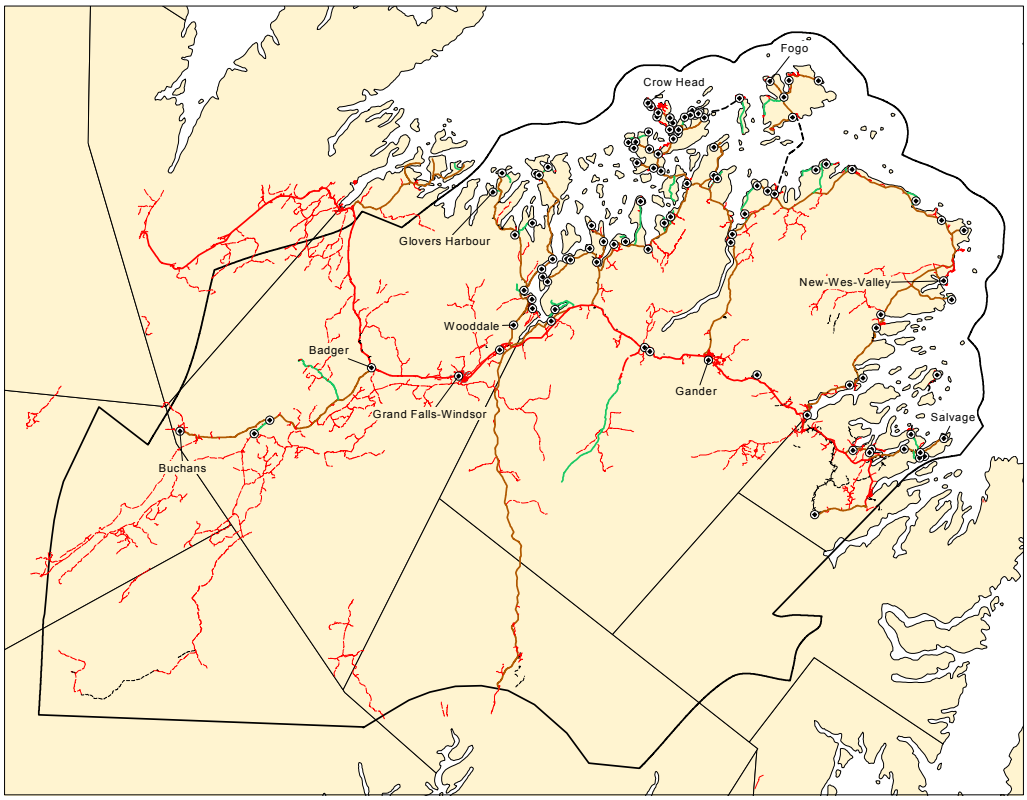
CENTRAL NEWFOUNDLAND SOLID WASTE MANAGEMENT PLAN

Executive Summary Report

Final Report Submitted to

Central Newfoundland Waste Management Committee

BNG PROJECT # 722021



BAE ◆ NEWPLAN GROUP

CENTRAL NEWFOUNDLAND
SOLID WASTE MANAGEMENT PLAN

Final Report
Solid Waste Management Plan
Executive Summary

Final Report Submitted to:

Central Newfoundland Waste Management Committee
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Project No.: 722021

Title: CENTRAL NEWFOUNDLAND SOLID WASTE MANAGEMENT PLAN

Final Report – Overview of Solid Waste Management Plan

Client: Central Newfoundland Waste Management Committee

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1.0 OVERVIEW

The Province of Newfoundland and Labrador has developed a comprehensive waste management strategy with a goal of 50% diversion of materials currently going to landfills by the year 2010. The strategy includes a reduction in the number of disposal sites, the elimination of open burning, and the phase out of obsolete technology, including unlined landfills.

In keeping with the goals of this strategy, the Central Newfoundland Waste Management Committee (CNWMC) has undertaken the task to oversee the development of a Waste Management System Plan for the Central Newfoundland Region. The study area encompasses a large area of the Central Region of Newfoundland from Buchans in the west, to Salvage in the east, north to, and including, Fogo Island. BAE-Newplan Group (BNG) was retained in March 2002 to assist the committee with the development of the plan. The CNWMC has a mandate to:

"Provide leadership in developing an environmentally responsible, comprehensive solid waste management system to meet the needs of the Central Newfoundland Region for present and future generations."

The Waste Management Plan has been developed using a very interactive process between BNG and the CNWMC following the Terms a Reference provided by CNWMC. The work was broken down into two phases. At the end of each phase, a draft report was presented to the CNWMC in a workshop forum and all information was discussed in detail. Decisions were then made by the CNWMC and directions given to BNG for the following phase. The main focus of each phase of the project is summarized below:

Phase I Report

- Determination of Study Area Boundary
- Waste Generation Rates and Population Projections
- Transportation and Technology
- Waste Generation for Central Newfoundland
- Analysis of Waste Management Systems
- Existing Disposal Site Evaluations
- Alternative Approached to Engineered Landfills
- Identification of Potential Local Waste Management Facility Locations

Phase II Report

- Identification of Potential Locations for the Regional Waste Management Facility
- Preferred Local Waste Management Facility System
- Materials Recovery Facility
- Compost Facility
- Household Hazardous Waste Depot
- Construction and Demolition Materials Facility
- Landfill Facility
- Cost Overview of the System
- Closure of Existing Landfill Facilities

2.0 WASTE GENERATION RATES AND POPULATION PROJECTIONS

2.1 WASTE GENERATION

For the purpose of determining accurate waste generation rates for the study area, the data collected by others has been supplemented with scale data from the Robin Hood Bay Sanitary Landfill and more recent scale data from the Harbour Grace incinerator site. No scale data was available for the Central Region. The rural estimated generation rate is based on the Jacques Whitford data, while the urban rate is based on the scale data from the Robin Hood Bay Sanitary Landfill. The assumed waste generation rates are 1.30 kg/person/day in rural areas and 2.51 kg/person/day in urban areas. Utilizing these waste generation rates and the population data from the Statistics Canada 2001 Census, the estimated waste generation for the study area was calculated and is presented in Table 2-1.

Table 2-1: Projected Annual Generation of Solid Waste for Central Newfoundland.

		Waste Generation (tonnes/year)	
Type of Community	Population	Residential	IC&I
Urban	22,991	7161	13,902
Rural	52,564	18,562	6,865
Total:	75,555	25,723	20,767

Total waste generated in the region is estimated to be 46,490 tonnes per year with 55% being residential and 45% industrial, commercial, and institutional (IC&I).

2.2 POPULATION PROJECTION

The current population in the study area, based on the 2001 Census data provided by Statistics Canada, is 75,555. The estimated population projection for 50 years is a 6.1% decrease for the region. This 6.1% decrease is considered to be the most conservative number of the three population projection scenarios. Table 2-2 illustrates the population projections for the study area.

Table 2-2: Population Changes in 50 Years – High, Medium and Low Scenarios.

Scenario	Central Region	Province
High	-6.1%	2.4%
Medium	-11.4%	-3.8%
Low	-27.1%	-22.9%

Based on the high scenario population decrease of 6.1% in the study area, BNG developed a waste generation projection over the next 50 years. The 50-year waste generation projection summary is provided in Table 2-3. The table presents 50% and 60% waste diversion scenarios and provides total tonnage expected to be landfilled after 50 years for each of these scenarios.

Table 2-3: 50-Year Waste Generation Projection Summary (6.1% decrease).

	Total Waste Generated (Tonnes)	50% Diversion		60% Diversion	
		Landfill (Tonnes)	Diverted (Tonnes)	Landfill (Tonnes)	Diverted (Tonnes)
Base Year	46,490				
Year 1	46,348	23,174	23,174	18,539	27,809
Year 50	43,574	21,787	21,787	17,430	26,144
Cumulative Total	**2,321,677**	**1,160,838.5**	**1,160,838.5**	**928,671**	**1,393,006**

3.0 TRANSPORTATION AND TECHNOLOGY

The Phase I Report provides a review of comparable waste management systems; a description of collection, haulage, transfer station alternatives; and land requirements for a waste management facility. The report also provides a description of a centralized compost facility, material recovery facility, hazardous waste depot, construction and demolition debris recovery facility, and engineered landfill.

3.1 REVIEW OF COMPARABLE WASTE MANAGEMENT SYSTEMS

There are many options available for managing municipal solid waste. The costs of operating the systems can vary significantly, depending on a wide range of factors such as:

- the collection of the wastes;
- the techniques and technologies used to process the wastes;
- waste composition;
- waste management promotion and public education;
- the local culture;
- the local economy; and
- the market demand for recovered waste.

The study team reviewed the following waste management systems during Phase I of the Solid Waste Management Plan:

- Recyclable Drop-off Centres;
- Single Stream or Mixed Waste Collection;
- Wet-Dry Collection;
- Three or Four Stream Waste Collection;
- Combined Waste Collection;
- Waste Minimization;
- Backyard Composting;
- Grasscycling;
- Leaf Mulching;
- Municipal Composting;
- Composting Methods; and
- Recyclables Processing

The review of comparable waste management systems provided information on diversion rates and typical costs per tonne of solid waste.

3.2 DESCRIPTION OF COLLECTION, HAULAGE, AND TRANSFER STATION ALTERNATIVES

3.2.1 Municipal Solid Waste Collection and Transportation - Issues and Options

This section of the report provided an overview of several key issues related to solid waste collection and transportation. The purpose of the overview was to provide information required to select an overall collection system. Key issues include:

- Collection of source separated materials,
- Volume Limitations,
- Single Side vs. Two Side Pick-up,
- Private Road Collection,
- Pick-up Frequency,
- Special Collection Days,
- Automated Collection, and
- Collection Zones/Distance to Off-loading.

3.2.2 Transportation Analysis

Transportation is a fundamental component of the waste management system. Transportation will influence the location of infrastructure, levels of service, and overall cost of the waste management system. The transportation road network in the Central Newfoundland Region was prepared based on the 1:50,000 scale topographic maps, and highway information from provincial Department of Works, Services, and Transportation. The road was classified into six different categories regarding traveling speed of Hauler:

1. Trans Canada Highway, average speed – 90 km/hr.
2. Other major highway, average speed – 90 km/hr.
3. Secondary highway, average speed – 70 km/hr.
4. Other secondary highway, average speed – 60 km/hr.
5. Road, average speed – 50 km/hr.
6. Community access road, average speed – 45 km/hr

The road network is shown in Figure 3-1 on the following page.

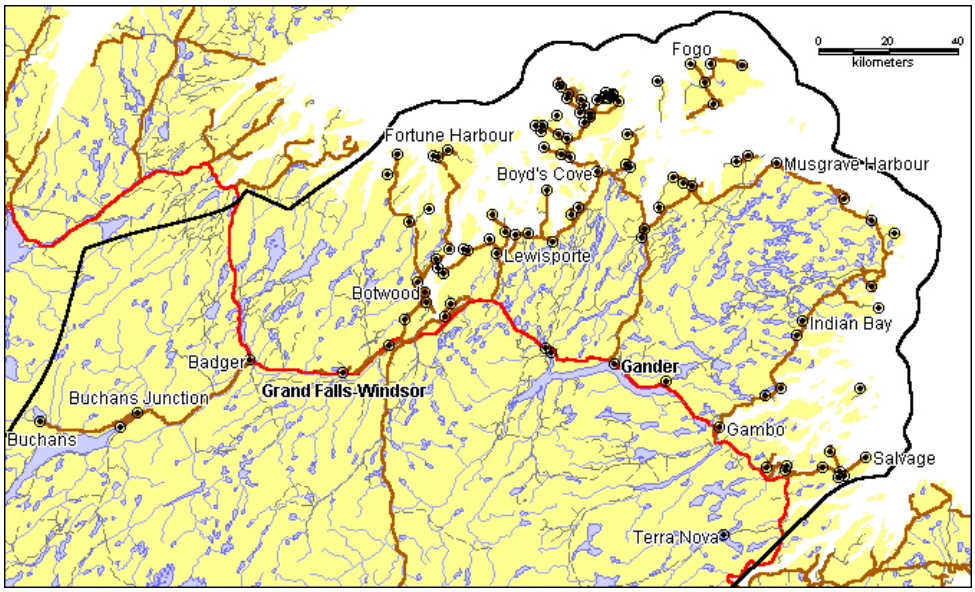


Figure 3-1: Road Network for the Central Newfoundland Region.

Based on the transportation road network and the waste generation data, the waste generation centroid was determined for the study area. The waste generation centroid by road distance is defined as a point of which the waste tonnage-distances from both sides of it are the same. The transportation section calculated the centroid of waste generation for the region as being located just east of Lewisporte Junction.

