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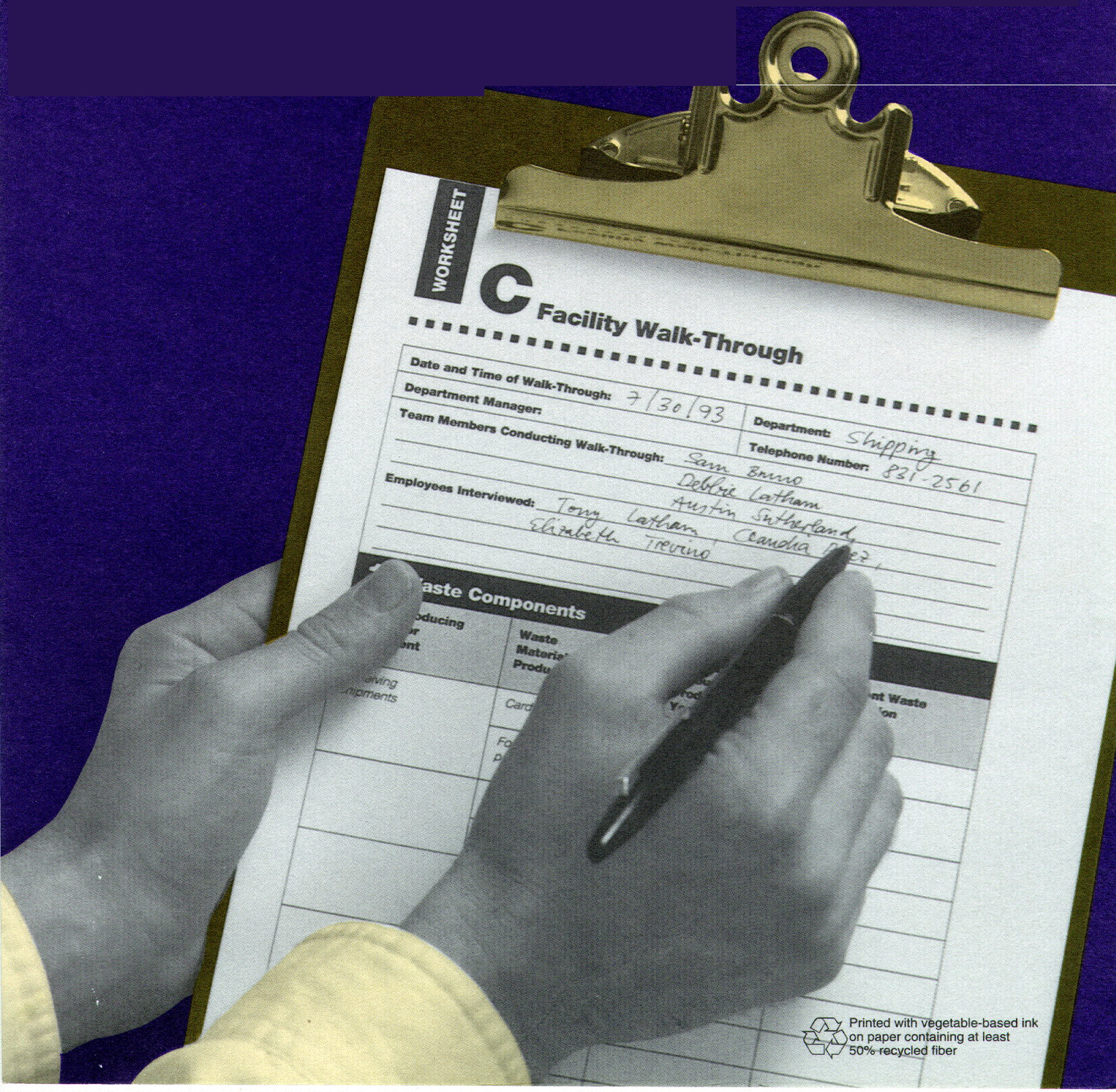
# Business Guide for Reducing Solid Waste

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# Business Guide for Reducing Solid Waste

## We Want to Hear From You!

*The US. Environmental Protection Agency (EPA) encourages businesses to share their waste reduction successes so that others can learn from these examples. If you have any success stories to share, please write to EPA at the address below. Information describing the types and amounts of waste reduced and the associated costs and benefits will be particularly useful.*

*RCRA Information Center*
*Source Reduction Successes*
*U.S. Environmental Protection Agency*
*Office of Solid Waste (OS-305)*
*401 M Street, SW.*
*Washington, DC 20460*

## Acknowledgments

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# Contents


Introduction 1

**The Benefits of Waste Reduction** 1

**Waste Prevention** 2

**Recycling** 4

**Composting** 4

**Purchasing** 5

Chapter One: Getting Started 7

**Management Support** 7

**The Waste Reduction Team** 7

**Setting Preliminary Program Goals** 9

**Notifying Personnel** 9

Chapter Two: Conducting "a Waste Assessment 10

**The Purpose of the Waste Assessment** 10

**Determining the Approach** 10

**Records Examination** 11

**Facility Walk-Through** 14

**Waste Sort** 14

**Documenting the Waste Assessment** 15

Chapter Three: Selecting, Implementing, and Monitoring Waste Reduction Options 16

**Compiling and Screening the Options** 16

**Analyzing and Selecting the Options** 16

**Waste Prevention Options** 17

**Recycling Options** 18

**Composting Options** 18

**Purchasing Options** 20

**Implementing the Options** 20

**Educating and Training Employees** 20

**Monitoring and Evaluating the Program** 22

**Waste Reduction in Your Workplace and Beyond** 22

Appendices 23

**Appendix A: Waste Reduction Ideas** 23

**Appendix B: Regional EPA and State Waste Reduction Program Contacts** 25

**Appendix C: Glossary** 31

**Appendix D: Volume-to-Weight Conversion Table** 33

**Appendix E: Common Recyclable Materials** 37

**Worksheets** 41

## How to Use This Guide

*This guide offers step-by-step instructions designed to assist medium and large businesses, governments, and other organizations establish a waste reduction program. Although not specifically designed for smaller companies, these firms also might find the guide useful. While employees at all levels can profit from this guide, the information that follows is directed toward members of the waste reduction team, a group of employees charged with planning and implementing the program.*

*The guide presents an overview on developing and implementing a waste reduction program, followed by a series of worksheets designed to help the team conduct a waste assessment and devise a program tailored for its company's specific goals. The worksheets lead the team through a set of calculations to estimate the types and amounts of waste generated by the company, identify potential waste reduction options, and determine which options will work in their facility. Teams in large companies with several departments might find it necessary to copy some of the worksheets so that information can be recorded for each department. In addition, teams can complete only those worksheets that are applicable to their operations or appropriate for their waste reduction program.*

*Appendix A lists a number of specific waste reduction measures that can be implemented in the workplace. You might want to scan this list before reading the remainder of the guide to get a better sense of the range of waste reduction options that can be implemented. This list, while fairly comprehensive, also can serve as a springboard for generating additional ideas tailored specifically for your company.*

*It should be noted that while this guide discusses a range of approaches to reducing waste in the workplace, in-depth discussions on comporting and recycling are beyond the scope of this guide. Many publications have been developed on these topics, however. Contact EPA's RCRA Hotline at 800424-9346 to obtain further information or documents on waste prevention, recycling, comporting, and purchasing recycled materials.*

# Introduction

Until recently, you might not have paid much attention to the municipal solid waste' your company produces. Many businesses have been content simply to establish and manage an efficient system for removing trash. Times have changed, however, and so has waste management, In many areas of the country, companies are seeing a dramatic increase in the complexity and costs of managing their waste. At the same time, public concern over the effects of all this waste has grown significantly. Today, more and more customers are taking environmental considerations into account when purchasing products and services.

