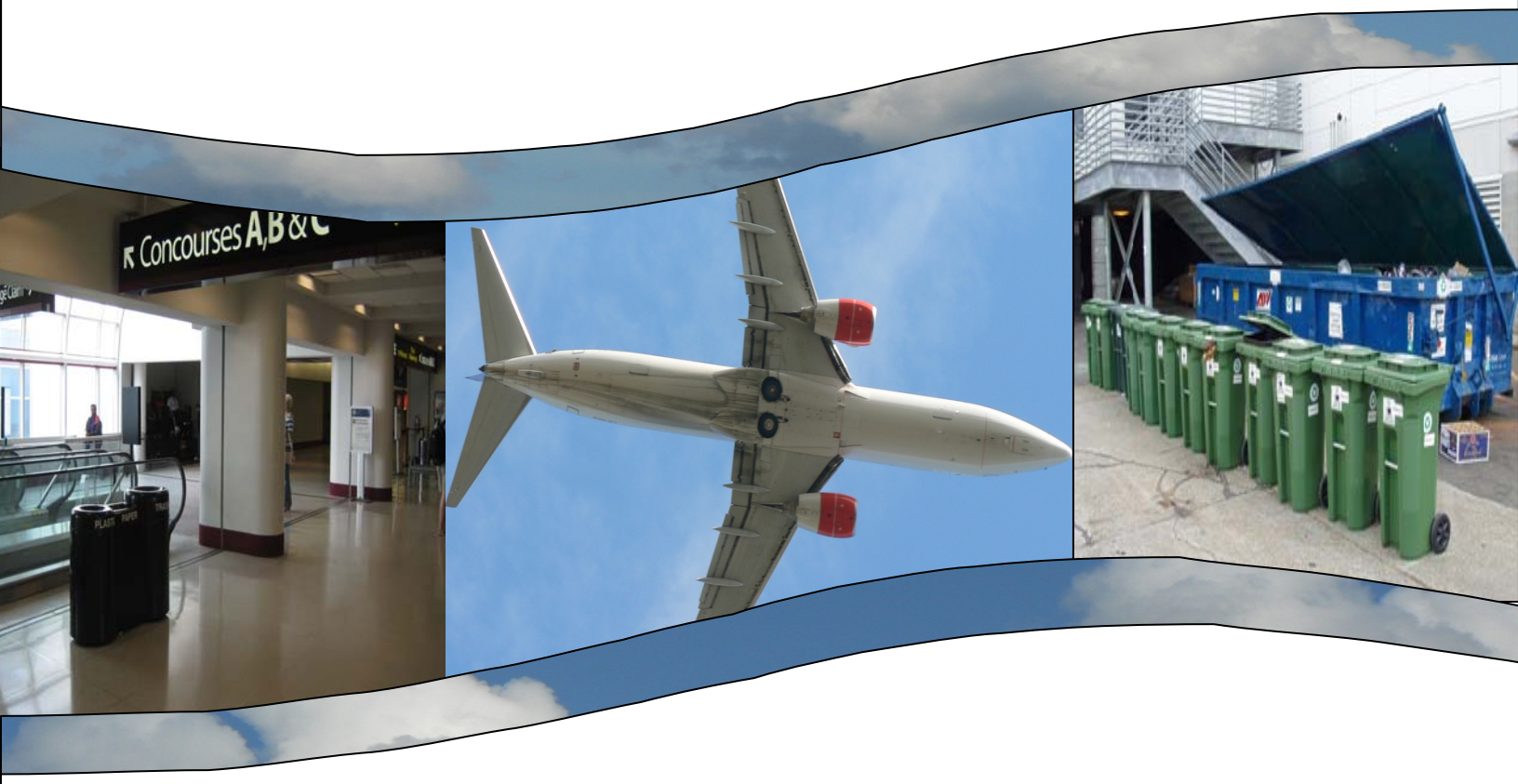
EPA United States Environmental Protection Agency



Developing and Implementing an **Airport Recycling Program**

Introduction

Airports throughout the United States are "greening" their operations. They are installing solar panels and energy efficient light fixtures, using low-emission vehicles in their fleets and changing their waste management programs. The Environmental Protection Agency (EPA) designed this guide to help airport managers who want to create a more environmentally-friendly waste operation. The EPA hierarchy of waste management prioritizes source reduction, then reuse, recycling and finally disposal in landfills. However, this guide focuses on recycling as a positive first step for airports to take as they conquer their waste issues.

Section 1 of this guide focuses on how to establish an airport recycling program. Using examples from the experiences of airports around the country, along with the experience of EPA, this document presents ten steps for designing and implementing a successful airport recycling program. Every airport is unique and there is more than one way to set-up and run a successful recycling program; however, there are general practices that are effective in most situations.

Section 2 provides examples of activities that promote source reduction, and the importance of purchasing environmentally friendly products. Examples of innovative airport waste reduction programs are included in Section 3.

Ten Steps to Establishing an Airport Recycling Program

1. Obtain commitment from upper management
2. Organize a green team
3. Identify types and sources of waste
4. Assess current waste collection contracts
5. Develop a plan
6. Educate staff and customers
7. Monitor and refine the plan
8. Measure performance
9. Promote successes
10. Expand the program

Appendix A is a set of worksheets and instructions for identifying and measuring waste. Appendix B is a glossary of waste management terms.

Section 1. Establishing a Successful Recycling Program

Step 1: Obtain Commitment from Upper Management

Management support is crucial to develop and sustain an airport recycling program. Before you assemble a team, management must authorize the use of the team's time and possible changes in job responsibilities and priorities. In addition, the initial stages of a program will require financial investments to purchase the necessary equipment and to train staff.

It is important to inform management that there are environmental and potential economic benefits in implementing an airport recycling program. Step 9, Promote Your Successes, describes tools to quantify the potential greenhouse gas benefits of recycling. For example, recycling 10 tons of corrugated cardboard saves 35 metric tons of carbon dioxide equivalent ($MTCO_2E$), which is equivalent to the emissions from the consumption of 3,973 gallons of gasoline. Comparisons such as these can help make the link between waste management and climate protection, an increasingly important issue in the transportation sector.

In addition, case studies from other airports demonstrate that programs can work in a variety of airports, regardless of size or location. Section 3 of this guide provides success stories from several different airports, with more examples available at the Web site for EPA's "Recycle on the Go" initiative (http://www.epa.gov/recycleonthego).

