

City of Sault Ste. Marie

**ALTERNATIVE WASTE
DIVERSION/COLLECTION SYSTEM OPTIONS**

June 2001

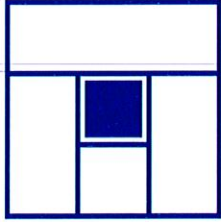


In Association With
Russell Environmental Services

CITY OF SAULT STE. MARIE

ALTERNATIVE WASTE DIVERSION/COLLECTION SYSTEM OPTIONS

TSH Project No. 38-60219



TSH
engineers
architects
planners

June 26, 2001

Mr. Jim Elliott, P.Eng.
Environmental/Construction Engineer
City of Sault Ste. Marie
P.O. Box 580
99 Foster Drive
Sault Ste. Marie, Ontario
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Dear Mr. Elliott:

Re: City of Sault Ste. Marie
Alternative Diversion/Collection System Options
TSH Project No. 38-60219

We are pleased to submit the final Alternative Waste Diversion/Collection System Options Report. This report outlines a number of potential waste diversion/collection systems and a methodology for evaluation of the systems. A financial model was developed specifically for the City waste management system which was used to conduct a financial evaluation of the systems. Finally, a comparative evaluation of the potential waste diversion/collection systems is presented.

We wish to express our appreciation to City staff whose cooperation enabled us to complete this report.

Yours very truly,

Michael Cant
Project Manager

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Encl.

**CITY OF SAULT STE. MARIE
ALTERNATIVE WASTE DIVERSION/COLLECTION SYSTEM OPTIONS**

TABLE OF CONTENTS

TRANSMITTAL LETTER

TABLE OF CONTENTS i
 LIST OF ABBREVIATIONS.....iv
 EXECUTIVE SUMMARYv

1. INTRODUCTION1

 1.1 General1
 1.2 Background.....1
 1.3 Waste Diversion Goals and Objectives2

2. ALTERNATIVE WASTE DIVERSION SYSTEMS5

 2.1 System 1 – The Status Quo6
 2.2 System 2 – Increased Yard Waste Collection6
 2.3 System 3 – Curbside Collection of OCC7
 2.4 System 4 – Recycling of Expanded Materials7
 2.5 System 5 - Organic Waste Composting8
 2.6 Mass Balance for Waste Diversion Systems 10

3. COLLECTION SYSTEMS 13

 3.1 System 1 – The Status Quo 13
 3.2 System 2 – Increased Yard Waste Collection 14
 3.3 System 3 – Curbside Collection of OCC 14
 3.4 System 4 – Recycling of Expanded Materials 14
 3.5 System 5 – Organic Waste Composting 15

4. CAPITAL COSTS FOR WASTE DIVERSION AND COLLECTION SYSTEMS..... 16

 4.1 System 1 – The Status Quo 16
 4.2 System 2 – Increased Yard Waste Collection 17
 4.3 System 3 – Curbside Collection of OCC 18
 4.4 System 4 – Recycling of Expanded Materials 19
 4.5 System 5 – Organic Waste Composting 20
 4.6 Summary 21

5. WASTE DIVERSION AND COLLECTION EVALUATION 22

 5.1 Evaluation Criteria 22
 5.2 Diversion from Landfill 22
 5.3 System Flexibility 25



5.4	Marketability of Materials and Products	27
5.4.1	Dry Recyclables	27
5.4.2	Compost	28
5.5	Availability and Expertise of the Private Sector	28
5.6	Partnership Possibilities	30
5.6.1	Federal Funding Programs	30
5.6.2	Ontario Clean Water Agency	30
5.6.3	Waste Diversion Organization Funding	31
5.6.4	Private Industries	32
5.7	Compliance With Legislation.....	32
5.8	Public Acceptability.....	34
5.9	Overall System Costs	36
5.9.1	Cost of Disposal	36
5.9.2	The Financial Model	37
5.9.3	Results of Financial Modelling	41
5.10	System Evaluation Summary	43
6.	CONCLUSIONS	47

LIST OF TABLES

Table 1.1 –	Per Capita Waste Generation	1
Table 2.1 –	Potential Waste Diversions Systems	9
Table 3.1 –	Materials Included in Fibre and Container Recycling Streams	14
Table 4.1 –	Expected Life Span of Capital Investments.....	16
Table 4.2 –	Capital Cost Estimate for Implementing System 1	17
Table 4.3 –	Capital Cost Estimate for Implementing System 2	18
Table 4.4 –	Capital Cost Estimate for Implementing System 3	18
Table 4.5 –	Capital Cost Estimate for Implementing System 4	20
Table 4.6 –	Capital Cost Estimate for Implementing System 5	21
Table 5.1 –	Expected Diversion Rates for Potential Waste Diversion Systems.....	24
Table 5.2 –	Markets for Dry Recyclables	28
Table 5.3 –	Private Sector and Public Sector Advantages	29
Table 5.4 –	Compost Quality Standards	33
Table 5.5 –	Estimated Average Number of Bags per Household per Week.....	40
Table 5.6 –	Net Yearly Cost of Potential Waste Diversion Systems (Costs per Household)	43
Table 5.7 –	Evaluation of Waste Diversion System Components (Costs, Diversion and Public Acceptability).....	44
Table 5.8 –	Evaluation of Waste Diversion System Components (Flexibility, Private Sector and Partnerships)	46

LIST OF FIGURES

- Figure 1 – Current Waste Generation in the City of Sault Ste. Marie
- Figure 2 – Existing Waste Management System (The Status Quo)
- Figure 3 – Increased Yard Waste Collection

- Figure 4 – Curbside Collection of OCC
- Figure 5 – Recycling of Expanded Materials
- Figure 6 – Curbside Collection of Organic Waste
- Figure 7 – Overall Diversion Rates for the Potential Waste Diversion Systems
- Figure 8 – Net Cost of Potential Waste Diversion Systems

LIST OF APPENDICES

- Appendix A – Mass Balance Tables
- Appendix B – List of Existing Equipment
- Appendix C – Spot Market Prices
- Appendix D – Landfill Cost Summary
- Appendix E – Financial Model of Systems

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LIST OF ABBREVIATIONS

C&D	Construction and Demolition
CCAF	Climate Change Action Fund
CCME	Canadian Council of Ministry of the Environment
CSR	Corporations Supporting Recycling
FCM	Federation of Canadian Municipalities
GMIF	Green Municipal Investment Fund
GMEF	Green Municipal Enabling Fund
HDPE	High Density Polyethylene
hh	Household
HSW	Household Special Waste
IC&I	Industrial Commercial and Institutional
km	kilometre
MRF	Material Recovery Facility
NaPP	National Packaging Protocol
OCC	Old Corrugated Cardboard
OCWA	Ontario Clean Water Agency
PET	Polyethylene Terephthalate
RES	Russell Environmental Services
TSH	Totten Sims Hubicki
WPCP	Water Pollution Control Plant
WDO	Waste Diversion Organization

EXECUTIVE SUMMARY

Twenty-one different waste diversion system components were evaluated as potential building blocks for the development of waste diversion/collection systems for the City of Sault Ste. Marie. The waste diversion system components were evaluated based on the following screening criteria:

- waste diversion potential;
- reliable operating history; and
- economic feasibility.

Nine waste diversion system components were found to satisfy the screening criteria and were considered for further evaluation as part of potential waste diversion systems:

- public education;
- landfill ban (yard waste);
- higher disposal fees;
- user pay waste systems;
- recycling of traditional materials;
- recycling of expanded materials;
- backyard composting;
- centralized outdoor aerobic composting of yard waste; and,
- centralized in-vessel aerobic composting of all organics.

Five (5) main waste diversion systems were developed based on the above waste diversion components. These systems build upon each other, as each system is intended to increase the amount of waste being diverted from the landfill. The five main waste diversion systems are:

- System 1: The status quo;
- System 2: Increased yard waste collection with a ban on yard waste at the landfill;
- System 3: Curbside collection of OCC;
- System 4: Recycling of expanded materials; and,
- System 5: Organic waste composting.

A Reuse Centre is being developed in the City by Clean North, and a municipal Household Special Waste (HSW) Depot has been constructed by the City and will likely begin operation in late 2001. These two waste diversion programs are considered to be inherent components of any of the proposed waste diversion systems.

There are a number of implementation options that can help to encourage waste generators to participate in new waste diversion programs. Bag limits, user-pay programs, and increased tipping fees are options that encourage residents and businesses to reduce the amount of waste set out for disposal, and encourage the recovery of waste for beneficial purposes.

Four different implementation options were evaluated for each of the main waste diversion systems.

Basic System

This is the basic system, with no incentives for the residential sector or Industrial, Commercial and Institutional (IC&I) sectors to participate in waste diversion programs. It comprises the current six bag limit and \$27.50 tipping fee for the IC&I.

Implementation Option A

With this option residents would be allowed to place only two bags of garbage at the curbside each week. Bag tags may be purchased for waste set out over the two-bag limit. Disposal fees for waste delivered to the landfill would be increased so that they more clearly reflect the true cost of waste disposal.

Implementation Option B

Implementation Option B includes a user-pay system on the residential waste stream such that residents would be required to purchase bag tags for each bag of waste placed at the curb. Tipping fees for waste delivered to landfill would remain at the current rates.

Implementation Option C

With this option, residents would be required to purchase bag tags for waste they set out at the curb. Tipping fees for waste delivered to landfill would be increased so that they more clearly reflect the true cost of waste disposal.

Each of these implementation options will impact the amount of waste being captured by the various waste diversion programs, and therefore the diversion rates achieved by the system and the cost of operating the programs.

The five waste diversion systems, and four different implementation options result in twenty (20) different waste diversion/collection systems. The waste quantities being captured by the various waste diversion system components will vary for each one of these systems. The main difference between the various systems is the amount of recyclables or organics that would be recovered and therefore diverted from disposal.

The proposed waste diversion and collection systems were evaluated based on the following criteria:

- Diversion from Landfill;
- Flexibility;
- Marketability of Materials and Products;
- Availability and Expertise of the Private Sector;
- Partnership Possibilities (Public and Private);
- Compliance with Legislation;
- Public Acceptability; and,
- Overall System Cost.

Diversion from Landfill is the total quantity of waste that would be expected to be diverted from landfill or other disposal if the system were implemented. The Canadian Council of Ministers of the Environment (CCME) and the Province of Ontario have established a target of 50% diversion from disposal.

The only waste diversion system that is expected to allow the City to reach 50% diversion of the overall waste stream is System 5 with user fees and increased tipping fees in place. This system includes the following components:

- curbside collection of expanded recyclables;
- processing of recyclables from the IC&I sector;
- curbside collection of organics;
- composting of organics from the IC&I sector;
- leaf and yard waste collection (13 time/yr/hh);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre;
- HSW depot;
- user fees: and
- increased tipping fees.

The Provincial Waste Diversion Organization (WDO) has reviewed the current municipal recycling programs and the costs associated with increasing diversion as part of the *Report to the Minister of the Environment – Achieving Sustainable Municipal Waste Diversion Programs in Ontario*. The WDO recommends a waste diversion goal for WDO funded programs be 44% for residential waste by 2005. The two System 4 options that incorporate user fees, and the System 5 options that incorporate either bag limits or user fees meet or exceed the 44% WDO goal.

Flexibility is the ability for the system to adapt to changing waste streams and generation rates.

It is apparent that if the City wishes to have the flexibility to divert a wider range of materials, it will be necessary to develop new facilities that are capable of accepting more materials. The existing waste diversion system in the City has little ability to adapt to increased tonnages or material mix. Systems 4 and 5 include new waste diversion facilities that would be designed so that they would have the flexibility to adapt to changes in the quantities and composition of the feedstock, and be able to accept and divert waste from the IC&I sector.

Marketability of Materials and Products is a measure of the ability to distribute the products that result from the waste diversion system and the financial implications of the product marketing. The sustainability of a waste diversion program is dependant upon the ability to market the materials and products that are generated by the program.

The waste diversion systems proposed for the City would produce a range of dry recyclables and organic compost products. A limited survey of potential markets was conducted to determine the marketability of these materials and products. The materials recovered from Systems 1 to 4 are recyclables that are readily marketable and generally obtain high revenues, depending on market conditions at the time. System 5 would also produce a Class A compost that would be saleable to local landscapers, nurseries, lawn care contractors, and residents.

Availability and Expertise of the Private Sector is the ability and willingness of private companies to develop and operate the infrastructure necessary for the waste diversion system.

There are a number of waste management firms that would be interested in entering into a Private/Public Partnership with the City for the development of new waste management facilities. The City received nine submissions to a Request for Proposals they issued recently for a waste diversion system. Although the companies that responded were not generally from Northern Ontario, if firms were contracted to design and build a facility, they would likely hire local contractors and labourers to complete the work.

Partnership Possibilities reflects the possibilities of obtaining partnerships for the funding of the waste diversion system. There are a number of opportunities available for the City to partner with other levels of government or the industry sector in the development and operation of a waste diversion program.

There are two separate federal infrastructure funding programs that the City may wish to apply to if it decides to develop new facilities for the management of waste in the City. The Ontario Clean Water Agency (OCWA) has also expressed an interest in partnering with the City in the development of a facility that could compost sewage sludge along with other municipal organic wastes, and there are a number of local industries that may be interested in partnering with the City in the development of new waste diversion facilities, providing that the new facilities would help to manage particular waste streams that the industry generates.

The Provincial Waste Diversion Organization (WDO) has developed a potential plan for funding municipal waste diversion programs. Industry partners representing the grocery, soft drink, packaging, and consumer product industries committed to fund 50% of the net municipal recycling cost. There is a single funding formula developed for all municipal recycling programs in the province. Based on this formula, each municipal recycling program will be funded a per tonne amount that is determined by the following factors:

- material mix;
- population density
- size of the municipality; and
- depot or curbside collection.

Data from municipal recycling programs for 1999 was input into the funding formula. Based on this information, the City would receive a total of \$65,299 in funding for its 1999 recycling program. This equates to \$33 per tonne of material processed, which is low in comparison to the Provincial average of \$45 per tonne. Municipalities that collect and process a more expanded mix of recyclables typically receive more funding on a per tonne basis (for example, based on 1999 data, the Centre and South Hastings municipal recycling program would receive \$71 per tonne of material processed).

It can be concluded, however, that if WDO funding is put in place, a waste diversion system that collects, processes and markets a more expanded mix of recyclables, such as System 4 or 5, will receive comparatively higher per tonne funding than a traditional recycling program.

Compliance with Legislation measures the ability of the system to comply with provincial and federal waste management regulations that are currently in existence.

The requirements for waste diversion of municipal waste are contained in Ontario Regulation 101/94. The regulation stipulates the minimum requirements for a municipal waste management system. All of the waste diversion systems proposed for the City comply with the current Ontario Regulation 101/94. It is difficult to know what future legislation will be in place for waste management, therefore it is impossible to be able to evaluate the proposed systems based on compliance with future legislation.

Public Acceptability is a measure of the expected reaction of the residents and businesses that are the users of the system. A successful waste diversion/collection system requires the participation of the residents and businesses that generate waste in the community. It is therefore important that the waste diversion/collection system be acceptable to the members of the public, so that they understand and participate in the program.

It is difficult to assess the public acceptability of the proposed waste diversion/collection systems until some public consultation has been done to determine the views of the community. It is recommended that an open house be conducted to determine the public acceptability of the proposed waste diversion systems.

Overall System Cost is the total annual system cost which factors in capital and operating costs, financing costs and depreciation. A financial model was developed specifically for the City waste management system to determine the cost of each of the waste diversion systems being considered. This model took into account the entire waste management system, including waste collection, waste diversion, the estimated cost to establish, operate and close a landfill site, and other waste management facilities.

The overall annual system cost consists of two components:

- the annualized capital cost for buildings and equipment; and,
- the system operating costs

It was found that the net costs of the five systems, without factoring in user fees or increased tipping fees, were basically equivalent, as outlined below.

ANNUAL COST OF WASTE DIVERSION OPTIONS	
Waste Diversion System	Annual Cost
1. Status Quo	\$5,130,000
2. Increased Yard Waste Collection	\$5,140,000
3. Curbside Collection of OCC	\$5,120,000
4. Recycling of Expanded Materials	\$5,320,000
5. Organic Waste Composting	\$5,340,000

The City must recover the system costs through general taxation and/or user fees (e.g. bag tags and tipping fees).

The implementation of user fees provides a mechanism to encourage waste diversion and to distribute the costs proportionally to the waste generators.

It has been demonstrated through the financial model that a user pay system can be tailored to balance expenditures and revenues and to ensure equity between the various waste generators (i.e. residential and IC&I).

In summary, the report concludes that:

- the products generated from all the diversion systems are marketable;
- all of the proposed waste diversion systems comply with current legislation;
- Systems 4 and 5 provide the greatest flexibility for managing the waste stream
- there is interest from the private sector to work with the City to develop a waste diversion system;
- there are a number of partnership opportunities for the City to develop and operate a waste diversion system:
 - Federal funding programs;
 - OCWA;
 - the Waste Diversion Organization; and,
 - local industries.

Systems 4 and 5 have the greatest potential for partnerships

- the only waste diversion system that is expected to allow the City to reach 50% diversion of the overall waste stream is System 5 with user fees and increased tipping fees
- two System 4 options and three System 5 options are expected to allow the City to reach the WDO goal of 44% diversion of the residential waste stream by 2005;
- the net cost of all of the waste diversion systems without user fees and increased tipping fees are basically equivalent;
- user fees encourage participation in diversion programs;
- user fees ensure equity between waste generators (e.g. residential and IC&I); and
- residents and businesses should be consulted to determine the public acceptability of the proposed systems

CITY OF SAULT STE. MARIE

ALTERNATIVE WASTE DIVERSION/COLLECTION SYSTEM OPTIONS

1. INTRODUCTION

1.1 General

The City of Sault Ste. Marie (City) retained Totten Sims Hubicki Associates (TSH), in association with Russell Environmental Services (RES) to provide the City with direction on all aspects of its solid waste management for the next 25 to 40 years. A four-phased study is being undertaken over the next 18 months with the goal to develop a practical, economically feasible, environmentally acceptable and technically competent long-term waste management system for the City.

The four phases of the study include:

- Phase 1: Identification of a Preferred Waste Diversion and Collection System
- Phase 2: Identification of a Preferred Waste Disposal System
- Phase 3: Development of an Implementation and Business Plan
- Phase 4: Development of an Environmental Assessment Terms of Reference

This report provides a description of several alternative waste diversion and collection systems for the City and presents a methodology for evaluating the systems.

1.2 Background

The Canadian Council of Ministers of the Environment (CCME) and the Government of Ontario have established a target to decrease the amount of waste going to disposal by 50%, by the year 2000, compared to 1987 rates. Although many municipalities track and attempt to reduce only the residential waste stream, in the case of the City of Sault Ste. Marie both residential and industrial, commercial and industrial (IC&I) waste is deposited in the municipal landfill. It is therefore prudent for the City to consider all of the waste generated in planning their waste diversion system.

The City began weighing waste going to the landfill in 1988, therefore the earliest weigh scale records are from the 1988/89 reporting year. Based on this data, the City has reduced the per capita waste generation rate from 1,167 kg per capita in 1988/89 to 928 kg per capita in 2000, which is an 20% decrease in waste going to landfill.

Year	Population	Waste Landfilled (tonnes)	Waste Landfilled (kg/capita)
1989	82,500	96,279	1,167
2000	78,534	72,868	928
Reduction in waste per capita			20%

Note: Populations based on Statistics Canada Estimates and include Prince Township and Rankin Reserve

In order to increase the amount of waste diversion in the City, the following waste diversion components are being considered as part of potential waste diversion systems:

- public education;
- bag limits;
- landfill bans (OCC and yard waste);
- increased disposal fees;
- user-pay waste systems;
- recycling of traditional materials;
- recycling of expanded materials;
- backyard composting;
- centralized outdoor aerobic composting of yard waste;
- centralized in-vessel aerobic composting of all organics;
- reuse centre; and
- Household Special Waste (HSW) Depot.

These waste diversion components will be combined in a variety of practical ways to create potential waste diversion systems that could be utilized by the City to reduce the amount of waste going to disposal. The waste diversion systems are described in detail in Section 2, various options for waste collection are presented in Section 3. Section 4 provides an outline of the capital costs to implement each system. Section 5 provides an evaluation methodology and evaluates the proposed systems.

A Reuse Centre is being developed and a municipal Household Special Waste (HSW) Depot will be constructed by the City in Spring of 2001 and will likely begin operation in late 2001. These two waste diversion programs will be considered to be inherent components of all of the waste diversion systems being evaluated.

1.3 Waste Diversion Goals and Objectives

The City has identified the need to develop a plan that will provide direction on how to manage all aspects of the municipal waste system for a minimum of the next twenty-five (25) years. The City owns and operates its own landfill, however, based on current usage, the site is expected to reach capacity in approximately ten (10) to twelve (12) years.

Although the City has not adopted a specific waste reduction target, the City has the objective to increase the amount of waste being diverted from landfill. It is important that the waste diversion plan be affordable to the City and use technologies and concepts that have proven successful in similar municipalities.

In order to assess the effectiveness of a waste diversion plan, a number of potential integrated waste diversion systems have been developed. These systems take into account all of the waste that is currently being managed by the City, including waste that is collected by municipal forces or under municipal contract, and waste that is delivered to the City's landfill by other haulers. The total quantity of waste handled by the City in 2000 was 80,558 tonnes and consisted of the following materials:

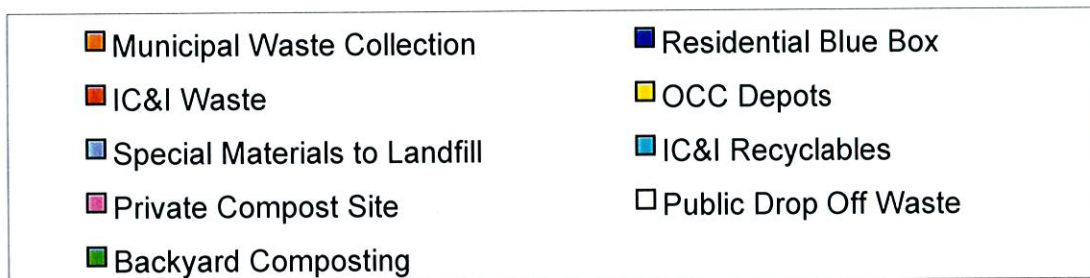
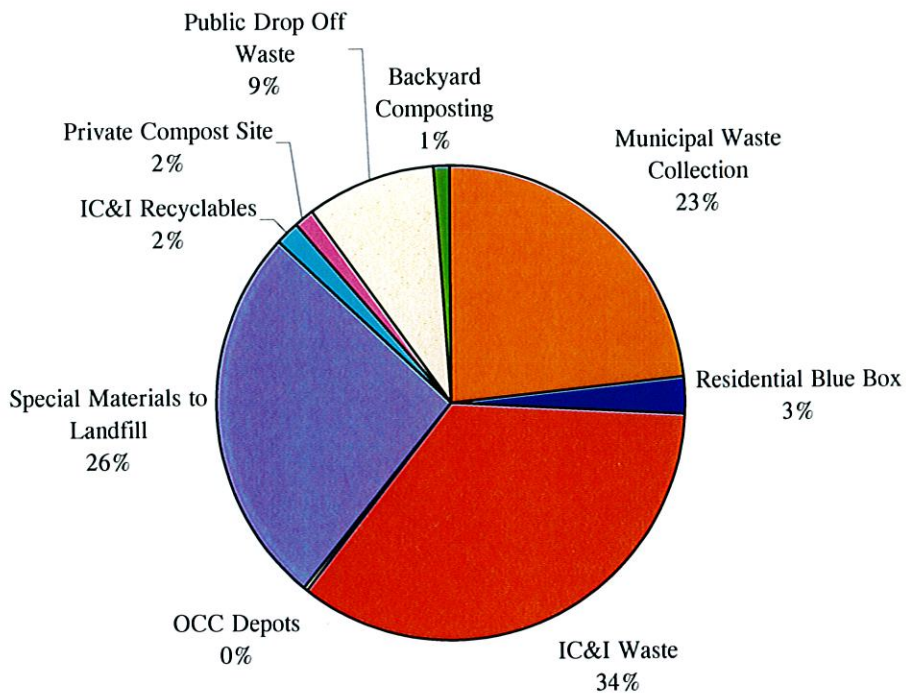
- 18,689 tonnes of residential garbage collected in the municipal collection program;
- 2,133 tonnes of recyclables processed in the City blue box program;
- 27,985 tonnes of Industrial, Commercial and Institutional (IC&I) waste accepted at the City landfill;
- 1,565 tonnes of waste from municipal departments accepted at the landfill;
- 7,055 tonnes of waste accepted at the public drop off at the landfill;
- 19,310 tonnes of special materials accepted at the landfill;
 - 9,185 tonnes of sewage sludge;
 - 7,750 tonnes of contaminated soil;
 - 1,197 tonnes of shingles;
 - 1,135 tonnes of metal/batters/brush/tires;
 - 43 tonnes of asbestos
- 300 tonnes of Old Corrugated Cardboard (OCC) collected in the OCC depot program;
- 1,300 tonnes of OCC and office paper from the IC&I sector processed at the recycling facility;
- 1,245 tonnes of organic waste processed at a private composting facility; and,
- 976 tonnes of waste currently going to backyard composting.

