



PREPARED FOR:
HOUSTON-GALVESTON AREA COUNCIL

Recycling and Waste Minimization Case Studies

Report | February 2008

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Recycling and Waste Minimization Case Studies

Houston – Galveston Area Council

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ES.1 Project Purpose

The Houston-Galveston Area Council (H-GAC) contracted with R. W. Beck to develop a series of case studies on behalf of five cities in the H-GAC region. These case studies were intended to evaluate the effectiveness of each city's recycling and waste minimization programs and to provide specific recommendations to each city regarding ways to increase diversion and improve their program operations.

The results of the five case studies were also used to develop and conduct a workshop open to all H-GAC member communities. The workshop highlighted lessons learned from each of the case study cities in order to assist other member communities with evaluating their own recycling and waste minimization programs, implementing best management practices, and improving diversion and overall operations for their programs.

ES.2 Project Approach

ES.2.1 Participant Selection

H-GAC selected the following five cities to participate in the recycling and waste minimization case studies:

- Bay City
- Huntsville
- Lake Jackson
- Pearland
- Texas City

These five cities were selected for a variety of reasons including the array of programs offered, commitment to recycling, development of innovative programs and cooperative partnerships, and willingness to participate in the study.

ES.2.2 Evaluation Template Development

R. W. Beck developed an evaluation template that was used for each of the case studies. The template included questions specific to each of the following types of recycling and waste minimization programs:

-
- Single-family
 - Multi-family
 - Brush/yard waste
 - Bulky/white goods
 - Household hazardous waste
 - Electronic waste
 - Public education

The evaluation template served as the basis for subsequent interviews with city staff and officials as well as the data requested from each participating city.

ES.2.3 Case Study Evaluations

In order to develop the case studies for each of the five selected cities, R. W. Beck completed each of the following key steps:

- Issued a Request for Information (RFI) to each city requesting data such as:
 - Program descriptions;
 - Quantities diverted by commodity type;
 - Revenues from sale of recyclables; and
 - Program budgets.
- Evaluated all data received via the RFI; and
- Conducted one day on-site interviews and site assessments with staff from each city.

Based on the information gathered through the data request and on-site interviews and site assessments, R. W. Beck developed summary reports outlining each city's programs, recent performance, and our Project Team's key findings and recommendations for program enhancement. The case study evaluations focused largely on program operations and efficiency, cost-effectiveness, and best management practices.

R. W. Beck and H-GAC staff also conducted on-site follow-up meetings with staff and officials from each participating city to discuss the key finding and recommendations for their programs.

ES.3 Selected Cities

The following table presents an overview of the five selected case study cities including their respective populations and recycling and waste minimization programs offered.

Table ES-1
Summary of Participating Cities

	Bay City	Huntsville	Lake Jackson	Pearland	Texas City
Population [1]	18,263	37,537 [2]	27,614	68,305	45,070
Recycling Programs:					
Single-Family Curbside			X	X	
Multi-Family On-Site			X		
Drop-Off	X	X	X	X	X
Brush/Yard Waste	X	X	X	X	X
C&D		X			
HHW	X [3]		X	X	
E-Waste	X [3]			X	

Notes: [1] Source: U.S. Census Bureau, 2006 Population Estimates, Census 2000. [2] If adjusted for group quarters (state prisons and Sam Houston State University), the city's population is 25,375. [3] Available to city residents; operated by Matagorda County.

Among the case study cities, the Project Team noted diversion rates between approximately 4 and 40 pounds per household per week. R. W. Beck would note that there are several caveats that must be taken into account in analyzing these diversion figures. There were some significant data limitations involved such as:

- Tonnage data not provided by all private contractors or collected by all cities;
- Brush/yard waste diversion estimates; and
- Certain cities acting as exclusive provider of recycling services, while others must compete with private recycling companies.

The following table shows the total tons diverted by material across all five case study cities during 2006.

Table ES-2
Tons Diverted by Material, 2006

Material	Tons Diverted (2006)	Percent of Total
Cardboard	437.62	1.8%
Glass	37.11	0.2%
Metals	578.43	2.4%
Paper	1,414.79	5.9%
Plastics	148.69	0.6%
Brush	21,330.46	89.0%
Total	23,947.10	100%

Note: Figures do not include tonnages collected through City of Pearland's curbside recycling program. Private contractor only reports tonnages broken out into co-mingled (glass, aluminum, plastic and steel) and newspaper. This is an additional 1,498.25 tons of material not included in this table.

ES.4 Best Management Practices

Through the process of developing the five case studies, R. W. Beck identified the following recycling program best management practices for the five case study cities as well as for other communities in the H-GAC region. Each of these best management practices are key to developing and maintaining successful recycling programs.

ES.4.1 Political Buy-In

Adequate support is needed from local politicians and senior level management to ensure sufficient funding, personnel, and equipment are available for recycling programs. Programs can benefit greatly from the support of local officials who are committed to recycling and waste minimization programs and who actively convey their commitment to employees and residents.

Cities should strive to create awareness and understanding of their program and its objectives among local leaders and the community at large. Some ways to improve political buy-in for recycling programs include:

- Adequately promoting a program's successes;
- Using examples of successful programs in other communities;
- Organizing workshops or presentations to officials that highlight tangible measures of program success and the specific goals and objectives of the program; and
- Presenting information personally or through someone who is a trusted source in the community.

ES.4.2 Public Education and Outreach

Education is critical to developing, expanding and maintaining a successful recycling program. Adequate public education can yield increases in volumes and quality of recyclable materials collected, thereby promoting an economically sustainable recycling program. With any recycling or waste minimization program, success is directly related to the amount of participation the program receives.

Some keys to effective public education and outreach include:

- Capturing the attention of the target audience and delivering an effective message in target audience's own language;
- Motivating your audience to take action;
- Providing feedback to residents that reinforces positive behavior;
- Encouraging feedback from program participants; and
- Maintaining consistency in programming, funding and staff.

ES.4.3 Contracting

A contract for collection, processing or sale of recyclable materials will frame the long-term relationship between the city and the contractor, and may have a significant impact on program performance and success. Therefore, it is important to adequately consider each of the following elements when developing a contract for recycling related services:

- Contract length
- Materials collected
- Collection method
- Operating requirements
- Customer service
- Personnel
- City responsibilities
- Enforcement
- Fees
- Reporting requirements

As a general rule, greater detail will yield a better contract. The following are some additional items to consider when developing a contract for collection or processing of recyclables:

- Include incentives for collector to divert as much clean material as possible;
- Include specific data and reporting requirements;
- Set standards for maximum allowable contamination rates;
- Specify who is responsible for reducing contamination, should it become necessary;
- Include provisions for revenue sharing;
- Specifying processing fees, floor prices and market indices for each type of commodity collected;
- Consider inclusion of educational initiatives paid for by the operator; and
- Include contract provisions that allow for additional processing capacity.

ES.4.4 Operational Issues

Operational standards are the key to daily operation of a safe and effective recycling and waste minimization program. The specific operational issues that should be addressed will vary depending on the type of recycling program; however the following are a few of the common operational issues that should be considered:

- Access Control
- Signage
- Layout
- Staffing
- Sorting
- Storage
- Aesthetics
- Collection methods
- Frequency of collection
- Vendor selection
- Handling practices
- Operating hours

ES.4.5 Materials

Common recyclables in the waste stream include: newspaper, glass, cardboard, paper, plastics, steel cans and aluminum cans. It is important to understand the potential revenues and costs associated with collecting each of these individual materials.

Program administrators should account for the cost of collecting, processing and transporting each different type of commodity when making decisions about the materials to be collected by a particular recycling program. It is important to take into account commodity values in your particular area. It can also be valuable to conduct a waste audit to determine what materials are most feasible to recycle within your community.

ES.4.6 Safety

All recycling facility staff and customers have a right to expect recycling facilities to be free of health and safety hazards. To ensure safe operation of programs, written procedures should be developed and training regarding those procedures conducted for all staff.

All written safety procedures should be compiled into a safety policies and procedures manual that includes guidelines for:

- Emergencies;
- Building and site safety;
- Potential health hazards;
- Equipment safety;
- Operator safety; and
- Material handling safety.

It is imperative that all recycling staff be familiar with a program's specific safety policies and procedures.

ES.4.7 Documentation and Record-Keeping

Documentation and record-keeping is crucial to the success of recycling programs, as it allows you to monitor performance, identify potential issues, and maintain public and political support. Adequate data makes it possible to:

- Monitor changes in tonnage and participation;
- Identify opportunities for improvement;
- Understand commodity market conditions;
- Ensure your program is receiving proper revenue sharing;
- Promote the program to community and decision makers; and
- Obtain grant funding for the program.

The following is a list of key items that should be tracked on an annual basis for any type of recycling program:

- Tonnages by material;
- Revenues by material;
- Purchasers of recyclables;
- Diversion per household;
- Amount of residuals disposed; and
- Disposal cost avoided.

ES.4.8 Continue to Monitor Markets for Glass

The recycling of glass continues to be a challenge for many communities throughout the H-GAC region due to collection related issues and lower relative pricing for the material. R. W. Beck staff spoke with a representative from Strategic Materials, Mr. Steve Russell, who stated that they typically pay the following prices for clean loads of glass with minimal to no contamination:

- Amber - \$25-\$30 / ton
- Green - \$25 / ton
- Flint (clear) - \$20-\$25 / ton
- Mixed - \$15-\$20 / ton

While there continues to be a market for recycled glass in the region, it is critical for cities to accurately sort and minimize opportunities for contamination in order to maximize potential revenues from the sale of glass. It is also critical for city staff to talk directly with representatives from Strategic Materials or other glass processors to specifically define allowable contamination levels for shipments of this material.

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1.1 Description of City

The City of Bay City is the county seat of Matagorda County. It is located at the junction of State Highways 35 and 60, in the north central portion of the county ninety miles southwest of Houston. The city's population has declined slightly from 18,667 in 2000 to an estimated 18,263 in 2006, representing an average annual decrease of 0.4 percent.¹ It is projected that by the year 2010, Bay City's population will be 18,247 or a decrease of 16 residents.² The corporate limits of the city currently encompass a total of 8.5 square miles.

Table 1-1
Bay City Population

Year	Population
1990	18,682
2000	18,667
2006	18,263
2010	18,247

Bay City was selected by the Houston-Galveston Area Council (H-GAC) to participate in this Recycling and Waste Minimization Case Study project because of its excellent drop-off recycling facility and its staff's commitment to creating successful recycling and waste minimization programs for residents.

1.2 Recycling in Bay City

Bay City provides the following recycling programs and diversion options to its residents:

- Drop-off recycling center;
- Curbside brush collection and diversion;
- County-wide school recycling program;
- Annual HHW collection event; and
- In-house recycling program for all city offices.

¹ Source: U.S. Census Bureau, 2006 Population Estimates, Census 2000.

² Source: Bay City Community Development Corporation, Demographic Analysis, April 2006.

The following sections describe each of the city's existing recycling programs in greater detail and provide an overview of their operations in terms of materials, costs, revenues, tonnages collected and educational efforts.

1.2.1 Drop-off Recycling

1.2.1.1 Program Description

Bay City has operated a recycling drop-off facility in cooperation with a local non-profit organization, Matagorda Services, Inc., since 1991. The program was initially started in 1990 by a group of local volunteers who were concerned about the environment. The facility is called the WhaMCo Recycling Center and is located at 1812 Avenue H in downtown Bay City (see Figures 1-1 and 1-2). The facility has been at its current location since 1994. Construction of the current facility was made possible through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC), as well as funding donated by Matagorda Services.



Figure 1-1: WhaMCo Recycling Center



Figure 1-2: Drive-through drop-off area

Annual funding and support for the WhaMCo Recycling Center is provided by both the City of Bay City and the Matagorda Association for Retarded Citizens (ARC). In 1994, ARC created Matagorda Services, Inc to provide jobs and vocational training for mentally challenged citizens of Bay City and Matagorda County. As mentioned previously, Matagorda Services now operates the recycling center, which provides valuable recycling services to the community while also providing mentally challenged citizens with opportunities for employment and training. The recycling center building and property are owned by the city.

The drop-off recycling center is the primary recycling option for the Bay City community. It is open to both city residents and non-residents. Commercial customers may also drop-off materials at the facility, however they are limited to fibers only (paper and cardboard) and must pay a \$200.00 fee to cover the facility's cost to process a 40-cubic yard roll-off of material.

The WhaMCo Recycling Center is a 24-hour residential recycling drop-off center. The facility's staffed hours of operation are as follows:

- Mondays, Tuesdays, Thursdays, Fridays and Saturdays: 8:00 am to 5:00 pm

The recycling center's current staff includes:

- A full-time supervisor;
- Two part-time office assistants;
- One part-time director; and
- Four part-time attendants.

The facility also receives periodic assistance from persons needing to fulfill community service requirements.

1.2.1.2 Materials Accepted

Materials accepted at the drop-off facility include:

- Paper – most types including newspaper, office paper and magazines;
- Cardboard;
- Plastics - #1 and #2;
- Glass – brown and colored;
- Metal – aluminum and steel cans;
- Oil – motor oil and cooking oil (no filters); and
- Antifreeze.

Customers of the facility are asked to separate all recyclable items into the appropriate containers in order to assist the drop-off facility staff. When customers arrive at the facility, they can place sorted recyclable materials into separate 1 ½-cubic yard self-dumping hoppers located along each side of a covered drive-through area (see Figures 1-3 and 1-4). All bins are clearly labeled with the type of material that should be deposited there.



Figure 1-3: Citizen dropping-off recyclables



Figure1-4: Sorting bins in drop-off area

Section 1

During the facility's staffed hours of operation, staff members or volunteers are available to assist and monitor customers as they unload materials to ensure that opportunities for contamination are minimized.

Recyclables are collected and stored on-site in used cotton trailers or 30-cubic yard open-top roll-offs until they are ready to be baled and processed (see Figure 1-5). Facility staff periodically bale materials and set the bales aside in storage until a full load of a single material is ready to be shipped (see Figures 1-6 and 1-7). The City's current processors will come to the drop-off facility and haul the material to their sorting/processing facilities at no cost so long as a full load (20 tons) of material is available for pick-up.



Figure 1-5: Trailers and roll-offs used for material storage



Figure 1-6: Baler inside drop-off facility



Figure 1-7: Bales of paper in storage

1.2.1.3 Annual Tonnages

The following table presents the tonnages of recyclables collected and shipped from Bay City’s drop-off facility during the last three years (2004-2006). It is important to note that the tonnages include all materials dropped-off at the site by residents and businesses, as well as materials collected through the city’s in-house recycling program (see Section 1.2.6) and school recycling program (see Section 1.2.3)

Table 1-2
Tons Diverted by Material and Year, 2004-2006

Material	Year		
	2004	2005	2006
Newspaper	158.26	152.74	181.06
Cardboard	166.56	162.07	137.25
Office Paper [1]	80.85	39.93	-
Plastics	16.72	11.53	10.35
Glass [2]	71.26	6.35	-
Steel Cans [3]	-	-	-
Oil	-	-	-
Aluminum [4]	7.69	0.33	0.15
Magazines	-	18.92	38.37
Total	501.35	391.87	367.18

Notes: [1] The South Texas Project began recycling their own office paper beginning in 2005, resulting in a decrease in paper received at the drop-off facility. [2] Decrease occurred in brown glass only. [3] Facility sells all steel cans collected to a private vendor, but weight data is not currently maintained for this material. [4] Decrease in aluminum tonnages is a result of theft.

The city’s drop-off recycling facility experienced a significant decrease in the number of tons collected over both of the last two years, primarily as a result of declines in the amount of office paper and glass collected. Overall, in 2006 the recycling center collected approximately 106 pounds of recyclable materials per household.³ That equates to diversion of approximately two pounds per household per week.

1.2.1.4 Processors and Contracts

Bay City’s drop-off recycling facility is a member of the Central Texas Recycling Association (CTRA) and uses them for the marketing of their recyclables. CTRA keeps 10 percent of the sale price of all materials sold by member cities as compensation for their assistance in actively seeking markets for materials collected and researching and negotiating market rates.⁴

³ Based on a total of 6,905 households within the city in 2005; Source: Bay City Community Development Corporation, Demographic Analysis, April 2006.

⁴ All glass collected at the drop-off facility is currently sent to Strategic Materials for processing.

1.2.1.5 Annual Program Costs and Revenues

The WhaMCo Recycling Center is operated by Matagorda Services with funding primarily from the City of Bay City. The city subsidizes the center by providing \$44,000 annually for operating expenses. The city also provides the facility with certain in-kind services such as use of their heavy equipment (front end loader, dump truck, etc.) and all maintenance of the property and building. The Association for Retarded Citizens of Matagorda County (ARC) also contributes \$1,000 per month to the operations of the recycling center. In total, the annual operating budget for the recycling center is \$56,000.

The city's current private refuse hauler, Allied Waste Industries, Inc. (Allied), provides the recycling center with a six-cubic yard dumpster for the collection of refuse generated at the facility. Allied provides the center with five day a week pick-up of their refuse as part of the company's existing contract with the city.

In addition to the funding provided by the city and ARC, the recycling center generates revenues from the sale of recyclable materials collected. The following table lists the revenues received for sale of recyclables by the recycling drop-off facility during the last three years (2004-2006). These revenues are the primary offsets for program costs.

