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Small Municipal Depot Guidebook And Depot Costing Model

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Introduction

Drop-off depots play a vital role in waste management systems by providing an efficient and convenient way for the public to properly manage waste and recyclable materials. Depots serve as collection and consolidation points for recyclable and waste materials that enable cost-effective bulk collection and transfer of materials to either local or more distant processors. Drop-off depots service Ontario communities in a variety of ways. Some depots service small, rural communities which do not offer curbside collection and provide the only waste management system available to residents. Many depots, however, augment curbside collection programs by offering additional services to residents, such as municipal household special waste (MHSW), waste electrical and electronic equipment (WEEE), tires, and other diversion programs not offered curbside.

Depots can act as an effective tool to drive diversion when designed and operated effectively and efficiently. In Ontario, on average, approximately 306,000[1] tonnes of material[2] are diverted annually from landfill through over 150 depots. As more depots are developed, residents and businesses gain access to additional, more convenient opportunities to divert waste.

Operating an efficient and safe recycling depot that offers a wide range of diversion services requires complex and unique planning that, in many ways, more closely represents a retail store than a waste management facility. Understanding the complexities in the design, construction and operations of a depot is an essential part of a well-functioning depot.

With this in mind, the Continuous Improvement Fund (CIF) has developed the Small Municipal Depot Guidebook (Guidebook), a “how to” guidance document for program operators. The content for this Guidebook is driven by feedback received in the past year from depot operators across Ontario. For the purposes of this Guidebook, the focus is on small tonnage depot operations.

This Guidebook adds to the CIF’s growing collection of Centre of Excellence products. CIF Centre of Excellence initiatives include demonstration projects, studies and better practices that are of broad benefit to multiple municipalities. This Guidebook is designed to provide a number of better practices in depot design and operation and a cost estimating tool to support program operators.

Purpose

This Guidebook offers information and strategies to those involved in the planning and operation of a recycling depot. It is intended for municipalities that generate less than 500 tonnes per year of recyclable materials. This Guidebook presents industry best practices including examples from other Canadian municipalities and practical information to support planning decisions and their potential financial implications. It provides basic guiding principles with respect to the design, operation and costing for a small but comprehensive depot operation.

[1] Current and New Approaches to Recycling Depots. Van der Werf, Paul. 2cg Waste Management Consulting Services. 3 May 2014.
[2] Includes printed paper and packaging, organics, WEEE, MHSW, textiles, C&D.

Many municipalities that are the intended users of this Guidebook will already have a recycling depot. For these municipalities, this Guidebook provides the tools to estimate costs and allocate them to various elements of depot operations and aid in considering the financial and operating impacts of adding new or enhancing existing programs to maximize waste diversion (e.g. adding new materials or changing current handling practices). Users of this Guidebook will be given the tools to assess the impacts of proposed changes made to existing or planned depots.

This Guidebook is supported by an interactive **Depot Costing Model** that enables the user to consider a number of depot operating options and their associated costs. Users will able to run scenarios to determine and then track estimated operating and capital costs.

The Depot Costing Model and the Planning Process

The Depot Costing model assists in the planning process by calculating an analysis of cost differences between depot development/expansion versus various direct haul options (e.g. curbside collection of recyclables and direct haul to the processor). The model also estimates tonnages for various types of recyclable materials that could be potentially managed at the depot and the associated costs based on various configuration options (e.g. ground level bins, sawtooth structures). The model provides a list of components to select from, to evaluate numerous planning scenarios and provide estimates for their various capital and operating costs and the overall cost per tonne.

Depot Purpose and Benefits

Depots can be multi-functional and vary in size, but most depots provide four main functions that must be carried out in a safe, user friendly, cost efficient way:

1. Receive materials
2. Identify and separate materials
3. Bulk materials for transport
4. Ship materials for disposal/processing

Where there is no curbside collection service provided by the municipality, depots are intended to provide residents with points of access for waste disposal and diversion services. Often these depots are located at existing landfills or transfer stations located within the municipality.

Depots may also be located in other areas, for example in high traffic areas that effectively accommodate seasonal population fluctuations (e.g. “cottage country”) and in areas with poor curbside collection accessibility (e.g. due to low density and poor road conditions).

There is no prescribed population limit or minimum annual tonnage required for a municipality to construct a depot and many larger municipalities use depots to augment curbside collection programs.

Depot programs can provide many benefits including:

- Enabling a municipality to meet the community demand for additional waste diversion services that are not economically feasible to be provided as part of the curbside collection service (e.g. wood waste) or may not be supported by the Material Recovery Facility (MRF) infrastructure and must be sent to other processors (e.g. polystyrene)
- Enabling the municipality to accommodate extended producer responsibility (EPR) programs (e.g. WEEE) and quickly adapt to the changes in recycling markets when new recycling markets become viable
- Enabling municipalities to manage materials that are difficult to handle with curbside collection programs (e.g. furniture, mattresses, construction and demolition wastes)
- Providing alternative disposal service, thereby eliminating direct public access to the landfill tipping face and creating a safer and more convenient way for the public to dispose of their wastes
- Providing access to more convenient disposal and diversion services (e.g. transfer stations) when the landfill may be located too far from a population centre
- Providing recycling and other diversion services to small commercial generators and/or seasonal residents who may not have access to curbside collection and/or may not have enough volume of recyclable material to attract private collection services

Disclaimer

This guide is designed to provide common principles and help identify variables and costs that may require more research by the user. Although the content in this guide attempts to be complete and accurate, costs, regulations and site variables change frequently and can be unique to each municipality. Therefore, this guide is not designed to replace qualified engineering, architectural or legal advice. Municipalities are cautioned to obtain qualified advice and certified/approved drawings, plans and local cost quotations prior to undertaking or adopting any recommendations that may affect their programs or facilities.

Section 1 - Siting a New Depot

While most users of this Guidebook already have an existing depot, this section is dedicated to those communities that may be considering constructing their first depot site, constructing additional depots sites or considering amalgamating several depot sites into one larger depot.

This section offers useful information and advice for those considering a new depot; however, users interested solely in infrastructure and/or service changes to an existing depot may choose to skip this section and move directly to Sections 2-4.

Many key elements need to be considered when siting a new depot. At minimum, the site selected should be sized appropriately to accommodate the intended services at the site and to enable expansion to those services as future needs grow.

Site selection processes should include the following tasks:

1. Initial desktop study with review of regulatory requirements
2. Site investigations (which includes suitability for site remediation and rehabilitation)
3. Economic assessment
4. Public consultation

Potential PartnershipsEach of these tasks is explored below.

1.1 Desktop Study

An initial desktop study can be undertaken to assess the physical qualities of proposed sites and surrounding areas in order to determine their suitability. A desktop study should focus on, without being limited to, the following issues:

- Identifying surrounding land uses
- Zoning restrictions
- Proximity to sensitive land uses and environmental features
- Review of satellite/aerial photographs
- Topographical maps and surveys to identify proximity to nearest receptors and hydrogeological conditions at the sites

1.2 Site Location

Ensuring that a depot is sited in a convenient and accessible location is crucial to its successful operation. A depot that is located at a landfill and/or transfer station meets the criteria of being convenient and accessible in that it provides the public a one-stop-shop to divert and dispose of their waste in one location. Siting depots at existing waste management facilities provides the following benefits:

- The waste management facility is already operating under a Certificate of Environmental Compliance (CEC) which can more easily be amended to permit the new depot services
- The public is familiar with the location and purpose of the waste management facility and can more easily transition to a waste diversion facility and purpose
- Most landfills (open or closed) have ample space to accommodate the development and expansion of a depot as service needs and demands change
- Depots provide an alternative, safer approach to disposing of waste directly into the landfill (tipping face) and provide for more effective traffic management

Some municipalities, however, will need to address public demand for more convenient depot locations that are closer to the community centre. When one northern municipality developed its waste management strategic plan in 2013, City staff received strong feedback from the public that the existing depot location, used to divert key materials such as leaf/yard waste and MHSW, was simply too far away.

As with any waste diversion programs, a lack of convenience, lack of understanding about the program, and/or lack of accessibility can act as significant deterrents for users to participate.

The number, size and location of depots to be built depends on the following factors:

1. Accessibility (e.g. location)
2. Convenience (e.g. hours of operation and usability)
3. Ability to accommodate population growth and seasonal demand
4. Ability to accommodate changes in material collected

Where population is spread over larger geographic areas, the number of depots needed should be determined by using either the recommended distances/travel time identified (see sidebar) or through a public consultation process. Less densely populated, larger geographical areas may require more than one depot, but the depot size might be smaller because of lower traffic volume. Hours of operation should also be convenient for users. Each of these factors is discussed in the operations section of this guidebook (Section 3).

In 2006, public surveys completed in York Region suggested that a network of Community Environmental Centres would provide an effective opportunity for residents to divert waste materials from disposal if the centres were located so that travel time to a facility was under 20 minutes.

Further, a study conducted in the United Kingdom in 2004 by the National Assessment of Civic Amenity Sites (NACAS), assessed depot performance with respect to proximity to households. This study indicated that the maximum catchment radii in urban locations should be no more than 4 km and/or no more than 20 minutes away; in rural locations, it should be no more than 11 km and/or 30 minutes away.

Factors affecting site suitability also include any statutory planning constraints associated with zoning, land designated for special purposes, airport safety (depots can lure birds) and proximity to sensitive cultural, historical or environmental areas.

1.3 Buffer Zone

During site selection, it is important to consider sensitive or protected areas as well as neighbours on adjacent land. Adjacent land uses should be investigated to determine current and future long term planned uses. This will help determine the suitability of a site and what, if any, buffer zone is required to minimize the effect of odours, noise, litter and dust.

Buffer zones are determined on a site-by-site basis and can be affected by many factors including type and compatibility of adjacent land use (e.g. protected wet lands, airports, and residential zones), wind direction, other geographical factors, and road accessibility considerations. The potential for off-site odour impacts associated with any waste management facility is of particular concern to the Ontario Ministry of Environment and Climate Change (MOECC). However, other applicable authorities will also need to be consulted for determining buffer zone, such as Transport Canada.

1.4 Stormwater Control

Stormwater control is an important component of the site selection process and needs to address issues such as elevation, slope, soil type, and nearby water courses. Other issues include local climatic conditions, including quantity and duration of seasonal precipitation to determine the impacts of runoff caused by winter snow clearing and salting operations. While these are matters of interest to the MOECC, special care can to be taken to manage materials received (e.g. using covers or tarps) in order to minimize any effect from site runoff to stormwater management systems.

1.5 Site Servicing Costs (Economic Assessment)

Determining site acquisition, construction and operating costs for a new site can be effectively determined and controlled by site design, size, materials managed and other factors.

Each site should be considered in terms of the relative economic investment required. Site specific design and construction cost estimates should be determined for:

- Planning, approvals (such as Environmental Compliance Approvals (ECA) and Site Plan Approval (SPA)
- Permitting and other studies, if required (e.g. potential nuisances, such as noise, traffic and odour)
- Land acquisition and carrying costs (e.g. municipal taxes, if applicable)
- Grubbing/clearing costs
- Grading and drainage (and associated cut and fill requirements)
- Providing hydro to the site, if needed
- Providing access to potable water, non-potable water, sewer if needed
- Stormwater management system requirements

- Infrastructure improvements (e.g. improved municipal road access to the site and traffic management) if required

The capital costs associated with the depot will depend on the number and sophistication of the structures and equipment chosen. These costs are detailed in the **Depot Costing Model** and operating costs are referenced in Section 3 below.

1.6 Public Consultation

Although site selection is generally based on technical factors, community preferences and values may also be critical to the acceptability of a particular site.

Notwithstanding the requirement to post the project on Ontario's Environmental Board Registry (EBR) by the MOECC (see Appendix A), it is recommended that public consultation occur with potentially impacted neighbours and the community in general in the early stages of a site selection process.

Public consultation is an important step in siting a depot. Effective consultation, conducted in a timely manner, can assist in proactively addressing any concerns or questions the public may have about the new depot. Any waste management facility can cause noise, odour and dust emissions, which can affect the surrounding community and the local environment. Public consultation not only allows the community to express any concerns about the planned operation of the depot but also achieves buy-in for the site and reduces the often negative perception that the public has with waste management sites.

The public consultation process should include information about the intended project, conceptual site plans, general results of any studies undertaken, discussion on operational matters (e.g. hours of operation, services to be provided and travel distance). Community members should have an opportunity to speak with municipal staff and technical experts about issues and concerns associated with the depot and have the means to provide input and feedback on the process.

Common approaches used in public consultation involve:

- Open houses with display information and presentation for feedback
- Press releases and other printed media (handouts at existing waste facilities)
- Social media (e.g. twitter and/or email message distribution)
- Notices in tax or utility bills and information posted on municipal websites
- Online surveys
- Road signage and public posters in local hubs

Consultation with the public can prove advantageous for municipalities as they can often receive valuable information about the community's wants and needs. The feedback can be used to design a depot that provides the most effective service to community members which ensures higher participation rates and support.

1.7 Partnerships

In determining the feasibility of a new depot or new depot program, the host municipality should explore the best practice of partnering with other municipalities (e.g. surrounding County, City within a County, or other). Partnering creates an opportunity to share and/or reduce costs for all municipalities involved. In one case, the City of St. Thomas applied for an Environmental Compliance Approval (ECA) for a new recycling depot and included all of Elgin County in their service area to provide a future opportunity for program and cost sharing.

Other communities have applied with the MOECC to become a regional hub for EPR materials, which enables them to provide expanded EPR services at a cost effective rate. For example, the Town of Renfrew has an Environmental Compliance Approval (ECA) that allows neighbouring municipalities to access Renfew's permanent MHSW depot. The member municipalities share the costs associated with the operations of the MHSW depot, which enables the Town of Renfrew to provide longer hours of operation. Member municipalities are able to offer a valuable service to residents that would be otherwise too costly to provide on their own.

1.8 MOECC Approval

An application for Environmental Compliance Approval (ECA), must be submitted to the MOECC for approval to construct and operate a depot (see Appendix A). At a minimum, the following information must also be included:

- Site location
- Site plan
- Landscape plan
- Identification of nearby groundwater wells and users (nearest well)
- Stormwater Management Plan
- Leachate Management Plan
- Location and proximity of site neighbours
- Location of any sites of cultural, historical or environmental significance (e.g. wetlands)
- Potential for nuisances associated with odour and vectors (including an Odour Management Plan)
- Access to the site, potential traffic effects, and road restrictions

Section 2 - Depot Design and Features

This section is designed to assist municipalities that do not currently have a depot in operation or intending to open additional depots. Municipalities with existing depots may benefit from reviewing this section and learning about depot best practices or they may wish to skip directly to Section 3, which covers depot operations.

2.1 Depot Design Considerations

Depots are commonly used to support the drop-off of waste and recyclable materials and can range in complexity and design from a very basic operation (e.g. small, unstaffed cart areas) that offer minimal waste management service, to fully integrated waste management facilities.

Each municipality has its own set of unique factors that will affect the depot planning and design process. As explored in the Section 1, these key factors can be impacted by:

- Capital and operating cost constraints
- Community service demands and program participation rates
- Geographic distance to markets
- Population dynamics (including seasonal populations, growth and population density)

Other key considerations include:

Property Size - Many small municipalities locate depots at an existing waste management facility (e.g. open landfill or transfer station operating at a closed landfill), which offers a range of benefits discussed in Section 1.2.1. In addition, the location often ensures ample space to accommodate the development and expansion of a depot as service needs and demands change.

If it is not possible to develop a depot at an established waste management site/landfill, then a depot should be sited in a location that is well established and known to the public. The property size will determine what services can be provided at the depot. Furthermore, it is expected that use of the facility will require time to become an established fixture in the community and will require a commitment to promotion and education to increase awareness and use.[3] See Section 2.8 for more information on promotion and education.