Figure 1 illustrates the current waste generation in the City of Sault Ste. Marie.

There are additional waste streams that are generated in the City of Sault Ste. Marie that are being managed directly by the waste generator (wastes being reprocessed by an IC&I waste generator) or through private operations (e.g. wood recyclers) which the City is not involved in, and has limited information on.

The waste diversion system is only one component of the overall integrated waste management system. Any waste remaining that is not managed by the waste diversion system will be disposed of in some manner. Although this phase of the study does not deal with the options for waste disposal, it is necessary to consider the waste disposal component of the integrated waste management system in order to evaluate the overall cost of each diversion system. For example, a system that diverts a large quantity of waste from landfill will increase the cost of waste diversion for the City, but will impact the cost of collecting and disposing of garbage. It is therefore necessary to include the cost of managing the entire waste stream in the financial evaluation of alternative waste diversion systems.

Figure 1
Current Waste Generation in the City of Sault Ste. Marie



2. ALTERNATIVE WASTE DIVERSION SYSTEMS

Five (5) main waste diversion systems have been developed based on the waste diversion components that were deemed to meet the mandatory screening criteria (see *Waste Diversion System Components Report*, February 2001). These systems build upon each other, as each system is intended to increase the amount of waste being diverted from the landfill. The five main waste diversion systems are:

1. the status quo;
2. increased yard waste collection;
3. curbside collection of OCC;
4. recycling of expanded materials; and,
5. organic waste composting.

The success of a waste diversion program is dependent primarily upon the participation of the residents and businesses that generate the waste. There are a number of implementation options that can help to encourage waste generators to participate in new waste diversion programs. Bag limits, user-pay programs, and increased tipping fees are options that encourage residents and businesses to reduce the amount of waste set out for disposal, and encourage the recovery of waste for beneficial purposes.

Four different implementation options were evaluated for each of the main waste diversion systems.

Basic System

This is the basic system, with no incentives for the residential sector or IC&I sectors to participate in waste diversion programs.

Implementation Option A

With this option residents would be allowed to place two bags of garbage at the curbside each week. Bag tags may be purchased for waste set out over the two-bag limit. Disposal fees for waste delivered to the landfill would be increased so that they more clearly reflect the true cost of landfilling.

Implementation Option B

Implementation Option B includes a user-pay system on the residential waste stream such that residents would be required to purchase bag tags for each bag of waste going to landfill. Tipping fees for waste delivered to landfill would remain at the current rates.

Implementation Option C

With this option, residents would be required to purchase bag tags for waste they set out at the curb. Tipping fees for waste delivered to landfill would be increased so that they more clearly reflect the true cost of landfilling.

Each of these implementation options will impact the amount of waste being captured by the various waste diversion programs, and therefore the diversion rates achieved by the system and the cost of operating the programs.

The five waste diversion systems, and four different implementation options result in twenty (20) different waste diversion/collection systems. The five (5) main waste diversion systems are described below and all twenty (20) systems are summarized in Table 2.1. It is assumed that for all of the systems an aggressive public education campaign will be implemented to make residents aware of the changes to the waste diversion program.

2.1 System 1 - The Status Quo

The Status Quo System is based on the existing waste diversion system that is operating in the City, and includes the following components:

- curbside collection of traditional recyclables;
- depot OCC program;
- leaf and yard waste collection (3 weeks/yr/hh);
- backyard composting;
- public education;
- Reuse Centre; and
- HSW depot.

2.2 System 2 - Increased Yard Waste Collection

This system incorporates the same components as with the City's current waste diversion system, however the leaf and yard waste collection is done on a biweekly basis from mid-May through to the end of November. *The City of Sault Ste. Marie Residential Waste Composition Study, Summer/Fall 2000* determined that the amount of yard waste in the residential waste stream in August was almost double that found in the waste stream in late October. It is expected that the amount of yard waste is higher still during the rapid growing season in the spring.

A ban on yard waste in the waste collection system and at the landfill would also be implemented to encourage participation in the yard waste composting program, and an aggressive public education program would be put in place.

The following components are included in System 2:

- curbside collection of traditional recyclables;
- depot OCC program;
- leaf and yard waste collection (13 times/yr/hh bi-weekly during the growing season);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre; and,
- HSW depot.

2.3 System 3 - Curbside Collection of OCC

System 3 incorporates the same components as System 2, however the depot OCC program is replaced with curbside collection of OCC. Residential OCC and small quantities of OCC from the IC&I sector would be picked up from the curbside with the regular blue box collection. Larger IC&I generators of OCC will be required to drop off material at the City's Material Recovery Facility (MRF), or contract with the private sector for OCC collection.

The following components are included in System 3:

- curbside collection of traditional recyclables, including OCC;
- leaf and yard waste collection (13 times/yr/hh, bi-weekly during growing season);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre; and,
- HSW depot.

2.4 System 4 - Recycling of Expanded Materials

With System 4, the list of materials collected for recycling will be expanded to include a number of new materials, such as:

- Boxboard (e.g. cereal boxes);
- polystyrene containers (e.g. styrofoam cups);
- paper cups and plates;
- plastic film;
- HDPE bottles (e.g. shampoo bottles);
- rigid polystyrene containers (e.g. blister paks);
- telephone directories;
- textiles;
- and polycoat paperboard containers (e.g. juice containers).

Due to the number of materials being collected, it will be necessary to commingle a number of materials that will need to be separated at the MRF. This would necessitate replacing the City's existing MRF in order to undertake the level of material sorting required.

The City's existing recycling facility does not have the capacity to manage large quantities of recyclables from the IC&I sector. A new MRF, however, would be able to accommodate recyclables brought in from IC&I generators. A tipping fee would be charged for the processing of the IC&I material, but it would be lower than the tipping fee at the landfill in order to encourage diversion.

The following components are included in System 4:

- curbside collection of expanded recyclables, including OCC;
- processing of recyclables delivered by the IC&I sector;

- leaf and yard waste collection (13 times/yr/hh, bi-weekly during the growing season);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre; and
- HSW depot.

2.5 System 5 - Organic Waste Composting

System 5 incorporates the curbside collection and processing of the organic component of the waste stream in an enclosed in-vessel aerobic composting system. There are a number of benefits to continuing to process leaf and yard waste at the existing outdoor windrow composting facility including:

- the cost of processing yard waste at an outdoor windrow facility is much cheaper than processing through an enclosed, more automated system;
- it is difficult for an enclosed system to handle the large surges of yard waste that occur in the spring of the year; and,
- any brush collected with the yard waste should be shredded prior to composting, and this is difficult to do if the brush is mixed with the rest of the organic waste stream.

The following components are included in System 5:

- curbside collection of expanded recyclables, including OCC;
- processing of recyclables delivered by the IC&I sector;
- curbside collection of organics;
- processing of organics delivered by the IC&I sector;
- leaf and yard waste collection (13 times/yr/hh, bi-weekly during the growing season);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre; and,
- HSW depot.

**TABLE 2.1
POTENTIAL WASTE DIVERSION SYSTEMS**

System	Implementation Option			Waste Diversion System Components							Public Education Campaign
	Bag Limits	User Pay	Higher Disposal Fees	Traditional Curbside Recycling	Corrugated Cardboard	Expanded Curbside Recycling	Leaf and Yard Waste (#/year)	Yard Waste Ban	Organic Waste Collection (Curbside)		
1 (Basic)				✓	✓ (D)		✓ (3)				✓
1A	✓		✓	✓	✓ (D)		✓ (3)				✓
1B		✓		✓	✓ (D)		✓ (3)				✓
1C		✓	✓	✓	✓ (D)		✓ (3)				✓
2 (Basic)				✓	✓ (D)		✓ (13)	✓			✓
2A	✓		✓	✓	✓ (D)		✓ (13)	✓			✓
2B		✓		✓	✓ (D)		✓ (13)	✓			✓
2C		✓	✓	✓	✓ (D)		✓ (13)	✓			✓
3 (Basic)				✓	✓ (C)		✓ (13)	✓			✓
3A	✓		✓	✓	✓ (C)		✓ (13)	✓			✓
3B		✓		✓	✓ (C)		✓ (13)	✓			✓
3C		✓	✓	✓	✓ (C)		✓ (13)	✓			✓
4 (Basic)				✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)		✓
4A	✓		✓	✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)		✓
4B		✓		✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)		✓
4C		✓	✓	✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)		✓
5 (Basic)				✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)	✓	✓
5A	✓		✓	✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)	✓	✓
5B		✓		✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)	✓	✓
5C		✓	✓	✓	✓ (C)	✓ (C)	✓ (13)	✓	✓ (C)	✓	✓

Note: Backyard composting, a Reuse Centre and HSW Depot are considered to be part of all the Waste Diversion Systems.
 D = Depot Collection
 C = Curbside Collection

2.6 Mass Balance for Waste Diversion Systems

The five main waste diversion systems, each with the four options for implementation, result in a total of 20 potential waste diversion systems. The waste quantities being captured by the various waste diversion system components will vary for each one of these systems. The main difference between the various systems is the amount of waste reduced or the quantities of recyclables or organics that would be recovered and therefore diverted from disposal. The amount of material recovered is dependent upon the participation of residents and businesses in the waste diversion programs.

According to *The City of Sault Ste. Marie Residential Waste Composition Study - Summer/Fall 2000*, approximately 44% of households in the City currently participate in the blue box program over a two-week period, compared to a 90% blue box participation rate¹ in the Province. The low participation rate in the City's current blue box program results in a very low capture of recoverable items.

The mass balance for each of the proposed waste diversion systems is included in Appendix A. The tables outline the quantities of waste that are expected to be handled by the various components of the waste diversion systems identified for possible use by the City.

The City should have an HSW depot and Reuse Centre available for residents in 2001. The mass balances have been developed with the assumptions that these programs are in operation. Therefore the diversion rates shown are slightly higher than the diversion rates currently being achieved in the City.

In developing the mass balances for the waste diversion systems, a number of assumptions were made based on the experiences of other municipalities. These assumptions are outlined below.

Bag Limits

Bag limits have been used in many municipalities to reduce the amount of waste set out for disposal. It has been found, however, that communities that establish a bag limit at four or more bags rarely experience a noticeable reduction in waste sent to landfill or an increase in materials diverted through recycling or composting programs². Bag limits of 3 bags or less have, however, resulted in a reduction in waste sent to landfill and increased waste diversion. Residents in the City currently set out an average of 2.7 units of garbage each week³, therefore a 3 bag limit is not expected to have a significant impact on diversion rates in the City. It has been assumed that if residents were limited to setting out 2 free bags of waste each week (any additional may be charged), the waste management system would be affected as follows:

- the recovery of recyclables would increase from the current rate of 42% to 60%;
- the amount of OCC recovered through the depot program would increase from 6% to 30%;

¹ Source: *Report to the Minister of the Environment, Achieving Sustainable Municipal Waste Diversion Programs in Ontario, WDO, September 1, 2000.*

² Source: *The Waste Diversion Impacts of Bag Limits and Pay as you Throw Systems in Selected Communities in North America, Enviros RIS, April 2001.*

³ Source: *The City of Sault Ste. Marie Residential Waste Composition Study - Summer/Fall 2000 (TSH)*

- the amount of waste going to backyard composters would increase 300 tonnes per year (an increase of approximately 30%);
- the amount of material going to a Reuse Centre would double; and,
- a general residential waste reduction of 500 tonnes would be realized by a change in consumer purchasing.

User Fees

Bag limits have a somewhat limited effect on waste reduction because once residents have reduced their waste to the two-bag limit, there is no further incentive to achieve further waste reduction. User fees, on the other hand, provide a continual incentive to reduce waste to the minimum. The implementation of user fees is more effective than bag limits in diverting garbage from landfill and increasing recycling rates. It has been assumed that if user fees were implemented (e.g. bag tags) on the residential waste stream, the waste management system would be affected as follows:

- the recovery of recyclables would increase from the current rate of 42% to 70%;
- the amount OCC recovered through the depot program would increase from 6% to 35%;
- 60% of households would use backyard composters, which would increase waste going to backyard composters by 731 tonnes;
- the amount of material going to a Reuse Centre would double; and,
- a general residential waste reduction of 500 tonnes would be realized by a change in consumer purchasing.

Tipping Fees

Bag limits and user fees affect only the residential waste stream that is set out for curbside collection, which makes up approximately 23% of the waste that is currently being landfilled in the City. In order to significantly reduce the total amount of waste being landfilled, it will be necessary to address the waste brought to the landfill by the IC&I sector, and waste delivered to the public drop-off area by residents. This can be done by increasing the tipping fees charged for disposal to a cost that is more reflective of the true cost of landfilling, and more in line with tipping fees being charged in other areas of the province. It has been assumed that if the tipping fee at the landfill was increased to \$65 per tonne, the waste management system would be affected as follows:

- the amount of waste being delivered to the public drop-off area would decrease by 35%;
- most of the brush that is currently being delivered to the landfill would be taken to a private composting facility;
- the amount of OCC being delivered to the OCC depots would increase from 16% to 35%;
- 35% of the IC&I yard waste would be delivered to the private composting facility;
- the amount of special materials, such as scrap metal, shingles, asbestos, and contaminated soils being delivered to landfill would decrease by 35%; and,
- a general IC&I waste reduction of 5000 tonnes would be realized by processing modifications and more internal reuse and recycling of wastes.

The existing MRF in the City does not have the capacity to process recyclables from the IC&I sector. It has been assumed (in Systems 4 and 5), however, that a new MRF would be designed to accept both residential and IC&I recyclables. A new composting facility (System 5) should also be designed to handle organics generated from the IC&I sector. Although it has been assumed that up to 70% of recyclables and organic materials would be recovered from the residential sector, it is the experience in other municipalities that the IC&I sector does not participate to the same extent in waste diversion programs. Therefore, for Systems 4 and 5, it has been assumed that a maximum of 60% of the IC&I recyclables and organics would be recovered, with the exception of sewage sludge. Because the City controls the management of sewage sludge, it has been assumed that all of the sludge would be delivered to the compost facility.

3. COLLECTION SYSTEMS

The collection system is an integral component of a waste management system. There are many collection system options available for the City, depending on the waste diversion system chosen.

There are two main methods of collecting multiple waste streams. The various waste streams (recyclables, organics, and garbage) can be collected separately in vehicles that pick up just one of the waste types at a time. This means that it is necessary for the collection vehicles to make numerous trips along each street in order to collect different waste streams. Another option is to collect more than one material type in a vehicle, thereby making another vehicle pass unnecessary. When more than one type of waste is collected on a single vehicle it is called co-collection.

3.1 System 1 - The Status Quo

Both waste and recyclables are currently collected on a weekly basis in the City. The City utilizes both private and public sector forces for the collection of waste and recyclables. The collection throughout the City is done five days per week.

Waste is collected in the central urban area of the City using municipal forces and municipally owned, operated and maintained equipment. Three (two-person) rear-loading packer vehicles are utilized on a regular basis, with two vehicles available for backup. The City also provides container collection to multi-family apartment units.

Collection of waste in the outlying, more rural areas is contracted to the private sector. In December 1999, a private contractor was awarded the contract to provide all labour and equipment necessary to complete the service for a 5-year period. The collection of waste from the 80 high-density residential (apartment) units is also part of the waste collection contract.

The collection of recyclables is contracted to a private contractor, who utilizes three city-owned Walinga top-loading collection vehicles. These vehicles have four compartments so that fibres, containers (metal and plastic), clear glass and coloured glass can be kept separate in the vehicle.

Leaf and yard waste is collected during a three-week period in the fall by City forces. The City's waste collection vehicles are used to collect yard waste on the day after the regular waste collection day during this period.

The City contracts with the private sector to provide depot collection at nine locations throughout the City. The contractor is required to supply the containers, collect the OCC from the containers as required, and process and market the OCC. The contractor is paid a lift fee for each container of OCC collected.

An HSW depot is being constructed in the City. Residents will be able to drop off HSW at the depot during regular hours, which will initially be scheduled for two days a week.

For the sake of this analysis, the collection system for the status quo option will remain the same. The status quo system is shown in Figure 2.

3.2 System 2 - Increased Yard Waste Collection

The changes proposed in System 2 are that the leaf and yard waste collection be increased to 13 times per year (biweekly throughout the growing season) in order to catch the spring and summer yard waste season. It is proposed that the collection system remain the same, however additional trucks will be required to service the expanded collection area and more frequent collections. Yard waste vehicles would be utilized on a weekly basis from May through November, however each household would receive collection on a biweekly basis.

The collection system proposed for this system is illustrated in Figure 3.

3.3 System 3 - Curbside Collection of OCC

It is proposed that with System 3, OCC be collected at the curbside along with the rest of the recyclables. This will require an additional compartment on the truck to keep OCC separate from the other materials. It has been assumed that residents and small generators from the IC&I sector will place their OCC at the curb for collection, while generators of large quantities of OCC will be required to bring the material to the recycling facility, or contract with the private sector to manage their OCC.

System 3 eliminates the need for the OCC depots, the separate collection of OCC from the depots, and the OCC processing operation. The collection system proposed for this system is illustrated in Figure 4.

3.4 System 4 - Recycling of Expanded Materials

With System 4, there will be a greater variety of materials that will be collected for recycling. Due to the number of materials being collected, it will be necessary to commingle materials in the collection process. These materials will then be separated at the MRF.

It is typical to divide the recyclables into a "fibres" stream and a "containers" stream, as indicated in Table 3.1.

Fibres	Containers
Newsprint	PET Bottles
Office Paper	Aluminum Cans
Boxboard	Aluminum Foil
Corrugated Cardboard	Ferrous Cans
Paper Cups and Plates	Clear Glass
Plastic Film	Coloured Glass
Telephone Directories	Polystyrene Containers
Textiles	HDPE Bottles

