Collection Systems

Overview

When residents, businesses, industries and institutions have materials that are no longer of value to them they make decisions on how to manage those materials. They can take it upon themselves to transport the materials to one of several diversion or disposal options or can arrange for a third party to handle those materials for them. For purposes of this technical paper the term waste "collection" will refer to both the gathering of solid waste or recyclable materials (including yard waste) into a truck by a private hauler and the transport of these materials to a management or disposal facility. Waste generators begin this process by determining how they wish to sort or manage materials and then contracting with a service provider to take the materials from an agreed upon location, on an agreed upon schedule or frequency, to the selected management/disposal location. In the case of multi-family residences, rental properties, and some small businesses, the contracting element may be handled by another entity (e.g., apartment complex agent/manager, property owner, or property manager). Typically the waste collection process involves the waste generator placing materials in a bin, container, bag or similar enclosure that the third-party collection firm has agreed will be used. Certain materials (e.g., bulky items) may not require containers, but this aspect of waste collection is not discussed further in this paper.

Once the materials have been consolidated into an acceptable/agreed upon container there may be a variety of pick-up alternatives, depending upon type of service, frequency of collection, and volume of waste. All such options ultimately place the material on a truck, which is then used to transport the waste to its final destination.

Article VIII of the City Charter defines the City's powers as it relates to refuse collection, utilization and disposal as well as the segregation of garbage prior to collection. Section 11a of the City Charter states:

> *"The City shall have power to provide for garbage and refuse collection and utilization or disposal. The City council shall have power, by ordinance to prescribe and enforce methods of segregation of different kinds of garbage by residents of the city, to provide for the collection of garbage and refuse either by equipment owned and operated by the city or by letting contracts therefor; to divide the city into convenient garbage districts. …The notice shall specify the district or districts to be covered by the contract and the term thereof, which in no case shall exceed one year. …..If the city provides for the collection of garbage and refuse in a district, either by city equipment or by contract, it may prohibit collection thereof within such district by any other person.*
>
> *The council may be ordinance fix charges for the collection of garbage to be paid by the persons, firms or corporations causing the same to accumulate and may make the same in lien upon the premises where the same is accumulated enforceable, as water rates or other municipally furnished utilities, or such collection and disposal may be paid for in whole or in part from funds raised by the general taxation as shall be deemed best by the city council from time to time."*

Currently the City has not used these powers to undertake City operated collection systems, to contract for collection services, to create districts or to fix charges for garbage collection.

Lincoln Municipal Code (LMC) 8.32 makes providing for the collection of commercial/industrial and residential waste the responsibility of the property owner, agent or manager in stating:

> **"8.32.200 Commercial and Industrial Businesses to Provide Receptacles or Containers.**
>
> *The owner, agent, or manager having charge of a commercial or industrial business shall furnish the same with containers or receptacles for solid waste and industrial waste for the purpose of receiving such wastes from their place of business. … It shall be the responsibility of the owner, agent, or manager having charge of the business to provide for the collection and disposal of all solid waste generated by said establishment. Solid waste accumulated by the establishment shall be removed from the establishment premises at intervals necessary to maintain proper sanitary conditions but not less than twice a week.…*
>
> **8.32.205 Garbage Service to be Provided.**
>
> *The owner of every dwelling in the city shall provide for the collection and removal of solid waste by a licensed waste hauler at least once a week, subject to any exceptions or additional requirements provided by governing law. The owner of every dwelling containing more than two dwelling units shall provide for collection and removal of solid waste accumulated by occupants of such rented or leased dwelling by a licensed waste hauler at least twice every week. All owners shall be responsible and liable hereunder whether or not the said owner occupies or resides in the dwelling, and whether or not said dwelling is leased or rented to another.".*

The exceptions to these mandates include the following:

- A homeowner conveying garbage, putrescible waste, or infectious waste from his or her own residence to the public sanitary landfills.
- Collecting, hauling or conveying dead animals, grease, and other putrescible wastes to rendering facilities.
- Collecting, hauling or conveying liquid wastes if said person holds a current Cleaner and Liquid Waste Hauler permit issued by the Lincoln-Lancaster County Health Department (LLCHD) Health Director.
- Collecting, hauling and conveying lawn waste.

LMC defines acceptable receptacles/containers and limitations on how waste materials can be stored and accumulated. LMC also defines a licensing program and bonding for waste haulers within the City and three miles of the corporate limits of the City. This program provides for certain minimum refuse collection vehicle standards of construction, vehicle appearance, cleanliness, good repair, and inspection by the Lincoln-Lancaster County Health Department (LLCHD). Licensed vehicles are required to display a sticker with license certificate number permanently affixed to the vehicle.

Current Programs

Current collection practices in the Planning Area include solid waste, lawn waste, and recyclables collection. Portions of these programs are described in greater detail in the Needs Assessment.

Solid Waste and Recyclables Collection Practices

Solid waste and recyclables collection in the City-County is performed by approximately forty independent, licensed waste haulers in an open-subscription collection system. Two

villages (Roca and Firth) in the Planning Area contract with a waste hauler for solid waste collection services; three villages (Bennet, Davey and Panama) contract with a waste hauler to provide a solid waste compactor which serves as a transfer station for community residents; the remaining communities in the Planning Area have an open-subscription collection system. Based on the Baseline Assessment Survey conducted as part of the planning process the median cost for residential garbage collection service in the City is $20 per month.

Independent waste haulers provide waste collection services to residents and businesses, in satisfaction of requirements established in LMC. Optional collection services available through various waste haulers or contractors include lawn waste (grass and leaves) collection (typically April 1st until December 1st), fall-only (October and November) leaf collection and collection of recyclable materials.

Commercial waste collection is also provided via an open-subscription services system. Rates for commercial services are established by the waste hauler and agreed to by the waste generator; these rates are a function of such things as container type and size, waste types, and frequency of collection.

Several private hauling companies provide curbside collection of recyclables on a subscription basis in Lincoln and surrounding communities. Based on the Baseline Assessment Survey conducted as part of the planning process, an estimated 24 percent of the households in Lincoln subscribe to curbside recycling. None of the municipalities in the County provide either public or franchise curbside collection service for recyclables. Curbside residential recyclables collection programs are funded by program users through subscription fees and revenue derived from the collected materials. Based on the Baseline Assessment Survey conducted as part of the planning process the median cost for residential curbside recyclables collection service in the City is $10 per month.

Most of the curbside recyclables collection provided to residents are “single stream” services, which mean that all acceptable recyclables are placed in a common container(s) for pick-up and are then hauled to a processing center for further sorting.

Some waste haulers have expanded their collection business to include recycling services for both residential and commercial customers. Because there are more waste haulers offering recycling services there is oppurtunties for commercial waste recycling. Commercial recycling is funded by program users through subscription fees and revenue derived from the collected materials.

There are no reporting requirements for waste and recyclables haulers; as a result, no data is available on the number of residents or businesses subscribing to the various types of collection services. Firms providing source separated recyclables collection services (only) are not required to license their collection vehicles. As a result, the number of waste haulers providing recyclables collection services is not currently known.

Construction and Demolition Waste Collection Practices

Building rubbish and construction debris (referenced herein as construction and demolition (C&D waste)) are typically hauled by the C&D companies, specialty firms, trucking companies (that provide container handling services) or by small businesses and residents who generate the C&D waste. When materials are collected and hauled to C&D recycling and processing facilities these materials are considered source separated and trucking operations are exempt from waste hauler licensing requirements; these collection opertions

are not required to report any information regarding the type of services provided and type and quantity of material diverted/recycled.

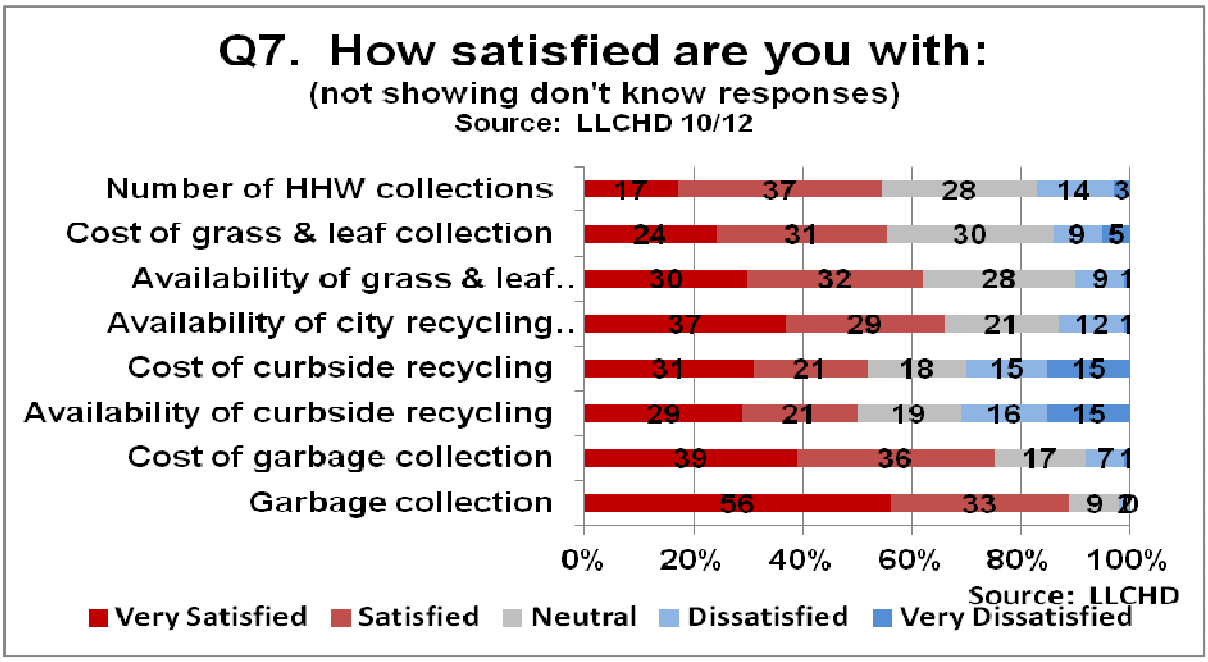
Yard Waste Collection

Residents, lawn service companies and waste haulers collect and deliver source-separated yard waste to the composting facility located at the Bluff Road Landfill or the North 48th Street Transfer Station site. Small quantities of yard waste may also be taken to private property for land application or composting. There are no reporting requirements for firms only hauling yard waste.

Survey Data

As a part of the Baseline Assessment Survey conducted as part of the planning process, City residents were asked to identify how satisfied they were with a variety of waste collection and diversion programs and the associated cost of these services. The results of that survey are displayed in Figure 1, below.

Figure 1 – Baseline Assessment Survey – Question 7



Additionally, 85 percent of respondents indicated that they thought curbside collection of recyclables should be offered to every home in Lincoln as part of the basic garbage collection service.

Program (Facility/System) Options

Waste and recyclables collection program options can take many forms and involve differing levels of participation, program/services, and management options. Methods of collecting waste and recyclables vary from community to community across the US. The technical papers on Residential Recycling and Diversion, and Commercial Recycling and Diversion provide additional detail on program options for recyclables collection. The general focus of the following discussion is collection of refuse/garbage, with the majority of the discussion related to residential solid waste collection. Basic options include the following:

- Status Quo
- Municipal Service - City Collection Service
- Municipally Regulated/Controlled Services
    - Contracts
    - Franchise
- Free market

Municipally managed service options include both the City as a market participant (e.g, a collection services provider) and a market regulator. The City's charter allows the City to be a market participant or a market regulator.

One of the guiding principles adopted in the LPlan 2040 states: "*The City policy of privately owned and operated collection of refuse and recyclables….will continue during the planning period*", thus this technical paper does not evaluate options in which the City owns and operates the collection system for solid waste or recyclables.

Status quo options are described above under Current Programs. General observations and comments in support of maintaining the status quo include:

- Refuse haulers provide a high quality of refuse service and help keep Lincoln clean.
- Survey respondents indicate they were very satisfied with garbage collection services.
- The current system has worked in Lincoln for nearly 100 years.
- Small business waste collectors could be negatively affected by changes to the current system.

General observations and comments in support of changing the status quo include:

- Multiple refuse and recycling trucks drive many of the same streets in a neighborhood, which increases overall fuel consumption, creates traffic safety concerns, and can lead to increased wear on roads.
- Rates per household are higher in Lincoln than in communities with organized collection programs.
- Similar to many communities the size of Lincoln, recyclables collection services could be a part of the basic garbage collection services.

Current subscription recyclable collection service rates could be viewed as a disincentive to increased levels of recycling. The Baseline Assessment/Survey found that approximately 24 percent of households subscribe to curbside recycling; the Baseline Assessment/Survey indicates that 85 percent of respondents felt curbside collection of recyclables should be offered to every home as part of the basic garbage collection service.