Table 1-3
Revenues from Sale of Recyclables, 2004-2006

Year	Revenue
2004	\$44,276.42
2005	\$36,034.00
2006	\$22,744.35
Total	\$103,054.77

In addition to the above revenues, the city realizes significant savings in the form of disposal cost avoidance from the diversion of recyclable materials. With recyclables collected of 367.18 tons during 2006, and assuming a cost of \$48.40⁵ per ton to collect, transport and landfill the material, the city avoided \$17,771.51 in disposal costs by recycling the materials collected by the recycling center rather than landfilling them. Table 1-4 outlines the city's net cost of drop-off recycling for 2006.

⁵ Based on the city's actual cost for their current refuse collection contractor to collect, transport and landfill one ton of material.

Table 1-4
Net Cost of Drop-off Recycling, 2006

Expenses:	Amount
City Funded Operational Expenses	\$44,000.00
ARC Contribution	\$12,000.00
Revenue:	
Sale of Recovered Materials	\$22,744.35
Cost Avoided:	
Disposal of Recyclable Materials	\$17,771.51
Net Cost of Drop-off Recycling	\$15,484.14

Bay City has also received a great deal of support for the drop-off recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). Following is a listing of some of the recycling projects the city has funded with these grant dollars:

Table 1-5
TCEQ/H-GAC Grant Funding Received by Bay City for Drop-off Recycling Center

Year	Project	Amount
1993	Recycling center development	\$50,000
1995	Purchase of recycling center equipment	\$48,000
2001	Purchase of glass crusher and four used recycling trailers	\$18,115
2004	Expansion of recycling facility and purchase of baler	\$92,321
Total		\$208,436

1.2.2 Curbside Brush Collection and Diversion

1.2.2.1 Program Description

Bay City has also provided weekly curbside brush collection to single-family residences within the city since 1996. All brush is collected by Allied Waste under their existing refuse collection and disposal contract with the city. All brush collected by Allied is taken to the city's brush site for temporary storage (see Figures 1-8 and 1-9). Every six months, Allied uses a tub grinder to grind all brush collected within the city during the previous six month period. All grinding is done at the city's brush site and all costs associated with the grinding services are included in the city's refuse collection contract. City staff use a front end loader to periodically turn the chips to promote more rapid and even decomposition of the material.



Figure 1-8: Truck unloading at brush site



Figure 1-9: Accumulated brush for grinding

Each spring, once the chips have reached a satisfactory mulch stage, the city rents a trommel screen to separate the larger chips from the finer mulch product (see Figure 1-10). The resulting mulch is then hauled to the city's compost distribution site and made available to city and county residents free of charge one time each year (Figure 1-11). Residents are allowed to take as much material as they can shovel. The city tries to limit distribution of the mulch to residential customers only. The mulch is also used by area schools and parks and for various Bay City Proud Committee projects.



Figure 1-10: Brush grinding in process



Figure 1-11: Final mulch product

1.2.2.2 Materials Accepted

Materials accepted as part of the city's weekly brush collection include:

- Tree trimmings;
- Grass cuttings;
- Plants;
- Weeds; and
- Leaves.

The city requests that residents cut all limbs into lengths no longer than six feet. Brush is not required to be bundled. All other materials such as grass cuttings and leaves must be bagged or placed in a container at the curb for collection.

1.2.2.3 Annual Tonnages

City staff estimate that approximately 2,500 tons of brush are diverted from the landfill through the curbside brush collection program each year.

1.2.2.4 Annual Program Costs and Revenues

City staff estimated the costs of the brush collection and diversion program to be approximately \$127,080 annually. Table 1-6 outlines the costs associated with the operation.

Table 1-6
Annual Cost of Brush Collection and Diversion

Expense	Amount
Curbside collection of brush [1]	\$99,840
Trommel screen rental	\$5,000
Cost to operate front end loader for composting [2]	\$7,200
Cost to operate bulldozer to load mulch into dump trucks [3]	\$4,800
Cost to operate dump trucks to transport mulch to distribution site [4]	\$10,240
Total	\$127,080

Notes: [1] Based on operating three collection trucks per week at a cost of \$80 per hour for eight hours per collection day, 52 weeks per year. [2] Based on 15 days of operation a year for eight hours per operation day at a cost of \$60 per hour. [3] Based on eight days of operation per year for eight hours per operation day at a cost of \$75 per hour. [4] Based on four trucks operating eight days a year for eight hours per operation day at a cost of \$40 per hour.

The brush collection and diversion program does not specifically generate any revenues for the city. City staff emphasized that the major focus of their brush collection and recycling is landfill avoidance. The city realizes significant savings in the form of disposal cost avoidance from the diversion of yard waste. At the City’s current combined collection, transportation and disposal cost per ton of \$48.40, the city avoids an average of \$121,000 a year in disposal costs by diverting and recycling brush.

At an annual cost avoided of \$121,000 and estimated annual program costs of \$127,080, the city’s brush collection and diversion program nearly pays for itself each year. The net cost to the city to operate the program annually is approximately \$6,080.

Bay City has received support for the brush diversion and recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). Following is a listing of some of the brush diversion and recycling projects the city has funded through these grant dollars:

Table 1-7
TCEQ/H-GAC Grant Funding Received by City for Brush Recycling Operations

Year	Project	Amount
1997	Purchase of front end loader for composting	\$85,000
1998	Lease of trommel screen	\$18,669
1999	Improve composting program by installing water line, fencing, signs, landscaping	\$23,705
Total		\$127,374

1.2.3 County-Wide School Recycling Program

The school recycling program is a joint effort between the city, four school districts within the county and Matagorda Services. The program began in 1996 when the city was awarded grant funding of \$90,500 to purchase 16 Pro-trainer trailers to be used for a county-wide school recycling program (see Figure 1-12).⁶ Each trailer purchased has four separate compartments for sorting recyclables and can be hauled by an ordinary pick-up truck. A recycling trailer is kept on the campus of each participating school for the collection of recyclable materials. Each school is allowed to select up to four of the following materials that they wish to collect: white paper, newspaper, cardboard, steel cans and plastics. The city labels the compartments of each school's trailer according to the materials selected.



Figure 1-12: Recycling trailers used in county-wide school recycling program

The city encourages teachers to promote recycling by placing recycling containers in their classrooms for use by teachers and their students. Once a week, students take the recyclables from their classroom to the recycling trailer on their campus and sort the materials into the appropriate compartments in the trailer. Each participating school's custodian is responsible for periodically transporting their trailer to the WhaMCo Recycling Center for unloading.

⁶ Solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC).

1.2.4 Household Hazardous Waste

Matagorda County has hosted an annual Matagorda County Household Hazardous Waste Collection Event for each of the last 12 years. The event is held each September and is open to all county residents. The city assists with the event each year by providing equipment and personnel for the one day event.

Table 1-8 lists the materials and amounts collected during the event in 2006.

Table 1-8
HHW Materials and Amounts Collected, 2006

Material [1]	Amount
Batteries	241
Tires	733
Oil (gallons)	1,000
Hazardous Paints	6,550
Other Hazardous Material	4,868
Non-Hazardous Material	4,750
Recyclables (cubic yards) [2]	59

Notes: [1] Listed in number of items unless otherwise noted. [2] Taken to WhaMCo Recycling Center.

The 2006 collection event drew 355 vehicles representing 541 families. The total cost of the event was \$41,163.88. The private contractor used for collection and disposal of all materials was Clean Harbors Environmental Services, Inc.

1.2.5 Electronic Waste

As with HHW materials, Bay City does not currently collect these materials itself, however Matagorda County has accepted certain e-waste materials at its annual HHW collection event for the past two years. To date, only computers and cell phones have been accepted as part of the event. In 2005, all e-waste collected was donated to the Texas Department of Criminal Justice. In 2006, a local company collected the items and refurbished them for use in area schools.

1.2.6 In-House Recycling Program

Bay City implemented an in-house work place recycling program for all city offices in 1996. All city offices recycle the following products:

- Office paper;
- Aluminum cans;
- Plastic soda bottles; and
- Cardboard.

The program is available to all 129 city employees. The city collects an average of 8-cubic yards of paper, 4-cubic yards of aluminum cans, 2-cubic yard of plastic and

8-cubic yards of cardboard on a weekly basis. The city also has an in-house oil recycling program which collects approximately 300 gallons of used motor oil each month.

All recyclables collected are taken to the WhaMCo Recycling Center.

1.2.7 Public Education

Public education and outreach efforts related to the drop-off recycling center and the brush collection and diversion program are typically done by the city.

Some of the specific public education and outreach methods used for promotion of these programs include:

- Radio station advertisements;
- Links to information regarding the WhaMCo Recycling Center on the city's website;
- Newspaper advertisements;
- Information displayed on scrolling marquee at the County courthouse;
- Cable television advertisements; and
- Use of promotional items such as brochures, stickers, posters, coloring books, etc.

1.3 Findings and Recommendations

Bay City is doing many positive things with respect to their recycling programs. They have an excellent recycling drop-off facility and brush diversion program and have valuable experience that can serve as a resource to other communities within the H-GAC region.

In the following sections, the R. W. Beck Project Team presents a number of recommendations that have been developed based on our research and evaluation of Bay City's various recycling and waste minimization programs. These recommendations are provided to the city strictly in an effort to assist in improving the efficiency, effectiveness and safety of their existing programs.

1.3.1 Drop-off Recycling

1.3.1.1 Consider Accepting Materials Only During Staffed Hours of Operation

Staff at the WhaMCo Recycling Center stated that the facility frequently has to deal with contamination issues. While the recycling center staff are very good at monitoring and assisting customers to ensure that contamination issues are minimized during the facility's staffed hours of operation, contamination problems frequently occur during hours when the facility is un-manned. During these times, people often

place recyclables in the wrong containers or place non-recyclable items and refuse in the recycling collection containers.

While the Project Team understands that the city and Matagorda Services want to make recycling as accessible and convenient for residents as possible, we generally recommend that all drop-off recycling facilities only accept materials during staffed hours of operation. Doing so will significantly reduce problems related to contamination of recyclables.

The recycling center is currently open and staffed on Saturdays from 8:00 am to 5:00 pm, which should allow most people who cannot drop-off their recyclables during the weekday hours a viable and relatively convenient option for drop-off during the weekend.

The Project Team would recommend that recycling center staff either roll each of the 1 ½-cubic yard self-dumping hoppers, located along each side of the covered drive-through area, into the front of the building for overnight storage at the end of operating hours each day. The hoppers can then be placed back along the drive-through area again for easy access by customers when the facility re-opens. Other options would include fencing the area around the recycling center or installing gates on each end of the drive-through area that can be closed during un-staffed hours. The Project Team would recommend that the city evaluate each option and select the one that will be most cost effective.

The Project Team would also recommend that the city post signage at the facility requesting that customers not leave materials outside the facility during non-operating hours. The city may also want to consider including language stating that violations of this request are considered illegal dumping and violators may be fined \$500-\$2,000 by the city for infractions.

Even if some customers continue to leave materials outside the facility after hours, it will be much easier for staff to take those items and place them in the appropriate place if they have not been mixed with clean recyclable materials. These efforts may also help improve the overall quality of the recyclables the center ships to its processors, which may in some cases increase the price per ton received for their sale or open opportunities to sell materials to processors that typically only take very clean, high quality shipments.

1.3.1.2 Consider Transferring Existing Glass Crusher to City of Pearland

In 2001, Bay City received solid waste management grant funding from TCEQ and H-GAC to purchase a glass crusher for use at the WhaMCo Recycling Center. City and recycling center staff have indicated that the glass crusher purchased with these funds is not currently in use due to the fact that all glass collected is shipped to Strategic Materials for processing and container applications.

In recent years, the City of Pearland has expressed significant interest in obtaining a glass crusher for use at their recycling drop-off facility. The City would use the glass crusher to explore the feasibility of possible alternative glass applications (i.e. non-container applications) within Pearland and the surrounding areas.

The Project Team would recommend that Bay City consider discussing potential opportunities for the transfer (whether temporary or permanent) of their existing glass crusher to the City of Pearland with staff from both Pearland and H-GAC.

1.3.1.3 Evaluate Opportunities for Sale of Used Motor Oil

City staff stated that the city is not currently receiving revenue from the sale of used motor oil collected at the recycling center or through the city's in-house recycling program. A number of other cities within the H-GAC region are currently contracting with Flex Oil Services, LLC, a company based in Channelview, Texas. Flex Oil is a licensed and permitted transporter and recycler of used oils, oil filters, and engine coolant. Other cities in the region are currently receiving \$0.15 a gallon for used motor oil from Flex Oil Services.

While the Project Team does not have any data on the amount of oil being collected at the drop-off recycling center, city staff stated that city offices alone generate approximately 300 gallons of used motor oil each month or 3,600 gallons a year. At \$0.15 a gallon, that has the potential to generate an additional \$540.00 a year in recycling revenues for the city.

The Project Team would recommend that the city contact Flex Oil Services regarding their used oil collection and recycling services to evaluate whether or not this is a potential option for Bay City.

1.3.1.4 Invest in Public Education to Improve Tonnages and Revenues

The tonnages of recyclable materials collected by the WhaMCo Recycling Center have dropped off significantly in each of the last two years. In 2004, the facility recycled just over 500 tons of materials, however tonnages decreased by approximately 110 tons the following year (2005) and another 24 tons last year (2006). The decrease in tonnage has resulted in severely declining revenues which were cut nearly in half between 2004 and 2006.⁷ Recycling center staff indicated that limited operating funds are currently one of their biggest issues. Improving diversion and thereby increasing the revenue received from the sale of recyclable materials is the best way to increase the funding available for recycling center operations.

In 2006, the average price per ton the city received across all recyclables combined was \$61.94. This means that for every additional ton of materials collected, the recycling center will get an additional \$61.94 of operating funds. In addition, the city reaps an additional cost savings of \$48.40 in collection, transportation and disposal costs for every additional ton diverted.

Combining these revenues and cost savings, the city would only need to divert seven more tons than were diverted in 2004 (a total of 508 tons) to make the entire drop-off recycling program pay for itself. Any increases beyond that tonnage mark would be straight profit to the city and the recycling center. While the Project Team realizes that 508 tons would be a substantial increase of 141 tons above the total tonnage collected

⁷ 2004 total revenue was \$44,276.42, while 2006 total revenue was \$22,744.35.

last year, the fact that diversion was recently as high as 500 tons just two years ago indicates that the increased tonnage of recyclable materials is out there.

The key for the city is to find ways to make sure that more of that tonnage gets recycled. The Project Team would suggest that improved public education and outreach efforts are the key to attaining those increases. Since the total tonnage collected at the drop-off facility is affected by not only drop-off customers, but also by the school recycling program and in-house recycling program, the Project Team would recommend targeting each of those three areas with improved education efforts.

Following are some ideas for public education efforts that would be effective for targeting each of these potential sources of increased diversion.

In general, the Project Team would recommend that the city designate at least one person who will be responsible for overseeing recycling education. This person can be a full-time recycling coordinator or a local official such as a solid waste manager, public works director or planner. This person should be a credible spokesperson who can speak effectively with the media.

In addition, the Project Team recommends appointing a volunteer recycling committee that represents a cross section of opinions and ideas that are representative of the community at large. Try to get people involved who are well connected among various subsets of the local population. For example, one person may be a teacher who is well connected within the local educational community, while another may be a member of a local church who is very active and well connected among the church's congregation. The same can be done for the business community, civic groups, senior citizens, homeowners, government, etc. This volunteer committee will serve as idea generators for how to effectively target different groups of people and will act as champions for the city's recycling programs within the community.

Following are some specific public education and outreach ideas for each targeted program.

Recycling Drop-off Center

- Targeted audience – all city residents
 - **Newspaper articles** – these should highlight and promote the program and its goals and motivate the reader to take action. Be sure to tell the reader exactly how they can get involved.
 - **Presentations to business and civic organizations** – the presentation should tell about the city's recycling programs and accomplishments and explain the programs specific goals for improvement. Again, try to motivate the audience to take action by telling them everything they need to know to participate while making it sound very simple.
 - **Direct mailings to all residents** – this can be accomplished through a recycling newsletter that goes out to all residents in their utility bill or other correspondence.

- **New resident recycling toolkit** – develop a packet of materials that can be sent to all new city residents. The materials should explain everything they need to know in order to start recycling immediately. Keep the materials simple and streamlined so that it doesn't seem complicated or time consuming. Work with the city's utility billing department or local utility company to get a list of the names and addresses for all new utility connections. Send a copy of the toolkit to all new customers.
- **City recycling webpage** – develop a page on the city's website that residents can refer to at any time for information about the programs offered. The page should tell a person everything they need to know to begin recycling in Bay City. Create an eye catching icon on the city's home page that will take a user directly to the recycling information page.

School Recycling Program

- Targeted audience – teachers and students
 - **Develop school recycling presentation** – this presentation should provide teachers and students with a complete understanding of the program and how they can get started in their own classrooms. Present the program to each school on an annual basis at a school assembly. Make the presentation fun and simple so that kids and teachers leave wanting to participate.
 - **Recycling contests among classrooms or among local schools** – sponsor a contest among classrooms at each school or among different schools in the county to see who can recycle the most in a given period. Recruit a local business or organization to donate a prize to the winning class or school. Make sure the prize is something the targeted age group will like and be motivated to obtain. If it is a class prize, have a nice prize for the winning teacher too.
 - **Recycling posters** – develop a poster that can be hung in important places around each school reminding kids to recycle and reminding them what and how to recycle. Another possible version of this would be to hold a county-wide contest for kids to develop a recycling poster that will be hung in all county schools.