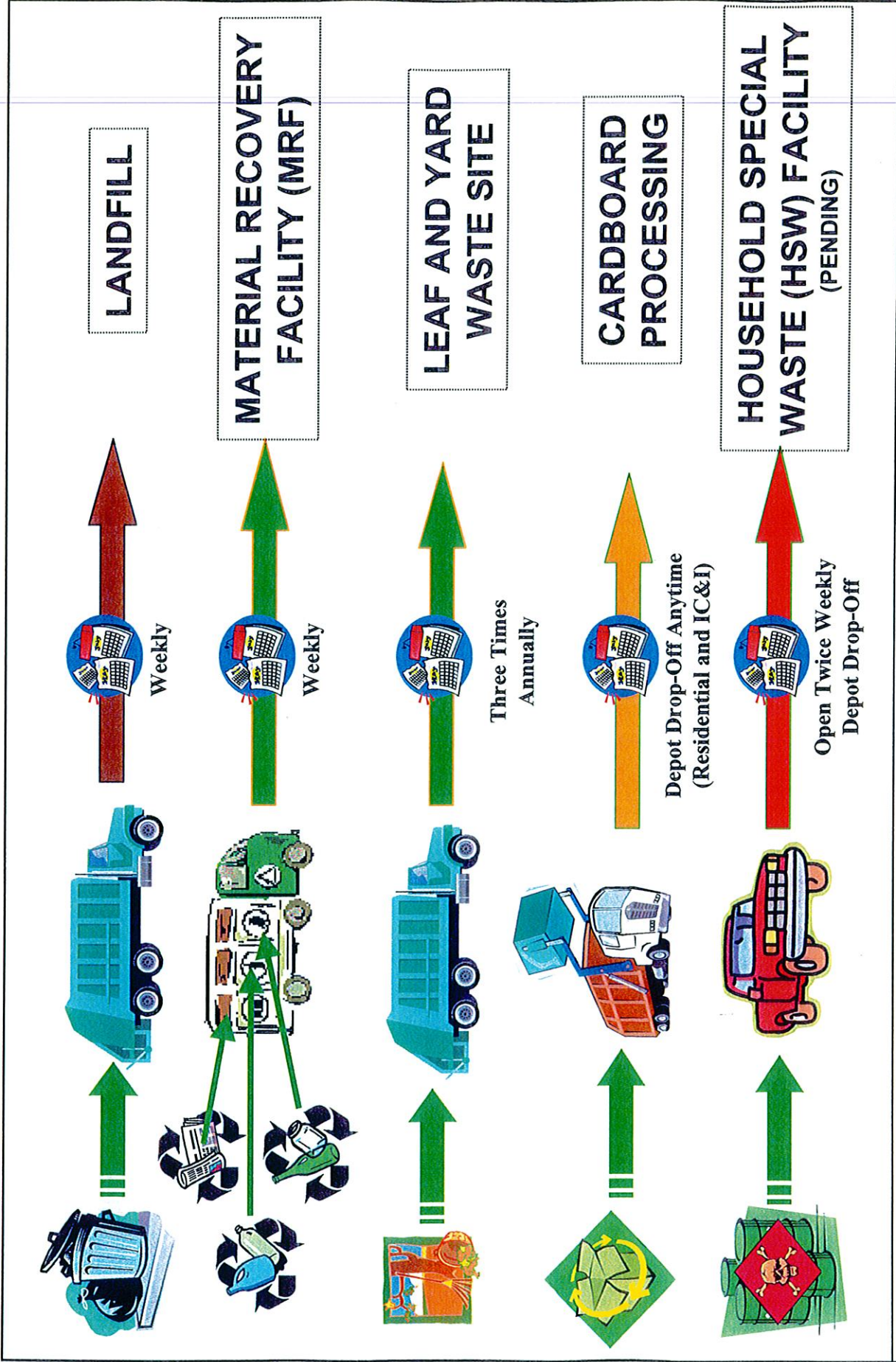
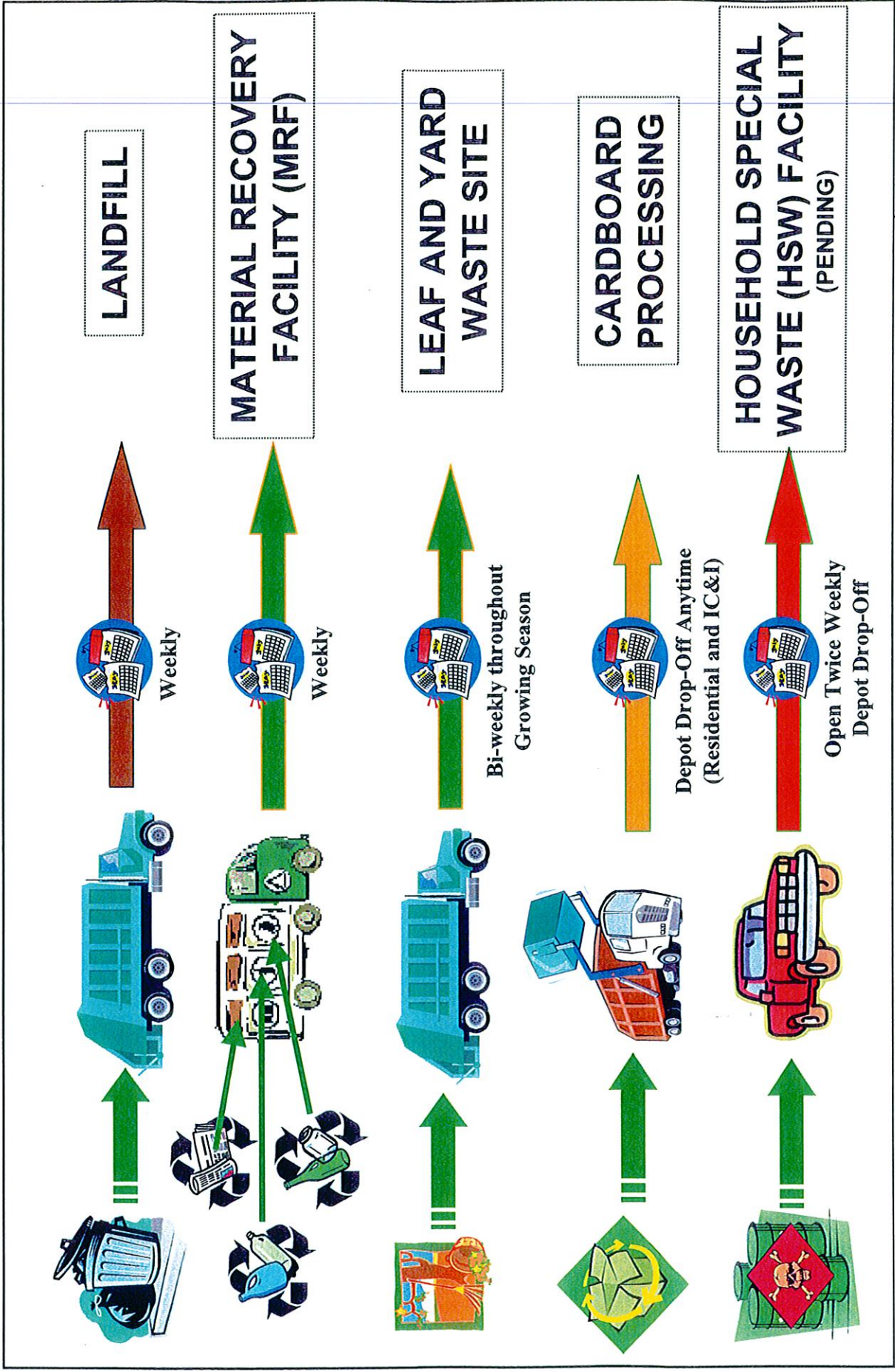


Figure 2



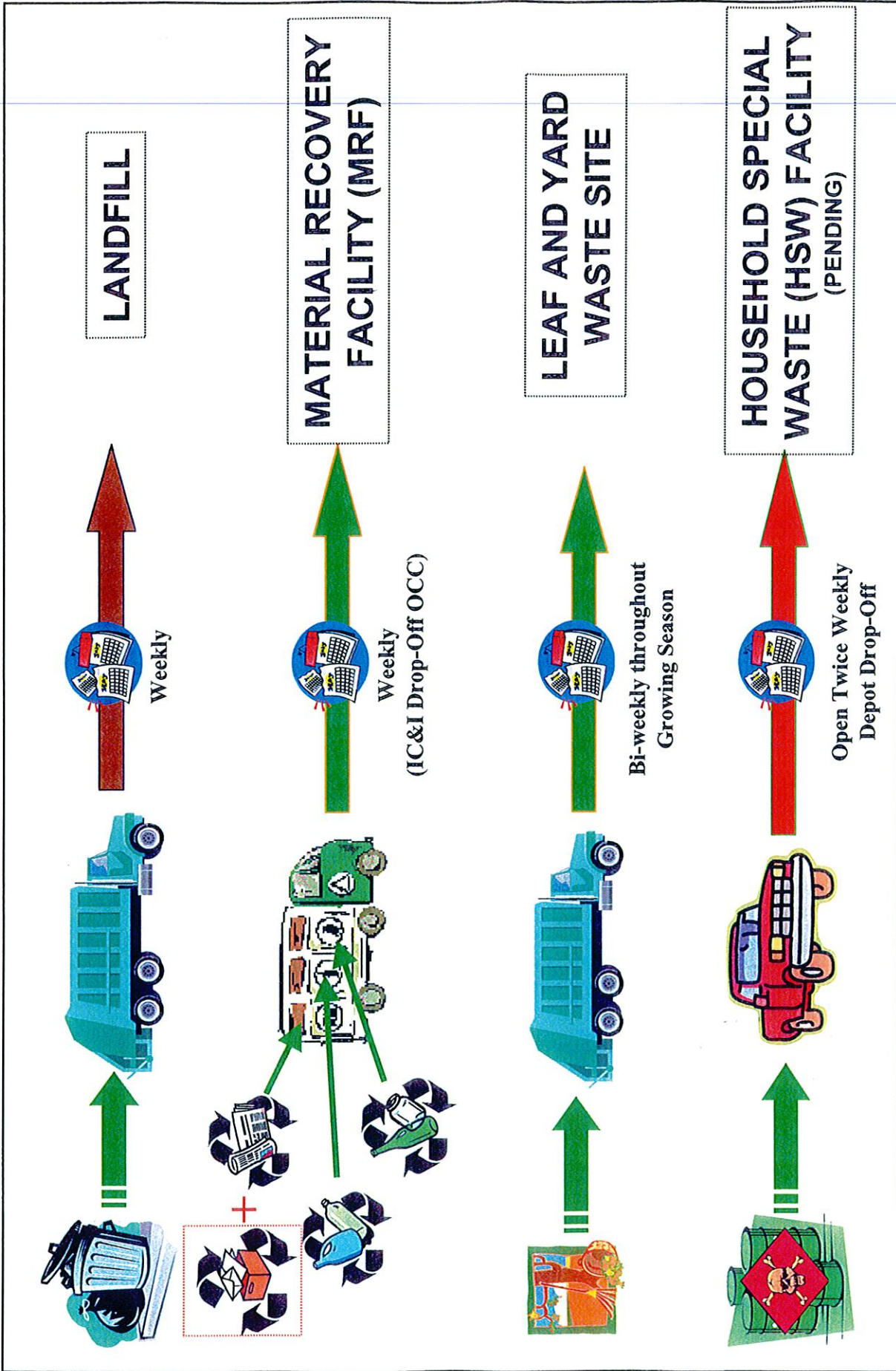


Figure 4

Containers are typically placed in the blue box, with fibres being placed in either a second box, or in a see-through (blue or clear) bag. Although this increases the amount of processing that is necessary when the material reaches the MRF, it makes the collection system much more efficient. Manual sorting is not required at the curbside, and there is not as much opportunity for a truck to "cube out" (a cube out occurs when a collection vehicle has one of the compartments on the truck full, while the others have space remaining). This results in a vehicle making a trip back to the MRF even though it does not contain a full load. The fibre and container waste streams can be collected in a two-compartment truck that is able to compact both streams.

The collection system proposed for this system is illustrated in Figure 5.

3.5 System 5 – Organic Waste Composting

System 5 requires the separation of an additional waste stream by the homeowner. As part of this system, organic wastes, such as meats, vegetable scraps, dairy products, etc. will be separated and sent for processing at a compost facility. There are many ways that this can be accomplished without requiring more trucks to pass by each house each week.

This system will require that residents separate their waste into 4 streams on a regular basis:

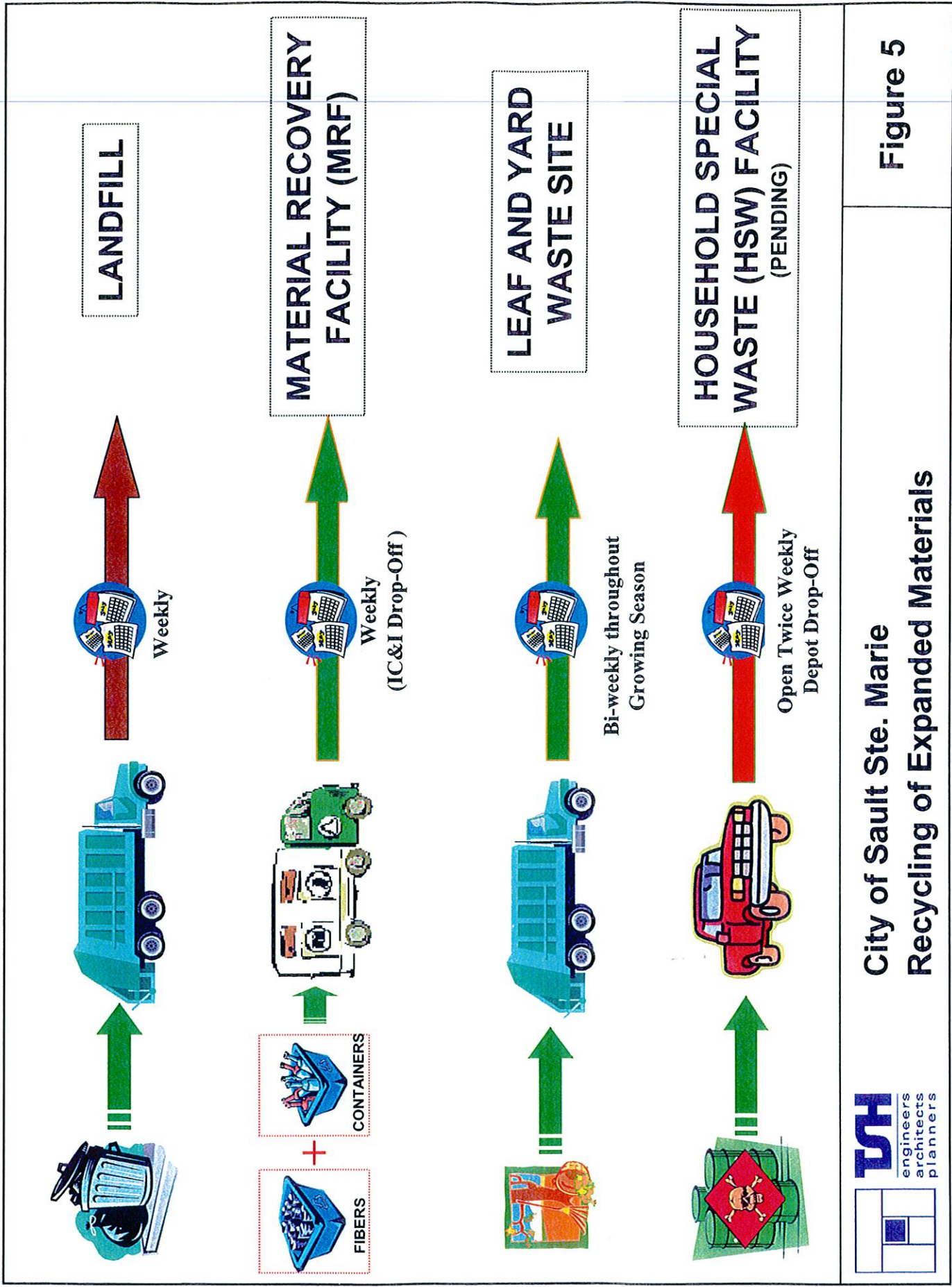
- fibres;
- organics;
- containers; and,
- garbage.

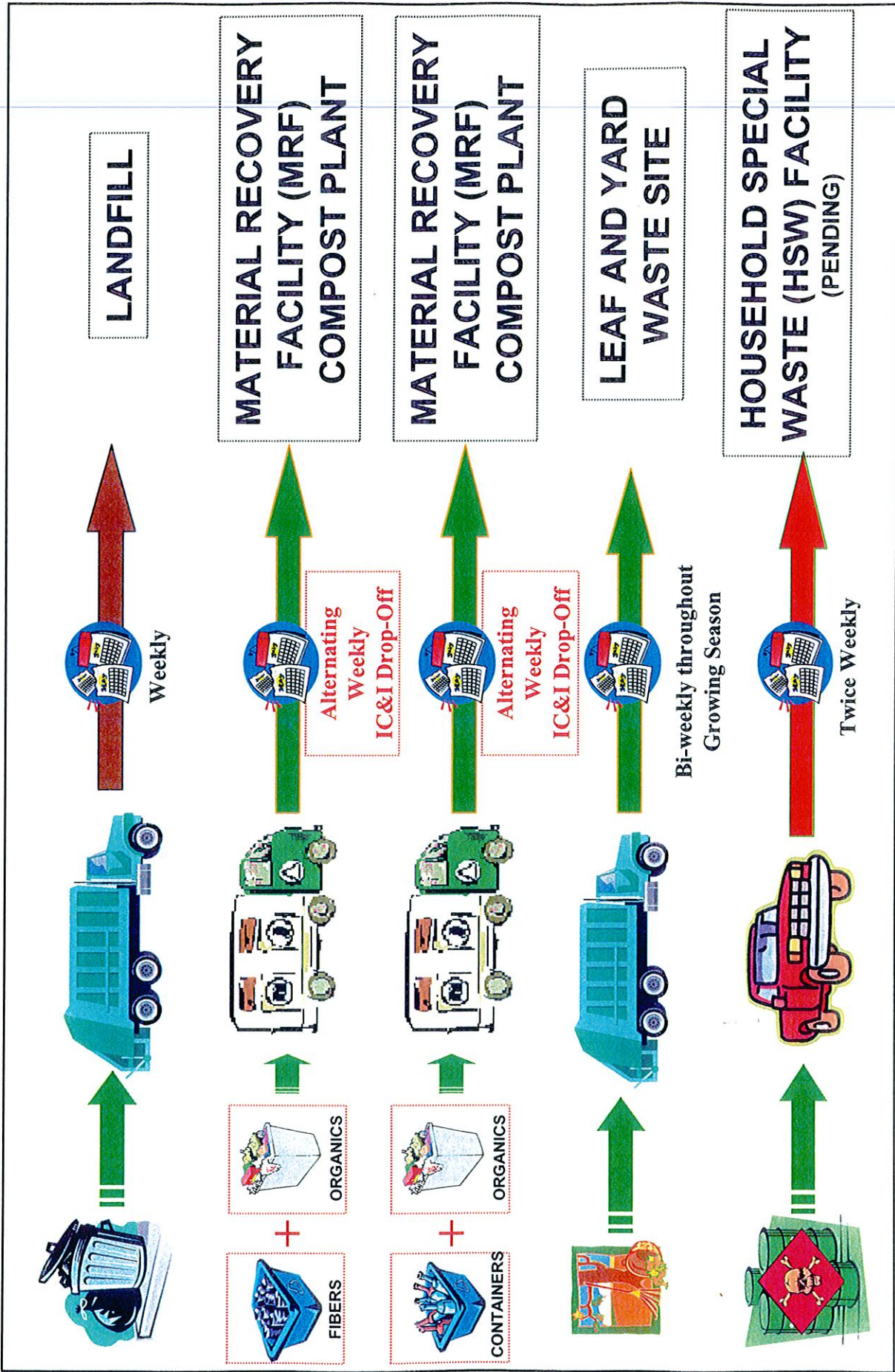
Leaf and yard waste will continue to be separated for collection on a bi-weekly basis throughout the growing season.

There are many combinations for collecting the various waste streams, but residents usually like to have their organic waste collected every week, since it is the most likely to cause odour problems. Recyclable fibres and containers can be co-collected with the organics on an alternating week schedule, so that fibres and organics are collected one week, while containers and organics are collected on the alternating week. This type of schedule is being utilized in many areas, including Markham and Halifax. These municipalities send out a calendar to residents advising them of what materials get collected in each area each week.

There are many different options for containers that residents can use to place the various waste streams at the curb. Some municipalities use different coloured see-through bags to differentiate containers, fibres and organic materials. Wheeled carts and various types of recycling boxes and pails are other options. The important point is that residents be given clear instructions as to what containers they can use for each of the separated waste streams.

The collection system proposed for this system is shown in Figure 6.





4. CAPITAL COSTS FOR WASTE DIVERSION AND COLLECTION SYSTEMS

The total annualized capital costs for the five proposed waste management systems are outlined in this section. The costs were calculated based on the following methodology:

- the capital costs for all equipment and buildings necessary to implement the system were calculated;
- financing charges for the capital expenditures were added to the capital costs; and
- the annualized capital costs were determined by allocating the capital costs over the expected life of the investment.

The implementation of the potential waste diversion and collection systems will use existing City-owned equipment wherever possible. A listing of the equipment currently used by the City for waste diversion and collection is included in Appendix B. The cost for replacement of any equipment scheduled for the next three years necessary for any of the potential systems has been included in the capital cost for that system.

Table 4.1 outlines the expected life span for the various capital investments that will be necessary in order to implement the potential waste diversion systems.

Capital Investment	Expected Life Span
Collection Vehicles	7 Years
Buildings	20 Years
Processing Equipment	10 Years

The following sections provide information on the capital cost investment for each of the potential waste management systems.

4.1 System 1 - The Status Quo

With the status quo system, the existing waste management programs would continue. Some of the equipment being used to deliver the existing programs have reached the end of their practical life span and should be replaced.

The City owns five waste collection vehicles, the oldest of which is seven years old. Currently, two collection vehicles are used for yard waste collection and for peak waste collection periods. Three of the waste collection vehicles should be retired over the next three years. The cost for the replacement of these vehicles with 30.2 m³ (39 yd³) rear-loading compaction vehicles is in the range of \$160,000 to \$220,000. For the sake of this analysis, an estimated cost of \$180,000 has been used.

Recycling collection services are provided using three City-owned 1990 Walinga 25 m³ (33 yd³) top-loading recycling vehicles. These collection vehicles have been in operation for 11 years and are at the end of their practical service life. In order to allow for expansion of the recycling program, it is recommended that these vehicles be replaced with three 33 m³ (43 yd³) top-loading recycling vehicles equipped with a can crusher to compact metal and plastic containers. The cost of each vehicle is estimated at \$137,000.

The recycling facility and equipment is owned by the City. This equipment has been in service for over ten years, and is generally due for an overhaul, however if the baler has been adequately maintained, it should have another ten years of service. The baler slider plates and the conveyor belt should be replaced, and some additional funds may be needed for general equipment upgrades. A figure of \$50,000 has been estimated for overhaul of the recycling equipment.

The recycling building was used as a works yard prior to being converted to a recycling facility. If the facility continues to operate at that location, it is expected that funds will be needed on an annual basis to keep the building in usable condition, and \$25,000 a year has been allocated for that purpose.

Table 4.2 outlines the capital cost estimate for implementing System 1.

	Total Cost (2001 \$)	Service Life (yrs)	Interest Rate (%)	Annualized Cost (2001 \$)
Waste Collection Vehicles (3)	540,000	7	6	96,736
Recycling Collection Vehicles (3)	411,000	7	6	73,626
Recycling Facility Upgrade	50,000	10	6	6,794
Recycling Building Maintenance (on an annual basis)				25,000
TOTAL ANNUALIZED COST				\$202,156

4.2 System 2 - Increased Yard Waste Collection

With System 2, the number of yard waste collections will increase to 13 per year for each household on a bi-weekly basis throughout the growing season. The increase in the number of collections and a ban on the disposal of yard waste is expected to increase the amount of yard waste collected from the current quantity of 300 tonnes per year to a maximum quantity of approximately 1000 tonnes a year. Based on an expected compacted yard waste density of 300 kg/m³, the City's existing 25 yd³ (19 m³) collection vehicle would be able to collect 5.7 tonnes of yard waste in each load. The new 30.2 m³ (39 yd³) rear-loading compaction vehicles would be able to collect 9.1 tonnes of yard waste per load. No additional collection vehicles will be required relative to System 1.

The necessary capital expenditures for implementing Waste Diversion System 2 are the same as for System 1, as outlined in Table 4.3.

TABLE 4.3 CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 2				
	Total Cost (2001 \$)	Service Life (yrs)	Interest Rate (%)	Annualized Cost (2001\$)
Waste Collection Vehicles (3)	540,000	7	6	96,736
Recycling Collection Vehicles (3)	411,000	7	6	73,626
Recycling Facility Upgrade	50,000	10	6	6,794
Recycling Building Maintenance (on an annual basis)				25,000
TOTAL ANNUALIZED COST				\$202,156

4.3 System 3 – Curbside Collection of OCC

System 3 replaces the OCC depots with curbside collection of OCC as part of the blue box program. In order to do this, the blue box collection system would be revised to a five-stream sort, which would include:

- papers (newsprint, office paper, and magazines);
- containers (PET bottles, aluminum cans, ferrous cans);
- clear glass;
- coloured glass; and
- OCC.

Due to the additional material being collected, and the additional time required to do a five-stream sort instead of a four-stream sort, one additional recycling collection vehicle would be required. The estimated capital cost of System 3 is as outlined in Table 4.4.

TABLE 4.4 CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 3				
	Total Cost (2001 \$)	Service Life (yrs)	Interest Rate (%)	Annualized Cost (2001 \$)
Waste Collection Vehicles (3)	540,000	7	6	96,736
Recycling Collection Vehicles (4)	548,000	7	6	98,169
Recycling Facility Upgrade	50,000	10	6	6,794
Recycling Building Maintenance (on an annual basis)				25,000
TOTAL ANNUALIZED COST				\$226,699

4.4 System 4 – Recycling of Expanded Materials

For the sake of this analysis, the cost for implementing System 4 is based on the City developing their own MRF to process recyclables. It may, however, be more economical for the City to send their recyclables to an established facility. Cost estimates for a City-owned facility have been developed and can be used as a comparison with the cost of sending recyclables for processing elsewhere.

System 4 is based on the recycling program being expanded to include a list of 18 different commodities being collected for processing and sale to secondary markets. As the number of materials being recycled increases from a traditional to an expanded system, it is not feasible to have separate compartments in the collection vehicle for each material type, therefore materials will be "commingled", or mixed together. More sorting is required at the recycling facility to further separate the collection streams. Recycling facilities have become more sophisticated with equipment to automatically separate the various material streams based on physical properties. The term Material Recovery Facility (MRF) was coined to reflect the increase in the amount of processing being done after the recyclables are collected. The current recycling facility being used to process blue box materials collected in the City would not be adequate to process and expanded mix of recyclables, therefore the City would need to construct a new MRF for that purpose.

