regulated EPR Programs in British Columbia

Product Category	Program(s)	Take Back Available in RDBN
Antifreeze, Used Lubricating Oil, Filters and Containers	BC Used Oil Management Association	13 sites
Beverage Containers	Encorp (non-alcoholic and wine, spirits, coolers and import beer in non-refillable containers)	6 sites
	Brewers Distributed Limited (fillable and canned beer)	27 sites
Electronics and Electrical	Call2Recycle/Recycle My Cell (household batteries and cell phones)	8 sites
	Electronics Products Recycling Association (EPRA) (electronic, including: computers, televisions, audio-visual, medical equipment, office equipment, toys)	3 sites
	LightRecycle (lamps and lighting equipment)	10 sites
	Major Appliance Recycling Roundtable (MARR) (large appliances)	8 sites*
	Outdoor Power Equipment Institute (OPEI) (Outdoor Power Equipment)	0 sites
	Canadian Electric Stewardship Association (CESA) (small appliances, power tools, sports and exercise equipment, hobby, craft)	4 sites
	AlarmRecycle (smoke and carbon monoxide alarms)	4 sites
	Switch the 'Stat (thermostats)	unknown
Lead Acid Batteries	Canadian Battery Association & Interstate Battery System	6 sites*
Packaging and Printed Paper (residential only)	Recycle BC (previously Multi-Material BC)	3 sites
Paint and Solvents and Flammable Liquids, Gasoline and Pesticides	Product Care (operating as ReGeneration)	9 sites*
Pharmaceuticals	Health Product Stewardship Association	3 sites
Tires	Tire Stewardship BC	25 sites

* Collection sites include select RDBN facilities (transfer station or landfill).

RDBN is a member of the BC Product Stewardship Council, a body that advocates on behalf of local government for effective EPR programs. Through this council, RDBN engages with the Province and the various EPR programs to improve services levels in the RDBN.

3.2.4 Regional District of Bulkley-Nechako Waste Management Facilities

The RDBN provides opportunities for recycling at its solid waste management facilities, as outlined in Table 3-2. Collection of paint, solvents, fuels and pesticides is done as part of an EPR program for these products and funding is provided by the stewardship agency Regeneration for RDBN to act as a collection site. The collection of plastic and mixed paper at the Vanderhoof Transfer Station is a service provided by the Nechako Waste Reduction Initiative (see Section 3.2 for additional information on this organization), with the collection containers being hosted by RDBN.

Table 3-2: Recycling at Solid Waste Management Facilities

Facility	Metal*	Yard Waste	Paint	Solvents, Fuels, Pesticides	Propane Tanks	Automotive Batteries	Plastic (#1-#7)	Mixed Paper
Smithers-Telkwa Transfer Station	✓	✓	✓	✓	✓	✓		
Knockholt Landfill	✓	✓	✓		✓	✓		
Burns Lake Transfer Station	✓	✓			✓	✓		
Granisle Transfer Station	✓	✓			✓	✓		
Area "D" (Fraser Lake) Transfer Station	✓	✓	✓		✓	✓		
Vanderhoof Transfer Station	✓	✓			✓	✓	✓	✓
Fort St. James Transfer Station	✓	✓	✓		✓	✓		
Manson Creek Landfill	✓							

*Includes scrap metal, auto hulks and large appliances

3.2.5 Construction and Demolition Waste Recycling

Waste from construction, demolition and renovation projects (C&D waste) consists primarily of wood and, to a lesser extent, roofing materials, drywall, plastic, cardboard, metal, concrete and other building materials. There are no known opportunities to recycle C&D waste in the RDBN, with the exception of cardboard and metal recycling, as described in the sections above.

3.3 Diversion: Organics Management

Organic waste generally refers to yard and garden waste (i.e., leaves, branches, weeds, and grass), food waste, and some non-recyclable paper products such as paper toweling, tissue and waxed cardboard. There are opportunities to reduce the amount of organic waste, particularly food waste, which is landfilled, as shown on Figure 3-2. This figure is a hierarchy of food waste management solutions that replicates the pollution prevention hierarchy of reduce then reuse then recycle, before considering disposal.

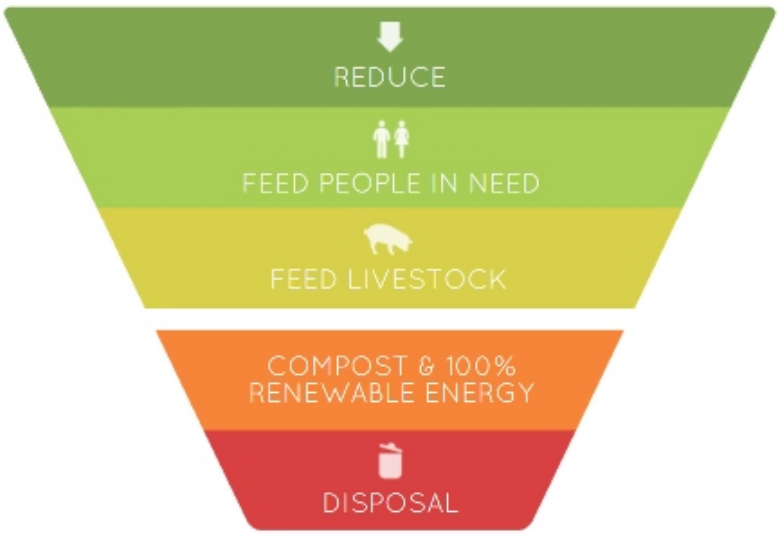

Figure 3-2: Food Waste Management Hierarchy

In the RDBN, there are programs in place to redirect excess food from some stores and bakeries to people in need through local social service organizations. In addition, some commercial generators of organic waste, such as grocers, restaurants and breweries, give some or all of their organic waste to local farmers for use as animal feed.

The RDBN receives yard and garden waste at most of their solid waste management facilities, which is composted with sludge from their septic ponds, for use as final cover at their landfills. This composted material has proven very effective as a growing medium for the grasses and other flora planted on the closed landfills.

3.4 Collection

Collection of solid waste is discussed in detail in Section 2.5.1. Residential garbage collection is managed by individual municipalities while residents in electoral areas are typically required to either self-haul their garbage to the nearest transfer station or landfill or individually contract collection services from a private waste hauler. Curbside collection of recyclables is provided in three communities (Town of Smithers, Village of Teklwa, and the District of Fort St. James) as well as on the Nak'azdli First Nation reserve lands. Some municipalities collect garbage from small ICI generators. Private haulers offer commercial collection of garbage and recyclables for the ICI sector.

3.5 Transfer

Regionally operated transfer stations are discussed in detail in Section 2.5.2. In addition to the seven transfer stations operated by RDBN which offer various diversion services in addition to garbage collection, the Takla First Nation also operates a small transfer station which primarily accepts garbage from the Takla Landing community.

3.6 Residuals Management

All disposal and transfer facilities in the region are managed by RDBN. The objective of the 1996 SWMP was to bring all operating landfills in the region in compliance with British Columbia's Landfill Criteria for Municipal Solid Waste (1993 Ministry) which was subsequently updated in 2016. The plan focused on eliminating small historical "dump" sites in favor of the two current sub-regional landfill sites:

- The Clearview Landfill in the eastern portion of the region (municipalities and electoral areas east of Burns Lake); and
- The existing Knockholt landfill in Houston (the western portion of the region servicing Burns Lake and municipalities and electoral areas to the west).

The plan also identified the need to upgrade and apply for exemptions to portions of the landfill criteria for the Manson Creek Landfill to service the small population in the area. Based on the low tonnages disposed at the Manson Creek Landfill, the Ministry has allowed continued operation as a trench fill landfill per the existing permit with the addition of an electrified perimeter fence to limit animal attraction.

As a result of the 1996 SWMP, the Clearview sub-regional landfill was sited and designed to serve populations of the eastern portion of the region. The Knockholt and Manson Creek landfills were updated to meet Ministry requirements. Scale systems were installed at both sub-regional landfills in 2007 to track materials received at each facility.

Prior to 2015, all landfills in the region were operated by contracted operators. RDBN now directly manages the operations at Knockholt and Clearview sub-regional landfills (2016) and has seen significant savings in operations costs since these changes were made. All of the region's operating landfills are enclosed by an electric fence to limit attraction of bears.

Both sub-regional landfills are operating under Operational Certificates (OCs) and associated approved Design, Operations, and Closure Plans (DOCPs) developed prior to release of the second edition of the landfill criteria (Updated Criteria) (Ministry 2016). The Ministry has not indicated any changes required to the existing landfill Operational Certificates. Operation as per the approved DOCP at each site is not anticipated to trigger updates to Operational Certificates. Updates to the DOCP may be necessary in the event that the sub-regional landfill OCs are amended.

3.6.1 Waste to Energy

There are currently no waste to energy (WTE) processes in the region that are using waste streams controlled by RDBN. The RDBN commissioned a feasibility study (AECOM 2010) to investigate "economic opportunities that may be created by applying new waste management technologies". Technologies for creating energy, fuel, and compost/soil conditioner from waste were investigated through the project. As a component of the project, an expression of interest was issued to identify private sector organizations to provide commercial available and appropriate refuse derived fuel technologies.

The study recommended:

- Supporting development of solid fuel industries by making suitable feedstock available to the private sector;
- Considering small scale composting of food and yard waste not desirable for fuel feedstock;
- Deferring WTE technologies and reviewing every five years to identify changes in available technologies or economics; and
- Reassessing tipping fees as a means to create a more level playing field by reflecting the true cost of managing waste.

Due to the high capital investment required for centralized systems and the significant hauling costs that would be incurred to consolidate waste tonnages to utilize commercially viable waste processing technologies, the 2010 WTE study (AECOM) did not recommend investment by RDBN in any technological solution. The long-term commercial viability of alternative processing technologies is still being proven even for large urban areas like Metro Vancouver. Recent guidance provided by solid waste professional organizations suggests caution for communities considering emerging technologies[5] to manage solid waste.

[5] The National Waste & Recycling Association (NWRA) and the Solid Waste Association of North America (SWANA) published a Briefing for Elected Officials Effective Responses to Emerging Waste Management Technology Proposals in 2017. Available online https://swana.org/Portals/0/Resources/SWANA_NWRA-Briefing_for_Elected_Officials-Effective_Responses_to_Emerging_Waste_Management_Technology_Proposals.pdf

3.7 Promotion and Education

Waste management-related promotion and education is done by RDBN, municipalities, local non-profit organizations with an interest in waste management issues, and by private waste management companies.

Municipalities provide information related to the waste management services that they provide to the community – generally curbside garbage collection. Common communication materials include information mailed to each home and published on the municipality's website. The Town of Smithers has launched an app called *Smithers Recycle Coach* to provide users with timely information on local waste management services.

Figure 3-3: RDBN Recycling Brochure Example

Similarly, private sector waste management companies, including local depots, provide information related to the waste management services that they provide to ensure that their customers know the range of materials that they can recycle or take to a depot, and how to prepare those materials properly.

The RDBN provides a broad range of information on their website, including information on where to take what materials/products, RDBN waste management facility information, how-to information on composting, and details on the solid waste management plan. Additionally, they publish a Sustainability Newsletter. Every month, a new issue is posted on their website, with recycling news from around the region, plus tips on sustainable living, crafts, recipes and more.

The non-profit organization Greening Up Fort Society, based in Fort St. James, keeps their community informed on local initiatives through their Facebook page. They also organize local clean up events.

Another non-profit organization, Nechako Waste Reduction Initiative, has a mission to initiate and support effective ways to reduce waste in the community of Vanderhoof. They receive funding from RDBN to undertake a range of initiatives in the Vanderhoof area, including:

- Creation of the Green Toolkit, which is a set of 200 reusable place settings that can be rented for community and private events instead of using disposable dishware.
- Working with Nechako Valley Food Network to help "green" local events. A green event is an event in which waste is kept to a minimum, local food is served and volunteerism is promoted. The NWRI is responsible for minimizing waste at these events and achieves this through the use of reusable dinnerware, composting food waste and recycling beverage containers and paper or cardboard packaging.
- Operating a program to collect corrugated cardboard and mixed paper at the Vanderhoof Transfer Station.
- Coordinating community clean up events.
- Writing articles in the local paper.

- Maintaining a website and Facebook page to keep local residents informed on the current recycling options and waste reduction initiatives.
- Working with the municipality to establish a residential curbside corrugated cardboard recycling pilot program in Vanderhoof in 2017.
- Providing free waste reduction workshops for classrooms, community groups, and youth programs across Vanderhoof.

4.0 FINANCE AND ADMINISTRATION

4.1 Plan Financing

The solid waste management system is primarily funded through taxation with approximately 60% of average annual revenue coming from taxes. Tipping fees account for approximately 5% of average annual revenue. Based on the region's budget, a tax rate is established and applied based on assessed property value.

Table 4-1 summarizes the RDBN's projected budget as identified in the five year financial plan through 2021. The RDBN has seen surpluses over several years but is projecting balanced budgets after 2017. RDBN's main solid waste expenses are administration and transfer station operations which comprise almost 70% of average annual expenses. Operations at the Region's three active landfills account for over 10% of annual expenses. Balanced budgets are projected from 2017 through 2021.

Table 4-1: Summary of RDBN Solid Waste Financial Plan 2017 to 2021

	2017	2018	2019	2020	2021
Taxation	$ 3,101,24	$ 3,536,058	$ 3,376,469	$ 3,460,692	$ 3,112,525
Recycling	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
Tipping Fees	$ 246,000	$ 241,000.	$ 246,000	$ 246,000	$ 246,000
Transfer from Reserves	$ 567,000	$ 120,000	$ 133,000	$ 45,000	$ 45,000
Prior Year's Surplus	$ 1,257,240	$ -	$ -	$ -	$ -
Other	$ 1,041,434	$ 1,460,312	$ 1,051,434	$ 1,244,495	$ 1,041,434
Revenue Total	**$ 6,249,918**	**$ 5,394,370**	**$ 4,843,903**	**$ 5,033,187**	**$ 4,481,959**
Administration	$2,003,245	$1,945,726	$1,831,464	$1,789,359	$1,467,310
Transfer Station Operations	$1,673,950	$1,681,966	$1,671,905	$1,695,643	$1,718,091
Active Landfill Operations	$655,207	$659,822	$670,668	$685,931	$703,898
Operating Contingency	$23,292	$28,786	$28,794	$29,184	$29,588
Inactive Landfill Closure/Post-Closure	$124,300	$47,300	$47,300	$47,300	$47,300
Recycling Operations	$935,692	$344,538	$344,539	$344,539	$ 344,539
Capital Expenditures	$593,000	$525,000	$ 88,000	$ 270,000	
Contribution to Reserves	$241,233	$161,233	$161,233	$ 171,233	$171,233
Expenses Total	**$6,249,919**	**$5,394,371**	**$4,843,903**	**$ 5,033,189**	**$4,481,959**
Surplus	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

5.0 INDUSTRY TRENDS AND DEVELOPMENTS

The effective management of solid waste and effective diversion of materials from landfills is a perennial challenge for communities across North America. These challenges are magnified in the North where harsh climate, low population density, and significant distance from material markets affect day-to-day operations and the ability for communities to effectively contribute to sustainable material markets for recyclable and reusable materials. A number of best practices are emerging as northern communities tackle challenges in managing solid waste.

- **Reduce**
  - **Single-use Bags**. Several communities have attempted to manage litter and debris around landfills by reducing the use of single-use plastic bags. In 2010, the Northwest Territories implemented a mandatory 25 cent surcharge for each single-use retail bag at all grocery stores. This was quickly followed by an expansion of the program to all retail stores in 2011. The program has seen an estimated 72% decrease in single-use retail bag use in the Northwest Territories. Several communities across Canada have banned single-use plastic bags including the Regional Municipality of Wood Buffalo (Fort McMurray, Alberta). These bans have varying levels of effectiveness depending on implementation.
  - **Food Waste Prevention**. Food waste reduction and rescue has become paramount in recent years. With food waste estimated to be at a third of food produced for consumption, local and senior level governments have responded by setting ambitious food waste reduction goals. In British Columbia, the Ministry has taken the initiative to provide food waste reduction tools[6] for residential and commercial sectors including a Food Waste Reduction Toolkit tailored to municipalities. Programs such as the residential food waste reduction prevention campaign, Love Food Hate Waste[7], serve as turn-key tools to implement across jurisdictions.
  - **Behaviour Change.** Adopting a community-based social marketing[8] (CBSM) approach to educating the community can foster more effect and long lasting behaviour change for waste reduction and diversion. CBSM provides a framework for how to target a specific behaviour such as increasing recycling participation for specific audiences by addressing barriers, reinforcing benefits, and using specific tools such as prompts and commitments to change norms. The Squamish Lillooet Regional District and Zero Waste Yukon have successfully integrated behaviour change tools into education initiatives to further optimize their success.
- **Reuse**
  - **Reuse facilities** offer the opportunity to give a number of household items a second life. The Reuse Shed at the Smithers/Telkwa Transfer Station is a good example of a well-used and effective facility that both diverts materials and offers a service to the community.
  - **Deconstruction and Building Material Reuse**. Reuse of building materials is a growing opportunity in many communities as building deconstruction services become increasingly available. Both industrial and residential materials are being recovered and diverted from landfills through development of stores that either sell or provide materials free of charge. In most communities, non-profit organizations or governments provide the storage services.

[6] BC Ministry of Environment and Climate Change Strategy, 2017. Food Waste Reduction Tools & Resources. http://www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/tools-resources

[7] Metro Vancouver, 2017. Love Food Hate Waste Canada. http://www.lovefoodhatewaste.ca

[8] Community-based Social Marketing, 2017. http://www.cbsm.com

- **Recycle**
  - **Volatile Recycling Markets.** Recyclable materials collected by local and regional governments are sold in markets as raw materials for future remanufacturing. Both low costs for virgin (non-recycled) materials and changes to international markets have significant impacts on the cost of providing recycling services. The Chinese government's "National Sword 2017" initiative enacted high quality standards for materials exported to the country resulting in decreased market for lower quality materials (such as mixed paper and mixed plastics) resulting in recyclers limiting or eliminating service for mixed materials. As recycling markets have changed, remote and northern communities have been challenged to meet their residents' growing aspirations for waste diversion while effectively managing program costs. Domestic haulers/recyclers have eliminated collection of mixed materials in some northern and remote areas. Markets for recyclable materials will likely continue to be volatile over the coming years as the industry adjusts to changes in export requirements and redevelops local material markets.
  - **Organic Waste Diversion**. A number of northern and remote communities have turned their focus to diverting organics which can be processed locally through centralized or decentralized composting facilities rather than focusing on recyclables. Diverting organic waste has the added benefit of creating an end product of high quality soil amendment that residents can see and use. The City of Whitehorse and the City of Yellowknife are both offering curbside collection of organics and managing small centralized compost facilities at their existing landfills. Despite northern climates, low technology static pile composting is possible with sufficient care and consideration.
  - **EPR Program Growth**. The contribution of EPR programs have significantly increased the ability for northern communities to offer cost-effective recycling programs in British Columbia. Since the 1996 SWMP was developed, EPR programs have developed to provide key support for municipal and regional recycling programs. On behalf of material producers, the EPR stewards provide financial and logistical support to collect and transport materials from communities to processors and markets. The list of products included in EPR programs has and will continue to grow with continued local government advocacy. Effective use of and coordination with these programs is key to successful diversion programs.
- **Recovery**
  - **Biomass and Energy Recovery**. Technology has successfully been applied at a number of facilities to effectively process waste from the manufacturing process to supplement energy production. Offcuts and sawdust from lumber mills are often collected and used to either produce additional materials or fuel WTE processes. Sawmill and logging waste is converted to electricity at the Veolia biomass facility in Fort St. James. The facility was constructed to manage the massive amount of waste produced by the mountain pine beetle epidemic in British Columbia. Other high energy industries such as cement producers are seeking C&D waste and other high energy materials as alternative fuel sources for their processes. Commercially viable WTE technologies have high capital costs and rely on economies of scale for efficient operations.
- **Residuals Management**
  - **Greenhouse Gas Management**. Northern communities typically landfill residual materials. The use of modern engineered landfills with effective environmental monitoring programs limits the risk of landfilling materials to the surrounding environment. The production of methane in landfills is a growing concern as this potent greenhouse gas contributes to climate change. Increasingly, landfills are looking for opportunities to manage methane through landfill gas collection, diversion of organics from landfills, and use of alternative cover systems.

6.0 SYSTEM GAPS AND OPPORTUNITIES

Section 1.0 to Section 5.0 summarize the current system for managing solid waste in the RDBN. Section 6.0 identifies a number of gaps and opportunities in the RDBN's solid waste management system and will be considered for further analysis:

- **Organics Diversion** is currently occurring on a small scale at all of the region's public access facilities. However, opportunities exist to expand the amount and type of materials processed through small composting sites. While the RDBN is reliant on global markets to accept its recyclable materials and is therefore impacted by market forces beyond regional borders, local markets could be developed to use the compost created through an effective organics diversion program.
- **Wood Waste** is collected separately at all facilities. Clean wood waste (which is collected separately from unclean wood waste in the western portion of the region) offers good potential for diversion if an alternate end use, such as fuel, can be identified in the region.
- **Packaging and Printed Paper EPR Programs** (Recycle BC) may provide additional financial and logistical support to expand Recycle BC recycling services in the region.
- **EPR** requirements have expanded since the original SWMP. The Ministry is likely to continue to add materials to the EPR system. As products are added, services in the region could expand to take advantage of additional support available.
- **Tipping Fees/Financial Structure** of the system is primarily financed through taxation verses tipping fees, which minimizes financial incentive for residents, business, and most municipalities to dispose of materials rather than recycle them. Reassessing the feasibility of implementing tipping fees at all facilities may better support the solid waste management system, diversify revenue sources, and support the RDBN's strategic priorities.
- **Regional Communications** between municipalities and waste diversion organizations is infrequent, which limits the sharing of best practices between communities to support reduction and diversion behaviour change initiatives and other local diversion programs.
- **Financial Support for Local Waste Reduction and Recycling Programs and Initiatives** is currently applied on a case-by-case basis. No overarching policy strategy or evaluation criteria have been developed to prioritize investments to ensure that they work toward the RDBN's waste reduction and diversion goals.
- **RDBN is working with Reduced Staff Levels** and is currently down one full time staff person while the strategic direction of solid waste management is being determined. In order to meet current and future organizational priorities additional staff will most likely be required.
- **Emerging Waste Conversion Technologies** were identified as an area of interest in several conversations. These technologies are expensive and without the quantities of waste (i.e., economies of scale) in RDBN, the unit processing costs would be very difficult to complete against the low disposal cost in the regional district. Decision makers may require guidance and additional context to assess the feasibility of emerging technologies in the region.

7.0 ESTABLISHING GOALS AND TARGETS

The Ministry has established waste disposal as an annual reporting requirement for regional districts and set a provincial target of 350 kg per capita per year to be achieved by 2020. A second performance measure set by the Ministry is to have 75% of the population in British Columbia covered by an organic waste disposal restriction by 2020. Through a separate Recycling Regulation, the Ministry oversees an extended producer responsibility (EPR) program that sets 75% recovery targets for products covered through the program (e.g., beverage containers, packaging and printed paper, electronics, and other items).

8.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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REFERENCES

AECOM. 2010. Waste-to-Energy, Job Creation to Sustainable Communities: Feasibility Study Final Report. Burnaby, BC. April 2010. Project Number: 60117232.

Government of British Columbia. 1993. Ministry of Environment: Landfill Criteria for Municipal Solid Waste. Victoria, BC.

Government of British Columbia. 2016. Ministry of Environment: Landfill Criteria for Municipal Solid Waste Second Edition. Victoria, BC.

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

TECHNICAL MEMORANDUM 1: DISPOSAL OPTIONS

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Regional Solid Waste Advisory Committee	**Date:**	May 16, 2018
c:	Rory McKenzie Janette Derksen	**Memo No.:**	1
From:	Lauren Quan, P.Eng. Michel Lefebvre, M.Sc., P.Eng.	**File:**	704-SWM.SWOP03664-01
Subject:	Solid Waste Management Plan Disposal Option Information		

1.0 INTRODUCTION

The Regional District of Bulkley-Nechako (RDBN) retained Tetra Tech Canada Inc. (Tetra Tech), Maura Walker Environmental Consultants, and Carey McIver and Associates Ltd. (the Consulting Team) to review and update RDBN's 1996 Solid Waste Management Plan (SWMP). The 2018 SWMP update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and set the RDBN's waste management principles, targets and strategies for the next ten years. A summary of the project phases and deliverables is included on Figure 1-1.

The assessment stage includes reviewing the Current Solid Waste System Report (Current System Report) that documents the current condition of RDBN's solid waste management system. The Current System Report was used as a basis for discussion for the direction of the SWMP update entering the second stage, "Analysis and Evaluation".

Within Stage Two, this technical memorandum (technical memo) focuses on recovery and residuals management, the interrelated fourth and fifth Rs of the 5-R waste prevention hierarchy (shown in Figure 1-2). The purpose of this technical memo is to determine which options require further research and analysis and include in the list of options for financial analysis, and which should be eliminated from consideration within the RDBN's SWMP update. The first three Rs (reduce, reuse, and recycle) will be evaluated under a separate cover. The financial implications for selected options for integration with the 2018 SWMP will be assessed in a subsequent technical memo.

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The project consists of four stages, as shown on Figure 1-1 below.