In-House Recycling Program

- Targeted audience – all city employees
 - **Create a name or slogan for your recycling program** - this will help to promote the concept of recycling amongst employees.
 - **Write a memo to all employees introducing/re-introducing the program** – include specific goals in the memo and encourage employees to suggest opportunities for improvement of the program or ways to further increase diversion.
 - **Identify employees who are interested in recycling and create a "Green Team"** - members of the Green Team can be champions for the program and

act as a source of information for other employees regarding what works and what needs to be changed as the program moves forward.

- **Create contests or incentives to encourage recycling** - initiate a recycling challenge to see which department can recycle the most or a waste prevention challenge to encourage employees to develop new ideas for preventing waste.
- **Post lists of recyclable items and methods for proper disposal** – these will act as a reminder to employees to recycle and a reference for what can be recycled.

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2.1 Description of City

The City of Huntsville is the seat of Walker County and is centrally located within the County at the junction of Interstate Highways 45 and 75, U.S. Highway 190, and State Highway 30.

The city's population has grown from 35,078 in 2000 to an estimated 37,537 in 2006, representing an average annual growth rate of 1.1 percent.¹ It is projected that by the year 2010, the City of Huntsville's population will reach 40,236 or an additional 2,699 residents.² It is important to note that a significant portion of Huntsville's population lives within institutionalized group quarters (Texas Department of Criminal Justice population) and non-institutionalized group quarters (Sam Houston State University students in college dormitories). As of the 2000 U.S. Census, these persons accounted for approximately 32 percent of the city's total population. Table 2-1 outlines the historical and projected population of the City of Huntsville in total and adjusted for institutionalized and non-institutionalized group quarters.

Table 2-1
City of Huntsville Population

Year	Population	
	Total	Adjusted for Group Quarters
1990	27,925	18,267
2000	35,078	23,701
2006	37,537	25,375*
2010	40,236	27,200*

The City of Huntsville was selected by the Houston-Galveston Area Council (H-GAC) to participate in this Recycling and Waste Minimization Case Study project because of its long-standing recycling programs, unique building materials reuse program and its long-term commitment to recycling and waste minimization efforts.

¹ Source: U.S. Census Bureau, 2006 Population Estimates, Census 2000.

² Source: Huntsville Horizon Comprehensive Plan, April 2007 - based on the plan's straight-line regression projections.

2.2 Recycling in Huntsville

Huntsville provides the following recycling programs and options to its residents:

- Drop-off recycling center;
- Curbside brush/yard waste collection;
- TIPS Warehouse for building materials recycling; and
- Recent HHW collection event.

The following sections describe each of the city's existing recycling programs in greater detail and provide an overview of their operations in terms of materials, costs, revenues, tonnages collected and educational efforts.

2.2.1 Drop-off Recycling

2.2.1.1 Program Description

The City of Huntsville has operated a permanent recycling drop-off facility since 1992. The facility is currently located at 590 IH-45 North. It is a staffed facility that offers drop-off service to residents, non-residents and businesses.



Figure 2-1: Recycling Drop-off Facility

The drop-off facility is the primary recycling option for Huntsville area residents. The drop-off facility is staffed five days a week (Monday-Friday 9:00 am to 5:00 pm) by one full-time attendant. This attendant is the only dedicated staff at the recycling center.

The facility's current hours of operation are as follows:

- Monday-Saturday: 7:30 am – 5:00 pm

As previously mentioned, the facility is staffed during most operating hours, with the exception of early mornings and Saturdays.

2.2.1.2 Materials Accepted

Materials accepted at the drop-off facility include:

- Plastics - #1 and #2;
- Paper – all types including newspaper, office paper, computer paper and magazines;
- Cardboard;
- Glass – clear and brown;
- Metal – aluminum cans and steel cans (scrap metal and appliances at the disposal facility); and
- Tennis shoes.

Customers of the facility are asked to separate recyclable items into major categories in order to assist the drop-off facility staff. When customers arrive at the facility, they can place sorted materials into the appropriate 4-cubic yard dumpsters lining one side of the drive-through drop-off area (see Figure 2-2). All bins are labeled with the type of material that should be deposited there. Separate bins are available for each of the various types of paper collected and for metal cans.



Figure 2-2: Containers for sorting materials in drive-through area

Cardboard is deposited into an outdoor, fenced pen area with a plywood sub-floor (see Figure 2-3). Plastics separated by type (#1 or #2) are bagged and stored inside a small warehouse which houses two balers, an office and storage area for materials (see Figure 2-4). The plastics are held inside the warehouse in preparation for baling. Containers for the deposit of oil filters, used motor oil and anti-freeze are also available to drop-off customers (see Figures 2-5 and 2-6).

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Figure 2-3: Cardboard drop-off area



Figure 2-4: Material storage inside warehouse



Figure 2-5: Oil filter and various fluid containers



Figure 2-6: Used motor oil container

During the facility's staffed hours of operation, an attendant is available to assist and to monitor customers as they unload materials to ensure that opportunities for contamination are minimized.

Materials are collected, baled and stored on-site until a full load of material is ready to be shipped. Each of the City's current processors will come to the drop-off facility and haul the material to their sorting/processing facilities at no cost so long as a full load of material is available for pick-up.

Used tennis shoes are also collected at the recycling drop-off facility as part of the Nike "Reuse a Shoe" program. The City of Huntsville was selected to be a participant and grant recipient for this program in February 2003. However, the city is considering discontinuing their participation in the program due to a lack of promotion by Nike and lack of interest on the part of local schools who are the intended beneficiary of the program.

2.2.1.3 Annual Tonnages

The following table presents the annual tonnages of recyclables collected at Huntsville's drop-off facility over the last three years (FY 03/04-FY 05/06).

Table 2-2
Tons Collected at Drop-Off Facility by Year and Material, FY 03/04-FY 05/06

Material	Fiscal Year		
	03/04	04/05	05/06
Mixed Paper	331.57	337.31	273.11
Cardboard	113.62	95.05	87.01
Plastics (#1 & #2)	12.11	20.81	25.72
Glass (Clear)	5.50	11.66	10.89
Glass (Brown)	4.47	9.16	4.59
Aluminum Cans	2.93	2.53	2.05
Steel Cans	5.87	2.51	1.24
Total	476.07	479.03	404.61

The city's drop-off recycling facility experienced a significant decrease in the number of tons collected during FY 05/06, primarily as a result of declines in the amount of paper and cardboard collected.

2.2.1.4 Processors

Huntsville is currently sending its recyclables to the following processors:

- Vista Fibers – paper, cardboard and plastics
- T.J. Burdett & Sons, Inc. – metals

Glass collected at the facility has historically been sent to Dlubak Glass Company, Inc., however the City is currently in the process of trying to identify an alternative glass processor in the Houston area.

2.2.1.5 Annual Program Costs and Revenues

Annual program costs for the City's drop-off recycling program including labor, benefits, materials and supplies, operating expenses, public education and special projects are summarized below in Table 2-3.

**Table 2-3
Annual Budgeted Recycling Program Expenses, FY 03/04-FY 05/06**

Expense	Year		
	FY 03/04	FY 04/05	FY 05/06
Salaries and Benefits	\$30,500	\$31,545	\$32,306
Materials and Supplies	\$9,200	\$9,213	\$9,213
Services and Utilities	\$3,700	\$3,137	\$1,090
Special Programs and Projects	\$4,200	\$3,500	\$3,500
Other	\$5,000	\$5,000	\$5,000
Total	\$52,600	\$52,395	\$51,109

The following table lists the revenues received for sale of recyclables by Huntsville’s recycling drop-off facility for the last three years (FY 03/04-FY 05/06). These revenues are the primary offsets for the program costs outlined above.

**Table 2-4
Revenues from Sale of Recyclables by Material, FY 03/04-FY 05/06**

Material	Year		
	FY 03/04	FY 04/05	FY 05/06
Mixed Paper	\$14,973.55	\$15,575.50	\$14,327.93
Cardboard	\$6,439.13	\$6,058.68	\$3,154.00
Plastics (#1 & #2)	\$2,640.27	\$4,117.00	\$4,926.81
Glass (Clear)	-	-	-
Glass (Brown)	-	-	-
Aluminum Cans	\$2,234.00	\$2,695.50	\$2,140.70
Steel Cans	-	-	-
Total	\$26,286.95	\$28,446.68	\$24,549.44

According to city staff, the city also receives approximately \$4,590 in revenues annually from the sale of scrap metal collected at the drop-off facility and another \$1,479 in revenues from scrap metal collected at the disposal facility.

In addition to the above revenues, the city realizes significant savings in the form of disposal cost avoidance from the diversion of recyclable materials. With recyclables collected of 404.61 tons during FY 05/06, and assuming a cost per ton to landfill the material of \$27.39, the city avoided \$11,082.27 in disposal costs by recycling the materials collected rather than landfilling them.³ Table 2-5 outlines the city’s net cost of drop-off recycling for FY 05/06.

³ The total cost per ton for disposal of \$27.39 assumes a tipping fee of \$18.25 per ton plus transportation costs of \$9.14 per ton. Transportation costs per ton are based on a cost of \$2.00 per mile and 96 miles round-trip at 21 tons per load.

Table 2-5
Net Cost of Drop-off Recycling, FY 05/06

Expenses:	Amount
All Operational Expenses	\$51,109.00
Revenue:	
Sale of Recovered Materials*	\$24,549.44
Sale of Scrap Metal	\$4,590.00
Cost Avoided:	
Disposal of Recyclable Materials	\$12,560.33
Net Cost of Drop-off Recycling	\$9,409.23

*Includes all recyclables except scrap metal.

Accounting for the impact of both revenues and disposal cost avoided, the drop-off recycling program only cost the city \$9,409 to operate in FY 05/06.

Huntsville has received a great deal of support for the drop-off recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). Following is a listing of some of the recycling projects the city has funded with these grant dollars:

Table 2-6
TCEQ/H-GAC Grant Funding Received by Huntsville for Drop-off Recycling Center

Year	Project	Amount
1994	Drop-off recycling program	\$9,174
2003	Construct recycling center/TIPS Warehouse	\$150,000
2005	Expand recycling facility and purchase forklift	\$73,020
2007	Purchase loader for recycling facility	\$175,288
Total		\$407,482

2.2.2 Curbside Brush and Yard Waste Diversion

2.2.2.1 Program Description

Huntsville also provides curbside brush and yard waste collection to single-family residences within the city once every other week. All brush and yard waste (including tree trimmings, hedge clippings, leaves, grass, pine needles and the like) are collected by city crews using four rear-loader trucks. Collection occurs every first, third and fifth Wednesday of the month. Residents can also take brush and yard waste to the city's drop-off recycling center. All customers dropping off yard waste at the facility are required to show proof of residency in the form of a current City of Huntsville utility bill.

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For curbside collection, residents are asked to place all grass and leaves in bags or 30 gallon containers. The bag or container weight should not exceed 50 pounds. Tree

limbs and brush must be cut into pieces no longer than four feet and no larger than four inches in diameter. Tree limbs should also be securely tied in bundles not to exceed two feet in diameter or 50 pounds in weight. All brush and yard waste must be placed at the curb within 10 feet of the street.

The city pays Scotts/Hyponex \$10.00 a ton to haul away all brush and yard waste collected. The material is processed into compost and sold on the market as Hyponex products.

2.2.2.2 Annual Tonnages

The following table presents the amount of brush and yard waste diverted by Huntsville through the curbside collection program during the last three years (FY 03/4-FY 05/06).

Table 2-7
Tons of Brush and Yard Waste Diverted, FY 03/04-FY 05/06

Year	Amount Collected (Tons)
FY 03/04	484.84
FY 04/05	453.81
FY 05/06	415.86
Total	1,354.51

The city has collected an average of approximately 450 tons annually over the last three years through the curbside brush and yard waste collection program.

2.2.2.3 Annual Revenues and Cost Avoidance

While the yard waste collection and diversion program does not specifically generate any revenues for the city, the major focus of the brush and yard waste program is landfill avoidance. The city realizes significant savings in the form of disposal cost avoidance from the diversion of brush and yard waste. Table 2-8 shows the cost avoided for each of the last three years (FY 03/04-FY 05/06), assuming a \$27.39 cost per ton to landfill the material.

Table 2-8
Tons of Yard Waste Diverted and Landfill Cost Avoided, FY 03/04-FY 05/06

Year	Brush Diverted (Tons)	Cost Avoided*	Processing Fees	Cost Avoided After Processing Fees
FY 03/04	484.84	\$13,279.77	\$4,848.40	\$8,431.37
FY 04/05	453.81	\$12,429.86	\$4,538.10	\$7,891.76
FY 05/06	415.86	\$11,390.41	\$4,158.60	\$7,231.81
Total	1,354.51	\$37,100.04	\$13,545.10	\$23,554.94

*Assumes a \$27.39 cost per ton to landfill material.

After factoring in the cost of processing fees, the city has avoided disposal costs of approximately \$23,555 over the last three years, or an average savings of \$7,852 per year, by diverting residential brush and yard waste through the curbside collection program.

2.2.3 TIPS Warehouse

Huntsville also has a TIPS Warehouse that accepts used or excess building materials that can be recycled through re-distribution to other residents for reuse. The warehouse has been in operation since November 2003. Huntsville and Walker County residents can avoid paying disposal costs for leftover building materials by donating the materials to the warehouse.



Figure 2-7: TIPS Warehouse



Figure 2-8: Ceramic tiles outside warehouse



Figure 2-9: Various doors inside warehouse

The following is a list of materials accepted by the facility:

- Bathroom fixtures
- Bricks
- Cabinets
- Ceiling tiles
- Doors
- Ductwork
- Electrical wiring
- Flooring
- Insulation
- Lighting fixtures
- Lumber
- Metal framing
- Paneling
- Pipes
- OSB and plywood
- Shelving
- Siding
- Tile
- Windows
- Wood beams

All items dropped-off must be in usable condition, with minimum repair or cleaning needed. For commercial customers, the city will send a roll-off to the construction site to collect reusable materials. Despite this service, interest in the program has been primarily from residential customers.

From the program's inception in November 2003 to September 2006, the warehouse received a total of 152.49 tons of reusable building materials. The program received 93.74 tons of material during FY 05/06 alone.

The city makes all materials at the warehouse available for reuse by local residents and non-profit organizations such as churches and the historic homes association.

2.2.4 Household Hazardous Waste

The City of Huntsville, in cooperation with other Walker County Proud communities, the Texas Cooperative Extension Service and the Texas Commission on Environmental Quality (TCEQ), hosted its first HHW collection event in March of this year. The event was open to all Texas residents for the drop-off and safe disposal of: pesticides, herbicides, oil, oil filters, grease, transmission fluid, diesel fuel, power steering fluid, paint, gasoline, fluorescent bulbs, lead-acid batteries, brake fluid and rinsed plastic pesticide containers.

The HHW event was held at the Kate Barr Ross Memorial Park parking area in Huntsville. It received a total of 71 customers, most from within Walker County. The following is a summary of waste collected at the event:

- Batteries – 30
- Oil filters – 310
- Oil – 2,400 gallons
- Pesticides and other waste – 1,127 containers

The event was sponsored and funded by TCEQ as part of their Texas Country Clean-Ups program. There are no plans at this time for Huntsville to have an annual HHW collection event.

2.2.5 Public Education

Public education for all of the City of Huntsville’s recycling programs is done by a combination of city staff, Walker County staff, Keep Huntsville Beautiful volunteers and Walker County Master Gardener volunteers. The city generally allocates a budget of \$10,000-\$12,000 a year for recycling public education and outreach efforts. According to the most recent household data available, the city had 10,266 total households in 2000. This puts the city within the recommended industry benchmark range of \$1.00-\$2.00 per household per year.

Some of the specific public education and outreach methods the city has used to promote its recycling programs include:

- Information regarding all programs on the city’s website;
- School presentations;
- Promotional talks;
- Signs;
- Radio spots;
- Use of promotional items such as brochures, educational door tags, workbooks, bookmarks, etc;
- Newspaper advertisements;
- Movie theater advertisements;
- Special events such as annual “Trash Bash”; and
- Use of recycling promotional materials available through H-GAC.

2.3 Findings and Recommendations

Huntsville is doing many positive things with respect to their recycling programs. They have an excellent recycling drop-off facility and brush diversion program, and have actively considered the development of additional recycling services such as

single-family curbside, multi-family and school recycling. The city has demonstrated an obvious commitment and dedication to recycling and waste minimization initiatives and has valuable experience that can serve as a resource to other communities within the H-GAC region.

In the following sections, the R. W. Beck Project Team presents a number of recommendations that have been developed based on our research and evaluation of the City of Huntsville's various recycling and waste minimization programs. These recommendations are provided to the city strictly in an effort to assist in improving the efficiency, effectiveness and safety of existing programs.

2.3.1 Drop-off Recycling

2.3.1.1 Evaluate Continued Participation in Nike "Reuse a Shoe" Program

The city was selected to participate in the Nike "Reuse a Shoe" program in 2002. This program had the purpose of collecting old tennis shoes whose components would then be recycled into new products such as athletic surfaces. The city has collected a large number of shoes that are currently being stored in the office/warehouse at the recycling drop-off center.

While the program seemed like a unique opportunity to recycle additional materials, city staff stated that Nike has made little effort to support or promote the program in recent years. In addition, the local schools who were to be the ultimate beneficiaries of this program, have not shown much support or enthusiasm for the program either.

The Project Team recommends that the city consider discontinuing their participation in the "Reuse a Shoe" program as the benefits to the city for their efforts have been minimal and support for the program is waning. The significant storage area currently occupied by the shoes collected could be used for a variety of other new recycling programs such as electronic waste recycling or HHW collection which would potentially be more highly utilized and beneficial to the community.