A MRF is typically a large warehouse with a tipping floor to receive the shipments of recyclables and conveyor belts for the recyclables to be transported through the separation system. Older MRF's rely on manual separation of the recyclables, as workers line the sides of the conveyor belts and pull off one type of material or another. This approach is time-consuming and expensive.

Automated techniques are available for some materials, and new separation equipment is being developed as the recycling industry evolves. Ferrous metals can be separated with a magnetic separator. Screening can be done to remove small pieces of glass and other waste that may contaminate streams. An eddy current separator uses an electromagnetic field to eject aluminum from a stream of mixed materials. Plastics can be separated from glass with an air classifier, which takes advantage of the density differences of the materials. Manual sorting is typically utilized to separate the different polymers of plastic, different colours of glass, and different grades of paper, however optical techniques are being developed to complete these tasks. Automated separation methods will greatly improve the economics of recycling by decreasing labour costs and increasing revenues through greater purity of the recovered materials.

It is expected that the City MRF would accept separate streams of commingled fibres and containers. Separate sorting lines would be dedicated to the separation of each of these streams. The various grades of paper and cardboard would be sorted manually on the fibre sorting line. The container sorting line would be more automated, with magnetic separation of steel, air classification of heavy and light materials, and aluminum being separated with an eddy current separator. The mobile equipment (skid steer and fork lift) could be moved to the new location to reduce the equipment costs of the new MRF. Based on these assumptions, a MRF to process

approximately 8000 tonnes of recyclables from the City would cost approximately \$5.5 million, of which \$2.5 million would be for the building, and \$3 million for equipment.

The collection of recyclables would be accomplished with 30 m³ (39 yd³) side-loading co-collection compaction vehicles. The following compaction densities are expected for each of the materials collected:

- 200 kg/m³ for containers; and,
- 350 kg/m³ for fibres.

Since the curbside sorting is virtually eliminated, three collection vehicles would be adequate to collect the expected quantities of residential recyclables (up to 7,300 tonnes a year). The cost of each co-collection vehicle is estimated at \$195,000.

Due to the decrease in residential waste being set out for collection, only two new waste collection vehicles will be needed for the collection of regular waste and yard waste.

The estimated capital costs of System 4 are outlined in Table 4.5.

	Total Cost (2001 \$)	Service Life (yrs)	Interest Rate (%)	Annualized Cost (2001 \$)
Waste Collection Vehicles (2)	360,000	7	6	64,490
Recycling Collection Vehicles (3)	585,000	7	6	104,797
MRF Building	2,500,000	20	6	217,950
MRF Equipment	3,000,000	10	6	407,610
TOTAL ANNUALIZED COST				\$794,847

4.5 System 5 – Organic Waste Composting

The System 5 scenario includes in-vessel composting of organic waste as a component of the waste management system. There are a number of in-vessel composting technologies that are currently being used in North America, however most systems include the following basic components:

- pre-processing equipment to remove contaminants from the organic feedstock;
- channels or other type of containers where the composting takes place;
- turning equipment to mix the organic feedstock during the composting process;
- an aeration system to ensure proper air flow during the composting process;
- a biofilter to remove odours from the exhaust air; and,
- an outdoor curing pad.

It is recommended that the composting facility initially be designed to process 18,000 tonnes per year of organic waste (see Section 5 for further discussion on composting capacity). Based on other composting facilities of this size currently in operation, it is estimated that the total cost of the composting plant would be \$7.5 million, of which \$3.5 million would be for the building, and \$4 million would be for equipment.

Based on the expected quantity of recyclables and organics that would be collected, four 30 m³ (39 yd³) side-loading co-collection compaction vehicles, at a cost of \$195,000 each would be required.

The total annualized capital cost of System 5 is shown in Table 4.6.

	Total Cost (2001 \$)	Service Life (yrs)	Interest Rate (%)	Annualized Cost (2001 \$)
Waste Collection Vehicles (2)	360,000	7	6	64,490
Recycling/Organics Collection Vehicles (4)	780,000	7	6	139,729
MRF Building	2,500,000	20	6	217,950
MRF Equipment	3,000,000	10	6	407,610
Compost Plant Building	3,500,000	20	6	305,130
Compost Plant Equipment	4,000,000	10	6	543,480
TOTAL ANNUALIZED COST				\$1,678,389

4.6 Summary

Based on the information presented in this section, the total annualized cost for capital expenditures for each waste diversion system is as follows:

- System 1 - \$ 202,000
- System 2 - \$ 202,000
- System 3 - \$ 227,000
- System 4 - \$ 795,000
- System 5 - \$1,678,000

5. WASTE DIVERSION AND COLLECTION SYSTEMS EVALUATION

5.1 Evaluation Criteria

It is proposed that the 20 potential waste diversion and collection systems shown in Table 2.1 be evaluated based on the criteria outlined in this section. These criteria were developed in consultation with City staff.

Diversion from Landfill is the total quantity of waste that would be expected to be diverted from landfill or other disposal if the system were implemented.

Flexibility is the ability for the system to adapt to changing waste streams and generation rates.

Marketability of Materials and Products is a measure of the ability to distribute the products that result from the waste diversion system and the financial implications of the product marketing.

Availability and Expertise of the Private Sector is the ability and willingness of private companies to develop and operate the infrastructure necessary for the waste diversion system.

Partnership Possibilities reflect the possibilities of obtaining partnerships for the funding of the waste diversion system.

Compliance with Legislation measures the ability of the system to comply with provincial and federal waste management regulations that are currently in existence.

Public Acceptability is a measure of the expected reaction of the residents and businesses that are the users of the system.

Overall System Cost is the total annual system cost as determined by the financial model, which factors in capital and operating costs, financing costs and depreciation. The costs for each of the potential waste diversion systems will be calculated with the assumption that the City would own and operate any facilities or equipment to be used for the waste diversion system. This does not, however, preclude the City from contracting for any of the waste management services.

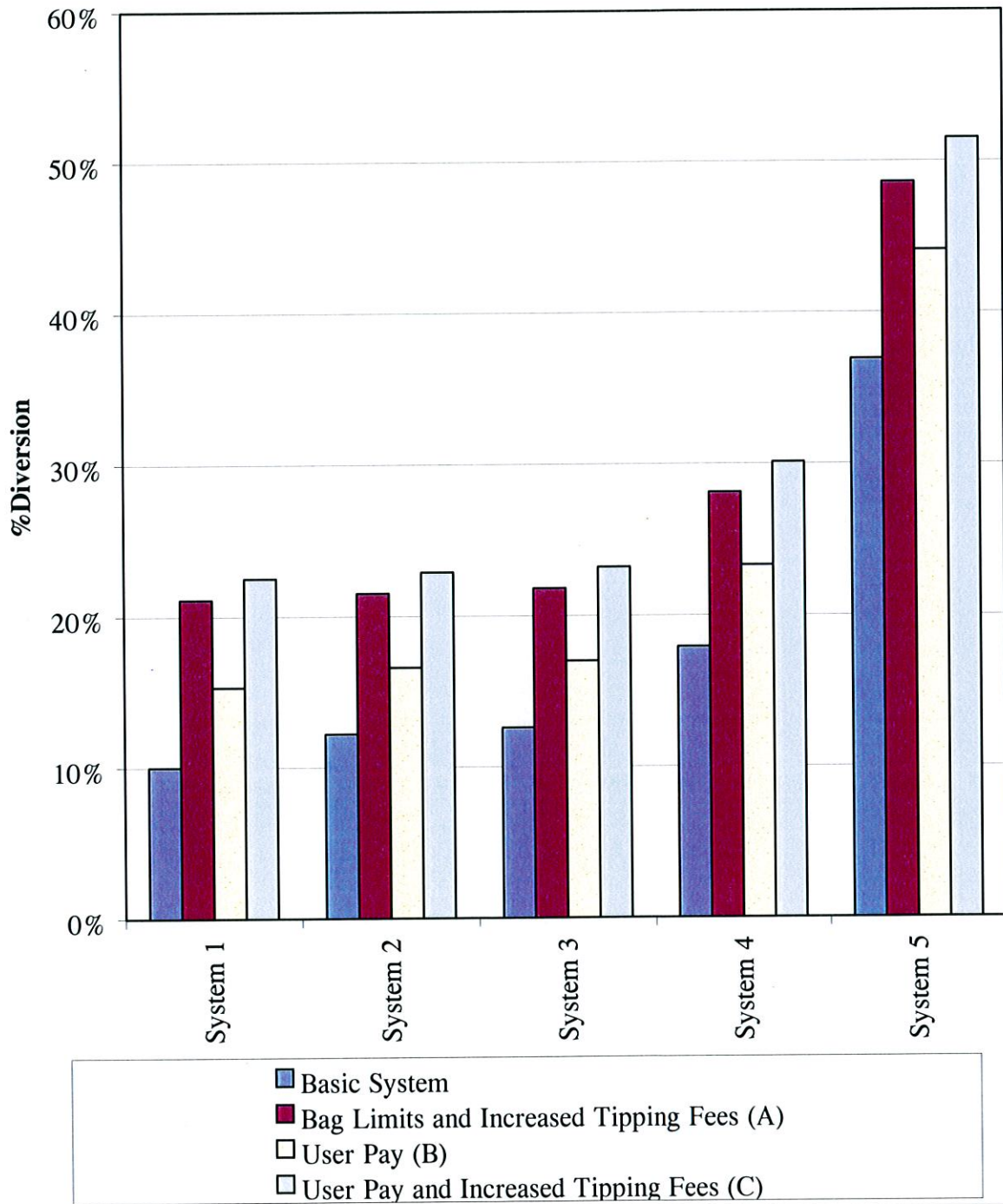
Each of the systems are evaluated using the aforementioned criteria in the sections that follow.

5.2 Diversion from Landfill

One of the main goals of this study is to increase the diversion of waste from landfill. The City currently has approximately 10-12 years of capacity remaining in its existing landfill. This timeframe could be extended if the City is able to increase waste diversion. An increased waste diversion rate will also mean more efficient use of existing and future landfill capacity.

The diversion from landfill rate was calculated for both the residential and total waste stream based on the mass balance tables found in Appendix A, and has been summarized in Figure 7 and Table 5.1.

Figure 7
Overall Diversion Rates for Potential Waste Diversion Systems



**TABLE 5.1
EXPECTED DIVERSION RATES FOR POTENTIAL WASTE DIVERSION SYSTEMS
(PERCENT)**

Options	System 1 Status Quo		System 2 Yard Waste Bans and Increased Yard Waste Collection		System 3 Curbside Collection of OCC		System 4 Expanded Recyclables		System 5 Organics Processing	
	Res.	Total	Res.	Total	Res.	Total	Res.	Total	Res.	Total
Basic System	18.1	10.0	21.8	12.2	22.9	12.6	30.0	17.9	41.9	36.9
Bag Limits and Increased Tipping Fees	28.7	21.1	29.7	21.5	30.5	21.8	38.9	28.1	53.2	48.6
User Pay	32.3	15.3	33.5	16.6	34.4	17.0	44.3	23.3	61.0	44.1
User Pay and Increased Tipping Fees	32.3	22.5	33.3	22.9	34.3	23.2	44.1	30.1	60.8	51.5

Res = Residential

The only waste diversion system that is expected to allow the City to reach 50% diversion of the overall waste stream is System 5 with user fees and increased tipping fees in place. This system includes the following components:

- curbside collection of expanded recyclables;
- processing of recyclables from the IC&I sector;
- curbside collection of organics;
- composting of organics from the IC&I sector;
- leaf and yard waste collection (13 time/yr/hh bi-weekly during the growing season);
- landfill ban (yard waste);
- public education;
- backyard composting;
- Reuse Centre;
- HSW depot;
- user fees; and
- increased tipping fees.

The Waste Diversion Organization (WDO) has reviewed the current municipal recycling programs and the costs associated with increasing diversion as part of the *Report to the Minister of the Environment – Achieving Sustainable Municipal Waste Diversion Programs in Ontario*. The WDO recommends a waste diversion goal for WDO funded programs be 44% for residential waste by 2005. The two System 4 options that incorporate user fees, and the System 5 options that incorporate either bag limits or user fees meet or exceed the 44% WDO goal.

The City is particularly challenged in achieving a high rate of waste diversion due to the number of IC&I generators that use the City landfill site. There are currently not many waste diversion alternatives for these IC&I generators, therefore almost all of their waste is being landfilled.

It is clear that the City will not achieve high waste diversion rates unless it establishes the infrastructure for waste diversion with the financial incentives in place to encourage residential and IC&I waste generators to use the waste diversion programs. This is done through direct financial penalties, such as a charge on each bag of waste generated, or tipping fees that reflect the true cost of developing, operating and maintaining the waste management system.

5.3 System Flexibility

The waste diversion and collection system that the City chooses to implement is expected to handle all of the waste generated in the City for the next 25 to 40 years. It is therefore very important that the system be flexible in managing varying waste compositions and quantities. Historically, the quantities and composition of the City's waste has changed from year to year, and it is important that the waste diversion system that the City chooses be flexible enough to be able to adapt to future changes.

It was identified in the *Organic Waste Diversion Report (TSH, March 2001)* that there is a significant amount of organic waste generated in the City that is currently not being managed by municipal facilities. The organic waste stream that was part of the municipal waste stream consisted of 22,752 tonnes in 2000, which was only 32% of the total organic waste stream. The City also manages an additional 9,185 tonnes of sewage sludge at the municipal landfill site. This quantity is expected to increase to 13,000 tonnes per year with the expansion of the East End Water Pollution Control Plant. Approximately 40,300 tonnes of organic waste was generated in the City in 2000 that was managed by other means. St. Mary's Paper produces 7,300 tonnes per year of paper fibre sludge that is currently being used as final cover for landfill sites and for mine rehabilitation. There is another 33,000 tonnes per year of wood waste that is being chipped by a private contractor and then sold to landscapers or to local industries for boiler "hog fuel". Some or all of these additional waste streams may enter the City's waste management system from time to time. It is therefore important that the City's system be able to deal with fluctuations in feedstock.

The City's current recycling facility is operating at capacity. The building is not adequately sized to allow for indoor tipping of the material being delivered, or for indoor storage of the processed materials. Both unprocessed and processed recyclables are being stored outside which can lead to problems of blowing litter, and a reduction of material revenues due to moisture contamination. The equipment in the facility is nearing the end of its useful life span and is not capable of separating a more expanded mix of recyclables (such as HDPE plastic or aseptic containers). There is very little flexibility for increased quantities of recyclables, or for increasing the material mix with the existing recycling facility.

A private composting facility is able to handle an increased quantity of yard waste, however they are not able to manage a full organics stream or sewage sludge due to the concern of odours and processing problems that may occur due to having an outdoor facility. The private facility is currently certified to accept the following materials:

- wood sludge;
- bark;
- vegetable matter;

- lawn clippings;
- leaf and yard waste; and,
- manure.

It is apparent that if the City wishes to have the flexibility to divert a wider range of materials, it will be necessary to develop new facilities that are capable of accepting more materials. One of the more challenging issues in developing new waste management facilities is to size the operations to allow for potential changing requirements in the future, particularly since the municipality has control over only the waste that is collected in the municipal collection. It is therefore important to design a waste management system that can adapt to changing waste quantities.

Systems 4 and 5 in this study propose a new MRF to process recyclables. Based on the figures in the mass balance tables, the MRF would need to process approximately 12,000 tonnes of recyclables a year, which is considered to be a small-scale operation. The size of a MRF is dependant upon throughput requirements, however, the building size and equipment requirements generally remain the same for most small-scale operations.

A MRF is designed with three main areas:

- a tipping floor for the storage of unprocessed recyclables;
- processing equipment area; and,
- storage for processed materials.

The tipping floor area should be designed to handle the material that would typically be delivered each day, as well as space for unloading the recycling collection vehicles, therefore there is not a direct relationship between the area required and the facility throughput. The processing equipment area is generally not throughput dependant since the same equipment would typically be required for a plant whether it processed 10,000 or 20,000 tonnes per year of recyclables. Storage area requirements are standard, since the area is determined based on the requirement to store a full truckload of each of the materials that the facility processes, regardless of how long it takes to generate a full truckload.

A MRF is therefore, by its very nature, flexible to changing waste streams. It is typical that the throughput of a MRF be rated based on a number of tonnes per hour and fluctuations in throughput are managed by adjusting the operating hours of the facility.

An in-vessel composting facility, on the other hand, is a constant biological process, so the annual processing capacity is dependant on the volume of the processing vessel. Composting capacity is rated in tonnes per year, with little ability to increase throughput by operational changes. Most composting technologies are easily expandable, however, by simply adding another vessel or bin (depending on the technology). It is therefore suggested that if the City chooses System 5 as the preferred waste diversion system, that the compost facility be designed to handle only the initial expected quantities (18,000 tonnes per year), with additional capacity being brought on line as required.

It has been determined that the existing waste diversion system in the City has little ability to adapt to increased tonnages or material mix. Systems 4 and 5 include new waste diversion

facilities that would be designed so that they would have the flexibility to adapt to changes in the quantities and composition of the feedstock.

5.4 Marketability of Materials and Products

The sustainability of a waste diversion program is dependant upon the ability to market the materials and products that are generated by the program. The waste diversion systems proposed for the City would produce a range of dry recyclables and organic compost products. A survey of potential markets was conducted to determine the marketability of these materials and products.

5.4.1 Dry Recyclables

Markets for dry recyclables are reasonably well established due to the amount of time that recycling programs have been in operation, however the value of dry recyclables has fluctuated significantly over the past ten years (see the Corporations Supporting Recycling (CSR) Sheet, Reported Spot Market Prices as of May 15th in Appendix C). The average market price for the blended mix of materials tracked by CSR for the first 5 months of 2001 is \$101 per tonne. The values quoted are free on board (F.O.B.) at the recycling facility for all materials other than glass and polystyrene.

The value obtained for recyclables is dependent upon the quality of the material recovered. The markets want material that is contaminant free, and in tightly compacted bales.

Often the best net market prices for materials are not obtained at markets in close proximity to the recycling facility. The Plant Manager of the Northumberland MRF, which processes a wide range of dry recyclables, states that she shops around for the best prices, and is currently marketing plastics in Texas and Quebec, and ferrous metals in Connecticut⁴. These markets pay transportation costs to their facilities, providing the material received is a clean product in tightly compacted bales. The Northumberland MRF received a net revenue (less transportation costs) of \$103 per tonne in 1999, and \$152 per tonne in 2000.

⁴ Source: Verbal conversation with Mary Little, Plant Manager, Northumberland MRF.

Table 5.2 outlines some potential markets that are in close proximity to the City.

TABLE 5.2 MARKETS FOR DRY RECYCLABLES		
Material	Market	Contact
OCC	Weyerhaeuser, Sturgeon Falls, Ontario	Greg Carello (705) 753-2170
OCC, Newsprint, Boxboard	Michigan Paperboard Co. Battlecreek, Michigan	Bill Bryant (616) 963-4004
Newsprint	Bowater Pulp and Paper Thunder Bay, Ontario	Gail Lock (807) 475-2300
Ferrous Metals	Traders Metal Sault Ste. Marie, Ontario	Donald Pitts (705) 945-2492
PET	ATI Grand Rapids, Michigan	Matt Paschick (616) 742-3872
PET	Cedar Salvage Cedar Springs, Michigan	Dick Capek (616) 696-2000

5.4.2 Compost

Compost operations typically sell their product to landscapers, nurseries, lawn care contractors, and residents. The markets for compost tend to be much more localized than markets for dry recyclables. Potential markets for compost (including a sod farm) in the City were contacted to determine the level of interest in purchasing organic compost. The companies contacted stated that they would purchase compost, providing that the price is competitive with the cost of topsoil and other alternatives. Topsoil sells locally for approximately \$70/tonne (\$30 - \$32 per cubic yard). Based on this information, a Class A compost priced at \$25 per tonne should be marketable in the area.

5.5 Availability and Expertise of the Private Sector

Traditionally, the public sector owned and operated the infrastructure needed to provide municipal services, such as water treatment plants, sewage treatment, and waste management facilities. The main goal of the public sector in establishing such facilities was to provide quality service to the taxpayer at a reasonable cost.

In recent years, there has been a greater involvement of the private sector in both owning and operating the facilities to provide municipal services. This is particularly the case with waste management services. The private sector is playing an increasing role in waste collection, disposal and diversion systems. There are a number of advantages and disadvantages in privatization of waste management services as outlined in Table 5.3.

Factor	Public Sector	Private Sector
Control of Waste Stream	Has control of residential waste but not IC&I	No control of waste stream
Accountability	Fully accountable for establishing service level	Accountable to meet terms of contract
Profit Goals	Driven by need to provide service	Must have a return on investment
Regulatory Requirements	Is exempt from certain laws and regulations	May have stricter regulatory requirements
Ability to Obtain Funds	Typically able to obtain good debenture rates	Typically obtains standard loan rates
Decision Making	Decision making may be onerous	More streamlined and pragmatic decision-making process
Cost Efficiencies	Typically higher labour costs	May be more efficient
Government Funding	Greater potential	Limited potential

Whatever waste diversion system is chosen for the City, there will likely be some private sector involvement in the construction, ownership or operation of one or more of the system components. Canadian Waste currently provides a number of waste management services in the City, including waste collection in the outlying areas, recycling collection, and processing of recyclables. Lemieux Composting is a local private sector business that owns and operates a composting site that processes the City's leaves and other yard wastes. Sault Ste. Marie Disposal Inc. currently operates the OCC Depot program.

A Private/Public Partnership involves both the private and public sectors in providing services to the taxpayer. One increasingly popular type of Private/Public Partnership is to have the private sector design, build, and possibly operate a municipal facility. This option allows for as much flexibility and innovation in the process as possible.

With a design/build scenario the municipality issues a list of general performance goals for the facility, the required throughput of material, and the type of waste that the facility will expect to receive. Potential contractors will be invited to submit preliminary design and costing figures for the owner's evaluation. In this way, the municipality defines the overall objectives of the facility, however they do not have as much control over the final product.

There are a number of waste management firms that would be interested in entering into a Private/Public Partnership with the City for the development of new waste management facilities. The City received nine submissions to a Request for Proposals they issued recently for a waste diversion system. Although the companies that responded were not generally from Northern Ontario, if firms were contracted to design and build a facility, they would likely hire local contractors and labourers to complete the work.

5.6 Partnership Possibilities

There are a number of opportunities available for the City to partner with other levels of government or the industry sector in the development and operation of a waste diversion program.

5.6.1 Federal Funding Programs

The Canadian government has committed funds for the development of the infrastructure to sustain Canada's growth and the Canadian quality of life. There are two separate infrastructure funding programs that the City may wish to apply to, if it decides to develop new facilities for the management of waste in the City.

FCM Green Municipal Funds

The Federation of Canadian Municipalities (FCM) has established the \$100-million Green Municipal Investment Fund (GMIF) and the \$25-million Green Municipal Enabling Fund (GMEF), which are designed to encourage advances in environmental technology and innovation. The expectation is that knowledge and experience gained with support from GMIF/GMEF in best practice and innovative environmental projects will be applied to national infrastructure projects.