Larger municipalities are more focused on promoting depots as waste diversion facilities and they are often referred to as Community Recycling Centres (CRCs), Community Resource Recovery Centres (CRRCs) and Eco-Centres (ECs). These facilities offer a wide range of services, from permanent MHSW depots to construction and demolition material reuse programs (e.g. Habitat for Humanity)

Services Offered - Depot design will also be influenced by the type of services you wish to provide. Over the past decade, depots have grown in complexity with larger municipalities expanding the role of depots as seen with the

[3] Report No. 1 of the Environmental Services Committee. Regional Council Meeting of January 27, 2011. http://www.york.ca/NR/rdonlyres/yyvgonqc5nfgqcxdbirmdknltxjf7yslumuw7vatexx35mauaxy73ttxmcu5w4dna2qzgdr6fcj3kvomqun6icy2qd/rpt+1+cls+3.pdf

development of Community Recycling Centres (CRCs) in the Region of Peel and Community Environmental Centres (CECs) in York Region (see sidebar). The cost associated with these sophisticated depots is well beyond the budget of most small municipalities but many of the services can still be replicated using a more modest approach.

Usability – Ensuring that the layout of the depot encourages effective and safe access to services is crucial to its successful operation. As with all waste diversion programs, a lack of convenience, lack of clarity in the program and/or lack of accessibility can act as significant deterrents for users to participate.

Users – Most municipalities design a depot for residential users and pay less attention to small commercial needs. It is common, however, for smaller municipalities to permit and encourage small commercial generators to use recycling depots. Shared use of municipal depots can help encourage small commercial recycling initiatives. By providing necessary infrastructure, this type of program can also help support potential existing or future landfill bans on materials, such as cardboard.

2.2 Types of Materials

Planning a depot starts with a decision about the type of materials that will be received. The size, design and geographic location of your depot will impact the materials you are able to divert and the infrastructure and costs necessary to deal with them.

Materials that are typically accepted at depots located in smaller municipalities, include:

• Blue Box Recyclables • Old Corrugated Cardboard (OCC) • Brush • Leaf and Yard • Clean Wood • Clean Fill/Soil • Items for reuse	• Used Tires • Scrap Metal and White Goods • Waste Electronics (WEEE) • Bulky Waste Items (e.g. mattresses, carpet) • Concrete • Mixed Waste

Some depots also handle additional divertible material, if economics and markets permit or partnerships with neighbouring municipalities are developed, including:

• Dirty Wood • Drywall • Asphalt Shingles • Mixed Construction & Demolition Debris or Materials	• Household Hazardous/Special Waste • Mattresses and Box Springs • Food Waste (organics) • Textiles

Economics play a major role in determining what materials to separate for diversion purposes at the depot. Many factors contribute to the cost of managing and diverting a specific material, such as the amount of material to be handled, the infrastructure (e.g. roads, fencing, bunkers, buildings) and equipment (compactors, trucks, loaders, skidsteers, bin types) required to manage the material, staffing requirements, market prices/costs to transport to end markets and sources of funding (e.g. WDO).

The **Depot Costing Model** is specifically designed to enable the financial impact of the variables above to be estimated and compared in support of the planning process. More detailed discussion with respect to the Depot Costing Model is provided in Section 4.

Other factors influencing the decision on which materials to divert include the impact on depot operations such as traffic congestion or safety issues and potential off-site effects like litter, odour or dust.

For example, a community may want to respond to public interest to collect plastic film at the local depot. In making a decision whether or not to collect film at the depot, municipal staff will need to consider many different factors in addition to the key one being cost, such as:

- **Volume and Quality of Material Available** – Film represents a very small portion of the recycling stream by weight and may be highly contaminated with food residues and other residues. Waste audits will provide insight into estimated volumes of materials and determine the level of contamination
- **Participation** – Despite community interest in recycling film, that interest may not translate into high community participation rates requiring additional promotion and education efforts/cost to become a successful, cost effective diversion initiative
- **Available Markets** - Markets for the film may not be well established and/or viable
- **Local processing capabilities** – The local material recycling facilitiy (MRF) may/may not have the equipment or desire to process/market film, in which case, alternative arrangements will need to be found resulting in higher transportation and possibly processing costs
- **Local Alternatives** – There may be grocery stores or other retailers that provide film return/recycling options. It may be more cost effective to promote the availability of these services and redirect residents to these locations
- **Storage Requirements** - An additional bin and long storage times to gather sufficient weight for shipment may be needed
- **Infrastructure Requirements** – Preparing the film for market or processing may require the use of a baler and require staff and utility/equipment resources

Additionally, if stored too long, this material can become odorous due to food residue and could be downgraded or even rejected at market. The market value for this material has also been historically low, see http://cif.wdo.ca/pricesheet/index.html

Municipalities must undertake a similar analysis for each material that it may wish to potentially divert as part of the depot design considerations.

Using the Depot Costing Model to Identify Target Materials

The Costing Model will allow input of material tonnage, if known, or calculate estimated tonnage based on population served by the depot along with costs for infrastructure to handle the material. This will generate an estimated cost analysis upon which to partially base a decision with respect to what materials make sense to receive at any given moment in time in your municipality.

2.3 Depot Configuration/Layout

Taking the time and money up front to thoroughly plan the design and layout of the depot will pay off in the long run by ensuring that the depot configuration maintains the balance between cost, efficiency, convenience, safety, existing infrastructure opportunities and constraints. The depot design and operating configuration will largely depend on the following factors:

- Property size
- Other site uses
- Amount and type of material to be managed
- Numbers and type of vehicle traffic
- Changes in community characteristics and needs over time

Future Recycling Initiatives

New recycling initiatives are available to divert mattresses and carpets, but for small northern or rural municipalities the costs remain prohibitive. As the markets mature and processing prices decline, recycling opportunities should become more viable. Alternatively, the Canadian Council of Ministers of the Environment (CCME) has set a target to introduce EPR for Phase 2 materials by 2017, which includes carpets, mattresses, textiles and construction/demolition materials.

2.3.1 Planning for Changes in Markets

Design concepts need to incorporate flexibility and sufficient site size to enable the municipality to accommodate growth and modify programs accordingly. The type of materials to be handled or segregated changes over time as new markets emerge and/or existing markets become more economically viable. Many municipalities may want to introduce new materials into their depot diversion programs but should conduct activity based costing as part of the decision making process.

2.3.2 Planning for Population Growth

Population growth rates will also affect the depot design. Depots should be planned to accommodate local long term waste projections associated with population growth and anticipated users/traffic. In areas where significant population growth is anticipated, depots can be modular or phased for expansion to meet both short term and eventual long term needs.

Figure 1: St. Rémi Que. - 8 bin precast modular depot can be moved or expanded with a crane

When planning the depot layout leave room for additional bins and containment structures to be added later. This is contingent on an appropriately-sized site. Even in areas where minimal population growth is expected and permanent facilities and design components can be considered, these can still be developed to plan for future added materials. These design strategies are discussed in more detail in the sections below.

2.3.3 Permanent Versus Temporary Depot Configuration

The decision to develop a temporary depot, without permanent structures and allowing for smaller bins to be re-located as needed, or a permanent depot, which has non-moveable structures resulting in less flexibility in bin location depends on the following variables:

- The smaller the property size, the more temporary the site may need to be. A temporary set up would allow collection bins and laydown areas to be moved to other parts of the site to manage these daily activities and the unpredictability of future recyclable material markets

- A more permanent set up (e.g. sawtooth or modular grade separation system, discussed in Section 2.6) may be better suited to a larger sized site and well established program where historical tonnage data and participation rates are available and these programs are expected to continue well into the future. While this is a more expensive option, it is associated with many benefits as discussed in Section 2.6

Whether a temporary or permanent depot is developed, flexibility must be built into the design to accommodate changes in the amount and type of materials collected (e.g. increased volumes of material generated due to population growth and/or increased participation and the addition of new recyclable materials when economical markets become available or collection is mandated by legislation).

For some materials (e.g. Blue Box materials), increased volumes may require more frequent lifts or switching to a larger bin. With the introduction of new materials, the depot may need to accommodate the preparation of new bin, bunker or compactor locations (e.g. grading, concrete pads, concrete barriers, signage).

Where future needs are difficult to predict and costs are an issue, a simple front end bin configuration provides flexibility at minimal cost, (see Figure 1A) compared to a sawtooth configuration (see Figure 2) that once constructed is fixed and requires more initial capital to build. Municipalities may choose to start with a simple set up (e.g. front end bins) and gradually transition to a more permanent set up (e.g. concrete structures) over time. The relative advantages and disadvantages of each are discussed further below.

Figure 1A: Simple front end bin configuration

Figure 2: Concrete sawtooth bin configuration

2.3.4 Layout and Flow

Depot layout is considered a best practice to be designed in accordance with the principles of the waste hierarchy as shown in Figure 2A. The design can encourage diversion by moving traffic through areas promoting waste reduction and reuse followed by bins and/or bunkers dedicated to waste diversion (e.g. Blue Box recycling and organics diversion), with the least convenient areas of the site dedicated to waste disposal.

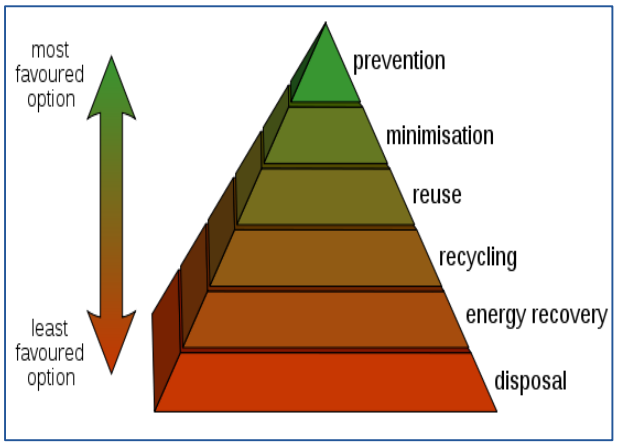

Figure 1A: Waste Hierarchy

By presenting diversion and reuse options before disposal options, users will be more inclined to think about diverting waste in the designated reuse and recycling areas, rather than disposing of materials as waste. As users frequent the depot, they become familiar with the layout and many will start to segregate materials at home to shorten their time on site.

Designing a Depot to Promote Recycling and Reuse

The McCleary Court Community Environmental Centre (CEC) in York Region was designed to follow the waste management hierarchy, with users required to consider reuse and recycling opportunities first, before being directed to disposal, the last option.

A best practice design consideration should incorporate separate service vehicle access areas and waste hierarchy principles, as shown in the sidebar. Public and green spaces are also given importance as these facilities can often be used as social gathering areas for some members of the community. User friendly facilities encourage frequent use and cleaner depots. Larger designs may also incorporate a separate reuse centre.

Figure 3: York Region, reuse hierarchy traffic flow layout

2.4 Scales, Scale Houses and/or Kiosks

Data management and record keeping are important tools used to measure depot performance. The use of scales and a scale house can serve an important role in tracking inbound and outbound tonnages and can also be used to analyze peak site use times, number of users, seasonal fluctuations in material, tipping fees and revenue, and daily, monthly and yearly activity.

Increasingly, small municipalities are recognizing the benefits of having scales and scale houses, especially if the municipality does not provide curbside collection services and all community members must self haul all waste and recyclables to the municipal depot. Small vehicle scales, scale house and equipment will typically meet the needs of a small municipality and a single scale can be used to weigh inbound and outbound vehicles, as shown in Figure 4. Scales should be paired with a scale house to improve record keeping, proper use, and traffic management on site. Small vehicle scales can be used for only residential vehicle traffic and cannot accommodate large vehicles.

Depending on the amount of traffic, some depots may benefit from having both an inbound and outbound scale to reduce wait times. For example, the County of Simcoe installed inbound and outbound scales at its Nottawasaga site. Compared to the County's other sites that are only equipped with one scale, the dual scale system was found to significantly decrease wait times.

Typical small vehicle scale and scale house costs range between $50,000 – $90,000 including software and equipment, maintenance and amortization. Municipalities are encouraged to run test loads across third party scales (gravel pits, agricultural etc.) to obtain more accurate annual tonnage estimates which are multiplied by tip fees to yield estimated potential revenue and compare with current actual revenue numbers to build a business case for installing scales.

Figure 4: Small scale and scale house in Muskoka

An effective and easy fee collection approach

In Prince Edward County, depot attendants use a ticketing system to record transactions. Upon collection of a user fee, the attendant issues a ticket to the customer while retaining the ticket stub. The money is stored in a cash box and ticket number recorded. At the end of the day, the money, ticket stubs and records are delivered to the county office clerk.

Alternatively, and more typical with low volume sites, inbound materials can be received by a kiosk attendant who can conduct visual load inspections, collect tipping fees and manually track user numbers. Kiosk and scale house attendants are beneficial to site operations since they can provide direction and information to visitors upon arrival at the site (See Figure 5)

The downside of a kiosk is that this arrangement is based on trust: site attendants need to be trusted to manage cash-based transactions and fair enforcement of local fees without supervision. Some municipalities monitor kiosk activity through the use of cameras and/or recording software and/or mechanical traffic counters. Site supervision may need to be increased on a random basis to reduce losses. Prepaid user cards or use of credit cards/debit cards have also be used by municipalities to eliminate the management of cash.

Figure 5: Kiosk at Township of Killaloe, Hagarty and Richards depot

Choosing between a Scale and Scale House and Kiosk

At what point does it make sense to install a scale versus a kiosk from a cost per tonne standpoint? Some variables to consider before investing in a scale and scale house include:

- Revenue gains and losses
- Impact on customer service and potential complaints
- Safety issues
- Staff and user time
- Benefits of tonnage monitoring and measurement

Refer to the **Depot Costing Model** to determine the cost-benefit of a scale versus a kiosk for your municipality. The Model can also help determine whether or not to have a site attendant, given the nature/number of materials received, complexity of the operation and costs.

2.5 Vehicle and Traffic Management

Proper design for traffic flow ensures efficient daily operations by providing adequate roadways for traffic queuing and ease of movement through the site by users and operations staff. This also increases the safety, capacity and probability of repeat use of the facility.

Depot facilities may need to accommodate four different types of vehicles including:

- **Residential and Small Commercial:** Cars, pick-up trucks, vans, cube vans and small utility trailers used to drop materials at the depot
- **Larger Commercial Vehicles**: Higher capacity trucks and trailers which are either physically too large or cause traffic flow issues during unloading
- **Transfer/Commercial Vehicles**: Transport trailers/large haul vehicles used to transport materials from the depot to processors and/or markets
- **Site Equipment**: Front-end loaders, skid steers, pick-ups with plow attachments and other mobile equipment used for site operations, loading and highway transport

Wherever possible, it is recommended that small vehicle traffic be kept separate from site equipment and larger transfer vehicle traffic. Direct interaction between larger equipment and small vehicle users increases the risk of on-site vehicle collision and/or human injury. Figures 6 and 7 show the difference between a bad traffic flow design and a good traffic flow design. As part of the site design, “truck access only” areas should be incorporated to minimize these risks. For example, allowing only transfer vehicles to access a bin area from the back not only increases safety but also minimizes disruption in service to users (this is further addressed below). Similarly, scheduling removal of materials from the bunkers to occur at either very low traffic user times or before or after receiving hours will also help minimize risks of collisions and injuries.

Figure 6: Bad residential traffic flow

Figure 7: Good residential traffic flow

2.5.1 Small Vehicle Traffic Flow

Critical to the layout of a depot, is the management of traffic flow, which needs to balance the need for convenient access and the safety of users and facility staff. Safety is discussed in more detail in Section 3. Whenever possible, it is beneficial for depots to incorporate a one-way traffic flow design for optimal user capacity, vehicle management and overall site safety. This approach to vehicle flow has been successfully used at many depots in Ontario, resulting in fewer accidents on site, shorter wait times, improved convenience for users and an overall safer operating environment for both visitors and staff.

Small vehicle traffic should be designed to flow in a continuous one way direction and loop back to the scale house or kiosk without interacting with large vehicle activity. The new Canborough Waste Management Facility in Haldimand County directs traffic in a continuous flow past the scale house then through the diversion area to the public drop off and looping back past the yard waste bunker to the scale house and exit, as shown in Figure 8.