1. Assessment	Assessing the current system and reporting on implementation status. **Deliverable:** ▪ Current Solid Waste System Report
2. Analysis and Evaluation	Analyzing opportunities and evaluating financial models. **Deliverables:** ▪ Technical memo 1: Disposal Options ▪ Technical memo 2: Diversion Options ▪ Technical memo 3: Financial Options Review and System Overview
3. Consultation	Community and stakeholder consultation, engaging the public, key stakeholders, and First Nations to provide input on selected options. **Deliverable:** ▪ Consultation Plan ▪ Consultation Summary Report
4. SWMP Update for 2018	Development and writing of the 2018 SWMP update for submission to the BC Ministry of Environment and Climate Change (the Ministry) for approval. **Deliverable:** ▪ Draft 2018 Solid Waste Management Plan (for Consultation) ▪ 2018 Solid Waste Management Plan

Figure 1-1: Project Phases and Associated Deliverables

1.1 Background

The waste prevention hierarchy (reduce, reuse, recycle, recovery, and residuals management) is a useful tool to evaluate opportunities to improve a solid waste management system (see Figure 1-2) and will be foundational for the RDNB's SWMP update. Where practical and feasible, prevention and reduction should be actively pursued ahead of other strategies with residual management treated as a last resort for materials that do not find a higher and better use. For example, after minimizing the amount of waste produced through reduction and reuse processes, the best practice is to divert as much useful and recyclable material as possible from the waste steam that is still being disposed. Opportunities for recycling should be explored after all opportunities for reduction and reuse of materials have been

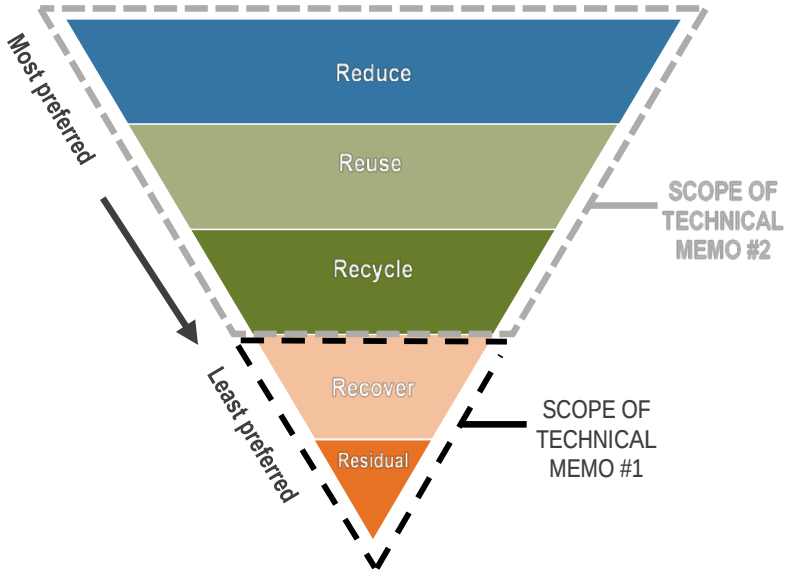

Figure 1-2: Waste Prevention Hierarchy

exhausted. Once these options have been exhausted, recovery technologies can be implemented prior to final disposal (landfilling) of any residuals to maximize the value of wasted resources.

The benefits to this approach are as follows:

- **Actions taken at higher levels in the waste prevention hierarchy can eliminate or reduce the environmental management costs of actions at lower levels**. For example, waste prevention programs can reduce costs associated with handling waste in the first place.
- **The waste prevention hierarchy can potentially reduce the environmental impacts of product manufacturing and distribution.** For example, reuse (and, to a lesser degree, recycling) will reduce the demand for and thus environmental impact of extracting and processing virgin resources, while the use of recycled materials can reduce the energy cost and virgin inputs needed to manufacture new products.

In 2016, the calculated per capita disposal rate in the RDBN was 644 kg per capita, and a total of just over 23,100 tonnes of municipal solid waste (MSW) was disposed in the region's three landfills including 8,400 tonnes at the Clearview sub-regional Landfill, 15,800 tonnes at the Knockholt Sub-Regional Landfill, and an estimated 40 tonnes at the Manson Creek Landfill.

1.2 Objective

This memo outlines the recovery and residual management options to consider for inclusion in the SWMP. The selected options will be included in the SWMP update. Recovery (the fourth R) is the application of technology to recover material and/or energy from the solid waste stream in a safe and environmentally sound manner.

Section 2.0 of this memo provides an overview of several common recovery technologies to inform the options available to the RDBN. Section 2.0 also includes some technologies that can be utilized to further optimize the recycling infrastructure, including capture of materials for recycling and energy recovery.

Section 3.0 provides an overview of key issues currently being investigated or resolved at the three landfill sites, and presents a summary of options available for improvement. Through the process of maximizing the first 4 R's, the residual management (fifth R) component of the waste stream is expected to be minimized.

As part of this technical memo, a brief summary of the technologies utilized in solid waste management systems to aid in the recovery of additional materials or energy are included for information. Technology recovery and residual options explored in this technical memo include:

Technology Opportunities

a. Mixed Waste Material Recovery Facilities (mixed waste MRF)
b. Anaerobic Digestion

Recovery Opportunities

c. Landfill Gas Capture
d. Thermal Conversion
    i. Refuse Derived Fuel
    ii. Gasification
    iii. Pyrolysis
    iv. Waste to Energy (Incineration)

Residual Management

a. Transfer Stations
b. Active Landfills
c. Closed Landfills

2.0 TECHNOLOGY OPPORTUNITIES

The 1996 SWMP did not address recovery. The previous plan update stated the following:

- No programs are planned for recovery through incineration at this time. Should the opportunity present itself, the Regional District will evaluate the potential for utilizing a co-generation facility to burn municipal solid waste.

In 2010, RDBN retained AECOM to conduct a Waste-to-Energy (WTE), Job Creation to Sustainable Communities: Feasibility Study (WTE Study) which focused on the potential of implementing WTE (conventional combustion, gasification, and plasma), composting, and fuel preparation systems to recover solid waste in the region. The WTE Study recommended that:

- RDBN support the development of solid fuel industries by making suitable feedstock available to the private sector;
- RDBN consider small scale composting of food and yard waste that cannot be used for fuel production;
- WTE options be deferred and reviewed every five years to determine if technologies or economics have changed; and
- RDBN should re-asses its policy on tipping fees which, if implemented, could create a more level playing field by reflecting the true costs to manage waste, and provide financial incentives that enable new industries that manage solid waste to develop.

Table 2-1 provides a brief description of the recovery technologies and applicable inputs that are used as a feedstock, and outputs that are recovered with the technology. Recovery is typically taken to mean the conversion of non-recyclable waste materials (or materials which otherwise escape the recycling stream) into useable energy which includes heat, electricity and fuel. The most common forms of energy recovery from waste in Canada include landfill gas (LFG) collection and advanced thermal conversion technologies.

Table 2-1: Recovery Technologies

Classification	Recovery Technology and Description	Inputs ("Feedstock")	Valued Outputs
Technology Opportunities			
Mechanical	**Mixed Waste Material Recovery Facilities (Mixed Waste MRF)** Manual and/or automated sorting and segregation of waste on conveyer belts to capture and recover recyclables that would otherwise be sent to landfill.	Mixed MSW	Recyclables Organic Materials
Biological	**Anaerobic Digestion** Biological processes that enable microorganisms to break down biodegradable material in the absence of oxygen.	Organic Material	Methane – Energy Digestate, used for composting, direct land application, or dehydration
Recovery Opportunities			
Biological	**Landfill Gas Capture** Using wells to capture the natural by-product of the decomposition of organic material in landfills.	Municipal Solid Waste (MSW)	Methane – Energy
Mechanical and Thermal	**Refuse Derived Fuel** A solid fuel produced from pre-processing MSW into combustible components and selected waste with recoverable calorific value for use in Thermal processes.	Mixed MSW or Pre-screened MSW	Solid fuel that can be combusted to offset use of fossil fuel
Thermal	**Gasification** High temperature oxidation process (oxygen starved environment) to break down organic portions of waste into elemental compounds and produce a syngas.	Mixed MSW or Pre-processed high energy content MSW	Syngas
Thermal	**Pyrolysis** Form of gasification, using high heat while being starved of oxygen utilizing catalyst to enhance the process.	Typically woody biomass, paper products, plastics, etc.	Syngas Char
Thermal	**Mass Burn "Waste to Energy" (Incineration / Combustion)** Combustion process that generates high heat to create high temperature steam for energy generation in turbines	MSW	High pressure steam, electricity and/or district heating

2.1 Mixed Waste Material Recycling Facilities (Mixed Waste MRF)

There are three general categories of material recovery facilities (MRFs):

- Clean MRFs which takes in co-mingled or source separated recyclable materials which is then sorted and baled for their respective commodity markets;
- Mixed waste MRF (aka “Dirty” MRF) which takes in mixed MSW (i.e., garbage), or MSW with organics removed, that is then sorted and baled for their respective commodity markets and/or separated for further organics processing; and
- Hybrid MRFs which may take in several different materials streams, some of which may be source separated recyclables, and/or mixed MSW.

Many solid waste management jurisdictions in North America are considering the use of mixed waste MRFs as part of an overall integrated solid waste management system. Mixed waste MRFs typically consist of conveyor systems, bag splitters, screens and/or trommels to separate the waste into different size fractions. The waste stream then travels through a series of magnets, eddy current separators, air classifiers and hand sorters to divide the waste stream into the required constituent streams for removal of recyclables and organics depending on the facility design. The process does not produce the same quality of commodities as a clean recycling MRF because of contamination from putrescible materials such as food scraps, liquids and other contaminants. As a result, the market value for commodities from a mixed waste MRF is typically less than that of a typical MRF used to sort collected recyclables.

Typically, mixed waste MRFs are considered an added element in the waste management system to increase the diversion of recyclable and compostable material that cannot be diverted through curbside recycling and composting programs. This added operation can increase diversion; however, there is an added processing cost to the waste management system to build and operate the facility.

There are many design considerations that impact the effectiveness of mixed waste MRFs, and the labour or technology required to capture enough recyclable materials from the MSW to justify the additional cost of building and operating the facility. Typical diversion rates of approximately 10% to >50% have been estimated for mixed waste MRFs depending on the facility design, the composition of the incoming waste, and the effectiveness of the source-separated recycling program. A mixed waste MRF could be used to enhance waste diversion and capture more recyclables from waste generators that choose not to divert waste.

2.1.1 Feasibility of Mixed Waste MRFs in RDBN

The objective of a mixed waste MRF is to reduce the amount of material requiring disposal thereby extending the available disposal capacity within the region. These facilities are typically employed in jurisdictions with significant disposal capacity shortages and high disposal costs (i.e. high tipping fees). Economies of scale are important in developing an economically feasible facility because the cost to finance the equipment required to separate materials is spread over the amount of MSW processed. Typically, these facilities are contemplated for large municipalities or regions that receive at least 200 tonnes per day of throughput (equivalent to 73,000 tonnes per year).

2.2 Anaerobic Digestion

Anaerobic digestion (AD) is a biological process where microorganisms break down biodegradable material in the absence of oxygen. The process is carried out by anaerobic micro-organisms that convert carbon-containing compounds (organics) to biogas in a contained vessel. The biogas produced is a mixture of methane (CH_4), carbon

dioxide (CO_2), water, and other impurities. Total mass from the beginning to the end of the cycle is typically reduced by 30% to 40%.

AD is an attractive option for food scraps processing because of its ability to generate energy from waste and containment of odours for highly putrescible materials. The technology has successfully operated at a commercial scale for many years, particularly in the European Union. The art of building low-cost, reliable digesters is dependent on the optimal adaptation of the design to the specific types of feedstock or substrate available. Their major drawback is that capital, operating and maintenance costs which is high (50 to 100% more) compared to aerobic composting systems.

The biogas is sequestered in storage tanks and can be sent through a combined heat and power unit ("CHP") to generate heat and electricity, or be upgraded using scrubbing technologies for direct injection into the natural gas pipeline network or used as fuel for compressed natural gas ("CNG") vehicles. At the end of the digestion cycle, residual organic solids (digestate) can be used as a base material for composting to increase the biological value of the end product and optimize nutrient update to plants.

There are a variety of systems available as described in Table 2-2 which are either referred to as "wet", involving high moisture content and often associated with waste water treatment plant residuals (biosolids) and agricultural manure, or "dry", which contain solid organics and yard debris from MSW.

Table 2-2: Anaerobic Digestion Technologies

AD Technology	Details
Complete Mix Digestion **"Wet"** 	▪ Most commonly in municipal sewage sludge digestion practices, this process uses substrates in a slurry [1% to 15% organic total solids (TS) by mass]. ▪ Waste entering the digester is mixed to uniformly distribute it. Waste is processed in a heated tank above or below ground. A mechanical or gas mixer keeps the solids in suspension so that the bacteria can decompose the feedstock. ▪ Generally suitable for liquid based feedstock (e.g., manure and pulped food waste) that has 2% to 15% solids. This is often referred to as "wet AD." ▪ As this technology requires a considerable amount of preprocessing to process the organic fraction of MSW, it is not considered a viable option for the RDBN.
High Solids Digestion **"Dry"** 	▪ Dry AD can process solid substrates with as much as 40% to 50% total solids (TS) by mass. This is well within the range of available high "solid" or "stackable" substrates such as MSW, food waste, yard waste, and other organic substrates. ▪ The higher solids content equates to higher transport efficiencies in comparison to wet systems where 90% or more of the feedstock transported is simply water. ▪ Numerous proprietary technologies have been developed to commercially execute dry AD. Most notable amongst these technologies are "garage style" digesters and assisted plug flow digesters. ▪ New innovations in the "dry" technology field have begun to address smaller scale waste streams which align with the needs of the RDBN, and this could be a viable technology option.

2.2.1 Feasibility of Anaerobic Digestion in RDBN

AD is an organic management processing option that can be taken into consideration given the amount of organics remaining in the RDBN's waste stream (approximately 35% according to the 2008 waste composition study). Typically, composting is a simpler and less expensive organic processing option than AD. For either technology to be feasible, source separated organics needs to be collected from generators and markets for the end products needs to be available. Typically, the cost to collect materials far outweighs the actual processing cost (approximately two-thirds of costs come from collection).

2.3 Landfill Gas Capture

The MSW disposed in landfills generate LFG due to the anaerobic decomposition of organic material in the waste material. LFG, comprised primarily of methane and carbon dioxide in combination with trace contaminants, is a significant source of greenhouse gas emissions. The capture of LFG from municipal landfills, and destruction via flaring or utilization of the captured gas offers the following environmental benefits:

- Reduced net greenhouse gas emissions associated with the destruction of methane, which has a global warming potential (GWP) 25 times greater than that for carbon dioxide;
- Reduced emissions of odours that may be associated with the LFG; and
- Development of LFG utilization opportunities typically associated with direct use (boiler fuel) options, the processing of renewable natural gas, and renewable electrical power generation projects.

LFG must be monitored at all landfill sites in British Columbia for health and safety reasons, and to reduce impacts to air quality. The BC Landfill Gas Regulation required that a landfill site that receives more than 10,000 tonnes of MSW per year, or has a total MSW in place at or above 100,000 tonnes completes an initial LFG generation assessment and report to the Ministry. Landfills that generate greater than 1,000 tonnes or more of methane per year must ensure that a LFG management plan is prepared for the landfill site and an active gas collection system installed to reduce fugitive LFG emissions to the atmosphere.

A LFG capture system typically consists of a series of vertical gas extraction wells installed beneath the landfill cover system joined through a system of lateral pipes, which are connected to a main header pipe that conveys the gas to a treatment facility. There are currently no LFG capture and treatment systems installed at RDBN facilities.

2.3.1 Feasibility of Landfill Gas Capture in RDBN

A LFG generation assessment was completed for Knockholt Sub-Regional landfill in 2010 with a supplementary report completed in 2016 (completed by XCG). Both reports project landfill gas production far below the 1,000 tonne per year threshold for LFG capture over their five-year timeframe for projections.

A LFG generation assessment was completed for the Clearview sub-regional landfill for the first time in early 2018. The report projects landfill gas projection below the 1,000 tonne per year threshold for LFG capture over the next five years.

The BC Landfill Gas Regulation would be the main driver for implementing landfill gas capture at RDBN facilities.

2.4 Thermal Technologies

2.4.1 Refuse Derived Fuel

Refuse-derived fuel ("RDF") are fuels made from the combustible components of MSW, including commercial, industrial and consumer waste. RDF can replace virgin biomass being used for energy production. Therefore, RDF can be used to replace finite resources like fossil fuels, and decrease the volume of waste being landfilled.

Photo 1: Typical RDF Pellet

From within the MSW stream, all materials that are inert (i.e. non-combustible) and those which have practical value as recyclables are removed prior to treatment. This may include ferrous and non-ferrous metals, glass, gypsum wallboard, plaster, rock, and dirt. What remains is ideally an assortment of plastics and fibre. The British thermal unit (Btu) value of RDF is determined by the caloric content of the material it contains. Typically, a higher plastic content RDF equates to higher heating values for the resulting fuel.

The initial waste sorting and processing can incorporate shredding, size screening, magnetic separation, coarse shredding and final refinement. Final refinement typically involves further shredding of the sorted material, or dehydrating the combustible waste portion using various pre-processing technologies. RDF is typically produced as fluff and then baled or densified into pellets to make storage and transportation more economical. Most RDF processing facilities are located near the source of MSW. Once the RDF product is prepared, it may be transported long distances to a co-generation facility, boiler, gasifier or any other such facility that can use this material as a substitute for fossil fuel.

2.4.1.1 Feasibility of Creating Refuse Derived Fuel in RDBN

RDF is currently gaining momentum as both an alternative to landfill and replacement for fossil fuel. The long-term hope in the industry is that this technology will be able to address dry material, including MRF residuals even for relatively low throughput facilities. This technology would likely be deployed as part of an integrated waste recovery system for MSW and would typically require complex mechanical sorting systems on the front-end.

This technology was identified in the 2010 Waste-to-Energy Study (AECOM) as providing the highest economic and environmental value of the options studied. The RDBN's existing MSW stream does not have sufficient quantities necessary to make investments in processing technology worthwhile; however, there are specific source separated material streams such as clean and dirty wood that could be utilized by a private sector processer. These materials could be put to a higher and better use as a fuel source rather than air curtain burning or landfilling.

2.4.2 Gasification

Gasification is a partial combustion process where the oxygen level is limited to convert organic or other carbon based materials into a carbon-rich ash and a synthetic gas comprised of carbon monoxide, hydrogen and carbon dioxide. This conversion of solid material into gas (fuels) and other desired end products is called synthesis and the gas therefore is known as synthetic gas or (syngas).

Photo 2: Gasification Plant

While gasification is a more complex technology than incineration, it allows for the recovery of valuable products (i.e., syngas) which can be processed into usable chemicals (fuels, alcohols, etc.) or burned to produce heat. The syngas is typically used to fuel a boiler and generate electricity via a steam turbine, although further processing can convert syngas into biofuels like synthetic gasoline, diesel and methanol. The energy derived from gasification and combustion of the syngas is considered a source of renewable energy if the gasified compounds were obtained from biomass or other natural sources. One perceived advantage of gasification is that it is potentially more efficient than direct combustion of the original fuel. The resultant clean syngas product can typically be used directly in gas engines, to produce methanol and hydrogen, or be converted into other synthetic fuels.

Efficiency of converting syngas to electric power may be offset by the power consumption required in preprocessing, the use of oxygen, and the gas cleaning process. Additionally, build-up of residue in reactors necessitates frequent shutdown for cleaning. This lessens the benefit of a continuous feed system. True capital and operating costs of a gasification system are still evolving as a full commercialization cycle has not been completed, making it difficult to compare to alternatives.

2.4.2.1 Feasibility of Gasification in RDBN

Commercialization efforts remain elusive due to the uncertainty of both capital costs and ongoing operating costs. Like incineration, this technology is expected to be capital intensive, necessitating deployment in large metropolitan areas where aggregation may help to leverage economies of scale. There is potential value in small scale gasification deployed in larger waste processing system but large-scale commercialization is likely needed to prove the technology and solve operational issues/challenges. Since gasification technology is more complex, more expensive, and has limited commercial viability compared to other thermal waste treatment technologies, it is not recommended as a viable option for the RDBN in the next ten years.

2.4.3 Pyrolysis

Pyrolysis is a method of applying heat (thermal energy) to organic materials to speed decomposition. Pyrolysis occurs in the absence of oxygen, sometimes with the addition of a catalyst to spur the reaction. Pyrolysis in the waste industry typically refers to transforming solids like plastics, tires or biomass, into gases, liquids and a solid by-product rich in carbon content. The products of the pyrolysis process and their uses are described in Table 2-3.

Table 2-3: Products of Pyrolysis

Products of Pyrolysis	Contains	Uses
Char (or 'biochar')	Solids with a high carbon content. Can also include inorganics or catalysts that were carried through the process.	Typically burnt, or more recently incorporated as a soil amendment.
Non-condensable Gas	Made up of hydrogen, methane, carbon monoxide and other non-condensable gases.	May be used as a heat source, flared, or burned similarly to conventional natural gas.
Liquid Fuel	Composed of dozens of organic chemicals. Pyrolysis 'oil' typically requires additional processing before replacing traditional fuels.	Liquids undergo a process to separate water from other materials, after which they may be processed and refined into fuels, oils and chemicals.

In general, the technology is thought to have a great degree of flexibility as most organic compounds can be broken down to basic components using the pyrolysis process, and upgrades enable pyrolysis systems to generate a range of specific, valuable end products within the categories identified above.

Pyrolysis has been used for many years in the chemical industry to produce charcoal, activated carbon, methanol, and other chemicals from wood, which are then converted to compounds used to produce consumer products; e.g., turn coal into coke; convert biomass into syngas and biochar. It can also be used to neutralize waste into non-hazardous substances for safe disposal. Recently, experimental and pilot pyrolysis plants have been used to turn waste plastics back into usable oil and fuels; waste tires into carbon black (used to manufacture new tires) or fuel oil blends, and; biomass into fuels and chemicals for transportation.

Photo 3: Plastics Pyrolysis Facility

2.4.3.1 Feasibility of Pyrolysis in RDBN

The most crucial determinant of success for these technologies is the ability to aggregate and prepare the feedstock materials. End products must meet market standards for quality and quantity which impact facility economics. Variability or inconsistency of feedstock in all processes makes it difficult to control the quality and uniformity of the final products. Pyrolysis is a technology with many potential applications for waste materials management, however, there are no known facilities operating in Canada. Capital costs and operating costs tend to be high due to the complexity of the process, varying feedstock quality, and additional processing requirements. Because this technology is not typically considered commercially viable for mixed waste it is not being considered further for implementation in the RDBN. There could be opportunity to support a private facility that could be built in partnership with the forestry industry, and the RDBN could consider separating the clean wood received at the landfills, and currently being used for cover, and provide it instead to a private facility for a higher and more beneficial use (e.g., Veolia's co-gen plant in Fort St. James).

2.4.4 Waste to Energy (Incineration/Combustion)

Waste remaining after diversion efforts must be dealt with. With declines in landfill capacity and significant challenges siting new landfills, long-term disposal options are a high priority for some regional governments. Waste-to-Energy (WTE) technologies are often considered a viable alternative to landfills as they convert waste materials to fuel products which can be used in place of virgin fossil fuel. Depending on the technology, employing WTE can result in an 80% mass reduction (by weight), and 90% reduction in volume. The remaining material is in the form of bottom ash and fly ash that must be landfilled or recycled depending on available markets.

Photo 4: Burnaby WTE Facility.

Although all the advanced recovery technologies covered in this section qualify as 'waste-to-energy', the most common and long-standing form of WTE processing is incineration (also known as combustion). Incineration is defined as the burning of fuel to produce power and/or heat. This requires oxygen and high temperatures in an enclosed vessel. Incineration technology produces heat, ash residue, and gas (predominantly nitrogen (N_2), carbon dioxide (CO_2), and water vapour).

Heat generated by incineration is captured and used to heat industrial boilers to generate pressurized steam for direct heating or electricity production, as in the Metro Vancouver WTE facility (WTEF) pictured in Photo 4. The gas

must be treated to meet regulatory emission requirements for chemical pollutants and particulates. Ash residues are produced in both light ("fly ash") and heavy fractions ("bottom ash"). Both forms tend to contain residual compounds, and are typically landfilled.

Two examples are summarized below to demonstrate this requirement.

Durham Region Waste to Energy Facility

Durham Region in Ontario has commissioned their mass-burn WTEF. It employs a similar thermal processing technology to Metro Vancouver's WTEF in Burnaby. This facility is estimated to cost $260 million and process 140,000 tonnes per year. Although the facility's capital cost was $260 million, much of the foundation and infrastructure was designed for a 400,000 t/yr facility. The WTEF has elevated capital costs which affects its unit processing cost. The calculated unit processing cost for the Durham WTEF is estimated to be $250 per tonne. This includes a 20-year amortization at an interest rate of 6%. If the facility was built for its design capacity, the unit processing cost is estimated to be $150 per tonne. This includes the cost for disposal of the residuals.

City of Edmonton Waste to Energy Facility

The City of Edmonton in Alberta is also commissioning a WTEF that uses gasification technology from Enerkem. This facility is one of the first commercial scale gasification facilities in North America and capital cost was over $210 million. It is designed to process 100,000 tonnes of MSW annually.

The unit processing cost was calculated for the Enerkem facility. Additional pre-processing activities supports higher operating costs (estimated to be 20% higher than the Durham WTEF). The unit processing cost is estimated to be $195 per tonne at current processing capacity or $127 per tonne at full-scale production including fuel sales (Edmonton Journal 2018).

Tri-Regional Waste to Energy Feasibility Study

In 2010, the Cowichan Valley Regional District, the Comox Valley Regional District, and the Regional District of Nanaimo conducted a Tri-Regional District Solid Waste Study. The study assessed the feasibility of thermal treatment (or WTE) technologies for MSW for the three southern Vancouver Island regional districts. The study assessed different technologies, considering the combined solid waste available from the three regional districts. Figure 2-1 illustrates the expected unit processing cost for thermal treatment technologies based on their design processing capacity. For the three regional districts, the design capacity was 200,000 tonnes per year. This indicates a unit processing capacity that is just over $100 per tonne in 2009 dollars.