The options to the status quo are generally presented with one of the following areas of focus:

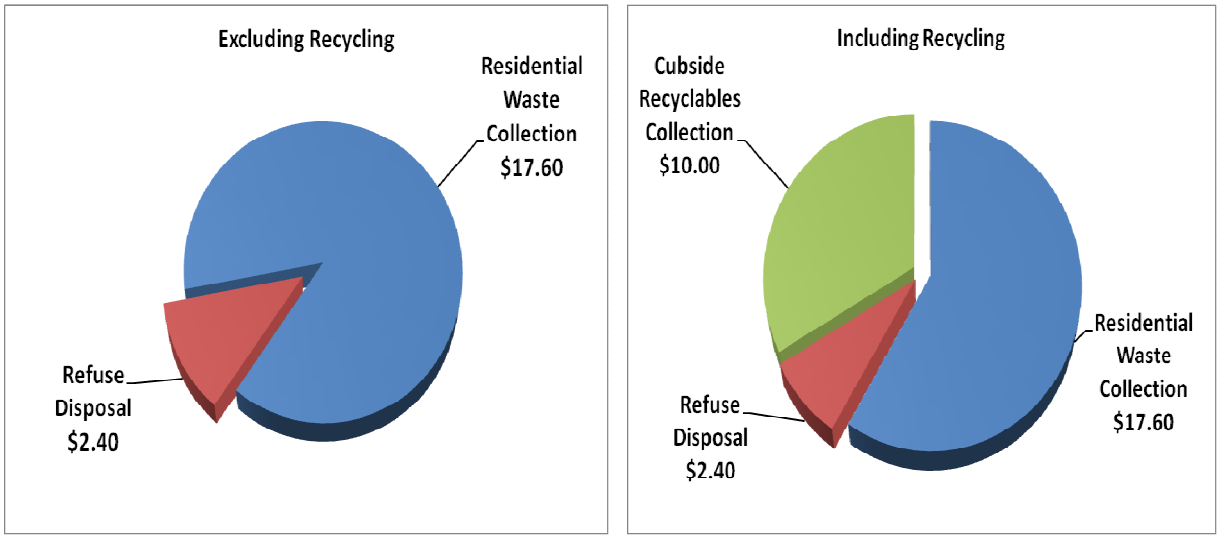
- Reducing costs
- Increased waste diversion
- Reduced community impacts

A comparative analysis of household refuse and recycling rates is provided below to help illustrate how different options result in different rates and how the City compares to other communities with different collection programs. As a general basis for this comparison it is necessary to provide some measure of how much of the collection program costs are influenced by waste disposal costs. Figure 2 was developed using information generally taken from the Needs Assessment and Baseline Assessment Survey, including:

- Population and household occupancy data suggests the average single family residential dwelling produces 1.4 tons of MSW per year.
- The current Bluff Road Landfill tipping fee of $21/ton.
- The median cost for residential garbage and recyclables collection services in the City are $20 and $10 per month, respectively, based on data from the Baseline Assessment Survey.

Based on the average household waste generation rate in combination with the median monthly refuse collection fee ($20) it is estimated that 12 percent or roughly $2.40 of the $20 per month goes toward disposal with the balance of $17.60 going toward collection and related services.

Figure 2 – Average Monthly Residential Collection Services Costs – in Lincoln

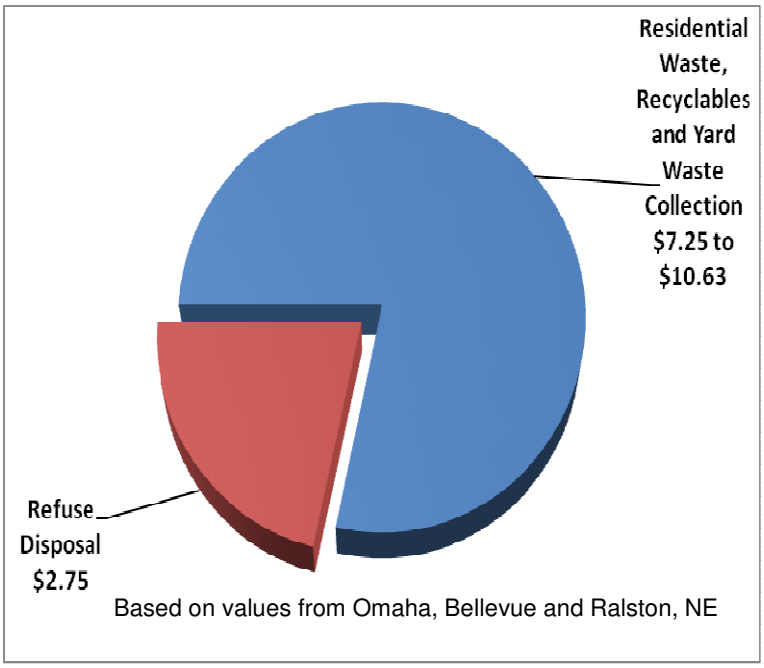


Monthly residential waste and curbside recyclables collection costs for select communities in Douglas County and Sarpy County with organized (municipally regulated/controlled) collection programs include the following:

- Omaha, NE – Less than $10/month (Municipal Contract)
- Bellevue, NE - $12.50/month (Exclusive Franchise)
- Ralston, NE - $13.38/month (Exclusive Franchise)

The rates above include weekly refuse collection, as well as weekly curbside collection of recyclables and unlimited (seasonal) yard waste collection, as well as refuse disposal. The landfill tipping fee in 2012 in Douglas County is $24.20/ton as compared to the Bluff Road Landfill tipping fee of $21.00/ton. Using an assumed similar household generation rate of 1.4 tons of MSW per year would yield a disposal cost component of $2.75 per month. Figure 3 was developed using the above monthly rates and the calculated disposal cost component.

Figure 3 – Average Monthy Residential Collection Services Costs in Other Nebraska Communities



It is likely that the biggest factors in the lower cost for collection services in other communities are: 1) the efficiencies achieved when a refuse collection firm can collect all of the households in a given geographic area; and, 2) the economy of scale associated with large volume programs (e.g., serving all households in a given community, with one vehicle fleet and one program manager).

Municipally regulated/controlled services can be further broken down to include:

- Municipality Contracts:
  - with another municipality
  - with a private firm(s)
- Municipality Franchise with a private firm(s)
- Free market (with minimum service levels)

Under the options of municipal contracts or franchises the City (as a market regulator) could more directly control such items as:

- Level of service or services, such as the following:
  - Requirements for recyclables and yard waste collection services
  - Container types, size, and appearance
- Price/Cost
- Data reporting
- Schedule and frequency of collection
- Policy enforcement

If the City were to undertake the implementation and management of such programs it would also need to anticipate added costs to manage and oversee the program, particularly if the City were to assume a role in billing and collection of fees. In the case of billing and fee collection it would likely be handled through current utility billing system, as provided for in the City Charter.

Municipal contracts are agreements whereby the hauler would provide services under specific terms and conditions and for a set duration. Under municipal contracts the municipality is generally responsible for collecting fees from service users and paying the collection firm. While there are examples of municipal contracts with other municipalities, this is more often a case of a small municipality having a contract with a larger, adjoining municipality and as such is likely not currently a viable option applicable to the Planning Area. A local example of a municipal contract with a private firm is the current arrangement used by the City of Omaha. In the case of the City of Omaha they have, through a competitive bidding process, selected a single firm to provide refuse, recyclables and unlimited yard waste collection. Another example, as noted in the technical paper on Residential Recycling and Diversion is the Metro Waste Authority's contract with a private firm to provide single stream recyclables collection services to approximately 73,000 households in select member communities (surrounding but excluding Des Moines).

Solid waste collection **franchising** can be defined as the right or license granted to one or more companies or organizations to provide collection services to specified waste/recyclables generators – such as residences or businesses - in a defined geographic area. There are two types of waste collection franchises:

- Exclusive franchises; and
- Non-exclusive franchises.

In an exclusive franchise, the right to provide collection services to a specified type of waste generator is granted to a single company or organization. In a non-exclusive franchise, this right is granted to more than one company or organization.

Cost reductions (and possibly increased service levels) are typically achieved when a community converts from a free market solid waste collection approach to solid waste collection provided through an exclusive franchise. A non-exclusive solid waste collection franchise approach may be similar to the free market approach, except that levels of service and fees are defined in the franchise license agreement. To protect all parties involved, a great deal of care is needed in the initial development of a franchise contract and ordinance.

There are numerous examples nation-wide of municipalities undertaking franchises for solid waste and recyclables collection; Bellevue and Ralston, Nebraska are simply two local examples. Under a franchise arrangement a hauler can typically offer higher levels of service to the community at lower costs, as evidenced in the following additional examples:

- **Kent County, Delaware** – In Kent County, a franchised waste collection area was established in 1994. A residence in the franchised waste collection service area received twice a week collection service at a cost of $10.48 per household per month. A similar residence in a non-franchised area of the County, received once per week collection at a cost of $21.48 per household per month.
- **Village of Skokie, Illinois** – When commercial waste collection services were franchised in 1997-1998, 88 percent of the approximately 2,200 businesses paid an average of 44 percent less for waste collection services, while 12 percent of the businesses paid an amount equal to their historical service costs. In both cases, service levels were increased to include collection of commercial recyclables. In aggregate, the new franchise program saved Skokie businesses over $1 million per year.

The general advantages and disadvantages typically associated with franchising of solid waste collection services are summarized in Table 1.

Table 1 – Pros and Cons of Franchise Collection

Pros	Cons
• Overall increase in waste collection service levels (refuse, recyclables, bulky items, yard waste). • Can be used as a mechanism to implement or enforce other waste programs (e.g. recycling, waste bans) • Reduced service costs • Reduced vehicular emissions • Reduced traffic and wear and tear on roads • Establishment of uniform levels of services (including recyclables collection services) • Provides a means through which a local government can exercise control over the location where collected waste is disposed • Franchise fees can be used to help fund non-revenue generating solid waste programs.	• Reduced market share for some haulers (could especially hurt or disadvantage small or limited services haulers) • Possible reduction of waste collection service choices • Transition away from a free market collection system can be contentious • Can limit flexibility to adapt to specific user needs (e.g., not customized to customers; may limit the types and quantities of waste collected)

In some jurisdictions, the franchise hauler directly collects the user fee from the residence or business while in others the local government collects both the user fee and an administrative fee and pays the franchise hauler. In the Bellevue and Ralston examples the fees are collected through the local water service utility.

Some cities that have established solid waste collection franchises also have municipal collection services. For example, Charlotte, North Carolina has divided its residential service area of 120,000 residences into four franchise districts. Municipal collection crews service three of these districts while a private hauler services the fourth district. Similar arrangements also exist in Phoenix, AZ and Sacramento County, CA. In these examples the municipalities competitively bids against private waste haulers for the rights to provide collection services.

The option of "**free market (with minimum service levels)**" is often associated with the implementation of a mandate that existing programs expand to include additional services – typically recycling or waste diversion. Minimum level of service mandates can also be used to standardized waste containers, frequency of collection, handling of special waste types (e.g., bulky items) and others. The technical papers on Residential Recycling and Diversion, Commercial Recycling and Diversion and to a lesser extent Construction and Demolition Material Recycling include other examples of minimum level of service programs.

Under a free market system with mandated increased levels of basic services and no significant increase in collection system efficiency it is likely that collection costs charged to residents and businesses would increase. Such cost increase(s) might be mitigated by other changes, but this would be specific to those changes.

Current licensing programs may need to be enhanced in the future if program changes are implemented to provide additional City enforcement powers.

Options Evaluation

The general issues associated with waste and recyclables collection programs are:

- Cost
- Level of service
- Diversity of existing programs versus standardized programs
- How to implement changes, if change is deemed appropriate
- Opposition to change

Consistent with the evaluation/screening criteria developed for use in the Solid Waste Plan 2040, the collection options have been further evaluated based on the considerations shown in Table 2.

Table 2 – Options Evaluation

Evaluation Criteria	Municipal Contract	Municipal Franchise	Free market (with minimum service levels)
Waste Reduction/ Diversion	Can be used to meet source reduction and recycling goals without increased costs to material generators. Has some potential to increase market options for recovered materials Could be used as a waste control mechanism for waste conversion technologies. Can be used to more effectively increase diversion of materials from landfills.	Can be used to meet source reduction and recycling goals without increased costs to material generators. Has some potential to increase market options for recovered materials Could be used as a waste control mechanism for waste conversion technologies. Has potential to be used to more effectively increase diversion of materials from landfills.	Can be used to meet source reduction and recycling goals but is anticipated to result in added costs to material generators. Not a mechanism to increase markets for recovered material or energy. Minimum service levels can help reduce quantities of materials going to landfill.
Technical Requirements	Can be used to standardize programs and services. Can be used directly to enhance other program elements. Minimum level of risk and uncertainty; proven reliable and effective in many other locations Can provide maximum flexibility when initially implemented but contract mechanism may have limits in flexibility for significant change, until contract term expires.	Can be used to standardize programs and services. Can be used directly to enhance other program elements. Minimum level of risk and uncertainty; proven reliable and effective in many other locations Can provide maximum flexibility when initially implemented but franchise mechanics may have limits in flexibility for significant change, until franchise agreement term expires.	To ensure compatibility with other programs may require changes in laws, regulations or ordinances. Historically reliable in dealing with risk and uncertainty. Historically reliable performance. May have limited flexibility to accommodate change due to differences in services and equipment associated with current collection service providers. Can provide maximum flexibility when not constrained by costs.
Environmental Impact	Can help conserve resources and reduce air emissions through increased system efficiency (e.g., reduced travel time it takes to get to the waste generator and reduced time it takes to pick up the waste generation areas.) Has some potential to reduce toxicity of waste and health and safety issues through uniform program standards.	Can help conserve resources and reduce air emissions through increased system efficiency (e.g., reduced travel time it takes to get to the residence and reduced time it takes to pick up the waste at the residence.) Has some potential to reduce toxicity of waste and health and safety issues through uniform program standards.	Does not serve as a means to conserve energy resources or reduce air emissions.
Economics	Will require the selected contractor to invest in capital for new service or services. Based on current service costs and similar services, this should reduce costs to residents and possibly businesses. Funding is assumed to occur through service provider. May provide a funding mechanism for non-revenue generating solid waste programs. Not viewed as an economic development mechanism. Would be anticipated to negatively impact some or all of the current service providers.	Will require the selected franchisee(s) to invest in capital for new service or services. Based on current service costs and similar services, this should reduce costs to residents and possibly businesses. Funding is assumed to occur through service provider. May provide a funding mechanism for non-revenue generating solid waste programs. Not viewed as an economic development mechanism. Depending upon strategy selected, it may negatively impact some or all of the current service providers.	Will only require the added capital costs for new or expanded services. Based on current service costs and similar services, implementing increased minimum levels of service will likely result in increased costs to residents and businesses. Licensing fees could be used to provide a funding mechanism for non-revenue generating solid waste programs. Not viewed as an economic development mechanism. Uncertain how increases in minimum levels of service will impact current service providers.