Figure 8: One way traffic design at Canborough Transfer Station in Haldimand County

In the case of depots with temporary layouts featuring laydown areas/pads without bunker walls, very clear signage and traffic flow indicators (e.g. arrows, physical barriers, signage, cones) are

required to indicate where residents should access those piles. An area should be designated to ensure no access by large vehicle traffic while piles are in use.

Figure 9: Woodstock public drop off curbs separate cars from equipment

To encourage safer traffic flow and small vehicle user activity at the depot, municipalities will place restrictions on the type of vehicles that access the site. Small vehicles should be restricted to:

- Cars, vans, pick-up trucks
- Vehicles with trailers (e.g. max. combined length 12 m or 40 ft. long)
- Box trucks and cube vans (e.g. maximum 5 m or 16 ft. long)
- All vehicles with a total gross weight of less than 5 tonnes

Vehicles with tip trailers (e.g. maximum 12 m or 40 ft. long) and dump trucks with a total gross weight less than 5 tonnes may be permitted based on the location, spacing, accessibility and intended use of the facility. Depots should not allow larger commercial generator's vehicles to enter a site designed for residential/small commercial users.

2.5.2 Large Vehicle Traffic Flow and Turning Radius

As a best practice, large vehicle traffic must be kept separate from small vehicle traffic to ensure safety of all users. Figure 10 shows the segregation of small vehicle traffic from larger equipment with signage used to direct public users away from large vehicle traffic.

Figure 10: Guelph public drop off depot

Figure 11 shows schematics for one-way traffic flow from the City of Calgary's, Recycling Depot Friendly Design Guide, which discusses many best practices in depot design.[4]

Figure 11: One way traffic flow

[4] City of Calgary, October 2005, Recycling Depot Friendly Design Guide at https://www.calgary.ca/UEP/WRS/Documents/WRS-Documents/recycling_design_guide.pdf?noredirect=1

If large vehicles cannot stay uni-directional because of site limitations, then a sufficient turning area should exist at the appropriate end of the depot. In both residential and "truck access only" areas, site design needs to ensure adequate turning radius, allowing vehicles to maneuver safely on site. While smaller residential vehicles only require typically 25 ft. for an SUV with trailer, larger semi-trailer vehicles can require road widths exceeding 50 ft. in order to complete a 180 degree turn safely. It can be challenging to accommodate these road widths/turning areas depending on site size, winter conditions and budget. For more information on turning radius requirements for various vehicle types go to:

http://onlinemanuals.txdot.gov/txdotmanuals/rdw/minimum_designs_truck_bus_turns.htm .

Public works vehicles will periodically require access to the depot. These services could include snow clearing, sanding/salting, landscaping, or equipment maintenance. To avoid interruptions in service, it is ideal to arrange for these services to be conducted outside of public hours. In some cases, where this is not possible, the amount of time service vehicles spend in the operating area of the depot should be minimized to reduce the effects on traffic flow and accessibility and to maximize safety. For this reason, it is worthwhile to ensure that any new or amended Environmental Compliance Approval (ECA) includes site operating hours beyond site receiving hours.

2.5.3 Signage

For any depot configuration to operate as intended, it is important to provide excellent signage. Signage not only helps to properly direct traffic, but also provides useful information with respect to location of drop off areas for different material types. Clear, unambiguous signage should be used to maintain proper traffic flow and ensure neither residential nor large vehicles access incorrect areas of the site. Signage is also one of the most effective methods for promoting proper separation of recyclables resulting in improved capture rates and decreased contamination levels.

Signs should be posted throughout the depot, including:

- At the facility entrance to provide information about services available at the site and hours of operation (see Figure 12). Note: It is important to make the text size large enough to read from a distance
- At the scale house (stop sign at minimum, others as applicable)
- Directionally throughout the site (e.g. arrows pointing to areas of the site as necessary to guide traffic) shown in Figure 13
- At each bin, bunker and/or laydown area to identify the material intended to be received at each, shown in Figure 14 and 15
- At any other service (e.g. reuse building, WEEE containers, etc.)
- To announce changes in services or upcoming events (e.g. MHSW event)

Figure 12: Sign at a depot entrance

Figure 13: Sign showing location of diversion at the Renfrew depot

Figure 14: Sign used to identify bins at Twp. of Killaloe, Hagarty - Richards depot

Figure 15: Sign used to identify a pile at Ottawa Valley

At the site entrance a minimum requirement is a sign indicating operating hours and emergency contact information as required by the MOECC. There should also be a list of accepted materials and a per unit charge for those materials. For more complex layouts, a sign could also be posted that includes a map with arrows showing the direction of traffic and the zones for material unloading and what is accepted in those zones.

When determining the location and number of signs, it is important to have enough signs to guide the user but not so many as to be confusing.

Generally when determining what information to include on the signs and how to place them effectively, consider the following:

- **Visibility and Language**: Signs should include a large and sans serif font so they can be easily read from a distance. Avoid large amounts of text and keep wording simple and unambiguous. In predominantly multi-lingual areas, consider including commonly spoken languages on signage and/or more pictograms.

- **Sign Height and Direction**: Signs should be placed at a height and direction so that they can be clearly seen by site users. If the site design incorporates a one-way traffic system, signs should be placed facing the direction of traffic so that users can easily navigate the site and have a clear understanding of the different drop off zones

- **Instructions**: Clear, simple and concise instructions can assist in maximizing operational efficiency, reducing contamination and improving traffic flow. For example, “one-way only” signs can assist in directing traffic and “no garbage” signs can help reduce contamination, both of which save in staff time and operating expenses. Signs are meant to be directional not motivational

- **Durability and Modifications**: Signs should be able to withstand adverse weather conditions and minor bumps and scrapes. With waste programs regularly changing, it is also important that signs are easily replaceable or can be updated to accommodate program modifications or changes in site operations

- **Colour Coding, Symbols and Pictures**: Symbols, colours and pictures should be used on signs as much as possible and consistency in that approach throughout the site will assist site users in understanding which materials are accepted and will improve familiarity with the site. Colour coding of locations and material types is considered a best practice (see Figure 16-18).

Figure 16: Woodstock labelled colour coded bins

Figure 17: Thunder Bay colour coding

Figure 18: Regional Municipality of York, Make the Drop signage

Depot field tests have proven picture/graphic signs yield significantly less contamination compared to the alternative layout with 'text only' signs. A pilot conducted by Quinte Waste Solutions as part of Phase 2 of the Rural Depot Project, funded by the Effectiveness and Efficiency Fund, tested "text only" signs versus "image/graphic" signs demonstrating the importance of graphic images. See the description and results below and Appendix D.

Text Only Signs verses Image/Graphic Signs

The pilot tested "text only" signs verses "image/graphic" signs. The signs were placed above the designated recycling carts in rural depots. Both test cases are presented below.

Text Only Sign

Image/Graphic Sign

Source: Quinte Waste Solutions. 2009. Phase 2 of Rural Depot Project. E&E funded project #45.

The pilot showed that the signs using graphics resulted in lowest contamination levels with about 50% fewer contamination errors in the carts using the graphics verses the text only signs.

Depot users commented that the signs with graphic contents were easier and faster to read and process information. The graphics also provided additional reminders about which materials could be recycled. Other observations included:

- The public was more inclined to read the graphic sign than the text sign
- Images were processed/understood faster than text
- The images served as a better reminder and were less overwhelming to read

Some municipalities choose to display their local waste diversion rate, or tonnes diverted this year, or other motivational messaging near the site entrance so that users can see that they are contributing to a cause. Displaying the diversion rate can assist in generating positive feedback and resident buy-in to both depot and other municipal recycling programs. Figure 19 shows a diversion meter displayed in front of the landfill of the Wahnapitae First Nations. Updates to the diversion sign are recommended to take place on a semi-annual or annual basis, depending on monitoring and reporting programs.[5]

Figure 19: Wahnapitae First Nation

2.6 Design for Storage and Handling

The types and volumes of materials managed at the depot will vary significantly, depending on a number of factors:

- The level of waste management services provided to the community (e.g. curbside collection or self haul only), the level of seasonal population, and the type of waste generators (e.g. residential and/or commercial) permitted to use the depot. For example, depots accessible to small commercial businesses are typically required to manage much larger quantities of cardboard than those used strictly for residents
- The geographic distance to markets/processing and the associated transportation, processing costs and potential for revenue
- The available site locations and overall size of the depot

2.6.1 Storage and Handling Practices

Proper storage and handling practices of recyclable materials at the depot will ensure higher material quality and market revenues. Cleaner materials will also reduce the potential for loads to be rejected due to contamination.

Municipal waste management depots typically use three approaches to storing and handling different waste streams:

1. Bunkers and Piles
2. Bins (open and covered)
3. Enclosed Structures

[5] Household Waste Recycling Centre Guidance. WRAP. October 2012.

Each of the three storage and handling approaches is addressed below with emphasis on best practices.

2.6.2 Bunkers and Piles

Higher volumes of materials, and those that are very heavy, like construction and demolition (C&D) wastes, appliances, brush, yard waste, dirty wood waste, concrete and fill are commonly managed using concrete block bunkers (see Figures 20 and 21).

Figure 20: Precast block bunkers

Figure 21: Bunkers at Hagarty- Richards depot

Bunkers are meant to separate material, minimize use of space on the site (stop spreading piles), clearly identify load out areas for certain materials and keep the site tidy (less material blowing reduces dust and litter). The concrete blocks are not meant to act as push walls. These bunkers are commonly housed on gravel pads and are at grade. Compacted stone dust, paved or concrete base pads can reduce loading contamination and litter. See Figure 20 above.

Regardless of the amount of material collected in a bunker, they should be wide enough to accommodate loading by designated equipment (i.e. front end loader or skidsteer) as appropriate and allow manoeuvring of that equipment. A heavy equipment manufacturer/supplier can assist with determining appropriate widths based on the equipment selected.

In cases where a site is well isolated from the nearest receptors that could be subjected to dust and/or windblown litter and the site is large enough that bunkers may not be required to contain material, simply designating segregated pile areas on the site with proper signage may suffice. Areas should be kept far enough apart to allow equipment to move between piles and easily load trucks for transport off site. Areas must be kept clean enough to reduce animal vectors and vehicle/tire damage or user injury from migrating pieces of material and to accommodate winter snow removal. (See Figures 22, 23)

Additionally, many materials delivered by residents cannot or should not be physically lifted into a bin/over a guardrail and are better pushed into a bunker (e.g. appliances) to reduce the potential for personal injury to the public.

Figure 22: Pile of clean wood waste at Ottawa Valley WRC

Figure 23: Tire pile at the Frankin depot

Once sufficient volume is received, it can be loaded onto larger and/or compaction vehicles as opposed to being placed in 20 or 40 yd^3 bins. This approach helps to reduce hauling frequency resulting in potentially lower operating costs.

Some materials will require further processing on site. This could include appliances requiring CFC extraction and brush, leaf and yard waste requiring grinding. Horton Township has begun to collect and grind rigid plastic products, such as toys and furniture and the Township of Bonnechere Valley grinds its mattresses and bulky furniture. Grinding these bulky materials can reduce transportation costs and landfill space but is contingent on end market acceptance, local grinder availability and processing costs.

2.6.3 Bins

Materials that tend to be lower in volume such as Blue Box recyclables, cardboard, electronics, carpet, mattresses, household organics and mixed waste must be contained in appropriate sized bins (6, 8, 20, 40 yd^3)

Where bins are used, they must be placed far enough apart to allow maintenance between the bins (litter pickup, snow clearing, safe tarping etc.).

Figure 24: Covered side load 40 yd^3 bin

Some of these materials need to be contained and covered (e.g. Blue Box fibre, cardboard, carpet, mattresses, electronics). This is important not only to keep these materials dry and eliminate unnecessary weight (to avoid paying to haul water) but also to ensure quality product is delivered to end processors and sale value is preserved. The bins can be tarped or covered with lids (e.g. smaller front end load bins) to protect the contents from rain or snow.

2.6.4 Bin Layout Design

The **Depot Costing Model** will help determine the estimated costs of transferring expected volumes of materials in different volume bins. It is recommended that extra bins are available for fluctuations and surges in material diversion and transport capacity limitations.

Three design concepts for a depot are shown in Figures 25 to 27, presented in order of lowest to highest cost. The first (Figure 25) is a simple design that consists of a fenced yard, front end bins at grade with an attendant on hand to ensure quality control. This design is cost effective but requires materials to be lifted up into the bins.

Alternatively, wooden or metal stairs, platforms and catwalks can be fitted alongside any size bin to allow larger materials to be dropped from above. (Figure 26) The benefit of installing stairs and catwalks is that the bin is more likely to fill compared to the “walk in” approach. However, the stairs may be hazardous in inclement weather so there is greater potential for injury to the public through slips and falls. This arrangement would have to be heavily monitored for maintenance, effect of rainfall and for winter snow and ice control.

Figure 25: Simple front end load bins at grade

Figure 26: Step to access top of bin

Lifting can be reduced for some materials, like Blue Box materials and cardboard, which can be side loaded into a bin fitted with side door openings. Larger materials can be walked into a bin (such as waste electronics stored in a sea container. (Figure 27)

Figure 27: Walk in WEEE 40 yd^3 sea container

Another design concept involves small vehicles driving up a ramp that enables the driver to drop the contents into bins below and then drive down a ramp on the other side. Dropping waste materials from above into a bin results in fewer bin hauls compared to loading the bin at grade level. Residents can conveniently pull up above the bin and easily and safely deposit the material (note: see guardrails section 2.6.5). A major benefit of the raised design is that it separates small vehicles from large vehicle traffic. With the proper site set up, this grade separation allows for the safe removal of bins when they are full, without interactions with the public and their vehicles. (Figures 28 to 30)

A raised modular design can be initially constructed at a smaller facility and expanded or reconfigured to accommodate additional material separation needs over time. These modular designs are constructed of precast concrete to provide stable, secure structures. Not all raised designs need to start off as full concrete structures, as shown in Figure 31. Smaller municipalities may begin with a dirt structure that is reinforced using concrete blocks or other means. (Figure 28)

Figure 28: Earthworks raised sawtooth depot at Franklin (Dwight)

Figure 29: Concrete block raised bin drop off Southgate Township

Figure 30: Raised drop off at Franklin depot (Dwight)

As the depot grows and becomes more established, the municipality may transition gradually to a more permanent concrete structure as shown in Figure 2 above or precast modules Figure 31 below.

Figure 31: 4 bin moveable precast modular depot design

Variations of the modular design are available, including a design featuring inside storage, (Figure 32) which could be used for containment of MHSW or storage of equipment. Discussion with the

manufacturer of this system (Modulo Béton Canada Ltd.) indicates this design is more cost effective with respect to fabrication, shipping and installation for four bins or more.

Figure 32: Precast modular depot design (6 x 40 yd. bins) with built-in MSHW storage

Another design is a conventional poured-in-place concrete sawtooth. Figure 33 shows a sawtooth design that uses 40 yd^3 bins. A major benefit of a sawtooth design is that the bins are top loaded and the grade separation keeps small vehicle traffic separated from large vehicle traffic. Bins can be safely removed when they are full with minimal interaction with users.

Figure 33: Concrete sawtooth design keeps heavy equipment separated

A minimum of five full size bins is likely necessary to justify the cost of the more expensive sawtooth design, which requires engineering fees, mobilization and demobilization of equipment for construction, earth works, concrete and sturdy guard rails. The costs associated with additional bin

walls from a design and construction perspective becomes incremental when more than six bins are planned.

The sawtooth design also enables waste materials to be dropped from above until the bin is full. All top loading bin designs require guard rails. Figure 2 above, shows that the bin sides in this design double as guard rails; however, this requires users to lift material over the wall above waist height potentially increasing strain injuries. A discussion of guardrails is provided in Section 2.6.5.