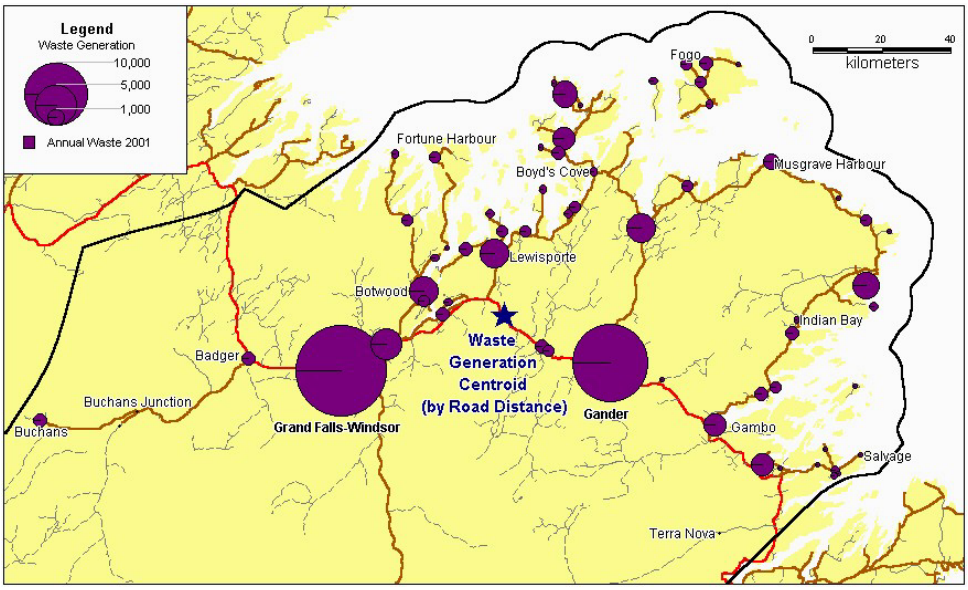


Figure 3-2: Waste Generation Distribution and Centroid.

3.2.3 Local Waste Management Facilities

In order to ensure a Waste Management System that is convenient for all communities, regardless of distance from the regional facility, it was determined that it would be necessary to use Local Waste Management Facilities (LWMFs), also known as waste transfer stations.

LWMFs are centralized facilities where waste is unloaded from several collection vehicles into a large transfer trailer or box. The primary reason for establishing a LWMF is to economize on haul costs. One transfer trailer can haul as much as three to five waste collection (packer) trucks or as much as 40 pickup loads. LWMFs can also serve as collection points for recyclable materials, special wastes, and household hazardous wastes. There are many different methods and combinations of methods for solid waste transfer.

Ideally, a LWMF should be sited as close as possible to the centroid of the population served in order to minimize collection costs, or some distance along the haul route to the landfill. The LWMF should be sited and operated so as to create no environmental or health hazard, and no nuisance. LWMF sitting guidelines were provided in this section.

Common types of LWMFs include:

- direct dumping to trailers;
- tipping floor dumping;
- pit dumping;
- compactor;
- roll-off box;
- drop-off box stations; and
- dedicated truck.

As part of the transportation analysis, the project team developed four scenarios to illustrate potential locations for LWMFs throughout the Central Newfoundland Region. The rationale behind the selection of the transfer station locations was provided and limitations for each scenario were noted. The annual transportation cost for each scenario was also calculated and presented to the CNWMC. The locations of the transfer stations for each scenario were as follows:

- **Scenario One (5 LWMFs and 1 RWMF)**
  LWMFs: Grand Falls- Windsor, Gambo, Botwood, Boyd's Cove, and Fogo Island.
  RWMF: Norris Arm North.

- **Scenario Two (5 LWMFs and 1 RWMF)**
  LWMFs: Buchan's Junction, Gambo, Botwood, Boyd's Cove, and Fogo Island.
  RWMF: Norris Arm North

- **Scenario Three (5 LWMFs and 1 RWMF)**
  LWMFs: Buchan's Junction, Norris Arm North, Gander, Boyd's Cove, and Fogo Island.
  RWMF: Grand Falls – Windsor

- **Scenario Four (7 LWMFs and 1 RWMF)**
  LWMFs: Buchan's Junction, Point Leamington, Virgin's Arm Carter's Cove, Gander Bay South, Indian Bay, Terra Nova Regional, and Fogo Island.
  RWMF: Norris Arm North.

4.0 ANALYSIS OF THE WASTE MANAGEMENT SYSTEM

The Phase I Report describes in detail waste management system alternatives, alternative approaches to an engineered landfill, potential locations for LWMFs, and potential locations for a Regional Waste Management Facility (RWMF). The analysis of the waste management system resulted in the wet/dry system (two stream) being preferred by the CNWMC. The wet/dry system can obtain the required 50% diversion rate to meet the provincial waste management strategy and it has the lowest overall cost. It also has the advantage of being easier to use (two bags) and requires less change of behaviour for the user. Both waste streams are also collected each week, thus reducing odour and pest problems with storage of organic waste. Existing collection vehicles can also be easier utilized with a wet/dry system than a three or four stream system. In the future, if higher diversion rates are required, the system can be easily upgraded.

4.1 ALTERNATIVE APPROACHES TO ENGINEERED LANDFILL

In the alternative approaches to landfill section, various methods of daily cover were presented. Alternate daily covers, such as spray foams and synthetic covers, would not be practical for our climate and site exposure. Other than using fill material obtained from the site for cover, the only other feasible alternative was balefill, whereby the waste itself is compacted into large bales that are stacked in the landfill cell. The costs for balefill were higher than using fill from site.

4.2 IDENTIFICATION OF POTENTIAL LOCATIONS FOR LWMFS

The number and locations of LWMFs were selected to provide equal access to the waste management system for all towns within the study area. All residents will have access to either the RWMF or a LWMF within a reasonable travel time. It was also determined during the transportation analysis that seven LWMFs would reduce overall transportation costs. It is proposed to locate the LWMFs at existing disposal sites to reduce site development costs and impact on existing collection systems. Each LWMF will have a public drop-off area, HHW Depot, C&D storage area and landfill, bulk waste storage, and weigh scales. However, the size of the facility and the type of building will vary depending on the volume of waste handled by the facility. See Figure 4-1 for the concept design of a typical LMWF.

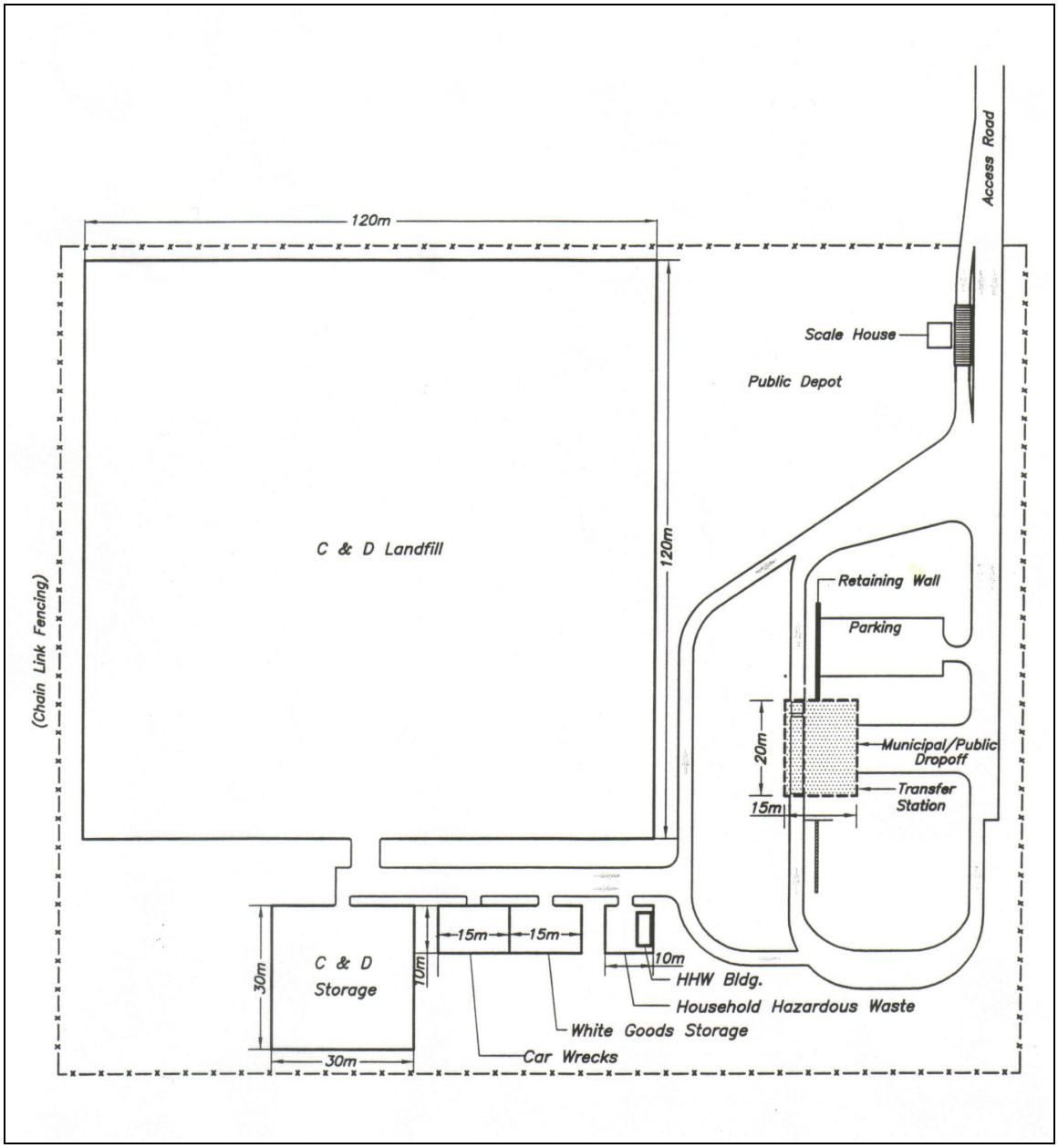


Figure 4-1: Typical LWMF (Transfer Station)

All LWMFs will utilize 16.1 m trailers for haulage to the RWMF. These units are more cost effective than the smaller roll on / roll off bins due to larger volumes. This is especially important for the low-density dry waste.

The assessment of the collection and transportation requirements of the new system has resulted in selecting a collection and local waste management facility system that includes the following locations:

- Buchan's Junction Waste Management Facility (524 tonnes / year)
- Point Leamington Waste Management Facility (1,282 tonnes / year)
- Virgin Arm – Carter's Cove Waste Management Facility (3,638 tonnes / year)
- Fogo Island Waste Management Facility (1,429 tonnes / year)
- Gander Bay Waste Management Facility (2,727 tonnes / year)
- Indian Bay Waste Management Facility (3,396 tonnes / year)
- Terra Nova Regional Waste Management Facility (3,040 tonnes / year)

Locations of the LWMF are provided in Figure 4-2.

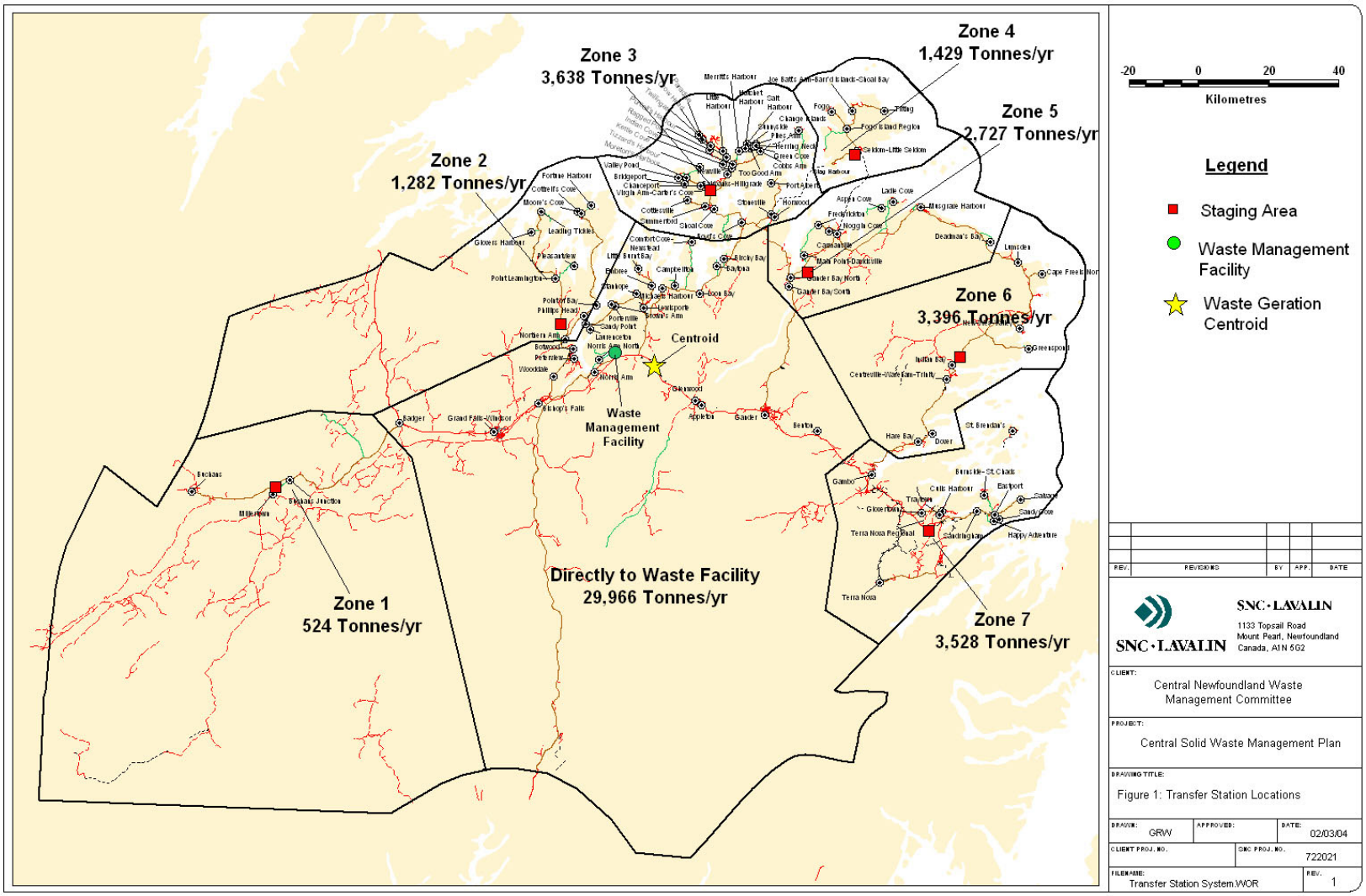


Figure 4-2: Proposed Local Waste Management Facility Locations for Central Newfoundland.