Evaluation Criteria	Municipal Contract	Municipal Franchise	Free market (with minimum service levels)
Implementation Viability	Will require changes in local ordinances, but not new legislation or regulatory changes (at a state or federal level). Some opposition would be anticipated to change – this could result in questions of social/political acceptability. Would likely be viewed as increasing government's role in providing collection services. Does not of necessity require additional land or added permitting. A phased in approach will likely be necessary and could take a few years to fully implement.	Will require changes in local ordinances, but not new legislation or regulatory changes (at a state or federal level). Some opposition would be anticipated to change – this could result in questions of social/political acceptability. Would likely be viewed as increasing government's role in providing collection services. Does not of necessity require additional land or added permitting. A phased in approach will likely be necessary and could take a few years to fully implement.	Will require changes in local ordinances, but not new legislation or regulatory changes (at a state or federal level) to implement additional service level changes. . Opposition would be anticipated if increases in level of service result in additional costs to households or businesses. Would not significantly increase government's role in providing collection services although some added monitoring may be required. Does not of necessity require additional land or added permitting. A phased in approach will likely be necessary to implement increases in level of service, but changes could be implemented quickly.

Relationship to Guiding Principles and Goals

The current solid waste and recyclables collection programs operate on a free market basis to provide necessary and desirable waste management services. As it relates to the Guiding Principles and Goals of the Solid Waste Plan 2040, the current and optional collection programs, described above, can be directly applicable, as further noted below.

- **Emphasize the waste management hierarchy**: Collection is a necessary part of solid waste management and diversion programs. Increased levels of recyclables collection will increase the emphasis on recycling as a preferred waste management method. Current programs are compatible with the hierarchy but contain some disincentives to increased diversion (e.g., added subscription fees for recyclables collection).
- **Encourage public/private partnerships**: The current system of waste and recyclables collection relies on subscription collection services provided by an array of private firms. To a limited extent the City currently regulates these services through ordinances and vehicle licensing. It is expected that private firms would provide the collection services associated with any change to the current collection system.
- **Ensure sufficient system capacity:** Approximately forty independent, licensed waste haulers currently provide solid waste and recyclables collection in the Planning Area. Independent waste haulers generally provide a varying menu of services to residents and businesses. Optional collection services available through various waste hauler or recycling contractors include programs such as lawn waste (grass and leaves) and collection of recyclable materials. Commercial waste collection is also provided via an open-subscription services system. There are no reporting requirements for waste and recyclables haulers; as a result, no firm data is available on the number of residents or businesses subscribing to the various levels of collection services.
- **Engage the community:** Any changes to solid waste collection or expanded recyclables collection program would need to engage the residents and businesses to increase their understanding of the benefits and changes. Changes to refuse collection services, including possibly an expanded recyclables collection program, will require education (behavior change) to encourage proper participation by residents and businesses and achieve desired outcomes.
- **Embrace sustainable principles:** Efficient collection of waste and recyclables is important to ensuring that systems, facilities and programs address economic and environmental considerations in solid waste management.

Summary

The City's charter provides the City the powers to: prescribe and enforce methods of segregation of different kinds of garbage by residents of the City; to provide for the collection of garbage and refuse either by equipment owned and operated by the City or by letting contracts; and, to divide the City into convenient garbage districts. The City Council may also fix charges for the collection of garbage to be paid by the persons, firms or corporations. Currently the City has not used these powers to undertake City operated collection systems, to contract for collection services, to create districts, or to fix charges for garbage collection.

Approximately forty independent, licensed waste haulers currently provide solid waste and recyclables collection in the Planning Area. Independent waste haulers generally provide a varying menu of services to residents and businesses. Commercial waste collection is also provided via an open-subscription services system. There are no reporting requirements for

waste and recyclables haulers; as a result, no firm data is available on the number of residents or businesses subscribing to the various levels of collection services.

As stated in LPlan 2040, *"The City policy of privately owned and operated collection of refuse and recyclables….will continue during the planning period."*

A comparison of current residential solid waste and recyclables collection rates with communities using municipal contracts and franchises indicates that Planning Area residents pay higher collection rates. The current system of independent waste haulers provide a high quality of refuse collection services and help keep Lincoln clean. The Baseline Assessment Survey indicates City residents are very satisfied with garbage collection services and satisfied with garbage collection costs. The Baseline Assessment Survey also indicates that 85 percent of respondents felt curbside collection of recyclables should be offered to every home as part of the basic garbage collection service.

Implementing municipal contracts or franchises have the potential to reduce costs to residents and businesses, reduce traffic in neighborhoods, and reduce fuel consumption. These options also provide an opportunity to implement more comprehensive and standardized residential curbside recycling City-wide with potentially no increase in cost to households.

Collection system changes will affect current waste collection firms.

Transfer Station and Processing Facilities

Overview

The Nebraska Department of Environmental Quality (NDEQ) Title 132 Integrated Solid Waste Management Regulation (Title 132) defines a solid waste management facility as a "*public or private site, location, tract of land, installation or building which has been used for the collection, source separation, storage, transportation, transfer, processing, treatment, or disposal of solid waste, and shall include solid waste disposal areas and solid waste processing facilities.*"

NDEQ's Title 132 defines solid waste processing facilities as "*any facility where solid wastes are processed, and shall include, but not be limited to solid waste compost sites, materials recovery facilities, recycling centers and solid waste transfer stations."* Each of the terms: 1) solid waste compost sites, 2) materials recovery facilities, 3) recycling centers, and 4) solid waste transfer stations are further defined in the Title 132.

By NDEQ's definition a materials recovery facility means "*any facility at which solid waste is processed for the purpose of resource recovery*" and solid waste processing means "*physically or chemically changed, temporarily stored, or salvaged prior to being transferred to a solid waste disposal area or to a secondary materials recovery facility*."

For purposes of this technical paper the term "processing facilities" will refer to only material recovery facilities and recycling centers. Recycling centers also includes recycling collection sites and drop-off sites.

NDEQ defines a solid waste transfer station as "*any site, location, tract of land, installation, or building that is used or intended to be used primarily for the purpose of transferring solid wastes that are generated off of the premises of the facility from vehicles or containers, into other vehicles or containers for transportation to a solid waste disposal area or solid waste processing facility*." In slightly simpler terms a transfer station is a facility where municipal solid waste is unloaded from smaller collection vehicles, temporarily stored, and reloaded to larger trucks (often semi-tractor/trailers) for shipment to solid waste management facility (a solid waste disposal area or solid waste processing facility).

NDEQ regulations include provisions for permitting of solid waste processing facilities, but include a variety of exceptions to these rules. Partial exemptions from NDEQ permit requirements exist for solid waste processing facilities (including composting and transfer stations) when:

- A solid waste compost site receives between 20,000 and 100,000 CY per year of lawn wastes only;
- A solid waste compost site receives less than 1,000 CY per year of material;
- A solid waste compost site receives between 20,000 and 100,000 CY per year of material that consists of lawn waste in combination with less than 1,000 CY of other materials; or
- A solid waste transfer station receives waste from vehicles other than those vehicles designed to compact solid waste.

The final partial exemption on this list is the reason none of the transfer stations in the Planning Area are required to have an NDEQ issued permit. Currently, there are regulations and licensing requirements within the Lincoln Municipal Code (LMC) related to "Recycling Processing Centers" which includes "*any premises that is maintained, used, or operated wholly or partially for recycling any recyclables that originated off the premises where the recycling occurs. Such recycling may include mechanical equipment for separating or modifying recyclable materials. Such modifying shall be limited to cutting, crushing, breaking, baling, and shredding. Recycling Processing Center includes both profit and not for profit operations.*" LMC also outlines operating requirements for salvage yards, recycling centers, recycling drop-off locations and commercial composting operations. LMC does not contain regulations on transfer stations. None of the state or local regulations requires transfer stations or processing facilities to report tonnages handled or information on type, source or destination of waste/materials received.

While transfer stations are often discussed in the context of saving money through reduced transportation cost, transfer stations are commonly developed to satisfy several purposes, not all of which are cost savings, including the following:

- Control expenses;
- Mitigate traffic at another site;
- Control the flow of waste;
- Provide user convenience (public cost savings);
- Screen waste;
- Facilitate recycling;
- Improve the control of illegal dumping;
- Help reduce air emissions; and,
- Strategically control future waste management.

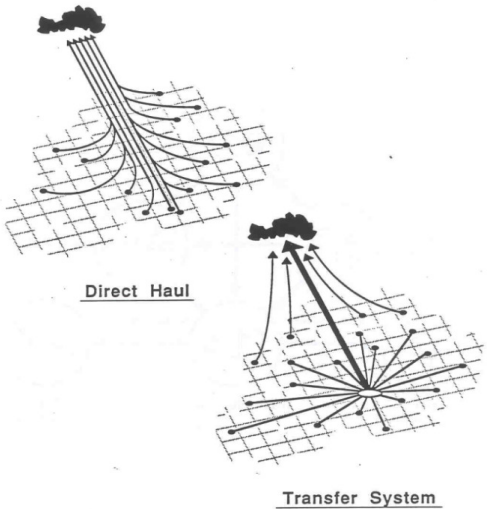


Figure 1 – Transfer Station Concept

As illustrated in Figure 1, cost savings or economic feasibility are often presented in terms of a break-even distance or cost, as a means to contrast direct (or primary) haul with secondary haul (via a transfer station).

Transfer stations and processing facilities can also be combined to provide for efficient transportation and handling of solid waste, recovered materials, processed recyclables, compostable materials, and compost products. They can also be combined operationally to share staff, equipment, building space and to allow materials delivered to a transfer station as waste to be diverted from disposal.

Nebraska's Integrated Solid Waste Management Act (Nebraska Revised Statutes Section 13-2001 to 2043) Part ***13-2023 - County, municipality, or agency; regulations authorized; limitations; noncompliance fee*** states:

> *"A county, municipality, or agency may, by ordinance or resolution, adopt regulations governing collection, source separation, storage, transportation, transfer, processing,*

treatment, and disposal of solid waste within its solid waste jurisdiction area as necessary to protect the public health and welfare and the environment."

The LPlan 2040 also says, relative to the City's existing North 48th Street Construction and Demolition Waste Landfill that "*while this landfill should be completed and closed, the N 48th Street transfer station and recycling areas are scheduled to remain*."

If a permanent household hazardous waste (HHW) facility were to be constructed it would also be anticipated to fall under the definition of a solid waste processing facility. The concept of a permanent HHW facility is discussed in the technical paper on Household Hazardous & Conditionally-Exempt Small Quantity Generator (Small Business) Hazardous Waste; as such, no further discussion of such a facility as a processing facility is included in this technical paper.

Current Programs

A recent Directory of Waste Processing & Disposal Sites 2012 by the Waste Business Journal suggests that there are approximately 3,300 transfer stations and over 1,500 material recovery facilities nationwide.

Solid waste processing facilities in Lancaster County include transfer stations, material recovery facilities (recycling processing centers), recycling centers and composting operations. Collected and transported materials are directed to these various waste handling and management facilities based on convenience, cost, vehicle size and material characteristics.

As further described in the Needs Assessment (2012), there are four transfer stations operating within Lancaster County. Based on the exceptions listed above, none of these facilities require a permit under NDEQ or LMC regulations.

North 48th Street Transfer Station - The City's small vehicle transfer station is located at 5101 North 48th Street and is used by cars, pickups, trailers, and other small vehicles that have specified maximum cargo box dimensions. Based on City records, this facility accepted an average of approximately 7,800 tons per year of solid waste over the last five years. This facility also accepts and manages lawn waste, brush, appliances, metals and tires that are sorted out and placed in designated storage areas on the site for additional processing or recycling. Waste oil and lead-acid batteries are also accepted for recycling at this facility. The number of vehicles using the transfer station has averaged approximately 25,000 vehicles per year over the past 5 years.