Request that management approve the time for several employees from different areas of the airport to participate on a "green team." Inform management that as the program progresses the green team will continue to seek their consultation. Step 2 includes details on assembling a green team and delegating responsibilities.

Management should be informed of any recycling regulations that are relevant. Many local governments have ordinances requiring recycling in all facilities located within their jurisdiction. Your airport might even be required by law to have a recycling system in place. In 2006, the Natural Resources Defense Council determined that "62 of 67 large and medium airports in the United States are located in states or cities with some kind of recycling target, goal or mandate." Contact your local and state environmental agencies to check waste and recycling regulations. Some states have landfill bans on green waste, including grass clippings, leaves and branches. Make sure you are able to identify which materials are covered by the regulations and if there are targets for the amount of waste reduction (e.g., recycle 30 percent of all waste, recycle 20 percent of paper waste).

Special Considerations for Airports

Airport Security

The first priority for airports is to ensure that all program elements are consistent with security requirements. Including a recycling element in your waste management plan may require additional personnel in secure areas of the airport and on the airfield. Bins may need to be additionally secured and inspected. Bomb-proof receptacles may be required outside secure areas.

Facility Space Constraints

Airports have unique space considerations. Gates areas, tenant space, and concessionaires often do not have large amounts of additional space for bins, and staging areas are limited. The airfield generally has space constraints as well, leaving little area for additional bins. On the airfield, airports need to be aware of concerns recycling bins may raise such as foreign object debris (FOD), animal attractants, and stormwater contamination. However, a successful recycling program will reduce the amount of trash generated and the number of containers to store trash. This space can be used for recyclable materials.

Time

When airlines become involved with your recycling program, time is a primary concern. Airline staff or cleaning service providers have limited time to clean an aircraft before it is scheduled for another departure. A program with easily accessible collection receptacles (dumpsters, compactors, etc) and clear instructions make it easier for airlines to actively participate in recycling.

Working with Tenants

Establishing and maintaining consistent recycling practices and educating airport tenants (food/beverage, concessions, airlines and others) are key components of an airport's recycling program. Educational material that is readily available for easy distribution to all new employees allows tenants to stay involved.

Step 2: Organize a Green Team

Once your program is approved, assemble a green team including individuals from every sector of the airport: terminals, offices, hangars, vendors, airlines, and flight kitchens. The green team plans and implements the recycling program in the initial phase, then maintains and monitors the program once it is in place. If there is a recycling program in your community, consider involving the local solid waste office. They are valuable team members with knowledge regarding local haulers and material markets. The green team may include individuals from inside and outside the airport. Portland International Airport and the Port of Portland work with faculty and graduate research assistants from Portland State University's Community Environmental Services. Philadelphia International Airport brought together a team of environmental professionals, local government staff, state officials, recycling staff from other airports, as well as their own staff from various departments, to discuss and develop the best options for implementing a recycling program at their airport. Once assembled, the green team is responsible for:

- working with airport management;
- gathering information needed to design and implement the program;
- encouraging the participation of other staff;
- training and educating tenants and concessionaires; and,
- monitoring the program.

Selecting a team leader or recycling coordinator

Appointing a recycling coordinator to oversee your program is beneficial. Too often recycling responsibilities divided among several individuals causes a disjointed program with low recycling rates. A recycling coordinator is responsible for the entire program, including overseeing implementation and monitoring operations. The recycling coordinator should understand the current waste management program. While the recycling coordinator does not need to work full time on recycling, it should be a top priority.

Creating a recycling coordinator position, either through contracting with a recycling specialist or creating a staff position, will enable your airport to organize, execute and evaluate your recycling program. Team members that may make a good recycling coordinator include the airport environmental specialist, an operations manager, or a construction and maintenance service manager. Many airports employ help from an outside group or expert to educate them about details of a recycling program. A recycling expert can help save time by researching basic needs for the program and possible markets for materials.

Step 3: Identify Types and Sources of Waste

Before you develop a recycling plan, understand what waste is generated and collected at your airport by performing a waste assessment. A waste assessment provides qualitative and quantitative data. It also provides a baseline to measure progress in the future.

A waste assessment will help you answer the following questions:

- What areas of the airport generate waste?
- What recyclable material is generated?
- What type of waste is generated in each area of the airport?
- How much waste is generated by each area of the airport (airlines, airport offices, customers, concessions, etc)?
- What are the waste-related costs for trash and recycling containers, hauling, disposal recycling and labor (in equipment dollars and worker time)?

There are three primary approaches to conducting a waste assessment:

- Records Examination
- Facility Walk-Through
- Waste Sort

The type of assessment you choose is based on the size of your airport, the existing knowledge of your waste stream, the goals of the program, and the resources available. Worksheets outlining the steps included in all three waste assessments are found in Appendix A.

Records Examination

A records examination provides information on the quantity of waste generated, as well as costs, for labor, equipment and services. If you don't have a centralized waste management system, try to compile all the waste data from the different haulers that service your airport. The records that may be useful include:

- purchasing, inventory, maintenance, and operating logs;
- supply and equipment invoices; and,
- waste hauling and disposal records and contracts.

Facility Walk-Through

A facility walk-through provides qualitative waste information through observation of staff and customers. The primary benefit of a facility walk-through is the first-hand observation of waste handling practices. The types and amounts of waste generated at the facility can be observed at this time. Track how waste moves through the airport. Assess existing space and equipment available for storage of waste, processing of recyclables, and other collection tasks. Also, talk to staff about their waste generation and disposal habits. The custodial staff is an excellent source of information in a facility walk-through.

Waste Sort

The most comprehensive and resource intensive waste assessment is a waste sort. A waste sort looks at the contents of waste receptacles throughout the airport to evaluate what and where material is disposed.

Waste sort for Portland International Airport.
Photo provided by: Portland International Airport

Any airport recycling program, from a new program to a well established program, benefits from understanding how much waste is generated and recovered by their facility. Due to fluctuations in passenger travel and the corresponding fluctuation in waste generated, it is useful to normalize waste assessment data to the passenger level. For example, some airports compare the pounds of waste generated per passenger to the pounds of waste recovered per passenger. Airports often define "recovered" as material recycled instead of placed in trash cans. This allows program staff to establish more accurate program goals and measure impacts.