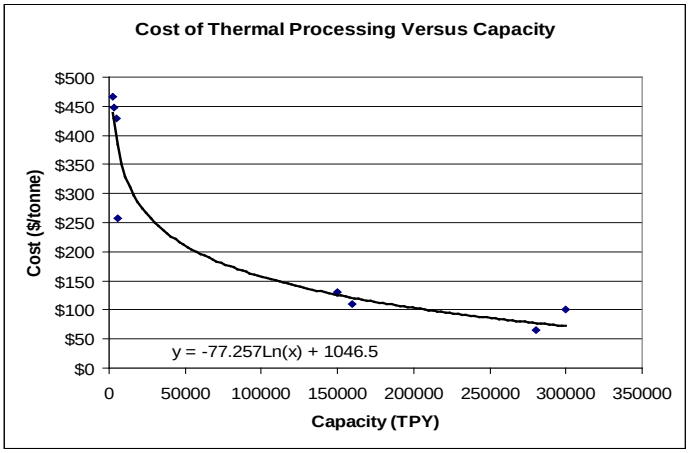

Figure 2-1: Cost of Thermal Processing Versus Capacity

2.4.4.1 Feasibility of Waste-to-Energy in RDBN

The combustion process is highly developed commercially and is available in numerous vendor specific designs. The technology is also highly complex and requires high upfront capital costs and long-term contracts typically 20 to 30 years that guarantee a specific quantity of MSW. There are four WTE incineration facilities currently operating in Canada all located in highly populated areas with sufficient volume to sustain the economics of incineration. There have been many proposals from companies that have come forward with smaller-scale WTE technologies;

however, there is no full-scale operational facility in Canada that can be used as operating examples for the smaller scale WTE technologies. Development of a WTEF is not recommended in RDBN based on the total landfilled tonnage of 24,134 tonnes in 2016, and new diversion programs likely to decrease the total material requiring disposal.

2.5 Application of Waste-to-Energy Technologies in Canada

Table 2-4 summarizes various aspects to the WTE technologies available.

Table 2-4: Comparison of WTE Technologies by Type

Technology Type	Scalability	Cost *	Environmental Impact	Typical Feedstock	Outputs
Incineration	Can be scaled down to a modular unit (20,000 to 300,000 tonnes per year)	Capital: $900 to $1,200 per annual design tonne Operating: $80 to $130 per tonne	High emission outputs can be mitigated with a proper designed APC 20-30% by weight bottom ash (depending on burnout of carbon); 2-6% fly ash	Municipal solid waste, preferably dry material with high calorific value	▪ Heat (steam boiler) ▪ Electricity ▪ Combined heat and power ▪ Recyclable metals
Gasification	Can be scaled down to a modular unit (20,000 to 100,000 tonnes per year)	Capital: $900 to $1,500 per annual design tonne Operating: $80 to $150 per tonne	20-25% bottom ash; 1-5% fly ash	Municipal solid waste, high energy waste, biomass	▪ Heat ▪ Electricity ▪ Hydrogen gas ▪ Renewable natural gas ▪ Methanol ▪ Ethanol
Pyrolysis	Can be scaled down to a modular unit (1,000 to 120,000 tonnes per year)	Capital: $800 to $1,000 per annual design tonne Operating: $50 to $110 per tonne	25-30% bottom ash; 1-5% fly ash	Same as Incineration	▪ Heat (steam boiler) ▪ Electricity ▪ Combined heat and power
Anaerobic Digestion	Can be scaled down to a modular unit	Capital: $490 to $630 per annual design tonne Operating: $50 to $70 per tonne	Odour issues	Source separated organics	▪ Biogas ▪ Soil amendment or compost

Table 2-5 summarizes the facilities in use in Canada including their size (annual waste processed) and technology used.

Table 2-5: Canadian Waste-to-Energy Facilities

Technology	Facility Name	Location	Annual Waste Processed (Tonnes)	Energy Generated	Status	Date Commissioned
Incineration	L'incinerateur de la Ville de Quebec	Quebec City, QC	300,000	Steam	Operational	1974
Incineration	Metro Vancouver Waste to Energy Facility	Burnaby, BC	280,000	Electricity and Steam	Operational	1988
Pyrolysis	Emerald (Previously Algonquin) Power Energy–from-Waste	Brampton, ON	182,500	Steam	Operational	1992
Incineration	Durham York Energy Centre	Durham Region, ON	140,000	Electricity and Steam	Construction Target	Completion Date: Late 2014
Anaerobic Digestion	Stormfisher (Previously Harvest Power) London Facility	London, ON	80,000 – 100,000	Biogas	Operational	2012
Gasification Thermo chemical	Enerkem Alberta Biofuels	Edmonton, AB	100,000	Bio-fuels, Chemicals	Operating Intermittently	June 2014 full production expected 2018
Anaerobic Digestion	Toronto Disco Anaerobic Digestion Facility	Toronto, ON	90,000	Biogas, gas is flared	Operational	2013
Anaerobic Digestion	City of Surrey Biofuel Processing Facility	Surrey, BC	80,000	Biogas	Operational	2017
Plasma Gasification	Plasco Trail Road Facility	Ottawa, ON	49,000	Electricity	Demonstration Facility Shut Down	N/A
Anaerobic Digestion	Toronto Dufferin Anaerobic Digestion Facility	Toronto, ON	40,000	Biogas, gas is flared	Operational	2002
Pyrolysis	Enwave (Previously Veresen) Power WtE	Charlottetown, PEI	30,000	Steam	Operational	1984
Incineration	MRC des Iles-de–la–Madeleine	Havre-aux-Maisons, QC	4,500	None reported	Operational	1955

Technology	Facility Name	Location	Annual Waste Processed (Tonnes)	Energy Generated	Status	Date Commissioned
TBD	New Waste-to-Energy Capacity to service Metro Vancouver	Metro Vancouver, BC	400,000	Electricity	Project on Hold, may be Cancelled	N/A
Incineration	Region of Peel Energy-from-Waste Facility	Peel Region, ON	300,000	Electricity	Project Cancelled	N/A

2.6 Technology Options Available and Priorities for Further Evaluation

The Ministry expects local governments to have a minimum diversion target of 70% (or a 350 kg/capita/year) before accepting new WTE as a waste management option. The 70% target is calculated only from reduce, reuse, and recycle initiatives. When a region has sufficient reduction, reuse, and recycling, there is often not a viable business case for incineration/combustion technologies such as waste to energy, pyrolysis or gasification, which rely on a minimum threshold of feedstock to be financially viable. Likewise, the production of RDF requires certain minimum feedstock to reach economic viability. Table 2-6 summarizes the recommendations for residuals management in the RDBN.

Table 2-6: Residual Management Options for Consideration in the SWMP

Recovery Technology and Description	Inputs ("Feedstock")	Valued Outputs	Considerations for SWMP Update
Mixed Waste MRF	Mixed/MSW	Recyclables	Not recommended for this SWMP update.
Anaerobic Digestion	Organic Material	Methane – Energy Digestate, used for composting, direct land application, or dehydration	Keep as an option for future organics processing.
Landfill Gas Capture	Mixed/Municipal Solid Waste (MSW)	Methane – Energy	Continue to monitor LFG generation and install collection when sub-regional landfills produce >1000 tonnes/year.
Refuse Derived Fuel	Feedstock preparation including shredding and screening of MSW	Solid fuel for waste to energy technologies	Not recommended as a technology for the RDBN, however some source separated materials (wood, asphalt shingles) could potentially find better use in these markets through private facilities involved in wood waste management or other energy-intensive industries.
Gasification	Pre-processed high energy content MSW	Syngas	
Pyrolysis	Typically, woody biomass, paper products, etc.	Syngas Char	

Recovery Technology and Description	Inputs ("Feedstock")	Valued Outputs	Considerations for SWMP Update
"Waste to Energy" (Incineration / Combustion)	Feedstock preparation including shredding and screening of MSW	Electricity, high pressure steam, or district heat Metals	Not Recommended.

With respect to waste recovery, LFG capture is considered the most viable measures to capture energy from waste and mitigate environmental impacts from landfilling in the long term. With respect to residual waste, landfilling is the RDBN's only current residual management process. A review and evaluation of the transfer stations, active landfills, closed landfills, and proposed next steps in landfill management are presented in Section 3.0.

3.0 RESIDUAL MANAGEMENT

3.1 Active Landfills

3.1.1 Landfill Facilities Overview

Landfilling has been the primary residuals management strategy in the RDBN since the first SWMP was developed in 1996. Landfills will continue to remain an essential component of the RDBN solid waste management system to deal with the residual waste which cannot be practically removed from the waste stream along with items not well designed for recycling that are disposed of as garbage. Since the first SWMP was developed for the RDBN in 1996, 21 small landfill sites have been closed and replaced with a network of seven transfer stations. The region's disposal was consolidated into two sub-regional landfills servicing the west end and east end of the Regional District and one small rural landfill in the northeast corner of the Regional District.

In British Columbia, landfills are designed and managed to minimize risk to public health and safety and to ensure environmental protection. The "Landfill Criteria for Municipal Solid Waste" guidance document provides standards for siting, design, construction, operation and closure of MSW landfills. This guidance document, originally developed in 1993, was updated by the Ministry in 2016 to reflect the current best management practices and standards that have been developed over the years to enhance environmental protection.

Modern landfills are engineered and managed facilities for the disposal of solid waste residuals. They are designed, operated and monitored to ensure compliance with environmental criteria. Landfills have value measured by the amount of MSW that can be placed into available engineered disposal capacity termed "airspace". It is typically advantageous to preserve the airspace to extend the lifetime capacity of a landfill as regions that exhaust their landfill capacity may have difficulty siting a new landfill.

3.1.2 Operational Risks and Opportunities

The Current Solid Waste Management System Report (Tetra Tech 2018) provided an overview of the three operating landfills within the RDBN.

Clearview Sub-Regional Landfill

Each year annual reports are produced by June 30th for the Clearview sub-regional landfill as required by the Ministry (from the previous reporting period of June 1 to May 31). Based upon this report, it is understood that the airspace available in the Clearview sub-regional landfill Phase 1 is expected to be consumed in 2029. Based on the site's DOCP the remaining portions of the east side of the landfill (Phases 2-6) provide sufficient airspace for

approximately 50 years. However, based on the airspace consumption rate of Phase 1, which is projected to approximately double lifespan from its projected closure year of 2015, the RDBN estimates that Phases 2-6 will have substantially longer lifespan than 50 years.

Knockholt Sub-Regional Landfill

Based on the Knockholt sub-regional landfill Phase 3 Design Brief (XCG 2016) the available airspace remaining in Phase 3 of the landfill is expected to be consumed within 32 years (beginning at construction in 2017). The landfill's original DOCP indicates that Phase 4 has an additional 37 years of airspace. Additionally, the contemplated Phase 5, Phase 6, and Phase 7 offer significant additional airspace for expansion.

Manson Creek Landfill

The Manson Creek landfill is a historical trench-type landfill. Landfill lifespan has not been calculated previously but based on the low population in the area, airspace is not expected to be an immediate concern.

Table 3-1 provides a synopsis of the ongoing operations at each of the RDBN's RDFs and provides a summary of the key risks and opportunities for consideration for a long-term disposal plan for the RDBN.

Table 3-1: Recycling and Disposal Facility Information Matrix

Variable	Knockholt Sub-Regional Landfill	Clearview Sub-Regional Landfill	Manson Creek Landfill
Population served and capture area	21,493	13,577	40
Filling rate 2016 (tonnes/year)	15,751 tonnes	8,383 tonnes	21 tonnes
Years until full/closure under current design plans	~2050 (>30 years) to end of Phase 3	~ 2110 (~90 years)	Not Calculated
Expansion capacity available	Yes	Yes	Yes
Tipping fee	Refuse/MSW - NA, C&D - $90/tonne		N/A
Years until full/closure under current design plans	~2050 (>30 years) to end of Phase 3	~ 2110 (~90 years)	Not Calculated
Expansion capacity available	Yes	Yes	Yes
Tipping fee	Refuse/MSW - NA, C&D - $90/tonne		
Approximate funds generated from tipping fees (2017 estimated)	**$240,000**		**$0**
2017 operation and maintenance expenditures	$329,353	$183,898	$14,357
Estimated closure cost	Under Review		
Landfill design type	Historical Houston Landfill converted to sub-regional landfill.	Sited to replace small historical sites. Unlined naturally attenuating landfill.	Unlined natural attenuation landfill
Significant work completed or underway since 1996 SWMP	▪ Phase 1: Constructed with a native clay liner with a leachate toe drain. Partial closure has been completed in this area to	▪ Landfill siting and land acquisition completed. ▪ Site constructed in 2007.	Upgraded perimeter fence to electrified bear fence.

Variable	Knockholt Sub-Regional Landfill	Clearview Sub-Regional Landfill	Manson Creek Landfill
	minimize infiltration and shape slopes. ▪ Phase 2: Constructed with a native clay liner, stone drains, central leachate collection pipe, and a leachate tie drain. ▪ Phase 3: Constructed in 2018 with engineered liner and leachate collection system. ▪ Phase 4: Future landfilling areas. Will be constructed with an engineered liner and leachate collection system. ▪ Constructed leachate treatment system (lagoons)	▪ Phase 1 expected to have sufficient airspace to last until 2029.	
Site challenges	▪ Possible need to expand leachate treatment lagoons as site expands. ▪ Closure and development cost planning. ▪ Sight may not align with 2016 Landfill Criteria. ▪ Future need for LFG capture.	▪ Phase 1 sub-cells 1 and 2 have experienced leachate breakouts. Minor upgrades to stormwater management were recommended in 2017. Possible upgrades to stormwater management and leachate treatment facilities may be required if problems persist. ▪ Closure and development cost planning. ▪ Sight may not align with 2016 Landfill Criteria.	▪ Ongoing engagement with the Ministry to ensure landfill is operating properly. ▪ Site is not staffed, limiting opportunities to control access and public behaviours. ▪ Maintenance of control systems (bear fence, contractor management)
Key risks	▪ Potential for new requirements based on 2016 Landfill Criteria	▪ Stormwater control and leachate management may require upgrades. ▪ Potential for new requirements based on 2016 Landfill Criteria.	▪ Potential for new requirements based on 2016 Landfill Criteria
Identified long term mitigation strategies or opportunities to minimized key risks	▪ Complete 2016 Landfill Guideline conformance review. ▪ Develop progressive closure plan and cost estimate. ▪ Assess need to expand treatment lagoons as new cells are constructed. ▪ Complete LFG Generation assessments every five years.	▪ Complete 2016 Landfill Guideline conformance review. ▪ Develop progressive closure plan and cost estimate. ▪ Repair and expand stormwater management system as recommended by XCG (2017). ▪ Study need to construct leachate treatment. ▪ Complete LFG Generation assessments every five years.	▪ Review service population and management policies every five years

Upgrades will be required to the sub-regional landfills as they grow to meet ongoing operational needs and move toward meeting the more stringent 2016 Landfill Criteria as directed by the Ministry through development of a landfill conformance review for each site. Long-term planning to assess closure costs and post-closure liability of the landfills may be required. No immediate environmental impacts have been identified through the Region's annual monitoring programs. Continued management of engineering controls will support the long-term sustainability of the facilities.

3.2 Closed Landfills

There are 21 closed landfills in the RDBN as identified on Figure 3-1. Seven of these facilities are used as transfer stations and one became the Knockholt Landfill. As directed by the Ministry, facilities with the potential to impact receptors have environmental monitoring programs to assess trends in groundwater, and in some cases surface water quality. The RDBN is currently engaging Ministry staff to confirm closure of the facilities and assess the potential to abandon previous permits for these historical facilities.

1. Vanderhoof Landfill
2. Fort St. James Landfill
3. Fraser Lake Landfill
4. Fort Fraser Landfill
5. Ootsa Lake Landfill
6. Burns Lake Landfill
7. Granisle Landfill
8. Smithers Landing Landfill
9. Old Smithers Landfill
10. Smithers/Telkwa Landfill
11. Endako Landfill
12. Cluculz Lake Landfill
13. Francois Lake
14. Grassy Plains Landfill
15. Southbank Landfill
16. Tatal Rose Landfill
17. Topley Landing Landfill
18. Topley Landfill
19. Perow Landfill
20. Palling Landfill
21. Houston Landfill

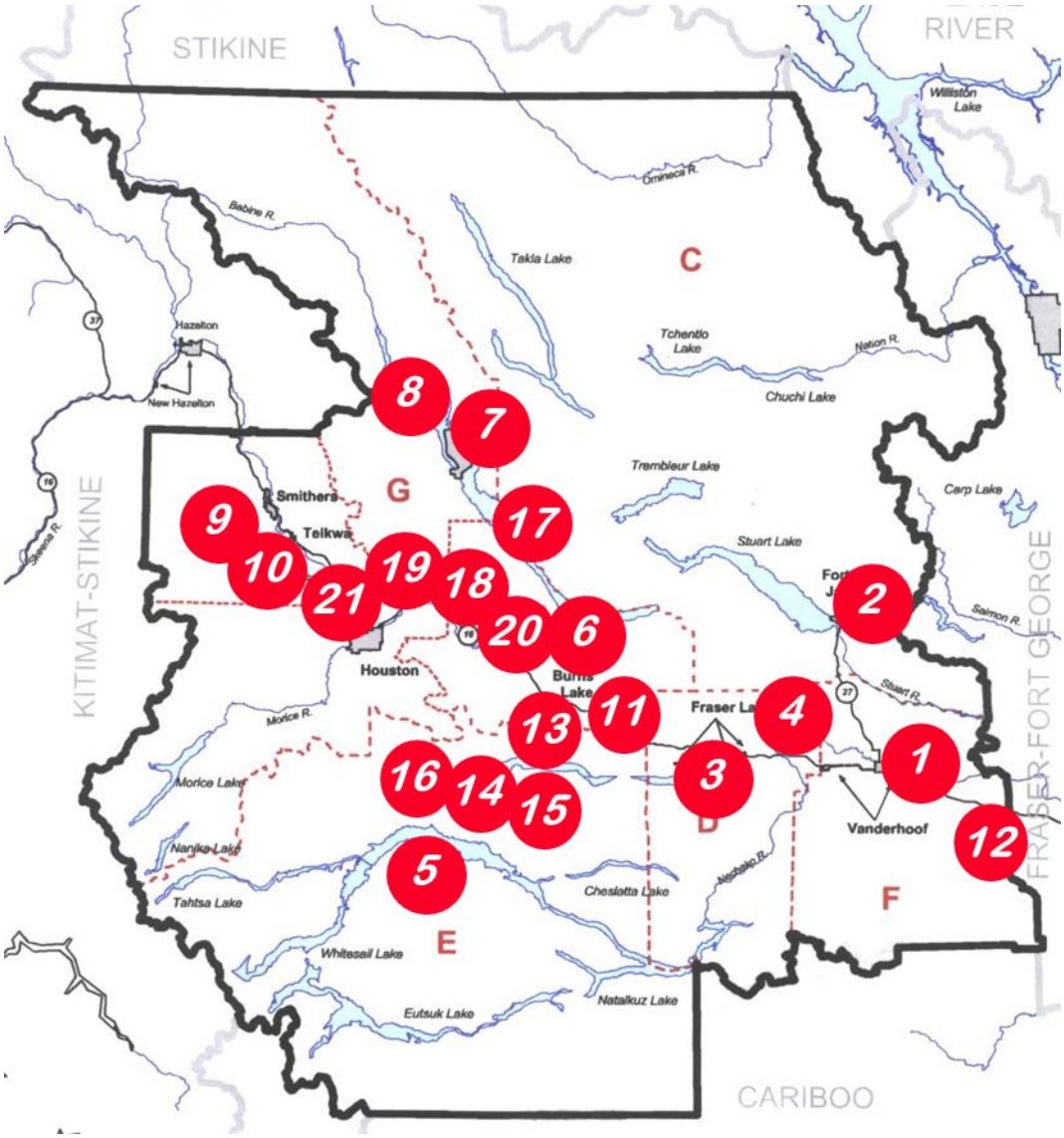

Figure 3-1: Map of Historical Disposal Facilities[1]

No new options have been developed for the closed landfill sites. Ongoing environmental monitoring and periodic site maintenance will be required for the foreseeable future.

3.3 Transfer Stations

The 1996 SWMP worked to provide sufficient access to solid waste disposal services while limiting the use of small rural landfills. The location of new facilities was based on user convenience, availability of land, zoning, natural screening, cost, and proximity to alternate disposal facilities.

[1] Map adapted from RDBN Internal Presentation (RDBN 2002).

The 1996 SWMP indicated that full service transfer stations would be considered for all communities including:

- Smithers/Telkwa
- Houston
- Granisle
- Burns Lake
- South and North Side of Francois Lake
- Fort Fraser
- Fraser Lake
- Fort St. James
- Vanderhoof
- Cluclz Lake[2]

As reviewed in the Current System Assessment Report, the RDBN manages seven transfer stations:

- Smithers/Telkwa Transfer Station
- Granisle Transfer Station
- Southside Transfer Station
- Burns Lake Transfer Station
- Vanderhoof Transfer Station
- Fort St. James Transfer Station
- Area "D" (Fraser Lake Rural) Transfer Station
- Knockholt Landfill (Drop-off area)

Table 3-3 summarizes the transfer stations and public MSW drop-off facilities identified within the RDBN. Solid waste is also self-hauled to the Manson Creek Landfill where residents dispose of MSW directly in the landfill area. The RDBN operates seven transfer stations in the region that are used by both residents and private haulers. In most instances, garbage is hauled directly from the transfer station to one of the region's two sub-regional landfills (Knockholt and Clearview Landfills). However, in order to increase transfer efficiency, garbage from small transfer stations is hauled to larger transfer facilities for consolidation and long-haul transfer to landfill (e.g., garbage from Southside Transfer Station and Granisle Transfer Station is hauled to Burns Lake Transfer Station and subsequently to Knockholt Landfill).

[2] Cluclz Lake Transfer Station is operated by the Regional District of Fraser-Fort George.

Table 3-2: Summary of Transfer Stations and Public MSW Drop-Off Facilities

Transfer Station	Smithers/ Telkwa Transfer Station	Granisle Transfer Station	Burns Lake Transfer Station	Fort St. James Transfer Station	Area D Transfer Station – Fraser Lake Rural	Southside Transfer Station	Vanderhoof Transfer Station	Takla Landing Transfer Station*	Public Drop-Off at Knockholt Landfill
Constructed	1998	2006	2002	2000	2006	1998	2003/2004	Unknown	1998
Began Operation	1999	2006	2002	2001	2007	1999	2005	Unknown	1999
Facility Type	Building/ Tipping Floor	Transtor Bin (1 x 50 yard^3)	Building/ Tipping Floor	Building/ Tipping Floor	Transtor Bin (3 x 50 yard^3)	Transtor Bin (2 x 40 yard^3)	Building/ Tipping Floor	Bins	Bins
Wasteshed Population (including First Nations)	11,984	604	4,226	4,256	3,144	1,735	8,435	192	3,595
Wasteshed Households (excluding First Nations)	5,141	434	1,644	1,498	1,563	840	3,733	93	1,702
2016 Tonnage	5,831	261	2,509	1,959	1,078	271	3,892	347	2,941**

*The Takla Landing Transfer Station is operated by the Takla First Nation.
** Tonnage reported in RDBN Waste Generation Report 2016 estimated based on population.

All RDBN transfer stations are fully fenced facilities, most of which were constructed on historical landfill sites. All RDBN facilities are staffed during open hours and locked when not open. Public drop-off areas at transfer facilities do not have scale systems or control gates installed to manage access during open hours. The Knockholt sub-regional landfill has scales for commercial and large loads (larger than $2m^3$) but regular residential loads are not weighed.

Infrastructure improvements would be required at transfer stations in order to collect tipping/gate fees or upgrade to a long-term depot with Recycle BC. The following are estimates of costs that would be included in a future financial analysis if these options are contemplated:

- Control Gates $10,000
- Gate Kiosk $25,000 (including $15,000 for utilities)
- Scale System $50,000 per side
- Recycle Depot $10,000+

4.0 OPTIONS AVAILABLE AND PRIORITIES FOR FURTHER EVALUATION

Based on a review of technology opportunities and residual management, the following scenarios and opportunities are under consideration for further evaluation in the economic analysis phase of the project and for potential inclusion in the updated plan. A more detailed review of technology option considerations is provided in Section 2.5 within the Table 2-4 Residual Management Options for Consideration in the SWMP. The selected scenarios and opportunities factored in what would still help to optimize reduction, reuse, and recycling and consider minimum feedstock thresholds needed to develop a business case.

- Mixed Waste Material Recovery Facilities
  - Not recommended to pursue any MRFs as a component of the 2018 SWMP Update.
- Anaerobic Digestion
  - Retain option for consideration if future organics (food scraps) diversion programs are implemented.
- Landfill Gas Capture
  - Continue with LFG generation assessments for the Knockholt sub-regional landfill and Clearview sub-regional landfill as required by the ministry; and
  - Consider minimizing the quantity of organics in MSW through implementation of programs to divert organic materials away from the landfill thus significantly reducing the potential for LFG generation.
- Thermal Technologies
  - Not recommended to pursue any thermal technologies for MSW treatment (as summarized in Table 2-4);
  - Include opportunities for some high energy source separated materials (clean and dirty wood) and identify markets for them through private thermal facilities involved in wood waste management or other local partners; and
  - Minimize costs associated with collection wood and other materials at transfer stations by having these materials direct hauled to local RDFs.

The options for potential residual management scenarios under consideration are summarized in Table 4-1.

Table 4-1: Summary of Residual Management Scenarios

Variable	Knockholt	Clearview	Manson Creek	Outcome
Current operation	▪ Monitor and evaluate site environmental performance, mitigate environmental issues as identified ▪ Update closure and post-closure costs	▪ Monitor and evaluate site environmental performance, mitigate environmental issues as identified ▪ Update closure and post-closure costs	▪ Monitor and evaluate site environmental performance, mitigate environmental issues as identified ▪ Confirm usage and service population	▪ Continue operating current facilities, minimize environmental liabilities, confirm future financial costs
Modified operation scenario for consideration	▪ Possible changes to align with 2016 Landfill Criteria	▪ Possible changes to align with 2016 Landfill Criteria	▪ Possible changes to align with 2016 Landfill Criteria ▪ Option to convert to MSW transfer station or staffed site with limited hours if additional site control is required	▪ Invest financial capital in existing facilities landfill site for optimal outcomes ▪
Performance criteria for decision making	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance meets monitoring requirements	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance meets monitoring requirements	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance meets monitoring requirements	▪ Use financial performance for maintaining environmental standards and performance benchmarks to evaluate and determine site upgrades

Landfill capacity in the RDBN is not currently a concern. Understanding of the implications of the 2016 Landfill Criteria and the upcoming closure and post-closure costs should be considered when assessing financial plans following options selection. Pending confirmation from the RDBN Board and RSWAC, these options will undergo financial analysis for application scaled to the RDBN's current and future projected waste management status. The results of this analysis will be presented in Technical Memo No. 3.