Bennet Refuse Transfer Station - The Village of Bennet operates a transfer station that serves community residents and area farmers that pay an annual permit fee to use the facility. The Village also operates a lawn waste and brush drop-off area at the transfer station. The transfer station site also serves as a multi-material drop-off site for recyclables.

Davey Refuse Transfer Station - The Village of Davey operates a transfer station that serves community residents and area farmers that pay an annual permit fee to use the facility. The transfer station site also serves as a multi-material drop-off site for recyclables as well as for brush and lawn waste.

Panama Transfer Station - The Village of Panama operates a transfer station that serves residents and area farmers that pay an annual permit fee to use the facility. The Village also operates a lawn waste and brush drop-off area at its transfer station. The transfer station site also serves as a multi-material drop-off site for recyclables.

For the convenience of citizens, the City operates a network of 29 multi-material recycling (drop-off) centers and 4 newspaper-only recycling (drop-off) centers in the Planning Area; most are open 24-hours per day. Two private recycling processing centers also operate multi-material recycling drop-off sites in the City. One village, (Hallam), operates its own recycling drop-off site. All total there are 36 drop-off sites; 27 are located in the City, and nine of these are in areas of the County outside of the City. The City contracts with a private hauler to collect and deliver the deposited materials from these recycling centers to a recycling processing center.

There are eight private buyback center locations in the City for metal cans and scrap metal; two of the centers only accept metal cans. Two private firms have facilities located in the Planning Area, and handle (process) large volumes of scrap from the Planning Area, including automobile and demolition scrap metals.

Three private materials recovery facilities (recycling processing centers) operate in the City. They accept recyclables from residential and business customers, and sort and process them to meet market specifications. All the facilities have warehouses, which are used for sorting and baling recyclables. These facilities process a wide variety of paper, plastics and metals for shipment to various markets and may offer recycling for a large part of eastern Nebraska and western Iowa. Some businesses that generate large quantities of cardboard ship it directly to processing facilities outside the Planning Area.

Generation and Diversion

Based on City records, the North 48th Street Transfer Station accepted an average of approximately 7,800 tons per year (approximately 20 to 25 tons per day) of solid waste over the last five years. The number of vehicles using the transfer station has averaged approximately 25,000 vehicles per year (approximately 75 per day) over the past 5 years. As such, the transfer station also serves a number of the purposes stated above, including the following:

- Mitigate traffic at another site (specifically the Bluff Road Landfill);
- Provide user convenience (public cost savings);
- Screen waste;
- Facilitate recycling;
- Improve the control of illegal dumping; and,
- Strategically control future waste management.

No data was available to quantify the tonnage or traffic handled at the other three rural transfer stations in the County.

Since FY1990-1991, the recycling centers managed by the City have collected 114,163 tons of recyclables. Table 1 shows the breakdown by material type and total tonnages of materials collected at recycling centers over the past 11 years.

Table 1 –Tons of Materials Recycled at Public Drop-off Sites

F.Y.	Newsprint	Containers				Paperboard	Mixed	Total
		Aluminum	PET & HDPE	Glass	Metals	& OCC	Paper	Tons
00-01	3,317	27	178	577	117	732	1,239	6,187
01-02	3,222	25	176	569	118	696	1,236	6,042
02-03	3,219	32	190	594	133	738	1,349	6,255
03-04	3,154	35	200	613	123	739	1,436	6,300
04-05	3,161	36	230	628	126	865	1,511	6,557
05-06	3,162	39	228	675	129	875	1,573	6,681
06-07	3,210	43	281	726	122	966	1,727	7,075
07-08	3,101	51	336	853	127	1,138	1,831	7,437
08-09	2,474	64	396	928	125	1,180	1,641	6,808
09-10	2,155	68	413	978	128	1,210	1,449	6,401
10-11	1,932	59	392	940	120	1,209	1,370	6,022

An annual City survey of recyclers provides some data on the quantity of residential and commercial recyclables handled by private-sector recyclers and processing facilities. Table 2 summarizes the reported data since 2000 for various recycled materials (excluding quantities in Table 1, which are also processed at these same facilities). The quantities originally reported by these processing facilities included metals associated with auto scrap, as well as salvage and demolition activities; quantities of metals in Table 2 were adjusted in an effort to reflect only metals from commercial and residential recycling activities. The quantities in Table 2 exclude materials such as tires, oil, wood pallets, electronics and other miscellaneous materials. The totals in Table 2 also exclude recycled concrete and asphalt materials (construction and demolition waste recycling).

Table 2 – Tons of Materials Recycled (Reported by Private-Sector)

Calendar Year	Metals [1]	Papers	Cardboard	Glass	Plastics	Totals
2000	5,967	10,095	12,412	1,899	92	30,465
2001	3,205	9,891	11,260	2,931	74	27,361
2002	5,623	11,343	13,690	2,665	281	33,603
2003	5,188	18,937	11,495	1,633	513	37,766
2004	7,962	14,108	14,464	1,702	276	38,512
2005	9,505	20,277	13,098	1,183	342	44,405
2006	7,434	12,262	20,931	1,696	461	42,784
2007	7,777	16,962	21,673	1,542	399	48,353
2008	9,716	9,227	14,317	316	449	34,025
2009	7,247	9,638	16,017	327	618	33,847
2010	9,815	14,252	16,750	1,874	1,308	43,999
2011	9,710	14,020	17,298	834	1,249	43,111

Notes:

(1) Actual quantities of reported ferrous metals have been adjusted to reflect 3 percent of the waste stream to correspond to the percentages of metals in NDEQ statewide waste composition study. Adjustments were made because the values reported to the City include items such as scrap automobiles and metals from salvage and demolition operations.

The average amount of materials reported to be managed, for recycling, by these private sector processing facilities since 2000 has been approximately 38,000 tons per year. These quantities have not been verified and it is not known what amounts come from subscription recycling service, buybacks, or other internal corporate recycling programs. Quantities of recyclables imported to these facilities are also unknown.

Program (Facility/System) Options

While this document presents economic and non-economic considerations, general approaches to evaluation, and rules-of thumb guidance in decision making related to transfer station it is not intended to be a substitute for a more formal feasibility evaluation. The outline of variables related to transfer stations presented in this document could serve as the basis for a site specific and more refined analysis of need and feasibility. Additionally, until further decisions are made relative to potential expansion of existing recycling programs it is not possible to fully address the need for additional or expanded processing facilities (material recovery facilities and recycling centers). Key options discussed in this technical paper include:

- Additional Transfer Station(s)
- Processing Capacity (to Meet Future Program Needs)
- Co-Located Facility(s)

For purposes of this technical paper, the flow of waste to a transfer station or processing facility is anticipated to occur principally through pricing structures as opposed to contracts, licensing requirements, mandates or other flow control mechanisms.

Transfer Station(s)

Beyond the City's current small vehicle transfer station at the North 48th Street site it is conceivable that an additional transfer station(s) could be constructed in the Planning Area for any of the purposes listed above, including economic benefits and cost savings. The cost savings typically associated with transfer stations are a result of combining the loads of several individual waste collection trucks into a single shipment thus saving labor and fuel and allowing collection vehicles to more quickly return to collection routes.

In USEPA's Waste Transfer Stations: A Manual for Decision-Making (EPA530-D-01-005 (Draft, February 2001)) it states "*Although cost-effectiveness will vary, transfer stations generally become economically viable when the hauling distance to the disposal facility is greater than 15 to 20 miles.*" Other publications might suggest that economic feasibility starts at one-way haul distances closer to 20 to 30 miles. These rule-of-thumb conclusions are obviously sensitive to a large number of assumptions, particularly haul distance, travel speed and time, payloads, the physical features and operating practices of a particular transfer station, and efficient equipment utilization.

As noted under the discussion of greenhouse gases (GHG) in the Needs Assessment (2012), the distance from the Bluff Road Landfill to the geographic center of the City is approximately 24 miles. Using either of the two rules-of-thumb distances (above) and the distance to the geographic center of the city would suggest that a transfer station located in the southern third of the City could under favorable economic conditions attract somewhere between one-quarter and one-half of the waste generated in the Planning Area. Such a

facility could also be located to correspond to the tiered growth pattern in the LPlan 2040 that is forecasted to be mostly to the south and east in the near term.

Using the average daily tonnage delivered to the Bluff Road Landfill, the concept of a transfer station accepting one-quarter to one-half of the waste tonnage would be equivalent to a transfer station sized to handle 200 to 400 tons per day, at current generation rates. This compares with the approximately 20 to 25 tons per day currently being handled at the North 48th Street Transfer Station; it is important to note that commercial refuse trucks are not allowed to use the North 48th Street Transfer Station.

As basis for further considerations the following is a summary of key issues that would need to be addressed in design and implementation of a new transfer station(s). A further breakdown of topics under each of these issues is included in Appendix 1.

- Users and Vehicles
- Wastes Handling
- Traffic Patterns
- Site
- Funding
- Schedule
- Capacity
- Technology
- Payloads
- Equipment
- Maintenance
- Personnel
- Operations
- Building and Safety Codes
- Environmental Concerns
- Support Facilities
- Construction

Before multi-million dollar commitments are made to construct and operatea transfer station, it is may be appropriate to perform a detailed analysis to confirm such rules-of-thumbs and provide support to questions which will be raised in the siting process and the political, social and possibly regulatory approval processes.

Processing Capacity

While NDEQ defines solid waste processing facilities in very broad terms, this technical paper focuses principally on **material recovery facilities** and **recycling centers**, as defined above. Material recovery facilities (MRFs -pronounced "murfs") sort recyclable materials to market specifications and then process them via shredding, crushing, and compaction (baling) techniques for shipment to appropriate secondary processors, end-users or markets. MRFs are generally described in the solid waste industry as either “Clean-MRFs” or “Dirty-MRFs”.

The term “Dirty-MRF” is used to describe a facility that processes raw waste or waste with high concentrations of recyclables with the intent of separating the recyclables from the waste. Such processing may involve varying degrees of mechanical separations such as screens and magnets, but often relies heavily on sorting by humans. Typically the more mechanized the system the lower the recovery rate for recyclables (on the basis of tons potentially recovered versus actually recovered). The original argument for Dirty-MRFs is that it allowed all potentially recoverable materials in the waste stream to be captured. Dirty-MRFs were widely touted in the early late 1980’s and early 1990’s but have generally declined in use due to several factors including: cost of construction, cost of operation, level

of recovery (post-disposal), difficulty in siting, and health and safety considerations for workers. One of the three processing facilities in Lincoln recently began sorting recyclables from select loads of (post disposal) waste from outdoor events and could be considered a form of a Dirty-MRF.

The term "Clean-MRF" is used to describe a facility that processes mixed or commingled recyclable materials collected from residences or commercial operations. Clean-MRFs handle recyclables which often contain less than 10 percent contaminants (waste materials). Clean-MRFs also rely on both mechanical and manual separation techniques, but are considered more efficient (than Dirty-MRFs) because they cost less to construct, cost less on a dollar per ton basis to operate, may be easier to site, and potentially pose less health and safety concerns for workers.

As discussed further in the technical papers on Residential Recycling and Diversion and Commercial Recycling and Diversion, the two most common forms of recyclables collection are single stream and dual (or multi-) stream. In the dual (or multi-) stream concept the resident separates materials into categories such as paper and containers, or by most distinct categories (e.g., paper would be separated by old newspaper (ONP), mixed paper, old corrugated containers (OCC), etc.); the goal of such programs is to reduce post collection processing costs and possible cross-contamination. In single stream programs all acceptable recyclable materials are placed in a common container(s) and sorted at a remote processing center. Single stream programs are often advocated because of ease and efficiency of collection, but are questioned in terms of optimum diversion because of potential for cross-contamination. Currently, there does appear to be a national trend toward more single stream programs.

Recycling centers can be staffed or un-staffed; however, staffing significantly increases costs – most drop-off sites in the US, including those in the Planning Area, are un-staffed. A key issue with recycling drop-off sites is the quality of materials deposited; the greater the failure to comply with establish program requirements the higher the cost, both in terms of contaminants and processing.

Waste exchanges and targeted materials programs are a form of recycling centers that generally focus on non-traditional materials that are more difficult to collect and/or recycle. Keep Nebraska Beautiful currently operates the Nebraska Materials Exchange Program, which focuses more on schools and businesses than at the residential services. Expanding material reuse centers/waste exchanges (public/private partnerships) have generally been discussed in technical papers related to Source Reduction. Facilities that target and process hard-to-recycle items, such as books, textiles, shoes, cooking oil, etc., are an advanced component of diversion programs. Targeting greater diversion of foods and fibers (i.e., organics) is further described and evaluated in the Organics Waste Diversion (Composting) paper.

As noted in technical papers related to recycling and composting, the capacity of existing facilities to process significantly larger volumes of materials would need to be evaluated if a significant increase of recyclables resulted from an expanded recycling program(s). Additionally, not all existing facilities may benefit from an expanded program.

Co-Located Facility(s)

Conceptually, co-locating a processing facility(s) with a transfer station is an option that could further enhance the recycling opportunities, increase tonnage diversion, and provide customers a one-stop site for most of their solid waste management needs. Conceptually, it can provide shared benefits including storage and transfer of commingled recyclables, select processing of concentrated loads of commercial waste, and an optional location(s) for citizen recyclables drop-off area. From a facility size perspective a shared/co-located facility can help to mitigate some traffic and unloading requirements thus reduce the overall processing facility and transfer station size requirements. Many transfer stations, similar to the City's North 48th Street Transfer Station include some processing and diversion opportunities, but not necessarily all of the attributes of a MRF-type facility.