A disadvantage of concrete sawtooth design is that it can accommodate only a fixed number of bins. It is not as flexible as other design options if new materials need to be added to the program or tonnage increases. Additional materials essentially equates to another sawtooth construction project. The major disadvantage of this design is the cost which can exceed $8,000 per bin space.

The **Depot Costing Model** calculates cost estimates for selected sawtooth sizes.

2.6.5 Guardrails

All top loading designs (ramps, modular structures and sawtooth structures) also require guardrails for public safety. Figures 34 and 35 show two swing gate options with a lower trip guard. At locations where material can easily be thrown over a guardrail, the guardrail should be fully reinforced (as in Figure 34). Heavy gauge galvanized steel guardrails should be installed for any drop off situation where customers may be at risk of falling into an empty bin or onto waste materials. Barriers will be used for leverage so design accordingly for strength, user abuse and slow speed vehicle contact.

Figure 34: Guardrail with swing arm

Figure 35: Guardrail with double swing gate

2.6.6 Enclosed Structures

Increasingly, municipalities are responding to the implementation of extended producer responsibility (EPR) programs and public demand for more services by introducing additional diversion programs at the depots. These services typically are housed in enclosed structures to provide protection from the elements. Services include:

- Reuse Centres
- Municipal Household Special Waste (MHSW) collection and/or exchange
- Waste Electric and Electronic Equipment (WEEE) collection

Each is explored below.

2.6.7 Reuse Centres

Reuse centres are now seen more frequently in many municipal depots, providing an opportunity for donation of gently used goods that can be taken away and reused by other depot visitors avoiding the need to recycle or landfill the items. The reuse centres typically accept household items, such as books, games, small furniture, sporting goods, toys, housewares, construction materials, etc. Reuse centres typically do not accept hazardous or electronic goods, textiles, or bulky items.

Many reuse facilities are unattended, relying on the good faith of users to only bring items in good condition. Users are encouraged to donate gently used items and take any item for free.

Many small municipalities operate the reuse centre out of a simple enclosed structure, such as a sea container, shed or trailer, incurring minimal cost to the municipality. Some reuse centres are more elaborate/costly to construct, as in the case of Wellington County, which operates three reuse centres from small, neat and clean structures (Figure 37).

Figure 36: Small reuse building at Franklin depot (Dwight)

Figure 37: Small reuse centre building (Wellington County)

The only necessary design feature of the reuse structure is that it must be covered to protect reusable items from the elements. To gather lessons learned, readers are encouraged to contact Wellington County, Rama First Nation, who operate a very small unmanned Reuse Hut, as well as McNab-Braeside, Clarence-Rockland or Horton Township operating a Reuse Centre from a trailer.

Reuse Centres do not divert significant tonnage from landfill, their primary focus is the recovery and/or reuse of materials, the avoidance of hauling/tipping fees and creation of municipal goodwill.

Many larger municipalities partner with non-profit agencies to operate their reuse facilities as a means to reduce associated staffing costs. Municipalities interested in reuse programs are encouraged to further investigate which non-profits (i.e., Goodwill, Habitat for Humanity) are available and interested in this opportunity.

2.6.8 Municipal Household Special Waste (MHSW)

In larger municipalities, Municipal Hazardous or Special Waste (MHSW) collection service is commonly provided to residents through a permanent drop-off depot. MHSW drop-off is typically offered at no cost to residents, as an incentive to discourage hording toxic substances in homes (fire hazards), disposal in landfill, or discharge into sewer of hazardous materials.

The Ministry of the Environment and Climate Change (MOECC) has mandated that MHSW be managed using some form of containment system. Municipalities use a wide range of enclosed structures for temporary storage of MHSW; for example, the City of Thunder Bay and West Gwillimbury use sea containers (Figure 38), Guelph and Huron County have enclosed buildings (Figure 39) allowing the municipality to operate the MHSW depot all year long.

Figure 38: Thunder Bay's MHSW container

Figure 39: Huron County permanent MHSW depot

Other municipalities, reduce operational costs by providing seasonal MHSW services using semi-permanent structures, for example, the Town of Renfrew has a building with a roof but semi-open side walls, providing seasonal MHSW service (Figure 40).

Costing for purchase and operation of a typical permanent MHSW building is included in the **Depot Costing Model**. Smaller and less expensive containers, like the one shown above, are also available from various manufacturers.

Figure 40: Covered MHSW material storage (Renfrew)

Some MHSW depots are licensed to receive from Small Quantity Generators (SQG) that meet the specified criteria outlined by the MOE. SQG's are characterized as small commercial or institutional establishments that generate less than 100 kg of MHSW in a month.

Most small municipalities, however, cannot afford to construct and operate permanent or seasonal MHSW depots and rely on partnering with other municipalities (see Section 1.5) or offering annual or semi-annual special events, often hosted at the depot or a large retailer's parking lot.

Increasingly, municipalities are allowing depot users to exchange reusable paints and other products free of charge. The City of Guelph has a separate covered area adjacent to the MHSW depot the enables the public to donate good quality reusable household special waste, including:

- Paint/Stains
- Aerosols
- Car care products (waxes, soaps, etc.)

- New motor oil
- New antifreeze
- Cleaning products
- Grout, drywall compound, cement

The paint and product exchange reduces these materials from being landfilled but does not reduce the operating cost of the depot. Some municipalities ask for a nominal fee or donation for reuse items.

2.6.9 Other Uses

Depending on the size of the site and availability of space, depots can also be used to store various supplies, including recycle bins, green bins, backyard composters and rain barrels. Other items such as bag tags and finished compost can also be stored and sold on-site.

By increasing the number of services available at a depot, the frequency of visitors attending the site also increases and it may extend the distances users will travel. Additionally, by providing a one-stop-shop for all waste needs, including promotional and educational materials, residents are more likely to be aware of the depot and make use of the services which can increase overall knowledge of waste programs and subsequently improve diversion rates.

2.7 Designing for Transfer of Materials Off-Site

A primary function of any depot is to effectively transfer materials after collection. This function is largely governed by local factors including, but are not limited to:

- The distance the material must travel from the site for processing
- The handling, transport specifications of materials and restrictions by receiving markets (e.g. compaction limits for Blue Box recyclables)
- The time it takes to accumulate sufficient tonnage to fill bins, bunkers or laydown areas or, conversely, size constraints to those same areas that may dictate more rapid movement of material off site

Large municipalities may use permanent transfer stations to bulk and transport recyclable and waste materials. These facilities are meant to receive curbside, commercial loads locally and bulk them for long-distance transfer in quantities usually in the range of 27-33 tonnes per tractor trailer haul. Higher tonnages are necessary to justify design and construction of a permanent transfer station, partly because sizing the receiving area/tip floor is not driven by the quantity of materials but rather the length of the transfer trailers as well as the need for wide, tall overhead doors to allow delivery trucks to back into the building. This drives up the overall cost/tonne to operate these facilities.

Smaller municipalities (< 500 tonnes/year of recyclable materials), would not normally have a separate permanent transfer facility as shown above. Since this Guidebook focuses on municipalities that generate less than 500 tonnes per year of recyclable materials, the discussion in this section is based on alternatives to conventional transfer station design.

The optimum size of the depot collection/bulking bin is dictated by the projected volume of material expected to be managed and the length of time that material should reasonably be on site (or as specified in the Environmental Compliance Approval). Materials that are covered and kept dry can be stored longer (recyclable newspaper and cardboard can start to degrade if exposed to the elements or allowed to sit for a long periods of time (three to six months or less depending on moisture levels). Some materials have a very limited storage time such as organics that will begin to degrade within days or receipt.

Certain materials can be taken off site using smaller 5, 6 or 8 yd^3 bins that are serviced by a front end load truck. (Figure 41) These trucks have onboard compaction capability and higher operating costs and are typically used for local movement of waste, however, in some cases using these trucks to deliver to end markets can be cost effective.

Figure 41: Front end load bins (5 $yd.^3$)

Larger open top roll off bins,10 - 50 yd^3, can be used for larger volumes of material and/or lower volume materials that can be stored for a longer period of time (e.g. C&D materials). Roll-off trucks are used to move these bins without compaction and are typically used for local movements as some form of compaction is usually more cost effective for long hauls.

Figure 42: Open top roll off bins (5 - 40 $yd.^3$)

For sites with limited shipping services (e.g. water access only sites) or sites shipping in excess of 40 yd^3 per week of material, compaction systems can often be very cost effective. Compaction systems can more than double the weight of a typical 40 yd^3 bin yielding significantly fewer transport trips and lower overall costs. A number of smaller municipalities have employed compactor units for waste (Bonnechere Valley Twp., see Figure 43) as well as recyclables (Muskoka District uses compactors for Blue Box containers and fibres at some depots, see Figure 44).

Figure 43: Waste compactor at Bonnechere Twp. depot

Figure 44: Recycling compactors at Franklin Valley depot (District of Muskoka)

The **Depot Costing Model** can help compare bin sizes and compaction ratios for the total tonnage to help estimate transfer costs expected at the depot.

Some companies have designed solar powered compacting units for sites without access to electricity. (Figure 45)

Some materials can be delivered to market without compacting, like shingles, fill or concrete where loose but heavy payloads can be achieved for long-distance transfer. For these types of materials, volumes and market distance dictate the type of truck used to transfer (e.g. trailer, 40 yd^3 bin or roll-off train).

Figure 45: Solar powered compactor unit

Innovation in Compaction

NexGen Municipal has started developing an alternative method of compaction and transfer using the Komar rotary compaction auger. This technology, while still being tested at the time this Guidebook was developed, eliminates the need for any grade separation and allows users to load materials from ground level using a simple, heavy duty chain conveyor. The Komar system permits the use of a low cost fibre shell cover for protection against weather, vectors, theft, and vandalism. More information on Komar can be obtained at www.nexgenmunicipal.com.

Figure 46: Komar compactor 3 bin system

Some small municipalities hire grinder services to process designated materials to be landfilled or sent for recycling. Grinders can be used to reduce the volume of wood, brush, leaf and yard waste. In the case of Bonnechere Valley Township, a large grinder is hired annually to grind mattresses and bulky furniture (with minimal metal) in order to reduce volume of waste landfilled and reduce valuable air space in the landfill. The grinder is also used to grind construction and demolition waste that will be landfilled. Staff estimated that grinding reduces the C&D pile by half and significantly reduced the volume of the mattresses and furniture waste. (Figure 47)

In another case, the Township of Horton, collects large plastic items in a bunker and grind it prior to transporting to an end market for recycling. Figure 48 shows the durable plastics ready for grinding.

Figure 47: Grinding C&D waste at Bonnechere Valley Twp. landfill

Figure 48: Durable plastics ready for grinding at Horton Twp. depot

In cases where the material must be transported, grinding can reduce the size of the load and costs of transportation. The cost-benefit of grinding depends on the distance to processors for these materials.

To optimize depot operations and minimize costs, municipalities should try to move bins off site only when full and on an on-call basis, noting that some materials, e.g. paper and paper products, may need to be moved more frequently to maintain product integrity and the highest market value.

Generally, the further the material needs to be transported, the heavier the payload should be in order to be most cost-effective. This general principle applies to all waste streams.

Many options are available for moving materials over longer distances, including a train configuration where two bins are hauled at the same time. This can done for both loose (Figure 49) and compacted loads. (Figure 50)

Figure 49: Open top 40 yd.^{3} roll off train

Figure 50: Compactor bin roll off train

2.8 Waste Diversion Policies and By-laws

Municipalities can use waste diversion policies and bylaws to encourage higher participation in waste diversion programs and demonstrate community commitment to environmental sustainability. Some key policies and by-law initiatives being introduced by smaller municipalities include:

1. Bag limits
2. Pay-as-you-Throw (PAYT) or User Pay programs
3. Clear bag programs
4. Mandatory recycling
5. Landfill bans
6. Differential tipping fees

2.8.1 Bag Limits

A community may choose to limit the number of waste bags collected at curbside on a weekly basis, as a way to increase participation in a recycling and other waste diversion programs. Bag limits help to make the householder more conscious of the amount and type of waste they generate weekly and encourage them to become more personally responsible for their generation of waste. Communities that require the public to self haul their waste and recyclables to a depot may use this approach to eliminate or limit outside waste from being set out with local community waste.

Smaller communities with bag limits include:

- Township of Lanark Highlands (pop. 5,100) – 2 bag limit per week (curb) with additional bags taken to the depot
- Mississaugas of the New Credit First Nations (pop. 700) – 4 bag limit (no PAYT)
- Rideau Lakes Township (pop. 10,200) – 2 bag/limit per week with each bag requiring a tag

Bag limits can be introduced as a step towards a Pay-As-You-Throw (PAYT) program because they enable residents to make a gradual transition from having no limits on waste set out to eventually paying a fee for some, then all, bags set out. Typically, however, most municipalities combine bag limits with PAYT, discussed below.

In 2014, WDO reported that 85 reporting programs (36%) have implemented bag limits. The average 2014 bag limit was 3.4 bags per collection day.[6]

[6] Source: 2014 Blue Box Tonnage Highlights (Residential), Dec 2015, WDO at http://www.wdo.ca/Partners/municipalities/municipal-datacall

2.8.2 Pay-As-You-Throw (PAYT) or User Pay

PAYT or User Pay programs require that residents pay on a volume basis for the disposal of their waste, which may employ a tag or authorized bag system. There are two approaches to PAYT: partial and full.

Partial PAYT programs permit the resident to set out a designated number of bags/cans of waste before requiring purchase of a tag for the remaining or additional bags. Full PAYT programs require that every bag/can of waste requires a tag. Typically a tag/bag can cost between $1.00 and $3.00 each.

PAYT programs are considered one of the most effective policies for promoting recycling and waste diversion. PAYT programs have a positive impact on residential waste generation and diversion behaviours because they place a direct financial cost on waste generation that is directly within the resident's control.

Smaller communities with PAYT programs include:

- Horton Township (pop. 2,500) – partial PAYT - 2 bag limit/week with additional bags @ $2/tag
- Chippewas of Georgina Island First Nation (pop. 300) – Partial PAYT - 2 bag limit/week with additional bags @ $1/tag
- North Frontenac Township (pop. 1,900) – Full PAYT – each bag requires a $2/tag
- Bonnechere Valley Township (pop.4,000) – Full PAYT – each bag requires a $1.50 tag

Small municipalities lacking scales at their depots can use PAYT to help pay for waste by requiring tags on every bag and setting the price of the tags to achieve full or partial cost of disposal and recycling. Communities, such as the Township of Madawaska Valley and Township of Killaloe, Hagarty and Richards apply a fee for all waste delivered to their landfills under a full PAYT system. As a rule of thumb, municipalities charge between $1.00 - $3.00 per bag as a fee. It is important, however, for municipalities do their own research on the true costs to provide waste management services and understand what is included in the tax base and how much is offset by PAYT.

In 2014, WDO reported that a total of 116 programs had implemented some type of PAYT program for residential waste. The average 2014 tag fee was $1.82 per bag (this does not imply full cost coverage and does not consider waste management fees covered in residential taxes).[7]

2.8.3 Clear Bags Programs

Clear bag programs are growing in acceptance among smaller Ontario municipalities. With a clear bag program, all waste must be placed in clear, transparent or translucent bags for disposal or collection or it will not be accepted/collected. For privacy issues, most communities allow residents to use one smaller opaque bag (e.g. grocery bag) placed in the clear bag for personal waste.

[7] Source: 2014 Blue Box Tonnage Highlights (Residential), Dec 2015, WDO at http://www.wdo.ca/Partners/municipalities/municipal-datacall

The benefit associated with clear bags for waste is that depot operators can easily see if the bag contains visible recyclable material and reject it before tipping into a bin. Depot users have the choice of removing the recyclables on-site or taking the waste home and sorting it off-site.