In response, innovative companies are incorporating waste reduction principles into their daily operations. What exactly is waste reduction? Waste reduction includes all actions taken to reduce the amount and/or toxicity of waste requiring disposal. It includes waste prevention, recycling, composting, and the purchase and manufacture of goods that have recycled content or produce less waste. Some companies are adopting simple waste reduction options such as reducing paper consumption through the use of electronic mail. Other businesses are reviewing their entire operation to identify and implement as many opportunities for reducing waste as possible, Whether simple alterations or large-scale initiatives, companies are finding that waste reduction offers impressive dividends,

## The Benefits of Waste Reduction

In addition to saving money through lower waste removal costs-sometimes thousands of dollars annually–waste reduction makes good business sense in other ways, too. Waste reduction can help reduce expenditures on raw materials, office

### Waste Reduction Approaches

- *Waste prevention, or source reduction, is the design, manufacture, purchase, or use of materials and products to reduce the amount and/or toxicity of discarded waste.*
- *Recycling is the collection and use of materials that would otherwise have been discarded as the raw materials in the manufacture of new products.*
- *Composting is a natural process by which food scraps, yard trimmings, and other organic materials are collected and allowed to decompose under controlled conditions into a rich, soil-like substance called compost,*
- *Purchasing is the procurement of products made from recycled materials and/or designed to result in less waste after their useful life.*

[1]For the purpose of this guide, municipal solid waste includes all materials typically disposed of in dumpsters and removed for offsite disposal by private or municipal haulers.

**supplies, equipment, and other purchases. Streamlining operations to reduce waste often can enhance overall efficiency and productivity as well, Furthermore, waste reduction measures can help demonstrate concern for the environment, increasing customer loyalty. For many companies, therefore, waste reduction is rapidly becoming an important component of their long-term business planning,**

**Waste reduction can help protect the environment, too. Waste reduction slows the depletion of natural resources, helps reduce pollution associated with the extraction of raw materials and the manufacture of products, and conserves valuable landfill space. Some waste reduction efforts also serve to reduce hazardous constituents in solid waste.**

## Waste Prevention

**The most effective way to reduce your company's waste is to generate less in the first place. Companies can adopt a wide range of waste prevention strategies, including:**

- Using or manufacturing minimal or reusable packaging. **Encourage suppliers to minimize the amount of packaging used to protect their products or seek new suppliers who offer products with minimal packaging, Work with suppliers to make arrangements for returning shipping materials such as crates, cartons, and pallets for reuse. In restaurants and company cafeterias, using bulk food and beverage dispensers instead of individual-serving containers also will help prevent waste. (When opting for reusable containers, be sure to take steps to ensure proper hygiene is maintained.) In addition, examine the packaging used for your own products to determine if it is possible to use fewer layers of materials or to ship merchandise in returnable or reusable containers.**
- Using and maintaining durable equipment and supplies. **Purchase quality, long-lasting supplies and equipment that can be repaired easily, and establish regular**

### Johnson & Johnson Cashes In On Waste Reduction

*Long-term waste reduction efforts at large companies can yield big savings. Johnson& Johnson, a Fortune 100 company primarily in the business of manufacturing health care products, began developing its waste reduction program in 1988. Since then, the company has reduced its packaging by 2,750 tons per year, including a reduction in its use of paper by 1,600 tons, plastic by 1,000 tons, metal by 100 tons, and other materials by over 50 tons. Over the first 2 1/2 years of the program, these reductions saved Johnson & Johnson an estimated $2.8 million in material costs alone.*

*The company began its program by comprehensively reviewing its product packaging, looking for ways to cutback on the amount of materials it purchased, as well as the amount of waste associated with the manufacture and use of these products. One measure Johnson & Johnson adopted was to reduce the weight of paper used to package one of its gauze products. Since millions of these particular products are sold every year, the company realized that even a small change would make a big difference. Simply by changing from 30-pound paper to 28-pound paper, Johnson & Johnson realized some dramatic results: a reduction in waste of 115 tons of paper, saving $450,000 annually.*

*Johnson & Johnson also has initiated more complex waste prevention initiatives. In one example, the company eliminated an aluminum pouch that surrounded a plastic film layer used to contain medical sutures. Since doctors and nurses used the pouch as part of their standard sterilized procedures, Johnson & Johnson worked with a health care organization to develop a new procedure that would retain a sterile environment without the need for the aluminum pouch. This coordination with the users of the product paid off, saving Johnson & Johnson 83 tons of aluminum foil and $300,000 in material costs each year.*

## Before You Throw It Out...

*Often, companies dispose of materials that other businesses, nonprofit organizations, or community groups could use in their operations. Instead of being thrown away, these materials can be traded, donated, or sold.*

*Materials exchanges are an effective waste reduction measure your company might want to consider to transfer items that would otherwise become waste. Materials involved in these exchanges include building supplies, manufacturing remnants, old equipment, and many other items. A company producing animal feed, for example, might use stale baked goods from a bakery as a feed supplement. The plastic wrapping used to protect paper shipments to printing companies typically gets tossed in the dumpster, In a materials exchange, instead of paying for its disposal, a company could give it to a local plastic bag manufacturer.*

*Your company also might participate in donations programs, giving away items such as office equipment and building supplies to charities and other nonprofit organizations. Some donations programs specialize in food donations,*

*Increasingly, businesses and state and local governments across the country are developing or participating in these kinds of programs. Contact your state or local solid waste or environmental agency for information on tapping into these networks (see Appendix B),*

**maintenance schedules for them, These items will stay out of the waste stream longer, and the higher initial costs are often justified by lower maintenance, disposal, and replacement costs. In addition, these items are replaced far less frequently, offering further cost savings.**

- Reusing products and supplies. **Using durable, reusable products rather than single-use materials is one of the most effective waste prevention strategies. Consider adopting simple, cost-effective measures such as washing and reusing ceramic mugs in place of disposable cups, Another idea is to reuse common items such as file folders and interoffice envelopes.**
- Reducing the use of hazardous constituents. **Often, substitutes for the standard cleaning solvents, inks, paints, glues, and other materials used by graphics and maintenance departments are available free of the hazardous ingredients that otherwise could end up being disposed of with the rest of your company's solid waste, Ask suppliers to direct you toward reformulated products such as toners with no heavy metals and water-based paints and cleaning solutions.**
- Using supplies and materials more efficiently. **There are many strategies that your company can adopt to reduce waste and conserve materials, including double-sided copying. In addition, purchasing and inventory practices that generate waste unnecessarily can be eliminated, For example, some companies might order large quantities of an item to receive a discounted unit price, only to have a portion of the order end up unused and discarded, Be cautious about over-ordering products with a limited shelf life.**
- Eliminating unnecessary items. **When reviewing your company's operations for opportunities to reduce waste, don't overlook the obvious. Your company may routinely use items that contribute little or nothing to your product or service. A number of effective waste reduction measures may involve simply eliminating the use of unnecessary materials and supplies,**

**While most of these waste prevention strategies involve daily facility operations, manufacturers also can consider lowering costs and preventing waste" by altering the design of products or changing their manufacturing processes. Among the strategies to consider are:**

- Using less raw material in a product that you manufacture.
- Avoiding or minimizing the use of hazardous substances in your manufacturing processes.
- Increasing the life span of your products by making them more durable and easier to repair.
- Cutting back on the amount of packaging associated with your products.
- Making your products' packaging reusable.