If it were determined that an additional transfer station was needed or justified and additional processing capacity were required there are additional matters that would need to be addressed before a co-located facility(s) could be considered. Among the added considerations are:

- Ownership and operation
- Siting
- Funding
- User costs and inducements
- Synergy with landfill and other waste collection and diversion programs
- Other implementation issues

Any options for a co-located facility would need to consider the guiding principle identified in the LPlan2040, which states: "The City policy of privately owned and operated collection of refuse and recyclables coupled with public ownership, operation and financing of disposal and selected integrated solid waste management services will continue during the planning period." As facilities currently exist in the Planning Area, the City owns and operates the North 48th Street Transfer Station (and ancillary diversion programs) and private industry has taken on the role of ownership and operation of the recyclables processing facilities.

Options Evaluation

There are a wide array of issue and options associated with solid waste transfer station(s), processing facility(s) or co-located facilities. It is not always possible to compare each option to the other. Consistent with the evaluation criteria developed for use in the Solid Waste Plan 2040, the transfer station and processing facility options have been further evaluated based on the considerations shown in the following table.

Options related to the status quo are not further evaluated in this table. As noted above, the capacity of existing facilities to process significantly larger volumes of materials would need to be evaluated if a significant increase of recyclables resulted from an expanded recycling program(s). Additional discussion related to the various options may also be included in other technical papers, including those of Markets (for recyclable materials) and Funding Options. Key issues that will need to be addressed with any of the options include the following:

- Need for such a facility (economic or other justification)
- Ownership and operation (including consideration of LPlan 2040 Guiding Principles)
- Siting (opposition to siting)
- Funding
- User costs and inducements (including incentives and market implications for recovered materials)
- Synergy with landfill and other waste collection and diversion programs
- Other implementation issues

The Solid Waste Plan 2040 may also consider the need to implement a transfer station(s) and processing facility(s) to capture and utilize the value of solid waste, to provide an integrated resource conservation and management system, and to ensure safe, sound, environmentally responsible waste management practices. Additional evaluation criteria may include the reduction in GHG and other air emissions and cost effectively transporting waste and materials generated and managed within the Planning Area.

Evaluation Criteria	Transfer Station(s)	Processing Facility Capacity	Co-Located Facilities
Waste Reduction/ Diversion	Transfer stations are not waste reduction/diversion facilities but provisions for reduction and diversion can be included or integrated into such facilities which can contribute toward source reduction and/or recycling/diversion goals. Transfer stations can help minimize waste exports or can be used as a mechanism to transport material to more distant disposal sites. They do not minimize a community's dependence on landfills.	Adequate processing facility capacity is necessary to ensure that collected recyclables are diverted from disposal. The methods and techniques used at a processing facility must be configured to maximize the marketing of recovered materials, by proper processing and preparation of materials to meet market specifications. Processing facilities help minimize dependence on landfilling and contribute to recycling/diversion goals by maximizing recyclables diversion.	Co-locating a transfer station and processing facility can create additional opportunities for waste recycling and landfill diversion by allowing an additional opportunity to capture recyclables that may be delivered in the waste stream and as such can help contribute toward source reduction and/or recycling/diversion goals. Co-locating can help minimize waste exports or can be used as a mechanism to efficiently transport material to more distant disposal sites and markets. Transfer stations can help minimize waste exports or can be used as a mechanism to transport material to more distant disposal sites. They do not minimize a community's dependence on landfills.
Technical Requirements	Transfer stations should be compatible with other program elements provided they are used to effectively manage waste and achieve the objectives of the Solid Waste Plan 2040. The level of risk associated with transfer stations is relatively low provided the economic evaluation and siting consider the needs of the waste collection community. Some risk for opposition exists with siting of any new solid waste management facility. Transfer stations are a reliable and proven technique for traffic mitigation, cost savings, and emissions reduction. Properly configured, transfer stations also provide for flexibility in the overall operations of solid waste program.	The capacity of existing processing facilities to process significantly larger volumes of materials would need to be evaluated if a significant increase of recyclables resulted from an expanded recycling program(s). Material recovery facilities and recycling centers are considered compatible with other program elements and represent a low level of risk and uncertainty. It is unclear how an expanded recycling program will affect existing material recovery facilities and recycling drop-off sites. Material recovery facilities and recycling centers are generally considered highly reliable and contain the necessary level of redundancy and redundancy to respond to market needs.	Co-located facilities could be used to meet any short-falls in existing capacity requirements. While issues of ownership, operation, user fees, and similar matters would need to be addressed, co-located transfer station and processing facility functions are theoretically compatible with other program elements and would provide program flexibility, redundancy and manageable levels of risk.
Environmental Impact	Transfer stations can help conserve energy resources by reducing fuel consumption associated with transporting waste from collection routes to solid waste management facilities; this also reduces air emissions. By using a transfer station for waste screening it can reduce toxicity of waste delivered to the landfill. Transfer stations typically provide safer unloading operations than do landfills because all waste is unloaded inside of a building and typically on a concrete floor.	Processing facilities are used to process recyclables and as such conserve both material and energy resources.	Co-located facilities, if appropriate, would help conserve resources (material and energy) by reducing transportation costs and could potentially be used to increase resource conservation by increasing material recycling; this also reduces air emissions. By using a transfer stations for waste screening it can reduce toxicity of waste delivered to the landfill. Transfer stations typically provide safer unloading operations than do landfills because all waste is unloaded inside of a building and typically on a concrete floor.

Evaluation Criteria	Transfer Station(s)	Processing Facility Capacity	Co-Located Facilities
Economics	Transfer station(s) will require a significant capital investment for the siting, design, permitting, and construction. These costs would generally be recovered though user fees. If feasible from strictly a cost savings perspective it should not represent an increased cost to residents or business. There are a variety of mechanisms that could be used to fund such a facility including revenue bonds and others as more fully discussed in the technical paper on Funding. Transfer stations are not considered as a tool for economic development, but to the extent that they keep solid waste management fees low they may be viewed as supporting economic development opportunities.	Increasing processing facility capacity, if required, would likely involve a significant capital investment for the siting, design, permitting, and construction. These costs would generally be recovered though charges for material processing and through revenues from the sale of recovered materials. It is unclear whether increasing processing facility capacity (if required) would represent an increased cost to residents or business. There are a variety of mechanisms that could be used to fund such a facility. Based on historic practices it is assumed that funding would be by private industry. See the technical paper on Funding for discussion of other funding options, which are more generally applicable to governmental funding. Processing facility(s) and processing capacity are not considered as a tool for economic development.	Co-located facilities will require a significant capital investment for the siting, design, permitting, and construction. These costs would generally be recovered through a variety of mechanisms including user fees, processing fees and revenues from the sale of recovered materials. If a transfer station(s) is feasible from strictly a cost savings perspective it should not represent an increased cost to residents or business. It is unclear whether increasing processing facility capacity (if required) would represent an increased cost to residents or business. There are a variety of mechanisms that could be used to fund such a facility. See the technical paper on Funding for discussion of funding options. A key issue in funding will be ownership of the facility. A co-located transfer station(s) and processing facility are not considered as a tool for economic development.
Implementation Viability	Implementation of a transfer station(s) will not require legislative or regulatory changes, but will require permitting and approvals. Implementing a facility(s) will likely require land acquisition and may involve a siting process. The potential exists for the siting of such a facility to face social/political acceptability challenges. Factors related to schedule would need to be addressed as part of a feasibility analysis and with consideration of the siting and permitting process.	Implementation of additional processing capacity, if required, will not require legislative or regulatory changes, but may require permitting and approvals. Implementing a new facility(s) will likely require land acquisition and may involve a siting process. The potential exists for the siting of such a facility to face social/political acceptability challenges. Challenges may not be significant for a clean-MRF; these challenges may be more significant for a dirty-MRF. Factors related to schedule would need to be addressed as part of the determination of the needs for a new facility and with consideration of the siting and permitting process.	Implementation of co-located facilities will not require legislative or regulatory changes, but will require permitting and approvals. Implementing such a facility will likely require land acquisition and may involve a siting process. The potential exists for the siting of such a facility to face social/political acceptability challenges, particularly aspects involving waste handling. Factors related to schedule would need to be addressed as part of a feasibility analysis and with consideration of the siting and permitting process.

Relationship to Guiding Principles and Goals

As it relates to the Guiding Principles and Goals of the Solid Waste Plan 2040, the existing transfer station and processing facilities, as well as potential additional facility(s) would be applicable as further noted below:

- **Emphasize the waste management hierarchy**: Both transfer station(s) and processing facilities can help process waste and materials to recover commercially viable material for making new products. Transfer stations can also be used to effectively manage residuals (waste) in an environmentally sound manner.
- **Encourage public/private partnerships**: Currently the City's role in providing the existing transfer station and private industry's role in providing processing facilities is also reflected in the guiding principles in the LPlan 2040 which states "*The City policy of privately owned and operated collection of refuse and recyclables coupled with public ownership, operation and financing of disposal … will continue during the planning period*." The City's role in providing multi-material recycling drop-off sites was a outcome of the previous planning process.
- **Ensure system capacity**: Additional transfer station(s) may be appropriate to keep MSW transportation costs low as the City grows to the south and east. A transfer station(s) can also be used to control the flow of waste within the Planning Area to ensure effective utilization of existing disposal capacity. Available processing capacity may need to be evaluated as part of any program that significantly expands recycling diversion rates (residential or commercial) to determine the need for additional processing capacity and facilities. It may be appropriate to further evaluate the need for additional transfer station(s) to reduce air emissions, cost-effectively transport materials generated and managed within the Planning Area and as part of an enhancement of current diversion programs.
- **Engage the community:** Public education to engage the community will be important to sustaining existing diversion programs and to implement any new management facilities. Any effort to implement a new transfer station(s) and possibly co-located or added processing facilities will create additional opportunities for public comment. In terms of siting and obtaining approval of a transfer station(s) an informed public will be important to understanding why approval of such a facility is necessary. Stakeholder input may also be necessary in the siting and design configuration of a new waste handling facility.
- **Embrace sustainable principles:** It is anticipated that any new waste transfer or processing facilities will need to consider economic, environmental, social, technological and political factors. Systems that contribute to maximizing waste reduction and materials recovery, reduce fuel consumption, reduce air emissions and help maintain low costs solid waste services are considered to be consistent with sustainable principles.

Summary

Both transfer stations and processing facilities fall under the NDEQ Title 132 definition of solid waste management facility, which includes both public and private facilities. Solid waste processing facilities currently in use in Lancaster County include transfer stations, material recovery facilities (recycling processing centers), recycling centers, drop-off sites and

composting operations. Collected and transported materials are directed to these various waste handling and management facilities based on convenience, cost, vehicle size and material characteristics. None of the state or local regulations requires transfer stations or processing facilities to report tonnages handled or information on type, source or destination of waste/materials received.

While transfer stations are often discussed in the context of saving money through reduced transportation costs, transfer stations are commonly developed to satisfy several purposes, not all of which are cost savings, including the following:

- Control expenses;
- Mitigate traffic at another site;
- Control the flow of waste;
- Provide user convenience (public cost savings);
- Screen waste;
- Facilitate recycling;
- Improve the control of illegal dumping;
- Help reduce air emissions; and,
- Strategically control future waste management.

Using general rules-of-thumb related to haul distances would suggest that a transfer station(s) located in the southern third of the City could under favorable economic conditions attract somewhere between one-quarter and one-half of the waste generated in the Planning Area. Such a facility could also be located to correspond to the tiered growth pattern in the LPlan 2040 that is forecasted to be mostly to the south and east in the near term. Before multi-million dollar commitments are made to construct and operate a transfer station, it is appropriate to perform a detailed analysis to confirm such rules-of-thumbs and provide support to questions which will be raised in the siting process and the political, social and possibly regulatory approval processes.

Additionally, until further decisions are made relative to potential expansion of existing recycling programs it is not possible to fully address the need for additional or expanded processing facilities (material recovery facilities and recycling centers).

Conceptually, co-locating a processing facility(s) with a transfer station is an option that could further enhance the recycling opportunities, increase tonnage diversion, and provide customers a one-stop site for most of their solid waste management needs. Transfer stations and processing facilities can also be combined to provide for efficient transportation and handling of solid waste, recovered materials, processed recyclables, compostable materials, and compost products. They can also be combined operationally to share staff, equipment, building space and to allow materials delivered to a transfer station as waste to be diverted from disposal.

Any options for a co-located facility would need to consider the fact that as facilities currently exist in the Planning Area, the City owns and operates the North 48th Street Transfer Station (and ancillary diversion programs) and private industry has taken on the role of ownership and operation of the recycling processing facilities.