4.3 IDENTIFICATION OF LOCATIONS FOR THE REGIONAL WASTE MANAGEMENT FACILITY

The Phase I and II Reports describe the process used to select the preferred Regional Waste Management Facility (RWMF) site. The process involves a phased assessment of site suitability:

- Phase I - Preliminary Identification (Constraint Mapping)
- Phase II - Site Screening (Ranking)
- Phase III - Financial Investigation
- Phase IV - Detailed Investigation

4.3.1 Phase I - Preliminary Identification (Constraint Mapping)

Considerable information has already been compiled for this area. The GIS base map information for physical constraints had been prepared for the study area and the project team upgraded the population database with 2001 census information and roadway classifications. The regulatory constraint criteria are well understood and have been applied to the base maps.

The site selection process applied regulatory and community based constraints to a GIS model. Topographic maps (1:50,000) and the Department of Government Services and Lands provincial Land Use Atlas were used in conjunction with site selection criteria and constraints. Each constraint and criterion was layered on a base map in the GIS model. A GIS map consists of several superimposed layers (i.e. a road network overlaid on a landmass). In an effort to site the proposed waste management facility, information and mapping were gathered from several government departments. These included:

- Government Services and Lands – Land Use Atlas
- Crown Lands – Cadastral mapping for each proposed site
- Department of Tourism, Culture, and Recreation
- Department of Forest Resources and Agrifoods
- Department of Government Services and Lands
- Department of Works, Services, and Transportation

The following constraints developed by the Government Departments were followed:

- The site should be located 150 meters from the nearest water body or watercourse. Bodies of standing water located in wetlands were not considered as part of this constraint;
- Site location should be located 300 m from the nearest public road and screened from view. Where possible, there should be a tree screen of 120 m or more maintained between the site and the road;
- Site location should not be closer than 1.6 km from the nearest residences or other structure where individuals work or are lodged 24 hours a day;
- Site should not be located within 2 km of an airport;
- Site should not be closer than 1 km from residential wells that are used as a drinking water supply. It was assumed that all residential wells would be within the 1.6 km residential buffer zone;
- Site should not be within 1 km of all Municipal/Provincial/Federal parks. This included sanctuaries, protected areas, and wildlife reserves;
- Site should not be located within an existing (or proposed) municipal water supply watershed area;
- Site should not be located within 1 km of the coastline;
- The site should be located 1 km from native land claims. There are no native land claims located in the Central Newfoundland Region; and
- Site should avoid endangered species habitat. It was assumed that endangered species habitat would be included in the parks buffer zone.

The following constraints developed by CNWMC were also followed:

- The site shall be located within 1 hour drive of the Regional centroid;
- Site should not be located on land that has a slope greater than 12%;
- Site should have a 2 m – 3 m soil cover to act as cover material for the landfill facility; and
- Site shall be located in close proximity to electrical service.

Based on the above constraints and opportunity criteria, the following map was generated (Figure 4-3).

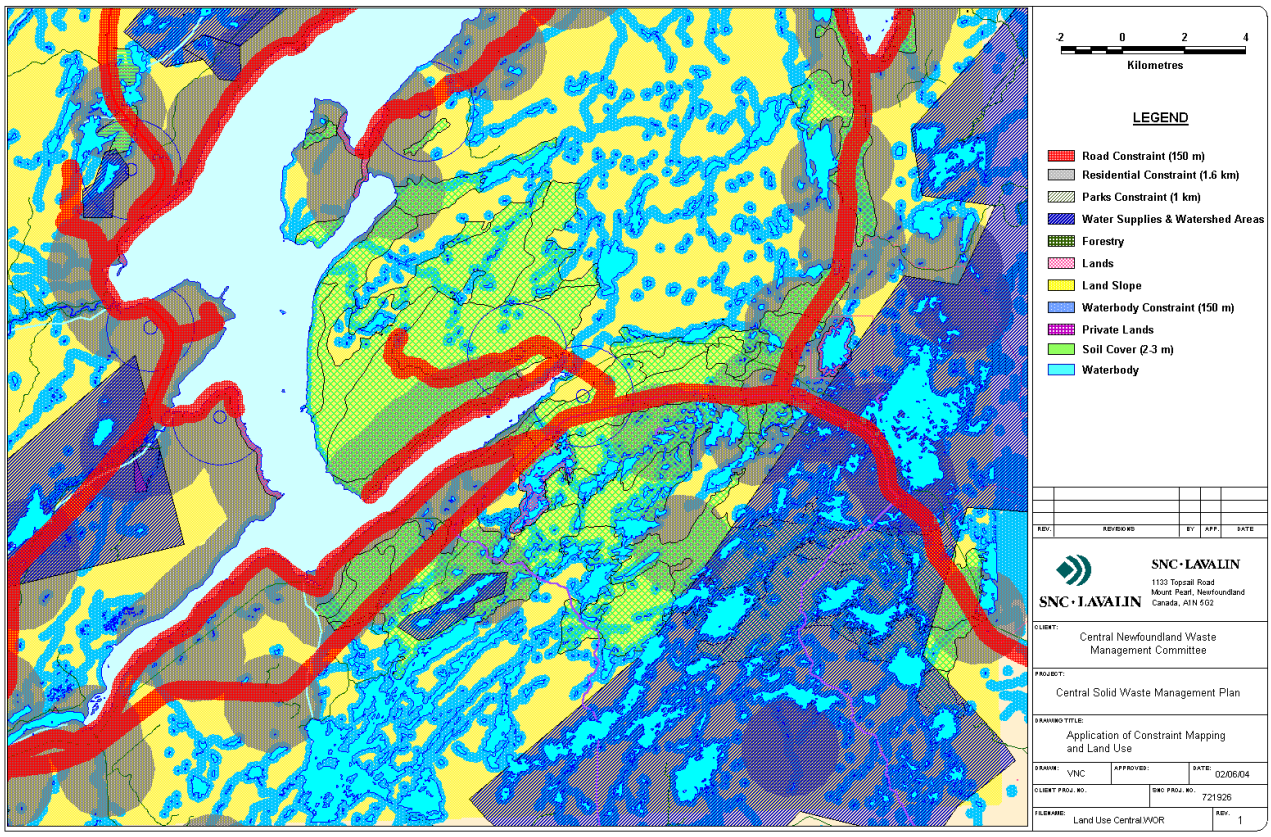


Figure 4-3: Application of Constraint Mapping, Land Use, and Opportunity Criteria.

Locations that fell within the constraint areas were excluded form the site selection process. Also, only areas that fell within the opportunity criteria were considered as suitable sites for the waste management facility. This process identified five possible locations where the waste management facility could be located. Figure 4-4 highlights these locations.

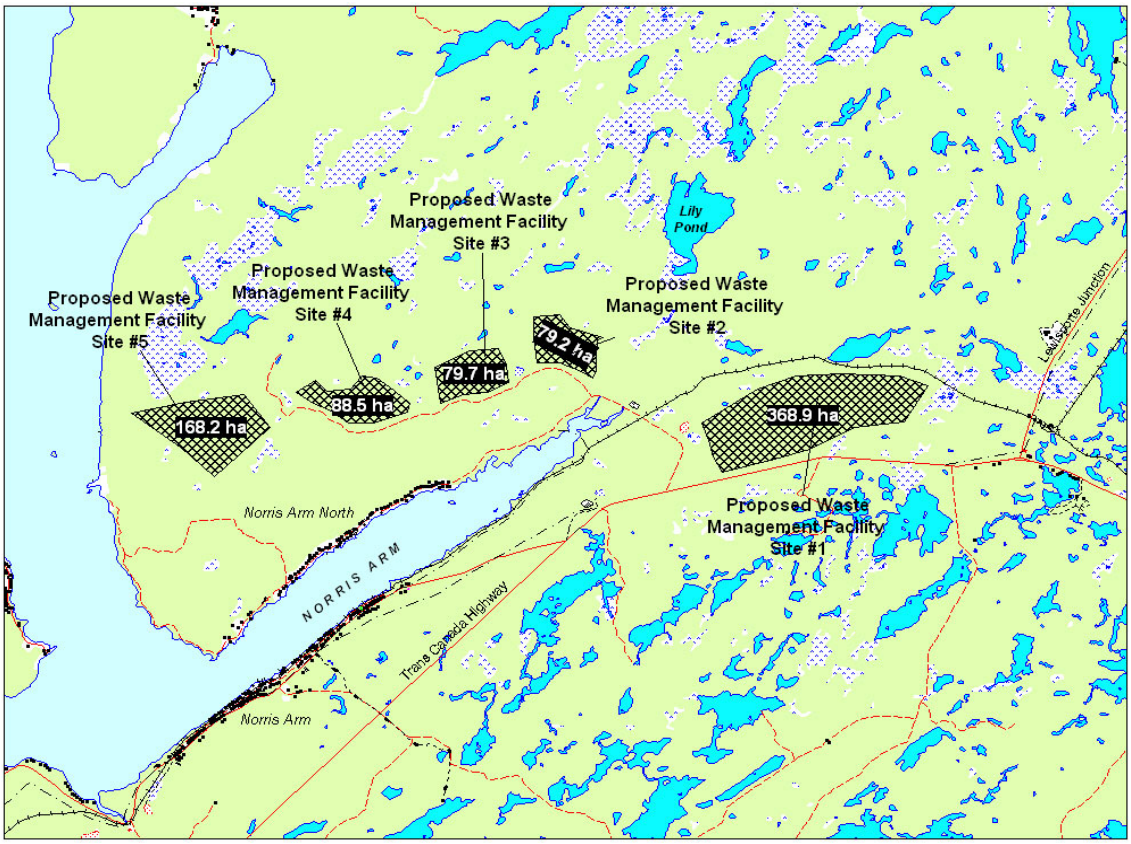


Figure 4-4: Five Proposed Waste Management Facility Locations.

4.3.2 Phase II - Site Screening (Ranking)

A site screening process, developed and used by BAE-Newplan Group (BNG) in 1996, was used to rank the remaining five sites in order of suitability. A comprehensive set of evaluation criteria had been developed for the site screening process. Following the identification of the five potential sites for the RWMF, an assessment to rank each location was undertaken. In addition to physical parameters, the ranking system considered the potential impact of a deficiency in the landfill system; for example, impact on water resources. The objective of this phase was to identify, in order of priority, several preferred sites. Each of the site evaluation factors was assigned a weight based on a scale of 1 to 10. This weight reflects the relative importance of the factor in the development of the site for waste disposal. Each site factor was also designated with a range of scores based on a scale of 1 to 10. Results of the preliminary site screening (ranking) are provided in Table 4-1.

Table 4-1: Preliminary Site Screening of Potential Landfill Sites.

	Factors	Weight	Site 1		Site 2		Site 3		Site 4		Site 5	
			Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Related to Public Acceptability and Aesthetics												
1	Visibility	6	5	30	1	6	4	24	3	18	2	12
2	Forest Coverage	3	3	9	2	6	2	6	3	9	2	6
3	Exposure	5	7	35	8	40	8	40	8	40	8	40
4	Prevailing Winds	3	10	30	10	30	10	30	10	30	10	30
5	Conflicting Land Use	4	10	40	10	40	5	20	5	20	10	40
6	End Use Potential	2	1	2	1	2	1	2	1	2	1	2
Related to Cost of Development, Operations and Long Term Site Flexibility												
7	Haul Distance	8	10	80	8	64	6	48	4	32	2	16
8	Site Access	6	10	60	10	60	6	36	4	24	2	12
9	Cover Material	10	5	50	5	50	5	50	5	50	5	50
10	Life Expectancy	10	10	100	9	90	9	90	8	80	8	80
11	Land Ownership	8	10	80	10	80	10	80	10	80	10	80
12	Fire Protection	4	5	20	4	16	7	28	5	20	5	20
13	Slope	10	10	100	10	100	10	100	10	100	10	100
14	Drainage	10	10	100	5	50	4	40	10	100	8	80
	TOTAL SCORES			736		634		594		605		568
	SITE RANKING		1		2		4		3		5	

Example: Evaluation of Site 3 for haul distance indicates a score of 10 on a scale of 1 to 10. Since haul distance was assigned a weight of 8 on a scale of 1 to 10, the weighted score of the Site 3 for haul distance is 10 x 8=80. The weighted score for each factor is added to obtain the total weighted score for each site.

4.3.3 Phase 3 – Preliminary Financial Investigation

Based on the results of the preliminary site ranking, it was recommended that proposed Sites 1, 2, and 4 warrant a detailed financial investigation to determine which sites are most cost effective. The objective of this phase is to identify the two most feasible sites for the location of the waste management facility.

Following the identification of the three potential sites, an assessment to rank the feasibility of each location was undertaken. The financial ranking system considered such criteria as the costs associated with the construction of the access road, stream crossings, drainage diversion, connecting site to three-phased power and telephone lines, pump house and waterlines required for fire protection, and etc. Infrastructure costs associated with the construction of the landfill cells, public drop-off areas, composting facility, materials recovery facility and etc. were not included as part of the financial investigation. These costs were considered to be equal for all three proposed sites.