Exhibit 1
Waste Assessment Approaches

Strengths	Limitations
Records Examination • Provides weights and volumes of waste generated • Tracks major potential waste from the point of origin • Identifies the expensive or valuable components of an organization's waste • Documents financial benefits of reuse and recycling including total revenues and avoided disposal costs • Requires the least time and effort • Establishes baseline for metrics	• Lack of quantitative data for specific waste components • Does not provide qualitative data on how or why wastes are generated • Substantial effort necessary to collect and analyze data
Facility Walk-Through • Requires less time and effort than waste sorts • Allows first-hand examination of facility operations • Provides qualitative information about major waste components and waste-generating processes • Reveals waste reduction activities • Develops appreciation of logistics and obstacles tenants encounter in their efforts to recycle	• Limited identification of wastes generated • Multiple attempts may be necessary for comprehensive evaluation • Relies on estimates of waste generation
Waste Sort • Provides quantitative data on total waste generation and specific waste components • Allows problem solving and design of recycling program to be site specific	• Requires more time and effort than other approaches • Multiple attempts may be necessary for comprehensive evaluation • Does not provide qualitative data on how or why wastes are generated

Source: USEPA, Business Guide for Reducing Solid Waste, 1993.

Step 4: Assess Current Waste Collection Contracts

Recycling programs require someone to transport the waste from the airport (a hauler) and a market to accept the material (a recycler). One company may provide both services or separate contracts may be needed for these services.

There are two systems of waste hauling contracts: decentralized and centralized. An airport with individual contracts for each tenant is a decentralized system. An airport that handles all waste together is a centralized system. Many airports decide to use a centralized waste management system to simplify collection. A centralized system requires only one set of bins and central collection areas for all tenants. A centralized system may be useful if tenants do not individually generate sufficient recyclable material to support collection.

You will want to assess the services available in your area. Contact your current waste hauler to determine if they have the ability to collect recyclables. Your current hauler may be able to change the terms of your contract to reflect reductions in waste collection due to recycling.

Cardboard Recycling
Photo provided by: Seattle-Tacoma International Airport

EPA's WasteWise program has compiled a list of questions to ask a potential recycler:

- What types of recyclables will the company accept and how must they be sorted/prepared (single-stream, commingled)?
- What contract terms will the buyer require?
- Who provides the transportation?
- What is the schedule of collection?
- What are the maximum allowable contaminant levels and what is the procedure for dealing with rejected loads?
- Where will the waste be weighed?
- Who will provide containers for the recyclables?
- Can "escape clauses" be included in the contract?
- What revenues should recycling generate?
- What tracking statistics (tonnage, costs, rebates, etc.) will they provide and in what format?
- Would baling onsite improve revenue and collection issues?

The custodial or maintenance staff will likely be tasked with moving recyclables from public areas to a common staging area. Evaluate internal waste collection practices to determine if collection of recyclables will require additional staff. Determine if there are contract limitations with the staff that currently collects waste. For example, they may be limited in the areas of the terminal they can service.

Step 5: Develop a Plan

To develop a successful recycling plan, consider factors such as the number of passengers that pass through your facility each day, the size of your airport, and the characteristics of your traffic. Identify all factors that will influence your plan and affect the scale and scope of your recycling program. Use the information from your waste assessment to identify your critical needs. For example, if you have a high traffic cargo area you may need special collection systems for wooden pallets.

Many airports initially target the "big five" recyclable materials – paper, plastic, glass, corrugated cardboard, and aluminum – then expand their program to recycle wooden pallets, food waste, electronics, used tires and other materials. Initially, target materials that would be easiest to collect and draft a plan to expand into other materials. Corrugated cardboard and aluminum are good initial materials with substantial environmental benefits and possible financial returns. Additionally, "back of the house" material collection only requires employee participation.

Select a Collection System

There are multiple types of sorting systems to consider for your program. The best system may employ a combination of sorting methods, including commingled recycling and multi-stream recycling. Each system has its own advantages and each airport should carefully consider its collection practices at all levels before making a decision. Local market conditions, the regulatory framework, and hauler collection standards must be taken into consideration during the system design phase.

- **Separate stream (multi-stream)** – requires airport patrons and employees to place recyclables in separate bins. The most common version of separate stream recycling is one bin for containers (plastics bottles, aluminum cans, and glass bottles) and another bin for paper.
- **Single stream (commingled)** – allows airport patrons and employees to place all recyclables in a single bin. The material is sorted later, usually at the materials recovery facility.
- **Post-treatment separation** – airport patrons and employees dispose of recyclables and trash together. All material is sorted later. This is a very labor intensive process and lacks visibility within the airport. The public may not realize the airport recycles if you use post-treatment separation.

Collection system options are limited by the options available in your area (as discussed in Step 4). Although they collect similar materials, you will most likely determine that your office spaces require a different system than the public areas of the airport. Construction and maintenance areas will also need special systems and different containers. If you have disposal facilities and haulers that can handle more than one type of system, compare the costs of collection containers and material reimbursements.

Staging area equipment at Seattle-Tacoma International Airport
Photo provided by: Seattle-Tacoma International Airport

Storage and staging areas

Staging areas are central locations where recyclables from throughout the airport are stored and haulers pick up material. A common problem among airports is finding sufficient area to stage materials. Staging areas require space for larger containers. As discussed in the previous step, the complex ownership and multiple tenants in airports may require airports to lease additional space from the airlines to establish staging areas.

The most common equipment found in staging areas are dumpsters, compactors and balers. Compactors and balers condense material, saving space. Depending on the quantity of plastic bottles and cardboard collected, a baler or compactor should be considered in order to maximize the weight and quantity in transportation. Your recycler may indicate that they prefer compacted or baled materials.

Exhibit 2
Common Recyclable Materials Found at Airports

		WHERE											
		Public Terminals	Ticketing	Security Gates	Food Service Areas	Offices	Cargo Shipping	Maintenance Areas	Airport Grounds	Aircraft	Airfield Ramps	Construction Areas	Concessionaires, Retailers, Rental Car Facilities
WHAT	Corrugated Cardboard				×	×	×	×		×			×
	Mixed Paper	×	×	×	×	×	×	×	×	×	×		×
	Newspaper	×	×	×		×				×			
	Glass	×	×	×	×	×	×	×		×			
	Aluminum Cans	×	×	×	×	×	×	×		×			
	Plastic Bottles	×	×	×	×	×	×	×		×			
	Pallets						×						
	Food Waste & Cooking Oil	×			×	×							
	Organics/ Green Waste								×				
	Electronics					×							
	Used Tires							×					
	Used Oil							×					
	Scrap Metal						×	×				×	
	Concrete											×	
	Lumber											×	
	Batteries					×							
	Toner Cartridges					×							×
	Plastic (non-bottles, e.g. film)						×	×					×

Bin Selection and Placement

Proper collection bins are vital to the success of your recycling program. They are also the major expense at the formation of your program. For these reasons, the decision of what bins to purchase, how they are labeled, and where they will be located is the most important decision you will make in this stage of your recycling plan.