MAKING THE RIGHT DECISIONS UP FRONT: A CHECKLIST FOR SUCCESSFUL PLANNING AND DESIGN OF TRANSFER FACILITIES

by

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MAKING THE RIGHT DECISIONS UP FRONT: A CHECKLIST FOR SUCCESSFUL PLANNING AND DESIGN OF TRANSFER FACILITIES

Design and Implementation - Expanded List

- Users and Vehicles
  - acceptable vehicles
  - vehicle volumes
  - vehicle types
  - weighing and recordkeeping requirements
  - fee assessment/billing requirements

- Wastes Handling
  - waste screening/acceptable waste
  - bulky waste, metals, small load handling requirements
  - recycling/waste sorting requirements
  - buyback and recyclables drop-off provisions
  - household hazardous provisions
  - other (e.g. compost)

- Traffic Patterns
  - queuing on-site/off-site - acceptable limits
  - interior/exterior maneuvering of waste vehicles
  - roadway geometrics (turning radii, lane widths)
  - traffic patterns/control signage (backing, crossing)

- Site
  - available land
  - site peculiarities
  - available utilities
  - drainage and erosion control
  - landscaping/visual screening/buffers
  - site security
  - public opinion
  - right-of-ways, easements

- Funding
  - available funds
  - procurement methods
  - procurement restrictions

- Schedule
  - implementation schedule (overall)
  - advertisement to award
  - seasonal restrictions
  - construction critical path
  - methods to accelerate
  - long lead items
  - code or review/approvals

- Capacity
  - waste storage capacity/method
  - waste throughput capacity (in and out)
  - technology constraints
  - transfer vehicle constraints

- Technology
  - operational simplicity
  - efficient operation/minimize staffing
  - weak link (mechanical/electrical)
  - loading and transfer equipment
  - redundancy/stand-by
  - open-top loading
  - compactors
  - balers
  - other techniques

- Payloads
  - optimizing payloads
  - legal roadway limits
  - load-out scales/in-place weighing

- Equipment
  - support equipment
  - transfer vehicle configuration
  - equipment compatibility
  - equipment procurement options

- Maintenance
  - site and facility maintenance
  - wear resistance
  - preventative maintenance
  - equipment maintenance

APPENDIX 1

- Personnel
  - parking employees/equipment
  - employee areas (showers, lockers, lunchrooms)
  - training, safety, and health
  - visitors

- Operations
  - design for continuous service
  - standard operating practices
  - hours of operation
  - interface with landfill or resource recovery facility
  - emergency operating procedures

- Building and Safety Codes
  - building codes and standards
  - zoning/permitting/environmental review
  - fire prevention and protection
  - user safety

- Environmental Concerns
  - dust and odor
  - noise
  - vehicle emissions
  - traffic
  - litter
  - rodents/vectors
  - wastewater
  - special wastes

- Support Facilities
  - equipment fueling, maintenance, washing
  - administrative areas
  - user convenience areas
  - storage
  - scales and scalehouses

- Construction
  - architectural aesthetics
  - local construction practices
  - materials of construction (non-combustible)
  - site security
  - testing and construction quality control

Markets (for recovered/recycled materials)

Overview

The purpose of this document is to provide an overview and assessment of markets, current market prices and gaps in market for potentially recovered or diverted materials. The materials addressed are those, which are currently being recovered and those for which markets are available or may potentially be available in the future. The marketable energy from waste or landfill gas combustion, the diverted byproducts from construction and demolition activities, and materials diverted through source reduction programs are not addressed in this technical paper. The materials discussed in this technical include the following:

- Papers:
  - Old newspaper,
  - Old corrugated containers,
  - High grade office papers,
  - Mixed papers,
- Glass,
- Metals:
  - Ferrous metal,
  - Nonferrous,
- Plastics:
  - PET,
  - HDPE,
  - Other Plastics
- Compostables:
  - Yard waste compost,
  - Wood mulch, and
  - Food waste compost.

These materials have both a resource value and resale/market value. Additional market analysis information is contained in Appendix 1. This list is not intended to be exhaustive and it is acknowledged that based on market volatility, this technical paper should be treated as a snap shot in time of current market status. Pricing for various recyclables/recovered materials are tracked on a regional and national basis similar to other commodities that are bought and sold.

For a material to be considered 100 percent recyclable, it must be able to meet the requirements of the "closed loop" cycle. The closed loop cycle requires that the material can be completely utilized in a manufacturing process and that the material manufactured is also recyclable. Many materials that can be recovered or removed from the waste stream do not conform to the closed loop description. For example, HDPE bottles can be reprocessed into secondary products such as plastic lumber; however, these secondary products are not currently recoverable or recyclable and, therefore, may be ultimately disposed or used in a non-recoverable manner. This is generally considered delayed disposal or landfill diversion. Glass and aluminum containers for drink products can in theory be endlessly recycled into new

containers for the same use and, therefore would meet the requirements of a closed loop cycle. The closed loop cycle is the ideal system for recovery and reuse programs, because materials are truly and permanently diverted from final landfill disposal. Much of Lincoln's glass is sent to Owens Corning in Kansas City which uses it to make fiberglass insulation. This means that glass currently recycled in the City would not be part of a closed loop system.

Educating consumers to choose products that are recycled or are packaged in recycled containers, to purchase reusable items and refillable containers and to purchase bulk items will help promote markets.

Marketing recovered materials is affected by the volume of material recovered (fluctuating supply), market demand (consistent end markets) and consumer demand. This leads to volatile markets and price volatility. In addition, in the production of many products, raw materials are frequently more abundant, less expensive, of higher quality and available in more consistent quantities. Many of the recovered materials must be reprocessed to make them suitable for remanufacturing/end-markets.

Materials such as papers, glass, metals and plastics recovered in the Planning Area are sent to brokers, which aggregate and ship materials to regional, national or international end users. As a result, the revenue from these recycled materials is reduced by the costs for transportation and possibly by added processing and handling costs. The information on pricing in this technical paper is based on the delivery of a market grade material, excluding transportation/shipping costs.

Current Programs

Appendix 1 provides information on existing markets, historic trends (including pricing) and gaps in markets for potentially recovered or diverted materials. Three private recycling processing centers operate in the City and accept recyclables from residential and business customers, and sort and process them to meet market specifications. There are eight buyback center locations in the City for metal cans and scrap metal; two of the centers only accept metal cans. Two firms have facilities located in the Planning Area, and handle large volumes of scrap, including automobile and demolition scrap metals. Their local facilities process and prepare material for shipment to markets.

Some businesses that generate large quantities of cardboard ship it directly to processors or markets outside the Planning Area.

There is a local firm that manufactures countertops and floor tiles that uses post-consumer crushed glass and porcelain from local businesses. This firm does not currently have the capacity to utilize a significant amount of the glass that might be recovered from the Planning Area. There is also a local foundry that uses recycled steel to produce steel building materials and manhole covers.

Generation and Diversion

Since FY1990-1991, the recycling center drop-off facilities managed by the City have collected 114,163 tons of recyclables. The diversion rate through these facilities peaked at 7,437 tons per year in FY2007-2008 and has declined since that time. Table 1 – Tons of Materials

Recycled at Public Drop-off Sites shows the breakdown in material and overall tonnages of materials collected at drop-off sites over the past 11 years.

Table 1 –Tons of Materials Recycled at Public Drop-off Sites

F.Y.	Newsprint	Containers				Paperboard & OCC	Mixed Paper	Total Tons
		Aluminum	PET & HDPE	Glass	Metals			
00-01	3,317	27	178	577	117	732	1,239	6,187
01-02	3,222	25	176	569	118	696	1,236	6,042
02-03	3,219	32	190	594	133	738	1,349	6,255
03-04	3,154	35	200	613	123	739	1,436	6,300
04-05	3,161	36	230	628	126	865	1,511	6,557
05-06	3,162	39	228	675	129	875	1,573	6,681
06-07	3,210	43	281	726	122	966	1,727	7,075
07-08	3,101	51	336	853	127	1,138	1,831	7,437
08-09	2,474	64	396	928	125	1,180	1,641	6,808
09-10	2,155	68	413	978	128	1,210	1,449	6,401
10-11	1,932	59	392	940	120	1,209	1,370	6,022

The City also provides Christmas tree grinding and mulching for approximately 3 weeks following the Christmas holiday. Christmas trees can be dropped off at drop-off sites located throughout the City. In the last 25 years, the City has recycled approximately 205,000 trees (approximately 2,950 tons), with an annual average of approximately 118 tons.

As mentioned above, there are also three local material recovery facilities. All the facilities have warehouses, which are used for sorting and baling recyclables. As presented in the Need Assessment (2012), an annual City survey of recyclers provides some data on the quantity of residential and commercial recyclables handled by private-sector recyclers. Table 2 summarizes the reported data since 2000 for various recycled materials. The quantities originally reported include metals associated with auto scrap, as well as salvage and demolition activities; quantities of metals in Table 2 were adjusted in an effort to reflect only metals from commercial and residential recycling operations. The totals in Table 2 exclude recycled concrete and asphalt materials (construction and demolition waste recycling).

Table 2 – Tons of Materials Recycled (Reported by Private-Sector)

Calendar Year	Metals [1]	Papers	Cardboard	Glass	Plastics	Totals
2000	5,967	10,095	12,412	1,899	92	30,465
2001	3,205	9,891	11,260	2,931	74	27,361
2002	5,623	11,343	13,690	2,665	281	33,603
2003	5,188	18,937	11,495	1,633	513	37,766
2004	7,962	14,108	14,464	1,702	276	38,512
2005	9,505	20,277	13,098	1,183	342	44,405
2006	7,434	12,262	20,931	1,696	461	42,784
2007	7,777	16,962	21,673	1,542	399	48,353
2008	9,716	9,227	14,317	316	449	34,025
2009	7,247	9,638	16,017	327	618	33,847
2010	9,815	14,252	16,750	1,874	1,308	43,999
2011	9,710	14,020	17,298	834	1,249	43,111

Notes:

(1) Actual quantities of reported ferrous metals have been adjusted to reflect 3 percent of the waste stream to correspond to the percentages of metals in NDEQ statewide waste composition study. Adjustments were made because the values reported to the City include items such as scrap automobiles and metals from salvage and demolition operations.

The average amount of materials reported to be recycled by these private sector activities since 2000 has been approximately 38,000 tons per year. These quantities have not been verified and it is not known what amounts come from subscription recycling service, buybacks, or other internal corporate recycling programs. Quantities of recyclables imported and exported are also unknown.

Program (Facility/System) Options

Currently most recovered/recycled materials are marketed by private processing facilities and scrap metal dealers. In their business they understand that marketing recovered materials is affected by the volume of material recovered (fluctuating supply), market demand (consistent end markets) and consumer demand. They also understand that these factors can lead to volatile markets and price volatility. In addition, in the production of many products, raw materials are frequently more abundant, less expensive, of higher quality and available in more consistent quantities. Many of the recovered materials must be reprocessed to make them suitable for remanufacturing.

From the above discussion of recovered material types, the current need and options for markets, which could be developed for local demand, may include:

- Papers: where an end product such as cellulose insulation could be cost competitive.
- Glass: while current supplies and market prices are a major limitation the development of a local market could provide a significant incentive to glass recovery.
- Plastics: where a local product could be developed for one or more types of plastic. This is complex because it may need to compete with larger national markets. A niche

opportunity might exist if products could be economically developed for the currently tough to market plastic types (Types 3 through 7).
- Compostables: Currently markets exist for yard waste compost and wood mulch, although demand, pricing and local/regional competition may inhibit significant growth. If food waste composting were to be undertaken it would probably be for a local market.

The first issue that must be addressed is what if any role government may wish to play in the support and development of markets. The major opportunities associated with new markets generally fall within two broad but closely related categories:

- Market Incentives
- Market Development

Incentives related to recycling were discussed in detail in the technical paper on Recycling Incentives. Additional discussions of incentives and market development are also included in the following technical papers:

- Residential Recycling and Diversion
- Commercial Recycling and Diversion
- Organic Waste Diversion (Composting)
- Construction and Demolition Material Recycling
- Conversion Technologies

This technical paper will not repeat all of the content in these various papers.

Incentive options can take many forms; some are very program specific, most are based in some measure on economic incentives/disincentives and will involve changes in laws, regulations, or ordinances to implement. Options for market incentives generally fall within the following categories:

- Bans, Restrictions and Mandates
- Grants or Subsidies

As discussed in the technical paper on Recycling Incentives, bans, restrictions and mandates can be used to create a demand for certain products and as such serve as an incentive (generally to private industry) to create markets or provide alternate management options. Bans and restrictions are generally more appropriate on a state-wide basis but can be used at the local level for select materials. As illustrated by the traditional recycling logo, using the collected material, in whole or in part, in new products is also necessary to complete the "recycling" cycle. Examples of programs to create a demand through mandates can include:

- **Building Specifications**: where new construction is encouraged or required to use of a certain amount of recycled materials, thus helping to support markets and create market demand for certain materials. This concept is a significant cornerstone of the Green Building Council and their Leadership in Energy and Environmental Design (LEED) certification program.
- **Utilization of Recycled Materials:** where mandates on the inclusion of a "buy-recycled" provision in purchasing policies and government construction specification. As a simple example, the City and County standard specification could be modified to include provisions to require use of recycled materials (such as local compost) in construction projects. This would create added markets for the City's LinGro compost.

New grant or subsidy programs could be developed by the City or in conjunction with specific funding sources to further encourage/promote the development of markets or new products from recycled materials, or to help businesses (e.g., through economic development grants or subsidies) implement/establish and maintain systems, facilities and programs. A key consideration will be the identification of funding sources and mechanisms for grants and subsidies. Long-term grants and subsidies may or may not represent sustainable funding approaches for market development.