Climate Change Action Fund

The Climate Change Action Fund (CCAF) was established by the federal government to help Canada meet the commitments it made towards the Kyoto Protocol for the reduction of greenhouse gas production. The CCAF was announced in the 1998 federal budget, where \$150 million was allocated over three years to support the development of an implementation strategy to meet these commitments and to facilitate early action to reduce greenhouse gas emissions. Landfills are the largest source of man-made methane (a greenhouse gas) entering the atmosphere, therefore infrastructure developed that helps to reduce the landfilling of waste may be eligible for funding under this program.

5.6.2 Ontario Clean Water Agency

The Water Pollution Control Plants (WPCP) in the City generate a significant amount of sewage sludge that is currently being landfilled. The WPCPs are operated by the Ontario Clean Water Agency (OCWA), who are looking for other alternatives for the management of the sewage sludge Province wide.

On January 31, 2001, the City met with representatives from OCWA to discuss organics management and the efforts OCWA is taking to divert this material from the landfill. The City learned that OCWA has taken the initiative to establish a northern team within their agency to evaluate alternative methods of dealing with sewage sludges and other organic wastes being generated by municipalities throughout the north. This initiative is being undertaken independently by OCWA with no involvement from the City. The OCWA team will focus on implementing sludge handling systems that produce a Class A compost.

It is possible that OCWA would be interested in partnering with the City in the development of a facility that could compost sewage sludge along with other municipal organic wastes.

5.6.3 Waste Diversion Organization Funding

The Province of Ontario recognizes that municipalities should not be responsible for the full cost of recycling materials that are produced by the private sector. In order to correct this situation, the Province formed the Waste Diversion Organization (WDO) in 1999 to develop a plan for funding municipal waste diversion programs. The WDO determined that the average net cost of collecting, processing and marketing recyclables in 1999 was \$99/tonne, based on data reported by municipalities using standardized data call procedures. Industry partners representing the grocery, soft drink, packaging, and consumer product industries committed to fund 50% of the net municipal recycling cost. Ninety percent (90%) of this money will be allocated directly to municipalities based on a funding formula that was developed by the WDO, and the remaining 10% of the funds will be available to support projects to improve recycling system efficiency.

The funding will apply only to materials collected from the residential sector. There is a single funding formula developed for all municipal recycling programs in the province. Based on this formula, each municipal recycling program will be funded a per tonne amount that is determined by the following factors:

Material Mix

Municipalities that market greater quantities of higher net cost materials (e.g. aseptic containers, film plastics, polystyrene) will receive higher per tonne funding than municipalities that market a more traditional mix of recyclables.

Population Density

Communities with lower population densities will receive comparatively higher per tonne funding which is reflective of the higher cost to collect recyclables in these areas.

Size of the Municipality

Recycling operations that service a smaller municipal base will receive higher per tonne funding to compensate for the increased cost to provide recycling services to smaller communities.

Depot or Curbside Collection

Municipalities that have curbside collection of recyclables will receive comparatively higher per tonne funding than municipalities that have depot collection programs to reflect the increased cost for curbside collection.

Municipalities will be required to report the annual tonnes for each material marketed from the residential sector. The standard costs for each municipality is then determined by applying the standard costs per tonne and per cubic metre to the quantities of materials reported by the municipality, then modified by a "population density factor" and "municipality size factor".

Although there was consideration given to making allowances for a "distance from market factor" for remote municipalities (such as northern Ontario), it was decided not to make this adjustment because it was found that municipalities that are a greater distance from markets for materials such as glass and plastics, are typically closer to markets for other materials (e.g. newsprint and OCC).

The data from municipal recycling programs for 1999 has been input into the funding formula. Based on this information, the City would receive a total of \$65,299 in funding for its 1999 recycling program. This equates to \$33 per tonne of material processed, which is low in comparison to the Provincial average of \$45 per tonne. Municipalities that collect and process a more expanded mix of recyclables typically receive more funding on a per tonne basis (for example, based on 1999 data, the Centre and South Hastings municipal recycling program would receive \$71 per tonne of material processed).

The WDO funding for any given year will be based on municipal tonnes recycled the previous year, and the average of marketed material revenues for the previous year. It is expected that the per tonne funding amounts would be lower for the 2000 year, as a result of the higher material revenues received by municipalities in 2000.

WDO funding was not included in the financial model used in this study because the Province has not yet approved the funding proposal of the WDO or put the legislation in place that would require the industry partners to participate in the plan. It can be concluded, however, that if WDO funding is put in place, a waste diversion system that collects, processes and markets a more expanded mix of recyclables will receive comparatively higher per tonne funding than a traditional recycling program, and that a system that maximizes the amount of recyclables captured for recycling will receive a greater overall funding amount.

5.6.4 Private Industries

There are a number of local industries (e.g. St. Mary's Paper, Domtar) that may be interested in partnering with the City of Sault Ste. Marie in the development of new waste diversion facilities, providing that the new facilities would help to manage particular waste streams that the industry generates. In particular, the development of a compost plant for System 5 would be able to process paperfibre sludges that are generated by these industries.

5.7 Compliance With Legislation

The Canadian Council of Ministers of the Environment (CCME) and the Province of Ontario have both adopted a target of 50% waste diversion from landfill. This waste diversion target is only a goal, and there are currently no legislative requirements for waste diversion rates in Ontario.

The requirements for waste diversion of municipal waste are contained in Ontario Regulation 101/94. The regulation stipulates that a municipality with a population of at least 5,000 shall establish, operate and maintain a blue box waste management system that includes the following materials:

- basic blue box waste, being aluminum food or beverage cans, glass bottles and jars, newsprint, PET bottles, and steel food or beverage cans.
- at least two categories of supplementary blue box wastes, being aluminum foil, boxboard, corrugated cardboard, expanded polystyrene containers, fine paper, magazines, paper cups and plates, plastic film, rigid plastic containers, telephone directories, textiles, and polycoat paperboard containers.

The current Sault Ste. Marie blue box management system complies with Regulation 101.

The regulation also requires municipalities with a population of at least 5,000 to establish, operate and maintain a leaf and yard waste system, which includes the provision of home composters to residents at cost or less and the provision of educational information to residents about composting. Municipalities with a population greater than 50,000 are required to collect or accept leaf and yard waste in a manner that is reasonably convenient to the generators of leaf and yard waste in the municipality. The leaf and yard waste system must also provide a leaf and yard waste composting site and information to promote the effective separation of leaf and yard waste and full use of the composting system.

Regulation 101/94 also outlines the requirements for aerobic composting operation and specifies the minimum quality of the final compost product for restricted and unrestricted usage, as indicated in Table 5.4.

TABLE 5.4 COMPOST QUALITY STANDARDS		
	Maximum Concentration for Unrestricted Use Compost (mg/kg dry weight)	Maximum Concentration for Controlled Compost (mg/kg dry weight)
Metals		
Arsenic	10	20
Cadmium	3	4
Chromium	50	50
Cobalt	25	25
Copper	60	100
Lead	150	500
Mercury	0.15	0.5
Molybdenum	2	3
Nickel	60	60
Selenium	2	2

TABLE 5.4 COMPOST QUALITY STANDARDS		
	Maximum Concentration for Unrestricted Use Compost (mg/kg dry weight)	Maximum Concentration for Controlled Compost (mg/kg dry weight)
Zinc	500	500
Plastic (Greater than Size 8 Mesh)	1%	1%
Other Non-Biodegradable Material (Greater than Size 8 Mesh)	2%	2%

Controlled compost can be used as compost in the soil subject to a number of restrictions, including a requirement that the person who uses the compost keeps a record, for at least 10 years after using the compost, of the date the compost was used, the amount of compost used, and the chemical analysis of the compost received from the producer of the compost. Compost that does not meet either of these quality standards cannot be sold or used on an area unless it receives a Certificate of Approval for Waste Disposal.

Because the composting facility in the proposed System 5 accepts only source separated organic feedstock, it is expected that the finished compost produced will meet the specifications for unrestricted use compost.

All of the waste diversion systems proposed for the City comply with the current Ontario Regulation 101/94. It is difficult to know what future legislation will be in place for waste management, therefore it is impossible to be able to evaluate the proposed systems based on compliance with future legislation.

5.8 Public Acceptability

A successful waste diversion/collection system requires the participation of the residents and businesses that generate waste in the community. It is therefore important that the waste diversion/collection system be acceptable to the members of the public, so that they understand and participate in the program.

Most of the systems being considered by the City will require some change in the way that people manage the waste that they generate. Some of the systems require people to sort different waste streams in their home or business prior to placing it out for collection. Some systems limit the amount of garbage that each household can generate, or require residents to purchase tags for each bag of garbage generated. Some of the systems target behavioural change in businesses through increasing the landfill tipping fees. These changes may be thought to be publicly unacceptable at first, but if residents and businesses are advised of the reasons for the changes, and if they feel that they are a part of the decision making process, a new waste management system may gain wide acceptance with the public.

There are a number of methods that can be used to notify and consult with the public on the proposed waste diversion/collection systems. The most popular methods of public consultation are outlined below.

Newsletters

Newsletters can be used to educate the public about waste management issues, the process being undertaken to plan for long term waste management needs, and to encourage interest and involvement in the process. Newsletters can be distributed through bulk mailings, as enclosures with utility bills, or through set-outs in public areas.

News Releases

A news release is a prepared article that is distributed to the media for inclusion in the newspaper, or on radio or television. The purpose of a news release is basically the same as a newsletter, and is often done at the same time as distributing a newsletter in order to reinforce the message.

Public Meeting

A public meeting is an open forum in which the proponent makes a presentation regarding the process that is being undertaken, and the public is invited to respond with questions and comments. Some members of the public find that public meetings can be intimidating, and are not inclined to bring forward their point of view, particularly if there is a large number of people in attendance at the meeting.

Open House

An open house is an informal event that allows people to "drop in" and obtain information at their convenience. Information is provided through a variety of exhibits, such as charts, maps, reports and brochures. Resource people are available to answer questions individually or in small groups. Comments and questions raised by the public should be recorded in order to document feedback.

Workshops

A workshop is a forum where a number of people work together in groups to solve a particular problem, usually with the assistance of a facilitator. If the number of participants at the workshop is large they are typically divided into smaller groups at the workshop.

Presentations to Organized Groups

It is often beneficial for a municipal representative to make presentations to various organized groups in the community, such as the Chamber of Commerce and local service clubs. These sessions can provide information regarding how the proposed waste management systems will affect their particular sector, and obtain feedback from that target group.

Questionnaires

Questionnaires can be a good method of determining public preferences. They can be mailed out to the general public, or administered to the respondent over the telephone or in person. They are generally most effective if used after the respondent has been able to receive information on the proposed systems, such as at a public meeting or open house.

Focus Groups

A focus group is a meeting of invited participants, designed to obtain a general sense of what the public response will be to a proposed system. Participants can be specifically selected to represent a cross section of geographical, socio-economic or demographic groups. Focus groups can provide the municipality with an in-depth understanding of the views and values of the community and, in particular, how people might respond to a specific idea or opinion.

It is difficult to assess the public acceptability of the proposed waste diversion/collection systems until some public consultation has been done to determine the views of the community.

5.9 Overall System Costs

This section outlines the financial model that was developed to determine the overall system costs for the potential waste diversion systems being evaluated for the City. This model takes into account the entire waste management system, including waste collected in the municipal pick up, waste delivered to the landfill and other waste management facilities, and IC&I waste generation. The evaluation will be based on the annual cost for each system.

The overall annual system cost consists of two components:

- the annualized capital cost for buildings and equipment; and,
- the system operating costs.

5.9.1 Cost of Disposal

As outlined previously, it is necessary to consider the waste disposal component of the integrated waste management system in order to evaluate the overall cost of each diversion system. The waste diversion system is a component of the overall integrated waste management system therefore the cost of any potential waste diversion system will be affected by the amount of waste that requires disposal.

The operating cost for the City Landfill is currently \$14.31 per tonne⁵. It is expected, however, that the City will need to either expand the current landfill or develop a new landfill during the 25 to 40 year planning period. It is therefore necessary to determine the true cost of disposal that will be incurred by the City in the future.

⁵ Source: *Sault Ste. Marie Current Waste Management System Summary, TSH (September 2000).*

According to the report *Cost Accounting Methods for Landfill* (February 1991), the following items should be taken into account to determine the true cost of landfilling:

- engineering and approvals costs;
- compensation costs;
- initial construction costs;
- occasional and ongoing capital costs;
- annual operating costs;
- equipment replacement costs;
- monitoring costs ;
- leachate treatment or natural attenuation costs; and
- site closure and post closure costs.

Using the above factors the costs to establish a greenfield landfill site, with a disposal capacity of 2 million tonnes for the City were calculated. The calculations assumed a twenty year operation and 100 year post closure period. The 2001 costs for the following seven components were calculated:

• Environmental Approvals	\$ 4,000,000
• Property Acquisition and Compensation	\$ 800,000
• Initial Site Construction	\$16,800,000
• Annual Operating Costs (20 Years)	\$58,800,000
• Closure Costs	\$ 4,500,000
• Post Closure Costs (100 Years)	\$32,900,000
• Contingency Costs	<u>\$12,500,000</u>
TOTAL	130,300,000

Therefore, the total lifetime costs of the landfill were calculated to be \$130 million. This represents a cost of \$65 tonne. Appendix D contains a table showing in more detail how the above costs were derived.

An overall figure of approximately \$65 per tonne will be used as the cost for disposal in the financial evaluation of potential waste management systems. This cost includes both the capital and operations. This number could be lower if landfill mining or expansion of the existing site resulted. A full analysis of long term disposal costs will be conducted as part of the preparation of the Disposal Options Report in Phase 3.

5.9.2 The Financial Model

A financial model was developed specifically for the City waste management system to determine the cost of each of the waste diversion systems being considered. When the preferred waste management system for the City is selected, a financial plan will be developed for a 25-year planning period. The multi-year financial plan will be presented as part of the Business Plan in Phase 3 of the study for the City.

The costs used in the Financial Model are based on the following costs for the waste system components.

Waste Collection (Single Family)

The cost for curbside collection of waste is based on the current cost per tonne of \$45.05/tonne for waste collection in the City. It is recommended that the method of waste collection remain the same for all of the potential waste management systems, therefore there should be little change to the waste collection cost.

Waste Collection (Multi-Family)

The cost for collection of from multi-family units is based on the current cost per tonne of \$13.08 for waste collection from these establishments. There is no change recommended to this collection system.

Landfill Diversion

The cost for the diversion of special materials (brush, tires, batteries, scrap metal) from landfill is based on the current average cost per tonne of \$50.00 for these materials.

Waste Disposal

The financial model for the existing system includes the \$14.31 per tonne cost that the City is currently paying to operate the existing landfill. This cost does not include any capital replacement or closure costs. As outlined in Section 5.9.1, the true cost of waste disposal is estimated to be \$65 per tonne, which is the cost that has been used in the financial model for the potential waste diversion systems being evaluated for the City.

Public Education

All of the proposed waste diversion systems, with the exception of the basic status quo system, will require a public education program to educate residents and businesses about the changes to the program. A figure of \$100,000 a year was used in the model for public education.

Recycling

The City's current recycling contract is based on a combined monthly cost for providing all recycling services, therefore it is difficult to determine the costs for each component of the program, i.e. collection, processing and revenue from recyclables. The total cost that the City currently pays for recycling is used in the financial model for the existing system.

For Systems 1, 2, and 3, the cost for collection of recyclables was estimated at \$100 per tonne, and the cost of processing is estimated at \$65 per tonne, which are typical costs for municipal recycling programs.

The cost for collection of recyclables for System 4 and 5 is reduced due to the reduced need for curbside sorting and the ability to compact the recyclables allowing more material per load. A collection cost of \$55/tonne is used in the financial model based on the experience of Guelph, Ontario where it costs approximately \$53/tonne to co-collect wet and dry waste.

The processing costs for Systems 4 and 5 have been estimated at \$80 per tonne, based on typical processing costs for expanded recycling programs. The processing cost for an expanded program is higher than for a traditional program because there are more materials to separate, and the recyclable streams are typically more commingled.

OCC Recycling (Depots)

The cost for recycling of OCC is based on the current cost per tonne of \$111 for the OCC depot recycling program. There is no change recommended to this collection system.

Yard Waste Collection

The cost for collection of yard waste is based on the current cost per tonne of \$57 for yard waste collection in the City. It is recommended that the yard waste collection system remain the same for all of the potential waste management systems, therefore there should not be any change to the collection cost.

Yard Waste Composting

Yard waste is currently being accepted at a private facility at no charge. The company receives revenue to pay for the composting operation through the sale of finished compost. Yard waste composting has been shown as a no-cost item in the financial analysis, however the City may wish to enter into a contract with the private contractor if they plan to continue to use the company to process yard waste collected in the municipal program.

Organics Collection

In System 5, organics are co-collected with recyclables, therefore the cost of organics collection will be \$55 per tonne.

Organics Composting

The cost for composting of organics is based on typical costs of \$40/tonne for other organics composting operations.

User Fees

Municipalities typically implement user fees for waste collected from curbside in the range of \$1.00 to \$3.00 per bag. Regardless of the fee charged per bag, it has been found that user fees consistently reduce the amount of waste placed at the curb for collection. As the amount of waste diverted from landfill increases, the number of bags, and therefore the revenue received from user fees, will decrease. For the sake of the financial analysis, a user fee of \$2.00 per bag has been used, which is in line with the bag tag fee being charged in other northern municipalities (Kenora, Sioux Lookout). The number of bags of waste set out per household is estimated based on Table 5.5.

Annual Residential Waste Collected (Tonnes)	Number of Bags/HH/Week
17,001 – 19,000	2.7
15,001 – 17,000	2.4
13,001 – 15,000	2.1
11,001 – 13,000	1.8
9,001 – 11,000	1.5
7,001 – 9,000	1.2
5,001 – 7,000	0.9

Landfill Tipping Fees

Landfill tipping fees are based on two scenarios for the various waste management systems:

- the current City tipping fee of \$27.50 per tonne; and,
- an increased tipping fee of \$65.00 per tonne which more closely reflects the true cost of landfilling.

MRF and Compost Plant Tipping Fees

A tipping fee of \$25/tonne has been included in the financial model for the processing of IC&I recyclables and organic waste at the MRF and Compost Facility. This tipping fee is based on the fact that it provides an incentive to divert these waste streams, as opposed to disposing of them.

Sale of Recyclables

The revenue value for recyclables is based on the value established by the 1999 Municipal Cost Survey conducted by the Municipal Chief Administrative Officers of Ontario of \$88/tonne. This value can be considered to be relatively conservative, since the values for most recyclable commodities have increased significantly since 1999 (see CSR Spot Market Listing in Appendix C). A lower revenue of \$85 per tonne is used for the expanded recycling program, because the additional materials being marketed typically have a lower value, therefore decreasing the overall revenue per tonne. Further information on the value of the sale of recyclables can be found in Section 5.4.

Sale of Compost

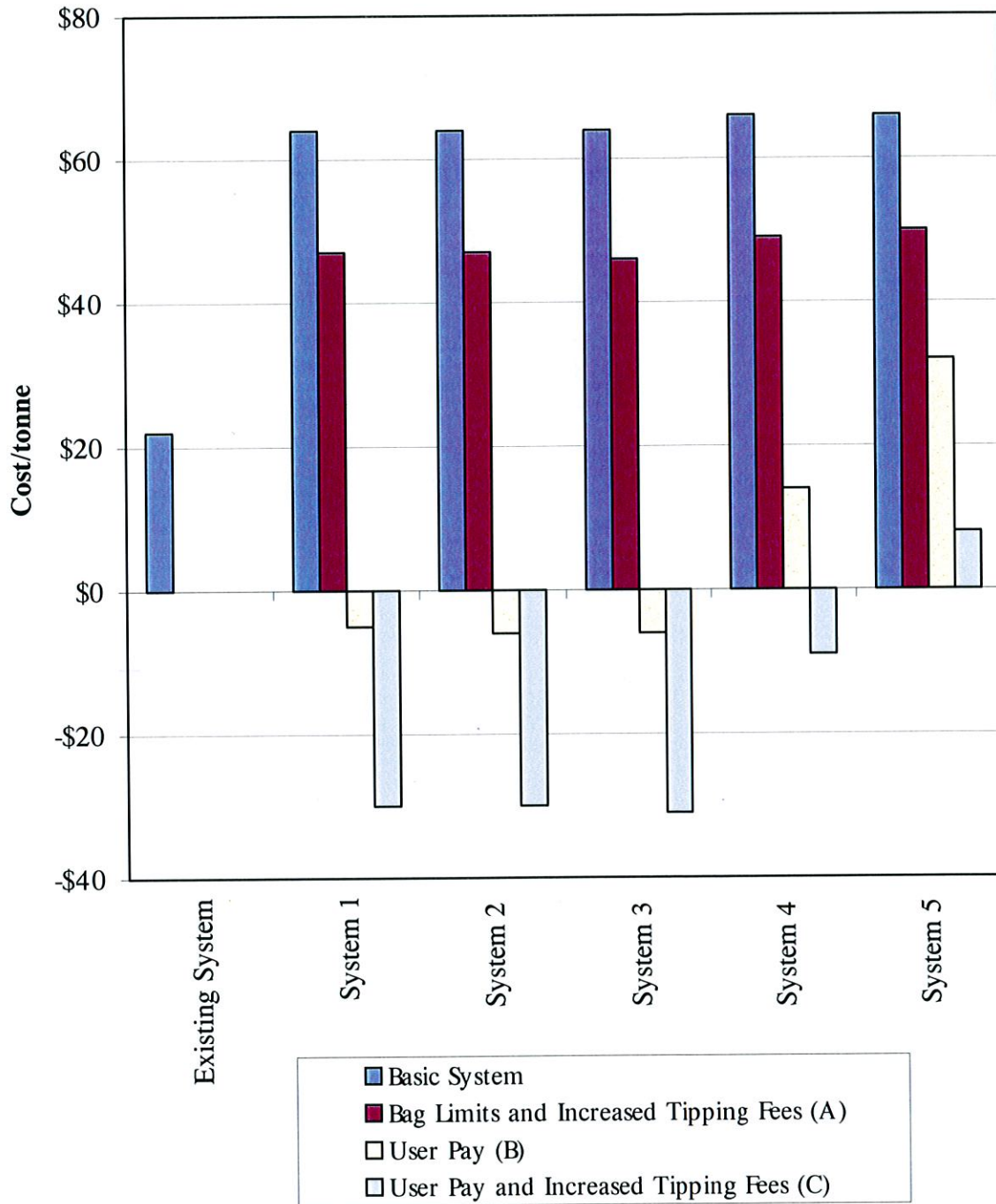
The cost for the sale of compost is based on a market value of \$25 per tonne, which is a typical value of compost being realized from similar operations.

5.9.3 Results of Financial Modelling

The cost of the existing waste management system in the City of Sault Ste. Marie is currently \$22 per household. This cost will increase substantially when the City is required to develop new landfill capacity. The financial modelling for each of the potential waste management systems is included in Appendix E. The results are shown in Figure 8 and Table 5.6.

It is important to note that although the cost of the systems that incorporate increased tipping fees or user pay systems have significantly lower costs per tonne and many of the systems generate a net revenue, this is in part due to increased revenues received from residents and the IC&I sector.