The type of collection bins used at airports is as unique as the airports. Some airports choose all-in-one systems that include compartments for recyclables and trash. Other airports use modular systems. A new trend in bins is the inclusion of advertising. The bin from Seattle-Tacoma International Airport, shown on the next page, utilizes space above the bins to earn revenues.

The best bins are those with clear labeling and design features that limit contamination. Be sure that each visible side of the bin is labeled. Mark the bins with words and pictures, so they are understandable to international passengers. Often, labeling "bottles and cans" rather than "glass, plastic, and aluminum" gives a stronger message, reducing confusion and contamination. Seattle-Tacoma Airport redesigned their recycling bins to make them more noticeable to the public. With a simple relabeling of the same basic bin, public recycling at the airport increased by 40 percent.

The bag choice for inside of the bins is important as well. Using different colored liners for the recycling bins allows the cleaning crew to easily keep track of what is recyclable and which central collection container it goes in. Other options include clear, see-through liners or half-clear/half-colored liners.

Placement of bins in high traffic areas and areas of material generation is important. Always place recycling containers next to trash cans to reduce contamination. It is important to check the waste bins often enough to keep them from overfilling and discouraging people from using the recycling bins for trash. Another way to prevent contamination is to buy bins with distinct openings (round for bottles and cans, slotted for paper) and different colored tops. Page 13 has photos of several different types of bins used at airports throughout the country.

Set goals

Establish goals for your program before you begin collection. These goals may be based on targets set by the community. Many localities are working to be the most environmentally friendly in the country. They may require the airport to recycle a certain percentage of their waste to help with this goal. Use information obtained during your waste assessment to establish goals.

Exhibit 3
In-Terminal Collection Bins

From top to bottom: Kansas City International Airport, Baltimore-Washington International Thurgood Marshall Airport, Philadelphia International Airport, Salt Lake City International Airport, and Seattle-Tacoma International Airport.

Step 6: Educate Staff and Customers

Airports must educate both employees and customers about a new recycling program. Employee education begins as soon as the plan is developed. Customer education will begin after you implement your plan. For a successful, long-term recycling program continual education of these groups is necessary.

Educate airport staff

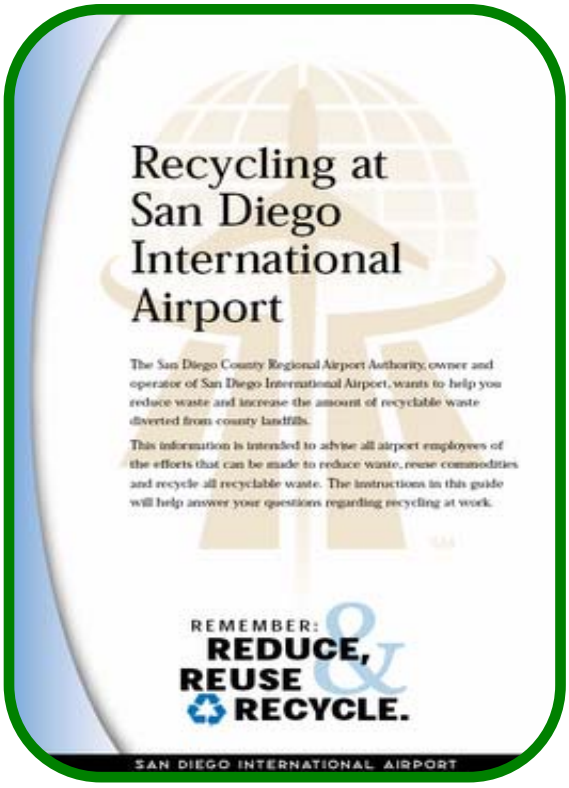
Before your plan is rolled out, meet with the participants. Airports with successful programs talk to vendors, maintenance staff, airline staff and other employees face-to-face about their role in the program. After the program is in place, they follow-up regularly to ensure there are no new questions.

Airports frequently re-educate the entire airport staff regarding the benefits of recycling and how the program functions in the airport. Portland International Airport includes information about the recycling program in new employee training, emails, staff meetings, vendor meetings, and through regular face-to-face interactions with airport users. San Diego International Airport created a handbook, in Spanish and English, explaining the recycling program. In the handbook, employees learn how the recycling program operates, why the airport chose a single-stream approach, the benefits of recycling and recycling facts.

Educate customers

As with any good recycling program, airports must clearly identify where bins are located and how to use them. Educating customers about the benefits of recycling reinforces the practice. Place informational signs on or near bins explaining why recycling is important. Midway Airport, in Chicago, developed signs that show products that are made from recycled materials. They also displayed large banners telling customers "Chicago Recycles". A terminal poster may encourage a visitor to walk a few extra feet to find the bin. External publicity should be considered through press releases to local news media to inform hometown customers and other interested parties of airport recycling.

Exhibit 4
Educational Materials



Source: San Diego International Airport.

Step 7: Monitor and Refine the Plan

During the life of the recycling program, periodically evaluate how well your plan is working and what adjustments are needed. Be prepared to make changes to bins, collection schedules, and educational material. Monitor the use of all bins to determine if they are being used properly. Visual inspections of the bins by members of the green team and discussions with the custodial staff can help identify bins that are not used or that are overfilling before collection. The solution may be as simple as moving the location of the bins; however, if resources are available you may also decide to add additional bins to certain areas of the airport.

The amount of recyclables collected varies by quantity and material throughout the day. For example, airports find that more newspapers are disposed of in the morning. As a result, the newspaper bins fill at a faster rate in the morning and may require earlier collection by custodial staff than plastic bottles, which are generated more frequently in the afternoon. If your program succeeds in dramatically changing the composition and timing of the waste collected, your initial estimates for hauler contracts may also require adjustment.

Even the most successful programs will experience contamination problems in their recycling program. Regular visual inspections of dumpsters and trash cans can educate the recycling team about problem areas. At Baltimore-Washington International Thurgood Marshall Airport, the recycling team inspects airfield trash and recycling containers twice a month. Weekly, they observe and photograph the contents of a compactor at the hauler's facility. Because of the staff's knowledge of which vendors and airlines use each dumpster, if they observe contamination, they can identify where more education is needed.