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We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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Attachment (1): Tetra Tech's Limitations on the use of this Document

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TECHNICAL MEMORANDUM 2: REDUCE, REUSE AND RECYCLE

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Regional Solid Waste Advisory Committee	**Date:**	May 16, 2018
c:	Rory McKenzie Janette Derksen	**Memo No.:**	2
From:	Lauren Quan, P.Eng. Carey McIver, M.A.	**File:**	704-SWM.SWOP03664
Subject:	Solid Waste Management Plan Diversion Options		

1.0 INTRODUCTION

The Regional District of Bulkley-Nechako (RDBN) retained Tetra Tech Canada Inc. (Tetra Tech), Carey McIver and Associates Ltd., and Maura Walker Environmental Consultants (the Consulting Team) to manage a review and update of the RDBN's 1996 Solid Waste Management Plan (SWMP). The 2018 SWMP update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and set the RDBN's waste management principles, targets and strategies for the next ten years. A summary of the project stages is included on Figure 1-1.

The assessment stage included the issued for review Current Solid Waste Management System Report that documented the current condition of the RDBN's solid waste management system. The Current Solid Waste Management System Report was used as a basis for discussion for the direction of the SWMP update entering the second stage, "Analysis and Evaluation".

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The project consists of four stages, as shown on Figure 1-1.

1. Assessment	Assessing the current system and reporting on implementation status. **Deliverable:** ▪ Current Solid Waste Management System Report
2. Analysis and Evaluation	Analyzing opportunities and evaluating financial models. **Deliverables:** ▪ Technical memo 1: Disposal Options ▪ Technical memo 2: Diversion Options ▪ Technical memo 3: Financial Options Review and System Overview
3. Consultation	Community and stakeholder consultation, engaging the public, key stakeholders, and First Nations to provide input on selected options. **Deliverable:** ▪ Consultation Plan ▪ Consultation Summary Report
4. SWMP Update for 2018	Development and writing of the 2018 SWMP update for submission to the BC Ministry of Environment and Climate Change (the Ministry) for approval. **Deliverable:** ▪ Draft 2018 Solid Waste Management Plan (for Consultation) ▪ 2018 Solid Waste Management Plan

Figure 1-1: Project Phases and Associated Deliverables

1.1 Background

The waste prevention hierarchy (reduce, reuse, recycle, recovery, and residuals management) is a useful tool to evaluate opportunities to improve a solid waste management system (see Figure 1-2) and will be foundational for the RDBN's SWMP update. Where practical and feasible, prevention and reduction should be actively pursued ahead of other strategies with residual management treated as a last resort for materials that do not find a higher and better use. For example, after minimizing the amount of waste produced through reduction and reuse processes, the best practice is to divert as much useful and recyclable material as possible from the waste steam that is still being disposed. Opportunities for recycling should be explored after all opportunities for reduction and reuse of materials have been exhausted. Once these options have been exhausted, recovery

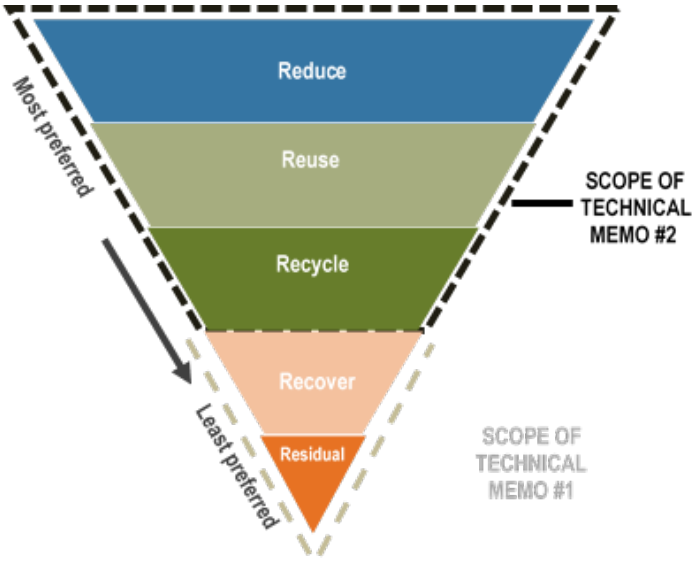

Figure 1-2: Waste Prevention Hierarchy

technologies can be implemented prior to final disposal (landfilling) of any residuals to maximize the value of wasted resources.

The benefits to this approach are as follows:

- **Actions taken at higher levels in the waste prevention hierarchy can eliminate or reduce the environmental management costs of actions at lower levels**. For example, waste prevention programs can reduce costs associated with handling waste in the first place.

- **The waste prevention hierarchy can potentially reduce the environmental impacts of product manufacturing and distribution.** For example, reuse (and, to a lesser degree, recycling) will reduce the demand for and thus environmental impact of extracting and processing virgin resources, while the use of recycled materials can reduce the energy cost and virgin inputs needed to manufacture new products.

In 2016, the calculated per capita disposal rate in the RDBN was 644 kg per capita, and a total of just over 23,100 tonnes of municipal solid waste (MSW) waste disposed of in the region's three landfills including 8,400 tonnes at the Clearview Sub-Regional Landfill, 15,800 tonnes at the Knockholt Sub-Regional Landfill, and an estimated 40 tonnes at the Manson Creek Landfill based on the local population. Table 1-1 summarizes the RDBN solid waste facilities with public drop-off for MSW. The interpreted service area (wasteshed) for these facilities is shown in the attached Figure A.

Table 1-1: Summary of Publicly Accessible RDBN Solid Waste Facilities

	Transfer Station	Smithers/ Telkwa Transfer Station			Granisle Transfer Station		Burns Lake Transfer Station		Fort St. James Transfer Station		Area D Transfer Station – Fraser Lake Rural			Southside Transfer Station	Vanderhoof Transfer Station		Takla Landing Transfer Station*	Public Drop-Off at Knockholt Landfill*	
Facility Information	Began Operation	1999			2006		2002		2001		2007			1999	2005		Unknown	1999	
	Wasteshed Population (including First Nations)	11,984			604		4,226		4,256		3,144			1,735	8,435		192	3,595	
	Wasteshed Households (excluding First Nations)	5,141			434		1,644		1,498		1,563			840	3,733		93	1,702	
	2016 Tonnage	5,831			261		2,509		1,959		1,078			271	3,892		124	2,941	
Serviced Populations	Muni/Area Serviced	Town of Smithers	Village of Telkwa	Electoral Area A	Village of Granisle	Electoral Area G	Village of Burns Lake	Electoral Area B	District of Fort St. James	Electoral Area C	Village of Fraser Lake	Fort Fraser	Electoral Area D	Electoral Area E	District of Vanderhoof	Electoral Area F	Takla Landing	District of Houston	Electoral Area G
	Population (including First Nations)	5,401	1,327	5,256	303	301	1,779	1,938	1,598	1,415	988	275	1,472	1,593	4,439	3,665	192	2,993	602
	Households (excluding First Nations)	2,389	539	2,213	284	150	748	896	761	737	551	158	854	840	1,831	1,902	93	1,402	300
Residential Collectio	Garbage	EOW	W	SH	W	SH	W	SH	W	SH	W	SH	SH	SH	W	SH	W	W	SH
	Recycling	EOW	EOW	SH	SH	SH	N/A	SH	EOW	SH	SH	SH	SH	SH	Pri - OCC	SH	SH	SH	SH
ICI Collection Available	Garbage	Pri	SH	SH	Muni - W	SH	Muni – 2x/W	SH	W	SH	Muni – 4x/W	SH	SH	SH	Pri	SH	FN - W	Pri	SH
	Recycling	Pri	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	Pri - OCC	SH	SH	SH	SH

* Tonnage estimated based on wasteshed population (excluding First Nations) and regional per capita disposal rate.
Muni – Municipality; SH – Self-Haul; EOW – Every Other Week; W – Weekly; Pri – Private; OCC – Old Corrugated Cardboard

1.2 Objective

This memo outlines the diversion options to consider for inclusion in the RDBN SWMP. The options selected by the Regional Solid Waste Advisory Committee (RSWAC) and approved by the RDBN Board of Directors (the Board) will be included in the SWMP Update. The purpose of this technical memo is to determine which options require further research and analysis and include in the list of options for financial analysis, and which should be eliminated from consideration within the RDBN's SWMP Update. The third and fourth Rs (recovery and residual management) are addressed under a separate cover. The financial implications for selected options will be assessed in a subsequent technical memo.

The diversion options outlined in this document encompass the first three Rs of the Ministry of Environment's (Ministry's) Waste Prevention Hierarchy. Reduce (the first R) is to reduce by as much as possible the amount or toxicity of material that enters the solid waste stream and also the impact on the environment of producing it in the first place. Reuse (the second R) is to ensure that materials or products are reused as many times as possible before entering the solid waste stream. Recycle (the third R) is to recycle as much material as possible.

Section 2.0 provides diversion options related to the first two R's in the waste prevention hierarchy. Sections 3.0 to 10.0 provides diversion options for recycling, the third R, as well as options related to extended producer responsibility (EPR), special waste diversion (including camp waste and agricultural plastics) and promotion and education.

Section 11.0 provides the potential diversion if the diversion options are implemented at the RDBN.

2.0 REDUCTION AND REUSE

Reduction and reuse prevent potential waste materials from entering the waste management system, ultimately conserving resources by limiting the amount of production required by society. Although reduction and reuse are at the top of the waste management hierarchy, they are often a challenge to implement in local government's management of solid waste

Progress has been made toward diverting waste from landfills through recycling and composting programs implemented since the province first mandated Regional SWMPs.

The role of local governments in changing consumer behaviour, or influencing product and packaging design is not always clear, frequently difficult to measure, and hard to rationalize against budgets spent. Nevertheless, it is ultimately changes in consumer behaviours that will most impact society and the way we manage solid waste in the future. These changes will undoubtedly require consumer education and proper financial incentives in order to drive substantial behaviour change throughout communities. Many governments choose to create financial incentives by limiting garbage volumes collected through curbside programs, or applying weight or volume-based tipping fees.

2.1 What Does the SWMP Say About Reduction and Reuse?

The 1996 Plan addresses Waste Reduction and Reuse saying that "Reduction can have the greatest effect of diverting waste away from landfills by keeping material out of the waste stream. However, due to practical considerations, it is the most difficult activity to enforce." Regarding promotion of reuse the 1996 Plan states "Reuse can also have a significant impact on minimizing the waste stream as it emphasizes the reuse of materials over and over again." Reduction and reuse efforts are a key component of solid waste management and will have significant

long-term impact however, in the short term these programs have little impact on the amount of solid waste being landfilled in the region.

The 1996 Plan does not identify any waste reduction initiatives however, the prioritized options to promote reuse were:

- Tipping fees;
- Material bans from landfills;
- Variable disposal rates;
- Waste reduction plans;
- Development of reuse facilities;
- Limits on waste cans per household;
- Demonstration programs; and
- Waste audits.

The 1996 Plan projected a diversion rate of 7.5% from implementation of these options.

2.2 What is Being Done Now in Regard to Reduction and Reuse?

The Current Solid Waste Management System Report identified a number of waste prevention techniques used in the RDBN. Waste reduction is encouraged through a backyard composter rebate program and educational materials.

The RDBN's Reuse programs include space for reuse at transfer stations:

- Bikes and lawn mowers that are dropped off at the site are set aside so that they can be taken for salvage or repair;
- Reusable windows and doors are set aside so that they can be reused or repurposed;
- The wood waste stockpile is made available for salvage; and
- Reuse sheds (four staffed) at Transfer Stations and the Knockholt Landfill.

There are also a number of community reuse initiatives including:

- A toy library located in a church basement in Vanderhoof;
- "Man Sheds" where volunteers receive non-working machinery with an aim to repair it and extends its useful life;
- Thrift stores are operated in most communities; and
- On-line services and garage sales to buy/sell/giveaway used goods (e.g., Craigslist, Kijiji, and Facebook).

2.3 What Other Options are Available in Support of Reduction and Reuse?

Food waste reduction and rescue has come to the forefront in the past few years as a way to both reduce waste and greenhouse gas emissions, and increase food security for vulnerable populations. The United Nations Food and Agriculture Organization (FAO) estimated that a third of food produced for human consumption is lost or wasted globally, amounting to 1.3 billion tons (imperial) per year. Almost half of all total food wastage occurs at home where 1 in 4 bags of groceries brought home are thrown away. In British Columbia, the Ministry has taken the initiative to provide food waste reduction tools[1] for residential and commercial sectors including a Food Waste Reduction Toolkit tailored to municipalities.

1. **Conduct a "Love Food Hate Waste"-style campaign.**

   Love Food Hate Waste (LFHW) was started by the United Kingdom based organization to helps UK households tackle food waste. The program is designed to raise awareness about the amount of "avoidable" food waste created in society – the roughly 60% of food waste which could have been eaten. LFHW partners with different groups (retailers and brands, local government, businesses, and community groups) to develop campaigns and tools for specific audiences to change behaviour to reduce food waste. Campaigns focus on food that is thrown away by households. Strategies address why food is thrown away at different stages from purchase to consumption and use different communications channels, to encourage behaviour change either directly or through partners. Following a Love Food Hate Waste campaign in West London, avoidable food waste decreased by 14% in just six months. Additionally, for every dollar invested the municipality estimated that it saved up to eight times that much in avoided waste management costs (i.e. collection and composting).

   The Province has also borrowed materials developed by the US Environmental Protection Agency (EPA) to address food waste reduction. These materials are available at no cost to local governments. Available statistics indicate that up to 6% of the waste disposed in RDBN landfills may be avoidable food waste. As the primary studies on food waste reduction in the developed world have focused on dense urban areas, the exact applicability and efficacy of the LFHW approach is not certain for RDBN. However, based on the relatively low cost and high potential of this campaign, the region may choose to invest in food waste education to reduce waste and engage citizens in conversations about the solid waste system.

2. **Obtain Board approval/consideration to implementing a food donation program for businesses and restaurants.**

   Food waste occurs at many restaurants and businesses due to surplus in food. With a food donation program, businesses and restaurants can donate the surplus of food to those in need.

[1] BC Ministry of Environment and Climate Change Strategy, 2017. Food Waste Reduction Tools & Resources. http://www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/tools-resources

3.0 RESIDENTIAL WASTE RECYCLING

Residential waste refers to waste generated by residents in single family and multi-family households. Local governments typically have the highest degree of control over residential waste as they are often responsible for collecting residential solid waste and/or providing the infrastructure needed to manage the waste generated by households. Residential recycling programs have been in place for decades in British Columbia. Northern and rural communities have historically faced cost and logistical barriers to accessing markets for recyclable materials but the growth EPR programs to manage household recyclables there are opportunities to increase recycling access for RDBN residents.

3.1 What Does the SWMP Say About Residential Recycling?

The 1996 Plan established a goal to support recycling programs to divert waste from disposal, provided that these programs were economically viable. This caveat recognized the barriers to implementing a recycling program in the RDBN such as, the Region's remoteness from markets, low volume of recyclables and low population densities. Considering these limitations, the 1996 Plan stated that the RDBN Board request that the Province and the private sector work together with the Regional District to stabilize market prices for recyclables to provide a better economic climate for entrepreneurs to become involved in recycling.

Once recycling became economically viable in the RDBN, the Plan recommended that a series of drop-off depots in the form of modified roll-off containers be placed in each municipality in the region. Initially these depots would accept newspapers, cardboard, fine paper, mixed waste paper, magazines and telephone books. A separate compactor unit and bin would be made available for cardboard. In the future, other items would be added to the program as appropriate, such as, plastics, glass and metals.

The 1996 Plan also recommended that the regional district issue a call for Expressions of Interest from the private sector for the provision of this recycling service at no cost to the regional district. The Plan also anticipated that the successful applicant would be able to set up bins at all RDBN landfill sites and transfer station to collect recyclables. However, if no cost-effective response was received from the private sector, the Plan stated that the RDBN may provide this service depending on the ability of the RDBN and its member municipalities to finance the service.

Further, the 1996 Plan states that the regional district was also fully committed to actively salvage metals, white goods, tires and car hulks from its landfills and transfer stations as well as promoting and supporting existing provincially sponsored recycling programs such as the beverage container deposit program; the paint return program, used oil return program; and any other future provincial recycling programs.

3.2 What is Being Done Now in Regard to Residential Recycling?

As outlined in the Current Solid Waste Management System Report, there are a range of recycling services available to residents of the RDBN, although the availability of services is variable across the region. Many of these services are due to the range of products managed through the expansion of provincial EPR programs since 1996.

EPR is a provincial policy tool that aims to shift the responsibility for end-of-life management of products (physically and economically) to the producer and away from local governments. This policy is intended to create an incentive for producers to include environmental considerations in design of products.

EPR programs in British Columbia are mandated by Recycling Regulation 449/2004, under the *Environmental Management Act* (EMA). The regulation requires producers of the designated products to develop a program for

their end-of-life collection and recovery of materials and to consult stakeholders (including local governments) when developing their plans.

Since 2011, the Recycling Regulation has required businesses that supply packaging and printed paper (PPP) to British Columbia residents to assume responsibility for the cost of collecting, sorting and recycling these materials. In 2014, Multi-Material BC (now Recycle BC) was formed to help businesses meet their recycling obligations.

Recycle BC provides incentives to local governments, First Nations, private companies and non-profits to collect packaging and printed paper through collection contracts. Local governments providing residential PPP or garbage curbside collection in November 2012 were initially offered a collection incentive to provide collection starting in May 2014. Recycle BC also offered a collection incentive to local governments and qualified private companies and non-profit organizations to provide collection of residential PPP from multi-family buildings and to operate drop-off depots.

In the RDBN, local governments in Smithers, and Telkwa as well as the Nak'azdli First Nation near Fort St. James accepted the incentive from Recycle BC to provide curbside collection of residential PPP. Recycle BC also funds the collection of residential PPP at the Burns Lake Return It Depot, Smithers Bottle Depot and Nak'azdli Recycling Depot.

As indicated in Table 4-1, this means that roughly 50% of households in the RDBN that have curbside collection of garbage have access to curbside collection services for residential PPP.

Table 4-1: Total Households and Curbside Collection

Municipality	Total Households 2016[2] (StatsCan 2016)	Residential Curbside Collection Availability	
		Garbage	Recycling
Smithers	2,389	EOW*	EOW*
Telkwa	539	Weekly	EOW*
Houston	1,402	Weekly	NA
Granisle	284	Weekly	NA
Burns Lake	748	Weekly	NA
Fraser Lake	551	NA	NA
Fort St. James	761	Weekly	EOW*
Vanderhoof	1,831	Weekly	NA
Electoral Areas	7,892	NA	NA
Total	**16,163**		

*EOW - every other week
** N/A – Collection is not managed provided by government but is available by subscription with private haulers in most non-remote areas.

In addition to residential PPP, Table 4-2 provides a list of the products currently covered by British Columbia's EPR programs and the number of collection sites available in the RDBN. As shown, the regional district is reasonably serviced with take back locations for products regulated under the Recycling Regulation, except for a take back location outdoor power equipment (no known sites) and the limited sites available for residential PPP (i.e., household recyclable materials).

[2] Population estimates based on Statistics Canada 2016 Census Profiles http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1

Table 4-2: EPR Programs

Product Category	Program(s)	Take Back Available in RDBN
Antifreeze, Used Lubricating Oil, Filters and Containers	BC Used Oil Management Association	13 sites
Beverage Containers	Encorp (non-alcoholic and wine, spirits, coolers and import beer in non-refillable containers)	6 sites
	Brewers Distributed Limited (fillable and canned beer)	27 sites
Electronics and Electrical	Call2Recycle/Recycle My Cell (household batteries and cell phones)	8 sites
	Electronics Products Recycling Association (EPRA) (electronic, including: computers, televisions, audio-visual, medical equipment, office equipment, toys)	3 sites
	LightRecycle (lamps and lighting equipment)	10 sites
	Major Appliance Recycling Roundtable (MARR) (large appliances)	8 sites
	Outdoor Power Equipment Institute (OPEI) (Outdoor Power Equipment)	0 sites
	Canadian Electric Stewardship Association (CESA) (small appliances, power tools, sports and exercise equipment, hobby, craft)	4 sites
	AlarmRecycle (smoke and carbon monoxide alarms)	4 sites
	Switch the 'Stat (thermostats)	unknown
Lead Acid Batteries	Canadian Battery Association & Interstate Battery System	6 sites
Packaging and Printed Paper (residential only)	Recycle BC	3 sites
Paint and Solvents and Flammable Liquids, Gasoline and Pesticides	Product Care	9 sites
Pharmaceuticals	Health Product Stewardship Association	3 sites
Tires	Tire Stewardship BC	25 sites

The RDBN also provides opportunities for recycling at its solid waste management facilities, as outlined in Table 4-3. Collection of paint, solvents, fuels and pesticides is done as part of an EPR program for these products and funding is provided by the stewardship agency Regeneration for RDBN to act as a collection site. The collection of plastic and mixed paper at the Vanderhoof Transfer Station is a service provided by the Nechako Waste Reduction Initiative, with the collection containers being hosted by RDBN.

Table 4-3: Residential Recycling

Facility	Metal*	Yard Waste	Paint	Solvents, Fuels, Pesticides	Propane Tanks	Automotive Batteries	Plastic (#1-#7)	Mixed Paper
Smithers-Telkwa Transfer Station	✓	✓	✓	✓	✓	✓		
Knockholt Landfill	✓		✓		✓	✓		
Burns Lake Transfer Station	✓	✓			✓	✓		
Granisle Transfer Station	✓	✓			✓	✓		
Area "D" (Fraser Lake) Transfer Station	✓	✓	✓		✓	✓		
Vanderhoof Transfer Station	✓	✓			✓	✓	✓	✓
Fort St. James Transfer Station	✓	✓	✓		✓			

3.3 Options for Residential Recycling

By shifting the responsibility for the cost of collection, sorting and recycling residential PPP from local governments to producers and consumers, the Province has significantly reduced the barriers faced by the RDBN in implementing programs to recycle residential PPP. Consequently, it is incumbent on the RDBN to take full advantage of the services offered by this stewardship program.

In December 2017, Recycle BC provided a formal offer to the RDBN to join the Recycle BC program as a contracted depot collection partner for a period of five years. The deadline to formally accept this offer and submit signed collection agreements to Recycle BC is September 1, 2018.

Table 4-4 illustrates the PPP recovery rates in regional districts that accepted the Recycle BC offer to provide collection in May 2014. The Cariboo Regional District (CRD), took full advantage of the partnership with Recycle BC. Partnering with EPR stewards was a guiding principle in their 2013 SWMP. Indeed, the top priority of their 2013 SWMP was to make recycling accessible to all residents in the CRD. At the time of plan approval, recycling was only accessible to residents living in the major urban centres of the CRD, including Williams Lake, Quesnel and 100 Mile House. Residents in outlying areas had the option to haul recyclables to recycling depots established in the three above-noted communities. Consequently, the CRD's 2013 SWMP looked to expand recycling services to all CRD landfills and transfer stations.

Table 4-4: Regional District Recycle BC Service Levels

Regional District	Population*	Density per km^2	kg per capita	Service Level
Bulkley-Nechako	35,515	0.5	14.4	Curbside: 3 Depot: 3
Cariboo	60,459	0.8	27.9	Curbside: 4 Depot: 15
Kitimat-Stikine	34,548	0.4	17.9	Curbside: 1 Depot: 4
Mount Waddington	10,909	0.6	33.5	Curbside: 4 Depot: 10
Peace River	56,098	0.5	4.0	Depot: 11
Skeena-Queen Charlotte	13,123	0.9	36.7	Curbside: 1 Depot: 2

* Populations based on Statistics Canada 2016 census data (not including First Nations).

It is important to note the local governments in the RDBN that currently collect curbside garbage but do not have an agreement to collect curbside recycling were not provided with an offer from Recycle BC to finance this service. In its new steward ship plan (under review), Recycle BC is proposing that new curbside programs must meet the following criteria:

- A curbside garbage collection program was in place by May 2014;
- The community represents an incorporated municipality; and
- The community has a minimum population of 5,000 residents.

Under the proposed criteria the communities of Houston, Granisle, Burns Lake, Fraser Lake and Vanderhoof will not be eligible for the curbside collection financial incentive. Many small communities in British Columbia will be impacted by this proposed change. Representatives from Recycle BC have indicated that local governments should

lobby the Province if they disagree with the 5,000-resident cut-off for curbside service as this new policy must be approved in Recycle BC's new stewardship plan.

To become a contracted depot collection partner, the RDBN would need to meet the requirements of the Depot Statement of Work (SOW) and sign a Master Services Agreement (MSA) with Recycle BC. Depots must be staffed when open and secure when closed. Depots must also be sufficiently staffed to ensure interaction with residents, checking of program material and removal of contaminants. Collected material must be stored in a way that protects material quality from inclement weather such as rain and snow.

Photos 3-1 and 3-2: Simple Residential PPP Drop-Off Areas at Cariboo Regional District Facilities

Recycle BC is also proposing that government run depots where there is curbside collection of PPP, the per tonne payment for paper, cardboard and containers be eliminated. If there is no curbside, Recycle BC is offering minor changes to the financial incentives. This new rule may impact current curbside and depot programs in Smithers and Fort St. James and should be considered in detail prior to accepting the Recycle BC offer.

For local governments providing depot only collection, Recycle BC will pay a Resident Education Top Up of $0.75 per household per year and a Service Administration Top Up of $2.50 per year.

Given this change in eligibility for financing curbside recycling programs, as well as the offer to join Recycle BC as a depot collection partner, the following options are available for consideration:

1. **Lobby the Province to change the Recycle BC curbside cut-off from 5,000 to 4,000 residents or less.**

   Although residents of small communities in British Columbia with populations less than 5,000 pay for recycling services as consumers of PPP, they are not eligible for the same level of service as residents in communities with populations greater than 5,000. This inequity should be addressed by the Province in their review and approval of the revised Recycling BC stewardship plan.