Smaller communities with clear bag programs include:

- North Frontenac Twp. (pop. 1,900)
- Twp. of Madawaska Valley (pop. 4,300)
- Twp. of Killaloe, Hagarty (pop. 2,400)
- Twp. of Amaranth (pop. 4,000)
- Twp. of Central Frontenac (pop. 4,600)
- Curve Lake First Nations (pop. 1,000)

Most of the clear bag programs in Ontario are supported by a mandatory recycling by-law (see below). Together they make an effective waste diversion tool which is supported by research showing increases in Blue Box diversion. The province of Nova Scotia reported an increase in Blue Box recycling of 35% after two years of clear bag program implementation in over 21 communities. In 2014, Nova Scotia Environment reported that 42 of 54 municipalities in the province had adopted a clear bag policy.

The community of Madoc and Centre Hastings, in Ontario, observed a 12% increase in Blue Box diversion during a 6 month period after introducing clear bags. In preparation for adopting a clear bag policy, Kawartha Lakes reported on its website that "All participating municipalities have reported an increase in the amount of recyclable material diverted from the curbside waste into curbside recycling where programs are in place. The amount of incremental diversion will depend upon the maturity and effectiveness of existing programs as well has how comprehensive they are. Experience has illustrated that overall diversion rates could increase by over 10% above current rates".[8] For municipalities interested in learning more about adopting a clear bag program, CIF has published a step by step guide available on the CIF website as project 748, the Clear Bag Garbage Program Implementation Toolkit: http://cif.wdo.ca/projects/documents/748-Clear-Bag-Toolkit.pdf

2.8.4 Mandatory Recycling Bylaws

Mandatory recycling stipulates that residents must source separate specified recyclable materials from the waste stream or prohibits them from discarding specified materials in the garbage.

Smaller communities with Mandatory Recycling by-laws include:

- Municipality of Central Manitoulin (pop. 2,000)
- Algonquin Highlands Township (pop. 2,100)
- Perry Township (pop. 2,300)
- Township of Madawaska Valley (pop. 4,300)
- Wahnapitae First Nations (pop. 200)

In order to make recycling a mandatory requirement, a community must first establish a waste management by-law that deals with the basic waste and recycling responsibilities of residents and other establishments receiving waste management services.

[8] Source: City of Kawartha Lakes at https://www.city.kawarthalakes.on.ca/residents/solid-waste-services/clear-garbage-bags-program

As part of a mandatory recycling requirement, the municipality must be prepared to communicate the requirement to all residents and enforce it. Enforcement can be as simple as relying on the depot operator to shake the waste bags and reject any containing recyclables. Depot staff can usually detect glass, steel cans, cardboard and stacks of paper by picking up the bag and shaking it.

2.8.5 Landfill Bans

Landfill bans target materials that can be effectively diverted from the waste. Materials for which extended producer responsibility (EPR) programs exist (such as for tires, waste electronics and Blue Box recyclables) are examples of materials that municipalities have started to ban from landfill. Other materials that offer a good source of revenue, such as cardboard, metals (steel and aluminum), may also be banned as well as materials that pose environmental, odour and health concerns, such as appliances containing Freon, hazardous wastes and propane cylinders, grass clippings, etc.

What if We Want to Implement a Cardboard Ban?

A cardboard ban should be supported through a municipal by-law prohibiting its disposal (along with any other designated materials). Loads of waste are inspected at the landfill for the prohibited material either before or during unloading, depending on the vehicle type. Loads that are found to exceed some pre-determined level (e.g. 5%) are then subjected to a surcharge. The surcharge should be large enough to discourage a repeat occurrence. Cardboard is a perfect target for a disposal ban because markets are long established and there is typically revenue from sale of the commodity.

Banned material can be further supported through differential tipping fees (see below), whereby loads exceeding a pre-determined level are penalized by the adding a surcharge. The surcharge must be high enough to encourage further diversion but not so high as to encourage illegal dumping. For example, the Regional District of Nanaimo (RDN) in British Columbia, has imposed disposal bans on 12 materials including cardboard, organics, wood waste, Blue Box materials etc. Loads entering the landfill that contain >5% to 10% of banned materials are charged double the normal tipping fee.

2.8.6 Differential Tipping Fees

Most municipalities that offer diversion programs have structured their tipping fee schedule to encourage diversion. That is, recyclables and other divertible materials are often accepted either free of charge or at a reduced rate (e.g. half the waste rate). The County of Simcoe has structured their tipping fees to further discourage residents from disposing of recyclable materials by charging a fee for loads containing divertible materials mixed with waste (mixed loads) that is more than twice the rate for waste.

While some materials can be accepted free of charge, the costs and revenues associated with hauling and processing these materials should be factored into the pricing decision. While stable markets exist for many recyclables (e.g. newsprint, cardboard, metal), which in turn can generate revenue for depot operators, other materials like C&D wastes, can often result in additional costs for hauling and processing. In this case, tipping fees should be determined on an individual material basis reflect the actual costs associated with managing the material.

The sidebar shows differential tipping fees imposed at depots (with weigh scales) within the District of Muskoka. Depots without scales would require judgment by the attendant to charge a differential fee by the bag or by the load.

District of Muskoka Depots with Weigh Scales	
3 standard size bags or less	no charge
4 or more standard size bags	$127.00/Tonne
Blue Box Recyclables	no charge
Compostable Waste	no charge
Residential Leaf and Yard Waste	no charge
Chipable wood/brush > 300 mm (12 in) in diameter	$ 64.00/Tonne
Freon appliances (not tagged)	$ 23.00 each
Clean wood	$ 64.00/Tonne
Unclean wood	$127.00/Tonne
Scrap Metal	no charge

2.9 Promotion and Education

Promotion and education (P&E) programs are used by many municipalities to increase awareness of and participation in diversion programs at depots and to improve quality of salable recyclables. As a best practice, it is recommended that municipalities set aside funds in their annual operating budgets to promote these facilities and activities. P&E programs should include outreach activities, which involved direct engagement of users through one-on-one interactions, commitment strategies and reward programs (see sidebar).

Any new initiative (e.g. adding a new material for diversion) introduced at the depot should be supported by a P&E program to ensure the community is fully aware of the program and how they can participate. Program changes that are not well communicated to users can result in user frustration, complaints to staff or councilors and poor participation.

North Frontenac Township Rewards Recycling

When residents bring a full bag or container of recyclables to the North Frontenac Twp. depot, they are rewarded with a free bag tag for their garbage (as part of the PAYT program). The reward initiative is administered at the Waste Site Attendant's discretion to ensure that the volume of recyclables generally equates to the volume of a bag of garbage.

A well executed P&E program will take into consideration the target audience, message content, media, scheduling/frequency of communications and monitoring of results before and after.

2013 WDO P&E Cost Analysis

Analysis performed on P&E blue box costs showed smaller municipalities with fewer than 6,000 households spent on average $1.20 per household on P&E. Municipalities with fewer than 3,000 households spent an average of $1.00 per household on P&E.

A recommended best practice requires a minimum $1.00 per household annual advertising budget to promote recycling programs.

The CIF has resources and materials available online to assist municipalities with P&E planning and implementation at the following link: http://cif.wdo.ca/resources/education.html

Any number of P&E approaches can be used, including radio advertisements, information slips with tax bills, newspaper ads and other forms of social media such as Facebook, Twitter and municipal websites. (Wellington County has a well used Recyclopedia on their web site whose visitors viewed over 20,600 pages in 2015; http://recyclopedia.net/?content=guide&siteid=163)

Although increased P&E is necessary to support any new program or policy (e.g. introducing a mandatory recycling by-law at a depot), it should also be planned as a regularly scheduled activity to encourage continued use, reduce illegal dumping and decrease contamination levels in diversion programs. Residents need to be reminded about recycling, and how to recycle correctly, on a regular basis.

While it is important to post information about depot operations at the front gate or scale house, (e.g. user fees for each type of material, what materials are accepted or not accepted, hours of operation), often municipalities use their websites to communicate additional information such as special handling requirements, seasonal scheduling changes, proposed or recent program changes, etc. Canadians are some of the most savvy users of the internet in the world and many rely on websites to keep up-to-date on information. Ensuring that the municipal website has relevant and up-to-date information about depot and diversion programs is becoming an increasingly important service that municipalities need to provide to their citizens.

Outreach strategies may include presentations at local schools and at community group meetings, which provide a popular low cost method of engaging future depot users about community recycling and diversion programs offered at the depot.

Depot attendants also provide one of the most effective P&E tools as they have direct access to the users and can provide one-on-one interaction. Trained, polite, knowledgeable staff act as key P&E ambassadors in helping users understand the various

The District of Muskoka uses a variety of P&E and outreach approaches to educate permanent and seasonal residents on the recycling program including:

- District of Muskoka's website (www.muskoka.on.ca)
- Outreach to primary, and secondary schools
- Outreach to local cottage associations, community groups, and churches
- Social media such as Twitter and Facebook
- Promotion and Education material such as brochures, posters and magnets
- Waste management guides specific to each lower tier municipality
- Articles and advertising in the media
- Information notices on local radio stations
- Seasonal newsletters

diversion programs offered at the depot and how to participate in the programs. Staff should have access to brochures and information to pass on to residents and during high season use, small municipalities should consider hiring additional support staff to help permanent and seasonal residents sort recyclables, answer questions and encourage involvement in other waste diversion activities. Some municipalities develop cottage kits, if they have large seasonal populations.

The Cottage Kit…

In Algonquin Highlands, cottage renters frequently lose/take home permanent resident landfill access cards. The Cottage Kit solves the issue well. A simple bag containing maps to depots, temporary pass, clear recycling bags, paper bag for fibre, clear bag for garbage, pamphlets from MNR Bear Wise, MHSW info. etc. is sold for $3 each or 10 for $25 at administrative offices and depots.

This approach is considered a best practice by several local municipalities.

Surveys are another simple and cost-effective tool that can be used to gain information about problem materials or community desires and used as part of the P&E program. In smaller communities, surveys are typically provided as a hard copy, either at municipal facilities or in the local newspaper. Surveys can also be accessible online, through the municipality's website. These can be effectively used to gather feedback on depot operations, including preferred operating hours, response to proposed closed days, changes in operating hours, and changes in programming (e.g. adding a new material, adding a reuse program). This will help gauge the likelihood of participation or negative reaction before a program is implemented in the community.

Typically, the more P&E initiatives undertaken to support depot programs and operations, the better the depot will operate. Enhanced P&E initiatives have been shown to have positive impacts on diversion, to significantly reduce contamination rates and to reduce litter/illegal dumping (see Appendix D).

2.10 Other Site Design Considerations

Designing a depot to be accessible, functional, and operationally safe are all fundamental components of a well-run facility. Aside from material segregation and drop off areas, many other site components need to be accounted for in the design, including:

- Safe, wide, site access and exit
- Parking areas for staff and visitors
- Driving surfaces and traffic flow indicators
- Flexibility for site expansion
- Landscaping requirements
- Equipment storage and maintenance
- Non-waste material storage (i.e., snow, salt, sand, Blue Boxes, composters, rain barrels etc.)

Best practices and costs are noted in the **Depot Costing Model**.

2.11 Site Access, Unloading and Exit

Site entrance and exit areas should allow for two-way vehicle traffic so that vehicles can enter and exit the site without interference. Entrances should also be large enough to accommodate larger vehicles such as trucks with trailers. In the case where transfer vehicles share an access with residential vehicles, design adequate turning radius required for transfer vehicles (see Section 2.4) and an appropriate road width.

During peak times, depots can often experience significant vehicle lineups waiting to use the site. It is important to take into consideration the design of vehicle queues so as not to interfere with general operation of the site and to place appropriate signage along the queue line to inform visitors of anticipated wait times. It is important to note that for the health and safety of visitors and employees, limiting access to the site to a safe number of vehicles at any one time is vital. Queue length can be determined by considering historical and anticipated vehicle traffic during peak times. Monitor wait time for vehicles to determine anticipated wait times at certain points along the queue and erect appropriate signage (if necessary).

Determining the minimum number of unloading areas to effectively and safely meet typical vehicle demand is also a key consideration. The sidebar illustrates how to determine minimum unloading area needs.

Determining unloading area needs

- ✓ Determine average unloading time (e.g. 6 minutes per vehicle).
- ✓ Determine Peak Cars per Hour (e.g. 30 vehicles per hour).
- ✓ Unloading Areas Needed = 60 minutes per hour / 6 minutes to unload = 10 vehicles per unload position per hour.
- ✓ 30 vehicles / 10 unload positions = 3 add +1 extra position for contingency = 3 + 1 = 4 unloading areas.

The minimum unloading areas required at the depot is 4.

2.12 Parking Areas for Staff and Visitors

Depending on the services provided at the depot, parking areas may be required for certain programs, such as Reuse Centre, MHSW operations and Blue Box pick up. To improve overall site safety, it is recommended that visitor parking areas be located at a distance from drop off areas and vehicle traffic. It is also considered a best practice to have separate designated parking areas for staff vehicles, operating equipment and visitor vehicles, to minimize the opportunity for accidents to occur.

2.13 Driving Surfaces

When designing a depot, consideration needs to be given to whether the roadways will be paved or kept as gravel or dirt. Paved roadways limit nuisances, especially with respect to dust, both on-site and off-site (e.g. limiting dust blown to towards neighbouring houses or farm fields). Paving will reduce the effect of visiting vehicles becoming dusty and muddy as well. Paved sites offer superior snow management, drainage, cleanliness, user acceptance and can be painted to assist in directing traffic.

Paving, however, can be costly depending on site size and paving requirements and paving requires regular maintenance. Paving eliminates the need for compacting, regrading or periodic re-graveling as in the case of dirt or gravel roadways. The entire site need not be paved and many small depots are adequately served with pavement only in the residential user areas.

The cost-benefit of paving and pay-back can be determined using the **Depot Costing Model**.

2.14 Road Markings and Signs

Prior to installing permanent road markings, curbs or traffic controls, a traffic flow study should be conducted to obtain accurate data on how traffic moves through the site, focusing on intersection points, obstacles, blind spots, etc. Highway safety cones or temporary barriers can be used during the first few months of operation to support testing of different traffic flows and reconfiguring the traffic patterns to obtain the best overall traffic management plan for the site. Cones and temporary barriers are an inexpensive and effective tool to enhance traffic flow and safety management and should be used on all sites as required.

Figure 51: Temporary traffic control

2.15 Landscaping Requirements

Depots that are well maintained and incorporate green space into their design can attract more visitors to the site (Figure 52). Throughout the warmer months, green space should be maintained either by site staff or through a contracted service in order to manage any blowing litter and maintain gardens and general landscaping. Grassed areas should be kept to a minimum in favour of low maintenance, native and drought resistant vegetation. This approach reduces grass cutting and associated equipment mobilization, use and maintenance and minimizes costs.

Figure 52: Well maintained landscape

A depot that is well maintained and aesthetically appealing can help to instill a sense of community pride in the depot and discourage visitors from littering or not participating properly in site activities.

Additional landscape considerations such as the use of berms to visually separate the site from adjacent properties or roadways should be investigated as part of any initial site selection and design process.

2.16 Equipment Storage and Maintenance

Depot operations may need to have appropriate storage areas for mobile equipment (e.g. loader and/or skidsteer, landscaping equipment), which may include a gated area, building or a three-sided covered structure to protect equipment from the elements. Equipment should be stored in a locked, gated area to reduce theft or vandalism whenever possible. The equipment storage area should allocate sufficient room to enable maintenance to occur and not interfere with public access areas.

2.17 Non-Waste Material Storage

Other storage requirements may include space for spare bins such as 20 yd^3 , 40 yd^3 or compactor empty bins that get switched for the full bins when they are being taken off the site to be emptied. This allows a continuous service to residents and avoids double handling of materials by staff if there are no spare bins.

Space for Blue Box or other container inventory, rain barrels or composters is commonly needed at many depots. Some municipalities also give away or sell finished compost to residents, from leaf and yard waste composting operations, requiring space for windrows or piles.