Step 8: Measure Performance

Establish a set of measures to monitor your performance. Metrics that are measured consistently (annually/quarterly/monthly) using the same collection methodology allow your team to correct problems and report measurements to airport management and the public.

Quantifying the amount of waste you collect is a challenging project. However, without accurate measurements it is difficult to improve or expand your program. Use your initial waste assessment (Step 3) as a baseline and methodology for monitoring your program. Airports with recycling programs recommend that measurement metrics are normalized by the number of passengers. Normalizing your waste collection data adjusts for seasonal and long-term changes in airport traffic.

Expenses are often higher during the first year of a new program. The largest first year costs include purchasing collection bins and training staff. As your recycling program progresses you should be able to see cost savings from reduced trash pick-ups and sale of recycled material.

Consider the following factors when collecting program data:

- Cost of waste disposal
- Cost of recycling
- Dumpster rental costs

- Internal labor cost (including custodial staff, recycling coordinator)
- Location of bins
- Weight of waste disposed
- Weight of materials recycled

Step 9: Promote Successes

Publicize your program inside and outside the airport. As cities compete to be classified as the most environmentally friendly, promoting recycling in your airport enhances your local image. An airport is often the first and last experience a traveler has with a particular area. Promoting an environmental message like recycling will send a positive message to the passengers coming through the airport. Many consumers have come to expect recycling bins in public areas. A successful program reflects positively on the airport's environmental stewardship, and it encourages employees and customers to continue to contribute to the program's growth.

Demonstrate the success of your program to the public by quantifying the positive impact the program is having on the environment. Waste reduction programs reduce greenhouse gas (GHG) emissions and saves energy by using fewer resources. Mining or harvesting virgin material is reduced in producing new products from recovered materials. EPA's Waste Reduction Model (WARM) (http://www.epa.gov/WARM) is a tool for airports and other businesses to estimate the greenhouse gas and energy savings from recycling, composting and source reduction.

Exhibit 5
Sample Greenhouse Gas Benefits of Recycling
Using EPA's WARM model

Material Recycled	Metric Tons of Carbon Dioxide Equivalent	Equivalency
Glass (10 tons)	**3**	Emissions from the consumption of 341 gallons of gasoline
Corrugated Cardboard (10 tons)	**34**	Emissions from the consumption of 3,859 gallons of gasoline
Mixed Plastics (10 tons)	**16**	Emissions from the consumption of 1,816 gallons of gasoline

Step 10: Expand the Program

After successfully running your recycling program for a year or season you may decide to expand your program to collect additional materials or include new areas of the airport. Periodic review of your original nine steps can help focus efforts to improve and expand your program.

As mentioned in Step 5, most programs start with paper, aluminum, plastic, glass and corrugated cardboard. While working to maximize the materials already collected, consider new materials such as organic waste. A program targeting organic waste, such as food scraps and yard waste for composting, may involve new partners outside of the airport. There are also non-composting options for food waste. For example, Seattle-Tacoma International Airport donates unused food to local food banks. See Section 3 for a description of Seattle-Tacoma's food waste program.

Program expansion may include involving additional partners**.** Integrate vendors, airlines and flight kitchens into your program if you were not able to do so initially.

Airports' recycling programs also expand to new areas of the airport as their programs grow. Parking areas are often not included in initial plans. Recycling in parking areas may require collection bins that are more durable than those inside of the airport in order to withstand weather and collisions with vehicles.

Section 2. Additional Waste Strategies

Chemicals Management

Airports handle an array of environmentally toxic chemicals in maintenance areas, on the runway, and on airport grounds. Properly managing these chemicals, which may include minimization and recycling, reduces the environmental impact of their use. Among the many examples of chemicals that airports may encounter are PCBs, de-icing fluids, mercury and pesticides. For some of these chemicals the main objective is reduction, such as with pesticides. For others, such as the glycol from de-icing fluids, the goal is recovery and recycling. As with other types of solid waste, you may need to find a market for the recycled material if it can not be used onsite. Recycling or reduction of chemicals may also require investments in equipment or the development of collection methods.

Several airports have joined EPA's National Partnership for Environmental Priorities (NPEP), a program designed to reduce the use and release of designated chemicals of a national concern (http://www.epa.gov/npep). Airports already enrolled in NPEP include Los Angeles International Airport, Dallas/Fort Worth International Airport, Dallas Love Field, and the Houston Airport System.

Source reduction

Source reduction is the design, manufacture, acquisition, and reuse of materials so as to minimize the quantity and/or toxicity of waste produced. Source reduction prevents waste either by redesigning products or by otherwise changing patterns of consumption, use and waste generation.

Every area of the airport has opportunities to reduce waste generation. One source reduction practice that is easy to implement is setting printers to print on both sides of the paper. Another popular office space source reduction practice is using reusable mugs and glasses. The airport could even encourage this practice by distributing mugs or reusable water bottles (mention your recycling program on the mugs and bottles to give your program extra exposure). Concessionaires in the airport can practice source reduction by using less packaging and limiting the amount of materials distributed to customers. The cargo area of the airport can reuse pallets.

The benefits of source reduction are more than just environmental. Using less material will result in fewer products purchased and less waste disposal – potentially leading to direct cost savings.

Buy Recycled

Another way for your airport to support resource conservation and recycling is by purchasing recycled-content products. By using recycled-content products you "close the loop" and increase demand for recycled-content products in the marketplace, helping to ensure demand for the recyclable materials your airport diverts.

Recycled products and supplies exist for all areas of your airport. For example, offices are an easy place to begin using recycled products. Recycled-content paper is available through most office suppliers. Some important terms to look for on a product with recycled content are "Percentage Recycled Content" and "Percentage Post-Consumer Material." Recycled material includes all material that would have been otherwise discarded. This may include material that was generated as part of the manufacturing process, but was never used by consumers. Post-consumer material is material from products that were used by consumers or businesses and would otherwise be discarded as waste. The primary goal is to find products with the highest percentage of recycled content available.

There are several sources online to help you identify recycled-content products.
The Federal government developed the Comprehensive Procurement Guidelines (CPG) and Environmentally Preferable Purchasing policies (http://www.epa.gov/cpg/links.htm). Not only does the website provide information on the availability of recycled content products, it can help you develop an environmentally friendly procurement policy for your airport.

Another helpful reference is the California Integrated Waste Management Board's "Recycled Content Products Directory Homepage" with categories ranging from Agriculture and Landscaping Products to Paper and Paper Products (http://www.ciwmb.ca.gov/RCP/).