Market Development is a complex topic as it entails a strategy that must address a wide range of topics including but not limited to:

- Market demand (consistent end markets) and consumer/buyer demand for either the raw product or re-manufacturer product. This may include increasing demand beyond current levels or new products with sustained demands. This may also involve creating a compelling reason to purchase the material. A further decision is whether the markets will be local, national or international.
- Adequate supply of raw product - volume of material recovered. This needs to address changes in consumer habits and product manufacturing, as well as potentially fluctuating supply.
- Diversity – Is the target market for a single product or will it require a diverse product line to compete with established programs, especially if it is not a new product.
- Distribution and sales (marketing) of the product or recovered materials. As part of distribution and sales it will be important to establish the markets position in the supply chain (e.g., as a middle man supplier or an end product supplier) and the extent to which the market is dependent upon others for product distribution.
- Pricing
- Competition/Competitors

From a very broad perspective market development could include integration with other businesses and industries in what is sometimes referred to as an eco-park or eco-industrial park. Under this concept the City would work with (co-operate with) businesses or developers to create a campus-type area where resources, products and energy needs could be shared with an emphasis on public health, economic and environmental benefits. The Eco-industrial Park Handbook[1] states that "An Eco-Industrial Park is a community of manufacturing and service businesses located together on a common property. Members seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues." The Innovation Campus on the site of the former Nebraska State Fair contains elements of these principles.

Options Evaluation

The general issues associated with markets, and market development/implementation are:

1. Lowe, Ernest A. 2001. Eco-industrial Park Handbook for Asian Developing Countries. A Report to Asian Development Bank, Environment Department, Indigo Development, Oakland, CA

- Most markets for materials diverted from disposal are national/international markets.
- Local markets for compost made from yard wastes and wood waste are not large revenue generators and compete with other local or regional markets.
- Markets for compost from food waste are not established.
- Markets for clear [flint] and brown [amber] glass have been the relatively consistent; the market for green glass has been more volatile. Prices for cullet have been quite low in comparison to the cost of recovery, processing and transportation making it difficult to justify on an economic basis. The absence of a container redemption program in Nebraska is a limiting factor on the volume and supply of cullet and which might justify construction of a commercial processing unit.
- Prices for almost all recovered/recyclable materials experience volatility.
- Local market development options may only exist for certain materials; market longevity/sustainability is a key issue in facility construction but may also be viewed as an economic development opportunity.

There is a wide array of issues and options associated with markets for materials currently being recovered and those for which markets are available or may potentially be available in the future. It is not always possible to compare them to each other. Consistent with the guiding evaluation criteria developed for use in the Solid Waste Plan 2040, the topic of markets have been further evaluated based on the following considerations:

Waste Reduction/Diversion: The availability of markets is critical to any source reduction and/or recycling goals established as a result of the Solid Waste Plan 2040 and necessary to prevent recovered materials from going to landfills for disposal. The availability of a market would also be essential for recovered energy.

Technical Requirements: Markets currently exist for materials currently being recovered in the Planning Area and general national trends suggest market capacity is increasing for these materials. The capacity of current processing facilities, with the exception of composting, is not known, but these and buy-back centers are generally only viewed as intermediate markets. Existing, large national and international markets represent risks to the local community from the standpoint of price, price volatility and demand; establishing local markets can represent some level of risk due to complexities associated with almost any new business. The establishment of viable local markets for certain recyclables could provide redundancy and flexibility in contrast to reliance on national and international markets.

Environmental Impacts: The availability of local markets could conserve resources by eliminating transportation costs and associated air emissions.

Economic Impacts: Establishing markets will require careful consideration of capital and operating costs. Establishing new, local markets may be beyond the role of government, except to help facilitate such markets though economic incentives. New, local markets represent an economic development potential, but careful economic analysis will be necessary to ensure the market is economically sustainable. Residents and businesses may benefit if an economically viable local market can be established for select materials.

Implementation Viability: Implementation viability is closely tied to economic viability. Because of the "green" nature of markets for recycled/recovered materials it would generally be anticipated to be socially/politically acceptable. Whether legislative and regulatory changes would be necessary for market development is not known and would likely be material specific. It is generally assumed the market development would be the responsibilities of private entities (with the exception of yard waste compost and wood mulch); these entities would generally provide the land and undertake any required siting and permitting.

Relationship to Guiding Principles and Goals

The current outlet for recovered/recycled materials relies on private service providers and private markets (excluding yard waste and wood mulch). As it relates to the Guiding Principles and Goals of the Solid Waste Plan 2040, the possibility of expanding markets is directly applicable, as further noted below.

- **Emphasize the waste management hierarchy**: Markets are essential to a successful waste reduction and recycling program. Recycling is one of the most preferred waste management methods in the hierarchy in that is places maximum emphasis on options to recover materials and convert them into new products. Current programs are compatible with this hierarchy.
- **Encourage public/private partnerships**: The current markets for recycled materials involves both public and private efforts including private recycling processing centers and private buy-back centers and City provided education and promotional outreach. Private companies also serve as retail outlets for the City' LinGro compost. If an expanded recycling program is selected for implementation it is expected to be developed with private parties providing processing and recovered materials marketing services. Services by non-profits, private companies, and public/private partnerships such as buyback centers, special materials take-backs, and thrift stores are expected to continue and complement any market needs created as a result of the planning process.
- **Ensure sufficient system capacity:** There are eight buyback center locations in the City for metal cans and scrap metal; two of the centers only accept metal cans. Two firms have facilities located in the Planning Area, and handle large volumes of scrap, including automobile and demolition scrap metals. Their local facilities also accept and recycle materials from other recyclers in the region. In conjunction with three private recycling processing centers, these firms serve to market most of the recyclable materials collected in the Planning Area. The need for local markets may require further evaluation as part of any program that significantly expands recycling diversion rates or attempts to recycle materials for which there is only limited current demand or for which the purchase price of the commodity is much lower than the cost of collection, processing and transportation. Incentives and program funding for markets development do not necessarily ensure sufficient system capacity, but can be used to encourage or support expanded capacity and markets for diverted materials.
- **Engage the community:** Any expanded recycling program would need to engage the residents and businesses to encourage them to divert more recyclables from disposal. Community engagement may have limited applicability to new markets unless the city is taking a role in funding, building, owning or operating such facilities/programs.

- **Embrace sustainable principles:** Maximizing recovery of materials though recycling into new products recognizes that waste is not inevitable and discarded materials are potentially valuable resources. Careful evaluation of economic and environmental aspects of new local markets will need to be undertaken to ensure the benefits are sustainable.

Summary

Markets and prices for recovered materials can be volatile and are influenced by supply and demand, as well as other factors such as material quantity and quality. Of the various materials targeted for recycling, only glass and metals currently have the potential to meet the criteria for a closed loop cycle.

Papers, metals and plastics (and possibly glass) generally targeted for diversion are often sorted locally and shipped to manufacturer's or secondary processors outside the Planning Area. For over a decade markets have existed for:

- Paper
- PET and HDPE Plastics
- Ferrous and Non-Ferrous Metals
- Yard Waste Compost
- Wood Mulch

While free market efforts tend to find markets, where opportunities exist, it is possible that the combined efforts of the public and private entities may be necessary to create markets or increase market opportunities.

Limited cost effective markets exist for glass and certain plastics; even when properly sorted and processed, the revenue stream for glass and certain plastics has been small in comparison to the costs associated with collection, processing and transporting. Since glass is inert, it does not pose a toxicity risk in landfills. Glass is sometimes viewed as a potential contaminant in single stream recycling operations. Therefore glass recycling has been a low priority target in some recycling programs. Of the other plastic streams film plastics may have the greatest near term market potential, assuming they can be made suitable for the end market.

Compost and wood mulch material markets are also well established, but again rely upon a high quality product to generate a commercial demand and revenues. If plan implementation activities pursue food waste composting on a commercial scale it will be very important to focus on product purity and to have established markets/outlets before investing in collection infrastructure, processing and distribution facilities.

As a part of the overall plan implementation strategy, Planning Area members should continue to look for local market opportunities to provide sustainable revenue streams, to help off-set collection and management costs associated with diverted/recycled materials. Where national or regional markets are utilized, local efforts should also support the consolidation, processing and transport of recovered materials to enhance their marketability. Additional attention may also need to be given to development of new local markets to reduce reliance on national markets or markets outside the Planning Area. As such Planning Area members may wish to pursue opportunities for local markets for items such as glass and certain plastics.

Marketing of recovered materials may be managed by private entities, individual communities or may be coordinated as a multi-jurisdictional effort; however, existing marketing practices, principally by private entities, are anticipated to be maintained to the extent that they are adequate to meet the needs of the Planning Area and effectively support the goals and objectives of the Solid Waste Plan 2040. In looking at local market development opportunities, Planning Area members may also need to consider the added potential to attract businesses and create green jobs in the Planning Area.

Further evaluation and adoption of changes to current purchasing policies, building codes and material purchase specifications used in Planning Area governmental procurement programs represent options to encourage waste reduction and recycling. Such changes would also enhance the markets for recycled and compost products/materials, thus completing the "recycling" cycle.

Appendix 1

Paper and Paper Products

Papers are referred to in the recycling market industry as "fiber", to more accurately describe the quality and component being recycled. The paper/fiber recycling industry has matured considerably since the 1994 Lincoln-Lancaster County Solid Waste Plan was prepared and markets now exist for essentially all types of recovered paper. Since 1994, the quantities of recycled paper in the US have nearly doubled and large numbers of processing mills, which de-ink and remove contaminants, have developed new or modified existing mills in the US. Such mills have generally located in proximity to large paper manufacturing or specialty products manufacturing markets to most efficiently deliver their fiber products to paper product manufacturers/markets.

The American Forest & Paper Association (AF&PA) reports that in 2011 66.8 percent of the paper consumed in the U.S. was recovered for recycling. According to the November 2012 Recovered Fiber Monthly Statistics Report (published 12-19-2012) by the AF&PA, year-to-date total consumption in 2012 was 4 percent lower than during the same period last year and year-to-date exports of recovered paper in 2012 are 6 percent lower than during the same period in 2011. In recent years, one of the most significant markets for recycled paper has been exports to China and other nations. These exports accounts for nearly 40 percent of the market for recycled paper collected in the U.S. in 2010. Additionally, while prices are more favorable than two decades ago, the material pricing is still somewhat volatile and generally fluctuates with the economic conditions.

Paper Markets

Local processing facility for residential and commercial waste paper is currently available at three facilities in the Planning Area. These include the following:

- Firstar Fiber
- Midland Recycling
- Recycling Enterprises of Nebraska

These facilities sort paper by grades/types, remove contaminants and generally bale the material for shipment to mills or markets. Regionally, there is one firm in Nebraska (Green Fiber) that processes old news paper into cellulose insulation.

Old Newspapers (ONP)

The AF&PA reported that total (national) recovery of news/mechanical papers declined 3.2 percent in 2010, but generation of these papers in the waste stream declined by an even larger rate of 5.4 percent. In 2011, ONP tonnage generated continued to fall, but most of these declines were the result of a reduction in hard-copy newspaper readership.

Currently ONP is being utilized in the production of the following types of products: tissue products, packaging and industrial papers, paper board, kraft (the flat board used in corrugated paper board), corrugated medium, roofing felt, gypsum wallboard liner, cellulose insulation, animal bedding, hydro-mulch, molded pulp products (egg

cartons, trays, and flower pots), packaging cushion material, kitty litter, and single-ply cardboard containers.

ONP Pricing

Mid-2011 prices for recovered ONP averaged $145 per ton.

Old Corrugated Containers (OCC)

The AF&PA reported that after declining in 2009, U.S. purchases of containerboard rebounded 7.2 percent in 2010. However, recovery of OCC, driven by both increased domestic demand and exports, rose 11.2 percent. As a result, the recovery rate for OCC increased to 85.1 percent in 2010, up from 82.0 percent in 2009.

Currently OCC is being used in the production of the following types of products: tissue products, packaging and industrial papers, chip board, kraft, corrugated medium, paper pulp, roofing felt, gypsum wallboard liner, cellulose insulation and hydro-mulch.

OCC Pricing

Mid-2011 prices for recovered OCC averaged $165 per ton.

High-Grade/Office Papers

The AF&PA estimated that the nationally, recovery rate for high grade papers (printing-writing) was at 54.6 percent in 2010 versus 61.3 percent in 2009 and 54.7 percent in 2008. An increase in the 2009 rate suggests a drawdown of inventories – a result of the global recession.

Because of their quality, the market demands for high-grade papers have remained fairly constant. These papers have a wide range of potential for reuse that include newsprint, toweling, wrapping, writing paper, card stock, and paper board, as well as many of those listed above for lower grades of fiber.

High Grade Paper Pricing

Mid-2011 prices for recovered high grade paper averaged $ 271 per ton.

Mixed Papers

This category of paper is a mixture of varying grades of papers such as colored papers, magazines, telephone directories and envelopes. Mixed papers may include high-grade papers that are not easily separable from the remainder of the mixed paper stream.

The current uses of mixed papers include, but are not limited to, the following: newsprint, tissue products, recycled paper board, recycled corrugated medium, roofing felt, and gypsum wallboard liner. In addition, mixed papers are also being combined with other paper, shredded, baled and used as animal bedding.