2. **Obtain Board direction regarding local government depot collection service and potentially accept the Recycle BC offer at the transfer stations.**

   For communities that have both curbside and depot funded PPP collection programs, the Board will need to consider whether providing additional depots at RDBN facilities will have negative repercussions to current operators.

3. **Depending on Board direction, accept the Recycle BC offer to join the program as a contracted depot collection partner with enough depots at RDBN facilities to provide access to service in all waste sheds.**

4.0 INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL WASTE RECYCLING

Historically, local governments have primarily focused diversion programs on the residential sector where they are most likely to manage waste collection. However, British Columbia residents only generate about 35% of the solid waste in the province (Statistics Canada 2014) with the other 65% coming from non-residential sources. Based on the region's relatively low population density and small urban centers, an estimated 50% of the solid waste going to RDBN's landfills comes from the industrial, commercial and institutional (ICI) I sector. Diversion from ICI sources is therefore considered critical to reaching the region's waste diversion goals.

4.1 What Does the SWMP Say about ICI Recycling?

The 1996 Plan did not quantify the proportion of the waste stream contributed by the ICI sector but assumed based on other jurisdictions that it can range from 40-60%. It was identified that paper products, either corrugated cardboard or fine paper, comprised the majority of the waste. Therefore, the 1996 Plan encouraged businesses to contribute to the residential recycling program through individual contract; or if there was sufficient interest, businesses could work together by contracting out their own recycling system.

4.2 What is Being Done Now in Regard to ICI Recycling?

In 2016, the RDBN banned cardboard from disposal as garbage as a means of ensuring that this material is recycled rather than landfilled. Cardboard is a large component of the waste volume generated by the ICI sector. This bulky material has well established recycling markets and is considered readily recyclable.

4.3 What Other Options are Available in Support of ICI Recycling?

1. **Educate businesses on recycling options.**

   This could be achieved through the development and distribution of consistent signage and messaging for use on collection containers and within the workplace, such as those shown below. Consistency within the region should result in better participation in recycling and lower contamination of the recyclables.

2. **Provide ICI only cardboard bins at transfer stations for small load ICI PPP or consider including small load ICI PPP with residential.**

   Currently the RDBN does not allow ICI PPP recycling in bins provided at transfer stations. While large generators have the option of private recycling service (especially for cardboard), smaller generators are left without reasonable options for recycling to comply with the region's cardboard disposal ban. In order to allow for ICI recycling at transfer stations the RDBN Board would have would need to rescind a previous motion to not support recycling ICI OCC through subsidies and approve small load ICI recycling at transfer stations.

3. **Implement disposal restrictions on readily divertible materials.**

   To encourage source-separation and diversion, many regional districts and municipalities implement disposal bans on recyclable and compostable materials. This is a low-cost policy tool that signals to waste generators and waste collection companies that they are expected to separate and recycle/compost specific materials for which alternatives are readily available (e.g., cardboard, metal, yard waste). Disposal bans are enforced at the point of disposal (i.e., at transfer stations and landfills) through the application of significant surcharges on garbage found to contain banned materials. The RDBN could expand the list of Regulated Recyclable Materials from tires and corrugated cardboard to include all stewardship materials, particularly residential PPP.

5.0 ORGANIC WASTE DIVERSION

Diverting organic waste from landfill disposal has become a significant solid waste management issue in British Columbia. This is because organic waste, comprised primarily of food waste, yard & garden waste, and clean wood waste, not only represents the largest component of landfilled waste (38%), but also generates methane, a potent greenhouse gas, during decomposition in a landfill.

Organic waste diversion is also essential to meeting the new goals set by the Ministry: to lower the provincial municipal solid waste disposal rate from 570 to 350 kilograms per person annually and to have 75% of the British Columbia's population covered by organic waste disposal bans. To meet these goals the Ministry is proposing that regional districts, as part of their solid waste management planning process, adopt as a guiding principle the separation organics and recyclables out of the solid waste stream wherever practical.

Options to divert organic waste (yard waste and food scraps) from the residential and ICI sectors are described above. The approaches, however, can only be accomplished if there is the capacity to process the diverted materials.

5.1 What Does the SWMP Say about Organic Waste Diversion?

The 1996 Plan recognized composting as a method to divert waste from the landfill. RDBN encouraged residents to compose their food and yard waste in backyards with the support of a *Master Composter* education program, which provides information on how to properly compost organic wastes.

Another action was to implement a centralized yard waste composting program through six centralized sites located at landfills and transfer stations. Organic material, such as municipal works waste, that cannot compost in backyards would be collected. After a few years, RDBN planned to investigate the feasibility of adding food waste to be centralized composting operations.

The 1996 Plan projected a diversion rate of 1% initially. But once the entire system was in place, it was anticipated that 7% would be diverted. Adding food waste to the centralizing composting program would increase the diversion rate to 10-15%.

- The 1996 plan set the objective to “encourage composting as a method for waste reduction” through: Including education and promotion as a high priority to encourage participation in backyard composting.
- Investigating the need for purchasing backyard composter units and for rural residents making them available to residents at cost, while encouraging municipalities to purchase and distribute the composter.
- Investigating the feasibility of centralized yard waste composting sites.
- Keeping abreast of the technology for small scale, cost effective centralized food waste composting and consider implementing the technology when economically feasible.

5.2 What is Being Done Now in Regard to Organic Waste Diversion?

The RDBN encourages backyard composting by offering a $30 rebate on home composters purchased at participating retailers and providing “how to” information on their website.

5.3 What Other Options are Available in Support of Organic Waste Diversion?

1. **Improve backyard composting program.**

   Backyard composting is a cost effective and environmentally friendly way to produce nutrient-rich soil for the yard and garden. The program can be further improved with education and promotion in K-12 schools or free workshops.

2. **Collaborate with municipalities to identify options to collect organics.**

   Any municipality that is currently collecting garbage from residences can consider implementing a curbside collection of organics. Curbside collection has shown a higher diversion rate compared to drop-off programs as the system is convenient and easy to use. If there is demand for organics processing, consider constructing a demonstration compost facility appropriate for the volume and type of material diverted to be located at an RDBN transfer station or landfill.

3. Assess requirements for centralized composting facilities to process collected organics.

An appropriate composting technique should be selected based on the projected tonnes of organics (food scraps and yard waste) collected, the space available for processing, potential vectors, and the anticipated end use of the compost material. Based on likely tonnages available from the larger municipalities in the region and assumed end-use of landfill cover material, small low-tech facilities could be constructed to process the organic material collected until the tonnage is sufficient to warrant more mechanized solutions.

Static pile composting has the lowest operating costs and is capable of processing around 10,000 tonnes per year. It is most beneficial in the case of high C:N ratio feedstocks (generally 40:1). Agitation of older material may occur in this composting process leading to increased odour production by restarting active composting. Organic feedstock is formed into large piles or windrows (long piles) which are allowed to decompose for two or three years. Once the piles are established, passive aeration by convection and diffusion occurs which is dependent upon available free air space (FAS). Occasional mixing is done to ensure exposure of older material on outside with active material on the inside. However, for the most part, these piles are left to decompose without mechanical interference.

Windrow composting is one of the most common methods of composting. This type of composting can sustain a wide range of feedstocks and does not require extensive infrastructure. It is generally suitable for up to 50,000 tonnes per year of organic waste. The feedstock is formed into long piles called windrows. These windrows are monitored continuously for oxygen, temperature, and moisture to ensure conditions are optimal for the decomposition of wastes. When moisture or oxygen is too low or the temperature is not sustaining at proper levels, the piles are mixed and, or water/ leachate is added to the piles. Leachate is the wastewater produced during the decomposition of waste.

In the summer months, the time required to complete composting may take as little time as 3 to 4 months for windrows. However, in colder climates, the total time is closer to 6 to 12 months (Environment Canada, 2013). Northern communities such as the City of Whitehorse (population 25,085) and the City of Yellowknife (population 19,569) have successfully used windrow composting to process small quantities for food scraps and yard waste. The City of Whitehorse recently upgraded their facility to aerated windrows to expand to commercial food scraps processing and produce a higher quality organic compost.

Case Study: In 2012, the Regional District of Kootenay Boundary implemented a Green Bin Food Scraps curbside collection service in Grand Forks, which was the first such program outside of Lower Mainland / Vancouver Island. The weekly curbside collection service is provided to 1,830 Grand Forks households and the collected food waste is processed in open windrows at the Grand Forks Landfill. Prior to implementing the green bin program, Grand Forks collected an average of 264 kg of garbage per household per year. After implementation of the program, garbage collected at the curb decreased to 119 kg per household per year. This equates to a 55% reduction in waste sent to disposal. With the collection of 123 kg of food waste per household annually, the overall residential diversion rate increased from 18% with recycling to 62% with recycling plus food waste collection.

For years the municipality of Grand Forks composted yard and garden waste in windrows at the Regional landfill, now they also include food waste from the green bin in the mix. The aerobic composting procedure is considered 'low-tech', with turning done by a front-end loader in 10' high windrows. Finished material is used as final cover at the landfill and the composting operation is considered part of RDKB landfill operations.

6.0 CONSTRUCTION AND DEMOLITION WASTE DIVERSION

Approximately 22% of the material landfilled at the RDBN's sub-regional landfills in 2016 was construction and demolition (C&D) and wood waste. Than annual disposal tonnage varies with the amount of economic activity in any given year. Much of this waste is recyclable or compostable, including cardboard, plastic, metal and wood, and therefore this waste stream can represent a significant waste diversion opportunity.

6.1 What Does the SWMP Say about C&D Waste Diversion?

The 1996 Plan does not address C&D waste as a whole but does specifically address management of wood waste. The Plan identifies potential for future air quality standards to limit burning. The Plan states "The RDBN will investigate alternative options for dealing with wood waste, which may include cost sharing with neighbouring regional districts and/or private industry for the purchase of a mobile tub grinder in order the grind the wood waste into chips. Other alternatives include acquiring air-curtain incineration units to burn the wood waste at a higher temperature, which will reduce the emissions."

6.2 What is Being Done Now in Regard to C&D Waste Diversion?

As outlined in the Current Solid Waste Management System Report, a number of C&D materials are segregated and stored on site for potential salvage. Windows, doors, and wood are all segregated and made available for salvaging.

Large load C&D materials (larger than $2m^3$) are required to go to one of the two sub-regional landfills where they are assessed a tipping fee of $90/tonne. Land Clearing waste is managed using the same rules.

Wood waste (clean wood and painted/treated wood) is segregated at all facilities in the eastern portion of the RDBN. Wood is burned under permit at facilities in the east. Clean wood is collected separately from painted/treated wood in the western portion of the region where the RDBN is only permitted to burn clean wood. Painted/treated wood collected at facilities in the west is transferred to the Knockholt sub-regional landfill for disposal.

6.3 What Other Options are Available in Support of C&D Waste Diversion?

1. **Work with local partners to identify potential processors and markets for high value materials.**

   Work with businesses to identify potential markets for divertible material. The clean wood waste collected separately in the western portion of the region may be desirable as fuel for private sector facilities including greenhouses which may be further developed in the region to accommodate emerging industries. Concrete and asphalt pavement are easily diverted and recycled through low-tech and common processes by willing businesses. If reliable processors are identified, differential tipping fees or material bans could be considered to encourage divertible material to stay out of the landfill.

2. **Hold off on provision of services until the Province announces how C&D materials will be incorporated into British Columbia's EPR system**.

   The Canadian Council of Ministers of the Environment (CCME) has indicated that it commits to incorporating construction and demolition materials into operational EPR programs. However, CCME has not provided an update for this inclusion.

7.0 EXTENDED PRODUCER RESPONSIBILITY

EPR is a provincial policy tool that aims to shift the responsibility for end-of-life management of products (physically and economically) to the producer and away from local governments. This policy is intended to create an incentive for producers to include environmental considerations in design of products.

7.1 What Does the SWMP Say About EPR?

The 1996 Plan does not address EPR programs.

7.2 What is Being Done Now in Regard to EPR?

As identified in the Current Solid Waste Management System Report and Table 4-2, the region is well served by most available EPR programs with the exception of a take back location for outdoor power equipment (no known sites) and the limited sites available for residential packaging and printed paper (i.e., household recyclable materials). Most of the EPR programs present in the region have partnered with private businesses, non-profit organizations, or municipalities. Some RDBN facilities do accept limited EPR materials such as paint.

RDBN is a member of the BC Product Stewardship Council, a body that advocates on behalf of local government for effective EPR programs. Through this council, RDBN engages with the Province and the various EPR programs to improve services levels in the RDBN.

7.3 What Other Options are Available in Support of EPR?

1. **Obtain Board's direction to establish a policy framework for making decisions regarding participation in current and future EPR programs.**

   As EPR becomes an increasingly significant component of British Columbia s waste management system, the RDBN and member municipalities may benefit from determining the extent that they wish to engage in EPR-related services. In British Columbia, three models of local participation appear to be emerging:

   - Provide as broad a range of EPR drop off services at local solid waste facilities as possible (i.e., try to provide "one stop drops")
   - Minimize local government participation or do not participate in EPR programs directly
   - Hybrid: Participate in the collection of specific products and packaging based on some or all of the following:
     - Available space and resources to manage the EPR program at local government facilities
     - The current role of the local government in collecting the designated product/package
     - The level of remuneration offered by stewardship organizations for the collection service
     - The presence of alternative service providers (e.g. A local bottle depot operates as a take-back depot).

8.0 HOUSEHOLD HAZARDOUS WASTE (HHW) DIVERSION

HHW represents approximately 1% of landfilled waste. Although small in volume, its toxic nature requires that there are on-going efforts to reduce its presence in landfills. The vast majority of household hazardous waste (HHW), such as paint, pesticides and batteries are included on of British Columbia's EPR programs (listed in Section 3).

8.1 What Does the SWMP Say about HHW Diversion?

The 1996 Plan supported the established EPR programs that managed wastes such as used oil, paint and lead acid batteries. The 1996 Plan committed to continue lobbying the province to expand the collection to other materials, such as solvents. Such materials were not accepted for disposal at the residual management facilities.

8.2 What is Being Done Now in Regard to HHW Diversion?

HHW is primarily managed through EPR programs at private businesses (i.e. stores, mechanics shops, etc.), and at recycling and bottle depots. Some RDBN transfer stations and landfills collect limited HHW (e.g. paint is collected at several transfer stations) but the materials collected vary by facility.

8.3 What Other Options are Available in Support of HHW Diversion?

1. **Obtain Board direction regarding household hazardous waste disposal.**

   With board direction, identify gaps in household hazardous waste disposal if there are no other service providers.

2. **Establish all solid waste facilities to collect the same household hazardous waste.**

   Consider standardizing the HHW collected at RDBN solid waste facilities. By ensuring the same collection standards across facilities, all residents have access to safely dispose HHW.

9.0 OTHER WASTE

The RDBN has identified a number of waste streams which are not considered Municipal Solid Waste under the EMA but due to lack of alternatives, are managed through the region's solid waste management system. Of particular interest are:

- Agricultural Plastics
  - The use of Agricultural Plastics has grown rapidly since 2001 (Alberta Plastics Recycling Association 2018). For example, hay bales are individually wrapped or packaged in long bale-bags, grain is stored in bags, and polypropylene twine is used in a number of applications. Agricultural plastics cause operational challenges at the RDBN's facilities and their disposal represents a significant waste of resources.
- Camp Waste
  - Ministry guidance on the management of waste from work camps indicates that landfills for work camps are generally not permitted with the exception of very remote sites which lack road access. The Ministry instructs camps to work with the local Regional District to discuss accepting camp refuse at municipal landfills. There are work camps currently using RDBN solid waste facilities.

9.1 What Does the SWMP Say About Other Waste?

The 1996 Plan does not address agricultural plastics or camp waste.

9.2 What is Being Done Now in Regard to Other Waste?

The RDBN currently has no official policies to address Agricultural Plastics or Camp Waste. Unofficially, large loads of Agricultural Plastics are directed to the sub-regional landfills in order to minimize operational issues caused by receiving these loads at the region's transfer stations. Agricultural Plastics received at the sub-regional landfills must be carefully buried to limit the potential for formation of perched leachate and leachate breakouts. Based on research completed in Alberta, up to 50% of Agricultural Plastics are burned on farms.

Informal tipping fee agreements have been made between the RDBN and people looking to develop new work camps in and around the region. There are camps using RDBN solid waste facilities but because these facilities are primarily funded through taxes, these camps are likely not paying enough to cover the current and long-term costs of disposal.

9.3 What Other Options are Available to Manage Other Waste?

1. **Partner to consolidate agricultural plastics in the region and identify markets for diversion.**

   Keep apprised of developments in the plastics recycling industry to identify opportunities for partnerships and demonstration programs for agricultural plastics. In the past, CleanFARMS has partnered with recycling organizations in Western Canada to conduct limited pilot projects for agricultural plastics recycling.

   With board direction, engage the agricultural industry and recycling industry to identify potential markets for key types of agricultural plastics. Once markets are identified, asses the feasibility of consolidating agricultural plastics in the region to minimize shipping costs to reach markets.

   There is at least one established processor of agricultural twine located in Minnesota. Farmers are asked to collect twine in large transparent plastic bags (typically supplied through local government or industry association) which can be collected at transfer stations, consolidated, and baled to be shipped from the region to the facility. A similar market exists for grain bags which can be collected locally, pre-processed (rolled), and shipped to a processing facility in southeast Alberta. The quality of material (cleanliness, contamination) is extremely important for agricultural plastics as the limited processing facilities are in high demand and are known to reject sub-standard materials. There is currently little or no market for silage wrap or bale wrap as the material is relatively difficult to recycle and maintaining material clean enough to meet market standards is difficult. Previous discussions with domestic plastics recyclers indicated that they may be willing to take this material provided that it meets their high standard for quality.

2. **Develop a policy that directs large loads of agricultural plastics to certain facilities.**

   Large loads of Agricultural Plastics are generally directed to the two sub-regional landfills however no policy exists to require delivery to the landfills or assess a fee for the additional cost of burying the material. Additionally, as Agricultural Plastics are not MSW, the tonnage of these materials should be tracked separately and not reported as MSW to the Ministry.

3. **Lobby the Ministry of Environment to create an Extended Producer Responsibility program for Agricultural Plastics.**

The Ministry has previously considered including agricultural plastics under the EPR regulation. Through the creation of an EPR program the onus would be placed on the producers of agricultural plastics to manage end of life care for the materials instead of local governments attempting to manage a material that is not defined as MSW. Producers have the ability to educate their customers and adjust design to make their products more easily recyclable.

The provinces of Manitoba and Saskatchewan are addressing Agricultural Plastics through their EPR regulations. Saskatchewan enacted Chapter E-10.22 Reg 4 the Agricultural Packaging Product Waste Stewardship Regulations in 2016. The Act limits the definition of Agricultural Packaging Product to grain bags. Manitoba has indicated that agricultural plastics will be addressed through future EPR legislation.

4. **Develop a policy to apply tipping fees or equivalent charges to industries generating a large amount of waste relative to their tax contributions.**

   The cost of airspace within the region's landfills can be established based on the cost to operate, close, and care for landfills over their contaminating lifespan. A per tonne or per head tipping fee could be established to ensure that the RDBN is adequately compensated to manage waste generated by these industries.

10.0 PROMOTION AND EDUCATION

The success of waste management programs and policies requires that people know and understand why and how to effectively participate. Promotion and education, therefore, are critical to all components of the solid waste management system, including components focused on waste reduction and diversion.

10.1 What Does the SWMP Say About Promotion and Education?

The 1996 Plan states that the success of any reduction, reuse, recycling and composting program depends on public education and promotion to support these programs. It was determined that the most effective and efficient approach to promote and education is to develop and implement the programs region-wide from a central office.

The education and promotion programs that were considered included:

- Newsletters that explain waste management activities at RDBN;
- Media campaigns to promote specific waste management events;
- *Smart Shopper* programs to educate consumers how to reduce waste when shopping and other opportunities for reducing waste at home;
- *Master Recycler/Composter* program to provide training to those who want to be involved in teaching others how to recycle and compost; and
- Regional District preferential purchasing policy that sets priorities for purchasing products with recycled and/or reduced material content.

10.2 What is Being Done Now in Regard to Promotion and Education?

As summarized in the Current Solid Waste Management System Report, promotion and education for waste management is done by the RDBN, municipalities, local non-profit organizations with an interest in waste management issues, and by private waste management companies.

- The RDBN provides a broad range of information on their website, including information on where to take what materials/products, regional waste management facility information, how-to compost, the solid waste management plan, and publishes a Sustainability Newsletter.
- Municipalities provide information related to the waste management services that they provide to the community including curbside garbage collection.
- Private sector waste management companies, including local depots, provide information related to the waste management services that they provide to ensure that their customers know the range of materials that they can recycle or take to a depot, and how to prepare those materials properly.
- Non-profit organizations such as Greening Up Fort Society and the Nechako Waste Reduction Initiative promote waste reduction, reuse, and recycling, organize events, and provide services for the community.

10.3 What Other Options are Available in Promotion and Education?

1. **Apply community based social marketing as a method to develop new and/or build on existing waste reduction and diversion programs and campaigns.**

   Community-based social marketing (CBSM) is an approach to program promotion and education that encourages high rates of effective participation and long-term behavior change. The CBSM process centres on uncovering barriers that inhibit individuals from engaging in sustainable behaviours, identifying tools that have been effective in fostering and maintaining behaviour change, then piloting takes place on a small portion of the community followed by ongoing evaluation once the program has been implemented community-wide. Therefore, as new behaviours are identified as desirable to achieve waste reduction objectives, CBSM should be employed and should include:

   - Identification of existing barriers to desired behaviours
   - Research on successful approaches in other jurisdictions
   - Undertake pilot projects to confirm that a selected approach will be effective in the RDBN
   - Monitor and measure to confirm that objectives are being met.

   This approach can be applied to campaigns for general waste reduction education, including increasing recycling rates, to help achieve longer-term behaviour changes.

2. **If available, use Recycle BC education and administration top-ups to support regional recycling education and promotions.**

   If the RDBN becomes a Recycle BC collector, an education top-up and program administration top-up of $0.75 and $2.50 per household serviced per year respectively could be directed to recycling education and promotion of services. Additionally, use of Recycle BC's province-wide materials would offer consistency in the look and feel of recycling throughout the region.

11.0 DIVERSION POTENTIAL

11.1 Waste Composition

Figure 11-1 shows the waste composition from a study in 2008 that was adjusted for 2016. The largest (by weight) component of what is landfilled is organic waste (37%), which includes food waste, yard waste and compostable paper products like paper toweling and tissues. The next largest component is paper (20%) such as cardboard, newspaper, office paper and magazines. The third largest is plastic (13%), including plastic containers, film plastic (e.g., bags) and rigid plastic items (chairs, toys, etc.).

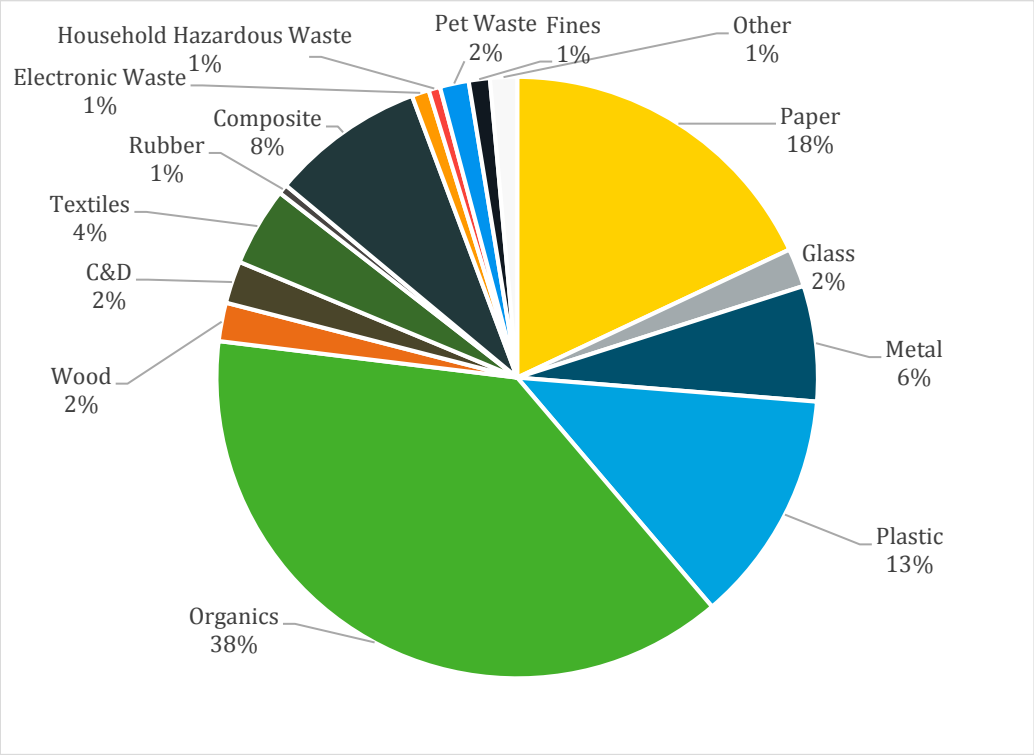

Figure 11-1: Adjusted 2016 Waste Composition

11.2 Potential Diversion

11.2.1 What is the Potential for Residential Waste Recycling?

According to the adjusted 2016 waste composition, approximately 39% of the waste stream is recyclable PPP. By expanding the access to PPP recycling, the region is expected to divert an additional 12% of the PPP products managed by Recycle BC (approximately 14 kg per capita).

Recycle BC reported collecting an average 27.9 kg per capita of residential PPP in the CRD compared to 14.4 kg per capita collected in RDBN. By increasing access to drop-off facilities for Recycle BC managed PPP, the RDBN could expect to divert an additional 14 kg of materials per capita per year. Expanded curbside recycling programs and participation could yield even greater results.

11.2.2 What is the Potential for Food Scraps and Yard Waste Diversion?

According to the adjusted 2016 waste composition, approximately 38% of the waste stream is organic food scraps and yard waste. The promotion and education from a food waste reduction program or other similar behaviour change process is expected to result in approximately 1% diversion (1 kg per capita per year).