## Recycling

The next preferred alternative for waste reduction is recycling, Recycling offers businesses away to avoid disposing of the waste that cannot be prevented. Many businesses are collecting bottles, cans, paper, corrugated cardboard, and other materials for recycling. If your company is interested in recycling, you will need to design a system to collect the recyclable materials. In many cases, these items also must be sorted and stored. Sometimes a company is responsible for transporting the collected materials to the recycling facility, too. It might be possible, however, to contract with your waste hauler or a local recycling company so that it is responsible for cleaning, transportation, and other steps in the recycling chain. Participation in existing municipal collection efforts also might be an option.

## composting

composting and "grasscycling" are other effective ways to reduce the amount of waste materials that your company must dispose of. Simply by leaving grass clippings on the lawn, your company can significantly reduce waste that would require management and disposal, while conserving nutrients and reducing the need for fertilizer. Companies with other yard trimmings such as leaves and branches may also consider collecting them into a pile and composting them on site. Such programs typically require limited space and attention. In some cases, food scraps, mixed paper, and other organic matter may also be composted with yard trimmings.

composting can make a significant contribution to achieving your company's waste reduction goals, especially if organic waste comprises a large proportion of its solid waste. In addition, the resulting compost can be used on company grounds as a soil amendment or mulch. If the quality of your compost is high enough, you might also be able to sell it to help cover expenses.

### Environmental Practices Can Enhance Public Image

*Waste reduction can bean effective way for your company to demonstrate its environments/ awareness. At College Park Bicycles, a small bicycle retail and repair shop in College Park, Mary/and, recycling and reuse have long been a priority. In the past few years, however, the store has started promoting waste reduction in the community, helping residents protect the environment and generating positive publicity in the process.*

*Over the years, the owner of College Park Bicycles and his 10 employees have devised dozens of creative, cost-saving ways to reduce waste, from reusing old inner tubes to encouraging vendors to minimize packaging whenever possible. In 1988, the shop had an opportunity to spread the message into the community. In cooperation with the county government, College Park Bicycles organized a contest to promote aluminum can recycling. The shop offered prizes to the children who dropped off the most cans at the store, eventually collecting a total of 34,000 cans for recycling.*

*The shop has received two awards from a county-sponsored civic group interested in promoting responsible solid waste management for its role in sponsoring the contest. In addition, the company has earned praise throughout College Park for its internal and community-wide efforts. The waste reduction efforts at College Park Bicycles saves the company several hundred dollars each year and provides immeasurable earnings from good will.*

**If your company is interested in composting, assistance can often be obtained from state solid waste or environmental agencies (see Appendix B); contacting these agencies is particularly important in those states where standards for composting have been established, These agencies, as well as county extension services, also can be helpful in identifying new composting techniques and equipment, Businesses also might participate in municipal or county composting programs. Contact your local department of public works for more information.**

## Purchasing

**Many waste prevention activities will invariably change the way you purchase supplies and equipment, For example, a switch to reusable**

### Reducing Waste Cuts Disposal Costs

*The reductions from waste prevention, recycling, and other measures can be impressive, In four years, the Brown and Sharpe Manufacturing Company, a multinational manufacturer of precision measuring tools, cut its Rhode Island plant's annual waste disposal rate by 60 percent—from 400 to 160 tons. At the company's headquarters, a 380-employee facility in North Kingstown, a comprehensive waste reduction program was launched in 1988. Through the program, the company now saves over $12,000 a year in disposal and transportation fees, as well as several thousand dollars in annual purchasing costs.*

*Brown and Sharpe began by zeroing in on the largest components of its waste stream. After discovering that wooden pallets and shipping crates account for over half of the company's annual discards by weight, Brown and Sharpe decided to reuse most pallets that arrive with incoming shipments, thereby eliminating the need to buy new ones. Irreparably damaged pallets and crates are sent to a New Hampshire mill, where they are burned to create steam for power. Shipping the wood to the mill costs two-thirds less than the cost of landfill disposal.*

*As another way to reduce packaging waste and save money, Brown and Sharpe no longer throws away the mounds of foam packing peanuts that come with most deliveries. Now, after an incoming shipment is unpacked, the peanuts are transferred into 55-gallon drums lined with plastic bags, which then are sent to the shipping department for reuse. The company reused more than 190 cubic yards of packing peanuts in 1992, saving several hundred dollars in avoided purchase costs.*

*Brown and Sharpe's paper recycling program has further reduced the company's waste. Nearly 35 tons of paper were recycled in 1992, more than half of which was white and colored office paper. Since the recycling company pays Brown and Sharpe for this high-quality paper, the paper recycling program pays for itself*

### Simple Measures Can Help, Too

*Waste reduction does not necessarily entail extensive planning and effort, as demonstrated by Taylor Equipment Company. Four years ago, this freezer equipment distributor in Forestville, Maryland, realized that it could reduce the amount of waste paper it discarded with one simple purchase: the company bought a paper shredder for about $250 and began replacing foam packing peanuts with shredded waste paper Taylor is saving $1,500 to $2,000 a year by reducing its waste disposal costs and avoiding the costs of purchasing the packing peanuts. Other simple steps the company has taken include reusing shipping crates it receives to package its own products and giving delivery pallets away as scrap wood.*

plates in your cafeteria will eliminate the need to buy single-use plates. In addition, purchasing products with recycled content is another important element of waste reduction. An important complement to your recycling efforts, buying recycled products helps ensure that collected recyclable will actually be used in new products and kept out of disposal facilities. Furthermore, when your company buys a product or package that was manufactured with recycled material, natural resources and energy often are conserved. And many companies have found that recycled products are now priced competitively with products made from virgin materials. To be sure your company is purchasing recycled products whenever possible, it might be necessary to review purchasing specifications to ensure that they do not unnecessarily discriminate against products made from recycled materials.