2.3.1.2 Reporting Requirements for Try 2 Recycle

A local, private recycler by the name of Try 2 Recycle began operating in Huntsville in late 2006. The private company has placed containers for collection of recyclables (particularly paper and cardboard but they accept most common recyclable materials) in approximately 10 locations throughout the city and at a number of private businesses. They have also opened a drop-off recycling facility within the city. The drop-off and all containers are available for anyone to deposit accepted recyclable materials.

Walker County has also signed a contract with Try 2 Recycle to have recycling containers located at various county offices within the City of Huntsville. The County had previously taken their recyclable materials (primarily paper) to the city's drop-off facility for recycling. Many other local residents, businesses and institutions including

Sam Houston State University have also begun taking their recyclable materials to Try 2 Recycle.⁴

In addition, the city has allowed Try 2 Recycle to place collection containers for newspaper, magazines and office paper alongside the city's own collection containers at their recycling drop-off facility. City staff stated that they expect Try 2 Recycle will collect at least 500 tons of recyclable material this year within the City of Huntsville. Given the significant amount of material being collected by Try 2 Recycle within Huntsville, the Project Team would recommend that the city require Try 2 Recycle to report its tonnage data to the city annually. This data in combination with the city's recycling records will allow Huntsville to track the total amount of material being recycled annually within the city.

The Project Team would recommend requiring reporting of the following information on an annual basis:

- Recyclables processed by commodity;
- Tons of residuals disposed; and
- Purchasers of recyclable materials by commodity.

While private recyclers such as Try 2 Recycle serve a niche in the recycling market, it will be important for the city to continue adequately funding and operating their own recycling drop-off center, as it provides valuable services that cater to the needs a different subset of the community's population.

The Project Team would also strongly recommend removal of all collection containers owned by Try 2 Recycle from the city's drop-off recycling center. Locating privately owned containers at a city owned and operated drop-off facility may be confusing to customers and will ultimately result in lost revenues for the city's recycling program. Mixed paper has historically generated a larger percentage of the city's total revenues from the sale of recyclables than any other material. By allowing a private vendor to collect a large portion of the paper coming into the drop-off recycling facility, the city is forgoing a significant share of the revenues which aid in offsetting costs associated with operating the drop-off facility.

2.3.1.3 Consider Implementation of Franchise Fee to Track C&D Recycling

It is common practice for cities to charge a franchise fee to private solid waste haulers within their jurisdiction. The franchise fee is paid by the private operator to the city in return for the right to use public right-of-ways to collect, haul or transport solid waste from commercial properties within the city.

The Project Team would recommend that Huntsville consider implementation of a franchise fee of approximately four percent of gross annual revenues for all private construction and demolition (C&D) haulers operating within the city. The franchise fee would allow the city to cover costs associated with the additional wear and tear that heavy collection vehicles place on local streets, and would allow the city to track

⁴ While never specifically stated, the Project Team believes these customers are taking their materials to Try 2 Recycle because they receive a share of the revenues generated from sale of recyclable materials.

city-wide tonnages and diversion rates. The accurate tracking of overall recycling diversion rates across the city is important for local solid waste planning and performance measurement, and may assist the city in obtaining future solid waste grant funding.

2.3.1.4 Consider Developing a Household Hazardous Waste Program

Household Hazardous Waste (HHW) programs can benefit communities in several important ways:

- HHW programs can reduce the risks to health and the environment from improper storage and disposal of HHW. Improper disposal of HHW has the potential to damage infrastructure, harm individuals and contaminate water.
- HHW programs can reduce property or health related liability for local governments such as from:
 - A fireman being exposed to toxic or reactive materials in a home during a fire;
 - Sanitation workers being injured as they pick up trash at the street or process it at the landfill;
 - Disruption at a waste water treatment plant; or
 - Environmental damage due to hazardous materials being poured down the sewers, storm drain or onto public or private property.

HHW programs provide a valued service to citizens. Based on response to the one-time TCEQ funded HHW collection event hosted by the City of Huntsville in March, there appears to be a definite demand for this service among residents.

The Project Team would recommend that Huntsville consider development and implementation of a HHW collection program that offers area residents a safe and convenient way to dispose of or reuse hazardous materials. While the cost of operating a HHW program can be costly, the city should consider not only the financial costs of collecting and disposing of these materials, but also the potential financial and non-financial costs of not providing a safe alternative for disposal of these materials when evaluating the costs and benefits of such a program.

There is ample room at the city's drop-off recycling center to house either a year-round HHW collection operation and reuse area or to host periodic HHW collection events. H-GAC has a standing contract with a vendor to provide HHW collection and disposal on a contract basis to member communities. The Project Team would recommend that the city consider talking with H-GAC staff regarding this and potential grant funding opportunities that would assist the city with the initial implementation costs of developing an HHW program.

2.3.1.5 Consider Staffing Drop-off Facility During All Operating Hours

While city staff have indicated that the recycling drop-off facility has not experienced any significant issues with contamination occurring during un-staffed hours (currently 7:30 am to 9:00 am Monday-Friday; and 7:30 to 5:00 Saturday), the Project Team

would generally recommend that the drop-off facility be manned during all operating hours. This can be particularly important during Saturday hours which are typically higher traffic times for recycling drop-off facilities.⁵

⁵ Based on conversations with City staff, it is the Project Team's understanding that contamination is not currently an issue for Huntsville's drop-off facility due to that fact that the City has a staff person who continually straightens and sorts materials that have been dropped-off during un-staffed hours. This is, however, the exception rather than the norm for most drop-off facilities. Therefore, the Project Team would recommend moving towards staffing during all operating hours should contamination ever become a significant issue for the facility.

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3.1 Description of City

The City of Lake Jackson is an incorporated, planned community located approximately ten miles upriver from the mouth of the Brazos River in south central Brazoria County.

The city's population has grown from 26,386 in 2000 to an estimated 27,614 in 2006, representing an average annual growth rate of 0.8 percent.¹ It is projected that by the year 2010, the City of Lake Jackson's population will reach 32,034 or an additional 4,420 residents.² The corporate limits of the city currently encompass a total of 18.8 square miles.

Table 3-1
City of Lake Jackson Population

Year	Population
1990	22,776
2000	26,386
2006	27,614
2010	32,034

The City of Lake Jackson was selected by the Houston-Galveston Area Council (H-GAC) to participate in this Recycling and Waste Minimization Case Study project because of its long-standing and wide array of recycling programs.

3.2 Recycling in Lake Jackson

The City of Lake Jackson provides the following recycling programs to its residents:

- Single-family curbside recycling;
- Multi-family on-site recycling;
- Permanent recycling drop-off center;
- Curbside brush/yard waste collection; and
- Annual HHW collection event.

¹ Source: U.S. Census Bureau, 2006 Population Estimates, Census 2000.

² Source: Texas Water Development Board, 2002 State Water Plan Population Projections, 1990-2050 by City.

The following sections describe each of the city's existing recycling programs in greater detail and provide an overview of their operations in terms of materials, costs, revenues, tonnages collected and educational efforts.

3.2.1 Single-Family Curbside Recycling

3.2.1.1 Program Description

The City of Lake Jackson has offered curbside recycling to all single-family households within the corporate limits of the city since 1998. Approximately 8,000 single family households currently receive curbside recycling collection service. The service is provided once a week to Lake Jackson residents on the same day as their second day of household garbage pick-up. Recyclables are collected by city collection crews using rear-loader trucks with a crew of two men. All recyclables except paper products are co-mingled and placed into a blue recycling bag for collection at the curb (see Figure 3-1). Blue bags are available for purchase at city hall, but residents may place their recyclables in any type of translucent blue bags they can find for collection. Paper products including cardboard must be placed in a separate paper or plastic grocery bag at the curbside.



Figure 3-1: Curbside recycling using blue bags

3.2.1.2 Materials Accepted

Materials accepted for curbside collection are:

- Plastics – all plastics;
- Aluminum and tin cans;
- Glass – all colors;
- Cardboard; and
- Paper – most types including office paper, magazines, newspaper and junk mail.

The city asks that all residents keep their recycling blue bags and paper recyclables separate from household garbage at the curb on recycling days. All recyclables are required to be placed out for collection by 8:00 am on the day of collection.

3.2.1.3 Annual Tonnages

The following table presents the tonnage of recyclables collected by the City of Lake Jackson through their curbside program, multi-family on-site program and school recycling programs during 2006. The city does not currently track the tonnages generated by each of these programs separately.

Table 3-2
Tonnage Collected by Material, 2006

Material	Quantity (Tons)
Newspaper	610.20
Metals	50.85
Aluminum	50.85
Plastics #1	50.85
Plastics #2	101.70
Cardboard	152.55
Total	1,017.00

In 2006, the City of Lake Jackson had about 10,650 households including both single-family and multi-family units. Using this figure, Lake Jackson residents recycled approximately 191 lbs. per household through a combination of the single-family curbside program and multi-family recycling program during 2006.³ That is equal to approximately 16 lbs. per household per month. City staff estimated that the current participation rate in the single-family curbside program is approximately 75 percent.

3.2.1.4 Processors and Contracts

The City of Lake Jackson transports all of its recovered materials (except brush, yard waste, HHW and e-waste) to a materials recovery facility (MRF) located at the Seabreeze Environmental Landfill site. The facility is located approximately eight miles from Lake Jackson in Angleton, Texas. The landfill and MRF are both owned by Republic Waste Services of Texas.

The MRF is currently operated by Brazosport Environmental and Recycling Services (BEARS), a private operator, and accepts recyclables from individuals, businesses and municipalities. The MRF was initially developed and funded in part through the efforts of a coalition of six cities within Brazoria County. These cities (Lake Jackson, Richwood, Clute, Sweeny, Quintana and Danbury) agreed to subsidize the

³ Please note that these figures also include tonnages generated through the school recycling program and therefore are not a truly accurate depiction of the performance of the single-family curbside and multi-family recycling programs. Per household figures should not be compared to other cities involved in these case studies.

construction and operations of the facility for a period of five years in order to incentivize the MRF to locate within the County.

Under the contract terms Lake Jackson currently has in place, all processing, storage and marketing of recyclables to end users is done by BEARS. The contract does not currently include the sharing of any revenues generated from the sale of recyclables between the city and the processor. The processor does not currently provide the city with reports detailing the quantities and types of materials diverted on a regular basis.

3.2.1.5 Annual Program Costs and Revenues

The City of Lake Jackson was unable to provide the Project Team with an accounting of their annual costs for operation of the single-family curbside recycling program. Therefore, we are only able to look at program revenues as a part of this case study at this time.

A portion of the cost of providing recycling services is passed on to residents through a \$2.00 per single-family household per month charge included on all utility bills specifically for provision of recycling services. This is in addition to the \$13.25 solid waste services charge also assessed on customer utility bills for all other solid waste services. With approximately 8,000 households served, the monthly charge generates around \$16,000 in recycling program revenues each month or \$192,000 annually. All billing for solid waste services, including curbside recycling, is done by the city's utility billing department.

While the curbside recycling program does not generate any revenues for the city, city staff emphasized that the major focus of the program is landfill avoidance. The city realizes savings in the form of disposal cost avoidance from the diversion of recyclable materials. Assuming a tipping fee of \$24 per ton, the city would have avoided a total of \$24,408 in disposal costs for all materials recovered through a combination of the single-family curbside program, multi-family on-site program and school recycling program during 2006. These cost savings, along with the monthly recycling fee assessed to all residents, act as the primary offsets to the cost associated with collection, transport and administration of Lake Jackson's single-family curbside recycling program.

The City of Lake Jackson has also received support for the curbside recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). For example, in 1998, the city was awarded \$70,000 in solid waste grant funding to purchase a new recycling collection truck.

3.2.2 Multi-Family On-Site Recycling

3.2.2.1 Program Description

The City of Lake Jackson has provided on-site recycling collection to all multi-family properties within its corporate limits since 1995. City staff estimates that the city currently serves approximately 2,650 multi-family units. The city has placed one or

more four-cubic yard side-load containers at each multi-family complex within the city. All of the collection containers are painted green and have a list of acceptable materials stenciled in large, white lettering on the front of the container (see Figure 3-2). This helps to distinguish the recycling containers from refuse containers which are typically located next to the recycling bin. All materials are collected co-mingled in the same container. The city collects recyclables from all multi-family sites once per week on Wednesdays.



Figure 3-2: Multi-family recycling containers

3.2.2.2 Materials Accepted

Materials accepted for multi-family on-site collection are:

- Plastics – #1 and #2;
- Aluminum and tin cans;
- Glass – all colors;
- Cardboard; and
- Paper – most types including office paper, magazines, newspaper and junk mail.

3.2.2.3 Processors and Contracts

The City of Lake Jackson transports all of its recovered materials (with the exception of brush, yard waste, HHW and e-waste) to a MRF located at the Seabreeze Environmental Landfill site. The MRF is owned by Republic Waste Services of Texas and operated by Brazosport Environmental and Recycling Services (BEARS).

As with the single-family curbside recycling program, the city’s current contract terms stipulate that all processing, storage and marketing of recyclables to end users is done by BEARS. The contract does not currently include the sharing of any revenues generated from the sale of recyclables between the city and the processor. The

processor does not currently provide the city with reports detailing the quantities and types of materials diverted on a regular basis.

3.2.2.4 Annual Program Costs and Revenues

The City of Lake Jackson was unable to provide the Project Team with an accounting of their annual costs for operation of the multi-family on-site recycling program. Therefore, we are only able to look at program revenues as a part of this case study at this time.

A portion of the cost of providing recycling services is passed on to multi-family residents through a \$1.00 per unit per month charge included in the utility bills of all property managers specifically for provision of recycling services. This is in addition to the \$13.25 monthly solid waste services charge for all other solid waste services also assessed on a per unit basis in the monthly utility bill. With approximately 2,650 multi-family households served, the monthly charge generates around \$2,650 in recycling program revenues each month or \$31,800 annually. All billing for solid waste services, including curbside recycling, is done by the city's utility billing department.

While the multi-family recycling program does not generate any revenues for the city, as with the single-family curbside program, city staff emphasized that the major focus of the program is landfill avoidance. The city realizes savings in the form of disposal cost avoidance from the diversion of recyclable materials. Assuming a tipping fee of \$24 per ton, the city would have avoided a total of \$24,408 in disposal costs for all materials recovered through a combination of the single-family curbside program, multi-family on-site program and school recycling program during 2006. These cost savings, along with the monthly recycling fee assessed to all residents, act as the primary offsets to the cost associated with collection, transport and administration of Lake Jackson's multi-family recycling program.

The City of Lake Jackson has also received support for the multi-family recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). In 1994, the city was awarded \$9,600 in solid waste grant funding to assist with start-up efforts associated with the city's multi-family recycling program.

3.2.3 Curbside Brush and Yard Waste Collection

3.2.3.1 Program Description

Lake Jackson has also provided twice monthly curbside brush and yard waste collection to single-family residences within the city since 1992. All brush and yard waste (including grass, leaves and brush) are collected by city crews using 20-cubic yard open-top tucks. Other large trash items such as bulky and white goods are also picked-up by the city on the same day of collection. The city runs two trucks, one for collection of brush and metal recyclables, and another for collection of non-recyclable materials. There is a per household limit on the amount of material (including brush)

that may be set-out on large trash collection days. The limit is currently set at 64 cubic feet of material. Above this amount, the city will leave a tag on the front door of the home with an estimate of the additional disposal costs that must be paid at the following rates:

- Brush - \$8.00 per cubic yard; and
- Refuse - \$12.00 per cubic yard.

The city requests that all brush be cut into pieces no larger than eight inches in width and four feet in length. Residents can also take brush to the mulch site for drop-off during operating hours.

All brush collected is taken to the city’s wood grinding/mulch site (see Figure 3-3) and ground into mulch (see Figure 3-4). The mulch is composted for an average of about 90 days and a company by the name of Novus Wood Group (Pasadena, TX) processes and screens the material on behalf of the city. According to city staff, processing the material costs the city an average of \$2.20 per cubic yard.



Figure 3-3: Sign for wood grinding/mulch site



Figure 3-4: Mulch piles on site

Once processed, the end product is made available to area residents year-round and free of charge at the mulch site. Due to the high demand for the mulch produced, visitors wishing to take material from the site must show proof of residency in the form of a City of Lake Jackson water bill or drivers license. The city also frequently provides mulch to local schools, churches and non-profit groups as a service to the community.

3.2.3.2 Annual Tonnages

City staff stated that the brush and yard waste program collects and processes approximately 36,000 cubic yards of material each year. The city does not currently track the amount of yard waste collected and processed on a regular basis.

3.2.3.3 Annual Revenues

The yard waste collection and diversion program does not specifically generate any revenues for the city. City staff emphasized that, as with its other recycling programs, the major focus of the yard waste program is landfill avoidance. The city realizes

savings in the form of disposal cost avoidance from the diversion of yard waste. Given the city's average annual diversion of 36,000 cubic yards of brush and yard waste, the annual cost avoided assuming a \$24.00 cost per ton to landfill the material and an average of four-cubic yards per ton of material, would equal approximately \$216,000 in cost savings before accounting for the processing costs. City staff stated that processing costs for the mulch operation average about \$2.20 per cubic yard or approximately \$79,200 annually given 36,000 cubic yards of material. The difference is a cost savings of \$136,800 to the city each year.⁴

3.2.4 Drop-off Recycling

The City of Lake Jackson also has a four-cubic yard recycling container located at its wood grinding/drop-off site (see Figure 3-5). This container is the same as those used for multi-family recycling collection. Residents can drop-off recyclables at the mulch site anytime during operating hours. There is also a small area at the mulch site for collection of used oil, oil filters, antifreeze, old gasoline, cooking oil and grease and paint (see Figure 3-6).