Section 3. Case Studies

Los Angeles International Airport's cargo area recycling

Los Angeles International Airport offers cargo handling companies free recycling of wooden pallets, cardboard and plastic. To optimize usage, the recycling bin is in close proximity to the trash bin. The use of magnetic signs allows bins to be used for the collection of different materials as needed.

Plastic film, bags and shrink wrap from cargo operations are collected in bins using the same methods as with pallets and cardboard. The bins are brought back to the recycling yard, the contents are checked for contaminants, loaded into containers and sent to area recycling companies.

Dumpsters for pallet recycling at Los Angeles International Airport
Photo provided by: Los Angeles International Airport

Cargo recycling occurs in addition to the established terminal recycling program. Various sized collection bins are placed around the airport. In addition, tenants can request bins for one time events such as file cleaning and relocation. The full bins are brought back to Los Angeles World Airport's maintenance facility where the contents are sorted, contaminants removed and the cardboard is baled. The mixed paper and cardboard is then sold to area recycling companies.

Seattle-Tacoma International Airport's Food Donation Program

Food scraps are a large portion of an airport's waste stream. Seattle-Tacoma International Airport found a way to reduce the amount of food they send to the landfill while helping the community. Unused (wrapped, packaged) food that would otherwise be discarded is donated to local food banks. The food donation program is also an excellent example of cooperation between airports and tenants. Concessions vendors are engaged as active participants and learn alternate ways to minimize their impact on the environment, while they simultaneously help the community. Since 2006, Seattle-Tacoma has donated 26,000 pounds of pre-packaged food to food banks. If your airport is concerned about liability, contact the local food bank to discuss the Federal Good Samaritan Food Donation Act of 1996.

Food scraps that are not suitable for donation are not wasted either. The airport collects over 10 tons of coffee grounds every month. The recovered coffee grounds are mixed with yard waste and sent to a compost facility. Cooking oil is another food waste that can be recycled. Reclaimed cooking oil, from airport restaurants and bars, is sold for use as biodiesel.

For additional information on food donation as a waste reduction practice see:

Putting Surplus Food to Good Use
http://www.epa.gov/epaoswer/non-hw/organics/pubs/food-guide.pdf

Donating Surplus Food to the Needy
http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/pubs/needy2.pdf

Recovering Organic Wastes – Giving Back to Mother Nature
http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/pubs/wwupda12.pdf

Delta Air Lines

A challenge facing airports with established recycling programs is capturing the recyclables from aircraft. Airlines face an entirely separate set of roadblocks to collecting recyclable material. Unlike the terminal and office space, airline staff – including flight attendants, airline cleaning crews and flight kitchens – collects materials on aircrafts, not the customer or employee. Waste collection is not, however, their primary concern. Flight attendants must ensure the safety of the passengers before shifting their priorities to waste collection. With limited time to move up and down the aisles and limited storage space in the aircraft, even the most well-intentioned efforts by flight attendants may be hindered.

Delta took on the challenge of recycling domestic in-flight waste during 2007. The first step was to launch the program at their largest hub and world headquarters in Atlanta, Ga. The materials identified for collection were aluminum cans, plastic cups, plastic bottles and paper. To keep the process simple and minimize the amount of time flight attendants spent collecting the material, they decided to use a single stream system. The single stream process also facilitated easy transfer of materials between aircraft, airports and crews. By placing all the recyclables in a separate bag on top of the trash, it could be stored in the trash cart where the service crew would be able to quickly identify the material when it was unloaded from the aircraft. Aluminum cans recovered in the beverage cart are recycled by the flight kitchen. Between June and December of 2007, Delta was able to divert 148.3 tons of material from Atlanta area landfills. In addition, Delta was able to realize monetary savings from reduced landfill fees. Rebates earned from recycling are put back into the program and a portion of the proceeds are given to charitable organizations.

Delta's experience provides lessons about publicizing the positive results of a program as well. Earlier attempts to recycle on flights had failed because, among other reasons, the flight attendants were not convinced that the material they collected was actually being recycled on the ground. To educate the flight attendants and assure them that their efforts were worthwhile, Delta created materials to show the recycling process and the goals of the program. They also developed a set of activities to support "continuous education." Continuous education is provided by materials displayed in flight attendant lounges, as well as through online newsletters and posters with monthly recycling statistics displayed in the break rooms.

Due to the success of their in-flight program, Delta continues to expand their program. They recently began recycling carpet from aircrafts and established a recycling center in their world headquarters for use by their employees.

Appendix A: Worksheets for Characterizing Your Waste

Records Review

The following worksheets help you estimate the total amount paid for waste removal services for your airport.

Airport records (including waste hauling contracts, maintenance and operating logs, and waste removal records) will be the primary sources of information needed to complete this worksheet. Maintenance staff or contractors also might be able to provide information.

This worksheet measures current costs of onsite waste collection and offsite waste removal. Waste collection involves gathering trash from areas throughout the airport and taking it to an onsite collection area such as a dumpster. Waste removal involves shipping the waste off site for disposal. In addition, this worksheet is designed to help you calculate waste removal costs whether you pay a flat fee or are charged per pull. A flat fee is a rate charged for waste removal services that remains constant over a specific period of time (such as a year) regardless of fluctuations in the amount of waste generated. A pull charge is a fee paid every time a hauler empties or removes a container. Charges in this fee structure do not reflect the volume of waste in the container.

If waste removal practices vary significantly in different areas of the airport, or if different waste contractors are used, record the information separately.

Onsite Waste Collection

Name of waste collector: _____

Telephone number: _____

Check one ☐ Maintenance staff ☐ Maintenance contractor

Collection Schedule:

Number of times _____ per (day/week/other) _____

Annual Cost of Waste Collection (if maintenance contractor):
If waste collection is performed by a maintenance contractor use this formula to calculate the annual cost.

$ _____ (Annual payments to maintenance contractor) + $ _____ (Waste container rental fee, if any) = $ _____ (Annual cost of waste collection)

Annual Cost of Waste Collection (if maintenance staff):
If waste collection is performed by in-house staff, calculate the costs below. When filling in hourly rate, be sure to calculate wage rate plus overhead including benefits. (In many businesses, a factor of 1.3 is often used. For example, for an employee earning $10.00/hr, use an hourly rate of $13.00.)