## About the Guide

*The remainder of this guide presents practical information to help companies design and implement a* waste *reduction program. To assist companies in gathering the necessary information, a series of worksheets are included at the back of this manual. Each worksheet is introduced in the text of the guide. The purpose of these worksheets is to help companies determine the types and amounts of waste generated by their company and identify potential waste reduction options. Companies need only complete those worksheets that are appropriate for their waste reduction needs.*

*Chapter One*

# Getting Started

**Successful waste reduction programs hinge on careful planning and organization. This chapter discusses how to lay the groundwork for an effective program. The key steps to getting started are:**

- ✔ *Obtaining management support and involvement.*
- ✔ *Establishing your waste reduction team and team leader.*
- ✔ *Setting preliminary program objectives.*
- ✔ *Getting the whole company on bored by announcing the program and its goals to all employees*

## Management Support

**The support of company management is essential for developing a lasting and successful waste reduction program. At the outset of a program, an endorsement from company management is needed to help establish your waste reduction team. Throughout the program, company management can support your team by endorsing program goals and implementation, communicating the importance of reducing waste within the company, guiding and sustaining the program, and encouraging and rewarding employee commitment and participation in the "effort. Stressing the range of benefits that can come from waste reduction, such as cost savings and enhanced company image, will help sell the program to management,**

## The Waste Reduction Team

**The waste reduction team is a group of employees who are responsible for many of the tasks involved in planning, designing, implementing, and maintaining the program, A team approach allows these tasks to be distributed among several employees and enables employees from all over the company to directly contribute to reducing waste.**

**Typically, members of your waste reduction team are responsible for:**

- **Working with company management to set the preliminary and long-term goals of the waste reduction program.**
- **Gathering and analyzing information relevant to the design and implementation of the program. (This is done through a waste assessment, which is discussed in Chapter 2.)**
- **Promoting the program to employees and educating them about how they can participate in the effort.**
- **Monitoring the progress of the program,**
- **Periodically reporting to management about the status of the program.**

**The size of your team should relate to the size of your company and be representative of as many departments or operations as possible. For a modest waste reduction program, an effective team might consist of just one or two people. The ideal candidate for a one-person team would bean individual who wears many hats and is familiar with the overall operations of your company. A two-person team might consist of a company manager and an administrative or technical support person. Larger businesses might opt to create a team of employees from different departments to encourage widespread input and support. These individuals can include environmental managers, building supervisor, technical or operational staff, administrative staff, maintenance staff, and**

purchasing staff, or other employees interested in waste reduction.

Team members can be volunteers or appointed members. To increase the members' motivation and interest, it might be appropriate to make membership a sign of special recognition within the company, Whether volunteer or appointed, however, it is important that members be enthusiastic about the waste reduction program and able to commit time to the effort.

Company management or the team should appoint a knowledgeable and motivated team leader. Depending on the size of the company and the type of program being implemented, the position can require a significant amount of time and energy. The leader must be capable of directing team efforts; administering the planning, implementation, and operation of the waste reduction program; and acting as a liaison between management and the team. Likely candidates include a facilities manager, an environmental manager, or an employee who has championed waste reduction in your company. If possible, the task should be incorporated into the person's job description.

Once your team has been established, members should meet regularly to develop a plan and begin program implementation. The time needed to design and implement a waste reduction program will vary. Generally, large facilities incorporating many different options will need several months to start up a program. Department-specific or more modest programs might be implemented in less than a month. Some businesses might even be able to implement simple options within a matter of days. In any case, the investment of time and resources at this stage will likely be returned by the savings realized through a successful waste reduction program,

## Waste Reduction at a Multisite HMO

*Waste reduction programs at companies with a number of different locations are not necessarily more difficult-they just require greater coordination. The northwest region of Kaiser Permanence, a 7,500-employee health maintenance organization (HMO) with 47 sites, recognized early on that an effective waste reduction program depended on promoting and coordinating the efforts at all its locations.*

*In 1989, after an informal paper recycling program commenced in some Kaiser facilities, the company organized a committee to formalize the recycling initiative and identifty other waste reduction opportunities. Eventually, the company realized that the committee, renamed the "Green Team, " could act as an important coordinating mechanism throughout the HMO's facilities. Consisting of representatives from every strata of the company the team was made responsible for organizing waste management efforts, investigating and recommending alternative products and practices, and acting as a liaison between management, physicians and dentists, and support staff at the different sites,*

*Today the Green Team publishes monthly updates and periodic position statements to update Kaiser employees about the HMO's waste reduction measures. To help with is coordination efforts, the team has organized smaller groups in each division of the company and "Green Line" telephone hotlines have been installed to let employees voice their comments, suggestions, and concerns,*

*Effective coordination efforts have enabled Kaiser to cutback on waste. generation and save money at the same time, For example, the company has replaced disposable foam/plastic mattress overlays with reusable pressure-relief mattresses that last up to 10 years and reduce patient bedsores. The new mattresses save almost $200,000 a year in purchasing costs. The HMO's radiology departments have begun to capture the silver remaining after developing X-rays. Currently, 600 pounds of the heavy metal are recycled per year generating $30,000 to $40,000 in revenues, The company also recycles waste paper and cardboard and has begun using a degreaser with reduced hazardous compounds in its housekeeping operations.*

## Setting Preliminary Program Goals

While the general objective of any waste reduction program is to reduce the amount and/or toxicity of municipal solid waste being generated, your first task as a team will be to work with management to establish and record specific, preliminary goals for the program. These goals might include enhancing the company's corporate image or increasing operational efficiency. The goals should be based primarily on how much waste reduction is possible given the level of effort that the company is willing to dedicate to the task. The goals set by the team will provide a framework for specific waste reduction efforts to follow. Keep in mind, however, that the preliminary goals set by the team should be flexible, as they might need to be reexamined and adjusted as specific waste reduction options are considered later on,

## Notifying Personnel

Once the general direction of the waste reduction program has been established, present the program to the rest of the company, This is a good opportunity to get employees excited and generate some momentum behind the team's efforts. The first step is an announcement from the president or representative of the upper management of the company, demonstrating that the program has full management support and is a high priority for the company. The announcement should:

- Introduce employees to waste reduction.
- Explain how waste reduction can benefit both the company and the environment.
- Outline the design and implementation stages of the program.
- Offer the team leader's name and number and encourage employees to contact him or her with any ideas or suggestions.

Your program is more likely to succeed if you solicit suggestions from employees for reducing waste, To reduce paper, the announcement should be posted in a prominent place, circulated, or distributed through electronic or voice mail, if available.

Throughout the duration of the program, periodic communications (in the form of centrally posted memos or announcements, for example) can help maintain employee support, Employees are likely to appreciate being asked to join in your company's waste reduction efforts, and such offers will encourage consistent participation.

*Chapter Two*

# Conducting a Waste Assessment

Having established the framework of your company's waste reduction program, the next step for the waste reduction team is to consider conducting a waste assessment. Some teams, especially those planning very limited programs or in companies where the waste stream is well understood, might opt to forego a waste assessment. In fact, many effective waste reduction measures can be adopted without the help of an assessment. The data generated in an assessment can, however, provide your team with a much greater understanding of the types and amounts of waste your company generates. These data can be invaluable in the design and implementation of a waste reduction program. The key steps to conducting a waste assessment are:

- ✔ *Understanding the purpose of the waste assessment.*
- ✔ *Determining the approach.*
- ✔ *Examining company records*
- ✔ *Taking a facility walk-through.*
- ✔ *Conducting a waste sort.*
- ✔ *Documenting the waste assessment.*

## The Purpose of the Waste Assessment

The waste assessment serves two basic purposes:

- To establish a baseline of data by collecting background information on a facility and its current purchasing, waste generation, and management practices.
- To identify potential waste reduction options for further evaluation.

The data you collect in the waste assessment can be used to identify and evaluate potential waste reduction options, including alternative purchasing practices, reuse, material exchanges, recycling, and composting. The waste assessment also will enable you to examine current waste reduction practices and to quantify their effectiveness, Furthermore, information generated by the assessment can act as baseline data against which the effectiveness of the waste reduction program can be evaluated.

If you do not have the time or resources to conduct a waste assessment, you might consider using industry averages of the amount of waste generated by companies in your field to approximate the amounts and types of waste your company generates. Often, waste generation estimates by general waste category can be obtained for a company's specific type of business and used as the basis for designing a waste reduction program. While this may be the easiest way to approximate your waste generation rate, these estimates are unable to account for specific conditions and may therefore result in inaccuracies. In addition, these potentially inaccurate data can hinder the evaluation process, since measuring waste reduction progress depends on comparing current waste generation data with information regarding the amounts and types of waste produced before program implementation.