The greatest waste diversion would come from a future curbside collection program. If the Town of Smithers, Village of Telkwa, Village of Burns Lake, and District of Vanderhoof implemented a curbside organics (food scraps) collection program, an estimated 23% of region-wide organic waste would be diverted from the landfill (approximately 28 kg per capita per year). Previous curbside collection programs, such as the Regional District of Nanaimo's curbside green bin program, have collected 50 kg per capita per year.

11.2.3 What is the Potential for ICI Recycling?

According to the adjusted 2016 waste composition, recyclable PPP makes up approximately 39% of the material landfilled. RDBN's cardboard disposal ban has successfully diverted a large amount of this material from the region's landfills. However, a significant amount PPP remains in the solid waste stream. Enhancing the cardboard disposal ban to include additional readily recyclable materials divert and additional 15% of the remaining material (19kg per capita per year).

According to the adjusted 2016 waste composition, building materials make up approximately 4% of the waste stream for the ICI and residential sectors. Programs and policies to encourage C&D diversion are expected to divert up to 80% of the easily recycled C&D material currently being landfilled resulting in up to 4 kg per capita per year diverted.

11.2.4 What is the Potential Waste Diversion?

The level of diversion achieved by a given program can be affected by program maturity (newly implemented programs often take a few years before higher capture rates are achieved) and level of supporting activities employed (e.g., financial incentives, public communication, enforcement effort). With successful diversion programs such as expanding access to residential PPP recycling and implementation of disposal bans, approximately 10% of solid waste could be diverted from landfills. Table 11-1 provides the estimated potential diversion of the options discussed in Section 2.0 through Section 10.0.

Table 11-1: Potential Waste Diversion

	Sector Contribution to Landfill	Material Contribution to Landfill	Diversion Potential Out of Landfill (%)	Diversion Potential Out of Landfill (kg/capita)
Residential	50%			
PPP		38.8%	12%	14
HHW and Electronics		1.6%	10%	0
Other recyclables		4.2%	10%	1
Compostable[1]		38.2%	23%	28
Building Material		4.3%	32%	0.4
Residential Diversion Potential				**33**
ICI	50%			
PPP		38.8%	15%	19
HHW and Electronics		1.6%	10%	0
Other recyclables		4.2%	10%	1
Compostable		38.2%	10%	12
Building Material		4.3%	32%	4
ICI Diversion Potential				**69**
Potential Additional Diversion from Landfill				86 kg/c
Estimated Annual Disposal[2]				**558 kg/c**

1 Includes food scraps and yard waste

2 Assumes disposal rate of 644 kg per capita

Table 11-2 provides a list of items that are included in the categories listed above.

Table 11-2: Category Items

Category	Included Items (e.g.)
PPP	Packaging and Printed Paper Materials (Residential Managed by Recycle BC)
HHW and Electronics	Electronics, Batteries, Used Oil, and Containers, Etc.
Other Recyclable	Textiles
Compostable	Organics (Food Scraps and Yard Waste)
Building Materials	Drywall, Masonry, Wood, and Metals

If the above options are considered for implementation, RDBN could divert approximately 86 kg per capita per year. This results in a disposal rate of 558 kg per capita.

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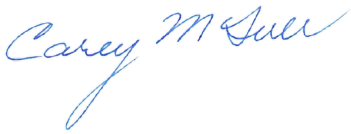

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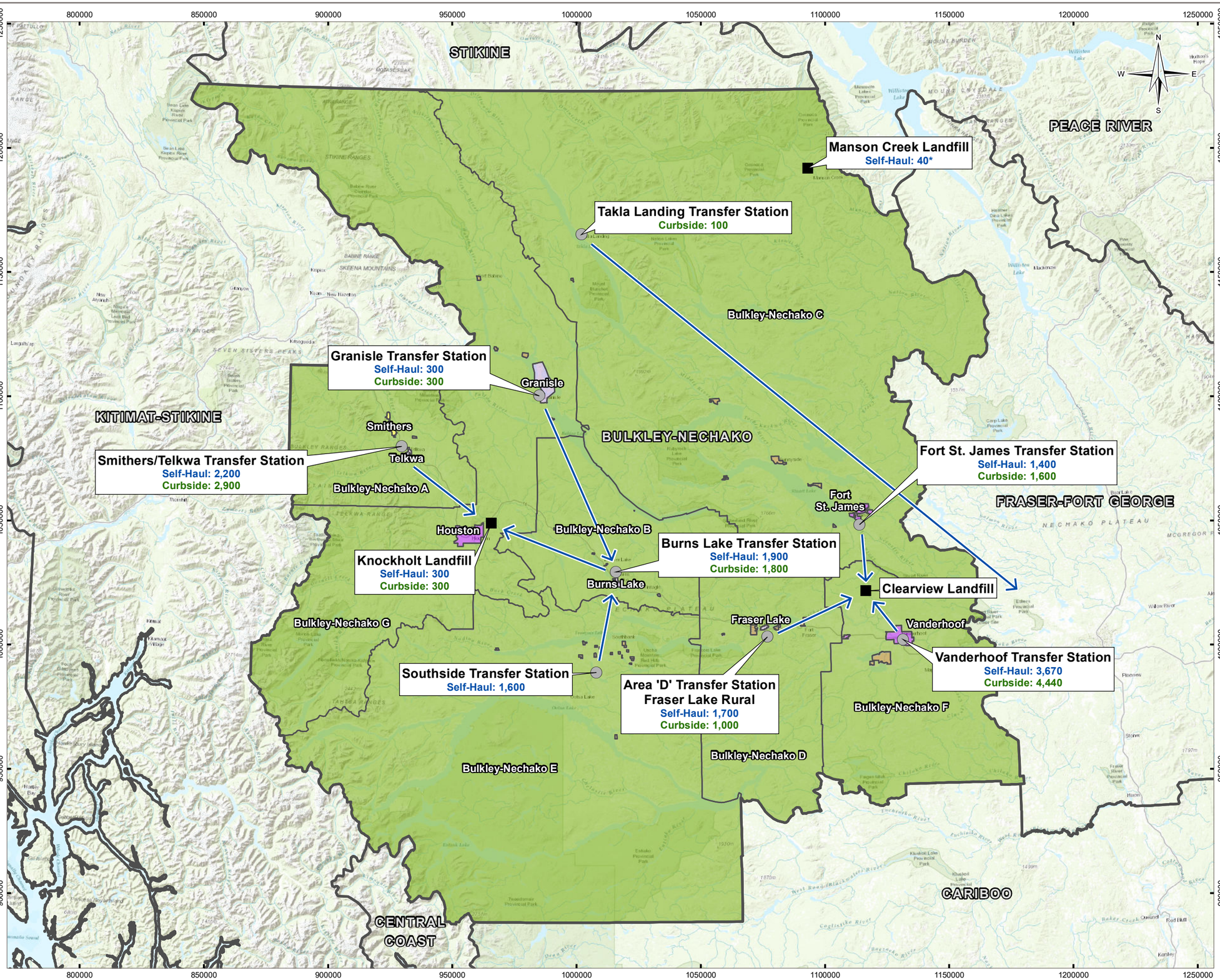
Attachment (1): Figure A
Tetra Tech's Limitations on the use of this Document

REFERENCES

Tetra Tech Canada Inc. 2018. Current Solid Waste System Report. Prepared for Regional District of Bulkley-Nechako, Vancouver, BC. Feb 2018. Project Number 704-SWM.SWOP03664-01.



LEGEND

RDBN Solid Waste Facility Type

- Landfill
- Transfer Station

RDBN Census Subdivision

- District Municipality
- Town
- Village
- Indian Reserve
- Regional District Electoral Area
- Regional District Boundary
- Waste Flow

XXX Households Self-Hauling to Facility

XXX Households Served by Curbside Collection

NOTES

* Estimated permanent residents. Mason Creek Facility also receives signifiant camp waste.

Base data source:
Regional District/Census boundaries: Statistics Canada 2016
ESRI Topographic Base Map

STATUS
ISSUED FOR USE

SOLID WASTE MANAGEMENT PLAN

Regional District of Bulkley-Nechako Solid Waste Facilities

PROJECTION BC Albers		**DATUM** NAD83		**CLIENT** Regional District of Bulkley-Nechako
Scale: 1:1,500,000 (20 10 0 20 Kilometres)				TETRA TECH
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OFFICE Tt-VANC	**DWN** SL	**CKD** MEZ	**APVD** LQ	**REV** 0
DATE March 5, 2018	**PROJECT NO.** SWM.SWOP03664-01			**Figure A**

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The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

TECHNICAL MEMORANDUM 3: OPTIONS COSTING AND FINANCIAL IMPLICATIONS

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Regional Solid Waste Advisory Committee	**Date:**	May 16, 2018
c:	Rory McKenzie Janette Derksen	**Memo No.:**	3
From:	Lauren Quan, P.Eng. Carey McIver, M.A.	**File:**	704-SWM.SWOP03664-01
Subject:	Tech Memo 3 – Options Costing and Financial Implications		

1.0 INTRODUCTION

The Regional District of Bulkley-Nechako (RDBN) retained Tetra Tech Canada Inc. (Tetra Tech), MWA Environmental Consultants Ltd. (Maura Walker), and Carey McIver and Associates Ltd., (the Consulting Team) to manage a review and update of the RDBN's 1996 Solid Waste Management Plan (SWMP). The 2018 SWMP update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and set the RDBN's waste management principles, targets and strategies for the next ten years. A summary of the project stages is included on Figure 1-1.

During the Stage One Assessment, the Consulting Team reviewed the current system, identified potential gaps and opportunities and presented their findings in the Current Solid Waste Management System Report. The Consulting Team presented this report to the Regional Solid Waste Advisory Committee (RSWAC) at their first meeting on January 24, 2018.

For Stage Two Analysis and Evaluation, the Consulting Team presented options related to additional reduction and diversion as well as residual management to the RSWAC as a Power Point webinar on February 21, 2018. Based on feedback from the Webinar, the Consulting Team issued two Technical Memoranda (Tech Memo) to assess opportunities for and evaluate: recovery and residual management (Tech Memo 1); and diversion options (Tech Memo 2).

The RSWAC reviewed these two Tech Memos at their March 7, 2018 meeting and selected a series of options to increase reduction and diversion and improve residual management. This third Tech Memo provides information on the costs associated with the diversion and residual management options selected by the RSWAC, the implications of these options on the 2018-2022 Financial Plan as well as cost recovery options and associated potential bylaw amendments.

Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

The project consists of four stages, as shown on Figure 1-1.

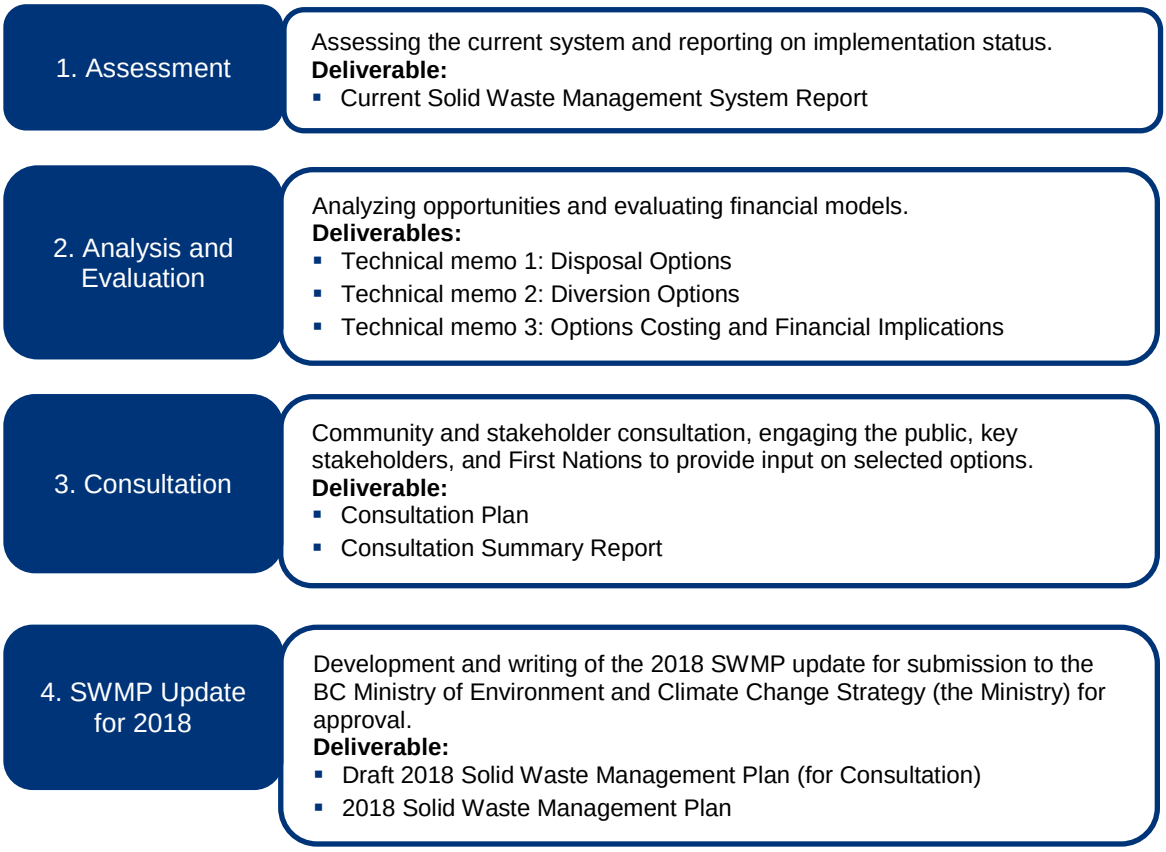


Figure 1-1: Project Phases and Associated Deliverables

2.0 DIVERSION AND RESIDUAL OPTIONS COSTING

The following sections summarize the estimated operating and capital costs of implementing the diversion and residual options approved for further analysis by the Regional Solid Waste Advisory Committee. The costs listed below are based on information available at the time of writing. Costs may be updated through the SWMP development process as additional information becomes available.

2.1 Diversion Options

This SWMP review process has identified issues and associated program and policy options available to reduce the current RDBN 645 kilogram per capital disposal rate (in 2015). The issues and options are summarized below.

2.1.1 Option 1: Reduce and Reuse

2.1.1.1 Promote ideas from "Love Food Hate Waste"-style campaigns in regional education and communication.

Available statistics indicate that up to 6% of the waste disposed in RDBN landfills may be avoidable food waste. Based on the relatively low cost and high potential of reducing food waste, the region will incorporate information on food waste reduction into regional education programs.

2.1.1.2 Encourage and promote food donation for businesses and restaurants to food banks and farms.

Food waste occurs at many restaurants and businesses due to surplus in food and spoilage due to lack of planning and transportation delays. The region will encourage food donation by providing information through regional education programs to support food rescue through food banks (for people) and farms (for animals).

Actions	Estimated Capital Cost	Estimated Operating Cost
Promote ideas from "Love Food Hate Waste"-style campaigns in regional education and communication. Encourage and promote food donation for businesses and restaurants to food banks and farms.	-	0.1 FTE

2.1.2 Option 2: Residential Recycling

2.1.2.1 Lobby the Province to reduce or eliminate the proposed Recycle BC population cut-off for curbside service.

Although residents of small communities in British Columbia (BC) with populations less than 5,000 pay for recycling services as consumers of packaging and printed paper (PPP), under Recycle BC's proposed Stewardship Plan they are not eligible for the same level of service as residents in communities with populations greater than 5,000. The region, in consultation with other largely rural regional districts, will lobby the Ministry to address this inequity in their review and approval of the revised Recycling BC stewardship plan. A letter should be written from the RDBN Board of Directors to the Minister of Environment and Climate Change Strategy expressing concern in the inequity in service between urban and rural populations.

2.1.2.2 Host Recycle BC depots at all RDBN public drop-off facilities (where practical).

With Board approval, accept the Recycle BC offer to join the program as a contracted depot collection partner with depots at RDBN facilities to provide access to residential PPP recycling services in all waste sheds.

By shifting the responsibility for the cost of collection, sorting and recycling residential PPP from local governments to producers and consumers, the Province has significantly reduced the barriers faced by the RDBN in implementing programs to recycle residential PPP. Consequently, it is incumbent on the RDBN to take full advantage of the services offered by this stewardship program.

In December 2017, Recycle BC provided a formal offer to the RDBN to join the Recycle BC program as a contracted depot collection partner for a period of five years. The deadline to formally accept this offer and submit signed collection agreements to Recycle BC is September 1, 2018. To become a contracted depot collection partner, the RDBN would need to meet the requirements of the Depot Statement of Work (SOW) and sign a Master Services

Agreement (MSA) with Recycle BC. Depots must be staffed when open and secure when closed. Depots must also be sufficiently staffed to ensure interaction with residents, checking of program material and removal of contaminants. Collected material must be stored in a way that protects material quality from inclement weather such as rain and snow.

The region has opted to purchase modified shipping containers (sea-cans) to begin providing collection of Recycle BC materials at the Vanderhoof Transfer Station (VTS) and Smithers-Telkwa Transfer Station (STTS) in 2018. Two sea-cans are expected to be required for the region's largest transfer stations. The region has opted to increase staffing levels at STTS and VTS so that an attendant is supervising the reuse shed and Recycle BC depot during all transfer station hours. The same assumptions have been used to set the budget for the depot at the Burns Lake Transfer Station (BLTS). Additional staff hours and one sea-can per site have been added to support management of the RecycleBC depots at the Fort St. James Transfer Station (FSJTS), the Area D Transfer Station (ADTS), and the Houston Transfer Station (HTS) at Knockholt Landfill for the busiest hours at the transfer stations. It is assumed that the existing transfer station attendant will supervise the Recycle BC depot during non-peak times. The smallest transfer stations (Southside Transfer Station and Granisle Transfer Station) are budgeted for one sea-can with a part-time recycling coordinator to support public communication and education and on-site supervision by the existing transfer station attendant.

The approved 2018 regional budget provides total subsidy of $263,448/year to local recycling organizations from 2019 to 2022. This equates to an average per capita subsidy of $7.40 throughout the region to fund recycling programs and support public communication/education. Proposals from local recycling organizations were considered on a case-by-base basis by staff and the Board for approval.

With the establishment of Recycle BC depots throughout the region, there is an opportunity to create a standard for funding local organizations to support the region's overall waste reduction, reuse, and recycling goals. The Board has approved staff plans to implement a Recycle BC depot at VTS. The staff plan included a $20,000 subsidy to the Nechako Waste Reduction Initiative to provide public education, public communication, recycling coordination and support reduction, reuse, and recycling initiatives in the area. This Board-approved subsidy equates to $2.50 per capita in the area serviced. For budgeting purposes, a subsidy of $2.50/capita (serviced population) has been applied to each local recycling organization subsidized under the region's existing budget and five-year financial plan. This represents a significant decrease in the region's contributions to local organizations (a reduction of approximately $212,000/year total) in favour of providing services at the existing transfer stations and landfills. No allocation to local organizations has been assumed for populations receiving curbside recycling collection as all municipalities with curbside collection programs receive funding from Recycle BC to provide recycling education to their residents.

Based on the success of these future residential recycling programs the region may also elect to construct consolidation centers for residential PPP. The decision to construct consolidation facilities will depend on the tonnage of recycling collected in the catchment area of the facilities and the incentives available from Recycle BC for providing consolidation and baling services. Consolidation facilities are contemplated for each of the eastern and western sections of the region (expected to be located at the Vanderhoof Transfer Station and the Smithers-Telkwa Transfer Station respectively). The estimated capital cost for the construction of a basic fabric-covered structure for storage and baling and purchase of a horizontal baler is estimated at $634,000.

Table 2-1: Recycling Consolidation Facility - Estimated Capital Cost

Item	Estimated Costs
Mobilization/Demobilization and Contract Costs	$78,268
Site Preparation	$37,340
Storage Building (10 m x 15 m)	$150,000
Lock Block Wall	$32,000
Surfaces (gravel surface)	$12,000
Horizontal Baler	$100,000
Fork Lift	$60,000
Subtotal	$469,608
Engineering/Design (15%)	$70,441
Construction Management (5%)	$23,480
Contingency (15%)	$70,441
Total Estimated Cost	**$633,971**

<table>
<tr><th>Actions</th><th colspan="2">Estimated Capital Cost</th><th>Estimated Operating Cost</th></tr>
<tr><td>Lobby the Province to reduce the proposed Recycle BC population cut-off for curbside service.</td><td colspan="2">-</td><td>Current Staff</td></tr>
<tr><td rowspan="10">Host Recycle BC depots at all RDBN public drop-off facilities (where practical).</td><td>Facility</td><td>Capital Costs</td><td rowspan="10">Full-time staff for re-use shed and Recycle BC depot at the three largest transfer stations:
$51,250/year (additional)
Part-time staff at three medium-sized transfer stations:
$29,874/year (additional)
Recycling Coordinator to support education and resident engagement at small transfer stations and throughout the region:
$30,000/year
Subsidy to local organizations for communication and education:
-$212,200/year</td></tr>
<tr><td>Smithers-Telkwa Transfer Station</td><td>$30,000</td></tr>
<tr><td>Granisle Transfer Station</td><td>$15,000</td></tr>
<tr><td>Burns Lake Transfer Station</td><td>$30,000</td></tr>
<tr><td>Fort St. James Transfer Station</td><td>$15,000</td></tr>
<tr><td>Area D Transfer Station – Fraser Lake Rural</td><td>$15,000</td></tr>
<tr><td>Southside Transfer Station</td><td>$15,000</td></tr>
<tr><td>Vanderhoof Transfer Station</td><td>$25,000</td></tr>
<tr><td>Public Drop-Off at Knockholt Landfill*</td><td>$15,000</td></tr>
<tr><td>Consolidation Center (each)</td><td>$634,000</td><td>Not assessed.</td></tr>
</table>

2.1.3 Option 3: Industrial Commercial Institution (ICI) Recycling

2.1.3.1 Work with the private sector to educate businesses on recycling options.

Develop consistent signage and messaging for use by municipalities, businesses and institutions on collection containers and within the workplace. Consistency within the region should result in better participation in recycling and lower contamination of the recyclables.

2.1.3.2 Implement disposal restrictions on readily divertible materials.

The RDBN currently defines corrugated cardboard as a regulated recyclable material and restricts its disposal at transfers stations and landfills. All stewardship materials, including PPP collected by Recycle BC should be added to the list of regulated recyclable materials to support diversion in the residential sector and encourage private-sector services in the ICI sector.

2.1.3.3 Advocate for ICI PPP to be included in Extended Producer Responsibility (EPR) legislation in the North.

Northern communities do not have local markets for recyclable materials. While much of the lower mainland and Vancouver Island is well serviced by the private sector for ICI recycling, rural and northern communities typically lack services due to the cost of transporting recyclables to consolidation facilities and eventually to commodity markets. The region will lobby the Ministry to address the challenges of ICI recycling in northern communities. A letter should be written from the RDBN Board of Directors to the Minister of Environment and Climate Change Strategy expressing the need for additional programs and resources to support ICI recycling in the North.

2.1.3.4 Provide ICI only cardboard bins at transfer stations for small load ICI Old Corrugated Cardboard (OCC) or consider including small load ICI PPP with residential.

Provide a bin for small load ICI OCC at large and medium sized transfer stations.

Actions	Estimated Capital Cost	Estimated Operating Cost
Work with the private sector to educate businesses on recycling options. Implement disposal restrictions on readily divertible materials. Advocate ICI to be included in EPR legislation in the North.	-	0.25 FTE
Provide ICI only cardboard bins at transfer stations for small load ICI OCC or consider including small load ICI PPP with residential.		Bins at STTS, BLTS, FSJTS, VTS, HTS: $8,500/year

2.1.4 Option 4: Organics Diversion

2.1.4.1 Improve backyard composting program.

Backyard composting is a cost effective and environmentally friendly way to produce nutrient-rich soil for the yard and garden. Increasing the number of subsidized composters available while improving education programs is a low-cost way to decrease the organic material going to the landfill. A 20% increase in program budget will provide additional composters for distribution to residents in the region.

2.1.4.2 Develop Regional Composting Facilities

Collaborate with municipalities to identify options to collect organics (i.e., food scraps, food soiled paper, yard and garden debris). If demand for organics processing exists, assess requirements for centralized composting facilities to process collected organics.

Any municipality that is currently collecting garbage from residences could consider implementing a curbside collection of organics. Curbside collection has shown a higher diversion rate compared to drop-off programs as the system is convenient and easy to use.

If there is demand for organics processing, the region will consider constructing a demonstration compost facility appropriate for the volume and type of material diverted to be located at an RDBN transfer station or landfill. An appropriate composting technique should be selected based on the projected tonnes of organics (food scraps, food soiled paper and yard and garden debris) collected, the space available for processing, potential vectors, and the anticipated end use of the compost material. Based on likely tonnages available from the larger municipalities in the region and assumed end-use of landfill cover material, small low-tech facilities could be constructed to process the organic material collected until the tonnage is sufficient to warrant more mechanized solutions.

A regional facility would be expected to process food scraps collected at curbside in multiple municipalities (including the Town of Smithers, Village of Telkwa, District of Vanderhoof, and Village of Burns Lake), collected from ICI in multiple municipalities (including the Town of Smithers, Village of Telkwa, and District of Vanderhoof), and dropped off at transfer stations throughout the region. An equal amount of carbon-dense material (yard waste and woody waste) would be required to balance out food scraps for organics processing.

Table 2-2: Summary of Estimated Annual Organics Available for Processing at Compost Facilities

Sector	Vanderhoof Transfer Station	Smithers-Telkwa Transfer Station	Regional Organics Facility
Residential Curbside Food Scraps (52kg/capita)	228 tonnes	344 tonnes	660 tonnes
Drop-Off Food Scraps (10kg/capita)	36 tonnes	53 tonnes	163 tonnes
ICI Food Scraps (30kg/capita – Urban)	133 tonnes	202 tonnes	335 tonnes
Total Food Scraps	**397 tonnes**	**598 tonnes**	**1,158 tonnes**
Browns (Yard Waste, Woody Waste)	397 tonnes	598 tonnes	1,158 tonnes
Total Organics	**794 tonnes**	**1,196 tonnes**	**2,316 tonnes**

Two small-scale facilities are contemplated for construction at the STTS and the VTS. Based on the amount of organic material available, a pilot facility could be constructed with a capital investment of approximately $200,000 to compost yard waste and limited food scraps.