Collection personnel:

_____ (# of employees) X $ _____ (Hourly rate) X _____ (Hours per week) X 52 = $ _____ (Total annual labor cost spent on waste collection)

If applicable, add:

$ _____ (Waste container rental fee) Per _____ (Time period) X _____ (Periods per year) = $ _____ (Annual waste container rental cost)

$ _____ (Total annual labor cost) + $ _____ (Annual waste container rental cost) = $ _____ (Annual cost of onsite waste collection)

Offsite Waste Removal

Name of waste removal company: _____

Telephone number: _____

Contract expires on: _____

Removal Schedule:

Number of times _____ per (day/week/month/other)

Day of week _____ Time(s) _____

Day of week _____ Time(s) _____

Day of week _____ Time(s) _____

Waste Removal Charge (if charged as flat fee part of rent):

$ _____ (Waste removal fee) X _____ (Time periods per year) = $ _____ (Annual waste removal charge)

Waste Removal Charge (if charged by weight or volume):

$ _____ (Waste removal charge) Per _____ (Unit of weight or volume) X _____ (Unit of waste removed annually) = $ _____ (Annual waste removal charge)

If applicable, add:

$ _____ (Hauling container(s) rental fee) Per _____ (Time period) X _____ (Time periods per year) = $ _____ (Annual waste container rental cost)

$ _____ (Annual waste removal charge) + $ _____ (Annual waste container rental cost) = $ _____ (Annual waste removal charge)

Waste Removal Charge (if charged by pull):

$ _____	X	_____	=	$ _____
Charge per pull		Pulls per year		Annual waste pulling charge

If applicable add:

$ _____	per	_____	x	_____	=	$ _____
Hauling container(s) rental fee		Time period		Time periods per year		Annual waste container rental cost
$ _____	per	_____	x	_____	=	$ _____
Tipping fee		Unit of weight or volume		Units of waste removed annually		Annual tipping fee

$ _____	+	$ _____	+	$ _____	=	$ _____
Annual waste pulling charge		Annual waste container rental cost		Annual tipping fee		Annual waste removal charge

Facility Walk-Through

This worksheet will help you to identify and record the different waste-generating activities and equipment in your airport, the types of waste produced, and any current waste reduction efforts. In addition, it will help you to identify all materials that could be targeted by your waste reduction program and brainstorm ways to reduce, reuse or recycle these materials.

The information needed to complete this worksheet can be obtained by conducting a walk-through of targeted functional areas of your airport. The walk-through entails carefully observing waste-generating activities and equipment, examining the contents of waste containers, and interviewing supervisors and employees.

Be sure to pay close attention to areas and operations that tend to generate the largest amounts of waste. Remember to include a review of the grounds maintenance operations. While conducting the walk-through, watch closely for activities and equipment that generate waste unnecessarily, as well as waste reduction practices that are already in place.

Before your walk-through begins, contact department managers to inform them of the visit and the possibility of short interviews with department staff. You may also want to interview custodial workers and operations staff.

If possible, schedule the walk-through just before trash pickups to allow a sufficient amount of waste to accumulate. During the walk-through, ask questions about variations in daily waste generation.

Team members conducting walk-through: _____

_____

Employees interviewed: _____

_____

Facility Walk-Through Form

Waste Components			
Waste producing activity	**Waste material produced**	**Estimated amount of waste produced per year**	**Current waste reduction activities (if any)**

Waste Sort

This worksheet can be used if you need a more detailed profile of the amounts and types of waste generated at your airport than a records review or facility walk-through can provide. This worksheet provides step-by-step instructions for sorting, weighing, and recording data on the waste your airport generates.

Two different types of sampling methods can be used during a waste sort. The first method is to collect and sort all the waste generated during the day. This is the most practical method for smaller companies. The second method is to use a representative sample of approximately 50 pounds of waste from each collection container (i.e., dumpster) at the airport.

If you elect to analyze a representative sample, be sure your sorting sample is truly representative. Waste generation and waste components can vary significantly from day to day, season to season, and year to year. If you suspect that the waste sample being sorted is not truly representative of your airport's waste-generating practices, consult with your trash collection or operations manager for input on the accuracy of the data. Make a note on this worksheet of any results you believe are not accurate. When sorting a sample, you will still need to weigh or estimate one day's worth of waste in order to extrapolate annual estimates for each waste category.

Determine the size and location of the area in which you will sort the waste. If large quantities of waste will be sorted, a large, flat area such as a parking garage or shipping area is an appropriate location to conduct the waste sort. It is advisable to sort in a sheltered area to provide cover from adverse weather. Be sure to consider health and safety issues as well. All members of the waste reduction team should wear protective clothing (such as leather or thick rubber gloves, heavy-duty shoes, safety glasses, and coveralls), and precautions should be taken to ensure that the waste does not come in contact with food or drink.

A waste sort requires several containers for holding the sorted wastes and a scale for weighing the samples. The size of the containers depends on the amount of waste to be sorted. Thirty or fifty gallon plastic containers, garbage cans or large corrugated cardboard boxes will be needed for most airports. If the airport does not have large scales, they can often be rented. In addition, you will need shovels or push brooms.

Waste Sort Instructions

Beginning the waste sort

1. Assemble the waste sample to be sorted, using either one day's worth of waste or an otherwise representative sample of waste from your facility.
2. Weigh the empty containers that the sorted wastes will be placed into and record these weights on a label on each container. It may be necessary to weigh the empty container multiple times throughout the sort to account for changes due to materials sticking to the containers.
3. Sort the waste sample by major component (paper, plastics, glass, metal, compostable organics, other).
4. If needed, further sort each major waste component into more specific component subcategories (e.g., sort glass into clear, green, amber, or other).
5. Place the sorted materials into separate labeled containers.

Date of Waste Sort: Department:

Sample collected over: ☐ One day ☐ Two days ☐ Other

Sample collected: ☐ All waste at source ☐ Representative sample (specify) _____

Team members conducting waste sort: _____

Factors affecting representativeness of sort: _____

Calculating net component weights

1. Weigh each filled waste container and subtract the weight of the container to obtain the net component weight. Record the net component weight on the spaces provided on the Waste Sort Form. If you did not sort these waste components into component subcategories, proceed to the last step.
2. If you sorted the waste components into component subcategories, add their net weights and record the total waste component weight on the Waste Sort Form.
3. Add all the total waste component weight figures to determine the total sample weight and record this total on the Waste Sort Form.