Mixed Paper Pricing

Mid-2011 prices for recovered mixed papers averaged $109 per ton.

Glass

The Glass Packaging Institute estimates that 80 percent of the recovered glass containers are recycled into glass bottles. They also report that nationally in 2010 over 41 percent of glass beer and soft drink bottles and 25 percent of the wine and liquor bottles were recycled. These rates of diversion are in part attributed to states with bottle deposit legislation. Although glass is considered a 100 percent recyclable material, because it meets the closed loop definition, the principal reason for the lower rates of recovery include: (i) it requires specialized optical sorting equipment to separate glass by color, and (ii) the cost of processing and transporting the glass to remote manufacturing markets is significantly higher than the revenue it generates. Glass processors have tended to locate in states where bottle refund laws exist, because such states provide a steady supply of high quality cullet and can provide a sustainable supply of recovered glass. The closest glass processing facilities are in Des Moines, IA and St. Paul, MN.

Glass Markets

Recovered and processed glass is referred to as “cullet”. The primary end markets for recovered glass have been manufacturers of glass containers. Other uses for recovered glass, though not as lucrative as the glass container industry, include fiberglass insulation, fiberglass swimming pools, masonry block and glass wool. Owens-Corning in Kansas City does accept recovered glass from Lincoln recyclers to produce fiberglass insulation. Additional potential uses for mixed glass which are currently being researched include use of cullet as an aggregate material in roadway construction and in concrete drainage pipes.

The Glass Packaging Institute reports that there are 48 glass manufacturing plants operating in 22 states. Approximately 76 cullet, or recycled glass, processors are in 31 states.

Manufacturers are most interested in glass that is furnace-ready. Furnace-ready cullet is glass that has been separated by color (clear [flint], brown [amber], and green), is free of contaminants and can be fed directly into the furnace melting pot without further processing. Depending on the manufacturer, furnace ready cullet in the form of whole or broken bottles is preferred for inspection for contamination. Cullet can also be crushed and cleaned by a commercial processing unit ("CPU") for delivery.

The CPU processes glass by color sorting, crushing, washing, removing and separating out the contaminants and grinding the glass to a specific particular size. The final product from a CPU facility is furnace ready cullet that can be used by glass container manufacturers. Presently manufacturers are incorporating approximately 30 percent recovered glass into newly manufactured glass containers. In 2008 glass container manufacturers set a goal to achieve 50 percent recycled content in the

manufacture of new glass bottles by 2013. Presently there are two CPUs in the region that produces furnace ready cullet:

- Greenstar Recycling in Des Moines, IA
- e-Cullet in Saint Paul, MN

The demand for clear [flint] glass has been the most consistent. However, markets have also been consistent for brown [amber] glass. The market for green glass has been more volatile. The markets for recovered glass have increased steadily since 1994 as manufacturers of glass containers have increased their percentage use of recovered glass and as other uses have developed. Absent the establishment of a container redemption program in Nebraska (which would provide a large volume, steady supply of cullet and which might justify construction of a CPU), there may be opportunities for niche markets that would improve the overall economics associated with glass recovery and recycling.

Glass Pricing

eCullet buys glass cullet from material recovery facilities (MRFs) and small volume recycling facilities for between $5 to $30 per ton depending on the color and level of contamination.

Metals

In the recycling industry, metals are normally classified as either ferrous or non-ferrous metals. Ferrous scrap, which is metal waste product containing iron, has been a recoverable material for many decades and has established markets. Nonferrous metals are those that contain very little or no iron. The most common nonferrous metal targeted for recovery in the solid waste stream is aluminum. Other nonferrous metals which are often targets for diversion or recovery include copper, lead, zinc, nickel, gold, silver, brass, bronze, mercury and platinum. While there are scrap yards in and adjacent to the Planning Area, regionally there is one firm in Nebraska (Nucor Steel) that serves as an end market and processes large volumes of recycled ferrous metals into new building products; no other significant end product manufacturers/markets are located in proximity of the Planning Area. No significant non-ferrous manufacturers/markets are located in proximity to the Planning Area.

Metal Markets

Metals have the most established recyclable markets. Metals can generally be recycled without losing their important properties and thus meet the requirements of the "closed loop" cycle. Although all metals are recyclable the most prominent metals found in the municipal waste stream are ferrous and aluminum.

Ferrous Metal

Ferrous scrap has become the steel industry's single largest source of raw material, because it is economically advantageous to recycle old steel into new steel. There is a well-established network of more than 2,000 ferrous scrap processors and more than 70 end markets across the United States. The steel recycling infrastructure has

grown and matured over the years in its efforts to meet the steel industry's demand for steel scrap. The Steel Recycling Institute estimates that 67 percent of steel cans, 90 percent of steel appliances, 98 percent of structural steel and 70 percent of the reinforcing steel sold in the United States is ultimately being recycled.

Ferrous Pricing

Prices for ferrous metal were depressed as a result of the 2008 recession to a level of approximately $100 per ton, rose to a high of $400 per ton in 2009, then dropped back to around $300 per ton in 2010 and were at $400 per ton in mid-2011. Ferrous is classified into several grades based on the level of contamination and prices vary according to grade.

Aluminum

Aluminum is one of the most marketable metals that can be diverted or recovered from the solid waste stream. As with ferrous and glass, aluminum meets the closed loop definition as a 100 percent recyclable product. In addition, reprocessing of aluminum requires approximately 95 percent less energy than making aluminum from raw materials.

Aluminum Pricing

Aluminum recycling markets have ranged from $2,240/ton in 2009 to $1,800 per ton in 2010, to 2,300 to $2,500 per ton in 2011.

Plastics

The components used to make plastics come largely from refinement of crude oil and natural gas. For purposes of distinguishing the different resin applications, plastics are assigned a recycling symbol and a number; the most common are listed as follows:

Type 1 - Polyethylene Terephthalate (PET)
Type 2 - High-Density Polyethylene (HDPE)
Type 3 - Polyvinyl Chloride (PVC)
Type 4 - Low-Density Polyethylene (LDPE)
Type 5 - Polypropylene (PP)
Type 6 - Polystyrene (PS)
Type 7 - Acrylonitrile Copolymers

Regionally, there are no identified large volumes manufacturers that are directly processing plastics into usable resins. Some local small businesses in the region may be using resins derived from recovered/recycled plastics, but no significant resin processors are located in proximity of the Planning Area. An opportunity for local market may exist for recycling Type 3 through 7 plastic because there are not currently good markets for this material. However, technology and supply infrastructure would be critical issues in attempting to develop local markets, especially since national markets are limited to non-existent for several of these plastics.

Plastic Markets

A major issues associated with plastics recycling is that in order for them to be recycled, different types of plastics cannot be mixed, yet to a typical consumer it is virtually impossible to distinguish one type from another merely by looking at them or even by touching them. Types 1 through 5 plastics are collected at the City's recycling drop-off sites. Private recyclers collect Types 1 through 7 plastics in their residential curbside recycling programs. While efforts are underway in various locations and by various companies to develop and expand markets for plastics, there are not strong markets for types 3 through 7 plastics. The absence of such markets may also represent opportunities within the Planning Area, but the development of such markets may be complex and is beyond the scope of this technical paper.

PET

The National Association for PET Container Resources (NAPCOR) reports that approximately 29 percent of the PET containers sold in the United States in 2011 were recovered. PET container recovery is also reported to have been gradually increasing over the last five years. Several new PET plants were opened in early 2011; these new plants have created new demand for recycled PET. PepsiCo Beverages of Canada has recently developed a process that it says will allow it to increase the use of PET in its bottles from 10 percent to 100 percent; this could significantly increase the demand for recycled PET.

PET Pricing

The average of price for PET has ranged from $400/ton in mid-2010 to approximately $840 per ton in early-2011.

HDPE

The market information on HDPE is much more difficult to quantify. Demand and pricing is higher for natural HDPE than for mixed colored HDPE materials. Recycled HDPE is generally used to produce non-food bottles, drainage pipe, plastic lumber and other plastic products.

HDPE Pricing

Over the last two years the prices per ton for natural HDPE have ranged from $580 to $800 with mixed colored selling for approximately $440 to $580 per ton.

Mixed Plastic Containers (Types 1 through 7)

Some communities accept/collect mixed plastic containers (Types 1 through 7) to encourage recycling, because residents do not have to concern themselves with identifying and sorting their plastics. This generally increases the amount of plastics diverted; however, from a revenue perspective the market value for mixed plastics is much less than for a single type (e.g., type 1 or Type 2) plastics, because end markets must ultimately sort the materials. No end market or plastic processing centers exist in the region.

Other Plastics

Plastic film, which is typically defined as any plastic less than 10 mm thick, is principally made from polyethylene resin and is readily recyclable if the material is clean, dry, and not pigmented black. There are no markets (firms paying for collected materials) in the Planning Area for film plastic; however there are a number of local grocery and department stores that will accept plastic bags for recycling purposes.

Compostable Materials

The decomposition of organic materials under controlled conditions produces a humus-like material referred to as compost. Compost can be produced from either the entire solid waste stream, or, as is more typically the case, from single components diverted from the waste stream such as yard and wood wastes. Certain materials can also be combined to produce compost, such as papers and foods. Most markets for compost and wood mulch type materials are local/regional. At home composting is a viable, multi-material composting/diversion opportunity (for organic material generated at a residence) but is not considered a viable processing option or market for the potential large volumes of materials from other generators. National market competition for compost and mulch would require large volume supplies and an extensive marketing initiative. The City of Lincoln has had success locally marketing its yard waste compost product (LinGro) and it appears that wood mulch produced locally by public and private efforts is being successfully marketed and consumed locally. While opportunities are believed to exist to use compost type products for local land restoration and to reduce urban run-off, the revenues generated from compost sales is not expected to exceed the costs of collection, composting facility construction, and operating and maintenance costs for composting facilities.

Markets

Most markets for materials diverted from disposal are local/regional markets. Within the Planning Area markets have been established for compost made from yard wastes and wood waste. Two private companies also market manure compost in the Planning Area.

Local, commercial-scale, revenue generating markets have not been established for compost from items such as food waste and solid waste. Markets, as used in the following discussions, refer to post processing (following composting operations). Additional market development opportunities may also exist to expand the use of compost and wood mulch products to improve storm water run-off quality, increase infiltration (reduce run-off), and improve soil conditions in the Planning Areas urban environment.

Yard Waste Compost

A large scale yard-waste composting program is currently operated by the City of Lincoln adjacent to the Bluff Road Landfill site. This site currently accepts only yard waste collected from within Lancaster County. The resulting composting material is marketed locally under the trade name LinGro.

Yard waste is also accepted the City's North 48th Street and then hauled by the City to the Bluff Road site for further processing/composting.

LinGro Compost is utilized by both the public and private sectors. Over the last 4 years, roughly 40 percent of compost produced has been used by the public sector for various projects ranging from rain gardens, landscape areas, and infrastructure improvements and to help establish a healthy vegetative cover in the closed areas of the City's landfills. The remaining 60 percent was sold to local landscapers, garden centers and homeowners.

Yard Waste Compost Pricing

Each spring the City of Lincoln sets aside a certain quantity of LinGro compost for distribution to the public at no cost. The material is available at the North 48th Street Transfer Station, 5101 North 48th Street. The material is available on a first come, first served basis and individual must self-load the compost.

Individuals and businesses may order a minimum of 10 cubic yards of LinGro Compost directly through the City. There is a $6.00 per cubic yard charge for the compost plus a delivery fee of $50 per dump truck load. Individuals may also arrange their own transportation of the material.

Wood Mulch

There are established local/regional markets for processed wood waste in the form of wood mulch. These wood wastes are generally processed by the private sector firms although City of Lincoln also accepts and grinds tree waste. Private firms, including landscapers and tree trimming services, generally grind brush, branches, tree trunks and pallets to produce mulch that they can use or sell in a natural or stained color for landscaping purposes. Mulch produced by the City is used by Solid Waste Operations.

Wood Mulch Pricing

Various grades and colors of this material sell in bulk for prices ranging from $18 to $35 per cubic yard. Prices also vary by volume with small bagged quantities generally selling for $3 to $4 per two cubic foot bag (equivalent of $40 to $55 per cubic yard).

Food Waste and Paper Compost

The composting of food waste (and other organic materials) must be conducted in a controlled environment as further discussed in the technical paper on Organic Waste Diversion (Composting), to prevent the spread of disease, to avoid attracting vermin and to avoid odor problems. While the quantities composted at individual residences in unknown, there are no facilities in the Planning Area that are currently undertaking commercial scale food waste composting operations. Compost operations are currently allowed to take up to 1,000 cubic yards (approximately 1,000 tons) per year in food waste without a permit from NDEQ.

If a commercial scale food waste (or food and papers) collection program were to be initiated and a commercial scale composting facility were to be operated, care would have to taken to make sure the compost product was free of other contaminants to be marketable. Where food and mixed organic waste composting has been done in other communities, one of the largest challenges is identifying/establishing sustainable market outlets.

Food and Paper Waste Compost Pricing

No readily useable information is available to characterize the price that might be assigned to compost produced from food and paper wastes. While the nutrient levels may be higher than compost associated with yard waste, marketing such materials may also be constrained by contaminant levels.