## Determining the Approach

Planning and executing an appropriate waste assessment involves determining its scope, scheduling the different assessment activities, communicating the necessary information to employees, and performing the actual assessment. Depending on the objective of your

waste reduction program, a waste assessment can involve:

- Examining facility records
- Conducting a facility walk-through
- Performing a waste sort

Your assessment may require just one of these activities, or a combination of approaches.

The team should determine what type of assessment is best for your company based on such factors as the type and size of the facility, the complexity of the waste stream, the resources (money, time, labor, equipment) available to implement the waste reduction program, and the goals of the program. For example, if your facility generates only a few types of waste materials, your team might only need to review company records and briefly inspect facility operations, On the other hand, if your company generates diverse types of waste and has established a goal to cut waste disposal by 50 percent, the team will need to thoroughly examine and quantify the wastes generated in most company operations by performing a waste sort, Each type of waste assessment activity is described below. The table on the following page summarizes the strengths and limitations of each activity,

## Records Examination

Examining company records can provide insight into your company's waste generation and removal patterns, The types of records you might find useful include:

- Purchasing, inventory, maintenance, and operating logs,
- Supply, equipment, and raw material invoices.
- Equipment service contracts.

## Renegotiating Your Waste Hauling Contract

*Companies implementing waste reduction programs often find that these programs offer them leverage that can be used to renegotiate their waste hauling contracts. One such firm is EG&G Pressure Science, a 300-employee aerospace design and manufacturing company located in Beltsville, Maryland. Through successful renegotiation of its waste hauling contract, Pressure Science, a division of EG&G, reduced its hauling fees after implementing a recycling program, As a result of its new contract, the company not only offset the costs of its recycling program, but saves thousands of dollars each year.*

*Pressure Science launched its recycling program as part of its effort to use waste reduction to demonstrate responsible corporate citizenship and reduce expenses at the same time. In order to determine which materials its recycling program should focus on, Pressure Science decided to sort through its company dumpster to identify the types and amounts of waste it was generating. Local county government officials conducted the sort as part of a waste reduction partnership effort between industry and government.*

*Based on the results of this serf, the company designed a recycling program targeting corrugated cardboard and office paper. Corrugated cardboard by far made up the largest percentage of the company's waste stream at 40 percent (by volume). Office paper while not representing a large portion of the waste stream, was a material that nearly everyone in the company could help recycle.*

*While this new recycling effort carried a price tag, Pressure Science recognized that this cost could be offset if it took advantage of the resulting waste reductions to renegotiate its waste hauling contract. Anticipating that it no longer would need to have its dumpster emptied three times per month, the company decided to switch to an "on-call" service. Today, Pressure Science simply calls the hauler whenever the dumpster is full. After subtracting the cost of the recycling program, this renegotiation is saving the company over $7,000 annually.*

## Waste Assessment Approaches

| Method | Strengths | Limitations |
|---|---|---|
| **Records Examination (Hauler Records)** | • May provide accurate data on the weight or volume of waste generated at the facility.<br>• Can require less time and effort than facility walk-throughs or waste sorts. | • Might not provide adequate data, if accurate waste hauling records do not exist,<br>• Not likely to provide information about specific waste components.<br>• Can be difficult to use if more than one business shares a dumpster. |
| **Records Examination (Purchasing Records)** | • Can provide data on waste generation of specific materials or products.<br>• Tracks major potential waste from the point of origin.<br>• Can require less time and effort than facility walk-throughs or waste sorts.<br>• Can be more accurate than waste sorts for tracking small items, low-volume waste materials, and occasional or seasonal waste materials<br>• Can help identify the most expensive components of a company's waste. | • Not likely to provide the full picture on waste generation,<br>• If company purchasing is not centralized, can be incomplete or require substantial effort to collect and analyze. |
| **Facility Walk-Through** | • Can require less time and effort than waste sorts.<br>• Allows first-hand examination of facility operations.<br>• Can provide qualitative information about major waste components and waste-generating processes.<br>• Allows interviews with workplace personnel, which can reveal waste prevention, recycling, composting, and purchasing opportunities that would not be found through records examinations or waste sorts. | • **Might not identify all wastes generated.**<br>• **Might not be representative if only conducted once.**<br>• **Does not provide precise information about the quantity of waste generated.** |
| **Waste Sort (Specific Functional Areas)** | . Provides quantitative information about specific types of waste and functional areas appropriate if targeting specific types of waste.<br>. Requires less time and effort than comprehensive waste sorts. | • Does not provide data on waste generated facility-wide.<br>• Might omit major components of the facility's waste.<br>• Might not be representative of the waste in the specific area if only conducted once. |
| **Waste sort (Facility-Wide)** | . Provides waste generation estimates for the entire facility.<br>. Provides quantitative information on each waste component. | • Requires significant time and effort to conduct.<br>• Might not be representative if only conducted once.<br>• Does not provide qualitative information on how or why wastes are generated. |

## Conducting an Effective Waste Assessment

*Waste assessments can be instrumental in gathering detailed information about your company's waste. For companies that plan to focus on a particular portion of their waste, an assessment can be indispensable. At one of Quaker Oats Company's largest food processing plants, in Newport, Tennessee, company officials suspected that a few types of recyclable materials-lass, aluminum, polyethylene terephthalate (PET) plastic, and corrugated cardboard comprised a large percentage of their waste, To find out, a waste assessment was conducted in 1990 focusing on recyclable materials.*

*Company Records Review*

*To conduct the assessment, the company setup a team of waste auditors. First, the team reviewed company records, a step that proved to be especially useful . In addition to indicating the total amount of waste generated annually, these records provided waste auditors with data on specific components of the company's waste stream. For example, shipments often arrive at the facility packaged in cardboard cartons. By researching how many cartons the facility received per year and estimating the weight of a single box, the waste auditors were able to calculate the total weight of the cardboard boxes discarded each year,*

*Facility Walk-Through*

*Waste auditors also spent a couple of days walking through the plant, observing waste-generating processes and watching what was thrown into dumpsters. During the walk-through, the auditors solicited input from both employees and the plant's four department managers, In addition, the managers were asked to complete detailed questionnaires recording every item thrown out in their department during one week, In place of a detailed waste sort, the auditors used data from the questionnaires and checked the contents of selected dumpsters.*

*Results*

*The waste assessment confirmed that glass, aluminum, PET plastic, and cardboard were the major components of the company's waste. Furthermore, the assessment provided highly specific data to help the company plan and set up its recycling program. With these data, the auditors were able to demonstrate to the company's management that, given the huge volume of recyclable waste the plant generated, certain pieces of equipment and capital improvements were justified. Management agreed to invest over $130,000 in a glass crusher, a plastic granulator a horizontal baler for corrugated cardboard, and dozens of color-coordinated dumpsters (blue for bottles, yellow for plastic, and brown for cardboard).*

*The waste assessment data also proved useful when negotiating contracts with buyers of recyclable materials. For buyers with minimum shipment requirements, for example, plant managers were able to determine at a glance if the facility could meet the requirement. Assessment data also showed the volume of materials the company expected to process, enabling equipment vendors to recommend a machine of the correct size and capacity,*

- Repair invoices,
- Waste hauling and disposal records and contracts.
- Contracts with recycling facilities and records of earned revenues from recycling.