Figure 3-5: Drop-off recycling containers



Figure 3-6: Various drop-off containers

This small recycling drop-off area serves as a place for residents to take recyclables if they miss a pick-up or have certain HHW materials that need to be disposed of in the time between the city's annual HHW collection events.⁵

The facility's current hours of operation are as follows:

- Tuesday-Friday: 8:30 am – 4:30 pm
- Saturday: 8:00 am – 3:30 pm

The facility is staffed during all operating hours. Visitors are asked not to leave materials at the facility during non-business hours.

The city receives a small amount of revenue from the used oil collected at the drop-off site. Flex Oil Services (Channelview, TX) pays the city \$0.15 per gallon for all used oil collected.

⁴ It is important to note, however, that collection cost data was not available and is therefore not included in this cost analysis.

⁵ HHW collection programs are discussed in Section 1.2.5 below.

The City of Lake Jackson has received support for their drop-off recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). In 2003, the city was awarded \$182,000 in solid waste grant funding to enhance citizen drop-off equipment and education efforts.

3.2.5 Household Hazardous Waste

The City of Lake Jackson has provided HHW collection to residents in the form of annual collection events for more than 10 years. The annual HHW event is held at the Brazoria County fairgrounds each year. The city has had a long-standing inter-local agreement with DOW Chemical Company for the incineration of all hazardous waste collected at no cost to the city. The annual event has historically been open to anyone wanting to dispose of materials including residents, non-residents and businesses.

Brazoria County is preparing to open a new, permanent, year-round HHW facility adjacent to the Republic Waste Seabreeze MRF on December 1, 2007 (see Figure 3-7). The facility is intended for use by all of southern Brazoria County.



Figure 3-7: Permanent HHW Drop-off facility

Funding for this project was provided to Brazoria County through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). In 2006, the county was awarded \$262,180 in solid waste grant funding to construct the permanent HHW drop-off facility. The process of obtaining this funding was a cooperative effort between the County, Keep Brazoria Beautiful and the City of Lake Jackson.

While the new facility will be held in the County's name, it will be operated by Keep Pearland Beautiful with a portion of the annual financial support for supplies and operations contributed by the City of Lake Jackson and other surrounding cities. Lake Jackson will also provide part-time volunteers to staff the facility and will play a significant role in the coordination and planning of events held at the new facility.

DOW Chemical Company will be the vendor for disposal of all HHW collected at the facility that cannot be re-distributed for use by other area residents.

3.2.6 Public Education

Public education for all of the City of Lake Jackson's recycling programs is done by a combination of city staff and Keep Lake Jackson Beautiful volunteers. According to city staff, the city allocated a budget of approximately \$40,000 to recycling public education and outreach efforts. The city has a full-time recycling coordinator who is responsible for development and implementation of all education efforts.

Some of the specific public education and outreach methods the City has used to promote its recycling programs include:

- Educational programs in all public schools;
- Use of "Charlie Chipper" as a mascot for the city's recycling programs;
- Lake Jackson "Clean City Cruiser"(see Figure 3-8);
- Spring/Fall city-wide clean-up;
- Flyers handed out at all apartment complexes for managers to give to all new tenants;
- Use of promotional items such as brochures, magnets, stickers, bracelets, posters, coloring books, etc;
- A newsletter that is distributed to all residents three times per year; and
- Special events such as "EnviroFest" held annually at the local mall.



Figure 3-8: Clean City Cruiser

The city has typically put a significant amount of effort into promoting its annual HHW collection events. The city has allocated an average of \$5,000-\$6,000 annually for various promotional efforts related to this event including:

- Newspaper advertisements that run for several weeks prior to the event; and

- A fall newsletter sent to all residents with details of the upcoming event.

City staff stated that they are making efforts to do more local cable channel advertising and to better utilize the city's website as a resource for recycling information and education.

3.3 Findings and Recommendations

Lake Jackson has a great variety of recycling programs and is doing many positive things with respect to recycling. The city's experiences in operating its long-standing, wide array of recycling programs can serve as a valuable resource for other communities within the H-GAC region.

In the following sections, the R. W. Beck Project Team presents a number of recommendations that have been developed based on our research and evaluation of Lake Jackson's various recycling and waste minimization programs. These recommendations are provided to the city strictly in an effort to assist in improving the efficiency, effectiveness and safety of their existing programs.

3.3.1 Single-Family Curbside Recycling

3.3.1.1 Require the Use of a Standardized Bag for Collection of Co-mingled Recyclables

The City currently allows residents to use any type of translucent blue bag for the set-out of recyclables at the curb. The city makes specifically approved bags available to residents for purchase at city offices for a price of \$6.00 for a box of 13-gallon bags. However, residents are not required to purchase these particular bags and are free to set-out recyclables in any type of similar bag.

The lack of a standardized bag or container for the collection of recyclables has a tendency to lead to confusion and less compliance with the rules for set-outs. Residents of Lake Jackson frequently set-out recyclables in bags that are clear or not translucent, often making it difficult for collection crews to distinguish between refuse and recyclables at the curb.

The Project Team would recommend instituting a standardized bag or container that must be used by all residents placing recyclables at the curb for collection. This could come in the form of a standardized, city-approved blue bag that is stamped with the city's name and made available for purchase by residents at city offices and at other frequently visited locations such as grocery and convenience stores. Non-city locations would be required to remit proceeds from the sale of these bags to the city on a regular basis. Recovery of the additional costs for administering this type of program could be achieved in part through a small mark-up on the price of the bags above the city's cost to purchase and distribute them.

The city could also consider the use of re-usable recycling bins for all residents. The bins would be used in place of the blue bags for the co-mingled collection of all non-paper items.

Regardless of the method the city chooses for containment and set-out of recyclables, the Project Team would recommend recyclables not contained in a proper city-approved bag or container not be collected by the city's collection crews. Non-conforming set-outs should be left at the curb with an educational tag stating the reason for non-collection and provide information regarding where the resident can find out more about the proper set-out of recyclables.

The Project Team would also recommend updating the city's ordinances to include language specifically stating their recycling collection practices.

3.3.1.2 Invest in Public Education to Reduce Contamination

While the city's curbside recycling program has been in operation for nearly 10 years, and many city residents are familiar the program, there is still a need to continually educate both new and existing residents about the curbside recycling program. In order to keep participation and volumes high and contamination low, it is important to continually educate residents on the materials collected and specific set-out requirements, and to provide the community with regular feedback on the accomplishments of the program. These measures will keep recycling in the forefront of resident's minds and keep them motivated to participate often and properly.

Initially, the Project Team would recommend developing an educational door tag for placement at households that set-out non-conforming materials. The tag would be used in situations where there is either obvious contamination of the recyclables or where recyclables have been set-out in an unapproved manner.

In addition, the Project Team would recommend that the city consider allocating additional funding for the purpose of curbside recycling education and outreach. It is important that adequate funding is budgeted for this purpose on an on-going basis, particularly since the city's curbside program generates the largest share of the total recyclables recovered by the city.

Industry benchmarks for recycling public education generally range from \$1.00-\$2.00 per household per year. By these standards, the city should allocate \$8,000-\$16,000 annually to effectively fund recycling public education and outreach targeted at its approximately 8,000 single family residences that have access to the curbside recycling program.

The Project Team would recommend that the city use these funds to communicate two key messages consistently and effectively:

- The importance of recycling; and
- Opportunities and rules for participation in available recycling programs.

These messages can be communicated through a wide variety various public education tools. Based on the Project Team's industry experience, recycling coordinators generally report the greatest satisfaction with the following educational tools:

Table 3-3
Educational Tools with Greatest Impact

Print Media	Direct Marketing
Recycling toolkits/handbooks	Workshops
Door hangers	Recycling hotline
Newspaper ads/articles	Business and multi-family presentations
Billboards	Community events
Direct mail	

3.3.2 Multi-Family On-Site Recycling

3.3.2.1 Invest in Public Education to Reduce Contamination

As with the city's curbside recycling program, there is a need to improve educational efforts related to the city's multi-family recycling program. According to city staff, the multi-family program currently struggles with persistent contamination issues. The only way to improve participation by multi-family residents and improve the quality of recyclables collected through this program is through consistent and effective public education and outreach to both the households, maintenance staff and property managers. If residents are not informed or are not given the proper literature, the recycling program will not be as effective as it could be.

The Project Team recommends that the city develop and distribute a recycling tool-kit and additional educational materials to all multi-family households annually throughout the life of the program. Residents need to be frequently reminded about the program and the key elements of participation need to be consistently reinforced. This is particularly important with a multi-family recycling program, due to the traditionally high turnover rate of residents in multi-family housing.

In developing the tool-kit, city staff should assume residents don't know anything. For many of them, this may be the first time they are participating in a recycling program. The kit should include information on:

- Why they should recycle;
- What materials can be recycled;
- What materials cannot be recycled;
- How to deposit materials for collection;
- A site map with the location of the recycling containers in their community;
- When recyclable materials will be picked up; and
- Where to go for more information.

As previously mentioned, industry benchmarks for recycling public education generally range from \$1.00-\$2.00 per household per year. By these standards, the city

should allocate \$2,650-\$5,300 annually to effectively fund public education and outreach efforts targeted at their multi-family recycling program.

3.3.2.2 Seek Support from Property Management and Staff

In addition to educating residents, it is critical to educate and involve property managers and maintenance staff in the city's multi-family recycling program. The Project Team recommends that the city also distribute recycling tool-kits and educational materials to the maintenance staff and management of all multi-family properties. These individuals need to be educated on the program so they can encourage residents to participate and answer basic questions about how to participate in the city's multi-family recycling program.

In addition, the Project Team recommends that the city reach out to apartment managers and staff to let them know that they play a critical role in the overall program's performance. The city should develop presentations, recommendations and incentives that will encourage management involvement and buy-in. The Project Team would encourage city staff to meet with the management and staff of each apartment community on an annual basis to review program basics, educate new management and staff members, and provide encouragement and tips for how they can play an important role in the city's recycling programs.

Following are a few ideas that city staff could suggest to apartment managers and staff to get them more personally involved and invested in the program:

- Keep residents informed and enthusiastic by providing consistent educational materials through newsletters, posters, banners or bulletins.
- Recruit one or more residents to assist in distribution of educational materials and watch for recyclables in the trash or vice versa.
- Educate your maintenance staff so they know what to watch for. Maintenance crews are integral in keeping garbage and recyclables separated by making daily checks on the enclosures.
- Educate office staff on the program so they can answer questions posed by residents.

Finally, the city should encourage all residents, apartment managers, apartment staff and apartment maintenance personnel to contact the city directly if they have specific opinions or suggestions on how the city's multi-family recycling program is working or could be improved.

3.3.3 Household Hazardous Waste Program

3.3.3.1 Implement Adequate System for Tracking Customers, Materials and Revenues

With Brazoria County preparing to open a new year-round HHW drop-off center, the Project Team felt it was important to provide the city with an overview of the basic recordkeeping procedures we would recommend for this program.

Accurate and up-to-date records of the following information should be maintained on a regular basis:

- Name, date and address for each customer dropping-off materials;
- Dates and quantities of all materials shipped out for disposal or processing (broken out by material where feasible);
- Name of markets to which all materials are sent;
- Revenues received for sale of any materials by commodity (if applicable); and
- Costs for facility operations, hauling and disposal.

Complete and up to date records for all of the above should be kept on-site at the HHW drop-off facility.

In addition, many HHW drop-off facilities that operate year-round also have exchange areas for unused or leftover paints, solvents, pesticides, cleaning and automotive products, and other materials. This allows excess or unused HHW materials to be picked-up and used by other customers, rather than being thrown away. If the city plans to have a re-use area at the new HHW facility, the Project Team would simply recommend tracking the amount of material taken from the facility for re-use. It is advisable to keep a log of the following items:

- Date;
- Name;
- Address;
- Material(s) and amounts taken;

The facility should also reserve the right to limit the amount of materials that can be taken at any time. In determining appropriate limits, the facility should consider the amount of product that would reasonably be used by a single customer in a household setting. The city could also consider requiring residents taking materials from the reuse area to sign a waiver absolving the facility of responsibility for the materials

3.3.4 Other General Recommendations

3.3.4.1 Improve Tracking and Recordkeeping of Individual Program Costs, Revenues and Cost Savings

The Project Team would recommend that the city improve its current record-keeping process for all of its recycling programs. Accurate and up-to-date records are needed for each individual program (single-family curbside, multi-family, school recycling, curbside brush and yard waste, and drop-off). At a minimum, recordkeeping for each individual program should include:

- Tonnage of materials collected – this should be broken down by commodity where feasible;

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- Dates and quantities of all recyclables sent to market by commodity (where feasible);
- Name of markets to which all recyclables are sent;
- All costs associated with collection, transport, processing or disposal;
- All costs associated with program administration and public education;
- All revenues generated by sale of recyclables by commodity (if applicable); and
- All revenues generated through customer fees or other means.

There may be additional recordkeeping needs for particular programs, but the above list is a good starting point for all programs.

3.3.4.2 Processor Reporting Requirements

The city does not currently receive any regular reports or data from its recycling processor. Processing reports would yield valuable knowledge for the city and allow the city to:

- Understand participation levels and contamination levels across areas of city;
- Target public education message in a particular area of city;
- Understand commodity market conditions; and
- Ensure city is receiving proper level of revenue sharing (if applicable).

The Project Team recommends that the city amend its contract with its processor to include language requiring the processor to provide the city with the following data on a monthly basis:

- Date, truck number, ticket number and net weight of all incoming loads;
- Recyclable materials processed by recyclable type (to the extent feasible);
- Tons of residuals disposed;
- Purchasers of recyclables; and
- Revenue generated from sales.

3.3.4.3 Consider Contract Options for Revenue Sharing

Revenue sharing involves the city and the processor sharing the revenue generated from the sale of recyclables. Under revenue sharing, the processor will typically sell recyclables on the open market and then pay the city its share of revenue earned on each ton.

Under the city's current contract for processing with Republic Waste/BEARS, the city does not receive a share of the revenues from the sale of recyclable materials recovered. The Project Team would recommend that the city examine the potential for a revenue sharing structure between the city and the processor. Proper revenue sharing has the effect of creating a public/private partnership in which both parties have incentives to maximize diversion and minimize contamination.

Under the city's current contract agreement, there are no incentives for either the city or the processor to increase the amount or quality of materials diverted. The Project Team would recommend that the city explore potential opportunities to amend their current contract with BEARS to include a clause that would provide the city with a share of the revenue annually for tonnages above what the city has typically recycled in recent years. For example, the city diverted just over 1,000 tons of recyclables in 2006. The contract could be amended to state that for every additional ton diverted by the city above 1,000 tons annually, the processor will share a portion of the revenue from those additional recyclables with the city.

This type of agreement would benefit both the city and the processor. The city would have incentive to increase diversion and an opportunity to generate some revenue to offset the costs incurred for their recycling programs. The processor would benefit because additional materials diverted by the city equal additional revenues from the sale of materials.

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4.1 Description of City

The City of Pearland is located in the northernmost portion of Brazoria County (as well as part of Harris County and Fort Bend County), 17 miles southeast of downtown Houston. The City of Pearland is currently the fastest growing community in Brazoria County. Its population has grown from 37,640 in 2000 to an estimated 68,305 in 2006, representing an average annual growth rate of 10.4 percent.¹ It is projected that by the year 2016, the City of Pearland's population will reach 78,931 or an additional 10,626 residents.² The corporate limits of the city currently encompass a total of 46.5 square miles.

Table 4-1
City of Pearland Population

Year	Population
1990	18,697
2000	37,640
2006	84,200
2016	100,000

The City of Pearland was selected by the Houston-Galveston Area Council (H-GAC) to participate in this Recycling and Waste Minimization Case Study project because of the wide variety of recycling programs that it offers, as well as the cooperative involvement it exhibits between the city and the local, non-profit, Keep America Beautiful affiliate, Keep Pearland Beautiful (KPB), with regard to recycling program development and education efforts. The city contracts directly with Keep Pearland Beautiful for much of its recycling promotion and environmental education initiatives.

4.2 Recycling in Pearland

The City of Pearland provides a wide variety of recycling programs and options to its residents including:

- Single-family curbside recycling;

¹ Source: U.S. Census Bureau, Census 2000 and population projections provided by city staff.

² Source: Pearland Economic Development Corporation, Projected Residential Growth 2006-2016, March 2007.

- Permanent drop-off recycling center;
- Curbside brush/yard waste collection; and
- Year-round HHW collection at drop-off facility; and
- Year-round e-waste collection at drop-off facility.

The following sections describe each of the city's existing recycling programs in greater detail and provide an overview of their operations in terms of materials, costs, revenues, tonnages collected and educational efforts.

4.2.1 Single-Family Curbside Recycling

4.2.1.1 Program Description

The City of Pearland has offered curbside recycling to all single-family households within the corporate limits of the city since October 1990. Keep Pearland Beautiful was instrumental in advocating for this service to be added to the city's refuse collection contract. Approximately 24,000 single family households currently receive curbside recycling collection service. The service is provided once a week to Pearland residents through a contract with Waste Management, Inc. All recyclable materials are collected co-mingled in a single 18-gallon recycling bin.

4.2.1.2 Materials Accepted

Materials accepted for curbside collection are:

- Newspaper – no phone books, mail, magazines or other paper;
- Glass bottles and jars – all colors;
- Aluminum and steel cans – must be rinsed; no scrap metal; and
- Plastics – only clear or translucent milk and water jugs and clear plastic soda bottles (plastics #1 and #2); no colored plastics.