Calculating percent of total sample weight

1. Use the following formula and the figures recorded in the Net Component Weight column of the Waste Sort Form to compute the percentage each waste component constitutes of the total weight of the sample.
2. Repeat the calculation for each waste component under consideration and record the results in the Percent of Total Sample Weight column on the Waste Sort Form. (Note: If you sorted the waste components into component subcategories, you also may choose to calculate the percentage of the sample occupied by each waste component subcategory, depending on the level of information you are interested in.)

$$\frac{\text{Net component weight}}{\text{Total sample weight}} \times 100 = \text{Percent of total sample weight}\ (\%)$$

Calculating weight of waste generated annually

If you sorted one day's worth of waste, calculate the weight of waste generated for each waste component using the following formula:

$$\text{Net component weight} \times \text{Number of working days per year} = \text{Weight of waste generated annually}$$

If you sorted a representative sample, first weigh or estimate all of the waste generated by your airport that day. Calculate the amount of waste generated annually for each waste component using the following formulas:

Total component weight generated/day	÷	Total sample weight (all components)	=	Multiplier

Net component weight	X	Multiplier	X	Number of work days per year	=	Weight of waste generated annually

Repeat the appropriate calculation for each waste component under consideration and record the figures in the "Weight of waste generated annually" column of the waste sort form. (Note: If you sorted the waste components into component subcategories, you may choose to calculate the amount of waste generated annually by each waste component subcategory; depending on the level of detail you are interested in obtaining.)

Waste Sort Form

Waste component		Net component weight	Percent of total sample weight (all components)	Weight of waste generated annually
Paper	High-Grade			
	Low-Grade			
	Newsprint			
	Corrugated Cardboard			
	Magazines/Glossy			
	Other			
	Total Component Weight			
Glass	Clear			
	Green			
	Amber			
	Other			
	Total Component Weight			
Metal	Aluminum			
	Other Non-Ferrous Metal			
	Tin-Coated Steel			
	Other Ferrous Metal			
	Bi-Metal			
	Other			
	Total Component Weight			
Organics	Yard Trimmings			
	Food Scraps			
	Scrap Wood			
	Other			
	Total Component Weight			
Plastics	PET (#1)			
	HDPE (#2)			
	PVC (#3)			
	LDPE (#4)			
	Polypropylene (#5)			
	Polystyrene (#6)			
	Other (#7)			
	Total Component Weight			
Other	Tires			
	Wooden Pallets			
	Rubber			
	Leather			
	Inorganic (e.g., ceramics, mixed materials)			
	Copier Toner Cartridges			
Total				

Appendix B: Glossary

Baler: A machine used to compress recyclables into bundles to reduce volume. Balers are used often on newspapers, plastic, corrugated cardboard, and other sorted paper products.

Bailing: The compaction of solid waste or recyclables into blocks or bales.

Bimetal containers: A typical example includes tin-plated steel cans with an aluminum top. These containers can be separated from aluminum cans using a magnet.

Biodegradable material: Materials that can be broken down by microorganisms into simple, stable compounds such as carbon dioxide and water. Most organic materials, such as food scraps and paper, are biodegradable.

Commingled recyclables: Two or more recyclable materials collected together (i.e. not separated).

Compactor: Power-driven device used to compress materials to a smaller volume.

Compost: The stable, decomposed organic material resulting from the composting process. Also referred to as humus.

Composting: The controlled biological decomposition of organic materials in the presence of oxygen into a stable product that may be used as a soil amendment.

Construction and demolition waste: Materials resulting from the construction, remodeling, repair or demolition of buildings, pavements and other structures.

Contaminant: Foreign material that makes a recyclable or compostable material impure; for example, food scraps on paper products.

Diversion rate: The amount of material being diverted for recycling, compared to the total amount that was previously disposed.

Ferrous metal: Includes iron and iron-containing metal scrap.

Generation rate: The amount of waste that is produced over a given amount of time.

Hauler: A waste collection company that offers a complete refuse removal service. Many haulers now offer to serve as collectors of recyclables as well.

Hazardous waste: Waste material that exhibits a characteristic of hazardous waste as defined in the Resource Conservation and Recovery Act (ignitability, corrosivity, reactivity, or toxicity).

High-grade paper: High-grade paper is usually generated in office environments. Types of high-grade paper include computer paper, white ledger, white envelopes and letterhead.

Inorganic waste: Waste composed of matter other than plant or animal.

Low-grade paper: These papers are less valuable than high-grade paper in terms of recycling, although they still can be cost-effective to recycle in many cases. Some examples include colored paper, paper bags, and packing paper.

Markets: Generally, a recycling business or municipal recycling facility that accepts recyclable materials for processing and final sale to an end user, either for their own use or for resale.

Municipal solid waste (MSW): MSW means household waste, commercial solid waste, nonhazardous sludge, conditionally exempt small quantity hazardous waste, and industrial solid waste.

Non-ferrous metals: Includes most types of scrap metal which do not contain iron (such as copper and brass).

Organic material (organic waste): Materials containing carbon. The organic portion of MSW includes paper, wood, food scraps, plastics and yard trimmings.

Pallet: A wooden platform used with a forklift for moving bales or other large items.

Processing: The operations performed on recycled materials to render them reusable or marketable. Processing can include grinding glass, crushing cans, or bailing newspaper. Processing has two distinct functions: a separation function and a processing or beneficiation function. Processing generally results in adding value to a particular material.

Recyclables: Materials that still have useful physical or chemical properties after serving their original purpose. Such materials can be remade into new products.

Recycling: The process by which materials are collected and used in place of raw materials for new products. There are five steps in recycling: collecting waste materials, separating them by type (before or after collection), processing them into reusable forms, marketing the "new" products, and using the goods made with reprocessed materials.

Reuse: Using items again by repairing, donating, or selling.

Source reduction: The design, manufacture, acquisition, and reuse of materials so as to minimize the quantity and/or toxicity of waste produced. Source reduction prevents waste either by redesigning products or by otherwise changing patterns of consumption, use and waste generation. (See also, "waste reduction.")

Tipping fee: A fee charged for the unloading or dumping of material at a landfill, transfer station, recycling center, or waste-to-energy facility, usually stated in dollars per ton (sometimes called a disposal or service fee).

Transfer station: A permanent facility where waste materials are taken from smaller collection vehicles and placed in larger vehicles for transport. Recycling and some processing may also take place at transfer stations.

Waste Reduction: Waste reduction is a broad term encompassing all waste management methods – source reduction, recycling, composting – that result in reduction of waste going to a combustion facility or landfill.

Waste Stream: A term describing the total flow of solid waste from homes, businesses, institutions and manufacturing plants that must be recycled, burned, or disposed of in landfills.

Yard trimmings: Leaves, grass clippings, prunings and other natural organic matter discarded from yards and gardens.

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