Company records will be needed to complete Worksheet A and **Worksheet** B found at the end of this manual, Worksheet A will help the team document background information regarding the physical layout of your facility and the functions of the different departments. Your

company's current waste collection and removal practices can be documented using Worksheet B. The tables and formulas in this worksheet will enable the team to estimate your company's annual waste generation rates and the costs of collecting this waste and removing it for disposal, regardless of whether your company is charged for waste removal by weight, volume, or through a flat fee. In this way, the team can compile important baseline data against which potential waste reduction options can be measured. Company records will be needed for some portions of other worksheets in this guide, as well.

## Facility Walk-Through

The walk-through involves touring the facility (and its grounds), observing the activities of the different departments, and talking with employees about waste-producing activities and equipment. A facility walk-through is a relatively quick way to examine a facility's waste-generating practices. Specifically, the walk-through will enable the team to:

- Observe the types and relative amounts of waste produced.
- Identify waste-producing activities and equipment.
- Detect inefficiencies in operations or in the way waste moves through the organization.
- Observe the layout and operations of various departments.
- Assess existing space and equipment that can be used for storage, processing recyclable, and other activities.
- Assess current waste reduction efforts.
- Collect additional information through interviews with supervisors and employees.

While a records examination provides the team with data (such as estimates of the types and amounts of waste generated by your company), the walk-through is an opportunity to observe the connection between the types of waste generated and the actual waste-generating activities or processes. In addition, a facility walk-through that includes interviews with groundskeeping staff is a good way to assess the amount of yard trimmings generated by your company. The team should be careful during the walk-through not only to record the types of waste observed and the ways in which waste is generated, but also to consider the potential waste reduction opportunities that lie in increasing the efficiency of these operations,

Before conducting the walk-through, the team leader should check with the managers of the departments that will be toured to avoid disrupting special deliveries, rush orders, or other department functions. He or she also can request that the supervisor and employees of each department be available during the walk-through to answer questions or describe operations, These interviews can offer important additional detail on waste generation and removal practices. Moreover, interviews help keep employees informed and interested in the evolving waste reduction program, and offer an opportunity to ask questions. Employees also can be a valuable source of ideas for reducing waste.

Worksheet C contains the information needed to organize and conduct a facility walk-through. The time necessary to complete a walk-through depends on the size and structure of your facility, For medium-sized businesses with few departments, the walk-through should be quick and relatively easy, It might take as little as an hour to tour facilities like small warehouses, office buildings, and restaurants. Teams in larger companies might need to devote more time and resources to this activity since more departments must be investigated and more employees interviewed. Large office buildings, complexes, or plants might require a day or more to tour,

## Waste Sort

If you need more data than company records or a facility walk through can provide, a waste sort can be conducted, A waste sort involves the physical collection, sorting, and weighing of a representative sample of the company's waste, The goal of the sort is to identify each waste component and calculate as precisely as possible its percentage of the waste your company generates. Depending on your needs, a waste sort can focus on the entire company's waste or target certain work areas. If the team believes one or more specific functional areas are responsible for much of the facility's waste, it may choose to concentrate its waste sort accordingly.

Worksheet D provides a step-by-tep procedure for conducting a waste sort,

For some companies, it will be feasible to assemble and measure one day's worth of waste, In larger firms where this is impractical, team members might choose instead to assemble a portion of the waste from each department for measuring. However you choose to structure the waste sort, consider whether waste generation at your company varies significantly enough from one day to the next to distort results, Seasonal and periodic variations in waste generation are also common. If the potential for inaccuracy is large enough, the team might want to sort samples on more than one day. Multi-day sampling might provide a more accurate representation of the waste generated at your company. Since the data gathered in the waste sort will be used as the basis for key waste reduction program decisions, it is important that you obtain a truly representative sample of your company's waste. If a representative sample is not obtained, calculations on waste generation, waste composition, and waste removal costs can be skewed significantly,

In addition, waste reduction teams in companies with active recycling programs will need to decide whether their waste sort should measure all materials or target just the portion of the waste stream that is not currently being recycled, For a complete assessment of the types and amounts of waste being generated, the waste reduction team should locate all recycling collection areas and measure the contents to be sure that all waste components are included in the sort. If your company is more concerned with finding ways to reduce just the materials that are not being recycled, it can focus exclusively on the waste collected in company dumpsters. This might also help companies with existing recycling programs to identify the amount of materials that could have been recycled under the current program but ended up being thrown away,

To organize a waste sort, you will need to determine which waste categories to quantify. Typically, the major components of a business' waste include paper, plastic, glass, metal, and organic material such as yard trimmings and food scraps. A range of other types of waste also can be generated by a company depending on the nature of its operations. The team also should choose whether to limit its waste sort to identifying and measuring these major waste component categories or further sorting the waste into subcategories (for example, sorting paper into such subcategories as high-grade, low-grade, newsprint, corrugated cardboard, magazines, and other), If possible, the team should strive to separate and measure the waste sample as completely as possible. These precise measurements will be useful later on when the team is determining which materials can be exchanged, reused, sold, or recycled. Also, consider whether a particular waste component needs to be measured. For example, if you know that a market for recyclable, high-grade paper exists in the area, team members might want to design the sort to ensure that this waste type is quantified accurately,

## Documenting the Waste Assessment

Once the team has determined the approach to use, it is time to perform the actual waste assessment. While examining the company's waste generation and management practices, team members also should search for opportunities to reduce waste and increase efficiency. Be sure to document all information gained through the waste assessment. Documenting your findings serves several purposes, including:

- Providing a record of the company's efforts to reduce waste,
- Developing a recordkeeping system so that costs, savings, and waste reduction quantities can be more easily tracked,
- Obtaining baseline data from which to investigate economic and technical feasibility of waste reduction options.
- Obtaining baseline data from which to evaluate the impact of these options once implemented.

In addition to guiding the waste assessment process, the worksheets will function as a record of your waste assessment activities and the data generated. Be sure to keep with the worksheets any related information you recorded during your waste assessment.

*Chapter Three*

# Selecting, Implementing, and Monitoring Waste Reduction Options

The information collected in the waste assessment now can be used to list, analyze, and choose appropriate waste reduction measures for your company. This chapter will help the team consider both the operational and the economic feasibility of the options under consideration, as well as the extent to which they will help achieve the goals of your waste reduction program, In addition, this chapter also discusses the process of implementing your program and monitoring it overtime to evaluate progress, The key steps of selecting, implementing, and monitoring waste reduction options are:

- ✔ *Compiling and screening the options*
- ✔ *Analyzing and selecting the options*
- ✔ *Implementing the options*
- ✔ *Educating and training employees*
- ✔ *Monitoring and evaluating the program*

## Compiling and Screening the Options

Using the findings from the waste assessment, the team should list all the possible waste prevention, recycling, composting, materials exchange, and purchasing measures that it feels might be effective, using Worksheet E as a guide. This list should be compiled based on the goals of your waste reduction program. For example, if your company hopes to reduce waste removal costs as much as possible, and is charged for waste removal based on volume, the list of options should focus on high-volume waste materials. (Appendix A lists a number of waste reduction ideas,) Brainstorming sessions among team members can provide additional options. Managers and employees that participated in the walk-through also can be consulted for more ideas, if necessary,

After all potential options have been identified, the team should screen them based on criteria such as whether the options will substantially reduce waste removal costs, reduce purchase costs, have low start-up costs, or are likely to boost employee morale. Companies may weigh these criteria differently based on the particular goals of their program. Use Worksheet E to screen all potential options against the criteria the team feels are important. This initial evaluation and screening will help you identify a subset of options that deserve further analysis and possible inclusion in your waste reduction program.