Newspapers may be folded and placed underneath other recyclable materials in the bin or residents may choose to place them in a brown paper sack next to the recycling bin. All bins are required to be placed out for collection by 7:00 am on the day of collection.

In order to reduce contamination, increase the quality of materials collected, and educate residents on the recyclable materials collected, any contaminants or non-recyclables identified in recycling containers are left in the recycling bin at the curb along with a notice stating the reason for non-collection.

4.2.1.3 Annual Tonnages

The following table presents the annual tonnage of recyclables collected through the curbside program over the course of each of the last three years. The co-mingled category represents all materials other than newspaper that are collected through the curbside program (i.e. glass, aluminum, plastic and steel).

Table 4-2
Annual Curbside Tonnage Collected, 2004-2006

Year	Material (tons)		
	Co-mingled*	Newspaper	Total
2004	385.33	995.41	1,380.74
2005	393.90	980.18	1,374.08
2006	477.85	1,020.40	1,498.25

*Includes glass, aluminum, plastic and steel

Assuming 24,000 households received curbside collection service during 2006, Pearland residents recycled approximately 125 lbs. per household through the single-family curbside program last year. That is equal to approximately 10.4 lbs. per household per month.

4.2.1.4 Annual Program Costs and Revenues

The City of Pearland recently signed a new five year contract with Waste Management to continue providing curbside recycling services to city residents through September 2011. According to city staff, the cost to the city to provide single-family curbside recycling under this contract is approximately \$2.00 per household per month. That amounts to an approximate cost to provide curbside service to the 24,000 single family homes within the corporate limits of \$48,000 monthly or \$576,000 annually.

This cost is passed on to residents as part of a single, lump-sum solid waste services fee of \$12.97 per month per residential unit that covers the cost of curbside refuse, recycling, and brush and bulk goods collection. Of this monthly charge, the city retains a \$1.00 processing fee per household, plus 15 percent of the remaining base rate per household (\$11.97), for a total of \$2.80 per household per month (\$806,400 annually) to cover all solid waste program administration, education, and billing costs. All billing for solid waste services, including curbside recycling, is done by the city's utility billing department.

Under the existing contract, the city also receives a direct contribution of \$5,000 per month (\$60,000 annually) from Waste Management to provide all recycling promotion, education and outreach services related to the single-family curbside program. These funds are then passed through to Keep Pearland Beautiful, whom the city has tasked with primary responsibility for providing curbside recycling education and outreach to city residents. The role of Keep Pearland Beautiful is described in further detail in the Public Education section below.

Under the contract terms, all processing, storage and marketing of recyclables to end users is done by Waste Management. The contract does not currently include the sharing of any revenues generated from the sale of recyclables between the city and the collection contractor.

Waste Management is required to provide the city with a monthly report detailing the recycling tonnages collected through the curbside program. Keep Pearland Beautiful collects these reports and monitors the data.

4.2.1.5 Public Education

The city maintains a contract with Keep Pearland Beautiful to provide recycling education and outreach to city residents. The city initially paid Keep Pearland Beautiful for this service through a portion of the proceeds received from the curbside recycling program.³ However, in place of this initial arrangement, the city's contract with Waste Management now stipulates that they receive a \$5,000 per month (\$60,000 annually) direct contribution from Waste Management to provide all recycling promotion, education and outreach services related to the single-family curbside program.

Of the \$60,000 Keep Pearland Beautiful receives, \$34,746 is budgeted specifically for outreach and education activities such as special events, recycling promotions, advertising, brochures and give-aways. The remaining \$25,254 is used for salaries and other operational expenses associated with these specific outreach activities. Given the approximate number of households currently served by this program (24,000), the current investment of \$34,746 in direct education and outreach activities represents \$1.45 per household per year for curbside recycling education. This is an adequate and healthy investment in public education for the program, as typical benchmarks for recycling public education funding are between \$1.00 and \$2.00 annually per household for established programs.

Outreach methods used by Keep Pearland Beautiful to promote the City's solid waste collection services, curbside recycling program, brush collection, recycling drop-off center and HHW program include:

- Coordinating with the city's utility billing department to send recycling program information to addresses activating utility service within the city;
- Mass mailings to all addresses within newly annexed areas of the city;
- Frequent presentations to a wide variety of community groups and organizations;
- Teacher/student educational programs in the local schools;
- Sponsoring local Chamber of Commerce social events;
- Advertising on the local community news page for Pearland/Friendswood/Alvin on the Houston Chronicle website;
- Use of promotional items such as brochures, magnets, rulers, notepads, bookmarks, etc;
- Weekly recycling column in the local newspaper; and

³ In 2006, Keep Pearland Beautiful received 14 percent of the total franchise fees collected for residential service by the City annually under its contract with Waste Management. This percentage amounted to a total of \$52,300 for recycling education and outreach for the curbside program.

- Periodic print advertisements in Pearland area special sections of the Houston Chronicle

As a non-profit service group, Keep Pearland Beautiful also raises money for recycling outreach and education programs through fundraising and grant funding opportunities, and spends significant efforts promoting each of the other recycling programs (described below) within the City of Pearland, in addition to the curbside program.

4.2.2 Drop-off Recycling

4.2.2.1 Program Description

The City of Pearland has operated a permanent recycling drop-off facility for approximately 15 years. The current facility located at the Southwest Environmental Center (3423 Harkey Road) has been in operation since June 2004. It is a staffed facility that offers drive-through, drop-off service to businesses, residents and non-residents alike. Customers dropping off materials are asked to provide their address in a customer log; however, this is for informational purposes only since there are no restrictions on who may use the facility.



Figure 4-1: Recycling Drop-off Facility

The drop-off facility is the primary recycling option for Pearland area residents who live in multi-family units within the city or who live outside of the city limits where curbside recycling is not provided. It is also an important resource for curbside customers who wish to recycle additional materials that are not accepted as part of the curbside program. Facility staff have also noticed recent increases in the number of local businesses utilizing the recycling drop-off facility.

The drop-off facility has two full-time staff members who manage the facility, one regular volunteer who assists with operations two days out of each week, and three part-time high school student workers. The facility also receives periodic assistance from persons needing to fulfill community service requirements.

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The facility's current hours of operation are as follows:

- Monday-Friday: 8:00 am – 5:30 pm
- Saturday: 9:00 am – 1:00 pm
- Closed Sundays, holidays and holiday weekends

As previously mentioned, the facility is fully-staffed during these hours. Visitors are asked not to leave materials at the facility during non-business hours. Violations of this request are considered illegal dumping and violators may be fined \$500-\$2,000 by the city for infractions.

4.2.2.2 Materials Accepted

Materials accepted at the drop-off facility include:

- Plastics - #1 and #2;
- Paper – all types including newspaper, office paper, computer paper, junk mail, magazines, telephone books and cardboard;
- Glass - all colors; and
- Metal – aluminum and steel cans, scrap metal, large appliances and aerosol cans.

It is important to note that the city's drop-off facility also accepts various e-waste items and household hazardous waste. These items are discussed separately in a subsequent section.

Customers of the facility are asked to separate recyclable items into major categories in order to assist the drop-off facility staff. When customers arrive at the facility, they can place sorted materials into the appropriate 2 ½-yard tilt hoppers lining the sides of the drive-through area (see Figures 4-2 and 4-3). All bins are noticeably and appropriately labeled with the type of material that should be deposited there. Staff members at the facility are available to assist and to monitor customers as they unload materials to ensure that opportunities for contamination are minimized. Separate bins are available for the various types of paper collected (i.e. newspaper, office paper, cardboard). However, in the event that the paper is not easily sortable, it may be placed in a container specifically designated for mixed paper.



Figure 4-2: Drive-through drop-off area



Figure 4-3: Sorting bins along side of drive

Once the 2 ½-yard containers housed inside the drop-off facility are full, they are emptied into 30 or 40-yard roll-off containers that are kept outside, behind the facility (see Figure 4-4). Materials are collected and stored in these roll-off containers until they reach capacity, at which time staff notify their processor for the particular material or materials that they have a full load to be picked-up. Each of the city’s current processors will come to the drop-off facility and haul the material to their sorting/processing facilities at no cost if a full load of material is available for pick-up.



Figure 4-4: Roll-off containers used for storage

4.2.2.3 Annual Tonnages

The following table presents the annual tonnages of recyclables shipped out of the City of Pearland’s drop-off facility during the past two years (2005-2006) and the first quarter of this year (2007).⁴

Table 4-3
Tons Shipped from Drop-Off Facility by Year and Material, 2005-2007

Material	Year		
	2005	2006	2007 (Q1)*
Aluminum	1.75	2.45	-
Steel	11.54	17.58	5.05
Paper	56.02	85.96	29.17
Glass	10.81	21.63	-
Cardboard	29.94	38.59	10.31
Plastics #1	4.39	6.16	1.77
Plastics #2	2.96	4.76	1.62
Total	117.41	177.12	47.92

*First quarter shipments only (January-March, 2007)

⁴ The City does not track the amount of recyclables that are brought into the facility, but tracks the amounts of each material that are shipped out of the facility for processing.

The facility has shown a steady increase in both the amount of materials collected and number of customers utilizing the facility over the past two years. In 2006, a total of 4,951 customers brought materials into the drop-off facility. In just the first quarter of this year, the facility has already had 2,283 customers, putting it on track exceed the number of customer visits in the previous year.

4.2.2.4 Processors and Contracts

The City of Pearland's drop-off recycling facility does not currently have contracts in place with any end-users for the sale of materials collected at the facility. Facility staff have elected to keep their options open as to whom they sell materials to once they have collected a full load. The facility is currently selling the majority of materials collected to BFI-ACCO Recycling for processing. The materials currently being sent to Acco include: all types of paper except magazines, all plastics, and aluminum. A much smaller amount of the paper collected at the facility (primarily magazines) is being sent to Tascon Incorporated for processing.

Glass collected at the facility is currently sent to Strategic Materials. However, the facility is currently examining other alternative markets for the sale of glass. Pearland facility staff are also currently considering the purchase of a glass crusher, which would allow the facility to crush the glass collected for beneficial use in alternative applications.

All steel, scrap iron and white goods collected at the facility are taken to either Cameron Metal Recycling (Cameron) in Manvel, Texas or Union Iron and Metal Company (Union) in Houston, Texas. Union picks-up materials at the drop-off facility and hauls them to their facility in Houston. The city currently has a volunteer who periodically transports CPUs, copper, transformers, white goods and aluminum siding to Cameron free of charge. In exchange for transporting these materials, the volunteer receives any revenues from their sale. Therefore, the city currently receives only a portion of the revenues generated from the sale of steel and scrap iron collected at the drop-off facility.

4.2.2.5 Annual Program Costs and Revenues

Annual program costs for the city's drop-off recycling program including labor, benefits, materials and supplies, maintenance, operating expenses and public education are summarized below in Table 4-4. These costs exclude the Household Hazardous Waste (HHW) component of the drop-off facility which is discussed separately in a subsequent section of the case study.

Table 4-4
Annual Budgeted Drop-off Program Expenses, 2005-2007

Expense	Year		
	2005	2006	2007
Labor and Benefits	\$ 84,215	\$ 108,467	\$ 93,759
Materials and Supplies	\$ 2,600	\$ 2,300	\$ 2,300
Maintenance	\$ 3,000	\$ 3,000	\$ 3,000
General Operating Expenses	\$ 41,800	\$ 19,900	\$ 19,400
Public Education	\$ 2,200	\$ 2,000	\$ 6,000
Total	\$ 133,815	\$ 135,667	\$ 124,459

The following table lists the revenues received for the sale of recyclables by the City of Pearland's recycling drop-off facility for the last two years (2005-2006) as well as for the first quarter of 2007. These revenues are the primary offsets for the program costs outlined above.⁵

Table 4-5
Revenues from Sale of Recyclables, 2005-2006

Processor	Year		
	2005	2006	2007 (Q1)[1]
Acco	\$ 6,479.73	\$ 4,878.47	\$ 2,961.40
Tascon	\$ 123.96	\$ 204.22	\$ 258.89
Awin		\$6,626.99	
Cartridges for Kids			\$ 211.50
Unspecified [2]	\$5,390.00	\$4,167.61	\$ 523.50
Total	\$ 11,993.69	\$15,877.29	\$ 955.29

Notes: [1]First quarter revenues only (January-March, 2007); [2] For a large number of the revenues, there was no specified vendor indicated in the accounting system.

The City of Pearland has also received a great deal of support for the drop-off recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). For example, in 2002, the city was awarded \$468,200 in solid waste grant funding to construct their current recycling drop-off facility, purchase equipment and fund first year salaries for facility staff.

4.2.2.6 Public Education

Public education for the drop-off recycling program is done by a combination of city staff and Keep Pearland Beautiful. Some of the specific public education and outreach methods used to promote the drop-off center include:

⁵ As stated in Section 1.2.2.4, this does not include the sale of steel, scrap iron and white goods.

- Newspaper advertisements;
- Roadway signage to direct people to the facility;
- Teacher/student educational programs in the local schools;
- Program information available on City of Pearland and Keep Pearland Beautiful websites;
- Use of promotional items such as brochures, pencils, magnets, rulers, notepads, bookmarks, etc;
- Facility tours for students, senior groups and scout troops; and
- Special events such as “Recycling Rangers” annual Keep Pearland Beautiful Camp, Texas Recycles Day, annual “Clean-Out Your Files” Day, and Business After Hours events.

4.2.3 Brush and Yard Waste

4.2.3.1 Program Description

Brush and yard waste diversion are offered to single-family residences within the city limits under the city’s current contract with Waste Management for curbside refuse and recycling services. Waste Management picks-up yard trimmings in separate trucks on residents' second garbage day of the week. All yard waste is taken to a commercial facility for composting.

The City of Pearland does not currently offer a yard waste diversion program for multi-family units or residents living outside of the city limits.

4.2.3.2 Materials Accepted

Residents are asked to place grass, leaves, flowers, stalks, stems and trimmings in a translucent bag at curbside on the appropriate collection day. The weight of the bag cannot exceed 35 pounds. Tree limbs and branches must be cut into lengths no longer than five feet and tied in bundles no larger than 18 inches in diameter and no heavier than 50 pounds. In December and January of each year, Christmas trees are also collected.

4.2.3.3 Annual Tonnages

The following bullets present the annual tonnages of brush collected during each of the last two years (2005-2006) and the first two months of this year (2007):

- 2005 – 3,782.68 tons
- 2006 – 4,558.94 tons
- 2007⁶ – 453.47 tons

⁶ Represents tonnages collected in January and February only.

4.2.3.4 Program Costs

Costs for curbside brush and yard waste diversion are included as part of the monthly solid waste services fee which covers the cost of curbside refuse, recycling, brush and bulk goods collection.

4.2.3.5 Public Education

Both the City of Pearland and Keep Pearland Beautiful advertise the curbside brush and yard waste diversion program on their respective websites. Detailed information on the program and the requirements summarized above are readily available online and are included in many of the public education efforts with regard to curbside recycling.

4.2.4 Household Hazardous Waste

4.2.4.1 Program Description

The City of Pearland has also provided permanent, year-round household hazardous waste (HHW) drop-off/disposal services at the recycling drop-off center since February 2005. This service is currently available to both City of Pearland residents and non-residents four days a week.⁷

The facility's hours for HHW collection are as follows:

- Monday-Wednesday: 8:00 am – 5:30 pm
- Thursday: 8:00 am – 12:00 pm

The facility is fully-staffed during all hours of operation to assist visitors with drop-off and proper handling of materials. As with all materials accepted by the recycling center, visitors are asked to not leave materials at the facility during non-business hours.

⁷ While there is presently no charge for this service, there are ongoing discussions regarding possible implementation of a nominal fee for non-residents.



Figure 4-5: HHW collection and storage area

4.2.4.2 Materials Accepted

HHW materials accepted at the drop-off facility during designated hours include:

- Flammables – oil based paint and paint products;
- Oxidizers – pool chemicals;
- Poisons – herbicides and pesticides;
- Corrosives – acids and certain cleansers;
- Batteries – lead acid, nickel cadmium, mercury and lithium;
- Oil – motor oil, filters and cooking oil;
- Paint – latex and oil based; and
- Antifreeze.

Most HHW materials collected at the recycling center are disposed of safely and properly through a contract with Phillips Services Corporation. Exceptions to this include most latex paints, which are mixed together onsite and made available for re-use by local public or non-profit entities, and certain pesticides and herbicides which are also made available for re-use by local residents upon request (see Figure 4-6).



Figure 4-6: Reuse area at recycling drop-off facility

4.2.4.3 Annual Pounds Collected

The following table presents the annual pounds of HHW materials collected through the city's recycling drop-off facility during the last two years (2005-2006) and the first quarter of this year (2007).

Table 4-6
HHW Collected at Drop-Off Facility by Year and Material, 2005-2007

Material	Year		
	2005	2006	2007 (Q1)*
Non-flammable Paint	25,882	30,783	6,629
Flammable Paint	18,853	15,049	6,994
Oil (gal.)	1,570	2,300	747
Batteries	8,592	14,804	7,320
Antifreeze (gal.)	115	233	50
Acid	510	820	365
Base	527	1,037	90
Poison	4,720	6,244	2,133
Flammable Liquid	5,416	2,309	1,445
Oxidizers	158	-	-
Cylinders	124	-	-

*First quarter shipments only (January-March, 2007)
Note: All amounts reported in pounds unless otherwise noted.