Results of the preliminary financial investigation revealed that Site 1 was ranked highest and Site 2 was ranked second highest.

4.3.4 Phase 4 – Detailed Investigation

Based on the results of the site screening, ranking, and preliminary financial investigation, Site 1 was selected by the study team and the CNWMC for further detailed investigations. The investigation included a multi-discipline investigation of the site. The objective of the investigation was to augment the data generated at the site screening stage of the study, and to collect sufficient additional data to allow a feasibility assessment the site. The objective of the detailed investigations will be to identify any physical or ecological factors that may preclude the site from further consideration and support the selection of a preferred site. The components of the investigation are listed below:

- Site Development Concept;
- Land Use Conflicts;
- Archaeological
- Biological Screening;
- Receiving Water;
- Geotechnical; and
- Hydrogeology.

The detailed investigation also included the confirmation of information collected during the site screening and ranking phase, and review of further information gathered from published sources on regional characteristics. Discussion with municipal and provincial representatives provided information on site development issues and land-use. Other information was collected from mapping and provincial databases, and intrusive sampling of site soils and waters.

The intrusive program included site visits to confirm physical characteristics, habitat types, and sites of archaeological significance or interest. Detailed vegetation and wildlife surveys were conducted to determine the presence/absence of rare and/or endangered species.

The assessment of soil depths and characteristics was carried out by the excavation of test pits. The necessary information was obtained from the geotechnical report prepared by Newfoundland Geosciences Limited.

4.3.5 Preferred Site

Site 1 has undergone both a screening level and intermediate level site investigation to collect sufficient data to assess the site for potential use as a regional waste management facility. The collective results of these studies support an informed opinion on the suitability of the site. A brief discussion of the results of the assessment is provided below.

The subject property meets the size and location criteria established by the committee for development of a regional facility. The site has a sufficient buffer zone from residential wells. The site access alternatives appear feasible and will not interfere with planned development in the area. There were no unique habitats identified on the site and the wetland areas are not considered to be restrictive. Further investigation may be required to ascertain if these are fish bearing streams. However, this does not preclude development as fish bearing habitat can be created elsewhere to meet the DFO no net loss principle for habitat conservation. There were no rare or endangered plants or animal species identified during the investigation that would represent a constraint to development.

The site investigation did not reveal any potential archaeological or heritage features. The site screening investigation has revealed some provincial land-use restrictions with regards to forest resources, but due to the mass size of the site, it is likely that these land-use restrictions can be avoided.

In general, the investigations indicate that the biophysical features of the site will not restrict development for a regional waste management facility. The investigation has established that Site 1 meets all of the technical criteria required for further consideration as the preferred site of the regional waste management facility.

5.0 DETAILED OUTLINE OF THE PREFERRED WASTE MANAGEMENT SYSTEM

The new system has been designed to meet the diversion objectives of the Provincial Waste Management Strategy, to be affordable, and to apply modern technology to the various system components. The following section describes each component of the preferred (recommended) waste management system for the Central Newfoundland Region. In summary,

- All existing municipal landfills and incinerator sites will be closed and replaced by seven LWMFs and one RWMF;
- The LWMFs will accept residential curbside collected waste material and sorted (wet/dry) ICI waste from a specified collection area;
- Residents will separate waste materials into two streams: wet material and dry materials. All materials will be placed in colour-coded bags for collection;
- All waste materials will be transported to the RWMF for processing;
- The RWMF will be constructed at Site 1 located near the community of Norris Arm North (~ 45 km west of Gander); and
- The RWMF will include an Access Road, Scale House, Public Drop-off Area, Materials Recovery Facility (MRF), In-vessel Compost Facility, Household Hazardous Waste Depot, Construction and Demolition Depot and Landfill, and a Containment Landfill with Leachate Collection and Treatment.

5.1 PREFERRED COLLECTION AND PROCESSING SYSTEM

The CNWMC has selected a two-stream system (Wet/Dry) as the preferred collection and processing system for the Central Newfoundland Region. With wet-dry collection, waste is separated into two categories: wet materials (yard trimmings, food scraps, diapers, soiled paper, animal waste, etc) and dry materials (glass containers, tin and steel cans, plastics, etc). The wet stream is composted while the materials within the dry stream are separated for recycling. Because wet materials are kept separate from the rest of the waste materials, recyclables are kept relatively uncontaminated and marketable. The system will use colour-coded plastic bags for collection and source separated waste. The two-stream system represents the most cost effective and comparable system for the region.

When the strategy objectives are applied, the wet/dry system will:

- provide a system capable of a 50% diversion rate;
- result in the least disturbance of the existing collection system;
- have lower collection and transportation costs;
- result in a limited impact on residential disposal practices;
- allow for flexibility in the design of recyclable processing systems and provides a higher degree of control at the regional processing facility; and
- be easily upgraded to a four-stream system.

5.2 LOCAL WASTE MANAGEMENT FACILITIES

The project team developed a detailed collection and transportation model that allowed the Committee an opportunity to study the advantages and disadvantages of several potential LWMF locations. The preferred system was selected based on the objectives of the waste management strategy, the convenience to users, and overall cost. The model can be used in the future to optimize the collection and transportation routes. It may also be used to calculate the specific capital and operating costs of the individual LWMF sites.

The assessment of the collection and transportation requirements of the new system has resulted in the CNWMC selecting a collection and LWMF system that includes the following components:

- Buchan's Junction Waste Management Facility
- Point Leamington Waste Management Facility
- Virgin Arm – Carter's Cove Waste Management Facility
- Fogo Island Waste Management Facility
- Gander Bay Waste Management Facility
- Indian Bay Waste Management Facility
- Terra Nova Regional Waste Management Facility

5.3 REGIONAL WASTE MANAGEMENT FACILITY

The Central Newfoundland Waste Management Strategy will include a single Regional Waste Management Facility (RWMF). The Committee has selected a site (Site #1) located near the community of Norris Arm North for the proposed location of the RWMF.

The RMWF will include the following components:

- Access Road;
- Scale House;
- Public Drop-off Area;
- In-vessel Compost Facility;
- Materials Recovery Facility;
- Construction and Demolition Depot and Landfill; and
- Regional Landfill Facility.

Concept Design for the RWMF is provided in Figure 5-1.

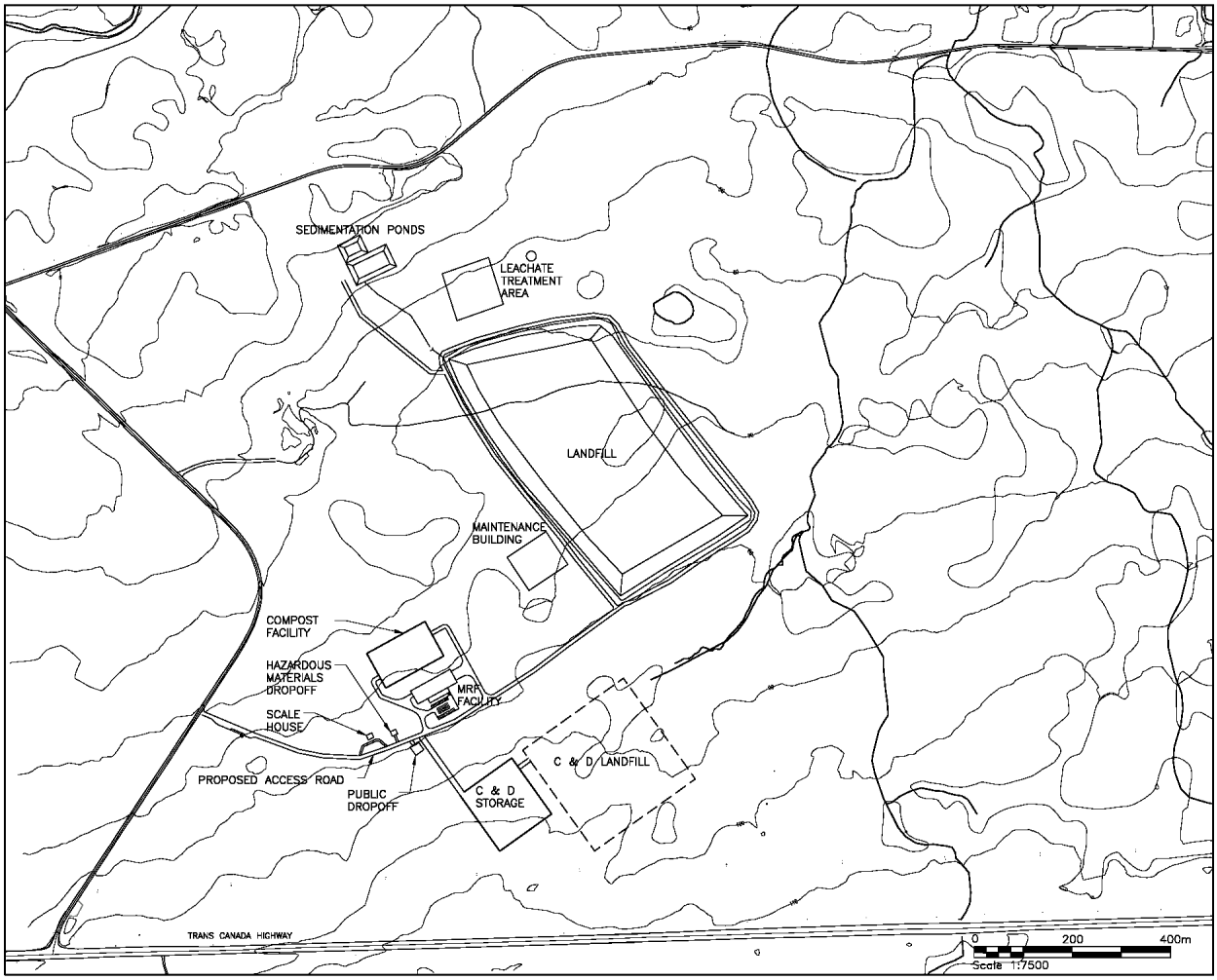


Figure 5-1: Concept Design of RWMF.

5.3.1 Site Description

The proposed RWMF site is located in the Norris Arm North area, between Lewisporte Junction and the Norris Arm North Access Road. The site would be accessed by a two-lane all-weather road from the Norris Arm North Access Road. The land available for development is roughly square in shape and encompasses approximately 369 hectares. Existing 1:12500 mapping identifies a number of surface water features, which include ponds, streams and bog/marsh areas, which limits the land available for landfilling. It is proposed that the access road would enter the site from the west with the initial infrastructure, scale, site building, and public areas located in the west portion of the site. The disposal area is located in

the approximate centre of the available land with the sedimentation control ponds and leachate treatment area located in the northwest.

5.3.2 Compost Facility

In-vessel composting technology has been selected as the preferred composting system for the RWMF. In-vessel composting systems are the most management and capital intensive of the four technologies studied. With these systems, organics (i.e. yard waste, food waste, food processing waste, agricultural wastes) are composted within a closed building.

As part of the selection process for the recommended in-vessel composting technology to be used at the RWMF, the project team contacted two compost technology companies (Wright Environmental Inc. and US Filter Group Limited) and asked them to provide a concept plan and cost estimate for the construction, operation and maintenance of a compost facility based on the characteristics and volume of the Central Newfoundland Region "wet" waste stream.

Based on the results of the investigation of the "Alternatives for Composting Technologies", BNG recommends the US Filter IPS Composting Facility for the Central Newfoundland Region. While both compost alternatives were similar in price, the US Filter IPS Composting System seems to provide higher quality compost using a lower quality feedstock than the Wright Composting System that requires a higher quality feedstock. The major difference between the two systems that allows the US Filter IPS Composting Facility to accept a lower quality feedstock is the daily turning of the feedstock within its concrete channels. This system will allow for more flexibility than the Wright System. The composting process is described in more detail below.

Under the two-stream system (wet/dry), all compostable material will arrive at the facility in the "wet" bag. The wet bag materials will include all organic materials, non-recyclable paper, contaminated recyclables and normal garbage. Wet bag materials are estimated to account for 30% of the waste stream. The wet bag material will be processed on a separate processing line. It is assumed that approximately 16,011 T/year of wet waste will be delivered to the facility, with 13, 885 T/year will be organics.

The system is an enclosed in-vessel, agitated, aerated, automated process with biofiltration odour control. It is designed to process a variety of organic residuals and transform the material into a quality compost product. The system has a reputation for ease of operation and dependability. Surpassing its nearest competitor by more than 200 percent, it is the most widely used in-vessel system in North America. Because front-end loaders load and off-load raw and finished materials into multiple open-top bays, complicated mechanical conveying systems are not needed. The bays and cure bunkers are open so access is easily afforded. One of the most desirable features is the IPS Composting System is comprised of multiple bays. This feature allows different materials to be received and processed under a wide variety or perimeters without changes in equipment or process. The facility will have a footprint of approximately 60 m x 130 m. A concept design of the facility is provided in Figure 5-2.