Consider any synergies that might exist for a municipality with respect to other municipal services; for example, storing seasonal materials like salt, sand or possibly even snow in what will be a secured area. Multi-purposing the site may reduce costs for a municipality. This would be especially true if a new site were being designed. Depots naturally lend themselves well to these operations as site design usually requires the accommodation of larger waste hauling vehicles. If a depot is to be used for additional material storage, it is recommended that these areas be established away from public access.

Section 3 - Depot Operations

3.1 Hours of Operation

Depot operating hours must be flexible enough to ensure user convenience and participation and comply with the depot CEC. To accommodate working residents, many municipalities structure operating hours to include evenings and weekends, especially municipalities located in cottage country and/or those that do not provide curbside service which requires all materials to be self hauled to the depot/landfill.

Figure 53: London seasonal hours depot sign

Peak times for traffic typically fall on weekday evenings and weekends. It is considered a best practice to operate the depot at least one day on the weekend. Keeping a depot open on select weekday evenings and weekend's helps to accommodate:

- People who work weekdays
- Seasonal residents, vacationers, cottagers, renters who are more likely to visit these areas when they are at their seasonal residence on weekends
- Small commercial generators who may need to use the depot after business hours

Businesses and haulers responsible for collecting material, conducting business, or other operating requirements will likely require access to the site during traditional business hours.

Some municipalities also close their depots on low traffic days and/or reduce the number of days in lower use seasons (e.g. winter) to realize cost efficiencies. Closed days can be used to maintain the site, move materials and bins and load materials.

3.2 Staffing Requirements

Sufficient staff resources will be necessary to operate a depot. As a best practice, staffing should reflect the extent of depot use. Many municipalities have a number of staff on site to both assist visitors and ensure smooth operations. For example, the County of Simcoe has one or two staff, depending on the season, dedicated to monitoring diversion areas and assisting residents. This approach has been very successful in reducing contamination of

Staffing Reduces Contamination

Waste composition studies recently completed at a number of depots located in northern Ontario reveal that staffed sites can reduce contamination of blue box materials by 8%. The waste studies were conducted on 20 yd^3 and 40 yd^3 bins used to collect blue box materials.

materials and reducing the amount of waste being sent for disposal, which has translated to lower overall operating costs for the County.

Extra Staffing Increases Recycling Rates

A pilot conducted in the Township of Stirling Rowdon tested the benefits of having an additional depot attendant on hand to help with depot operations. The Township hired an additional attendant over an eight month period and experienced the following benefits:

- Increased time to monitor activities at the recycling depot resulted in an 8% increase in the amount of recyclables collected compared with the previous year
- The depot appeared to be better organized, especially in the case of the reuse area which had become unmanageable due to the lack of time available to maintain the area with only one attendant on site
- The extra attendant was able to devote more time to helping people with recycling, including teaching users how to properly sort their recyclables. In contrast, the former depot attendant could not always assist people with recycling because a significant amount of time was consumed with other duties

Further discussion of the pilot is provided in Appendix D.

Staff needs will vary depending on the size of the site, type and quantity of material being managed. If a scale house/kiosk is used on a smaller site then one trained staff may be sufficient to manage operations, especially if all material transfer is contracted out. It should be noted, however, that Ontario depot sites receiving household hazardous waste (MHSW) must have at least one staff dedicated to handling and managing the MHSW received from the public.

The number of staff on site is also dictated by traffic volumes. As traffic volumes increase, more staff are needed to help oversee traffic movement and queuing, ensure safe and orderly use of the site and ensure diversion activities are carried out properly. Combinations of full, part time, student and volunteer staff along with carefully managed operating hours can be used to minimize staff costs.

Figure 54: Staff monitoring traffic

Improperly staffed depots can result in high congestion and wait times for customers and mounting frustration. During peak usage, additional staff may be brought on to ensure safe and effective operation of the site and to help move traffic. If long wait times cannot be avoided then the additional staff can help reduce frustration by

speaking with drivers, processing waiting customers, answering questions and taking the time to promote waste diversion programs. (See Figure 54)

Some depots with relatively simple operations that accept limited materials such as recyclables only, operate without an attendant, however, the risk of illegal dumping, contamination and site vandalism increases. Staff provide key services such as collecting tipping fees for materials received and managing traffic. If theft or illegal dumping is an issue, consider installing monitoring equipment such as cameras, traffic counting and recording software.

The number of staff required, will be determined on a site-by-site basis and should be compared against the cost for managing illegally dumped materials and/or contamination in recyclables. Annual budgets should take into consideration the optimal number of staff required for effective and efficient operation of the depot and to enable resources to be allocated for ongoing staff training, human resources management, supervision and safety.

Staff costs can be assessed for various scenarios using the **Depot Costing Model**.

3.3 Staff Training

Site staff training should include, but is not limited to:

- Environmental Compliance Approval
- Emergency response
- Fire prevention, detection and response
- Proper use of portable or fixed fire extinguishers
- General first aid
- Use of personal protective equipment (PPE)
- Hazardous waste operations (if applicable)
- Identification of personnel responsible for safety and health at the facility
- Identification of hazards (including local wildlife and weather conditions)
- Work practices to minimize risk, Standard Operating Procedures (SOP)
- Electrical hazard awareness
- Proper use of powered industrial trucks and loaders
- WHMIS training
- Hazard/emergency communication
- Dealing with the public and P&E
- Spotting procedures and activities

Records of staff training should be maintained and checked regularly to ensure training requirements are met and up to date. In Ontario, depot owners and operators should consult the Occupational Health and Safety Act (OHSA) to ensure they meet the training requirements set forth in this regulation.

3.4 Waste Acceptance and Screening

During the operation of the depot, all inbound vehicles should be screened prior to entering the site to identify opportunities to encourage recycling and other waste diversion activities. Screening incoming wastes, by polite, trained staff, not only helps reduce contamination rates, but can also provide an opportunity to educate users on how to segregate materials properly and promote waste diversion.

Sites experiencing periods of high peak traffic may need to randomly screen vehicles to reduce their wait times to access the site. If municipalities cannot screen every vehicle (considered a best practice) then they should establish random screening methods or select vehicles for screening checks based on if the attendant can see unacceptable materials or mixed loads.

Signs (see Section 2.4) should be posted near the site entrance and/or scale house/kiosk to communicate which materials are accepted and which are prohibited. Prohibited wastes may be determined, to some extent, on a case-by-case basis but will ultimately be reflective of the terms stipulated in a municipality's CEC. Most depots prohibit the following materials:

- Explosive or reactive materials
- Bulk liquid waste
- Animal carcasses
- Biomedical wastes
- Radioactive wastes
- Other materials as directed in CEC

If a waste load is rejected, the attendant should record the reason for the rejected load, the vehicle ID, customer name and contact information, date/time of visit and any corrective action taken. This information greatly assists administrative staff and/or councillors if complaints about rejections are received later and helps to identify promotion and education opportunities and effectiveness.

3.5 Monitoring and Record Keeping

Monitoring depot performance is an important part of a properly functioning facility and considered a best practice. Monitoring provides key information in helping the municipality assess whether they are achieving operational efficiencies and waste diversion goals. Proper monitoring and measuring of depot performance serves many functions, including the ability to:

- Track waste diversion activity and develop reliable reporting procedures
- Provide viable feedback to the public and Council
- Identify operating issues and mitigate them effectively
- Schedule material transfer based on volumes and peak traffic times (Many small municipalities reduce depot costs significantly by switching from regularly scheduled bin transfers to transfer only when bins are full)
- Identify storage or container requirements
- Assist in the selection and development of appropriate promotion and education initiatives to support new or existing depot programs

- Identify opportunities for cost savings and increased effectiveness of the program

Proper monitoring also assists municipalities with several other reporting exercises, including:

- Completing the annual WDO Datacall (tonnage and financial)
- Reporting on the Municipal Performance Management Program (MPMP) as part of the preparation of the annual municipal Financial Information Return
- Reporting internally for departments and Council
- Reporting annually to the MOECC

Data can be collected through many methods, such as manual tracking, mechanical counters, weigh scales and tracking software. Data that should be recorded on a regular basis include:

- Number of vehicles and vehicle IDs
- Inbound and outbound tonnages (or volumes), waste types and tip fees
- Origin and destination of the waste
- Rejected waste loads
- Customer complaints and resolutions
- Service vehicle records
- Payments received
- Daily weather conditions (temperature, wind speed/direction to respond to odour issues)
- Spills, health and safety incidents, and identification of potential hazards
- Incidental waste (illegal dumping, unacceptable waste drops, etc.)

3.6 Tipping Fees

Determining appropriate tipping fees to charge for inbound materials requires careful consideration to the impacts on other programs, including curbside programs, diversion programs, and disposal disincentive programs (e.g. pay-as-you-throw, bag limits). If tipping fees are set too high, illegal dumping activities may increase and depot use will be relatively low. In contrast, if depot fees are too low, residents may not participate in curbside waste diversion programs.

In Ontario, tipping fees are on the rise, with many small municipalities setting tipping fees over $100/ tonne (see sidebar). Municipalities without scales at their depots use a combination of approaches, including setting fees based on size of the vehicle and load, adopting Pay-as-you-throw for waste bags, paying per item (e.g. mattresses), etc. Many municipalities are introducing differential tipping fees to encourage waste diversion.

2015 Tipping Fees for Standard Waste Established by Non-Urban Municipalities in Ontario

- Muskoka District - $127/tonne
- Township of Lanark Highlands - $155/tonne
- Haldimand County - $116/tonne
- Township of Douro-Dummer - $95/tonne
- Ottawa Valley Waste Recovery Centre (OVWRC) - $89/tonne (partner municipality) and $133/tonne (non partner)
- Loyalist Township - $125/tonne

To avoid overly long waiting times (in excess of 30 minutes during busy times), which can discourage depot use and increase illegal dumping, some municipalities make use a number of different approaches including:

- Separate free (recyclables only) and paid entry lines
- Flat rate (tooney) gates
- Prepaid card options
- Pre-payment (e.g. $20.00) inbound with payment correction taking place during the outbound, and
- "Pay-in-the-line" scheme where staff walk the que and collect payment from customers in order to reduce transaction time

3.7 Housekeeping and Nuisance Controls

3.7.1 Dust and Litter

Dust can be caused by traffic on roadways (especially unpaved), bin moving activities, and wind.[9] The potential problems caused by dust include allergies, visual impairment, accidents and increased equipment maintenance.

Most sites also experience a certain amount of wind, causing air blown litter, which can create operational nuisances. Other sites, located at high local elevation points, may experience frequent high winds, which can cause dust-related problems.

Figure 55: Portable Litter Screen

To mitigate the effects of litter and dust, depot operators can:

- Install litter screens and/or fencing to avoid contaminating adjacent sites;
- Use landscaping techniques, earth berms, hedges or portable wind breaks where there are prevailing winds;
- Spray water or dust suppressants on unpaved dirt areas of the site and roadways

3.7.2 Odours

Odour problems are often seasonal in nature and are typically linked to the type of wastes managed at a depot. Depots receiving only non-putrescible (non-organic) materials will experience minimal odours, whereas those sites accepting organic wastes or waste containing organic materials can experience stronger odours, particularly during the warmer summer months. Depots generating

[9] Solid Waste Association of North America. Manager of Landfill Operations Course Manual. 2009.

odours can face community complaints, negative public perception and medical nuisance conditions for those affected.

To control odour generated from putrescible materials, these should be stored in a contained area for short periods of time (e.g. maximum of one week in winter, maximum of a few days in summer) before being shipped to landfills or composting facilities. Some communities have installed in-ground storage systems (e.g. Molox systems) that keep the organic materials cool and prevent them from decomposing quickly. This reduces odour problems and prolongs storage time. Grass clippings also should be banned from disposal at the depots and not permitted in leaf and yard waste piles in order to reduce odour emissions.

During hot weather, bins should be power washed on a regular basis to reduce odour and insect infestations.

3.7.3 Noise

Noise will always be a part of depot operations but uncontrolled noise can cause additional stress and hearing impairment (mainly of site personnel) and become a nuisance to adjacent property owners. Noise is typically caused by trucks and site equipment, back-up alarms, acceleration of engines while working, operation of hydraulic equipment, chippers etc.

Noise control can be accomplished by properly creating buffer zones or barriers between the source and the receptor. In many cases, noise barrier walls, berms, trees, and other landscaping features can be incorporated into site design to assist in reducing noise impacts offsite, as shown in Figures 56 and 57. Using natural sound barriers (shrubs, trees, grass/meadow berms) can also add to the aesthetics of the property.

Figure 56: Berm and vegetative barrier

Figure 57: Concrete fence barrier

Regularly maintaining equipment and installing noise reducing technology (e.g. mufflers) can also reduce noise problems. Establishing an adequate buffer zone during the planning and design stages and regulating hours of operation to coincide with adjacent land uses is another way of controlling noise.[10]

3.7.4 Vectors (aka nusiance animals)

Any facility that receives waste can attract animals including bears, rodents, insects, birds and vermin. Animals can cause issues for site operators as well as owners of adjacent property. Many animals can carry a number of diseases, causing danger to human health and can also act as a deterrent for people to visit the site.

To control animal nuisances, it is crucial that any waste (especially putrescible waste) be contained or covered as much as possible and any food or shelter, that will attract animals, be eliminated. If issues arise with animal control, a professional pest control service would need to be contacted. Warning signage for users may also be required.

Figure 58: Animal warning

3.8 Site Security

Maintaining site security is an important function of depot operations. Depots should be fenced or in a closed off area and locked after hours to ensure public safety and to discourage scavenging, vandalism and theft. Properly secured sites can help prevent unauthorized use that can result in liability for injuries. During operating hours, staff can maintain site security by monitoring dumping activity and conducting regular perimeter checks. Solar powered, motion activated, video cameras can also improve site security and provide evidence against repeat offenders.

Security measures, such as the cost of fencing is included in the **Depot Costing Model**.

3.9 Emergency Response Plan

An Emergency Response Plan should be developed to address how on site emergencies will be managed and who will be responsible for taking action. The Emergency Response Plan is a requirement of the ECA application process and should include, at a minimum:

- Response plans for fire, emergency, hazardous waste spills
- Location and usage of emergency response equipment
- Duties and responsibilities in emergency situations for both site staff and supervisors
- First aid, health and safety training requirements (e.g. preventative and response actions)

[10] Solid Waste Association of North America. Manager of Landfill Operations Course Manual. 2009.

- Coordination with emergency services
- Designated meeting areas in case of emergency
- Emergency contact # on a sign
- Reporting and response plans for injuries and other health and safety incidents

All staff on site should be trained in emergency management, be familiar with the Emergency Response Plan, have resources available on site to carry out emergency action and know where to find emergency response related information. Practice drills should be carried out regularly and documented.

3.10 Safety

A number of matters associated with safety have been addressed throughout the guidebook as it relates to depot design considerations, including traffic flow, traffic barriers, large and small vehicle separation, signage, guardrails, bin set up and more. This section discusses best practices for safe site operations.

In accordance with the Occupational Health and Safety Act (OHSA), a safety plan should be developed and included in the training program for all depot staff. The Workplace Hazardous Materials Information System also stipulates the need for worker education and training. A basic safety plan should address:

- Safe proximity activities and clearance operations of heavy equipment
- Identification of hazards on site
- Standard Operating Procedures (SOPs)
- Protection against climatic conditions
- Avoidance and response for slips and falls
- Hazardous materials management
- WHMIS and OHSA training requirements
- Ergonomics (addressing supportive equipment (e.g. back belts) on the job to reduce worker injuries and improve safety)

Daily health and safety practices should include, but are not necessarily limited to, the following activities:

- Site inspections (e.g. visual examination of disposal/diversion areas, scale house, site perimeter, etc.) to identify any potential health and safety hazards posed to either staff or site visitors. Efforts to mitigate these hazards should be made immediately upon discovery
- During winter months, snow should be cleared and the site should be salted/sanded. Particular attention should be paid to salting stairs, walkways, platforms and other areas that have high pedestrian traffic
- Equipment should be inspected and results recorded on a daily basis. If safety concerns are identified, equipment should be serviced or repaired prior to operation
- Dusty or sandy paved areas should be swept

On a regular basis the following health and safety practices should be followed:

- Site-specific orientation training for staff (see Section 3.3)
- Provision and inspection of Personal Protective Equipment (PPE). PPE should be provided to all staff and regularly inspected to ensure equipment is in good condition and meets the size/job specific needs of workers. Examples of PPE include latex and/or heavy gloves, safety vests, hard hats and steel toe boots
- All signs and safety guards should be inspected on a regular basis to ensure visibility and proper functionality
- Regular scanning with a magnet to reduce tire and shoe punctures in user areas

Site accessibility can be an issue for physically challenged and senior customers and staff training is important to avoid potential challenges with these customers. Unstaffed depots can raise liability issues and additional signage may be required.