Table summarizes the conceptual level costs for low to medium technology Aerated Static Pile (ASP) or Aerated Static Bunker (ASB) facilities. Depending on the ultimate use of the compost produced, some aspects of the conceptual designs below may be limited, eliminated, or expanded. For example:

- If the compost will be used for final landfill cover, a limited amount of screening would be required.
- Depending on the placement and existing infrastructure at the facility, less site grading and leachate & surface water management may be required.

Facility cost is highly variable depending on the composition of the material to be composted and the goals for the finished product. Limited pilot-scale test facilities have been constructed for as little as $50,000 (excluding labour) at small institutions and government sites. The following costs represent construction of typical permanent government composting facilities constructed at the region's existing solid waste facilities.

Table 2-3:Compost Facility Conceptual Costs - Vanderhoof and Smithers-Telkwa Transfer Stations

Item	Aerated Static Pile or Aerated Bunker at Vanderhoof Transfer Station	Aerated Static Pile or Aerated Bunker at Smithers-Telkwa Transfer Station
Capital		
General Site Grading and Preparation	$66,400	$72,800
Leachate & Surface Water Management	$33,200	$35,400
Receiving Area	$3,800	$6,900
Organics Processing	$60,500	$68,700
Screening, Curing, and Storage	$40,500	$49,600
Equipment (mobile)	$200,000	$200,000
Subtotal Capital (without mobile equipment)	**$204,500**	**$233,500**
Subtotal Capital (with mobile equipment)	**$404,500**	**$433,500**
Engineering (10% of non-mobile equipment capital)	$20,400	$23,300
Contingency (25% of non-mobile equipment capital)	$51,100	$58,400
Total Capital	**$476,000**	**$515,200**
Annualized Capital (20 years)	**$41,500**	**$44,900**
Operations		
Electricity	$7,000	$7,000
Water	$50	$100
Labour	$34,500	$35,700
Equipment Maintenance and Use	$38,200	$50,200
Bi-Product Revenue	$-	$(200)
Subtotal	**$79,700**	**$92,700**
Contingency (20%)	$15,900	$18,500
Total Operating	**$95,700**	**$111,200**
Cost Summary		
First Year Cost (Capital + Operating)	**$571,750**	**$626,400**
Annualized Total	**$137,200**	**$156,200**
Cost per Tonne	**$160**	**$100**

A regional composting facility could be constructed at one of the sub-regional landfills to process materials collected throughout the region. Due to a higher material throughput, lower costs per tonne would be achieved by a regional

facility. The cost to transport materials to one location have not been accounted for in the conceptual costs in Table 2-4.

Table 2-4: Regional Compost Facility Conceptual Costs

Regional Organics Facility	Aerated Static Pile	Membrane Covered Aerated Static Pile
Capital		
General Site Grading and Preparation	$78,400	$75,000
Leachate and Surface Water Management	$39,000	$37,800
Receiving Area	$11,200	$11,300
Organics Processing	$153,100	$303,700
Screening, Curing, and Storage	$53,400	$32,500
Equipment (mobile)	$-	$-
Subtotal Capital (without mobile equipment)	**$335,100**	**$460,300**
Subtotal Capital (with mobile equipment)	$335,100	$460,300
Engineering (10% of non-mobile equipment capital)	$33,500	$46,000
Contingency (25% of non-mobile equipment capital)	$83,800	$115,100
Total Capital	**$452,300**	**$621,400**
Annualized Capital (20 years)	**$39,400**	**$54,200**
Operations		
Electricity	$7,000	$7,600
Water	$30	$20
Diesel	$-	$-
Labour	$36,200	$36,500
Equipment Maintenance and Use	$61,200	$93,700
Bi-Product Revenue	$-	$(300)
Subtotal	**$104,400**	**$137,500**
Contingency (20%)	$20,900	$27,500
Total Operating	**$125,300**	**$165,000**
First Year Cost (Capital + Operating)	$577,600	$786,500
Annualized Total	$164,700	$219,200
Cost per Tonne	$60	$90

Actions	Estimated Capital Cost	Estimated Operating Cost
Improve backyard composting program.	-	Increase program budget by 20%: $2,500/year (additional)
Develop regional composting facilities.	Vanderhoof Transfer Station: $476,000 Smithers-Telkwa Transfer Station: $515,200 Regional Compost Facility: $621,400	Vanderhoof Transfer Station: $95,692 Smithers-Telkwa Transfer Station: $111,200 Regional Compost Facility: $165,000

2.1.5 Option 5: Construction and Demolition (C&D) Waste Diversion

2.1.5.1 Work with local partners to identify potential processors and markets for higher value materials.

Work with businesses to identify potential markets for divertible material. If reliable processors are identified, differential tipping fees or material bans could be considered to encourage divertible material to stay out of the landfill. The region will make materials available to the private sector if financially neutral or positive for the RDBN.

2.1.5.2 Lobby the Province to include C&D materials into BC's EPR system.

C&D materials were identified as a priority for inclusion in EPR programs by the 2009 Canadian Council of Ministers of the Environment Canada-Wide Action Plan for EPR. These materials are often difficult to divert at a local or regional level as processers and recyclers are primarily located in the lower mainland. The region will lobby the Ministry to address the challenges of diverting C&D materials. A letter should be written from the RDBN Board of Directors to the Minister of Environment and Climate Change Strategy expressing the need for additional programs and resources to support C&D diversion.

Actions	Estimated Capital Cost	Estimated Operating Cost
Work with local partners to identify potential processors and markets for high value materials. Lobby the Province to include C&D materials into BC's EPR system.	-	0.1 FTE

2.1.6 Option 6: Extended Producer Responsibility

2.1.6.1 Establish a policy framework for making decisions regarding participation in current and future EPR programs.

As EPR expands to cover an increasing portion of BC's waste management system, the RDBN and member municipalities may benefit from determining the extent that they wish to engage in EPR-related services. In BC, three models of local participation appear to be emerging:

- Provide as broad a range of EPR drop off services at local solid waste facilities as possible (i.e., aim to provide "one stop drops").
- Minimize local government participation or do not participate in EPR programs directly.

- Hybrid- Participate in the collection of specific products and packaging based on some or all of the following:
  - Available space and resources to manage the EPR program at local government facilities.
  - The current role of the local government in collecting the designated product/package.
  - The level of remuneration offered by stewardship organizations for the collection service.
  - The presence of alternative service providers (e.g. A local bottle depot operates as a take-back depot).

Depending on direction from the Board, staff will prepare a policy to direct participation in future EPR programs.

Actions	Estimated Capital Cost	Estimated Operating Cost
Establish a policy framework for making decisions regarding participation in current and future EPR programs.	-	Current Staff

2.1.7 Option 7: Household Hazardous Waste (HHW) Diversion

2.1.7.1 Increase public education and communication on proper handling and collection locations for HHW.

To facilitate diversion of HHW materials, staff will integrate information from product stewards into regional education and public communications and collaborate with EPR programs as relevant.

Actions	Estimated Capital Cost	Estimated Operating Cost
Increase public education and communication on proper handling and collection locations for HHH.	-	Current Staff

2.1.8 Option 8: Other Waste

2.1.8.1 Work with local partners to encourage alternative management of Agricultural Plastics.

Agricultural plastics are typically difficult to recycle due to the types of material used for packaging and wrapping of agricultural products and the difficulty in keeping material clean on farms. The region will provide information as requested to support the work of local partners who are identifying potential alternative solutions to manage Agricultural Plastics and may take part in pilot programs to manage these materials.

2.1.8.2 Lobby the Ministry to create an EPR program for Agricultural Plastics.

The Ministry has previously considered including agricultural plastics under the EPR regulation. Through the creation of an EPR program the onus would be placed on the producers of agricultural plastics to manage end of life care for the materials instead of local governments attempting to manage a material that is not defined as municipal solid waste (MSW). Producers can educate their customers and adjust design to make their products more easily recyclable.

The provinces of Manitoba and Saskatchewan are addressing Agricultural Plastics through their EPR regulations. Saskatchewan enacted Chapter E-10.22 Reg 4 the Agricultural Packaging Product Waste Stewardship Regulations in 2016. The Act limits the definition of Agricultural Packaging Product to grain bags. Manitoba has indicated that agricultural plastics will be addressed through future EPR legislation.

The region will lobby the Ministry to address the challenges of diverting Agricultural Plastics. A letter should be written from the RDBN Board of Directors to the Minister of Environment and Climate Change Strategy expressing support to include Agricultural Plastics in future EPR programs.

Actions	Estimated Capital Cost	Estimated Operating Cost
Work with local partners to encourage alternative management of Agricultural Plastics. Lobby the Ministry to create an EPR program for Agricultural Plastics.	-	Current Staff

2.1.9 Option 9: Education and Behaviour Change

2.1.9.1 Apply community based social marketing (CBSM) as a method to develop new and/or build on existing waste reduction and diversion programs and campaigns.

CBSM is an approach to program promotion, education and behaviour change that encourages high rates of effective participation and long-term behaviour change. This approach can be applied to campaigns for general waste reduction education, including increasing recycling rates, to help achieve longer-term behaviour changes. The region will include CBSM as a key component of education and public communication programs.

2.1.9.2 If available, use Recycle BC education and administration top-ups to support regional recycling education and promotions.

If the RDBN becomes a Recycle BC collector, an education top-up and program administration top-up of $0.75 and $2.50 per household serviced per year respectively could be directed to recycling education and promotion of services. Additionally, use of Recycle BC's province-wide materials would offer consistency in the look and feel of recycling throughout the region.

Actions	Estimated Capital Cost	Estimated Operating Cost
Apply CBSM as a method to develop new and/or build on existing waste reduction and diversion programs and campaigns.	-	Current Staff
If available, use Recycle BC education and administration top-ups to support regional recycling education and promotions.		When all facilities are in operation: -$42,000 (i.e. net revenue)

2.2 Disposal Options

This SWMP review process has captured issues and potential solutions to address residual management over the next 10 years, as outlined below. The costs listed below are based on information available at the time of writing. Costs may be updated through the SWMP development process as additional information becomes available.

2.2.1 Option A: Continue operating disposal sites according to ministry requirements.

Continue operating the region's three disposal sites, upgrade environmental controls and infrastructure as needed to meet MOE requirements.

Based on historical records and current site conditions the following items have been budgeted for the Clearview Sub-Regional Landfill:

- Complete a study to confirm compliance and conformance with the 2016 landfill guidelines ($6,000 in 2019);
- Complete a leachate management plan ($25,000 in 2020);
- Provisional installation of leachate treatment pond ($100,000 in 2023).

The following items have been budgeted for the Knockholt Sub-Regional Landfill:

- Additional budget for consulting fees to support landfill design and planning ($5,000 per year).
- LFG generation assessment study ($5,000 in 2020).
- Complete a study to confirm compliance and conformance with the 2016 landfill guidelines ($6,000 in 2021).
- Study to assess the performance and capacity of existing leachate treatment ponds ($15,000 in 2022).
- Development of Phase 3B and 3C (Phase 3B - $382, 000 in 2023, Phase 3C - $704,000 in 2028).
- Provisional leachate treatment pond improvements ($250,000 in 2024).

The following items have been budgeted for the Manson Creek Landfill:

- Provisional budget for landfill operation and management review ($5,000 in 2022).
- Provisional budget for additional site maintenance ($10,000 in 2022).

Actions	Estimated Capital Cost	Estimated Operating Cost
Continue operating disposal sites according to Ministry requirements. (Clearview Sub-Regional Landfill)	Leachate management improvements: $100,000	Landfill compliance and conformance review: $6,000 Leachate management plan: $25,000
Continue operating disposal sites according to Ministry requirements. (Knockholt Sub-Regional Landfill)	Development of Phase 3B: $382,000 Development of Phase 3C: $704,000 Leachate treatment pond improvements: $250,000	Additional landfill design and planning: $5,000 per year Landfill gas generation assessment study: $5,000 Landfill compliance and conformance review: $6,000 Leachate pond performance and capacity study: $15,000
Continue operating disposal sites according to Ministry requirements. (Manson Creek Landfill)	-	Landfill operation and management review: $5,000 Additional landfill site maintenance: $10,000

2.2.2 Option B: Continue to assess landfill gas (LFG) generation and manage as needed.

LFG must be monitored at all landfill sites in BC for health and safety reasons, and to reduce impacts to air quality. The BC Landfill Gas Regulation required that a landfill site that receives more than 10,000 tonnes of MSW per year, or has a total MSW in place at or above 100,000 tonnes completes an initial LFG generation assessment and report to the Ministry. Landfills that generate 1,000 tonnes or more of methane per year must ensure that a LFG management plan is prepared for the landfill site and an active gas collection system installed to reduce fugitive LFG emissions to the atmosphere.

LFG generation assessments were completed for the Knockholt Sub-Regional landfill (in 2010 and 2016), and for the Clearview Sub-Regional landfill (in 2018). The assessments estimated that each facility was generating well under 1,000 tonnes of methane per year. Based on these assessments LFG capture will likely not be required within the plan timeframe.

The region will work to manage and limit the production of LFG by:

- Continuing to assess LFG generation at Knockholt and Clearview sub-regional landfills.
- Minimize organics in MSW to reduce LFG generation.
- Considering an alternative cover (e.g. biocover) to naturally treat methane produced instead of conventional cover for future landfill closure systems which attempt to confine emissions within the landfill.

Actions	Estimated Capital Cost	Estimated Operating Cost
Continuing to assess LFG generation at Knockholt and Clearview sub-regional landfills.	-	Cost identified in Option A
Minimize organics in MSW to reduce LFG generation.	-	Cost identified in Option 4
Consider an alternative cover system to naturally treat methane produced in landfills.	-	No additional cost identified at this time.

2.2.3 Option C: Implement disposal charges for Camp Waste and other industries not already paying into the system.

The region's solid waste system is primarily funded through taxes based on property assessments. Therefore, some industries may not be paying their fair share into the system. The region has identified industry work camps as one industry that requires an alternative method to fund their use of the solid waste system if no tipping fees are charged for disposal at regional facilities.

Two options are identified to allow the region to recover the cost of managing waste from these industries:

- Require that all materials from specified industries are delivered to scaled facilities and charge a weight-based tipping fee for all landfilled waste.

The region has established a cost for landfilling C&D waste as $90/tonne. Depending on direction from the board, this cost or an equivalent future MSW tipping fee could be applied to specified industries under a regional policy developed by staff.

- Set an annual per head or per bed cost for all facilities being constructed in the region and assess this as a solid waste disposal fee with other regional fees and taxes.

The cost of airspace within the region's landfills can be established based on the cost to operate, close, and care for landfills over their contaminating lifespan. The current system costs of the region's landfills are far less than the operating costs of the transfer station system, administration, and other programs. Therefore, a cost per tonne of has been established based on the total regional solid waste system costs. The average system cost per tonne of waste disposed in 2015 and 2016 was $220/tonne.

An average waste generation rate of 410 kg/person has been calculated based on Peace River Regional District reporting. The resulting estimated cost of solid waste services for industry work camps is $90/person/year.

Actions	Estimated Capital Cost	Estimated Operating Cost
Implement disposal charges for Camp Waste and other industries not already paying into the system.	-	Current Staff No revenues have been projected.

2.2.4 Option D: Partner to identify alternatives to disposal.

Due to lack of economies of scale there are limited cost-effective opportunities to recovery energy from waste as an alternative to disposal however some source separated materials (wood, asphalt shingles) could potentially find better use in these markets through private facilities involved in wood waste management or other energy-intensive industries. The region will look for opportunities and partners to manage select materials with thermal treatment (such as clean wood in co-gen facilities) and if a partnership is advantageous to the region will make waste materials available for alternative management.

Actions	Estimated Capital Cost	Estimated Operating Cost
Partner to identify alternatives to disposal.	-	Current Staff

2.2.5 Option E: Manage small closed landfills according to ministry requirements.

There are 21 closed landfills in the RDBN. Seven of these facilities are used as transfer stations and one became the Knockholt Landfill. As directed by the Ministry, facilities with the potential to impact receptors have environmental monitoring programs to assess trends in groundwater, and in some cases surface water quality. The RDBN is currently engaging Ministry staff to confirm closure of the facilities and assess the potential to abandon previous permits for these historical facilities. No additional costs related to management and final closure of historical landfills have been identified in the plan.

Actions	Estimated Capital Cost	Estimated Operating Cost
Manage small closed landfills according to ministry requirements.	-	Current Staff

3.0 FINANCIAL IMPLICATIONS

The proposed options to increase reduction and diversion and improve residual management discussed above will have an impact on the current RDBN Financial Plan. Section 3.1 provides an overview of the current 2018-2022 Financial Plan and staff establishment to provide a baseline for assessing financial implications. Section 3.2 provides a summary of the costs of the proposed diversion and residual management options and their impact on the current Financial Plan as well as recommendations for changes to the staff establishment.

3.1 Current Financial Plan and Staff Establishment

The solid waste management system in the RBDN is primarily funded through taxation with approximately 60% of average annual revenue coming from taxes. Tipping fees account for approximately 5% of average annual revenue. Based on the region's budget, a tax rate is established and applied based on assessed property value. Table 3-1 summarizes the RDBN's projected budget as identified in the five-year financial plan through 2022. RDBN's main solid waste expenses are administration (41%) transfer station operations (31%) and landfill operations (12%) which comprise almost 85% of average annual expenditures. Recycling expenditures represent roughly 10% and are directed to funding for re-use sheds, subsidies to local recycling organizations and the provision of recycling services at facilities. Contributions to reserves and landfill closure and post-closure costs represent 4% and 2% respectively.

Table 3-1: Existing Five-Year Financial Plan (Approved in 2018)

	2018	2019	2020	2021	2022
REVENUE					
Taxation	$3,144,752	$3,383,962	$3,428,064	$3,008,737	$3,011,903
Recycling	$240,000	$140,000	$140,000	$140,000	$140,000
Tipping Fees	$206,000	$206,000	$206,000	$206,000	$206,000
Transfer from Reserves	$1,043,700	$783,700	$741,700	$693,700	$693,700
Prior Year's Surplus	$1,171,798	$ -	$ -	$ -	$ -
Grants	$390,395	$390,395	$390,395	$390,395	$390,395
Other	$95,000	$5,000	$220,000	$5,000	$5,000
TOTAL REVENUE	**$6,291,645**	**$4,909,057**	**$5,126,159**	**$4,443,832**	**$4,446,998**
EXPENDITURES					
Operating Expenditures					
Administration	$2,249,988	$1,764,351	$1,776,830	$1,382,498	$1,393,608
Transfer Station Ops	$1,683,821	$1,658,334	$1,681,933	$1,704,256	$1,726,842
Landfill Ops	$663,943	$651,618	$664,645	$667,328	$680,668
Recycling	$525,959	$417,944	$417,944	$417,944	$417,944
Contribution to Reserves	$239,233	$159,233	$159,233	$169,233	$169,233
Post-Closure	$93,700	$93,700	$43,700	$43,700	$43,700
Closure	$30,000	$15,000	$15,000	$15,000	$15,000
Total Annual Operating Expenditures	**$5,486,644**	**$4,760,180**	**$4,759,285**	**$4,399,959**	**$4,446,995**
Existing Capital Expenditures					
Capital Expenditures	$805,000	$105,000	$323,000	$ -	$ -
Total Annual Capital Expenditures	**$805,000**	**$105,000**	**$323,000**	**$ -**	**$ -**
TOTAL EXPENDITURES	**$6,291,644**	**$4,865,180**	**$5,082,285**	**$4,399,959**	**$4,446,995**

Staffing costs (Administration) cover a full-time Director of Environmental Services, Deputy Director of Environmental Services, Environmental Services Assistant, and Environmental Services Operations Supervisor. Operations/Field Staff for regional waste hauling, landfill attendants, transfer station attendants, and reuse shed attendants are covered under facility operations costs. The staff structure is shown in Figure 3-1 below.

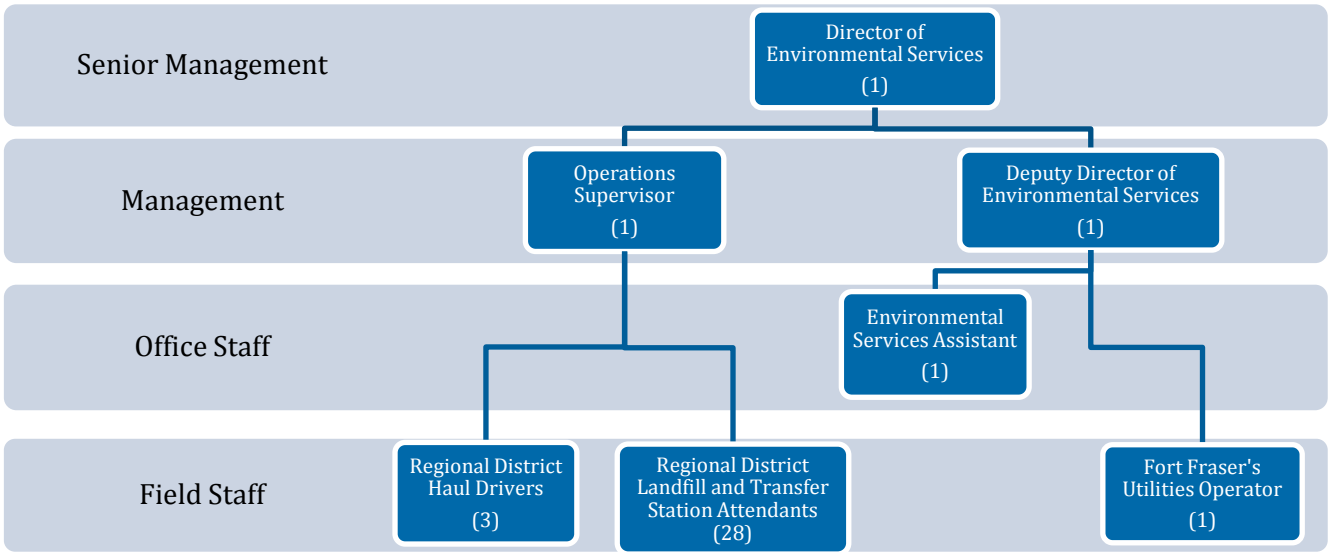


Figure 3-1: Current Staffing Structure

The Director of Environmental Services is responsible for updating and implementation of the Regional District's Solid Waste Management Plan and overseeing the operations and capital infrastructure works of the Environmental Services, Fort Fraser Water and Sewer, and Liquid Waste Functions. The Director of Environmental Services is also responsible for overseeing the RDBN Invasive Plant (Weed) function and participating in the Occupational Health and Safety Program.

The Deputy Director of Environmental Services is responsible for contract administration, managing RDBN's landfill leachate collection and treatment systems, conducting environmental monitoring, overseeing proper operation of sewer and water systems, report preparation, providing information to the public, and overseeing RDBN's invasive plant program. The Deputy Director of Environmental Services is also responsible for assisting with the implementation of the SWMP.

The Environmental Services Operations Supervisor is responsible for the supervision and to assist in the operations of all RDBN landfills, transfer stations and waste hauling services. The Supervisor will also be called upon to assist other Environmental Services staff in performing required tasks.

The Environmental Services Assistant is a primarily clerical position responsible for assisting in the development and implementation of waste reduction initiatives, public education programs, sustainability initiatives including the RDBN's Corporate Energy and Emissions Plan, report preparation, maintaining and developing databases and other clerical duties.

Prior to 2018, an Operations Foreman reported to an Environmental Services Manager of Operations for a total of five senior management, management, and office staff in the region. This position was absorbed into the Operations Supervisor role following changes in staff in 2017. The Environmental Services department elected to continue with four full-time office, management, and senior management staff through the SWMP update process to better assess the future needs of the department before hiring an additional staff member.

3.2 Summary of Proposed Costs

The cost of the proposed options and additional staffing required to support future programs are summarized in Table 5.

Table 3-2: Summary of Financial Implications of Proposed Options

	2018	2019	2020	2021	2022
Revenues					
CURRENT TOTAL OPERATING REVENUE	**$6,291,645**	**$4,909,057**	**$5,126,159**	**$4,443,832**	**$4,446,998**
EXISTING Expenses					
Operating Expenses	$5,486,644	$4,760,180	$4,759,285	$4,399,959	$4,446,995
Capital Expenses	$805,000	$105,000	$323,000	-	-
CURRENT TOTAL EXPENSES	**$6,291,644**	**$4,865,180**	**$5,082,285**	**$4,399,959**	**$4,446,995**
PROPOSED Operating Expenses					
DIVERSION					
Option 2: Expand Residential Recycling (excluding capital, including tonnage revenue)	-$13,200	$33,000	$34,700	$34,700	$34,700
Option 3: Increase ICI Recycling	$3,000	$8,500	$8,500	$8,500	$8,500
Option 4: Increase Organic Waste Diversion	$2,500	$2,500	$2,500	$98,192	$98,192
Option 9: Promotion and Education (Recycle BC education and administration top-ups)	-$19,300	-$27,100	-$41,800	-$41,800	-$41,800
DISPOSAL					
Option A: Continue facility operation and upgrades as needed.	-	$11,000	$35,000	$11,000	$35,000
Additional Staffing Costs		$90,000	$90,000	$90,000	$90,000
Proposed Implication to Operating Expenses	**-$27,000**	**$117,900**	**$128,900**	**$200,592**	**$224,592**
PROPOSED Capital Expenditures					
DIVERSION					
Option 2: Expand Residential Recycling (capital)	$55,000.00	$45,000.00	$60,000.00		
Option 4: Increase Organic Waste Diversion (capital)	-	-	-	$515,000	
DISPOSAL					
Option A: Continue facility operation and upgrades as needed.					
Proposed Implication to Capital Expenses	**$55,000**	**$45,000**	**$60,000**	**$515,000**	**$-**
PROPOSED Operating and Capital EXPENSES	**$28,000**	**$162,900**	**$188,900**	**$715,592**	**$224,592**
TOTAL EXPENSES	**$6,319,644**	**$5,028,080**	**$5,271,185**	**$5,115,551**	**$4,671,587**
Budget Implications (Revenues-Expenses) *	**-$27,999**	**-$119,023**	**-$145,026**	**-$671,719**	**-$224,589**

* In budget implications a negative value indicates a budget deficit (net expense to the region).