## Analyzing and Selecting the Options

Once a short list of waste reduction options has been identified, the team should begin the process of deciding which options are the most appropriate for your program. Worksheet F provides a set of decision-making criteria to help lead the team through the evaluation process, At the end of Worksheet F, the benefits and drawbacks of each option under consideration can be summarized.

During this evaluation process, the team should be clear on the relative importance of the different criteria against which the options are being measured, Depending on your company's waste reduction goals, for example, cost-effectiveness may not always be the overriding criteria for selected options. Other criteria, such as improved environmental awareness, employee morale, and community relations, may be equally important. In

## When Evaluating Your Options...

*It is important that the waste reduction team throughly review the potential effects of each waste prevention, recycling, composting, and purchasing option. While a strong consideration is likely to be whether the option's costs are justified by potential savings, the waste reduction team also should consider:*

- *Effects on product or service quality and product marketing*
- *Compatibility with existing operations*
- *Equipment requirements*
- *Space and storage requirements*
- *Operation and maintenance requirements*
- *Staffing, training, and education requirements*
- *Implementation time*
- *Effects on employee morale, environmental awareness, and community relations*

**addition, teams whose companies feel cost-effectiveness must be a key criteria should be sure to consider the long-term economic feasibility of an option. While the team may be inclined to disregard a particular option with large start-up costs, the measure may end up yielding impressive savings over several years. Worksheet F contains a formula for calculating an option's payback period, which is one way of measuring the long-term economic feasibility of a proposed investment. Your company may use other such measuring tools.**

**In addition, after completing the evaluation of these options, review the long-term feasibility of the program as a whole. Successful programs can be designed around complementary options that take advantage of their different strengths. Before removing any items from consideration, for example, consider whether certain waste . reduction efforts may, over time, save enough money to pay for other waste reduction activities that improve environmental awareness, employee morale, or community and customer relations,**

**Some options might not require extensive analysis. For example, if your facility already has a copy machine with the ability to make two-sided copies efficiently, then a policy mandating double-sided copying usually can be implemented easily, On the other hand, you will want to carefully analyze complex options that require a significant change in operations or large capital investments. For instance, a food service considering a switch from disposable to reusable serviceware needs to assess factors ranging from the cost of new equipment and added labor expenses to the savings from reduced waste removal costs and the avoided purchase of disposable serviceware. The health and sanitation aspects of such a switch also should be considered. For complex options, the team will want to contact suppliers, product refurbishers, packaging designers, and any other individuals who could help determine if the option is feasible. These individuals also can help pinpoint any unforeseen obstacles or complications that could hinder implementation,**

### *Waste Prevention Options*

**When analyzing and selecting specific options, team members should focus first on waste prevention, which will enable your company to eliminate some of its waste, After studying your company's waste generation and management practices, you will likely have compiled a number of waste prevention options. Use Worksheet F to determine the capital and operating costs of these options and compare them against potential**

savings and revenues. Be sure to examine the potential operational effects, as well. For example, while modifying packaging can significantly reduce waste, you will want to consider carefully how these changes will affect storage, operations, and labor costs.

One waste prevention option may result in savings in several different areas, including avoided purchasing, storage, materials handling, and removal costs. For example, switching to double-sided copying can result in cost savings associated with reduced paper purchasing, reduced space necessary for paper storage, reduced employee time associated with handling paper and filling paper trays, and reduced paper packaging removal costs. Be sure to consider savings in each of these areas when evaluating waste reduction options.

## Recycling Options

Next, evaluate the recycling options the team has identified to better manage waste that cannot be prevented. Before implementing any recycling option, the team needs to consider the marketability of the materials to be collected. To locate potential buyers, contact local recycling companies. Consult the Yellow Pages (under "recycling"), trade associations, chambers of commerce, and state or local government recycling offices for assistance. When conducting preliminary contract discussions with local buyers and haulers, there are a number of questions you should ask. The box on the following page provides a starting point. Appendix E provides information on the types of materials that commonly are collected for recycling.

Be sure to carefully weigh the cost-effectiveness and potential operational effects of your recycling options. Recycling programs, especially more ambitious efforts, often require purchases of equipment like containers, compactors, and balers. Additional labor also might be required. Moreover, steps might be necessary to ensure that contamination of collected materials is minimized. Some companies also may have to pay a fee to have their collected recyclable material removed. In many cases, however, the savings and revenues (such as reduced removal costs and revenues from selling collected materials) will offset these costs. In addition, consider whether the new recycling program will affect current purchasing practices. For instance, your company might want to begin buying exclusively white legal pads instead of yellow ones to take advantage of the strong market for white office paper. Also examine the extent to which internal collection, transfer, and storage systems are needed and whether these new systems will be compatible with existing operations.

## Composting Options

If the team discovers that yard trimmings or other organic matter make up a significant percentage of your company's waste, evaluate the feasibility of "grasscycling" or composting. Most companies can benefit by "grasscycling" — leaving cut grass on the lawn where it will decompose quickly and help add nutrients that improve the quality of the lawn. Though not necessary, a mulching mower can cut the grass clippings into smaller pieces, allowing them to decompose more quickly. Your company will save time and money by no longer bagging the clippings, and will reduce its disposal fees,

If your company has available outdoor space, onsite composting can be used. Companies with composting programs usually find them to be a cost-effective method for turning lawn trimmings into a product that may then be sold or used on company grounds. The team can design a program to collect all types of organic materials into piles for composting, or a simpler program designed to compost just yard trimmings might be used. If the local municipal government operates or participates in a composting project, offsite composting also may be an option. A program can be designed to collect and store organic materials and, if necessary, haul it to the composting facility. Even when hauling is necessary, however, these programs also tend to be cost-effective.

To determine if composting is appropriate for your company's waste reduction program, it is important to calculate likely startup and ongoing expenses against projected savings at the outset. Worksheet F will help the team estimate likely costs, including training groundskeeping staff in compost management, educating company employees about participating in the program, equipment and operating cost, and compare

## Questions to Ask Potential Buyers of Recyclables

*When meeting with recycling companies interested in purchasing your collected materials, there are a number of issues you should discuss, including:*