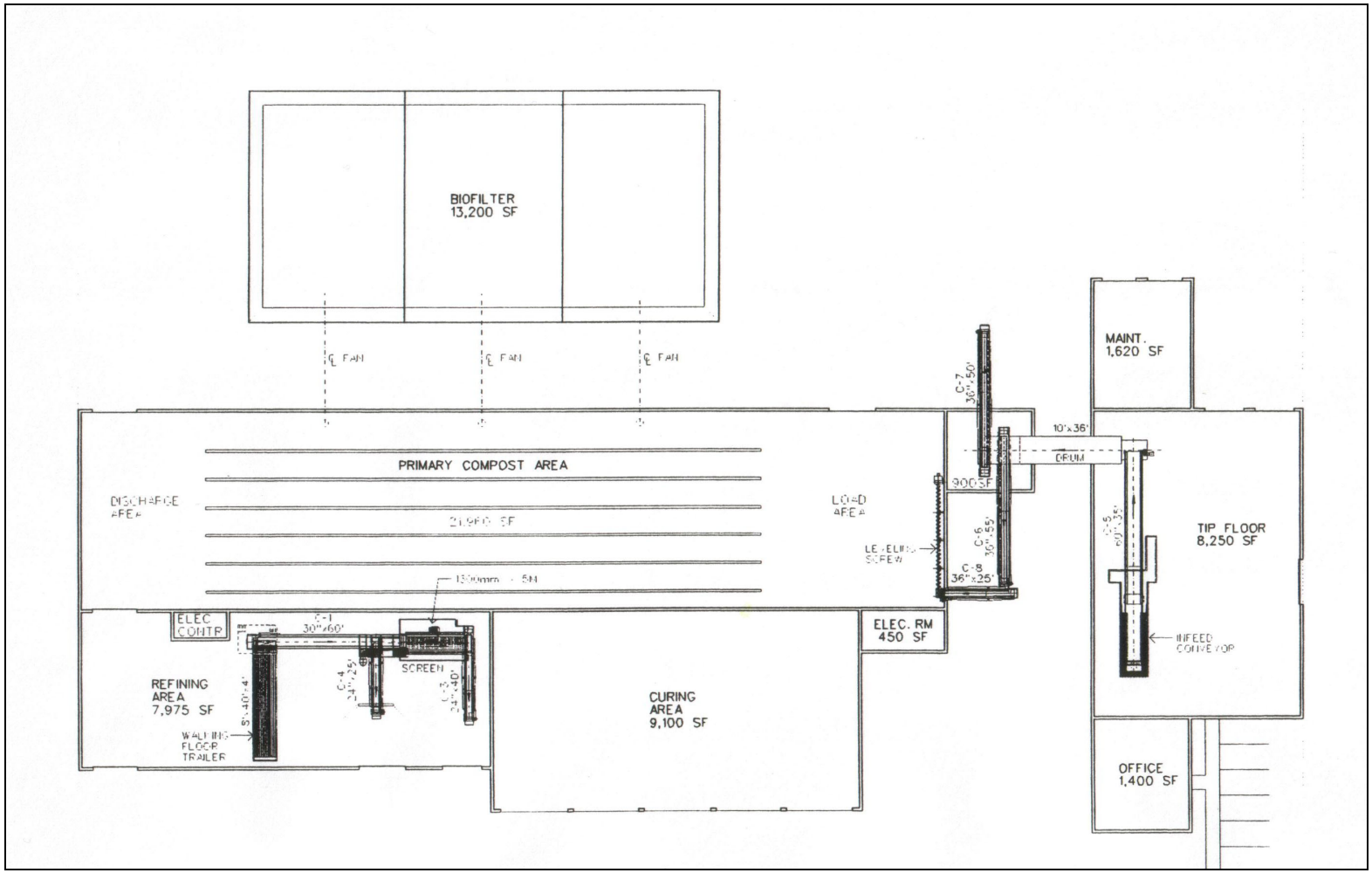


Figure 5-2: Concept Design of IPS Compost Facility.

5.3.3 Materials Recycling Facility (MRF)

With wet-dry collection, waste is separated into two categories: wet materials (yard trimming, food scraps, soiled paper, animal waste) and dry materials (glass containers, tin and steel cans, plastics). Since the Dry materials are kept separate from the Wet materials, recyclables are kept relatively uncontaminated, thus increasing their marketability. The wet material is directed to a compost facility while the dry material would be delivered to the MRF for sorting.

Since the material would arrive at the MRF completely commingled in a single bag, the materials would be sorted using a single conveyor system. A two-conveyor system is typically used when materials arrive at the facility pre-sorted into fibres (cardboard, newsprint, etc.) and containers (pop cans, plastic bottles, etc.). It is assumed that the material will arrive at the MRF during on 8-hour shift and be sorted during two shifts per day, five days per week. Based on a work year of 250 days resulting in a theoretical throughput of 66 tonnes per day.

The building would consist of three separate areas, a tipping floor, process floor, and bale storage area. The building would be a pre-engineered "conventional" steel framing (beams and columns) building with open web steel joists spanning the building width to create a column free floor area. The exterior walls of the plant would be pre-finished metal siding with metal building insulation. The roof of the plant would be a prefinished metal standing seam system.

The tipping area would be uninsulated with reinforced concrete push walls to a height of 3.65 m. The tipping floor would accommodate the storage of two days worth of material delivery in case problems occur within the facility.

The process room has been sized for the necessary sorting and baling equipment. The area would be insulated but unheated. A loading dock area has been provided for loading of bales into trucks for delivery to market.

The bale storage room would provide storage for baled material. The bale storage room should be capable of storing approximately one full trailer load of each commodity. Excess bales can also be stored along the south wall of the process room if necessary. An asphalted trailer storage area would be provided outside the north wall of the plant next to the truck loading area. Figure 5-3 schematically outlines the building components.

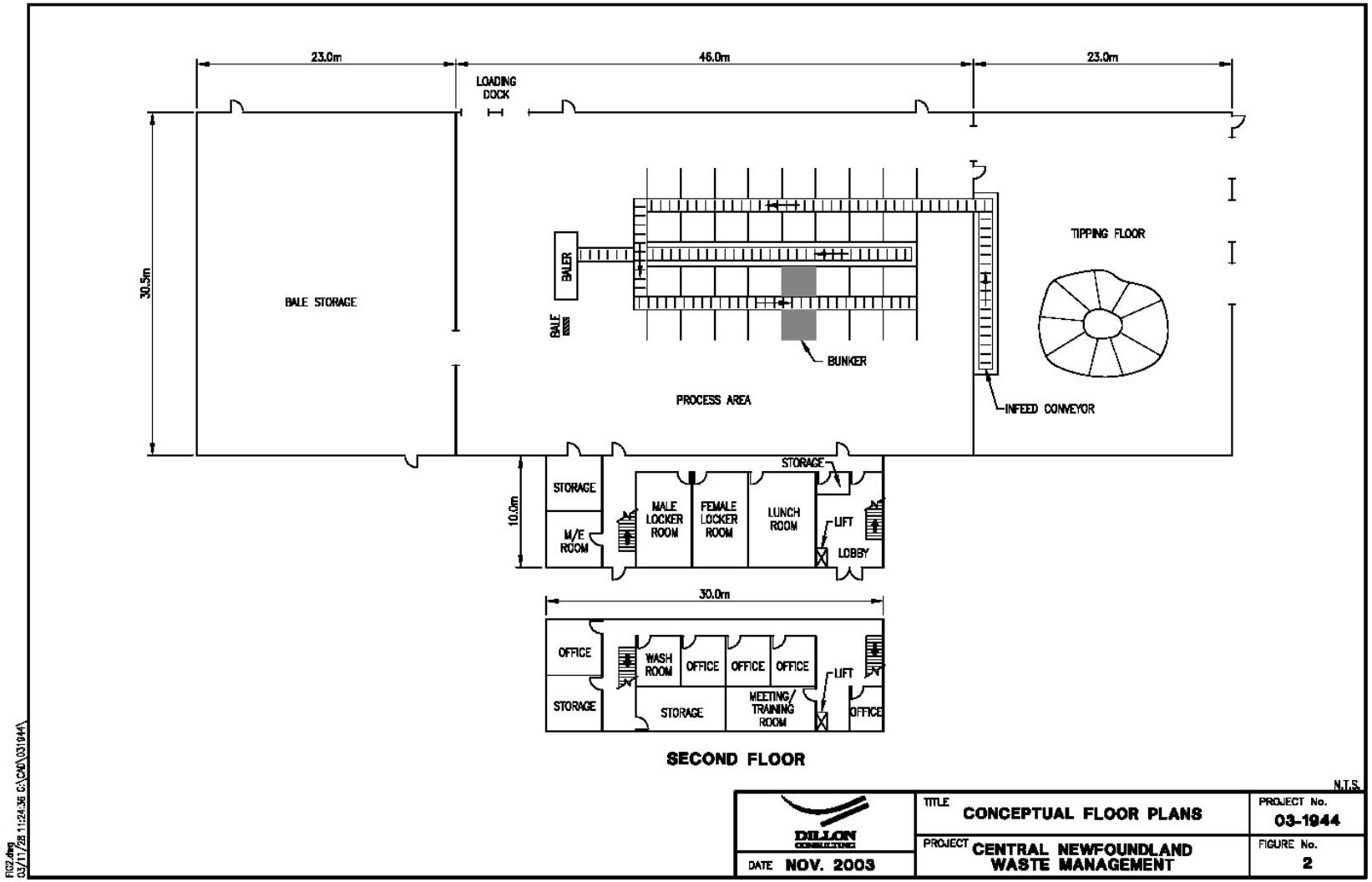


Figure 5-3: Concept Floor Plan for Material Recovery Facility.

The receiving process begins as a material delivery vehicle enters the facility and proceeds to the weigh scale station. After the material has been inspected, approved material is pushed onto the process line infeed conveyor by a front-end loader or skid steer loader. The infeed conveyor (rubber belted with steel cleats) would carry material to an inclined conveyor that raises the material to the height of the sorting station platform, approximately 4.5 m. Since the material on the conveyor consists of commingled fibres and containers, automatic pre-screening would be required to remove large pieces of material from the waste stream that may hinder the sorting of other items and prevent bridging of the bag opener. The material would then enter the sorting stations. All stations would be manual sort stations with the exception of the magnetic separator. Material is manually picked off the conveyor line and deposited into a drop chute where it falls into a collection bunker. Sorted material would be pushed from the collection bunkers onto the baler conveyer by a small loader. Completed bales would be transferred by a forklift and stored in a dedicated area of the building until shipment to market.

5.3.4 Construction and Demolition Depot and Landfill

Materials which may be present in the waste stream that are inert, do not readily compost, do not create leachate, and do not require permanent disposal in a containment landfill may provide resources for recycling and re-use. Construction and Demolition (C&D) waste is mostly generated from the construction, renovation, repair, and demolition of structures such as residential and commercial buildings, roads, and bridges.

It is proposed that a C&D recycling depot be located at the RMWF. Recycling of C&D materials at the facility will be dependent on the quantity of C&D materials delivered to the facility and availability of markets for products produced from recycling C&D materials. The preferred option is to stockpile the C&D debris at the facility until the quantity of C&D materials and demand for the recycled products justify recycling the material. If and when the quantity of C&D materials and availability of markets justify the recycling of the C&D material, processing equipment can be either purchased or rented and the materials can be processed. A concept design of the facility is provided in Figure 5-4.

Based on the results of a financial investigation, it is recommended that products of the C&D waste stream that cannot be recycled or reused be landfilled at both the LWMF and the RWMF. This would greatly reduce transportation cost associated with transporting the C&D material to the regional waste management facility.

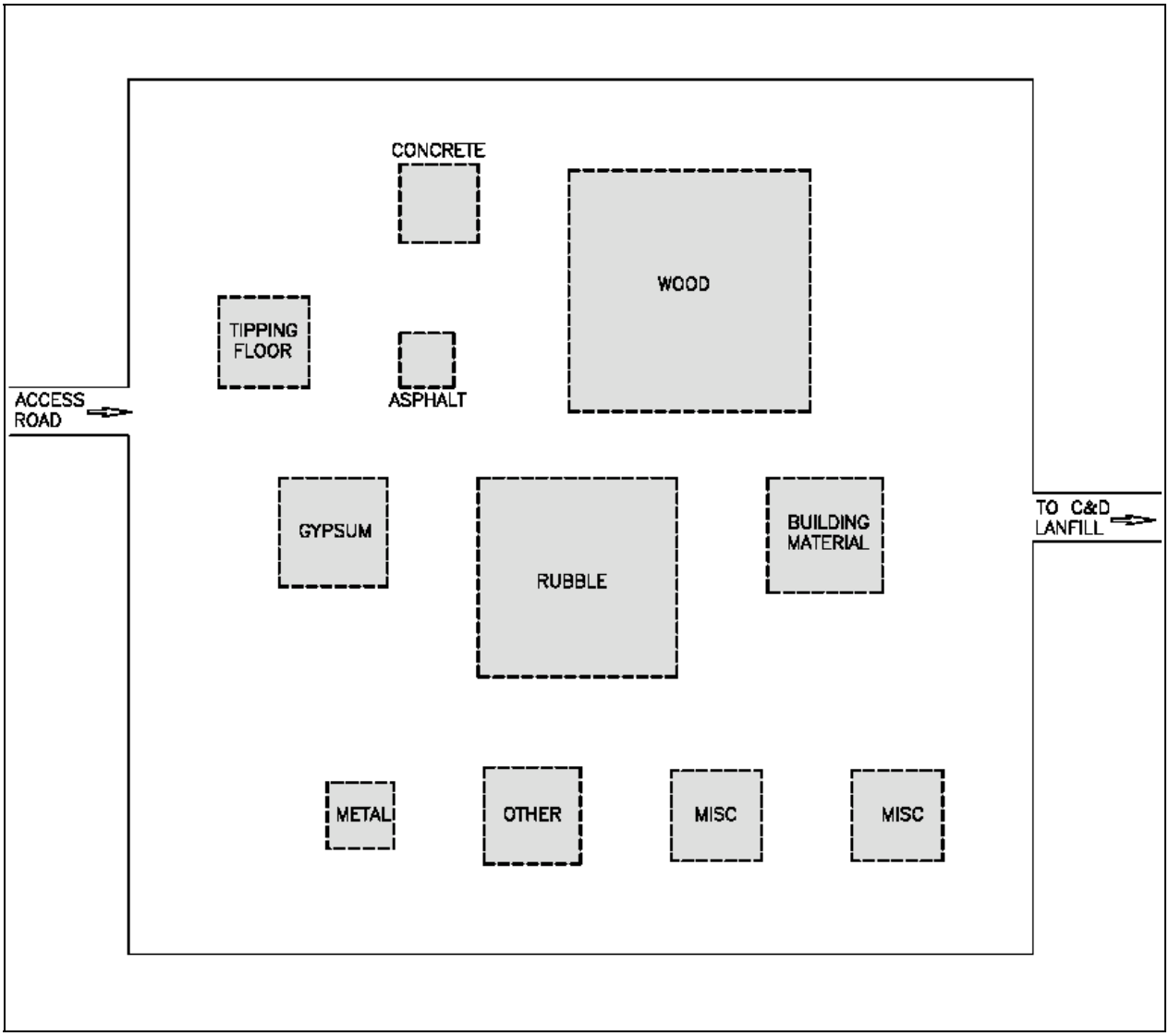


Figure 5-4: Concept Plan for C&D Recycling Depot.