Figure 8
Net Cost of Potential Waste Diversion Systems



Options	Basic System	Bag Limits and Increased Tipping Fees (A)	User Pay (B)	User Pay and Increased Tipping Fees (C)
Existing System	\$22	-	-	-
System 1: Status Quo	\$64	\$47	(\$5)	(\$30)
System 2: Yard Waste Bans and Increased Yard Waste Collection	\$64	\$47	(\$6)	(\$30)
System 3: Curbside Collection of OCC	\$64	\$46	(\$6)	(\$31)
System 4: Expanded Recyclables	\$66	\$49	\$14	(\$9)
System 5: Organics Processing	\$66	\$50	\$32	\$8

Source: Pages 1 through 21 in Appendix E
 Based on a total waste stream of 80,558 tonnes

5.10 System Evaluation Summary

The potential waste diversion systems were evaluated as to their suitability for implementation in the City, based on the information developed in the previous sections.

For two of the criteria, **marketability of materials** and **compliance with legislation**, it was found that all of the systems equally met the criteria, and therefore the systems have not been further evaluated for these criteria.

For three criteria, **overall system cost**, **diversion from landfill**, and **public acceptability**, it was deemed necessary to evaluate all 20 waste diversion/collection systems, because the method of implementation would affect the evaluation for that particular criteria. The results of the evaluation of for all 20 potential waste diversion systems are shown in Table 5.7 for these criteria.

For the remaining criteria, it was found that the method of implementation would not have any affect on the evaluation, therefore only the five main waste diversion/collection systems were evaluated. This evaluation is shown in Table 5.8.

**TABLE 5.7
EVALUATION OF WASTE DIVERSION SYSTEM COMPONENTS
(COSTS, DIVERSION AND PUBLIC ACCEPTABILITY)**

System	Overall System Cost	Diversion	Public Acceptability
System 1: Status Quo	\$64 per tonne	10%	<ul style="list-style-type: none"> No change from current system.
System 1A: Status Quo with bag limits and increased tipping fees	\$47 per tonne <ul style="list-style-type: none"> Additional revenue received from increased tipping fees 	21%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector
System 1B: Status Quo with user fees	(\$5) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees 	15%	<ul style="list-style-type: none"> User fees may be opposed by residents
System 1C: Status Quo with user fees and increased tipping fees	(\$30) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees and increased tipping fees 	23%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector User fees may be opposed by residents
System 2: Increased yard waste collection	\$64 per tonne	12%	<ul style="list-style-type: none"> Little change from current system
System 2A: Increased yard waste collection with bag limits and increased tipping fees	\$47 per tonne <ul style="list-style-type: none"> Additional revenue received from increased tipping fees 	22%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector
System 2B: Increased yard waste collection with user fees	(\$6) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees 	17%	<ul style="list-style-type: none"> User fees may be opposed by residents
System 2C: Increased yard waste collection with user fees and increased tipping fees	(\$30) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees and increased tipping fees 	23%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector User fees may be opposed by residents
System 3: Curbside collection of OCC	\$64 per tonne	13%	<ul style="list-style-type: none"> Little change from current system
System 3A: Curbside collection of OCC with bag limits and increased tipping fees	\$46 per tonne <ul style="list-style-type: none"> Additional revenue received from increased tipping fees 	22%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector
System 3B: Curbside collection of OCC with user fees	(\$6) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees 	17%	<ul style="list-style-type: none"> User fees may be opposed by residents
System 3C: Curbside collection of OCC with user fees and increased tipping fees	(\$31) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees and increased tipping fees 	23%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector User fees may be opposed by residents
System 4: Expanded Recycling	\$66 per tonne	18%	<ul style="list-style-type: none"> Little change from current system

TABLE 5.7
EVALUATION OF WASTE DIVERSION SYSTEM COMPONENTS
(COSTS, DIVERSION AND PUBLIC ACCEPTABILITY)

System	Overall System Cost	Diversion	Public Acceptability
System 4A: Expanded recycling with bag limits and increased tipping fees	\$49 per tonne <ul style="list-style-type: none"> Additional revenue received from increased tipping fees 	28%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector
System 4B: Expanded recycling with user fees	\$14 per tonne <ul style="list-style-type: none"> Additional revenue received from user fees 	23%	<ul style="list-style-type: none"> User fees may be opposed by residents
System 4C: Expanded recycling with user fees and increased tipping fees	(\$9) per tonne <ul style="list-style-type: none"> Additional revenue received from user fees and increased tipping fees 	30%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector User fees may be opposed by residents
System 5: Organic waste composting	\$66 per tonne	37%	<ul style="list-style-type: none"> Requirement to separate organic waste
System 5A: Organic waste composting with bag limits and increased tipping fees	\$50 per tonne <ul style="list-style-type: none"> Additional revenue received from increased tipping fees 	49%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector Requirement to separate organic waste
System 5B: Organic waste composting with user fees	\$32 per tonne <ul style="list-style-type: none"> Additional revenue received from user fees 	44%	<ul style="list-style-type: none"> User fees may be opposed by residents Requirement to separate organic waste
System 5C: Organic waste composting with user fees and increased tipping fees	\$8 per tonne <ul style="list-style-type: none"> Additional revenue received from user fees and increased tipping fees 	52%	<ul style="list-style-type: none"> Increased tipping fees may be opposed by business sector User fees may be opposed by residents Requirement to separate organic waste

**TABLE 5.8
EVALUATION OF WASTE DIVERSION SYSTEM COMPONENTS
(FLEXIBILITY, PRIVATE SECTOR AND PARTNERSHIPS)**

System	Flexibility	Availability and Expertise of the Private Sector	Partnership Possibilities
System 1: Status Quo	<ul style="list-style-type: none"> • Little flexibility for increases in quantity or mix of recyclables • Ability to increase quantities of yard waste • No ability for composting other organics 	<ul style="list-style-type: none"> • Private sector involvement may be limited due to the size of current operations 	<ul style="list-style-type: none"> • Little or no opportunity for funding partners • Comparatively low WDO per tonne funding
System 2: Increased Yard Waste Collection	<ul style="list-style-type: none"> • Little flexibility for increase in quantity or mix of recyclables • Ability to increase quantities of yard waste • No ability for composting other organics 	<ul style="list-style-type: none"> • Private sector involvement may be limited due to the number of licensed composting facilities in the area 	<ul style="list-style-type: none"> • Little opportunity for funding partners • Comparatively low WDO per tonne funding
System 3: Curbside Collection of OCC	<ul style="list-style-type: none"> • Little flexibility for increases in quantity or mix of recyclables • Ability to increase quantities of yard waste • No ability for composting other organics 	<ul style="list-style-type: none"> • Private sector involvement may be limited due to the size of current operations 	<ul style="list-style-type: none"> • Little opportunity for funding partners • Comparatively low WDO per tonne funding
System 4: Expanded Recycling	<ul style="list-style-type: none"> • Flexibility for increases in quantity or mix of recyclables • Ability to increase quantities of yard waste • No ability for composting other organics 	<ul style="list-style-type: none"> • Increased private sector involvement due to the development of new recycling facility 	<ul style="list-style-type: none"> • Opportunities for infrastructure funding from Federal Government • Comparatively high WDO per tonne funding
System 5: Organic Waste Composting	<ul style="list-style-type: none"> • Flexibility for increases in quantity or mix of recyclables • Flexibility for increases in quantity or mix of organics 	<ul style="list-style-type: none"> • Increased private sector involvement due to the development of new recycling and composting facilities • Potential industrial partners 	<ul style="list-style-type: none"> • Opportunities for infrastructure funding from Federal Government • Opportunity to partner with OCWA for composting facility • Comparatively high WDO per tonne funding

6. CONCLUSIONS

Five (5) main waste diversion/collection systems were evaluated for the City. Each system had four implementation options, which resulted in 20 different waste diversion/collection systems. Based on the evaluation, the following conclusions can be made.

1. The cost of the current waste management system in the City is \$22 per tonne. This cost is expected to increase significantly when the existing municipal landfill site reaches capacity and City is required to locate, finance and operate alternative waste disposal capacity.
2. The only waste diversion system that is expected to allow the City to reach 50% diversion of the overall waste stream is System 5 with user fees and increased tipping fees in place. This system includes the following components:
 - curbside collection of expanded recyclables;
 - processing of recyclables from the IC&I sector;
 - curbside collection of organics;
 - composting of organics from the IC&I sector;
 - leaf and yard waste collection (13 time/yr/hh);
 - landfill ban (yard waste);
 - public education;
 - backyard composting;
 - Reuse Centre;
 - HSW depot;
 - user fees: and
 - increased tipping fees.
3. The WDO recommends a waste diversion goal for WDO funded programs of 44% for the residential waste stream by 2005. The two System 4 options that incorporate user fees, and the System 5 options that include either bag limits or user fees meet or exceed the 44% WDO goal.
4. Systems 4 and 5 provide the greatest flexibility because with these systems the City would construct new recycling and composting facilities that would be able to adapt to increased quantities of recovered materials, and a broader range of recyclables and organics.
5. The materials and products generated from all of the systems should be readily marketable.
6. There is interest from the private sector in working with the City to develop a waste diversion/collection system.

7. There are a number of opportunities for the City to partner with other levels of government or the industry sector in the development and operation of a waste diversion system, such as:

- Federal funding programs;
- The Ontario Clean Water Agency (OCWA);
- The Waste Diversion Organization (WDO); and,
- Local industries.

Systems 4 and 5 have the greatest potential for partnerships.

8. All of the proposed waste diversion/collection systems comply with current legislation.

9. Residents and businesses in the City should be consulted to determine the public acceptability of the proposed systems.

All of which is respectfully submitted,

Pamela Russell, P.Eng.

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APPENDIX A
MASS BALANCE TABLES

Assumptions Used in Mass Balance Calculations

Residential Curbside Collection

1. 50% recovery assumed if no incentive for diversion
2. 60% recovery assumed if bag limits in place
3. 70% recovery assumed if financial incentives in place (user fees or increased tipping fees)

Depot Collection

1. 30% recovery assumed for depot programs if bag limits in place
2. 35% recovery assumed for depot programs if financial incentives in place (user fees or increased tipping fees)

Other Programs

1. Residential waste reduction increases by 500 tpy if bag limits or user pay is in place
2. Backyard composting increases by 300 tpy with bag limits and 731 tpy (60% participation) with user fees
3. Material to reuse centre doubles with bag limits or user fees
4. Public drop quantities decrease by 35% if tipping fees at the landfill increase
5. A yard waste ban diverts 60% of the yard waste from landfill
6. IC&I waste reduction increases by 5000 tpy if tipping fees increase.
7. 135 tonnes of HSW will go to the HSW depot instead of in the municipal waste collection
8. IC&I recyclables are recovered when a new MRF is constructed

	Total Available	30% recovery	35% recovery	50% recovery	60% recovery	70% recovery
Residential Blue Box materials (trad.)	5351			2676	3211	3746
Residential yard waste	2960		239	279	1480	1776
Residential OCC	797				399	478
Residential Blue Box materials (exp.)	10427			5214	6256	7299
Residential organics (excl. yd waste)	7218			3609	4331	5053
IC&I OCC	1548		464	542		
IC&I recyclables	7293			3647	4376	
IC&I yard waste	1877			657	939	1126
IC&I organics (excl. yd. waste)	4994			2497	2996	

Note: Residential quantities include single family residential and public drop off

Total available quantities as per Table 3.1 in Waste Diversion System Components Report
All quantities in tonnes

Mass Balance for Waste Diversion System 1
Status Quo System

	System 1	System 1A		System 1B		System 1C	
	Status Quo	Bag limits and high tipping fee	User Pay	User Pay	User Pay & high tipping fee	Difference	Total
Residential Waste Stream:							
Municipal waste collection	18,554	-1012	17,542	-4,298	14,256	-2,118	16,436
Collection of recyclables	2,133	1078	3,211	1,613	3,746	1,613	3,746
Public drop-off waste	6,230	-2180	4,050	0	6,230	-2,180	4,050
OCC to depots	50	189	239	229	279	229	279
Yard waste collection	300	300	600	400	700	400	700
Yard waste to private composting	944	100	1,044	0	944	100	1,044
Organic waste to compost plant							
Backyard composting	976	300	1,276	731	1,707	731	1,707
Reuse Centre	825	825	1,650	825	1,650	825	1,650
HSW depot	135	135	135	135	135	135	135
Brush	120	-100	20	120	120	-100	20
Tires	10	10	10	10	10	10	10
Residential waste reduction	0	500	500	500	500	500	500
Total residential waste	30,277	0	30,277	0	30,277	0	30,277
IC&I Waste Stream:							
IC&I waste delivered to landfill	27,985	-2601	25,384		27,985	-2,601	25,384
municipal departments waste	1,565		1,565		1,565		1,565
OCC waste to depots	250	292	542	250	250	292	542
Yard waste to private composting	0	657	657		657	657	657
IC&I recyclables to the MRF	1,300	0	1,300	0	1,300	0	1,300
Organic waste to compost plant							
Scrap metal	575	-201	374		575	-201	374
CSD brush	431		431		431		431
Shingles	1,197	-419	778		1,197	-419	778
Asbestos	43	-15	28		43	-15	28
Contaminated Soils	7,750	-2713	5,037		7,750	-2,713	5,037
Sewage sludge	9,185		9,185		9,185		9,185
IC&I waste reduction	0	5000	5,000		0	5,000	5,000
Total IC&I waste	50,281	0	50,281	0	50,281	0	50,281
Summary:							
Residential waste diverted	5,493		8,685		9,791		9,791
Total residential waste	30,277		30,277		30,277		30,277
Diversion rate for residential waste	18.1%		28.7%		32.3%		32.3%
Total waste diverted	8,049		16,989		12,347		18,095
Total waste	80,558		80,558		80,558		80,558
Diversion rate for total waste stream	10.0%		21.1%		15.3%		22.5%

All quantities in tonnes

Mass Balance for Waste Diversion System 2
Increased Yard Waste Collection and Yard Waste bans

Status Quo	System 2		System 2A		System 2B		System 2C	
	Basic System		Bag limits and high tipping fee		User Pay		User Pay and high tipping fee	
	Diff.	Total	Diff.	Total	Diff.	Total	Diff.	Total
Residential Waste Stream:								
Municipal waste collection	18,554	17,461	-1312	17,242	-4,648	13,906	-2,418	16,136
Collection of recyclables	2,133	2,676	1078	3,211	1,613	3,746	1,613	3,746
Public drop-off waste	6,230	6,230	-2180	4,050	0	6,230	-2,180	4,050
OCC to depots	50	50	189	239	229	279	229	279
Yard waste collection	300	800	600	900	700	1,000	700	1,000
Yard waste to private composting	944	50	100	1,044	50	994	100	1,044
Organic waste to compost plant	976	976	300	1,276	731	1,707	731	1,707
Backyard composting	825	825	825	1,650	825	1,650	825	1,650
Reuse Centre	135	135	135	135		135		135
HSW depot	120	120	-100	20		120	-100	20
Brush	10	10	10	10		10		10
Tires	0	0	500	500	500	500	500	500
Residential waste reduction								
Total residential waste	30,277	30,277	0	30,277	0	30,277	0	30,277
IC&I Waste Stream:								
IC&I waste delivered to landfill	27,985	27,290	-2639	25,346	-695	27,290	-2,639	25,346
municipal departments waste	1,565	1,565		1,565		1,565		1,565
OCC waste to depots	250	250	292	542		250	292	542
Yard waste to private composting	0	1,126	1,126	1,126	1,126	1,126	1,126	1,126
IC&I recyclables to the MRF	1,300	0	1,300	0	0	1,300	0	1,300
Organic waste to compost plant	575	575	-201	374		575	-201	374
Scrap metal	431	-431	0	-431	-431	0	-431	0
CSD brush	1,197	1,197	-419	778		1,197	-419	778
Shingles	43	43	-15	28		43	-15	28
Asbestos	7,750	7,750	-2713	5,037		7,750	-2,713	5,037
Contaminated Soils	9,185	9,185		9,185		9,185		9,185
Sewage sludge	0	0	5000	5,000		0	5,000	5,000
IC&I waste reduction								
Total IC&I waste	50,281	50,281	0	50,281	0	50,281	0	50,281
Summary:								
Residential waste diverted	5,493	6,586		8,985		10,141		10,091
Total residential waste	30,277	30,277		30,277		30,277		30,277
Diversion rate for residential waste	18.1%	21.8%		29.7%		33.5%		33.3%
Total waste diverted	8,049	9,837		17,327		13,392		18,433
Total waste	80,558	80,558		80,558		80,558		80,558
Diversion rate for total waste stream	10.0%	12.2%		21.5%		16.6%		22.9%

All quantities in tonnes

Mass Balance for Waste Diversion System 4
Recycling of Expanded Materials

Status Quo	System 4 Basic System		System 4A Bag limits and high tipping fee		System 4B User Pay		System 4C User Pay and high tipping fee	
	Diff.	Total	Diff.	Total	Diff.	Total	Diff.	Total
Residential Waste Stream:								
Municipal waste collection	18,554	14,973	-4118	14,436	-7,922	10,632	-5,692	12,862
Collection of recyclables	2,133	5,214	4123	6,256	5,166	7,299	5,166	7,299
Public drop-off waste	6,230	6,230	-2180	4,050	0	6,230	-2,180	4,050
OCC to depots	50	-50	-50	0	-50	0	-50	0
Yard waste collection	300	800	500	900	700	1,000	700	1,000
Yard waste to private composting	944	50	994	1,044	50	994	100	1,044
Organic waste to compost plant	0	0	0	0	0	0	0	0
Backyard composting	976	976	300	1,276	731	1,707	731	1,707
Reuse Centre	825	825	825	1,650	825	1,650	825	1,650
HSW depot	135	135	135	135	135	135	-100	35
Brush	120	120	-100	20	20	120	20	120
Tires	10	10	10	10	10	10	10	10
Residential waste reduction	0	0	500	500	500	500	500	500
Total residential waste	30,277	30,277	0	30,277	0	30,277	0	30,277
IC&I Waste Stream:								
IC&I waste delivered to landfill	27,985	25,193	-5173	22,812	-2,792	25,193	-5,173	22,812
municipal departments waste	1,565	1,565	0	1,565	0	1,565	0	1,565
OCC waste to depots	250	-250	-250	0	-250	0	-250	0
Yard waste to private composting	0	1126	1126	1,126	1,126	1,126	1,126	1,126
IC&I recyclables to the MRF	1,300	2347	3076	4,376	2,347	3,647	3,076	4,376
Organic waste to compost plant	575	575	-201	374	0	575	-201	374
Scrap metal	431	-431	-431	0	-431	0	-431	0
CSD brush	1,197	1,197	-419	778	0	1,197	-419	778
Shingles	43	43	-15	28	43	43	-15	28
Asbestos	7,750	7,750	-2713	5,037	0	7,750	-2,713	5,037
Contaminated Soils	9,185	9,185	9,185	9,185	9,185	9,185	9,185	9,185
Sewage sludge	0	0	5000	5,000	0	5,000	5,000	5,000
IC&I waste reduction	0	0	0	0	0	0	0	0
Total IC&I waste	50,281	50,281	0	50,281	0	50,281	0	50,281
Summary:								
Residential waste diverted	5,493	9,074	0	11,791	0	13,415	0	13,365
Total residential waste	30,277	30,277	0	30,277	0	30,277	0	30,277
Diversion rate for residential waste	18.1%	30.0%	0%	38.9%	0%	44.3%	0%	44.1%
Total waste diverted	8,049	14,422	0	22,667	0	18,763	0	24,241
Total waste	80,558	80,558	0	80,558	0	80,558	0	80,558
Diversion rate for total waste stream	10.0%	17.9%	0%	28.1%	0%	23.3%	0%	30.1%

All quantities in tonnes

Mass Balance for Waste Diversion System 5
Organic Waste Composting

	Status Quo	System 5 Basic System		System 5A Bag limits and high tipping fee		System 5B User Pay		System 5C User Pay and high tipping fee	
		Diff.	Total	Diff.	Total	Diff.	Total	Diff.	Total
Residential Waste Stream:									
Municipal waste collection	18,554	-7190	11,364	-8449	10,105	-12,975	5,579	-10,745	7,809
Collection of recyclables	2,133	3081	5,214	4123	6,256	5,166	7,299	5,166	7,299
Public drop-off waste	6,230		6,230	-2180	4,050	0	6,230	-2,180	4,050
OCC to depots	50	-50	0	-50	0	-50	0	-50	0
Yard waste collection	300	500	800	600	900	700	1,000	700	1,000
Yard waste to private composting	944	50	994	100	1,044	50	994	100	1,044
Organic waste to compost plant	0	3609	3,609	4331	4,331	5,053	5,053	5,053	5,053
Backyard composting	976		976	300	1,276	731	1,707	731	1,707
Reuse Centre	825		825	825	1,650	825	1,650	825	1,650
HSW depot	135		135	135	135		135		135
Brush	120		120	-100	20		120	-100	20
Tires	10		10	10	10		10		10
Residential waste reduction	0	0	0	500	500	500	500	500	500
Total residential waste	30,277	0	30,277	0	30,277	0	30,277	0	30,277
IC&I Waste Stream:									
IC&I waste delivered to landfill	27,985	-5289	22,696	-8169	19,816	-5,289	22,696	-8,169	19,816
municipal departments waste	1,565		1,565		1,565		1,565		1,565
OCC waste to depots	250	-250	0	-250	0	-250	0	-250	0
Yard waste to private composting	0	1126	1,126	1126	1,126	1,126	1,126	1,126	1,126
IC&I recyclables to the MRF	1,300	2347	3,647	3076	4,376	2,347	3,647	3,076	4,376
Organic waste to compost plant		11682	11,682	12181	12,181	11,682	11,682	12,181	12,181
Scrap metal	575		575	-201	374		575	-201	374
CSD brush	431	-431	0	-431	0	-431	0	-431	0
Shingles	1,197		1,197	-419	778		1,197	-419	778
Asbestos	43		43	-15	28		43	-15	28
Contaminated Soils	7,750		7,750	-2713	5,037		7,750	-2,713	5,037
Sewage sludge	9,185	-9185	0	-9185	0	-9185	0	-9185	0
IC&I waste reduction	0	0	0	5000	5,000	0	0	5,000	5,000
Total IC&I waste	50,281	0	50,281	0	50,281	0	50,281	0	50,281
Summary:									
Residential waste diverted	5,493		12,683		16,122		18,468		18,418
Total residential waste	30,277		30,277		30,277		30,277		30,277
Diversion rate for residential waste	18.1%		41.9%		53.2%		61.0%		60.8%
Total waste diverted	8,049		29,713		39,179		35,498		41,475
Total waste	80,558		80,558		80,558		80,558		80,558
Diversion rate for total waste stream	10.0%		36.9%		48.6%		44.1%		51.5%

All quantities in tonnes

APPENDIX B

LIST OF EXISTING EQUIPMENT

City of Sault Ste. Marie - List of Existing Equipment

Waste Collection

- 1994 Ford model CRT 8000 c/w Heil model 5000, 25 cubic yard packer
- 1995 Ford model CRT 8000 c/w Heil model 5000, 25 cubic yard packer
- 1996 Freightliner model FL 80 c/w Heil model 5000, 25 cubic yard packer
- 2000 Mack model MR 688S c/w Heil model 5000, 25 cubic yard packer
- 2000 Mack model MR 688S c/w Heil model 5000, 25 cubic yard packer

Blue Box Program

- three 1990 Walinga top-loading recycling vehicles
- 1 Economy #5042ATX Conveyor/Baler System
- 1 Formil Ferrous Separator/Conveyor System
- 1 Sorting Conveyor
- 5 Dump carts
- 2 Thomas Model T-132 Skid Steer Loaders, propane powered
- 1 Cat #V40D Lift Truck
- a 4960 ft² building