4.2.4.4 Annual Program Costs and Revenues

Because HHW collection is offered in conjunction with recycling drop-off services at the city's recycling center, many of the costs associated with operation of this program are accounted for in the budget previously outlined in Section 4.2.2.5 regarding the City of Pearland's recycling drop-off center. However, there is a significant additional cost associated with disposal of the HHW materials collected at the facility. The city's contract with Phillips Services to properly dispose of these hazardous materials currently costs the city \$32,000 annually in addition to the standard operating budget for the recycling center.

The city has received significant financial support for the HHW program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). In 2005, the city was awarded \$83,018 in solid waste grant funding to enhance HHW facilities and disposal.

4.2.4.5 Public Education

Both the City of Pearland and Keep Pearland beautiful advertise the HHW drop-off program on their respective websites. Detailed information on the program, materials collected and hours of operation are readily available online and are included in many of the public education efforts outlined in the above section regarding the recycling drop-off facility. Information on the program is also distributed through brochures sent to all new utility customers within the city.

4.2.5 Electronic Waste

4.2.5.1 Program Description

The City of Pearland began accepting e-waste at their drop-off recycling center in February 2005 in conjunction with the initiation of year-round HHW collection. This service is currently available to both City of Pearland residents and non-residents four days a week. Drop-off hours for e-waste follow the same schedule as HHW collection.

The facility's hours for e-waste collection are as follows:

- Monday-Friday: 8:00 am – 5:30 pm
- Saturday: 9:00 am – 1:00 pm
- Closed Sundays, holidays and holiday weekends

The facility is fully-staffed during all hours of operation to assist visitors with drop-off and proper handling and unloading of e-waste materials. As with all materials accepted by the recycling center, visitors are asked not to leave materials at the facility during non-business hours.

4.2.5.2 Materials Accepted

E-waste materials accepted at the drop-off facility during designated hours include:

- Ink cartridges;
- Cell phones;
- Re-chargeable cell phone batteries and accessories;
- Computers;
- Monitors;
- Keyboards;
- Televisions; and
- Printers.

4.2.5.3 Annual Tonnages

The city groups all electronic waste items together for record-keeping and recording purposes, when reporting the amount of e-waste material shipped out of the recycling facility each year. In 2005, the first year of the e-waste program, 8.94 tons of electronic waste was collected at the recycling center. In 2006, the amount of material collected increased dramatically to 27.55 tons of electronic waste. Through the first quarter of 2007 (January-March), the facility collected 8.47 tons of e-waste.

4.2.5.4 Processors and Contracts

Ink cartridges collected at the Pearland facility have historically been sent to Cartridges for Kids, a national program that pays schools and non-profit organizations for empty laser and inkjet cartridges (among other items). However, the City is currently storing all cartridges collected with a final processor to be determined. All other electronic waste items collected at the facility are currently taken to WM Recycle America or CompuCycle, Inc. for processing.

At this time the city does not have a formal contract with any of the above processors stating specific terms and conditions. As with the other recyclable materials accepted at the drop-off facility, city staff prefer to remain flexible in their choice of processors.

4.2.5.5 Annual Program Costs and Revenues

Because e-waste collection is offered in conjunction with recycling drop-off services at the city's recycling center, the costs associated with operation of this program are accounted for in the budget previously outlined in Section 4.2.2.5 regarding the City of Pearland's recycling drop-off center.

4.2.5.6 Public Education

Both the City of Pearland and Keep Pearland Beautiful advertise the e-waste drop-off program on their respective websites. Detailed information on the program, materials collected and hours of operation are readily available online and are included in many of the public education efforts outlined in the above section regarding the recycling drop-off facility. Information on the program is also distributed through brochures sent to all new utility customers within the city.

4.3 Findings and Recommendations

The City of Pearland is doing many positive things with respect to their recycling programs. They offer a wide variety of programs designed to reach many different citizens and collect a wide selection of recyclable materials. The city has an obvious commitment and dedication to recycling and waste minimization initiatives and has valuable experience that can serve as a resource to other communities within the H-GAC region.

In the following sections, the R. W. Beck Project Team presents a number of recommendations that have been developed based on our research and evaluation of the City of Pearland's various recycling and waste minimization programs. These recommendations are provided to the city strictly in an effort to assist in improving the efficiency, effectiveness and safety of existing programs.

4.3.1 Single-Family Curbside Recycling

4.3.1.1 Inclusion of Additional Reporting Requirements in Contract

Under the city's current contract, the collection and processing of recyclable materials is integrated into one contract for all services to be performed by Waste Management. As part of any recycling collection and processing contract, it is generally important to require periodic reporting of the following data:

Collection

- Gross weight of materials collected, broken out by individual material categories to the extent feasible;
- Total number of set-outs collected; and
- Total number of households.

Processing

- Date, truck number, ticket number and net weight of all incoming loads;
- Recyclable materials processed, by recyclable type;
- Tons of residuals disposed;
- Purchasers of recyclables; and
- Revenue generated from sales.

The City of Pearland does currently require a monthly report detailing the weight of materials collected (broken down between co-mingled and newspaper) as part of their contract for curbside recycling collection with Waste Management.

The Project Team would recommend that the additional reporting requirements related to set-outs, number of households and all processing information be added to the contract at the next contract negotiation or renewal period. These additional items would provide the city with valuable additional information for monitoring changes in

tonnages, participation, contamination and commodity markets and would assist in identifying opportunities for targeted public education and/or program improvement.

4.3.1.2 Consider Contract Options for Revenue Sharing

Under the current collection and processing contract, the city pays Waste Management a fixed fee for all collection and processing of recyclables. This type of contract structure may reduce overall costs to the city, but will not typically provide the greatest incentive for the contractor to maximize diversion and does not include the city in revenue sharing generated from the sale of recyclables.

The Project Team would recommend that the city examine the potential for a declining revenue sharing structure between the city and contractor. Under a declining revenue sharing agreement, the city would receive a certain percentage of revenues from the sale of recyclable materials up to a certain pre-determined point, after which the contractor's share of the revenues would increase. In other words, the contractor's revenue sharing percentage increases as tonnage diverted increases. This type of contract structure is generally ideal as it maximizes incentives to drive diversion and produce materials sold at high prices. Proper revenue sharing has the effect of creating a public/private partnership in which both parties have incentives to maximize diversion and minimize contamination.

A declining revenue sharing structure should not negatively affect the processors willingness to contribute funding to the city for recycling public education and outreach efforts. In fact, under this type of contract structure, the processor has more incentive to help the city maximize the amount of recyclables diverted, since the processor receives a greater share of the revenues as tonnages increase.

4.3.2 Drop-off Recycling

4.3.2.1 Continually Evaluate Markets and Document Contracts

City staff should continually monitor the recyclables markets and indices to remain up to date on prices and processors. This will ensure that the city is receiving the best prices for recovered materials. At this time, it does not appear economically feasible for the city to partner with other processors. However, it is recommended that the City continue to monitor pricing and collection terms for other processors serving the H-GAC region. The Project Team would also recommend improving the documentation associated with contracting procedures used with individuals or corporations for the sale of recovered materials.

4.3.2.2 Improve Systems for Tracking Customers, Materials and Revenues

The Project Team would also recommend that the city improve some elements of the current record-keeping process for the city's recycling center. Accurate and up-to-date records are needed for each of the following:

- Dates and quantities of all recyclables sent to market by commodity;
- Name of markets to which all recyclables are sent;

- Revenues received for sale of materials by commodity; and
- Costs for hauling and disposal of any non-recyclables.

Complete and up to date records for all of the above should be kept on-site at the recycling facility.

4.3.2.3 Examine Practices Related to Steel and Scrap Iron Recycling

The city currently has a volunteer who periodically transports all CPUs, copper, transformers, white goods and aluminum siding collected at the facility to Cameron Metal Recycling (Cameron) in Manvel, Texas. The volunteer does this free of charge to the city. However, in exchange for transporting the materials, the volunteer receives all revenues from sale of the materials.

City staff are currently evaluating alternatives for steel and scrap iron processing to determine the most economical transportation and processing arrangements.

4.3.2.4 Improve Facility Signage Along Harkey Road

The city currently has good signage along highway 518 directing customers to the recycling drop-off facility. However, signage for the facility along Harkey Road is currently very limited and can be difficult to see. The Project Team would recommend that the city either improve the existing signage or add additional signage along Harkey Road that will more effectively direct visitors to the recycling drop-off facility.

4.3.2.5 Construct Berm Around Paint Mixing Area

The Project Team would recommend putting in place an absorbent berm or other barrier around the paint mixing area to prevent the potential for any run-off flowing off the facility property in the future.



Figure 4-7: Paint mixing area

4.3.2.6 Review Safety Procedures in Handling of E-Waste and HHW

Many e-waste items contain potentially hazardous materials. Certain types of these products are currently being taken apart by volunteers at the city's recycling drop-off facility. If done improperly, taking these items apart can result in the possible release of toxic chemicals into the environment. The Project Team would recommend reviewing the facility's current practices regarding the handling of e-waste to ensure proper safety guidelines are in place to protect staff and volunteers working in the facility.

In addition, due to the hazardous nature of HHW materials, the Project Team would also recommend that city staff regularly review HHW safety measures in place at the drop-off facility and attend regular HHW training. This will help to ensure that all proper procedures for handling and storage of HHW materials are followed.

4.3.3 Household Hazardous Waste

4.3.3.1 Record Keeping and Possible Limits on Materials Taken for Reuse

HHW drop-off facilities that operate year-round like the Pearland Recycling center frequently have exchange areas for unused or leftover paints, solvents, pesticides, cleaning and automotive products, and other materials. While this allows excess or unused HHW materials to be picked-up and used by other customers, rather than being thrown away, the Project Team would recommend tracking the amount of material taken from the facility. It is advisable to keep a log of the following items:

- Date;
- Name;
- Address;
- Material(s) and amounts taken;

The facility should reserve the right to limit the amount of materials that can be taken at any time. In determining appropriate limits, the facility should consider the amount of product that would reasonably be used by a single customer in a household setting. The city could also consider requiring residents taking materials from the reuse area to sign a waiver absolving the facility of responsibility for the materials.

4.3.3.2 HHW Collection for Pearland Residents Only

The costs associated with HHW material collection, recycling and disposal can be significant. The cost to the City of Pearland for contracted disposal of HHW is approximately \$32,000 annually. Staff members at the Pearland recycling drop-off center indicated that a significant number of customers come to the facility from outside the Pearland area each year to dispose of their HHW.

Due to the high cost of disposal of these items, the Project Team would recommend monitoring the amount of material coming from outside the Pearland area. While there

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is not presently a charge for this service, there are ongoing discussions within the City regarding possible implementation of a nominal fee for non-residents.

5.1 Description of City

The City of Texas City is located on the southwestern shore of Galveston Bay seven miles from Galveston and eleven miles from the Gulf of Mexico in Galveston County. The city's population has grown from 41,521 in 2000 to an estimated 45,070 in 2006, representing an average annual growth rate of 1.4 percent.¹ It is projected that by the year 2010, Texas City's population will reach 50,607 or an additional 5,537 residents.² The corporate limits of the city currently encompass a total of 167.2 square miles, of which 62.4 square miles (37 percent) is land and 104.9 square miles (63 percent) is water.

Table 5-1
Texas City Population

Year	Population
1990	40,822
2000	41,521
2006	45,070
2010	50,607

Texas City was selected by the Houston-Galveston Area Council (H-GAC) to participate in this Recycling and Waste Minimization Case Study project because of its excellent drop-off recycling facility and its staff's commitment to creating successful recycling and waste minimization programs for residents.

5.2 Recycling in Texas City

Texas City provides the following recycling programs and options to its residents:

- Drop-off recycling center; and
- Curbside brush collection and diversion.

¹ Source: U.S. Census Bureau, 2006 Population Estimates, Census 2000.

² Source: Texas Water Development Board, 2002 State Water Plan Population Projections, 1990-2050 by City.

The following sections describe each of the city's existing recycling programs in greater detail and provide an overview of their operations in terms of materials, costs, revenues, tonnages collected and educational efforts.

5.2.1 Drop-off Recycling

5.2.1.1 Program Description

Texas City has operated a recycling drop-off facility since November 1995. The facility is called Biosphere 1 Recycle Center and is located at 3301 Loop 197 North. The facility was developed as part of the city's "Goals 2000" Projects, which led to over \$100 million in city improvements and brought national recognition when Texas City was named an All-America City finalist in 1995 and 1996 and received the title in 1997.



Figure 5-1: Entrance to Biosphere 1 Recycle Center

Biosphere 1 is a staffed facility that offers drop-off services to Texas City residents, non-residents and businesses. Businesses and non-residents, however, may not drop-off household garbage, brush, tires or refrigerators at the facility. All customers are asked to provide their name and address in a customer log at the gate house located at the entrance of the recycling center. Customers dropping off trash or brush at the facility are asked to provide a current City of Texas City water bill. Non-recyclable materials brought to the facility are limited to a maximum volume of 8 cubic yards. No residency verification is required for persons dropping-off other recyclable materials.

The drop-off facility is the primary recycling option for Texas City area residents. The drop-off facility is staffed seven days a week by one guard shack attendant and one recycling attendant. These two attendants are the only dedicated staff at the recycling center. However, the facility also receives regular operational assistance from shared Public Works Division staff, which split time among various departments including sanitation.

The facility's current hours of operation are as follows:

- Monday-Saturday: 8:00 am – 4:00 pm
- Sunday: 12:00 noon – 4:00 pm

As previously mentioned, the facility is staffed during all operating hours. Visitors are asked not to leave materials at the facility during non-business hours.

5.2.1.2 Materials Accepted

Materials accepted at the drop-off facility include:

- Paper – most types including newspaper, office paper, magazines, cardboard and paperboard;
- Metal – aluminum and steel cans, scrap metal and metal appliances;
- Plastics - #1 and #2;
- Glass – clear and colored;
- Oil – motor oil and filters;
- Antifreeze; and
- Tires.

The Biosphere 1 Recycle Center does not accept roofing materials, automobile batteries, paint or other toxic or hazardous materials.

Customers of the facility are asked to separate all recyclable items into the appropriate containers in order to assist the drop-off facility staff. When customers arrive at the facility, they can place sorted recyclable materials into separate containers for each material. Containers for collection of recyclables are located in several different areas or stations on one side of the facility property and include:

- Individual 25 or 30-cubic yard open-top roll-off containers for scrap metal, #1 plastics, #2 plastics, clear glass, colored glass, and aluminum cans lining each side of a walk-up catwalk (see Figure 5-2);
- Two enclosed, recycling roll-off containers are located close by for collection of various types of paper (see Figure 5-3);
- Containers for the deposit and storage of used antifreeze, oil and oil filters (see Figure 5-4);
- A covered and partially enclosed concrete utility building which houses the facility's balers and other necessary equipment and serves as the facility's cardboard recycling area (see Figure 5-5); and
- A large area to the rear of the facility, surrounded by concrete berms, and labeled as the drop-off area for metal appliances.



Figure 5-2: Roll-offs for sorting materials



Figure 5-3: Enclosed roll-offs for paper



Figure 5-4: Fluid and filter containers



Figure 5-5: Baler and cardboard storage area

All bins are noticeably and appropriately labeled with the type of material that should be deposited there. The staff attendant at the facility is available to assist customers in unloading materials if needed or to answer any questions.

The recycling center also includes an area for the disposal of non-recyclables and household garbage (see Figure 5-6). It consists of a large two car width elevated ramp with two 40-cubic yard open-top roll-off containers on each side of the ramp.



Figure 5-6: Ramp to access roll-offs for household garbage

Materials are collected and stored in these various containers on-site until they reach capacity, at which time staff notify their processors for the particular material or materials that they have a full load to be picked-up. Each of the city's current processors will come to the drop-off facility and haul the material to their sorting/processing facilities at no cost if a full load of material is available for pick-up.

It is important to note that the other half of the Biosphere 1 Recycle Center houses all of the facility's brush recycling operations. These services are discussed separately in Section 5.2.2.

5.2.1.3 Annual Tonnages

The following table presents the tonnages of recyclables collected and shipped from Texas City's drop-off facility during the one year period of October 2005-September 2006.

Table 5-2
Tons Shipped from Drop-Off Facility by Material and Month, Oct 2005-Sept 2006

Month/Year	Material						
	Paper	Cardboard	Plastic	Scrap Metal	Oil [1]	Batteries [2]	Aluminum
Oct 2005	18.38	-	-	29.49	1,200.00	2,206.00	-
Nov 2005	23.29	-	-	41.66	200.00	-	-
Dec 2005	20.81	-	-	34.04	1,250.00	-	-
Jan 2006	33.57	-	-	26.74	1,050.00	-	-
Feb 2006	13.09	-	-	26.62	1,120.00	-	-
Mar 2006	12.91	-	-	42.71	1,200.00	-	-
Apr 2006	25.03	-	-	40.16	210.00	-	-
May 2006	12.65	-	-	30.88	1,120.00	-	-
Jun 2006	14.06	-	-	37.43	1,150.00	-	-
Jul 2006	13.68	22.22	-	50.88	1,200.00	-	-
Aug 2006	12.90	-	-	58.83	1,120.00	1.25	0.71
Sep 2006	25.72	7.0	-	33.11	1,200.00	-	-
Total	226.09	29.22	20.9 [3]	452.55	12,020.00	2,207.25	0.71

Notes: [1] Reported in gallons; [2] Reported in pounds; [3] City takes plastics to market on an annual basis and averages approximately 1.74 tons collected per month.