5.3.5 Household Hazardous Waste Depot

Household hazardous waste (HHW) makes up a very small portion of the waste stream, however it represents a potential risk to employees and facility operations and the landfill. HHW are those materials that would be classified as hazardous wastes or waste dangerous goods if stored in quantities that exceed Transportation of Dangerous Good Regulations. Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." Products are also considered hazardous if they are capable of causing substantial injury, serious illness, or harm to humans, domestic

livestock, or wildlife. Products, such as paints, cleaners, oils, batteries, and pesticides that contain potentially hazardous ingredients require special care when you dispose of them. Biomedical wastes are not classified as HHW and will not be accepted at the facility.

As part of the selection process for the recommended number and locations of HHW Depots through out the study area, the study team investigated the capital and operational cost, and level of service provided by the following three scenarios:

1. One HHW Depot at the RWMF;
2. One HHW Depot at the RWMF and the LWMFs; and
3. One HHW Depot at the RWMF and One Mobile Collection Unit.

Although the Option 1 has the lower annual cost of all three scenarios, the study team recommends Option 2 based on the level of service provided to residents of the Central Region. One depot for the RWMF will only provide a low level of service to the entire area. HHW depots located at all the LWMF will drastically increase the level of service for the study area and reduce the transportation (driving) time for local residents to deliver their waste to HHW depots.

Municipalities will be responsible for collection and transportation of the HHW generated in their jurisdiction to the HHW depots. This can be carried out by designating special waste collection events (usually a day or weekend) that allows householders to remove hazardous substances from their homes for safe transport to the depot by license personnel.

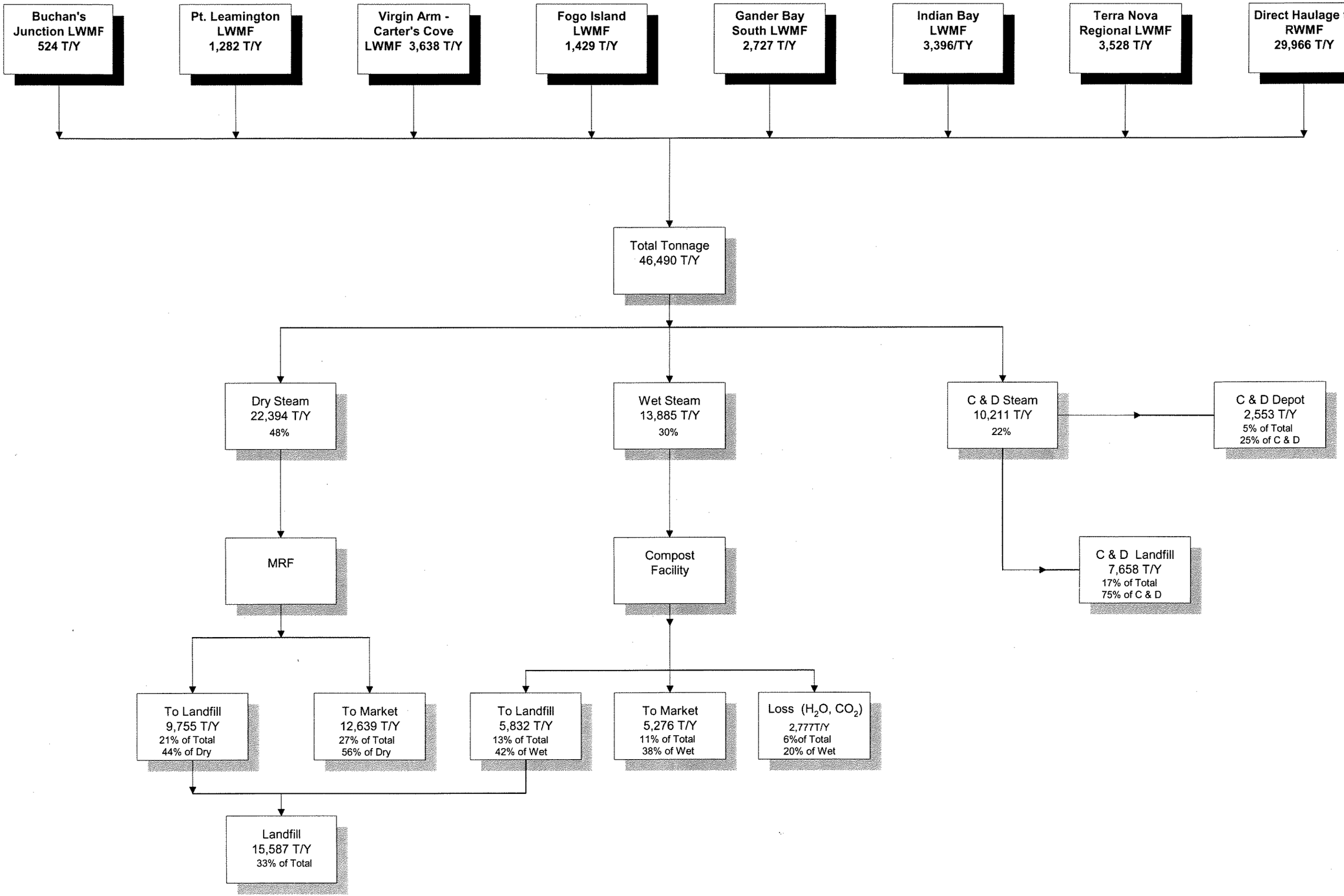
Once delivered to the depots, trained staff will sort the waste and place it into separate drums for safe transportation. All drums are labeled to indicate that they contain hazardous wastes and the type of chemicals contained in the drum. The drums will then be collected by hazardous waste transporters and shipped to licensed hazardous waste disposal sites.

5.3.6 Regional Landfill Facility

The landfill will provide permanent storage of materials after the recycling and organic diversion efforts are complete. The landfill facility will be designed to accommodate 46,500 tonnes of annual waste for a potential site life of 50 years. The liner system of the landfill will consist of two basic elements. The first element will be a leachate collection layer and the second is a barrier system to prevent

leachate from entering the surrounding environment. Once a portion of the landfill has reached its operational height (maximum of 20 m), the area will be covered to reduce infiltration of precipitation and redirect the surface runoff to the sedimentation control system. The cover system consists of granular layer to promote runoff and reduce infiltration.

Site infrastructure that will be directly associated with the landfill facility include a maintenance building, leachate collection and treatment system, sedimentation control system, site roads, and environmental monitoring wells.


Buchan's Junction LWMF 524 T/Y
Pt. Leamington LWMF 1,282 T/Y
Virgin Arm - Carter's Cove LWMF 3,638 T/Y
Fogo Island LWMF 1,429 T/Y
Gander Bay South LWMF 2,727 T/Y
Indian Bay LWMF 3,396/TY
Terra Nova Regional LWMF 3,528 T/Y
Direct Haulage to RWMF 29,966 T/Y
Total Tonnage 46,490 T/Y
Dry Steam 22,394 T/Y 48%
Wet Steam 13,885 T/Y 30%
C & D Steam 10,211 T/Y 22%
C & D Depot 2,553 T/Y 5% of Total 25% of C & D
C & D Landfill 7,658 T/Y 17% of Total 75% of C & D
MRF
Compost Facility
To Landfill 9,755 T/Y 21% of Total 44% of Dry
To Market 12,639 T/Y 27% of Total 56% of Dry
To Landfill 5,832 T/Y 13% of Total 42% of Wet
To Market 5,276 T/Y 11% of Total 38% of Wet
Loss (H_2O, CO_2) 2,777T/Y 6%of Total 20% of Wet
Landfill 15,587 T/Y 33% of Total

6.0 ESTIMATED CAPITAL AND OPERATING COSTS

This section of the report provide estimated capital and operating costs associated with the preferred waste management system. Each component of the system was first described separately, and then the entire system cost was presented based upon the anticipated cost per tonne of material collected. The cost analysis has been completed using generally accepted costing principles. The analysis is supported by numerical models, in the case of the collection and transportation components; examples of actual construction unit rates in the case of the capital works; and written estimates from commercial suppliers in the case of the wet and dry processing systems. The results of the cost analyses have been audited by comparison with actual costs of similar facilities and systems in other jurisdictions.

6.1 CAPITAL AND OPERATING COSTS

6.1.1 Regional Waste Management Facility

Tables 6-1 and 6-2 provide an overall summary of the gross costs for each component of the Waste Management System with the capital cost sharing ratios at 100% and 0% respectively. Revenue from sale of recycling and composting materials has been included at in the cost estimate.

The costing of each component is presented separately. The facility components reflect the preferred system design established by the CNWMC. Costs have been developed based on either first principal engineering analysis of system components or reflect price estimates provided by commercial suppliers. The cost estimate does not include land purchase. Close out cost for the existing landfill sites are not included in the tipping fee calculation.

The annual estimated volume of waste to be received by the Regional Authority will be 100% of residential (25,723 tonnes), the wet stream of the IC&I sector (3,158 tonnes), 100% of the Rural IC&I (5,821 tonnes), and 50% of the Urban IC&I (5,894 tonnes), for a total of 40,596 tonnes.

Table 6-1: Central Waste Management System Estimated Costs with Capital Cost Sharing Ratio at 100%

Item	Capital Cost	Amortization Cost[1]	Operating Cost	Annual Cost	Cost Per Tonne to Regional Authority
Local Waste Management Facilities	$8,038,112	$818,699	$879,926	$1,698,625	$41.84
Disposal Site (Landfill)	$14,700,000	$1,497,227	$1,394,222	$2,891,450	$71.22
Materials Recovery Facility (MRF)	$7,629,250	$777,056	$1,104,000	$1,881,056	$46.34
Compost Facility (IPS)	$11,298,180	$1,150,745	$561,600	$1,712,345	$42.18
Household Hazardous Wastes Depot (Regional Site Only)	$124,113	$12,641	$71,500	$84,141	$2.07
C & D Debris Depot and Landfill	$228,000	$23,222	$58,720	$81,942	$2.02
Public Drop-off Facility	$250,000	$25,463	$30,000	$55,463	$1.37
Public Education				$200,000	$4.93
Administration				$300,000	$7.39
Capital For Equipment				$250,000	$6.16
Revenue From Recovered Materials				-$687,168	-$16.93
TOTALS	$42,267,655	$4,305,054	$4,099,968	$8,467,855	$208.59
				Cost Per Person	$71.01

NOTES:
1. Amortization period is 20 years at 8% interest rate.
2. Total Waste Tonnage received by CNWMA: 40,596
3. Estimated Annual Revenue from Recovered Materials: MRF = $660,787 & Compost = $26,381

Table 6-2: Central Waste Management System Estimated Costs with Capital Cost Sharing Ratio at 0%

Item	Capital Cost	Amortization Cost	Operating Cost	Annual Cost	Cost Per Tonne to Regional Authority
Local Waste Management Facilities	$8,038,112	$0	$879,926	$879,926	$21.68
Disposal Site (landfill)	$14,700,000	$0	$1,394,222	$1,394,222	$34.34
Materials Recovery Facility (MRF)	$7,629,250	$0	$1,104,000	$1,104,000	$27.19
Compost Facility (IPS)	$11,298,180	$0	$561,600	$561,600	$13.83
Household Hazardous Wastes Depot	$124,113	$0	$71,500	$71,500	$1.76
C & D Debris Depot and Landfill	$228,000	$0	$58,720	$58,720	$1.45
Public Drop-off Facility	$250,000	$0	$30,000	$30,000	$0.74
Public Education				$200,000	$4.93
Administration				$300,000	$7.39
Capital For Equipment				$250,000	$6.16
Revenue From Recovered Materials				-$687,168	-$16.93
TOTALS	$42,267,655	$0	$4,099,968	$4,162,801	$102.54
				Cost Per Person	$34.91

NOTES:
1. Total Waste Tonnage received by CNWMA: 40,596
2. Estimated Annual Revenue from Recovered Materials: MRF = $660,787 & Compost = $26,381

6.1.2 Local Waste Management Facilities

Tables 6-3 and 6-4 provides an overall summary of the cost associated with the LWMFs for the Central Newfoundland Waste Management System with the capital cost sharing ratios at 100% and 0% respectively.