APPENDIX C
SPOT MARKET PRICES



The CSR Sheet

Reported Spot Market Prices as of May 15th

MATERIALS	CURRENT \$ (2000-2001)											
	June 1880	July 1909	Aug. 1909	Sep. 1902	Oct. 1902	Nov. 1808	Dec. 1806	Jan. 1780	Feb. 1866	Mar. 1868	Apr. 1834	May 1840
Aluminum	95	95	95	95	84	73	73	89	78	89	89	89
Steel (mill price)	51	51	50	52	52	45	45	43	29	32	32	32
Steel (broker price)	50	50	50	50	50	50	50	50	50	50	50	50
Glass (clear)	24	24	24	24	24	24	24	24	24	(2)	(3)	(6)
Glass (coloured)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
Glass (3 coloured)	320	342	395	390	390	401	396	386	393	395	393	390
PET	370	397	460	460	503	503	413	330	325	325	359	355
HDPE (mixed)	5	5	5	5	5	5	5	5	5	5	5	5
Plastic Tubs & Lids	5	15	15	15	15	15	15	25	25	23	23	25
Film Plastic	125	125	125	125	125	125	125	125	125	125	125	125
Polystyrene	140	133	116	114	111	103	98	83	76	76	76	75
ONP (#8)	155	145	82	71	63	65	60	60	59	59	59	51
OCC	87	82	70	64	55	49	46	44	40	40	40	36
Res. Mixed Paper	95	95	95	90	90	90	75	65	65	60	58	55
Polycoat Containers	151	147	131	129	126	119	115	105	102	101	100	98
CSR Composite Index												

MATERIALS	HISTORICAL AVERAGE \$ (1990-2001)											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 to date
Aluminum	1118	866	838	758	1731	2045	2045	1827	1595	1608	1893	1838
Steel (mill price)	77	77	80	80	97	141	141	146	121	101	94	87
Steel (broker price)											52	34
Glass (clear)	47	47	47	47	47	48	47	47	49	50	50	50
Glass (coloured)	44	44	44	44	44	44	42	39	27	24	24	7
Glass (3 coloured)							0	(4)	(25)	(20)	(15)	(15)
PET	220	220	141	141	181	650	650	155	300	144	326	391
HDPE (mixed)	90	90	90	90	259	345	356	447	226	211	373	339
Plastic Tubs & Lids						100	100	76	66	3	5	5
Film Plastic	0	0	28	40	40	40	40	(4)	(5)	(12)	7	24
Polystyrene					88	110	125	125	125	125	125	125
ONP (#8)	5	15	28	28	80	214	159	31	48	76	118	77
OCC	28	28	28	30	94	159	214	97	73	99	112	58
Res. Mixed Paper	0	20	20	20	38	159	120	5	17	20	65	40
Polycoat Containers						189	198	99	26	24	83	61

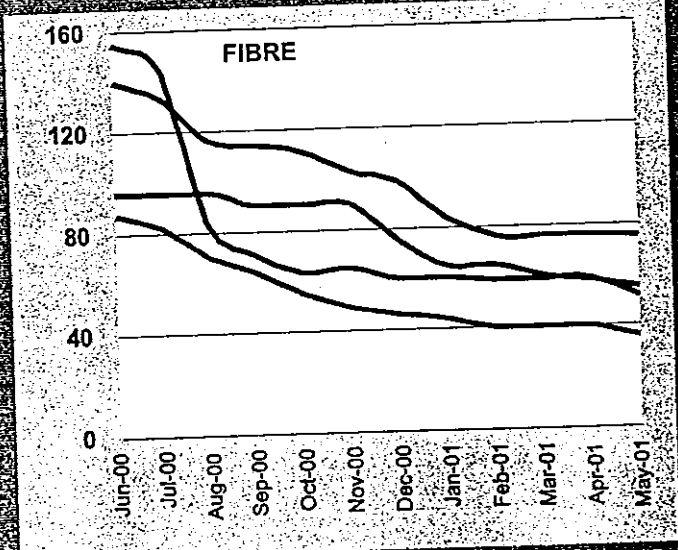
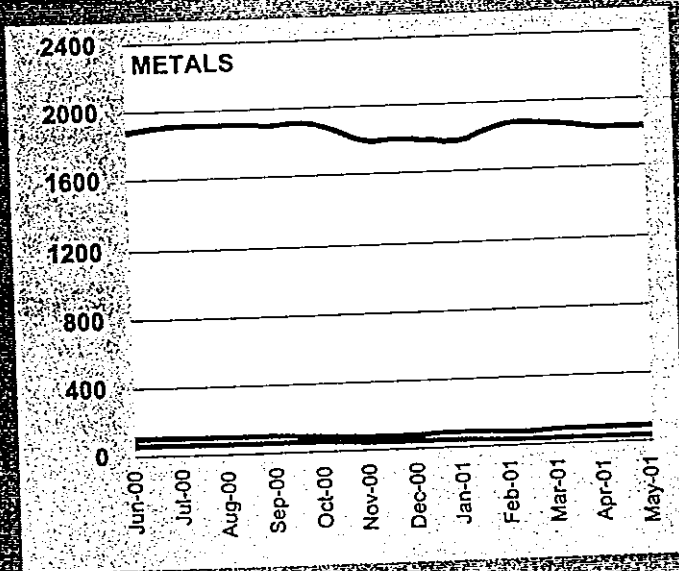
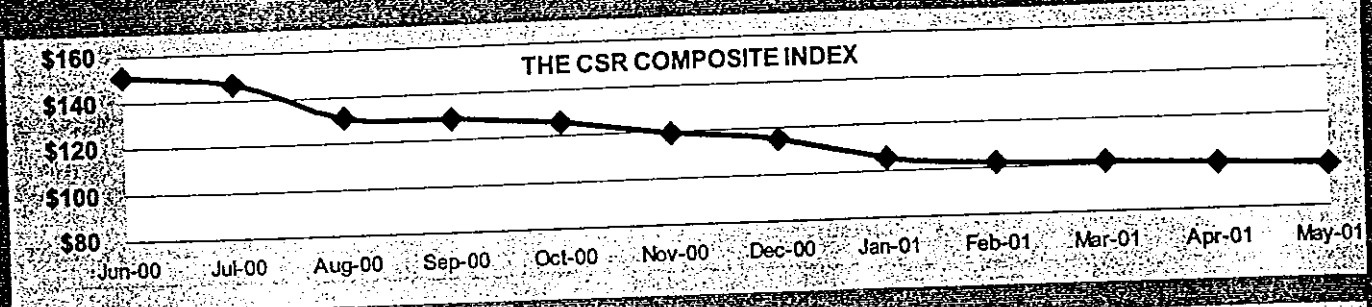
Notes:

- 1. Average spot market prices are given in Canadian \$ per metric tonne.
- 2. Market prices do not reflect special contract or pricing arrangements which may exist. The spot market prices are based on information from key network contacts, but should not be taken as the market prices being paid for residential material across Ontario.
- 3. These prices are based on post-consumer residential materials, baled to specifications and uncontaminated.
- 4. The CSR Composite Index is calculated using a provincial average of multi-material program composition. A detailed breakdown is available upon request.
- 5. Effective January 2000, the calculation for the CSR Composite Index reflects broker's prices for steel (instead of mill prices).
- 6. Coloured glass pricing is based on 700 tonnes per month to NexCycle/Consumers at \$24/metric tonne delivered and remainder of Ontario tonnage at \$10/metric tonne delivered.

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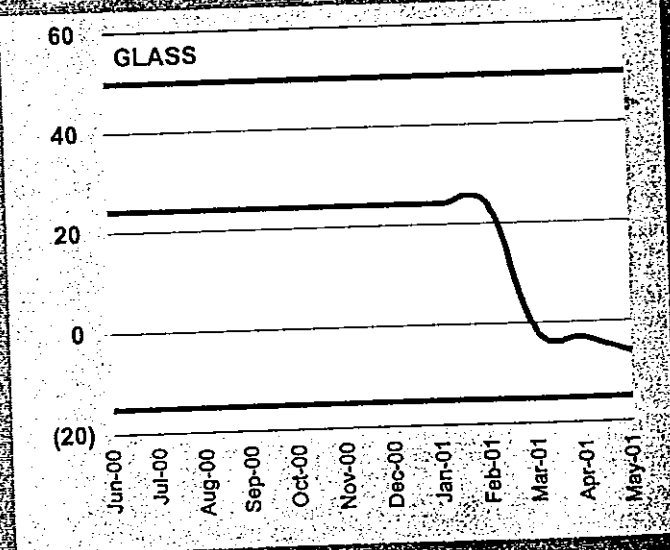
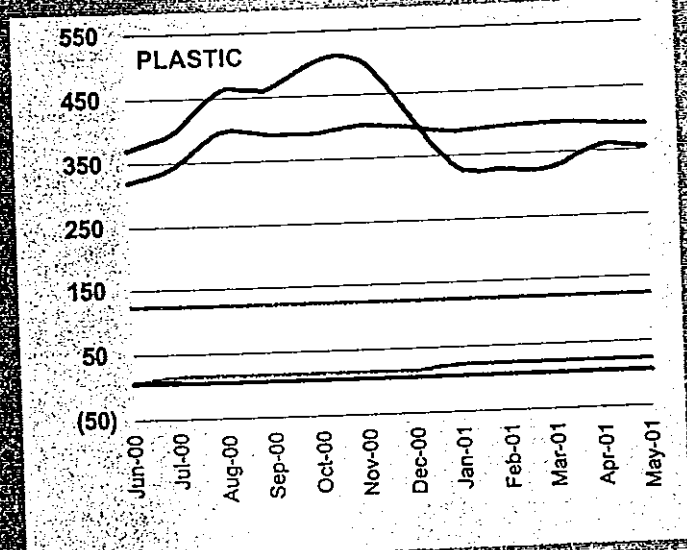
The CSR Sheet

Market Price Trends (CAD \$ per metric tonne)



Aluminum
 Steel (mill price)
 Steel (broker price)

ONP (#9)
 OCC
 Res. Mixed Paper
 Polycoat Containers



HDPE (mixed)
 PET
 Plastic Tubs & Lids
 Film Plastics
 Polystyrene
 Glass (clear)
 Glass (coloured)
 Glass (3 coloured)

GRAPHS PRODUCED FROM CURRENT TABLE (see reverse)

PREPARED BY CSR: CORPORATIONS SUPPORTING RECYCLING, PUBLISHED MAY 2001

APPENDIX D

LANDFILL COST SUMMARY

**City of Sault Ste. Marie New Greenfield Site
2 Million Tonnes of Disposal Capacity**

Component	Unit	Unit Cost	Units	Total Cost	20 Year Operation 100 Year P. Closure	Cost per tonne
1. Environmental Approvals						
Environmental Assessment Act Approvals	LS			\$1,000,000		
Environmental Protection Act Approvals	LS			\$1,000,000		
Hearing Costs	LS			\$1,200,000		
MOE Review Fees		\$50,000	1	\$50,000		
Detailed Design and Tender	LS			\$750,000		
Sub-Total				\$4,000,000	\$4,000,000	\$2.00
2. Property Acquisition and Compensation						
Land Purchase (footprint and 100m buffer)	ha	\$5,000	50	\$250,000		
Legal Survey	ha	\$600	50	\$30,000		
Compensation (within 500 metres)	ha	\$2,000	170	\$340,000		
Compensation (within 1000 metres)	ha	\$1,000	214	\$214,000		
Sub-Total				\$834,000	\$834,000	\$0.42
3. Initial Site Construction						
Construct Maintenance/Admin Building	LS	\$750,000	1	\$750,000		
Site Access Road	km	\$400,000	3	\$1,200,000		
Construct Weigh Scale & Scale House	LS	\$250,000	1	\$250,000		
Public Drop off Area	LS	\$200,000	1	\$200,000		
Gate/Fencing	m	\$60	2900	\$174,000		
Clearing and Grubbing	ha	\$5,000	3	\$15,000		
Liner and Leachate Collection System	ha	\$1,000,000	3	\$3,000,000		
Force Main to Sanitary Sewer	m	\$80	3000	\$240,000		
Pumping Station	LS	\$125,000	1	\$125,000		
Monitor Well Installation	each	\$2,500	15	\$37,500		
Power Supply	LS	\$200,000	1	\$200,000		
On-site Treatment Facility	LS	\$1,250,000	1	\$1,250,000		
Initial Excavation	m3	\$7	90000	\$630,000		
Sub-Total				\$8,071,500		
Engineering and Contingency(15% of total)				\$1,210,725		
Sub-Total				\$9,282,225		
20 Year amortized cost (6%)				\$16,760,000	\$16,760,000	\$8.38
4. Annual Operating Costs						
Cell Excavation	m3	\$7	45000	\$315,000		
Liner Installation	ha	\$1,000,000	1.15	\$1,150,000		
Salaried Employees and Benefits	LS	\$340,000	1	\$340,000		
Site Equipment	LS	\$370,000	1	\$370,000		
Grant In Lieu of Taxes	LS	\$60,000	1	\$60,000		
Landfill Monitoring and Reporting	LS	\$180,000	1	\$180,000		
Utilities	LS	\$25,000	1	\$25,000		
Road Maintenance	LS	\$25,000	1	\$25,000		
Building and Grounds Maintenance	LS	\$60,000	1	\$60,000		
Supplies	LS	\$10,000	1	\$10,000		
Leachate Pumping Station Maintenance	LS	\$10,000	1	\$10,000		
Leachate Treatment	gal	\$0.05	2300000	\$115,000		
Janitorial Services	LS	\$5,000	1	\$5,000		
Clearing and Grubbing	ha	\$5,000	1.5	\$7,500		
Sub-Total				\$2,672,500		
Engineering & Contingency (10% of total)				\$267,250		
Sub-Total				\$2,939,750	\$58,795,000	\$29.40
5. Closure Costs						
Closure Report	LS	\$50,000	1	\$50,000		
Final Cover Material	m3	\$15	205000	\$3,075,000		
Topsoil	m3	\$30	41000	\$1,230,000		
Seed	m2	\$2	27000	\$40,500		
Removal of Facilities	LS	\$100,000	1	\$100,000		
Sub-Total				\$4,495,500	\$4,495,500	\$2.25
6. Post Closure						
Annual Monitoring and Reporting	LS	\$150,000	1	\$150,000		
Site Inspections and maintenance	LS	\$30,000	1	\$30,000		
Leachate Pumping Station and Plant Maintenance	LS	\$40,000	1	\$40,000		
Leachate Treatment	gal	\$0.05	115000	\$5,750		
Sub-Total				\$225,750	\$22,575,000	\$11.29
Leachate Plant and Pumping Station Replacement	LS	\$1,375,000	4	\$5,500,000		
Force Main Replacement	LS	\$240,000	2	\$480,000		
Sub-Total				\$5,980,000		
20 Year amortized cost (6%)				\$10,280,000	\$10,280,000	\$5.14
7. Contingency Cost	tonne	\$5	2500000	\$12,500,000		
Sub-Total				\$12,500,000	\$12,500,000	\$6.25
Total Cost					\$130,239,500	\$65.12

APPENDIX E

FINANCIAL MODEL OF SYSTEMS

FINANCIAL MODEL (Existing System)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
	18,554	\$47.05	\$872,966
curbside collection (single-family)	4,534	\$13.08	\$59,305
curbside collection (multi-family)			\$96,736
capital collection costs			\$0
user fee revenue	23,088		\$1,029,006
Subtotal waste collection			
DISPOSAL			
	23,088		
municipal waste collection	6,230		
depot (public drop off)	23,451		
IC&I waste	1,565		
municipal department waste	9,185		
sewage sludge	10,126		
other special materials (brush, tires, soils)	73,645		
incoming waste	1,136		
landfill diversion (brush, tires, scrap metal)	72,509	\$14.31	\$1,037,604
landfill operating cost	39,807	\$27.50	-\$1,094,693
landfill tipping fee (\$27.50/tonne) revenue	72,509		-\$57,089
Subtotal disposal			
REDUCTION			
			\$0
public education	0	\$0.00	\$0
residential waste reduction	0	\$0.00	\$0
other waste reduction	825	\$0.00	\$0
reuse centre	825		\$0
Subtotal reduction			
RECYCLING			
	2,133	\$214.00	\$457,346
recycling collection (residential)	1,300	\$0.00	\$0
IC&I recyclables dropped off	3,433	\$0.00	\$0
recyclables processed	1,136	\$50.00	\$56,800
landfill diversion (brush, tires, scrap metal)	300	\$111.00	\$33,300
OCC recycling (depots)			\$105,420
capital diversion costs	0		\$0
MRF tipping fee revenue	0		\$0
sale of recyclables revenue	4,869		\$652,866
Subtotal recycling			
ORGANICS			
	300	\$57.00	\$17,100
yard waste collection	944	\$0.00	\$0
yard waste drop off	1,244	\$0.00	\$0
yard waste composting	976	\$0.00	\$0
backyard composting	0		\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting			\$0
capital organics cost	0		\$0
compost plant tipping revenue	0		\$0
sale of compost revenue	2,220		\$17,100
Subtotal organics			
	135	\$1,000	\$135,000
HSW depot	135		\$135,000
Subtotal HSW depot			
	825		
REDUCTION	7,089	\$95	\$669,966
DIVERSION COSTS (including organics)	72,509	\$13	\$971,918
DISPOSAL & WASTE COLLECTION COSTS	135	\$1,000	\$135,000
HSW COSTS	80,558	\$22	\$1,776,884
TOTAL SYSTEM COSTS			

FINANCIAL MODEL SYSTEM 1 (Status Quo System)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	18,554	\$47.05	\$872,966
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee revenue			\$0
Subtotal waste collection	23,088		\$1,029,006
DISPOSAL			
municipal waste collection	23,088		
depot (public drop off)	6,230		
IC&I waste	23,451		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	10,126		
incoming waste	73,645		
landfill diversion (brush, tires, scrap metal)	1,136		
true cost of waste disposal	72,509	\$65.00	\$4,713,085
landfill tipping fee (\$27.50/tonne) revenue	39,807	\$27.50	-\$1,094,693
Subtotal disposal	72,509		\$3,618,393
REDUCTION			
public education			\$0
residential waste reduction	0	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	825	\$0.00	\$0
Subtotal reduction	825		\$0
RECYCLING			
recycling collection (residential)	2,133	\$100.00	\$213,300
IC&I recyclables dropped off	1,300	\$0.00	\$0
recyclables processed	3,433	\$65.00	\$223,145
landfill diversion (brush, tires, scrap metal)	1,136	\$50.00	\$56,800
OCC recycling (depots)	300	\$111.00	\$33,300
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	3,433	\$88.00	-\$302,104
Subtotal recycling	4,869		\$329,861
ORGANICS			
yard waste collection	300	\$57.00	\$17,100
yard waste drop off	944	\$0.00	\$0
yard waste composting	1,244	\$0.00	\$0
backyard composting	976	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	2,220		\$17,100
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	825		
DIVERSION COSTS (including organics)	7,089	\$49	\$346,961
DISPOSAL & WASTE COLLECTION COSTS	72,509	\$64	\$4,647,399
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$64	\$5,129,360

FINANCIAL MODEL SYSTEM 1A (Status Quo System)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	17,542	\$47.05	\$825,351
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee revenue			\$0
Subtotal waste collection	22,076		\$981,392
DISPOSAL			
municipal waste collection	22,076		
depot (public drop off)	4,050		
IC&I waste	20,850		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,678		
incoming waste	64,404		
landfill diversion (brush, tires, scrap metal)	835		
true cost of waste disposal	63,569	\$65.00	\$4,131,985
landfill tipping fee (@\$65.00/tonne) revenue	31,578	\$65.00	-\$2,052,570
Subtotal disposal	63,569		\$2,079,415
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	3,211	\$100.00	\$321,100
IC&I recyclables dropped off	1,300	\$0.00	\$0
recyclables processed	4,511	\$65.00	\$293,215
landfill diversion (brush, tires, scrap metal)	835	\$50.00	\$41,750
OCC recycling (depots)	781	\$111.00	\$86,691
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	4,511	\$88.00	-\$396,968
Subtotal recycling	6,127		\$451,208
ORGANICS			
yard waste collection	600	\$57.00	\$34,200
yard waste drop off	1,701	\$0.00	\$0
yard waste composting	2,301	\$0.00	\$0
backyard composting	1,276	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	1,300	\$0.00	\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	3,577		\$34,200
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	9,704	\$60	\$585,408
DISPOSAL & WASTE COLLECTION COSTS	63,569	\$48	\$3,060,807
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$47	\$3,781,215

FINANCIAL MODEL SYSTEM 1B (Status Quo System)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	14,256	\$47.05	\$670,745
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee (2.1 bags/week @ \$2.00/bag) revenue			-\$5,331,580
Subtotal waste collection	18,790		\$4,504,794
DISPOSAL			
municipal waste collection	18,790		
depot (public drop off)	6,230		
IC&I waste	23,451		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	10,126		
incoming waste	69,347		
landfill diversion (brush, tires, scrap metal)	1,136		
true cost of waste disposal	68,211	\$65.00	\$4,433,715
landfill tipping fee (@\$27.50/tonne) revenue	39,807	\$27.50	-\$1,094,693
Subtotal disposal	68,211		\$3,339,023
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	2,150		\$100,000
RECYCLING			
recycling collection (residential)	3,746	\$100.00	\$374,600
IC&I recyclables dropped off	1,300	\$0.00	\$0
recyclables processed	5,046	\$65.00	\$327,990
landfill diversion (brush, tires, scrap metal)	1,136	\$50.00	\$56,800
OCC recycling (depots)	529	\$111.00	\$58,719
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,046	\$88.00	-\$444,048
Subtotal recycling	6,711		\$479,481
ORGANICS			
yard waste collection	700	\$57.00	\$39,900
yard waste drop off	944	\$0.00	\$0
yard waste composting	1,644	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	1,300	\$0.00	\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	3,351		\$39,900
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	2,150		
DIVERSION COSTS (including organics)	10,062	\$62	\$619,381
DISPOSAL & WASTE COLLECTION COSTS	68,211	-\$17	-\$1,165,772
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$5	-\$411,391

FINANCIAL MODEL SYSTEM 1C (Status Quo System)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	16,436	\$47.05	\$773,314
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital-collection costs			\$96,736
user fee (2.4 bags/week @ \$2.00/bag) revenue			-\$6,093,236
Subtotal waste collection	20,970		-\$5,163,881
DISPOSAL	20,970		
municipal waste collection	4,050		
depot (public drop off)	20,850		
IC&I waste	1,565		
municipal department waste	9,185		
sewage sludge	6,678		
other special materials (brush, tires, soils)	63,298		
incoming waste	835		
landfill diversion (brush, tires, scrap metal)	62,463	\$65.00	\$4,060,095
true cost of waste disposal	31,578	\$65.00	-\$2,052,570
landfill tipping fee (@\$65.00/tonne) revenue			\$2,007,525
Subtotal disposal	62,463		
REDUCTION			\$100,000
public education			\$0
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			\$374,600
recycling collection (residential)	3,746	\$100.00	\$374,600
IC&I recyclables dropped off	1,300	\$0.00	\$0
recyclables processed	5,046	\$65.00	\$327,990
landfill diversion (brush, tires, scrap metal)	835	\$50.00	\$41,750
OCC recycling (depots)	821	\$111.00	\$91,131
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,046	\$88.00	-\$444,048
Subtotal recycling	6,702		\$496,843
ORGANICS			\$39,900
yard waste collection	700	\$57.00	\$39,900
yard waste drop off	1,701	\$0.00	\$0
yard waste composting	2,401	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,108		\$39,900
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	10,810	\$59	\$636,743
DISPOSAL & WASTE COLLECTION COSTS	62,463	-\$51	-\$3,156,356
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$30	-\$2,384,613