During this one year period, the drop-off facility collected and sent 729.47 tons of combined paper, cardboard, plastics and metals to processors for recycling. They also recycled 12,020 gallons of motor oil and 2,207.25 pounds of batteries at the facility.

Glass is noticeably absent from the list of materials shipped out to processors over the past year. This is due to the fact that the city did not receive any revenue from glass collected and shipped during the year. The city currently ships all glass to Strategic

Materials, however they did not have a clean load accepted by the processor during the year. As a result, rather than the city receiving any revenue for the materials, they have had to pay a fee to the processor to accept each load of glass shipped. City staff stated that one 30-cubic yard load of glass is shipped from the recycling drop-off approximately every two to three months. The city typically pays a fee of \$150.00 to Strategic Materials to accept one of these 30-cubic yard loads.

The city continues to accept glass at the recycling facility and is actively looking into options to either decrease contamination or find potential alternatives markets and uses for the glass collected.

The city estimates that approximately 40,000 vehicles visit the recycle center annually to drop-off their household recyclables.

5.2.1.4 Processors and Contracts

Texas City's drop-off recycling facility is a member of the Central Texas Recycling Association (CTRA) and uses them for the marketing of many of its recyclables.³ CTRA keeps 10 percent of the sale price of all materials sold by member cities as compensation for their assistance in actively seeking markets for materials collected and researching and negotiating market rates.

Texas City is currently sending its recyclables to the following processors:

- Vista Fibers – all paper, cardboard and plastics
- Strategic Materials – all glass
- Flex Oil – all motor oil and filters
- Santa Fe Recycling (local) – scrap metal

5.2.1.5 Annual Revenues

The following table lists the revenues received for sale of recyclables by Texas City's recycling drop-off facility during the one year period from October 2005-September 2006. These revenues are the primary offsets for the program costs described in Section 5.2.4.

³ While the City uses CTRA to negotiate pricing for materials, the City currently hauls all of its own materials to their respective processors.

Table 5-3
Revenues from Sale of Recyclables, Oct 2005-Sept 2006

Material	Amount Collected*	Average Price per Ton	Revenue
Paper	226.09	\$49.65	\$11,224.84
Cardboard	22.22	\$54.00	\$1,199.88
Plastic	20.90	\$303.00	\$6,332.70
Scrap Metal	452.55	\$51.02	\$23,087.59
Oil (gal)	12,020.00	\$0.15	\$1,803.00
Batteries (lbs)	2,207.25	\$0.11	\$235.30
Aluminum	0.71	\$700.00	\$497.00
Total Revenue	-	-	\$44,380.31

*Reported in tons unless otherwise noted.

During the one year period, a total of \$44,380.31 in revenue was generated from the sale of recovered materials. Revenues from the sale of scrap metal and paper accounted for the bulk of this revenue due to both the higher quantities collected and the higher relative price per ton for those materials.

The city also generates revenue for the operation of the recycle center through a \$0.50 per month charge on the water utility bill of each household. The 2000 U.S. Census recorded a total of 12,750 households within the City of Texas City. Using this figure as the approximate number of total households within the city, this monthly assessment would generate a total of \$6,375 per month or \$76,500 in annual revenues for recycling center operations in addition to revenues received from the sale of recovered materials.

Texas City has also received a great deal of support for the drop-off recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). Following is a listing of some of the recycling projects the city has funded with these grant dollars:

Table 5-4
TCEQ/H-GAC Grant Funding Received by Texas City for Drop-off Recycling Center

Year	Project	Amount
1995	Purchase of equipment for recycling center	\$13,000
1996	Purchase of roll-off containers for recycling center	\$16,065
1997	Construction of concrete recycling pad	\$28,293
1998	Purchase of roll-off containers	\$37,250
1999	Enhancements to recycling center and purchase of 12,000 recycling bins for city residents	\$29,982
Total		\$124,590

5.2.2 Curbside Brush Collection and Diversion

5.2.2.1 Program Description

Texas City has also provided weekly curbside brush collection to single-family residences within the city since 1995. All brush is collected by city crews using two rear-loader trucks and two knuckle boom trucks in the summer months when tonnages are greater and one of each type truck in the winter months when tonnages are lighter. Residents can also take brush to the Biosphere 1 Recycle Center for drop-off.

All brush collected is ground into mulch and made available to area residents free of charge at the Biosphere 1 facility. A portion of the mulch is also processed into compost that is also made available to city residents at no charge. All grinding is done at the recycle center in a large area reserved for brush recycling (see Figure 5-7). The city initially used two horizontal grinders to process all brush collected. However, in 2003 they invested in a tub grinder (see Figure 5-8) that has saved significant labor hours associated with the operation.



Figure 5-7: Brush recycling area



Figure 5-8: Tub grinder

5.2.2.2 Materials Accepted

Residents are asked to cut all brush into 8-10 foot lengths prior to placing it at the curb for collection.

5.2.2.3 Annual Tonnages

The following table presents the amount of brush diverted and recycled by Texas City during the one year period of October 2005- September 2006. The following figures include all brush collected through both the residential curbside collection service and the drop-off recycling facility.

Table 5-5
Tons of Brush Diverted, Oct 2005-Sept 2006

Month/Year	Brush Diverted (Tons)
Oct 2005	1,948.00
Nov 2005	445.00
Dec 2005	420.00
Jan 2006	532.50
Feb 2006	482.50
Mar 2006	557.50
Apr 2006	302.50
May 2006	457.50
Jun 2006	437.50
Jul 2006	414.00
Aug 2006	598.40
Sep 2006	2,819.20*
Total	9,414.60

*Increased tonnage due to storm event.

During this one year period, the city diverted 9,415 tons of brush from the landfill.

5.2.2.4 Annual Revenues

The yard waste collection and diversion program does not specifically generate any revenues for the city. City staff emphasized that the major focus of the yard waste program is landfill avoidance. The city realizes significant savings in the form of disposal cost avoidance from the diversion of yard waste. Table 5-6 shows the cost avoided for the one year period from October 2005-September 2006, assuming a \$28.00 cost per ton to landfill the material.

Table 5-6
Tons of Brush Diverted and Landfill Cost Avoided, Oct 2005-Sept 2006

Month/Year	Brush Diverted (Tons)	Cost Avoided*
Oct 2005	1,948.00	\$54,544
Nov 2005	445.00	\$12,460
Dec 2005	420.00	\$11,760
Jan 2006	532.50	\$14,910
Feb 2006	482.50	\$13,510
Mar 2006	557.50	\$15,610
Apr 2006	302.50	\$8,470
May 2006	457.50	\$12,810
Jun 2006	437.50	\$12,250
Jul 2006	414.00	\$11,592
Aug 2006	598.40	\$16,755
Sep 2006	2,819.20	\$78,938
Total	9,414.60	\$263,609

*Assumes a \$28.00 cost per ton to landfill material.

During this one year period, the city diverted 9,415 tons of brush from the landfill. Assuming a cost of \$28.00 per ton to landfill this material, the city avoided a total of \$263,609 in disposal costs by diverting and recycling this brush.

Texas City has also received a great deal of support for the brush diversion and recycling program through solid waste management grant funding provided by the Texas Commission on Environmental Quality (TCEQ) through the Houston-Galveston Area Council (H-GAC). Following is a listing of some of the brush diversion and recycling projects the city has funded through these grant dollars:

Table 5-7
TCEQ/H-GAC Grant Funding Received by City for Brush Recycling Operations

Year	Project	Amount
1998	Purchase of brush grinder to assist with composting operations	\$125,000
1999	Purchase of grinder	\$95,000
2000	Purchase of compost spreader, dump truck and rental of trammel screen	\$94,000
Total		\$314,000

5.2.3 Electronic Waste

Texas City plans to begin offering e-waste collection at the Biosphere 1 Recycle Center in the near future. The city had been considering this additional service for some time, and recently approved the construction of a dry storage area for this new operation. The money has been allocated for construction of the storage area and city

staff indicated that the new e-waste collection program should be in operation within the next 12 months. The city is currently talking with a variety of vendors regarding their interest in a contract for processing of e-waste collected by the city.

5.2.4 Annual Program Revenues and Costs

The annual costs for the Biosphere 1 Recycle Center are not maintained in a separate budget from the overall Sanitation Department Budget. This makes it difficult to determine the specific costs associated with operation of the recycling facility and the brush collection and processing operations. However, the city does calculate the cost of recycling based on both a revenue and cost avoidance basis since each ton of material recycled represents a ton of material that the city does not pay to dispose of.

The following table outlines the city's methodology for calculating the net cost of recycling using the sample year of data (Oct 2005-Sept 2006) the Project Team received from city staff. These calculations include costs and revenues for both the drop-off recycling facility and curbside brush collection.⁴

Table 5-8
City's Net Cost of Recycling, Oct 2005-Sept 2006

Cost:	
Salaries/Labor	\$227,948
Revenue:	
Sale of Recovered Materials	\$44,380
Cost Avoided [1]:	
Disposal of Brush	\$263,609
Disposal of Other Non-Hazardous Recyclables [2]	\$19,644
Net Cost of Recycling	\$(99,685)

Notes: (1) Costs avoided are based on a disposal cost of \$28.00 per ton. (2) Includes paper, cardboard, scrap metal, plastics and aluminum., but specifically does not include oil or batteries.

Accounting for the impact of both revenues and disposal costs avoided, the city realized a net savings from recycling operations of \$99,685 during the one year period from October 2005-September 2006. This savings does not take into account the additional estimated \$76,500 the city receives annually for operation of the recycle center through the monthly \$0.50 fee included in the utility bills of all city residents.

5.2.5 Public Education

Public education and outreach efforts related to the drop-off recycling center and the brush collection and diversion program have generally been fairly limited in scope.

⁴ It is important to note that only costs attributable to salaries and labor required to operate the recycle center and brush collection and processing operations are considered in the cost portion of this calculation.

The city's annual budget for promotion and education related to these programs has been around \$3,000 or \$0.19 per household per year.

Some of the specific public education and outreach methods used to promote the drop-off center include:

- Recycling facility signage;
- Information regarding the Biosphere 1 facility on the city's website;
- Distribution of recycling themed book covers within the local public school system; and
- Development of a recycling education program for local schools including a video that can be aired on public access television.

5.3 Findings and Recommendations

Texas City is doing many positive things with respect to their recycling programs. They have an excellent recycling drop-off facility and brush diversion program, and are actively considering and developing additional recycling services such as e-waste recycling. The city has an obvious commitment and dedication to recycling and waste minimization initiatives and has valuable experience that can serve as a resource to other communities within the H-GAC region.

In the following sections, the R. W. Beck Project Team presents a number of recommendations that have been developed based on our research and evaluation of Texas City's various recycling and waste minimization programs. These recommendations are provided to the city strictly in an effort to assist in improving the efficiency, effectiveness and safety of their existing programs.

5.3.1 Drop-off Recycling

5.3.1.1 Modify Catwalk at Recycling Drop-off Facility

The open-top roll-off containers for collection of scrap metal, plastics, glass and aluminum at the city's drop-off facility are currently arranged along a central catwalk with four containers lining each side of the catwalk (see Figure 5-9).



Figure 5-9: Catwalk at Biosphere 1 Recycle Center

Having the containers situated in this manner tends to cause a build-up of materials within each container at the end abutting the catwalk area.

The Project Team would recommend modifying the catwalk to include walkways extending out from the existing, central catwalk area, between each of the collection containers. This would allow materials to be deposited along the full length of each container and would reduce opportunities for uneven build-up of materials in one portion of the containers.

5.3.1.2 Consider Developing a Household Hazardous Waste Program

Household Hazardous Waste (HHW) programs can benefit communities in several important ways:

- HHW programs can reduce the risks to health and the environment from improper storage and disposal of HHW. Improper disposal of HHW has the potential to damage infrastructure, harm individuals and contaminate water.
- HHW programs can reduce property or health related liability for local governments such as from:
 - A fireman being exposed to toxic or reactive materials in a home during a fire;
 - Sanitation workers being injured as they pick up trash at the street or process it the landfill;
 - Disruption at a waste water treatment plant; or
 - Environmental damage due to hazardous materials being poured down the sewers, storm drain or onto property.

HHW programs provide a valued service to citizens. City staff have stated that there is a definite demand for this service among residents, but that the cost of operating an HHW program has been too cost prohibitive for the city to date.

The Project Team would recommend that Texas City consider the development and implementation of an HHW collection program that offers area residents a safe and convenient way to dispose of or reuse hazardous materials. When evaluating the costs and benefits of such a program, the city should consider not only the financial costs of collecting and disposing of this material, but the potential financial and non-financial costs of not providing a safe alternative for disposal of these materials as well.

There is ample room at the Biosphere 1 Recycle Center to house either a year-round HHW collection operation and reuse area or to host periodic HHW collection events. H-GAC has a standing contract with a vendor to provide HHW collection and disposal on a contract basis to member communities. The Project Team would recommend that the city consider talking with H-GAC staff regarding this and potential grant funding opportunities that would assist the city with the initial implementation costs of developing an HHW program.

5.3.2 Curbside Brush Collection and Diversion

5.3.2.1 Consider Purchase of Windrow Turner

The city has a fairly large composting operation for recycling of brush collected through their curbside collection service and through the drop-off facility. The city is currently using a crawler excavator and wheel loaders to turn the many large windrows of mulch they have accumulated.



Figure 5-10: Mulch/Compost Windrows



Figure 5-11: Crawler Excavator Used by City

The Project Team would recommend that the city consider the purchase of a windrow turner for this operation. A windrow turner would:

- Increase the efficiency of turning the material, thereby reducing the number of labor hours required;
- Allow full composting of the material in less time (generally 8-12 weeks);
- Produce a more consistent end product; and
- Improve the overall safety of the city's composting operations.

5.3.3 Other General Recommendations

5.3.3.1 Expand Public Education and Outreach Efforts

Adequate and effective public education is a hallmark of successful recycling programs. A key difference between typical recycling programs and award-winning recycling programs is that award-winning programs typically devote a meaningful amount of effort and resources to public education and awareness campaigns for their recycling programs.

The benefit of an investment in education and outreach is that ultimately, well-educated citizens will recycle more material with minimized contamination, thereby improving overall recycling program performance and promoting an economically sustainable program. The success of any recycling program is directly related to the amount of participation it receives.

The Project Team would recommend that the city consider allocating additional funding for the purpose of community recycling education and outreach. It will be important for adequate funding to be budgeted for this purpose on an on-going basis. Industry benchmarks for recycling public education generally range from \$1.00-\$2.00 per household per year. By these standards, the city would need to allocate approximately \$15,500 annually to fund recycling public education and outreach as opposed to the current amount of \$3,000 per year.

The Project Team would recommend that these additional funds be used in part to fund the following types of specific public education improvements for the program:

- Improved signage on bins in which glass is collected to reduce contamination –

Currently, the city's most problematic contamination issues occur with the collection of glass at the drop-off facility. The Project Team would recommend improving the signage on the glass collection bins to clearly state that commonly found contaminants such as window panes and coffee mugs do not belong in those bins. The city already has similar signage on its bins used for scrap metal collection (see Figure 5-12).



Figure 5-12: Signage on scrap metal collection container

- Develop an ongoing public education and outreach campaign to increase participation in both the drop-off and curbside brush collection program.

The success of any recycling program is directly related to the amount of participation the program receives. Texas City has historically put minimal effort or funding into public education initiatives. The city currently offers a well-run recycling program that collects many materials and has the capacity to easily handle much larger quantities of recyclables. Public education is the key to expanding participation in the current recycling programs.

There are two key messages that must be communicated to customers consistently and effectively:

- The importance of recycling; and
- Opportunities and rules for participation in available recycling programs.

These messages may be communicated through various public education tools. Based on the Project Team’s industry experience, recycling coordinators generally report the greatest satisfaction with the following educational tools:

**Table 5-9
Educational Tools with Greatest Impact**

Print Media	Direct Marketing
Recycling toolkits/handbooks	Workshops
Door hangers	Recycling hotline
Newspaper ads/articles	Business and multi-family presentations
Billboards	Community events
Direct mail	

Presentations to children have also been a mainstay of many recycling education and outreach programs. It is widely accepted that children are open to new ideas and often are eager to act constructively to improve their community. Children can also build family support for a recycling program and get their parents involved in the recycling effort. The Project Team would strongly encourage the city to develop a recycling education program that focuses on educating local students about the importance of recycling in general and the recycling programs that the city offers.

5.3.3.2 Practice Due Diligence in Selection of E-Waste Processor

In anticipation of the city offering e-waste collection at the Biosphere 1 Recycle Center in the near future, the Project Team recommends that the city practice due diligence when selecting an electronics recycling vendor. The Electronic Resource Recovery Council (ERRC) of the Recycling Alliance of Texas has established guidelines for selecting an electronics recycler. The guidelines (Texas E-cycling Standards or TEST) are intended to help minimize electronic waste and the negative economic, environmental, and public health impacts that it can create.

The Project Team recommends that Texas City select a vendor that subscribes to these standards and is committed to the responsible management of surplus and end-of-life electronic equipment. Such vendors will provide the city with a copy of the Texas E-cycling Standards, including a signed statement by an officer of the organization agreeing to abide by them. More information on TEST standards can be obtained on the Recycling Alliance of Texas website.

The Project Team also recommends that the city talk with H-GAC staff regarding the possibility contracting for e-waste processing services through their regional contract with Recycle America Alliance, LLC. The contract allows H-GAC member cities and counties to contract with the vendor for the collection, transportation and disposal of electronic waste (e-waste) within the H-GAC region at pre-negotiated prices. The contract can cover either one-day collection events or permanent e-waste facilities.

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