Table 6-3: Local Waste Management Facilities Estimated Costs with Capital Cost Sharing Ratio at 100%

Location	Capital Cost	Amortization Cost	Operating Cost	Transportation Cost	Cost Per Tonne to Regional Authority
Buchan's Junction	$1,001,766	$102,032	$34,580	$30,227	$4.11
Point Leamington	$1,045,766	$106,514	$53,335	$22,262	$4.49
Fogo	$1,056,766	$107,634	$53,785	$53,662	$5.30
Gander Bay South	$1,125,891	$114,674	$73,725	$48,288	$5.83
Indian Bay	$1,317,016	$134,141	$77,725	$104,386	$7.79
Terra Nova	$1,157,641	$117,908	$77,925	$80,912	$6.82
Virgin Arm	$1,173,266	$119,500	$94,665	$74,449	$7.11
Trailers	$160,000	$16,296	$0		$0.40
TOTALS	$8,038,112	$818,699	$465,740	$414,186	$41.84

NOTES:
1. Amortization period is 20 years at 8% interest rate
2. Total Waste Tonnage received by CNWMA: 40,596
3. Total Waste Tonnage received at LWMF: 16,036

Table 6-4: Local Waste Management Facilities Estimated Costs with Capital Cost Sharing Ratio at 0%

Location	Capital Cost	Amortization Cost	Operating Cost	Transportation Cost	Cost Per Tonne to Regional Authority
Buchan's Junction	$1,001,766	$0	$34,580	$30,227	$1.60
Point Leamington	$1,045,766	$0	$53,335	$22,262	$1.86
Fogo	$1,056,766	$0	$53,785	$53,662	$2.65
Gander Bay South	$1,125,891	$0	$73,725	$48,288	$3.01
Indian Bay	$1,317,016	$0	$77,725	$104,386	$4.49
Terra Nova	$1,157,641	$0	$77,925	$80,912	$3.91
Virgin Arm	$1,173,266	$0	$94,665	$74,449	$4.17
Trailers	$160,000	$0	$0	$0	$0.00
TOTALS	$8,038,112	$0	$465,740	$414,186	$21.68

NOTES:
1. Total Waste Tonnage received by CNWMA: 40,596
2. Total Waste Tonnage received at LWMF: 16,036

6.1.3 Engineered Landfill Facility

This section provides an estimate of the probable capital cost associated with the development of a landfill facility at the Norris Arm North RWMF (Site 1). The capital costs reflect a 50 year development period and are in 2003 dollars and do not reflect the future value of money associated with periodic construction activities. The following tables reflect the estimated capital costs for the landfill development and leachate treatment facility.

Operational costs were developed for the waste landfill option. These costs were based on discussion and review of the annual operating budgets of the landfills with operators. Tables 6-5 and 6-6 provide an overall summary of the cost associated with the Landfill Facility for the Central Region.

Table 6-5: Landfill Facility Estimated Costs with Capital Cost Sharing Ratio at 100%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost Per Tonne to Regional Authority
Initial Cost (5 year cell)	$10,650,000	$1,084,726	$1,084,726	$26.72
Development Costs Year 6-50	$13,600,000		$302,222	$2.75
Annual Operating Costs			$882,000	$21.73
Closeout Costs	$10,500,000		$210,000	$1.91
Leachate Treatment Capital Cost	$4,050,000	$412,501	$412,501	$10.16
TOTALS	**$38,800,000**	**$1,497,227**	**$2,891,450**	**$71.22**

NOTES:
1. Amortization period is 20 years at 8% interest rate
2. Total Waste Tonnage received by CNWMA: 40,596

Table 6-6: Landfill Facility Estimated Costs with Capital Cost Sharing Ratio at 0%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost Per Tonne to Regional Authority
Initial Cost (5 year cell)	$10,650,000	$0	$0	$0.00
Development Costs Year 6-50	$13,600,000		$302,222	$2.75
Annual Operating Costs			$882,000	$21.73
Closeout Costs	$10,500,000		$210,000	$1.91
Leachate Treatment Capital Cost	$4,050,000	$0	$0	$0.00
TOTALS	**$38,800,000**	**$0**	**$1,394,222**	**$34.34**

NOTES:
1. Total Waste Tonnage received by CNWMA: 40,596

6.1.4 Materials Recovery Facility

The dry bag material processing cost reflects the preferred system components. The estimated cost was developed after consultation with equipment suppliers and review of actual costs reported by other jurisdictions. The estimated gross installation cost of $7.63 million includes the building and related infrastructure. The preferred system incorporates the use of both mechanical and manual operations. The estimated annual revenue to be generated by the MRF is $660,787. Tables 6-7 and 6-8 provide an overall summary of the cost associated with the MRF for the Central Region.

Table 6-7: MRF Estimated Costs with Capital Cost Sharing Ratio at 100%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost per Tonne Processed	Cost Per Tonne to Regional Authority
Capital Cost	$7,629,250	$777,056	$777,056	$34.86	$19.14
Annual Operating Costs			$1,104,000	$49.52	$27.19
TOTALS	**$7,629,250**	**$777,056**	**$1,881,056**	**$84.38**	**$46.34**

NOTES:
1. Amortization period is 20 years at 8% interest rate
2. Total Waste Tonnage received by CNWMA: 40,596
3. Total Waste Processed 22,294

Table 6-8: MRF Estimated Costs with Capital Cost Sharing Ratio at 0%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost per Tonne Processed	Cost Per Tonne to Regional Authority
Capital Cost	$7,629,250	$0	$0	$0.00	$0.00
Annual Operating Costs			$1,104,000	$49.52	$27.19
TOTALS	**$7,629,250**	**$0**	**$1,104,000**	**$49.52**	**$27.19**

NOTES:
1. Total Waste Tonnage received by CNWMA: 40,596
2. Total Waste Processed 22,294

6.1.5 IPS In-Vessel Compost Facility

The processing of the wet bag materials is separate from the dry bag materials sorting line. Wet bag materials contain a high percentage of organic materials that requires a separate sorting line, ventilated enclosed processing area, and a covered compost facility. The costing includes a concrete curing pad. Based upon the estimated 13,885 tonne annual volume, the estimated capital cost of the preferred compost system is $11.3 million. The estimated annual revenue to be generated by the Compost Facility is $26,381. Tables 6-9 and 6-10 provide an overall summary of the cost associated with the Compost Facility for the Central Region.

Table 6-9: Compost Facility Estimated Costs with Capital Cost Sharing Ratio at 100%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost per Tonne Processed	Cost Per Tonne to Regional Authority
Capital Cost	$11,298,180	$1,150,745	$1,150,745	$82.88	$28.35
Annual Operating Costs			$561,600	$40.45	$13.83
TOTALS	**$11,298,180**	**$1,150,745**	**$1,712,345**	**$123.33**	**$42.18**

NOTES:
1. Amortization period is 20 years at 8% interest rate
2. Total Waste Tonnage received by CNWMA: 40,596
3. Total Waste Processed 13,885

Table 6-10: Compost Facility Estimated Costs with Capital Cost Sharing Ratio at 0%

Item	Capital Cost	Amortization Cost	Annual Cost	Cost per Tonne Processed	Cost Per Tonne to Regional Authority
Capital Cost	$11,298,180	$0	$0	$0.00	$0.00
Annual Operating Costs			$561,600	$40.45	$13.83
TOTALS	**$11,298,180**	**$0**	**$561,600**	**$40.45**	**$13.83**

NOTES:
1. Total Waste Tonnage received by CNWMA: 40,596
2. Total Waste Processed 13,885

6.1.6 Household Hazardous Waste Depot

The Central Newfoundland Waste Management System will include the sitting of a permanent Household Hazardous Waste depot. The HHW depot will be located at the regional waste management facility. The Committee may give consideration to a mobile service offer to those at some distance from the regional facility. The users of the depot would not be charged. A private sector company under contract will operate the depot. The operation of a HHW depot requires specialized training and dangerous good handling certification. The private sectors are also aware of the market conditions for product sale.

Estimated Capital cost is $124,113 and the operating cost is $71,500.

6.1.7 Construction and Demolition Debris Recycling Depot

The construction and demolition debris-recycling depot will consist of a designated storage area located near the weigh scale. The depot will be staffed. The depot will accept inert construction and demolition waste materials including; concrete, brick, wood waste, fibre board, wall board, asphalt, bulk steel and metals, clean soil, asphalt shingles, and general construction debris. The depot will promote the reuse and recycling of these materials. A tipping fee will be charged to drop-off materials. The depot will be sited on a graded flat area. The area will be covered with gravel and have a dedicated storm water collect network and detention pond.

Estimated Capital cost is $228,000 and the operating cost is $58,720.

6.1.8 Public Drop-off Area

The regional facility will include a public drop-off area. The public drop off area will include a grade separated off-loading area where materials can be segregated into various waste streams. The off-loading area will be covered with a steel frame roof. The drop-off area will accommodate room for six steel roll-on/off bins. The bins will be designated for source separated materials such as white goods (must have refrigerants removed), waste wood, waste metal, organic materials, cardboard, and wet and dry bagged materials. The capital cost of a facility similar to that built by the Valley Waste-Resource Authority in Kentville, N.S. is $ 250,000. The facility is staffed on a part-time basis; equipment costs are required to move the bins to the processing areas. An annual operating cost of $ 30,000 is estimated.

6.2 STAFFING REQUIREMENTS

The regional waste management strategy will result in the direct creation of approximately 70 new jobs (conservative estimate). The opportunities associated with the management and recovery of recyclable materials will also result in the creation of many indirect private sector opportunities.

The preferred waste management system employment projections are summarized below:

Regional Waste Management Facility
Manager
Administration (2)
Equipment Forman
Scale House Operators (2)
Site Supervisors – Landfill (2)
Process Supervisor – Compost
Process Supervisor – Dry recyclables
Equipment Operators (4)
Labourers (30 full time, 20 part-time)
Security (2)

Buchan's Junction Waste Management Facility
One part time employee

Point Leamington Waste Management Facility
One part time employee

Virgin Arm – Carter's Cove Waste Management Facility
One part time employee

Fogo Island Waste Management Facility
One part time employee

Gander Bay Waste Management Facility
One part time employee

Indian Bay Waste Management Facility
One part time employee

Terra Nova Regional Waste Management Facility
One part time employee

7.0 PHASED IMPLEMENTATION OF WASTE MANAGEMENT SYSTEM

7.1 REQUIREMENTS

THE CNWMC recommends that the implementation of the Solid Waste Management System will require Government assistance to develop appropriate legislation to ensure mandatory compliance of the system and to set up a Regional Authority to govern and monitor the day-to-day operations of the system. The committee is also recommending that the capital works for the waste system be 100% funded by the Government to reduce the cost of waste disposal to the Regional Authority and the residents of the study area. The plan must also consider the existing landfill sites closure schedules being imposed by individual municipal units within the region. The existing site closures are the responsibility of the municipal operator of the site. Closeout costs are not included in the tipping fess. The implementation schedule will also require consideration of the schedule detailed in the Provincial Waste Management Strategy.

7.2 IMPLEMENTATION SCHEDULE

Due to the large amount of funding required to design and construct the required capital works for this project, the CNWMC has recommended a "phased" approached to the implementation of the Waste Management System for the study area. The following sections outline the proposed implementation schedule for the various components of the proposed Waste Management System. The implementation schedule is also provided in Table 7-1.

7.2.1 Phase 1 – Environmental Impact Assessment

Before any construction can begin, the project will have to be registered under the Environmental Assessment Act. If an Environmental Impact Assessment (EIA) is required, it may take two years before the project is released and construction can begin.

7.2.2 Phase 2 – Landfill Facility

Once the project has undergone an EIA and has been released by the Department of Environment, the CNWMC recommends that the landfill facility be designed and constructed. It will likely take an estimated six months to design the landfill facility and another year to construct. Components of the RWMF that will be constructed

during this phase of the project include a Scale House, Public Drop-off Area, HHW Depot, C&D Depot & Landfill, and the Regional Landfill Facility. Once the facility is completed, those communities within hauling distance to the RWMF will deliver their waste to site. Those communities located outside the direct haulage zone will not be required to deliver their waste to the facility. All waste delivered to the site, with the exception of HHW and C&D materials, will be landfilled.

It is acknowledged that without the Compost Facility or Materials Recovery Facility in place, there may be no direct benefit to implementing the two stream source separation and collection systems. The collection system would be implemented once these components are operational. The educational component of the new waste management system should start well ahead of the planned implementation date. The Waste Management Authority or government may decide to introduce specific waste diversion programs prior to the RWMF becoming fully operational.

7.2.3 Phase 3 – Local Waste Management Facilities

The next component of the Waste Management System to be implemented is the design and construction of the Local Waste Management Facilities (LWMFs). Once the landfill facility is operational, it is recommended to start work on the design of the LWMFs in an attempt to complete the facilities during the following year. It will likely take six months to design the facilities and another year to construct them. Once the facilities have been constructed and opened for operation, the communities located outside the direct haulage zone of the RWMF will deliver their waste to the LWMF. At this stage, all waste generated within the study area will be delivered to the RWMF.

Once again, it is acknowledged that during this phase, there may be no direct benefit to implementing the two stream source separation and collection systems.