Standard Operating Procedures (SOPs) should be developed for staff and address a wide range of potential operational challenges, such as developing a protocol for operating the depot during extreme cold or hot weather conditions and other extreme weather events. SOPs can address specific issues, such as individual health and safety concerns or for cover and compaction activities. As an alternative, these procedures may be developed as a master document, otherwise known as a Site Operating Plan, intended to address not only health and safety concerns, but also all operating procedures and safe operating practices.

Section 4 – Determining Costs

As discussed in earlier sections, there are many depot site configuration and operating options. Capital and operating costs also vary significantly depending on the complexity, design, location within the Province/Municipality and size of the site in question. The capital costs to develop depot facilities are typically based on:

- The existing infrastructure at the site (e.g. the site may already have existing useable access roads, fencing, utilities, permits etc.)
- The amount of preparation required to develop the site (e.g. grading, subsoil conditions and stormwater management)
- The type and potential quantity of materials to be managed, which will determine and be determined by the facility footprint and resources required for construction
- The storage and handling configuration (e.g. saw tooth, modular or grade level bins, bunkers and enclosed structures)
- The depot layout and features (e.g. will the facility be equipped with scales, scale house, kiosk, staffed entry system or no staff)

Operating costs to run facilities can also vary significantly based on:

- The types and quantities of material managed - Some materials such as wood waste may have a net cost to divert from landfill (e.g. if diversion of these materials involved grinding/chipping wood or other wastes once or more a year). Other materials may generate revenues, such as scrap metals and Blue Box materials, which will reduce overall costs
- The method used to manage the materials **-** For materials which are placed in 40 yd^3 roll-off bins, there is a cost associated with bin rental or amortized capital purchase, maintenance and transport to designated processors. Materials managed in bunkers will require equipment (e.g. loader/skidsteer) for loading on transport vehicles. A municipality would likely require an operating contract with a company or multiple companies to supply bins and/or haul materials and/or to maintain the site and equipment
- The staffing and monitoring of the depot - Depots with higher diversion rates and lower contamination levels generally have dedicated staff on site to direct residents to the appropriate areas and to ensure that residents are separating their materials properly. Depots that experience higher traffic volumes can justify the need for staff to manage traffic queuing, traffic/equipment flow and user/staff safety

Identifying the types of materials that should be separated and the number of predicted users (on a seasonal and annual basis) will help determine the depot footprint, configuration and overall capital and operating cost implications for the municipality.

4.1 Depot Costing Model

In order to assist municipalities in determining the costs involved with the planning, construction and operations of a depot, the **Depot Costing Model** has been developed as an interactive tool supporting this Guidebook. The **Depot Costing Model** is intended for small municipalities and

provides planners with a simple tool designed to help identify numerous depot design and operation components and the effects on both capital and operating costs associated with each component. The Model is also intended to assist planners in comparing the costs of directly hauling materials to processors (e.g. through curbside collection direct to an end processor) with the costs of operating a depot and transferring materials from that location (e.g. transfer from depot or separate transfer station).

Disclaimer:

This costing model was designed to help municipal staff identify many of the common variables to be reviewed during the planning and budgeting phase of their local depot development and to generate potential capital and operating costs for activity based costing comparisons. Care has been taken to obtain average costs and produce accurate results, however, this model is not intended to predict the exact tonnes of materials that will be received or exact costs to build and/or operate a depot. The information generated by the costing model is provided as opinion for discussion only and is not designed to replace qualified engineering, architectural or legal advice in any way. Municipalities are cautioned to obtain qualified advice, certified/approved drawings and plans and accurate local pricing prior to undertaking or adopting any recommendations that may affect their programs or facilities. The Continuous Improvement Fund and its partners accept no responsibility for the use of this Guidebook or the Costing Model.

4.2 Overview Of The Depot Costing Model

The **Depot Costing Model** is intended to help estimate the cost of expansion, construction and operating depots that receive less than 500 tonnes per year (tpy) of recyclable materials. Using the model to generate costs for larger depots may result in less accurate estimates.

The Model permits input of material types and tonnages, sorting configurations, collection and haul vehicle configurations, program operating costs and, using those inputs, produces an estimate of cost/tonne and overall annual costs for comparison of different user selected options.

4.2.1 Using The Model

The **Depot Costing Model** is presented as a question and answer spreadsheet where users enter their municipality's tonnage, distance and cost information sequentially, in yellow highlighted cells, on five separate pages (Tabs). The information entered is automatically processed through a series of formulas and options to calculate and display the summary and total costs of the user's choices on Tab 6.

The Model has default and reference information available to assist users in determining unknown information/costs. Better practices and notes are included on Tab 5 to inform the user and explain why a line item might/should be included in their cost planning exercise. To improve accuracy, at all

input points, local/current pricing can and should be substituted for the costs suggested by the model, which are based on current market research and previous CIF municipal depot projects. **Users are cautioned that prices and mandatory requirements change frequently and this costing model may not be updated with the latest information available. It is the users responsibility to obtain accurate local pricing and legal requirements prior to making any final decisions on any aspect of depot design and operation.** Users are encouraged to contact CIF staff for help using the cost model.

4.2.2 General Instructions

The Costing Model is designed for use in a question and answer format and includes assistance in completing the yellow input fields required on each Tab.

Where assistance is needed with completing these fields, 'pop-up' help can be seen by clicking on the input cell. Additional directions can also be found at the top of each Tab or users can contact CIF staff for support.

Tabs 1-5 are provided to collect your specific local information, which is used to provide an analysis and estimate of costs in Tab 6. Complete the questions and answers in order, starting with Tab 1. Better/best practice and depot construction information can be found on Tab 5.

4.2.3 Frequently Asked Questions

1. Why are some fields yellow throughout the Model?

Yellow fields may need your input or can be calculated for you based on your earlier answers to questions. Where numbers do not appear, questions should be answered based on suggested responses supplied or enter your local costs, tonnes, distance, wages, etc. into the blank cell as required.

2. I am not sure what to input in certain fields, where can I find help?

At the top of each Tab, additional Tab-specific direction is provided. Users can also move their cursor onto the "**?**" cells to view additional 'pop-up' help. Contact CIF staff if you need additional help.

3. Where can I quickly access best/better practice information?

Better practice information and explanatory notes are provided on Tab 5. Additional better practices are available above in the text portion of this Depot Guidebook or contact CIF staff.

4. Why are density calculations needed on Tab 2?

Tonnages must be converted to estimated volumes to calculate the number of trips required annually to haul materials based on a given container size. Totals are estimated based on trips x distance x local haul costs.

Resources

APPENDICES

Appendix A – Approvals Required

Appendix B – Costing Model

Appendix C – CIF Material Density Study Project #737

Appendix D – E&E Project #45 selected sections

Appendix E – Additional Resources

Appendix - A - Approvals Required

Federal and Provincial Requirements

In Ontario, there is a strict regulatory environment for depot operation and the necessary approvals must be obtained before the development phase. Ontario Regulation 347 is part of the Environmental Protection Act (EPA) and addresses waste management, with a focus on protecting public health and safety by ensuring certain measures are taken during the development and operation of a facility, including regulating, tracking and disposal of hazardous and non-hazardous wastes. This regulation applies to waste generators, carriers, and receivers, and stipulates individual requirements for each.

The Environmental Assessment Act also applies to waste facilities; Currently the EAA applies to a waste disposal site at which waste is handled, treated or processed, if, on an annual basis, an average of more than 1,000 tonnes of waste per day is transferred from the site for final disposal. O. Reg. 101/07, s. 3 part 11 (1) 4.

The following sections provide discussion on the applicable sections of O. Reg 347 and their requirements. [http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900347_e.htm]

Section 27 - Approval, Waste Management System or Waste Disposal Site

Section 27 of the EPA requires that “No person shall use, operate, establish, alter, enlarge or extend a waste management system or a waste disposal site except under and in accordance with an environmental compliance approval (ECA).” Under Section 27, all depots are required to obtain an ECA from the Ministry of the Environment and Climate Change (MOECC) before construction and operation. As part of the ECA submission, applicants are required to submit a Design and Operations (D&O) report, outlining proposed depot design and operating conditions. Once approved, the conditions set forth in the ECA must be abided by in order to remain in compliance.

Under the EPA, Ontario Regulation 101/94 there are some exemptions for waste disposal sites requirements for ECA’s. Municipalities should review to 5 (1) 1 and 2 if sites have waste storage capacity limits of less than 300 cubic meters and waste is removed every 30 days.

Section 9 - Air Approvals

Approval under Section 9 of the EPA is required for air emissions from any processes or venting. Section 9 of the EPA requires that proponents of facilities obtain approval before construction, alteration, extension or replacement of any equipment or structure or any ongoing operation that may emit or from which may be emitted a contaminant to the natural environment other than water. To obtain approval under Section 9 of the EPA, applicants are required, to demonstrate compliance with O. Reg. 419/05. Generally, a Section 9 Approval is not required for a depot. However, during the design phase, applicants will need to account for potential odours, noise or vibrations. For example, this could include the installation of exhaust fans for operation of a grinder (e.g. for wood) which could trigger the need for a Section 9 approval.

Section 53 - Ontario Water Resource Act

The Ontario Water Resources Act (OWRA) requires that all sewage discharges be approved by an Environmental Compliance Approval issued by the MOECC, unless the discharge has been exempted by the OWRA or another exempting regulation. Section 53 of the OWRA provides the details surrounding approvals for sewage disposal systems. The Act states that "No person shall establish, alter, extend or replace new or existing sewage works except under and in accordance with an approval granted by a Director."

The Environmental Assessment and Approvals Branch (EAAB) of the MOECC issues ECA under the OWRA for the treatment and disposal of sewage by a variety of sewage disposal systems, including those that discharge to groundwater receivers at designed capacities of more than 10,000 L/day. A system (or collection of systems) that has a designed capacity of 10,000 L/day or less and discharges to groundwater receivers is approved under the Building Code by municipalities.

Note that all discharges of sewage to surface water receivers require approval from the MOECC.

Depending on the complexity of design requirements, there will be varying degrees of documentation required to support an application. This may include, but not be limited to: an Environmental Study Report; Preliminary Engineering Report; Site and Soil Assessment Report; Environmental Impact Reports (e.g. groundwater, surface water, odour, noise), Storm Water Management Report; and Plans, Specifications, and documentation supporting hydraulic and process calculations, influent sewage quantity and quality characteristics, sludge handling, and process effluent monitoring plans. Less complex applications will not require all this documentation.

Municipal Approvals

Each municipality has its own approval requirements relating to land use, zoning, official plan, building code, and site services that must be factored into depot development. While these approvals can vary between municipalities, the following sections discuss some of the more common elements that should be considered in obtaining these approvals.

Land Use, Zoning and Official Plan Amendments

Verification of conformance to existing land uses, zoning and Official Plan use will be necessary in the planning stages. A zoning change or amendment to the Official Plan may be required.

Site Plan Approval

A Site Plan Approval (SPA) application process typically could take three to six months.

Building Code Permit

Siting of new buildings or modifications to existing buildings on site would require a building permit based on prescribed directives of the individual municipality.

Site Services Connection Permit

If a new water service is required, a water meter will be needed. If the intent is to build new sanitary services then a Sewage Service Permit may be required. The necessity to issue this permit would be determined by the municipality.

Appendix - B - The Depot Costing Model

The Depot Costing Model tool is available as an excel spreadsheet on the CIF website.

www.CIF.wdo.ca

Appendix - C - Materials Density Study

CIF Project #737 - (Density Study Phase 1)

Project Background

In the summer of 2014, bin and truckload weight data from 16 municipalities were assessed to estimate “in the field” average densities and standard deviations of various recyclable materials and bin and truck sizes.

Phase 1 of this project was designed to gather as many data points (truck and bin weights) as possible to attempt to minimize geographic, weather and local operational idiosyncrasies. The resultant spreadsheet permits readers to identify the bin/truck size of interest and reference it to a payload weight of a specific recyclable material.

Summary of Results

The chart below is not an attempt to identify target weights/densities, ideal weights/densities or the truth of manufacturers’ payload claims. The data displayed is considered reliable; however, this density study is a work in progress and is intended to be updated from time to time.

Changing material mixes, especially packaging, and local variables such as operations, equipment, climate, scheduling, compaction settings, etc. can all significantly affect the density of materials observed in the field, therefore, CIF assumes no responsibility or liability for any use made of the data provided herein and reserves the right to change said data anytime without notice as new information becomes available.

Notwithstanding the above disclaimer, municipalities are encouraged to review the spreadsheet and compare their own results to the densities reported. Significant differences, either above or below the reported weights, may prompt further investigation and be of financial value to the local municipality as well as Province wide. Therefore, municipalities observing significant differences in weights compared to their own similar sized bins/trucks are requested to contact CIF who will assist with investigating the difference and may recommend a variety of options up to and including financial assistance, if appropriate/available.

Material	Fibre + OCC			Fibre No OCC			OCC			Containers + Glass			Containers			Glass			Single Stream			Single Str. No OCC		
	Average			Average			Average			Average			Average			Average			Average			Average		
Bin Size yd^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3	t/load	kg/m^3	t/m^3
20	**1.22**	83.10	0.08				**0.61**	39.10	0.04				**0.61**	39.40	0.04	**5.97**	392.00	0.39	**1.22**	82.60	0.08			
compacted 20																			**1.38**	89.00	0.09			
30													**0.92**	41.70	0.04	**7.80**	343.40	0.34						
compacted 30																								
35							**0.54**	17.20	0.02															
compacted 35							**2.94**	111.70	0.11															
40	**3.36**	106.90	0.11	**3.36**	110.60	0.11	**1.22**	41.60	0.04	**1.83**	64.40	0.06	**1.22**	39.80	0.04				**1.53**	52.60	0.05	**3.06**	98.40	0.10
compacted 40	**5.20**	166.90	0.17	**4.89**	198.91	0.16				**3.67**	118.80	0.12												
Truck Size yd^3																								
35				**2.41**	93.20	0.09				**1.07**	40.70	0.04												
compacted 35																			**4.01**	154.20	0.15			
37																								
compacted 37																			**5.66**	200.70	0.20			
38	**1.16**	44.50	0.04							**1.83**	64.40	0.06												
compacted 38	**4.94**	0.17	4.94							**3.20**	118.80	0.12												
40																								
compacted 40																			**5.50**	178.40	0.18			
42	**1.28**	44.80	0.04							**1.28**	44.00	0.04							**1.93**	59.40	0.06			
compacted 42																								
43	**2.37**	64.50	0.06							**1.15**	35.11	0.04												
compacted 43																								
48																			**1.83**	53.00	0.05			
compacted 48																								
49																			**1.87**	47.30	0.05			
compacted 49																								

Appendix - D - Rural Recycling Depot Programs Best Practices

The following appendix provides the results of Phase 2 of Rural Depot Project: Best Practices of Rural Recycling Depot Programs E&E Funded Project #46. This includes summary findings of:

D-1 Customer Education

D-2 Wasps and the Environmental Issues

D-3 The Addition of an Extra Staff person

D-4 Testing the Effectiveness of Different Recycling Depot Layout Designs

D-5 Placement of Posters in High Traffic Areas to Promote the Recycling Depot

D-1 Customer Education:

Customer education is critical to the successful operations of a recycling depot. An informed and satisfied customer will result in higher recycling rates and lower contamination rates.