Based on existing and proposed program needs a minimum 1 FTE is required to fill the vacant position in supporting ongoing and small proposed programs. Additional focus is required to plan and implement diversion programs which will require additional staff as the region take on a greater role in recycling and composting programs.

4.0 POLICY AND BYLAW OVERVIEW

Policies and bylaws define the “rules of the road” for how solid waste can be managed in the RDBN. They can also be applied to achieving many of the targets for increasing waste reduction and diversion identified so far in the SWMP update process. This section discusses the current cost recovery policy to fund the solid waste management function in the RDBN as well as the associated bylaws that implement this policy. The section ends with options to adjust the current cost recovery policy and amend the current regulation and tipping fee bylaw to support additional waste reduction and diversion in the RDBN.

4.1 Cost Recovery Policy

One of the most important aspects of a SWMP is financing, namely, what will the plan cost and how will costs be recovered. Given the potential cost increases associated with the options to increase reduction and diversion and improve residual management discussed in Section 3.2, it may be timely for the regional district to reconsider its cost recovery policy.

Over twenty years ago the original SWMP identified the following funding objectives:

- Waste management funding should include mechanisms for user-pay to encourage waste reduction but retain enough taxation for stability of funding.
- There should be a minimum level of service for all residents across the region.
- All tipping fees at waste management facilities across the region should be harmonized.

These objectives were used to evaluate various funding models for financing the 1996 Plan. The results of the evaluations showed that a regional approach would be the best method of apportioning the costs of the plan to the various municipalities and rural areas. This is currently the case for the RDBN solid waste management function.

With respect to cost recovery, the 1996 Plan considered two options: user-pay and taxation. The funding model adopted in the Plan was based on a user-pay system in conjunction with taxation according to the following principles:

- User-pay should be phased in gradually so that municipalities, residents, businesses and industries can adjust to the change.
- There must be alternatives (e.g. recycling, composting) in place in all areas of the regional district, which allow people the opportunity to reduce their waste stream before user-pay is fully implemented.
- User-pay should fund, at a minimum, all operating costs for waste transfer, landfill and recycling.

Based on implementation costs at the time ($2.8 million per year), the 1996 Plan included a funding formula based on taxation to fund administration costs and capital expenditures and user fees to pay for operations. The estimated split was 70% user fees and 30% taxation. While the plan implementation schedule showed user fees being implemented in 1998, an addendum to the 1996 Plan stated the regional district was prepared to implement a user-pay system as soon as was feasibly possible.

According to a consultant's report on tipping fees prepared for the RDBN in 2004, during 1998 and 1999, there were extensive consultations to review the implementation of the SWMP, especially the implementation of tipping fees. Because of these consultations, the implementation of tipping fees for residential and commercial garbage was deferred.

Instead, the RDBN adopted Bylaw 1109 in 1999 to implement tipping fees for the disposal of contaminated soils; Bylaw 1202 in 2001 to implement a service fee for the disposal of appliances containing Ozone Depleting Substances; and, Bylaw 1258 in 2003 to implement tipping fees for the disposal of construction, demolition and land clearing waste. These three bylaws were repealed and replaced by Solid Waste Management Facility Regulation and User Fee Bylaw 1764 in 2016. This bylaw will be discussed further in Section 4.2.

As discussed in Section 3.1 the current solid waste management system in the RBDN is primarily funded through taxation with approximately 60% of average annual revenue coming from taxes. User fees for the disposal of contaminated soil, appliances containing ozone depleting substances and construction, demolition and land clearing waste amount to $206,000 annually which represents approximately 5% of average annual revenue.

If the Board approves some or all the potential options discussed in Section 2, there will be a need to either increase taxes or recover a greater percentage of costs from user fees. The RDBN is one of only three regional districts in BC that do not charge weight or volume-based tipping fees for residential and commercial garbage. The other two regional districts, the Central Coast Regional District (CCRD) and the Regional District of East Kootenay (RDEK) do impose fees for construction and demolition waste and some controlled waste such that user fees represent 9% of revenue in the CCRD and 13% of revenue in the RDEK.

Other regional districts of a comparable size and population density recover a much higher percentage of their costs from user fees. For example, the North Coast Regional District obtains 80% of their revenue from user fees, the Regional District of Kitimat-Stikine recovers 33%, the Peace River Regional District recovers 38%, the Cariboo Regional District recovers 20% and the Thompson-Nicola Regional District (excluding the City of Kamloops) recovers 25%. These regional districts have successfully introduced weight and volume-based user fees for sites with and without scales. The RDBN could consider reviewing the cost recovery programs in these regional districts to assess whether a similar approach should be adopted in the Bulkley-Nechako region.

4.2 Solid Waste Bylaws

There are typically two types of bylaws that local governments adopt to manage solid waste: collection service bylaws and facility regulation bylaws. Collection service bylaws regulate the curbside collection of garbage, recyclables and organics from primarily single family residential customers, although in some cases curbside collection is also available to multi-family and ICI customers. Facility regulation bylaws apply to recycling and disposal facilities and establish regulations, conditions of use as well as user fees and penalties. Given that the RDBN does not provide any curbside collection services, this section will deal with the current facility regulation bylaw.

4.2.1 Solid Waste Management Facility Regulation and User Fee Bylaw

In 2016 the RDBN repealed Contaminated Soil Tipping Fee Bylaw No. 1109, 1999, Appliance Containing Ozone Depleting Substances Service Fee Bylaw No. 1202, 2001 and Construction/Demolition and Land Clearing Waste Regulation and Tipping Fee Bylaw No. 1258, 2003 with a consolidated Solid Waste Facility Regulation and User Fee Bylaw No. 1764. This bylaw applies to the RDBN's solid waste facilities consisting of three regional landfills and seven transfer stations. Table 6 provides an outline of the sections and schedules to this bylaw.

Table 4-1: Solid Waste Management Facility Regulation and User Fee Bylaw

Sections	Schedules	
Citation, Interpretation and Definitions,	Schedule A	RDBN Solid Waste Facilities
Schedules, Application, Exemptions	Schedule B	Prohibited Waste
Conditions of Use/Regulations	Schedule C	Regulated Recyclable Material
Violations and Penalties	Schedule D	User Fees
Inspection, Dispute Resolution, Repeal	Schedule E	Volume to Weight Material Conversion Factors

The bylaw defines biomedical waste, free liquids, hazardous waste, industrial waste, PCBs, waste on fire or smoldering, and regulated recyclable material as prohibited waste and states that no person shall deposit prohibited waste unless the acceptance of such waste is specifically authorized in writing by both the Regional District and the BC Government. Tires and corrugated cardboard are currently the only materials designated as regulated recyclable materials.

Table 7 provides an outline of the user fees for various waste types at the staffed RDBN solid waste facilities except Manson Creek which is unstaffed.

Table 4-2: User Fees at RDBN Facilities

Waste Type	User Fees	
	Landfill	**Transfer Station**
Household, Commercial, Institutional Waste	No Charge	No Charge
Yard Waste, Noxious Weeds, Wet Organic Waste	No Charge	No Charge
Auto Hulks, Scrap Metal	No Charge	No Charge
Mixed C/D, Concrete, Roofing/Asphalt Shingles – less than 2m3	No Charge	No Charge
Clean Wood Waste	No Charge	No Charge
Contaminated Wood Waste	No Charge	No Charge
Land Clearing Waste - less than 2m3	No Charge	No Charge
Dead Animals and Dead Stock Excluding Specified Risk Material (SRM)	No Charge	No Charge
Slaughter House Waste Excluding SRM	No Charge	No Charge
Mixed C/D, Concrete, Roofing/Asphalt Shingles – greater than 2m3	$90/tonne	Not Accepted
Bulky Waste - greater than 2m3	$90/tonne	Not Accepted
Land Clearing Debris - greater than 2m3	$90/tonne	Not Accepted
Asbestos	$90/tonne	Not Accepted
Contaminated Soil Characterized as CL/IL or ≤ CL/IL	No Charge	Not Accepted
Contaminated Soil ≥ CL/IL or ≤ Hazardous Waste	$18/tonne	Not Accepted
Specified Risk Material (SRM) – In Region	No Charge	Not Accepted
Specified Risk Material (SRM) – Out-of-Region	$100/tonne	Not Accepted
ODS Appliances (e.g. fridges, freezers/air conditioner/water coolers)	$20 per unit	$20 per unit

As indicated in Table 7, fees only apply to construction demolition and land clearing waste, contaminated soils, out-of-region specified risk material and appliances containing ozone depleting substances (ODS). With respect to construction, demolition and land clearing waste fees are only charges on loads that are greater than 2 cubic meters, which, as outlined in Schedule E, are loads arriving in vehicles that are larger than a filled pickup truck or passenger vehicle. In general, except for appliances containing ODS, fees are only charged at the Knockholt and Clearview Landfills which are equipped with scales. Therefore, user fees only represent roughly 5% of average annual revenue.

The lack of user fees minimizes financial incentive for residents, businesses and municipalities to divert rather than dispose of materials. Although many residents and businesses will recycle because it is the right thing to do, some will only respond to financial incentives. In regional districts that charge tipping fees for garbage, recyclable materials are usually accepted at no charge or for a reduced or variable fee. These policies encourage and support significant waste reduction and diversion. Also, regional districts that charge tipping fees typically apply a surcharge to loads that contain banned recyclable materials such as corrugated cardboard, scrap metal and yard waste. However, under the current RDBN cost recovery structure, although corrugated cardboard is prohibited from disposal as a regulated recyclable material, there is no financial penalty in the bylaw for including this material with regular waste.

As discussed in Section 4.1, some regional districts with similar populations, geographic characteristics and solid waste management facilities (attended, unattended, scaled and unscaled) are applying either weight-based or volume-based fees to increase cost recovery from users and provide more incentives for waste reduction and diversion. These systems are discussed in the next section.

4.3 Options to Increase Cost Recovery

As the cost of sustainable solid waste management increases, regional districts adjacent to the RDBN that previously recovered little or no revenue from user fees have adopted bylaws to apply user fees in varying degrees to increase this funding source. The following section provides information for the Regional District of Kitimat-Stikine, the Peace River Regional District, the Regional District of Fraser-Fort George, the Cariboo Regional District and the Thompson-Nicola Regional District.

Regional District of Kitimat-Stikine (Population 36,270)

The Regional District of Kitimat-Stikine adopted Kitimat-Stikine Terrace Area Waste Management Facility Regulation Amendment Bylaw No. 682 in 2016 to establish fees and regulations for depositing solid waste at the new Thornhill Transfer Station and Forceman Ridge Waste Management Facility which consists of a compost processing facility and lined landfill. As both these facilities are staffed and have weigh scales the tipping fee for garbage, construction and demolition waste, and land clearing waste is $110 per tonne for all users. The fee for metal is $55 per tonne and $99 per tonne for organic materials. The minimum charge for deposit of solid waste at the Thornhill Transfer Station or Forceman Ridge Waste Management Facility, regardless of quantity is $10.00. Cost recovery from user fees is roughly 33%.

Peace River Regional District (Population 62,231)

In the Peace River Regional District, Bylaw No. 2053 imposes fees for the disposal of solid waste at regional disposal facilities. The bylaw imposes weight-based fees for staffed facilities with scales and volume-based fees for staffed facilities without scales. The bylaw imposes a range of fees and other charges based on weight. The fee for 5 bags of garbage or less is $0.80 per bag after which the charge is $55.00 per tonne. There is also a minimum fee of $3.75 for all materials except for 5 bags of garbage or less.

For fees and charges based on volume, the Bylaw 2053 charges $0.80 per bag for eight garbage bags or less. A passenger car (containing bagged or non-bagged waste) is charged at $5.00, stations wagons, mini-vans and sport utility vehicles are charged at $7.00 with fees increasing based on the size of the vehicle. There is also a minimum fee of $3.75. Cost recovery from user fees is roughly 38%.

Regional District of Fraser-Fort George (Population 19,805 excluding City of Prince George)

The Regional District of Fraser-Fort George (RDFFG) operates 17 transfer stations and 3 landfills. RDFFG Municipal Solid Waste Tipping Fee and Site Regulation Bylaw No. 3023 2016 classifies each facility according to whether it is staffed, scaled, gated, full service, mid-level or basic. Staffed scaled landfills charge fees based on weight ($85/tonne with a minimum fee of $6.00 up to 100 kg), while staffed transfer stations without scales charge volume-based fees.

Volume-based fees are charged by load class with no charge applied to Load Class 1 (passenger and light truck vehicles up to 3 cubic metre capacity) and Load Class 2 (passenger and light truck vehicles towing utility trailers, up to 3 cubic metre capacity. Vehicle with greater than 3 cubic metre capacities are charged escalating fees starting at $62 for Class 3.

Volume based fees are also charged to municipal waste collected by the Villages of McBride and Valemount and deposited at the non-scaled McBride and Valemount Transfer Stations. The McBride collection vehicle is charged $105.00 per municipal collection and the Valemount vehicle is charged $73.00 per municipal collection. Cost recovery from user fees is roughly 50%.

Cariboo Regional District (Population 63,364)

The Cariboo Regional District (CRD) operates 14 landfills and 18 transfer stations throughout the region. The CRD updated their SWMP in 2013. Under the current Plan, costs for disposal of average amounts of residential waste are covered through taxation and not from tipping fees. However commercial waste and above-average/large loads of residential waste are charged tipping fees. CRD Fees and Charges Bylaw 4950 does not charge tipping fees for residential loads of 450 kg or less, however CRD staff advised that this will be reduced to 250 kg in 2019. Residential loads greater than 450 kg are charged at $53 per tonne at scaled facilities. Residential users at attended facilities without scales are not charged a volume-based fee, however commercial users with loads of wood and other CD waste at increasing fees based on the size of vehicle. Cost recovery from user fees is roughly 20%.

Thompson-Nicola Regional District (Population 46,106 excluding City of Kamloops)

The Thompson-Nicola Regional District (TNRD) operates 10 Eco-Depots, 18 transfer stations and 2 landfills. The City of Kamloops operates 3 landfills separate from the TNRD. As of 2009, region wide tipping fees were introduced to satisfy the user pay goal outlined in the 2008 SWMP. Tipping fees were initially paid on a per volume basis, weight-based fees have been in place at the region's 10 Eco-Depots as of 2013. TNRD Solid Waste Management Facilities Bylaw No. 2465, 2014 establishes weight-based and volume-based user fees that apply to all users, regardless of source (residential or commercial). For example, the weight-based charge for refuse is $80/tonne with a $1 minimum charge and the volume-based user fee is $10/$m^3$ with a $1 minimum charge or $1/bag. There are set rates applied to various vehicles depending on type and capacity. Cost recovery from user fees is roughly 25%

The range of user pay systems implemented by the regional districts described above can provide valuable insights to the RDBN with respect to recovering more costs from users. The updated SWMP should include a study to investigate these approaches in detail to determine their applicability to the RDBN. This is significant since increasing cost recovery from user fees will provide funding for increased waste reduction and diversion and improved residual waste management without raising taxes.

4.4 Support Expansion of EPR Programs

EPR is a provincial policy tool that aims to shift the responsibility for end-of-life management of products (physically and economically) to their manufacturer and retailers (called “producers”) and away from local governments. This policy is intended to, among other things, create an incentive for producers to include environmental considerations in design of products.

Regional districts can engage with the product stewards through facility agreements (collecting products for the stewards), program promotion, sharing knowledge and information, and stewardship plan consultation. The SWMP should reflect how the RDBN wants to share in the responsibility of managing products with and for the Stewards, including continuing to advocate for the expansion of product stewardship programs through Recycling Regulation enforcement and improvement: covering the full cost of program implementation; requiring an increased return for products in the program (i.e., from 75 to 100% especially for more established programs such as tires); and ensuring that program access is readily available in rural areas.

The Canadian Council for Ministers of the Environment (CCME) also continues to provide guideline updates for Canada-wide implementation of EPR programs. For example, products not yet in the BC Recycling Regulation that are recommended for Canada-wide EPR include carpet, textiles, and furniture. RDBN can continue to stay abreast of industry trends through conferences and annual updates as provided by the CCME and the BC Product Stewardship Council (BCPSC). There is also an opportunity to advocate for new programs through direct correspondence with the Ministry or through associations of which RDBN is a member (e.g., BCPSC). The management by the RDBN of materials such as mattresses, propane tanks and drywall through well managed programs presents an opportunity to justify the expansion of EPR to these materials.

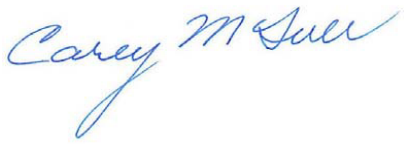
5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Regional District of Bulkley-Nechako and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Regional District of Bulkley-Nechako, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.



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Attachment (1): Tetra Tech's Limitations on the Use of this Document
Attachment (2): Table A: Five Year Operations and Capital Plan and Ten Year Capital Plan for Solid Waste in the Regional District of Bulkley-Nechako

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

Table A: Five Year Operations and Capital Plan and Ten Year Capital Plan for Solid Waste in the Regional District of Bulkley-Nechako

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
REVENUES											
CURRENT TOTAL OPERATING REVENUE	**$ 6,291,645**	**$ 4,909,057**	**$ 5,126,159**	**$ 4,443,832**	**$ 4,446,998**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
EXPENSES											
Existing Expenses											
Operating Expenses	$ 5,486,644	$ 4,760,180	$ 4,759,285	$ 4,399,959	$ 4,446,995	$ -	$ -	$ -	$ -	$ -	$ -
Capital Expenses	$ 805,000	$ 105,000	$ 323,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CURRENT TOTAL EXPENSES	**$ 6,291,644**	**$ 4,865,180**	**$ 5,082,285**	**$ 4,399,959**	**$ 4,446,995**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PROPOSED Total Operating Expenses	**$ (27,000)**	**$ 117,900**	**$ 128,900**	**$ 200,592**	**$ 224,592**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PROPOSED Capital Expenditures											
DIVERSION											
Option 2: Expand Residential Recycling (capital)	$ 55,000	$ 45,000	$ 60,000	$ -	$ -	$ 634,000	$ -	$ -	$ 634,000	$ -	$ 60,000
Option 4: Increase Organic Waste Diversion (capital)	$ -	$ -	$ -	$ 515,000	$ -	$ -	$ 476,000	$ -	$ -	$ -	$ 452,000
DISPOSAL											
Option A: Continue facility operation and upgrades as needed.	$ -	$ -	$ -	$ -	$ -	$ 482,000	$ 250,000	$ -	$ -	$ -	$ 704,000
PROPOSED Total Capital Expenses	**$ 55,000**	**$ 45,000**	**$ 60,000**	**$ 515,000**	**$ -**	**$ 1,116,000**	**$ 726,000**	**$ -**	**$ 634,000**	**$ -**	**$ 1,216,000**
PROPOSED OPERATING AND CAPITAL EXPENSES	**$ 28,000**	**$ 162,900**	**$ 188,900**	**$ 715,592**	**$ 224,592**	**$ 1,116,000**	**$ 726,000**	**$ -**	**$ 634,000**	**$ -**	**$ 1,216,000**
TOTAL EXPENSES	**$ 6,319,644**	**$ 5,028,080**	**$ 5,271,185**	**$ 5,115,551**	**$ 4,671,587**	**$ 1,116,000**	**$ 726,000**	**$ -**	**$ 634,000**	**$ -**	**$ 1,216,000**
Budget Implications* (Revenues-Expenses)	$ (27,999)	$ (119,023)	$ (145,026)	$ (671,719)	$ (224,589)	$ (1,116,000)	$ (726,000)	$ -	$ (634,000)	$ -	$ (1,216,000)

* In budget implications a negative value indicates a budget deficit (net expense to the region).

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APPENDIX B

REGIONAL SOLID WASTE PLAN MONITORING WORKING GROUP DRAFT TERMS OF REFERENCE

REGIONAL SOLID WASTE ADVISORY COMMITTEE (RSWAC)

TERMS OF REFERENCE

Background/Purpose: The Regional District of Bulkley Nechako (RDBN) is undertaking a review and update of the solid waste management plan (SWMP). Public and stakeholder consultation is integral to the review. In accordance with the Ministry of Environment's Guide for the Preparation of Regional Solid Waste Management Plans, a combined public and technical advisory committee will act as a working group for the region's interests and will provide sound advice to the RDBN Board of Directors for approval.

Scope: The scope of the RSWAC is to review the existing SWMP and provide input from a stakeholder and community perspective which will be considered as part of the SWMP update.

Roles and Responsibilities: The roles and responsibilities of the committee and its individual members include the following:

- Represent a balance of community interests;
- Act as advisors to the RDBN Board of Directors on the development of the SWMP update;
- Assist in reviewing current programs and identifying issues and opportunities;
- Act as a liaison between committee member's Council/Board and the RDBN; providing feedback from their Council/Board to the RDBN and increasing awareness of solid waste issues amongst their constituency;
- Review guiding principles and provide feedback for the SWMP update;
- Review information provided by the RDBN and its consultants and provide comments and suggestions as well as highlight information gaps to be considered for the SWMP update;
- Assist in developing and evaluating a variety of options and strategies for the SWMP update;
- Participate on smaller ad-hoc committees dealing with specific issues or tasks (as required);
- Contribute to programs and policies that are in the best interests of all residents of the RDBN, balancing both community and industry needs and technical requirements; and
- Participate in the public consultation phase through public meetings (as required).

Authority: The RSWAC makes recommendations on the proposed plan to the RDBN Board of Directors via the Waste Management Committee. The RDBN Board of Directors is the final decision-making authority.

Membership Composition: The committee shall consist of no more than 25 members representing a diversity of backgrounds, interests and geographical location. The committee will combine technical, political and community representation and will involve the RDBN, municipal and First Nation governments from the Bulkley-Nechako region. Membership shall include representation as follows.

Voting Members:

- District of Vanderhoof;
- Village of Fraser Lake;
- Village of Burns Lake;
- Town of Smithers;
- Village of Granisle;
- Lake Babine Nation;
- Cheslatta Carrier Nation;
- Takla First Nation;
- Saik'uz First Nation;
- Nak'azdli First Nation;
- Public Sector/Institutions (e.g., School District, Hospital);
- Waste Management Service providers;
- Agricultural Sector;
- General; and
- Public (rural and municipal).

The RSWAC will also include 3 non-voting technical advisors representing the RDBN. A consulting firm experienced in waste management planning will facilitate the planning process and serve as an advisor and resource to the committee.

Term and Time Commitment: The Committee will operate during the plan review process which is expected to be from January to June 2018. The Committee will be discontinued once the updated SWMP is approved by the RDBN Board of Directors for submission to the Minister of Environment. It is anticipated that there will be 5 to 6 meetings of the Committee during the planning process, with the provision for workshops and teleconferencing and webinars or other presentations at the discretion of the RDBN and the RSWAC. Committee members will be asked to review documents related to the review process on their own time. Following the adoption of the final SWMP the RDBN will be selecting a standing committee from the RSWAC that will meet annually to review the plan moving forward.

Appointments: Voting members shall be approved by the RDBN Board of Directors.

Chair: The RSWAC will elect a Chair for the RSWAC from among its voting members at the start of the first RSWAC meeting.

Quorum: Shall be a minimum of 50% plus one of the voting members.

Communications: Committee members are asked to be in attendance at all the meetings if possible. Any absentee members should notify Rory McKenzie at the RDBN about missing a meeting. Record of meeting minutes will be taken by assigned RDBN staff member and emailed out with meeting agendas to committee members prior to the next RSWAC meeting. Agendas and adopted meeting minutes will be posted on the RDBN website.

Conduct of Members at Meetings:

1. Committee members are expected to be respectful of one another and to offer input and suggestions that are relevant, constructive and productive.

a. Members should be committed to providing advice on developing recommendations.

b. Members will respect the ideas, concerns and opinions of others.

c. Everyone will have an opportunity to speak but only one person shall speak at a time as determined by the Chair.

2. Administrative matters related to the RSWAC will be conducted by the RDBN staff acting through the Chair.

3. For clarity, these terms of reference do not delegate any authority or corporate powers to the RSWAC.

APPENDIX C

PLAN DISPUTE RESOLUTION PROCEDURES

PLAN DISPUTE RESOLUTION PROCEDURES

The parties will make all reasonable efforts to attempt to resolve the dispute in an amicable manner without outside intervention. The Ministry of Environment does not become involved in resolving or making a decision in a dispute.

This dispute resolution procedure may apply to the following types of conflicts:

- Administrative decisions made by RDBN staff;
- Interpretation of a statement, bylaw, policy or provision in the plan;
- The manner in which the plan or facility Operational Certificates implemented; and
- Any other matter not related to a proposed change to the wording of the plan or Operational Certificate.

Collaborative Decision Making and Dispute Resolution Procedure

Negotiation	▪ Parties involved in the dispute make all efforts to resolve the dispute on their own. ▪ Parties may make use of a facilitator.
Regional Solid Waste Advisory Committee (if appropriate)	▪ Parties involved in the dispute will have opportunity to speak to the group. ▪ Group will review, consider and provide recommendations to the Board.
Board	▪ Parties involved in the dispute will have opportunity to speak to the Board. ▪ Board will receive recommendations from the Committee and settle the dispute; or, recommend mediation.
Mediation	▪ Parties involved in the dispute agree on a mediator. If the parties cannot agree on a mediator, the matter shall be referred to the BC Mediation Roster Society of equivalent roster organization for selection of a mediator. ▪ All efforts will be made to reach an agreement throughout mediation. ▪ Costs for mediation are shared by the parties in dispute.
Independent Arbitrator	▪ If the dispute cannot be resolved by a mediator, the matter will be referred to arbitration and the dispute will be arbitrated in accordance with the Local Government Act or BC Commercial Arbitration Act. ▪ The arbitrator shall make a final, binding decision. ▪ Costs for arbitration shall be apportioned at the discretion of the arbitrator.

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TETRA TECH

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ENVIRONMENTAL CONSULTANTS

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