7.2.4 Phase 4 – Compost Facility

The next component of the Waste Management System to be implemented is the design and construction of the Compost Facility at the RWMF. It will likely take an estimated twelve months to design the facility and another two years of construction before the facility is operational. Therefore, in order to have the compost facility in operation one year after the LWMFs are in operation, it is recommended that the design of the facility be initiated before the design of the LWMFs.

Once the construction phase for the compost facility has been completed, implementation of the two-stream source separation and collection systems will be vital to its operation. The educational component of the new waste management system should start well ahead of the planned implementation date.

The CNWMC has set a higher priority on the completion date for the startup of the compost facility over that of the MRF for the following two reasons:

- There are already measures in place (i.e. green depots, paper and cardboard recycling, and etc.) that help to divert dry materials from landfill facilities; and
- The moisture content of the wet stream would add to the volume of leachate to be collected and treated at the RWMF, thus increasing the operational expense of the facility over time.

7.2.5 Phase 5 – Materials Recovery Facility

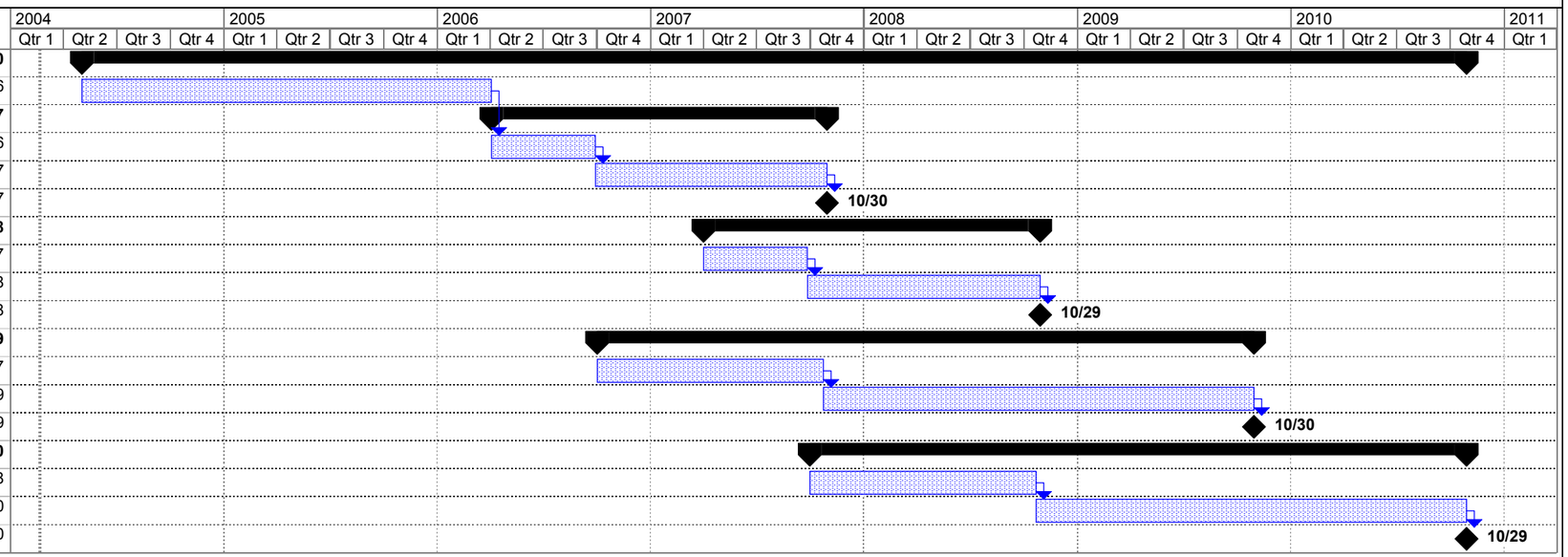
The next component of the Waste Management System to be implemented is the design and construction of the Materials Recovery Facility (MRF) at the RWMF. It will likely take an estimated twelve months to design the facility and another two years of construction before the facility is operational. Therefore, in order to have the MRF in operation one year after the compost facility is in operation, it is recommended that the design of the facility be initiated once the design phase of the compost facility has been completed.

Once construction phases of the MRF and Compost Facility at the RWMF has been completed and the facilities are in operation, all residential waste delivered to the RWMF will be processed by these facilities, thus reducing the volume of solid waste being landfilled in the RWMF landfill facility. The wet bag will be delivered to the Compost Facility and the dry bag will be delivered to the MRF.

Table 7-1 Implementation Schedule
Central NL Solid Waste Management Plan

BAE ◆ NEWPLAN GROUP

ID	Task Name	Start	Finish
1	**Project Duration**	**Mon 5/3/04**	**Fri 10/29/10**
2	Environmental Impact Assessment	Mon 5/3/04	Mon 4/3/06
3	**Landfill Facility**	**Tue 4/4/06**	**Tue 10/30/07**
4	Design	Tue 4/4/06	Thu 9/28/06
5	Construction	Fri 9/29/06	Tue 10/30/07
6	Start-up	Tue 10/30/07	Tue 10/30/07
7	**Local Waste Management Facilities**	**Mon 4/2/07**	**Wed 10/29/08**
8	Design	Mon 4/2/07	Wed 9/26/07
9	Construction	Thu 9/27/07	Wed 10/29/08
10	Start-up	Wed 10/29/08	Wed 10/29/08
11	**Compost Facility**	**Mon 10/2/06**	**Fri 10/30/09**
12	Design	Mon 10/2/06	Wed 10/24/07
13	Construction	Wed 10/24/07	Fri 10/30/09
14	Start-up	Fri 10/30/09	Fri 10/30/09
15	**Materials Recovery Facility**	**Mon 10/1/07**	**Fri 10/29/10**
16	Design	Mon 10/1/07	Wed 10/22/08
17	Construction	Wed 10/22/08	Fri 10/29/10
18	Start-up	Fri 10/29/10	Fri 10/29/10



Project: Implemntation Schedule - Cer
Date: Fri 2/20/04

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

7.3 PHASED TIPPING FEE CALCULATIONS

A tipping fee will be charged for every tonne of waste material delivered to the RWMF. The Regional Authority will administer this tipping fee. Since the Waste Management System will be implemented in a phased approach, so will the associated tipping fees for each component (Landfill, LWMF, Compost Facility, & MRF) of the system. As the various components of the system are completed, the tipping fee associated with the component will be added to the overall tipping fee of the system. Table 7-2 provides the schedule of tipping fees that will be administered through the implementation for the Waste Management System for the Central Newfoundland Region.

Table 7-2: Implementation Schedule for Tipping Fees.

Item	Capital Cost	Annual Cost	Cost Per Tonne to Regional Authority	Cost Per Person to Regional Authority
Phase 2 - Landfill - Directly to Landfill	$15,302,113	$1,594,899	$54.49	$21.09
Phase 3 - Landfill + LWMF	$8,038,112	$2,934,368	$63.12	$21.49
Phase 4 - Landfill, LWMF & Compost	$11,298,180	$3,669,587	$90.39	$30.77
Phase 5 - Landfill, LWMF, Compost & MRF	$7,629,250	$4,162,801	$102.54	$34.91
Total	**$42,267,655**			

NOTES:
1. Waste Tonnage Received: 40,596 (87% of Total Waste Generated in the Study Area)
2. Population Served: 75,555 (100% of Total Population in the Study Area)
3. IC&I Tonnage Received: 14,873 (100% of IC&I less 50% of Urban Dry IC&I)

8.0 CLOSURE OF EXISTING LANDFILL FACILITIES

The implementation of the Regional Waste Management System will require that site closure schedule being imposed by individual municipal units with in the region. Government has developed appropriate standards for close out of existing sites.

The regional local waste management facility sites are all located on existing municipal dumpsites and/or incinerator sites. The new facilities would be constructed to maximize the existing benefits of the site (road and services), however these existing sites will require site closure and remedial actions to minimize the long term risk to health and safety and the environment.

8.1 ESTIMATED CLOSURE COST FOR EXISTING LANDFILL FACILITIES

Once a waste disposal site is closed it must be decommissioned. The improper closure of sites can result in a range of health and environmental concerns. The project team surveyed all the existing waste disposal sites in the study area to determine the area of waste to be covered and identify any outstanding environmental concerns associated with the sites. A summary of the landfill close out cost is provided in Table 8-1.

Table 8-1: Estimated Closure Cost for Existing Waste Disposal Sites.

Landfill Facility	Estimated Closure Cost
1. Aspen Cove Landfill	$129,398
2. Badger Landfill	$245,013
3. Benton Landfill	$72,347
4. Birchy Bay Landfill	$138,051
5. Boyd's Cove Landfill	$107,330
6. Botwood Landfill	$256,769
7. Browns Arm Landfill	$116,300
8. Buchans Landfill	$153,059
9. Buchans Junction Landfill	$87,009
10. Campbellton Landfill	$128,168
11. Cape Freels Landfill	$75,429
12. Carmanville Landfill	$260,750
13. Change Island's Landfill	$87,048
14. Comfort Cove Landfill	$72,588
15. Cottrell's Cove Landfill	$67,988
16. Fogo Island Landfill	$131,484
17. Gambo Landfill	$464,910
18. Gander Landfill	$1,990,829
19. Glenwood Landfill	$115,495

Landfill Facility		Estimated Closure Cost
20.	Grand Falls - Windsor Landfill	$593,817
21.	Horwood Landfill	$168,319
22.	Indian Bay Landfill	$206,971
23.	Laurenceton Landfill	$63,423
24.	Leading Tickles Landfill	$57,351
25.	Lewisporte Landfill	$446,243
26.	Little Burnt Bay Landfill	$68,529
27.	Lumsden Landfill	$165,502
28.	Main Point Landfill	$131,945
29.	Millertown Landfill	$188,076
30.	Musgrave Harbour Landfill	$63,475
31.	New World Island - Virgin Arm Landfill	$339,571
32.	Stoneville Landfill	$153,220
33.	Twillingate Landfill	$207,113
34.	New Wes Valley	$162,535
35.	Norris Arm	$115,483
36.	Peterview	$234,651
37.	Point Leamington	$115,690
38.	Point of Bay	$88,780
39.	St Brendan's North	$108,963
40.	St Brendan's South	$71,645
41.	Terra Nova Regional Landfill	$479,933
42.	Terra Nova Municipality	$74,509
TOTAL		**$9,005,709**

9.0 BASIS FOR SIZING AND POTENTIAL EXPANSION

The basis for sizing of the waste management system was developed from actual waste generation data from the region. Where data for specific waste streams were not available, the project team utilized a considerable reference database generated from other jurisdictions. Considerable work has been undertaken by other firms and organizations on the development of municipal waste management systems, and the Central Newfoundland Region has benefited from this experience. As a result, the sizing for each component of the system was based upon proven models and experience.

The key consideration in the design of the Regional Waste Management System has been the focus on **flexibility**. The collection, transportation, transfer, and processing system components have all been designed to allow a maximum in flexibility. For example, a bag collection system will accommodate any changes to at-source separation requirements; the wet/dry collection system supports the ability of current collection contractors to use existing equipment; and the selection of a dry/wet processing system at the regional facility will allow changes in process technology to be implemented quickly and effectively at a single location.

The site selected for the RWMF near Norris Arm North has an area of approximately 389 hectares, which allows for future expansion beyond the 50-year study period.

10.0 CONCLUSIONS

The Waste Management System selected by the CNWMC for the Central Newfoundland Region consists of the following major components:

- The analysis of the waste management system alternatives resulted in the wet/dry system (two-stream) being the preferred option.
- The wet/dry system requires the user to separate the waste into two streams (residents will use bags): a wet bag for organic and other wet (soiled) material and a dry bag for recyclables and paper. The wet and dry bags are then kept separate during collection and transportation.
- The Regional Waste Management Facility (RWMF) will be located near the community of Norris Arm North, approximately 6 km west of Lewisporte Junction.
- Areas distant from the RWMF will be served by Local Waste Management Facilities (LWMFs). LWMFs will be located at Buchan's Junction, Point Leamington, Virgin Arm – Carter's Cove, Gander Bay South, Fogo Island, Indian Bay, and Terra Nova Regional. Other areas located near the RWMF will have their waste delivered directly to the RWMF.
- The LWMFs will accept waste from communities where it will be then placed into large specially designed trailers for transportation of wastes to the RWMF. The LWMF will also accept construction and demolition materials, white metals, bulk materials, and will have a public drop-off area. Construction and demolition materials will be landfilled at the LWMFs.
- All waste being delivered to the LWMF and the RWMF will be weighed and a tipping fee charged. The tipping fee charge at the LWMF will be the same as that charged at the RWMC for wastes delivered directly to site.
- The RWMF will include a Access Road, Scale House, Public Drop-off Area, Household Hazardous Waste (HHW) Depot, Materials Recovery Facility (MRF), In-vessel Compost Facility (IPS), Household Hazardous Waste Depot, Construction and Demolition Depot and Landfill, and a Containment Landfill with Leachate Collection and Treatment;
- Pre-sorted wastes received at the RWMF will be weighed and then directed to the MRF (dry bags) or compost facility (wet bags) for processing. At the MRF, recyclable materials will be removed from the waste stream for recycling.

Waste received at the compost facility will be processed and turned into compost material for reuse. The uncompostable and unrecycable materials will be delivered to the landfill site for final disposal. Unsorted waste received will be placed directly into the landfill site.

- It is recommended that the Waste Management System be implemented in a phased approached. Implementation of the proposed Waste Management System will likely take an estimate 6 to 8 years.