1. Respond to customer education needs.

Interviews with depot attendants revealed the need to educate customers on how to properly use the recycling depot. Educating people to become competent in the recycling process will improve depot operations, increase recycling rates and reduce program costs. In particular, customers need to be educated on the importance of:

- ***Properly rinsing out recyclable containers*** - Depot attendants were adamant about the need to educate customers about the need to rinse out containers before bringing them to the depot in order to reduce the problems associated with unwanted wasps, odors, and animals.

- ***Properly separating recyclables and reducing contamination*** - People need to recognize that improper separation of recyclables results in increased program costs due to contamination of the recycling stream which is paid for through their taxes. Special attention should be given to separating clear from coloured glass, boxboard from cardboard.

- ***Differentiating between acceptable and non-acceptable materials*** - Customers need to be educated on the importance of bringing only acceptable materials to the depot and using alternative means for managing unacceptable materials, such as hazardous waste, especially paint and broken window and mirror glass.

- ***Providing uniform recycling procedures*** - People need guidance on the recycling process, especially newcomers, cottagers, and tourists. Many new customers say they find the recycling process confusing at the beginning because it varies from community to community.

- ***Educating customers about the lifecycle of recyclables*** - Customers need to be educated about the lifecycle of the recyclable and reassured that their efforts are making a difference.

- ***Educating customers about the proper management plastics*** – Special attention needs to be given to plastics which were found to experience the highest contamination rates at the depots and were considered the most frequently misplaced recyclable, especially plastic film. Appendix 6 describes a pilot test conducted at a site over a 9 week period to determine what type of items people were misplacing the most. Hard and soft plastic items accounted for almost half of the total recycling errors. Plastic film proved to be the most problematic material which was often placed in the wrong recycling bin.

- ***Ensuring that customers are adequately informed about program changes*** – To prevent customer confusion and potential dissatisfaction, it is important to provide adequate and timely information about program changes. This would also help the depot attendants who have to enforce the changes and deal with frustrated customers who have not been properly informed about program changes. This is especially important when changes to fees and rates are involved.

Case Example:

At one depot, a new practice was introduced where the depot attendants had to charge $2 for every bag going to landfill that contained any recyclables (residents previously incurred no charges). The intent was to encourage separation of recyclables. The problem was the absence of educational support to help education the customers about the new fees. The depot attendants had to do the 'dirty work' of introducing the $2 bag fee to people with 'mixed bags'. Some customers were not happy to learn of this unexpected change when they arrived at the depot. The depot attendants eventually gained public support but it was a challenging journey. During the interview, the head depot attendant motioned over to a man diligently separating his recyclables. He said that this man used to shout in resistance to recycling and storm away. It was evident that the man has accepted the change and is quite a competent recycler now.

D-2 The Wasp and Environmental Issues:

Wasps and flies were a problem at every site visited and actually interfered with the recycling process because some customers were cautious about recycling when wasps were around them or rushed through the recycling in order to get away from the wasps. This affects the level of compliance and may deter people from going to the recycling depot. Every effort should be made to manage the wasp problem in order to avoid potential liability issues.

Implement a variety of actions to reduce wasps.

The following observations were made and advice offered:

Sea bins appeared to have significantly less wasps compared to the 95 gallon carts. They should be washed down each time they are emptied - One of the depot attendants mentioned that there are fewer wasps around sea bins because the opening is from the side. Wasps tended to hide underneath the sea bin rather than inside it. The 95 gallon carts, however, open from the top and wasps tended to congregate around the top and inside the open lids. When sea bins are removed for pick-up, the attendants can easily spray the wasps or wasp hives nesting underneath.

- ***95 gallon carts should be washed on a rotating system in order to decrease the attraction of wasps -*** Two of the waste site managers mentioned they flag dirty carts and clean them before being used again. The depot attendants at the Centre Hastings recycling depot use a pressure washer to spray down their 95 gallon carts and large green bins for glass. The water is mixed with a small bit of chlorine. They had virtually no problem with wasps.

- ***Keep the lids of the carts closed as much as possible -*** Most of the sites keep the lids open on the recycling carts when in use. Keeping them shut would attract fewer wasps. Unfortunately, keeping the lids shut slows down the recycling process. One depot attendant said that people complain about having to open the lids, which takes extra time. Another depot attendant mentioned that the wasps would fly in your face when opening the lid.

- ***Use several wasp traps in the depot area -*** According the Pest Control Canada web site, it is effective to set out wasp traps in the spring when the 'queen' wasps emerge. Trapping the 'queen wasps' during the thirty to forty-five day period in the spring has the potential to decrease the wasp population for the rest of the season. More traps may also need to be placed in the fall[11].

- ***Use rain-catcher containers to collect water at the depots with poor water access.*** Rain-catcher containers (with a screened lid, a regular covering, and a tap that can be connected to a pressure washer) should be provided for sites that do not have access to water to enable the carts to be washed down. For sites with access to water, using rain catchers is an effective cost saving and water conservation strategy.

D-3 Pilot Test 1: The Addition of an Extra Staff Person

Description of Pilot Test: An extra staff person was hired by the Township of Stirling Rawdon over an eight month period (October 2006 to May 2007) to assist the depot attendant at the Springbrook waste site, which had only one depot attendant supervising all activities at the landfill including, waste drop off and collection of fees from the public, management of the scrap piles and the recycling depot.

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[11] Pest Control Canada. *Wasp and Hornet Control.* Date Accessed: January 2007

http://www.pestcontrolcanada.com/INSECTS/wasp_and_hornet_control.htm

The intent of the pilot was to measure whether an extra attendant resulted in higher recycling rates. The additional attendant performed tasks at the recycling depot that may not have been performed by the main depot attendant if taken away to perform other landfill related tasks. The pilot measured the total tonnage of recyclables collected over the eight month period with the total tonnage of recyclables collected during the same time span from the previous 2 years.

Pilot Test Results: The total amount of recyclables collected over the 8 month pilot (October 2006 – May 2007) resulted in a 3.4% and 7.9% increase compared with similar time periods for the two previous year (see Table D1).

Table D1: Total Recycling Collected over the Past 3 Years

8 month period	Total Recycling Tonnage Collected (metric tonnes)	Total Increase or Decrease from the Previous Year (metric tonnes)	Percentage Change from the Previous Year	Percentage Change from Pilot Test
One depot attendant				
Oct. 2003 – May 2004	51.91			
Oct.r 2004 – May 2005	55.13	3.22	6%	3.4%
Oct. 2005 – May 2006	52.75	(2.38)	(4.3%)	7.9%
Pilot Test – Additional depot attendant				
Oct. 2006 – May 2007	56.94	4.19	7.9%	

The test results suggest that the additional depot attendant helped to increase the amount of recyclables collected at the depot. The addition of an extra staff person had a positive impact on the Springbrook's depot recycling program. The benefits provided by the additional depot attendant are summarized as follows:

- Increased time to monitor activities at the recycling depot – the second attendant ensured that the depot had a staff person available at all times to provide additional monitoring activities and customer assistance;
- A significant improvement in the appearance of the site – the site appeared to be better organized with the additional staff person, especially in the case of the reuse area which had become unmanageable due to the lack of time available to maintain the area with only the one attendant in charge;
- More time devoted to helping people with recycling, including proper sorting - A depot attendant was always observed to be actively helping people with their recycling. In contrast, the former depot attendant could not always be available to assist people with recycling because a significant amount of time was consumed with other duties.

D-4 Pilot Test 2: Testing the Effectiveness of Different Recycling Depot Layout Designs

Description of Pilot Test: Two recycling depot designs were pilot tested to determine if they improve the quality of recycling. The level of recyclable contamination was compared for each layout style (by comparing the average number of incidents of recycling contamination – recycling errors - per customer car and per cart) and tracked on a weekly basis and compared to the traditional layout common at most recycling depots in the Quinte Region. The traditional approach involves providing a continuous row of 95 gallon carts with no physical dividers between each category of recyclables. Each cart has a label located on the inside of the lid, which identifies the type of recyclables collected (see Figure D1).

Figure D1: Traditional approach with text labels used on the lid of a 95 gallon cart

The pilot test was nine weeks in duration. Each new layout was tested over a three week period and compared with the traditional layout also tested over three weeks. The following new layouts were tested:

- **'Text Only' Sign:** The labels on each cart were removed and replaced by two overhead signs, each representing a different category of recyclables. Each sign contained a text list of all recyclables collected for that category (see Figure D2). A physical divider was used between the two categories of recyclables.

- **Picture/Graphic Sign*:*** The labels on each cart were removed and replaced by two overhead signs, each representing a different category of recyclables. The text list of recyclables was augmented with graphics on each sign, representing the recyclables collected for that category (see Figure D3). Although graphics were mainly used, one of the signs contained a picture as well. A physical divider was used between the two categories of recyclables.

Figure D2: 'Text Only' Signs Used for Pilot Test

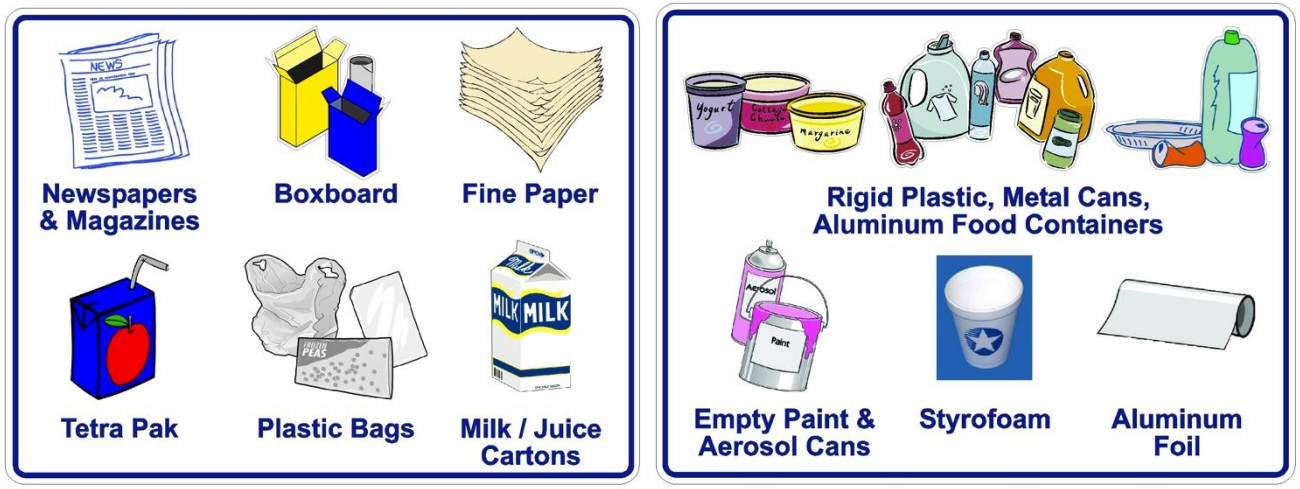

Figure D3: Picture/Graphic Signs Used for Pilot Test

Pilot Test Results: The layout with the graphic/picture signs resulted in the lowest contamination rate. In comparison to the traditional layout, it had 61% fewer recycling errors per car. The 'text-only' sign did not perform as well with only 3% fewer recycling errors per car (see Table D2).

Table D2: Contamination (Errors per car)

	Traditional Layout	Text Only Layout	Picture/Graphic Sign Layout
	# of Errors Per Car		
Week 1	1.30	2.20	0.80
Week 2	1.00	0.67	0.38
Week 3	0.75	0.37	0.08
Total Average	**1.04**	**1.01**	**0.41**

The results are even more dramatic when examining the number of errors per 95 gallon cart. In comparison to the traditional layout test results, the picture/graphics sign produced 73% fewer contamination errors and the 'text only' sign produced 49% fewer contamination errors (see Table D3).

Table D3: Contamination (Errors per Cart)

	Traditional Layout	Text Only Layout	Picture/Graphic Sign Layout
	# of Errors Per Cart		
Week 1	3.04	1.86	1.37
Week 2	2.55	1.03	0.21
Total Average	**2.80**	**1.44**	**0.77**

Note: due to resource limitations, the cart analysis was conducted over a two week period only

The new layouts appeared to overcome some of the common problems and frustrations encountered by customers using the recycling depots. For example, some customers were very frustrated with the traditional layout because it did not have a physical divider between carts which made it difficult to determine where one recycling category began or ended. Unlike the traditional approach the new layouts provided physical dividers (tables), which people used to place their Blue Boxes while attendants helped them to sort and differentiated the different recycling carts.

Many people voluntarily commented that the signs with graphics made it faster and easier for them to process the information. One resident stated that, "The use of pictures is a fast way to get the message across". It also serves as a reminder for items that people tend to place in the wrong recycling category. Another resident commented that the picture/graphic signs provided better clarification of certain terms. In general, the graphic signs provided the following benefits:

- They resulted in a significant reduction in recycling contamination;
- People looked at them more than the 'text only' sign;
- They helped some people process the information faster;
- Some residents may not be adept readers for a variety of reasons, so picture/graphics helped provide visual information;
- They served as a reminder for items that people tend to place in the wrong recycling category;
- They helped ensure that people understood the meaning of each item listed (e.g. tetra pak);

- Replacing the labels on each cart with large picture/graphic overhead signs was found to be less overwhelming for the customers.

D-5 Pilot Test 3: Placement of Posters in High Traffic Areas to Promote the Recycling Depot

Description of Pilot Test: Posters were placed in high traffic areas in the community of Coe Hill, to inform the public of recycling depot hours and location. The posters were posted at the local grocery store, LCBO store, post office, two local restaurants, gas station, public library, and town office.

A survey at the landfill and recycling depot was used to determine the effectiveness of placing posters in the high traffic areas to promote the recycling depot. Unfortunately, the pilot test was conducted during the off-season and would have been more relevant had it been conducted during the high season when there are more non-permanent residents in the area.

Pilot Test Results: The pilot test findings revealed that the posters had little to no effect in prompting people to recycle and the vast majority of people did not notice them. Only 8 of the 60 people surveyed acknowledged viewing at least one of the posters. More than half of the people surveyed (35) simply did not notice the poster while 17 people did not see the posters because they were not shopping in Coe Hill during that time period.

All of the people who saw the posters were permanent residents with the exception of one cottager. The permanent residents indicated the sign did not prompt them to recycle because they already did. The cottager was the only person who communicated that it prompted her to recycle.

Permanent residents tended not to observe the signs because they already know the schedule and routines of the recycling depots. They contact the township office or rely on word of mouth when they are unsure of something. Many people communicated that they obtain waste site information from their tax bill and waste site card. Posters may be useful for permanent residents when communicating any changes such as holiday hours.

In order to determine if posters might be effective in educating tourists and cottagers, the pilot test should be conducted during the summer peak season. It is important not to overlook the fact that the only cottager who saw the poster said that it prompted her to recycle. This indicates that promoting the depot in high traffic venues during the summer season may be an effective way to reach cottagers and tourists.

Appendix – E - Additional Resources

ELaws – https://www.ontario.ca/laws

SWANA – Solid Waste Association of North America – Managing Transfer Station Systems. www.swana.org

Getting to 50% and Beyond – Success Stories of Canadian Municipalities (2009).
https://www.fcm.ca/Documents/tools/GMF/Getting_to_50_percent_en.pdf

Ontario Waste management approvals – Sample applications, guides and resources
https://www.ontario.ca/page/waste-management-approvals-sample-applications-guides-and-resources

Waste Transfer Stations – A Manual for Decision-Making, United States Environmental Protection Agency (2002)
https://www3.epa.gov/wastes/nonhaz/municipal/pubs/r02002.pdf

City of Calgary, October 2005, Recycling Depot Friendly Design Guide –

www.calgary.ca/UEP/WRS/Documents/WRS-Documents/recycling_design_guide.pdf?noredirect=1