FINANCIAL MODEL SYSTEM 2 (Yard waste collection and ban)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	17,461	\$47.05	\$821,540
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee revenue			\$0
Subtotal waste collection	21,995		\$977,581
DISPOSAL			
municipal waste collection	21,995		
depot (public drop off)	6,230		
IC&I waste	22,756		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	71,426		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	70,721	\$65.00	\$4,596,865
landfill tipping fee (@\$27.50/tonne) revenue	38,681	\$27.50	-\$1,063,728
Subtotal disposal	70,721		\$3,533,138
REDUCTION			
public education			\$100,000
residential waste reduction	0	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	825	\$0.00	\$0
Subtotal reduction	825		\$100,000
RECYCLING			
recycling collection (residential)	2,676	\$100.00	\$267,600
IC&I recyclables dropped off	1,300	\$0.00	\$0
processing	3,976	\$65.00	\$258,440
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	300	\$111.00	\$33,300
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	3,976	\$88.00	-\$349,888
Subtotal recycling	4,981		\$350,122
ORGANICS			
yard waste collection	800	\$57.00	\$45,600
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	2,920	\$0.00	\$0
backyard composting	976	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	3,896		\$45,600
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	825		
DIVERSION COSTS (including organics)	8,877	\$56	\$495,722
DISPOSAL & WASTE COLLECTION COSTS	70,721	\$64	\$4,510,718
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$64	\$5,141,440

FINANCIAL MODEL SYSTEM 2A (Yard waste collection and ban)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	17,242	\$47.05	\$811,236
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee revenue			\$0
Subtotal waste collection	21,776		\$967,277
DISPOSAL			
municipal waste collection	21,776		
depot (public drop off)	4,050		
IC&I waste	20,812		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	63,635		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	63,231	\$65.00	\$4,110,015
landfill tipping fee (@\$65.00/tonne) revenue	31,109	\$65.00	-\$2,022,085
Subtotal disposal	63,231		\$2,087,930
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	3,211	\$100.00	\$321,100
IC&I recyclables dropped off	1,300	\$0.00	\$0
processing	4,511	\$65.00	\$293,215
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	781	\$111.00	\$86,691
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	4,511	\$88.00	-\$396,968
Subtotal recycling	5,696		\$429,658
ORGANICS			
yard waste collection	900	\$57.00	\$51,300
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,070	\$0.00	\$0
backyard composting	1,276	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,346		\$51,300
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	10,042	\$58	\$580,958
DISPOSAL & WASTE COLLECTION COSTS	63,231	\$48	\$3,055,207
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$47	\$3,771,165

FINANCIAL MODEL SYSTEM 2B (Yard waste collection and ban)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	13,906	\$47.05	\$654,277
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee (2.1 bags/week @ \$2.00/bag) revenue			-\$5,331,580
Subtotal waste collection	18,440		-\$4,521,262
DISPOSAL			
municipal waste collection	18,440		
depot (public drop off)	6,230		
IC&I waste	22,756		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	67,871		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	67,166	\$65.00	\$4,365,790
landfill tipping fee (@\$27.50/tonne) revenue	38,681	\$27.50	-\$1,063,728
Subtotal disposal	67,166		\$3,302,063
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	2,150		\$100,000
RECYCLING			
recycling collection (residential)	3,746	\$100.00	\$374,600
IC&I recyclables dropped off	1,300	\$0.00	\$0
processing	5,046	\$65.00	\$327,990
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	529	\$111.00	\$58,719
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,046	\$88.00	-\$444,048
Subtotal recycling	6,280		\$457,931
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	3,120	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,827		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	2,150		
DIVERSION COSTS (including organics)	11,107	\$55	\$614,931
DISPOSAL & WASTE COLLECTION COSTS	67,166	-\$18	-\$1,219,199
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$6	-\$469,268

FINANCIAL MODEL SYSTEM 2C (Yard waste collection and ban)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	16,136	\$47.05	\$759,199
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee (2.4 bags/week @ \$2.00/bag) revenue			-\$6,093,236
Subtotal waste collection	20,670		-\$5,177,996
DISPOSAL			
municipal waste collection	20,670		
depot (public drop off)	4,050		
IC&I waste	20,812		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	62,529		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	62,125	\$65.00	\$4,038,125
landfill tipping fee (@\$65.00/tonne) revenue	31,109	\$65.00	-\$2,022,085
Subtotal disposal	62,125		\$2,016,040
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	3,746	\$100.00	\$374,600
IC&I recyclables dropped off	1,300	\$0.00	\$0
processing	5,046	\$65.00	\$327,990
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	821	\$111.00	\$91,131
capital diversion cost			\$105,420
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,046	\$88.00	-\$444,048
Subtotal recycling	6,271		\$475,293
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,170	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost	0		\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,877		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	11,148	\$57	\$632,293
DISPOSAL & WASTE COLLECTION COSTS	62,125	-\$51	-\$3,161,956
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$30	-\$2,394,663

FINANCIAL MODEL SYSTEM 3 (Curbside collection of OCC)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	17,112	\$47.05	\$805,120
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user-fee revenue			\$0
Subtotal waste collection	21,646		\$961,160
DISPOSAL			
municipal waste collection	21,646		
depot (public drop off)	6,230		
IC&I waste	22,756		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	71,077		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	70,372	\$65.00	\$4,574,180
landfill tipping fee (@\$27.50/tonne) revenue	38,681	\$27.50	-\$1,063,728
Subtotal disposal	70,372		\$3,510,453
REDUCTION			
public education			\$100,000
residential waste reduction	0	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	825	\$0.00	\$0
Subtotal reduction	825		\$100,000
RECYCLING			
recycling collection (residential)	3,075	\$100.00	\$307,500
IC&I recyclables dropped off	1,550	\$0.00	\$0
processing	4,625	\$65.00	\$300,625
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$129,963
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	4,625	\$88.00	-\$407,000
Subtotal recycling	5,330		\$366,338
ORGANICS			
yard waste collection	800	\$57.00	\$45,600
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	2,920	\$0.00	\$0
backyard composting	976	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	3,896		\$45,600
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	825		
DIVERSION COSTS (including organics)	9,226	\$55	\$511,938
DISPOSAL & WASTE COLLECTION COSTS	70,372	\$64	\$4,471,613
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$64	\$5,118,551

FINANCIAL MODEL SYSTEM 3A (Curbside collection of OCC)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	17,003	\$47.05	\$799,991
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee revenue			\$0
Subtotal waste collection	21,537		\$956,032
DISPOSAL			
municipal waste collection	21,537		
depot (public drop off)	4,050		
IC&I waste	20,812		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	63,396		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	62,992	\$65.00	\$4,094,480
landfill tipping fee (@\$65.00/tonne) revenue	31,109	\$65.00	-\$2,022,085
Subtotal disposal	62,992		\$2,072,395
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	3,689	\$100.00	\$368,900
IC&I recyclables dropped off	1,842	\$0.00	\$0
processing	5,531	\$65.00	\$359,515
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$129,963
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,531	\$88.00	-\$486,728
Subtotal recycling	5,935		\$391,850
ORGANICS			
yard waste collection	900	\$57.00	\$51,300
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,070	\$0.00	\$0
backyard composting	1,276	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,346		\$51,300
HSW depot			
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION			
REDUCTION	7,150		
DIVERSION COSTS (including organics)			
DIVERSION COSTS (including organics)	10,281	\$53	\$543,150
DISPOSAL & WASTE COLLECTION COSTS			
DISPOSAL & WASTE COLLECTION COSTS	62,992	\$48	\$3,028,427
HSW COSTS			
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS			
TOTAL SYSTEM COSTS	80,558	\$46	\$3,706,577

FINANCIAL MODEL SYSTEM 3B (Curbside collection of OCC)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	13,627	\$47.05	\$641,150
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$96,736
user fee (2.1 bags per week@ \$2.00/bag) revenue			-\$5,331,580
Subtotal waste collection	18,161		-\$4,534,389
DISPOSAL			
municipal waste collection	18,161		
depot (public drop off)	6,230		
IC&I waste	22,756		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	67,592		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	66,887	\$65.00	\$4,347,655
landfill tipping fee (@\$27.50/tonne) revenue	38,681	\$27.50	-\$1,063,728
Subtotal disposal	66,887		\$3,283,928
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	2,150		\$100,000
RECYCLING			
recycling collection (residential)	4,304	\$100.00	\$430,400
IC&I recyclables dropped off	1,550	\$0.00	\$0
processing	5,854	\$65.00	\$380,510
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$129,963
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	5,854	\$88.00	-\$515,152
Subtotal recycling	6,559		\$460,971
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	3,120	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,827		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	2,150		
DIVERSION COSTS (including organics)	11,386	\$54	\$617,971
DISPOSAL & WASTE COLLECTION COSTS	66,887	-\$19	-\$1,250,461
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$6	-\$497,490

FINANCIAL MODEL SYSTEM 3C (Curbside collection of OCC)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	15,857	\$47.05	\$746,072
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital-collection costs			\$96,736
user fee (2.4 bags/week @ \$2.00/bag) revenue			-\$6,093,236
Subtotal waste collection	20,391		-\$5,191,123
DISPOSAL			
municipal waste collection	20,391		
depot (public drop off)	4,050		
IC&I waste	20,812		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	62,250		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	61,846	\$65.00	\$4,019,990
landfill tipping fee (@\$65.00/tonne) revenue	31,109	\$65.00	-\$2,022,085
Subtotal disposal	61,846		\$1,997,905
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	4,304	\$100.00	\$430,400
IC&I recyclables dropped off	1,842	\$0.00	\$0
processing	6,146	\$65.00	\$399,490
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$129,963
MRF tipping fee revenue	0		\$0
sale of recyclables (@ \$88.00/tonne) revenue	6,146	\$88.00	-\$540,848
Subtotal recycling	6,550		\$439,205
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,170	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	0		\$0
IC&I organics dropped off	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,877		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	11,427	\$52	\$596,205
DISPOSAL & WASTE COLLECTION COSTS	61,846	-\$52	-\$3,193,218
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$31	-\$2,462,013

FINANCIAL MODEL SYSTEM 4 (Expanded Recycling)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	14,973	\$47.05	\$704,480
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee revenue			\$0
Subtotal waste collection	19,507		\$828,274
DISPOSAL			
municipal waste collection	19,507		
depot (public drop off)	6,230		
IC&I waste	20,659		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	66,841		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	66,136	\$65.00	\$4,298,840
landfill tipping fee (@\$27.50/tonne) revenue	36,584	\$27.50	-\$1,006,060
Subtotal disposal	66,136		\$3,292,780
REDUCTION			
public education			\$100,000
residential waste reduction	0	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	825	\$0.00	\$0
Subtotal reduction	825		\$100,000
RECYCLING			
recycling collection (residential)	5,214	\$55.00	\$286,770
IC&I recyclables dropped off	3,647	\$0.00	\$0
recyclables processed	8,861	\$80.00	\$708,880
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$730,357
MRF tipping fee (@ \$25.00/tonne) revenue	3,647	\$25.00	-\$91,175
sale of recyclables (@ \$85.00/tonne) revenue	8,861	\$85.00	-\$753,185
Subtotal recycling	9,566		\$916,897
ORGANICS			
yard waste collection	800	\$57.00	\$45,600
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	2,920	\$0.00	\$0
backyard composting	976	\$0.00	\$0
organics collection	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	3,896		\$45,600
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	825		
DIVERSION COSTS (including organics)	13,462	\$79	\$1,062,497
DISPOSAL & WASTE COLLECTION COSTS	66,136	\$62	\$4,121,054
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$66	\$5,318,551

FINANCIAL MODEL SYSTEM 4A (Expanded Recycling)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	14,436	\$47.05	\$679,214
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee revenue			\$0
Subtotal waste collection	18,970		\$803,009
DISPOSAL			
municipal waste collection	18,970		
depot (public drop off)	4,050		
IC&I waste	18,278		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	58,295		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	57,891	\$65.00	\$3,762,915
landfill tipping fee (@\$65.00/tonne) revenue	28,575	\$65.00	-\$1,857,375
Subtotal disposal	57,891		\$1,905,540
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	6,256	\$55.00	\$344,080
IC&I recyclables dropped off	4,376	\$0.00	\$0
recyclables processed	10,632	\$80.00	\$850,560
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$730,357
MRF tipping fee (@ \$25.00/tonne) revenue	4,376	\$25.00	-\$109,400
sale of recyclables (@ \$85.00/tonne) revenue	10,632	\$85.00	-\$903,720
Subtotal recycling	11,036		\$932,077
ORGANICS			
yard waste collection	900	\$57.00	\$51,300
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,070	\$0.00	\$0
backyard composting	1,276	\$0.00	\$0
organics collection	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,346		\$51,300
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	15,382	\$70	\$1,083,377
DISPOSAL & WASTE COLLECTION COSTS	57,891	\$47	\$2,708,549
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$49	\$3,926,926

FINANCIAL MODEL SYSTEM 4B (Expanded Recycling)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	10,632	\$47.05	\$500,236
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee (1.5 bags per week@ \$2.00/bag) revenue			-\$3,808,272
Subtotal waste collection	15,166		-\$3,184,242
DISPOSAL			
municipal waste collection	15,166		
depot (public drop off)	6,230		
IC&I waste	20,659		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	9,695		
incoming waste	62,500		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	61,795	\$65.00	\$4,016,675
landfill tipping fee (@\$27.50/tonne) revenue	36,584	\$27.50	-\$1,006,060
Subtotal disposal	61,795		\$3,010,615
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	2,150		\$100,000
RECYCLING			
recycling collection (residential)	7,299	\$55.00	\$401,445
IC&I recyclables dropped off	3,647	\$0.00	\$0
recyclables processed	10,946	\$80.00	\$875,680
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$730,357
MRF tipping fee (@ \$25.00/tonne) revenue	3,647	\$25.00	-\$91,175
sale of recyclables (@ \$85.00/tonne) revenue	10,946	\$85.00	-\$930,410
Subtotal recycling	11,651		\$1,021,147
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	3,120	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,827		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	2,150		
DIVERSION COSTS (including organics)	16,478	\$71	\$1,178,147
DISPOSAL & WASTE COLLECTION COSTS	61,795	-\$3	-\$173,627
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$14	\$1,139,520

FINANCIAL MODEL SYSTEM 4C (Expanded Recycling)

	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	12,862	\$47.05	\$605,157
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital-collection costs			\$64,490
user fee (1.8 bags per week @ \$2.00/bag) revenue			-\$4,569,926
Subtotal waste collection	17,396		-\$3,840,974
DISPOSAL			
municipal waste collection	17,396		
depot (public drop off)	4,050		
IC&I waste	18,278		
municipal department waste	1,565		
sewage sludge	9,185		
other special materials (brush, tires, soils)	6,247		
incoming waste	56,721		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	56,317	\$65.00	\$3,660,605
landfill tipping fee (@\$65.00/tonne) revenue	28,575	\$65.00	-\$1,857,375
Subtotal disposal	56,317		\$1,803,230
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
recycling collection (residential)	7,299	\$55.00	\$401,445
IC&I recyclables dropped off	4,376	\$0.00	\$0
recyclables processed	11,675	\$80.00	\$934,000
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost			\$730,357
MRF tipping fee (@ \$25.00/tonne) revenue	4,376	\$25.00	-\$109,400
sale of recyclables (@ \$85.00/tonne) revenue	11,675	\$85.00	-\$992,375
Subtotal recycling	12,079		\$984,227
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,170	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection	0		\$0
organics composting	0		\$0
capital organics cost			\$0
compost plant tipping fee revenue	0		\$0
sale of compost revenue	0		\$0
Subtotal organics	4,877		\$57,000
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	16,956	\$67	\$1,141,227
DISPOSAL & WASTE COLLECTION COSTS	56,317	-\$36	-\$2,037,744
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	-\$9	-\$761,517

FINANCIAL MODEL SYSTEM 5 (Organic Waste Composting)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	11,364	\$47.05	\$534,676
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee revenue			\$0
Subtotal waste collection	15,898		\$658,471
DISPOSAL			
municipal waste collection	15,898		
depot (public drop off)	6,230		
IC&I waste	18,162		
municipal department waste	1,565		
sewage sludge	0		
other special materials (brush, tires, soils)	9,695		
incoming waste	51,550		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	50,845	\$65.00	\$3,304,925
landfill tipping fee (@\$27.50/tonne) revenue	34,087	\$27.50	-\$937,393
Subtotal disposal	50,845		\$2,367,533
REDUCTION			
public education			\$100,000
residential waste reduction	0	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	825	\$0.00	\$0
Subtotal reduction	825		\$100,000
RECYCLING			
curbside collection (recycling)	5,214	\$55.00	\$286,770
IC&I recyclables dropped off	3,647	\$0.00	\$0
recyclables processed	8,861	\$80.00	\$708,880
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost (with 3 vehicles)			\$730,356
MRF tipping fee (@ \$25.00/tonne) revenue	3,647	\$25.00	-\$91,175
sale of recyclables (@ \$85.00/tonne) revenue	8,861	\$85.00	-\$753,185
Subtotal recycling	9,566		\$916,896
ORGANICS			
yard waste collection	800	\$57.00	\$45,600
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	2,920	\$0.00	\$0
backyard composting	976	\$0.00	\$0
organics collection (residential)	3,609	\$55.00	\$144,360
IC&I organics dropped off	11,682	\$0.00	\$0
organics composting	15,291	\$40.00	\$611,640
capital organics cost (with 1 vehicle)			\$883,543
compost plant tipping fee (@ \$25.00/tonne) revenue	11,682	\$25.00	-\$292,050
sale of compost (@ \$25.00/tonne) revenue	9,175	\$25.00	-\$229,375
Subtotal organics	19,187		\$1,163,718
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	825		
DIVERSION COSTS (including organics)	28,753	\$76	\$2,180,614
DISPOSAL & WASTE COLLECTION COSTS	50,845	\$60	\$3,026,003
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$66	\$5,341,617

FINANCIAL MODEL SYSTEM 5B (Organic Waste Composting)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	5,579	\$47.05	\$262,492
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee (0.9 bags per week@ \$2.00/bag) revenue			-\$2,284,964
Subtotal waste collection	10,113		-\$1,898,677
DISPOSAL			
municipal waste collection	10,113		
depot (public drop off)	6,230		
IC&I waste	18,162		
municipal department waste	1,565		
sewage sludge	0		
other special materials (brush, tires, soils)	9,695		
incoming waste	45,765		
landfill diversion (brush, tires, scrap metal)	705		
true cost of waste disposal	45,060	\$65.00	\$2,928,900
landfill tipping fee (@\$27.50/tonne) revenue	34,087	\$27.50	-\$937,393
Subtotal disposal	45,060		\$1,991,508
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	0	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	2,150		\$100,000
RECYCLING			
curbside collection (recycling)	7,299	\$55.00	\$401,445
IC&I recyclables dropped off	3,647	\$0.00	\$0
recyclables processed	10,946	\$80.00	\$875,680
landfill diversion (brush, tires, scrap metal)	705	\$50.00	\$35,250
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost (with 3 vehicles)			\$730,356
MRF tipping fee (@ \$25.00/tonne) revenue	3,647	\$25.00	-\$91,175
sale of recyclables (@ \$85.00/tonne) revenue	10,946	\$85.00	-\$930,410
Subtotal recycling	11,651		\$1,021,146
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,120	\$0.00	\$0
yard waste composting	3,120	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	5,053	\$55.00	\$202,120
IC&I organics dropped off	11,682	\$0.00	\$0
organics composting	16,735	\$40.00	\$669,400
capital organics cost (with 1 vehicle)			\$883,543
compost plant tipping fee (@ \$25.00/tonne) revenue	11,682	\$25.00	-\$292,050
sale of compost (@ \$25.00/tonne) revenue	10,041	\$25.00	-\$251,025
Subtotal organics	21,562		\$1,268,988
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	2,150		
DIVERSION COSTS (including organics)	33,213	\$72	\$2,390,134
DISPOSAL & WASTE COLLECTION COSTS	45,060	\$2	\$92,830
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$32	\$2,617,964

FINANCIAL MODEL SYSTEM 5C (Organic Waste Composting)			
	Tonnages	\$/tonne	Annual Cost
WASTE COLLECTION			
curbside collection (single-family)	7,809	\$47.05	\$367,413
curbside collection (multi-family)	4,534	\$13.08	\$59,305
capital collection costs			\$64,490
user fee (1.2 bags per week@ \$2.00/bag) revenue			-\$3,046,618
Subtotal waste collection	12,343		-\$2,555,410
DISPOSAL			
municipal waste collection	12,343		
depot (public drop off)	4,050		
IC&I waste	15,282		
municipal department waste	1,565		
sewage sludge	0		
other special materials (brush, tires, soils)	6,247		
incoming waste	39,487		
landfill diversion (brush, tires, scrap metal)	404		
true cost of waste disposal	39,083	\$65.00	\$2,540,395
landfill tipping fee (@\$65.00/tonne) revenue	28,579	\$65.00	-\$1,857,635
Subtotal disposal	39,083		\$682,760
REDUCTION			
public education			\$100,000
residential waste reduction	500	\$0.00	\$0
other waste reduction	5,000	\$0.00	\$0
reuse centre	1,650	\$0.00	\$0
Subtotal reduction	7,150		\$100,000
RECYCLING			
curbside collection (recycling)	7,299	\$55.00	\$401,445
IC&I recyclables dropped off	4,376	\$0.00	\$0
recyclables processed	11,675	\$80.00	\$934,000
landfill diversion (brush, tires, scrap metal)	404	\$50.00	\$20,200
OCC recycling (depots)	0	\$111.00	\$0
capital diversion cost (with 3 vehicles)			\$730,356
MRF tipping fee (@ \$25.00/tonne) revenue	4,376	\$25.00	-\$109,400
sale of recyclables (@ \$85.00/tonne) revenue	11,675	\$85.00	-\$992,375
Subtotal recycling	12,079		\$984,226
ORGANICS			
yard waste collection	1,000	\$57.00	\$57,000
yard waste drop off	2,170	\$0.00	\$0
yard waste composting	3,170	\$0.00	\$0
backyard composting	1,707	\$0.00	\$0
organics collection (residential)	5,053	\$55.00	\$202,120
IC&I organics dropped off	12,181	\$0.00	\$0
organics composting	17,234	\$40.00	\$689,360
capital organics cost (with 1 vehicle)			\$883,543
compost plant tipping fee (@ \$25.00/tonne) revenue	12,181	\$25.00	-\$304,525
sale of compost (@ \$25.00/tonne) revenue	10,340	\$25.00	-\$258,500
Subtotal organics	22,111		\$1,268,998
HSW depot	135	\$1,000	\$135,000
Subtotal HSW depot	135		\$135,000
REDUCTION	7,150		
DIVERSION COSTS (including organics)	34,190	\$69	\$2,353,224
DISPOSAL & WASTE COLLECTION COSTS	39,083	-\$48	-\$1,872,650
HSW COSTS	135	\$1,000	\$135,000
TOTAL SYSTEM COSTS	80,558	\$8	\$615,574