- ***What types of recyclables will the company and how must they be prepared?*** *Recycling companies might request that the material be baled, compacted, shredded, granulated, or loose. Generally, recyclers will offer a better price for compacted or baled material. Compacting or densifying materials before transporting also can be a cost-effective method of lowering hauling costs for the buyer.*
- ***What contract termswill the buyer require?*** *Discuss the length of the potential contract with the buyer, Shorter contracts provide greater flexibility to take advantage of rising prices, while longer contracts provide more security in an unsteady market, Often, buyers favor long-term contracts to help ensure a consistent supply of materials. The terms of payment should be discussed as well, since some buyers pay after delivery of each load, while others setup a periodic schedule. Also, ask whether the buyer would be willing to allow changes to the contract over time, The buyer might want some flexibility as well; in many cases, the buyer will be willing to pay a higher rate in return for a stable supply of quality materials.*
- ***Who provides transportation?*** *If transportation services are not provided by the buyer, you will need to locate a hauler to transport materials to the buyer. The Yellow Pages, local waste haulers, and state or local waste management authorities can help provide this information.*
- ***What is the schedule of collections?*** *If the recycling company offers to provide transportation, check on the frequency of collections. Some businesses might prefer to have the hauler be on call, picking up recyclable when a certain weight or volume has been reached. Larger companies might generate enough recyclable material to warrant a set schedule of collections.*
- ***What are the maximum allowable contaminant levels and what is the procedure for dealing with rejected loads?*** *Inquire what the buyer has established as maximum allowable levels for food, chemicals, or other contaminants, If these requirements are not met, the buyer might reject a contaminated load and send it back to your company. The buyer also might dispose of a contaminated load in a landfill or combustor which can result in your company incurring additional costs.*
- ***Are there minimum quantity requirements?*** *Find out whether the buyer requires a minimum might or volume before accepting delivery. If a buyer's minimum quantity requirements are difficult to meet, consider working with neighboring offices or retail spaces. By winking together it might be possible to collect recyclables in central storage containers and thereby meet the buyer's requirements,*
- ***Where will the waste be weighed?*** *Ask where the material will be weighed, and at what point copies of the weight slips will be available. Weighing the material before it is transported will eliminate the problem of lost weight slips and confirm the accuracy of the weight recorded by the buyer.*
- ***Who will provide containers for recyclables?*** *Buyers should be asked whether they will provide containers in which to collect, store, and transport the material, and whether there is a fee for this service.*
- ***Can "escape clauses" be included in the contract?*** *Such clauses establish the right of a company to be released from the terms of the contract under conditions of noncompliance by the buyer.*
- ***Be sure to check references!*** *Obtain and thoroughly check the buyer's references with existing contract holders, asking these companies specifically whether their buyer is fulfilling all contract specifications,*

these against projected savings' in waste removal costs and the potential for selling the compost or using it on site in place of commercial mulch.

In addition to grasscycling and composting, other practices can reduce yard trimmings at your facility and should be considered by the team. The team can investigate the possibility of chipping other ground debris, like branches, into mulch, The mulch can be used on company property to reduce weeds and conserve moisture around plantings, Other options include planting low maintenance plants. Slow-growing species and evergreen trees generally do not create large amounts of debris.

### *Purchasing Options*

During the waste assessment, the team may have noted purchasing changes that could help reduce waste, from buying supplies with reduced packaging to careful inventory control to avoid overordering and possibly throwing away perishable items. In addition, during the team's exploration of local recycling markets, the need for favoring products made with recycled content also may have become evident. In any business, many opportunities exist to use the company's buying power to reduce waste and encourage the growth of recycling markets. To identify specific changes in purchasing that your company could adopt, the team might contact its suppliers and discuss alternative products that would meet the new purchasing criteria. Check with other suppliers, as well, to see what they may be able to offer. In addition, various industry groups, state solid waste agencies, and federal information services such as EPA's RCRA Hotline can help identify ways to reduce waste through product purchasing and sources of products made from recycled materials.

After you have identified opportunities to purchase recycled products and products that can help you reduce waste, each item should be evaluated in terms of availability and cost. Reduced waste and recycled products do not necessarily cost more than other products, For example, while paper made from recycled fibers was once considerably more expensive than virgin paper, the price of paper with recovered content today is competitive with traditional paper. In addition, be sure to compare recycled or reduced waste products to other products on the basis of long-term costs, rather than purchasing costs alone. For example, while benches and picnic tables made from recycled plastic may initially cost more than their wooden counterparts, they last up to four times longer and do not require maintenance. Similarly, while reusable products may cost more to purchase initially, they often save money over time by avoiding frequent purchases of single-use items.

## Implementing the Options

Having determined the initial waste reduction measures to adopt, the team should now begin to implement the measures. Consider building your program slowly, implementing a few options at a time, so employees are not overwhelmed by changes in procedure. This is particularly important for more complex waste reduction programs. Building slowly also provides an opportunity to identify, assess, and solve any operational problems in the early stages. If a program involves only a few simple measures, however, it might be possible to implement all options at once.

## Educating and Training Employees

As the team begins to implement the waste reduction program, it is essential that all employees be informed about the program and the importance of their cooperation and involvement. Be sure to update employees regarding the options being implemented, changes in work patterns or equipment, expected benefits, and their roles and responsibilities. These messages can be conveyed in a variety of ways, including:

- Staff meetings and training sessions.
- Employee newsletters
- Posters, signs, or flyers.
- Notices on electronic mail.
- Special events, such as slogan contests, cash awards, or other recognition for waste reduction activities.
- New employee orientation.
- Job performance standards.

**Some companies can effectively reach all their employees by circulating memos or holding informal meetings. Larger businesses might need to conduct a full-cale education or training campaign to be sure their entire company is aware of and involved in the program.**

**These outreach techniques also should be used to keep staff up-to-date on the program's successes and problems. Employees will feel a greater stake in the program if they receive frequent updates on the quantity of waste being reduced, reused, or recycled; the recycled products being purchased; and the cost savings that have resulted. These reports also might impress management, increasing their commitment to the program.**

**Another method of sustaining employee interest is to encourage them to submit new ideas for increasing the efficiency of company operations. You also might consider asking employees to help**

## Encourage Employee Participation

*In 1990, the independently owned and operated Boston Park Plaza Hotel& Towers expanded its modest white paper recycling initiative into a comprehensive environmental program that includes waste prevention, recycling, energy and water conservation, as well as education and communications, Recognizing that the effort's success depended on widespread employee support, management launched the program with a formal "Environmental Policy" statement signed by the president and the environmental program director. A copy of the statement was distributed in three languages-English, Spanish, and French-to all 600 employees, and was framed and posted in each department at the 977-room hotel.*

*The next step was to develop an ongoing effort to increase employee participation. The management at The Boston Park Plaza quickly learned that regular communication with individual employees-on the phone or one-on-one kept the staff informed about the program and encouraged them to suggest improvements. The hotel adopted many other outreach methods, including:*

- ***Holding regular "Green Team" meetings.*** *Representatives from different departments meet monthly to discuss possible program changes. Green Team members also encourage fellow employees to participate in the program.*
- ***Holding monthly company-wide "Green Day" luncheons.*** *At lunchtime on the third Thursday of every month, the company celebrates Green Day. In the employee cafeteria, educational displays are setup and a raffle is held to give away prizes, such as canvas tote bags, plants, and water-saving devices.*
- ***Publicizing program changes and achievements in the company newsletter.*** *Articles highlight employees' efforts, press coverage of the program, and basic operations and changes.*
- ***Announcing special happenings in memos and paycheck stuffers.*** *When the hotel's program receives outstanding recognition, such as the President's Environment and Conservation Challenge Award that it won in 1992, employees get a memo from the hotel president thanking them for their assistance and support.*
- ***Rewinding employees for program involvement.*** *Once a year, the most dedicated employees are awarded a small gift and a framed certificate praising them for their involvement.*

*In addition to attracting national attention, The Boston Park Plaza Hotel has proved that even a luxury hotel can "reduce, reuse, and recycle" without sacrificing quality. In fact, since the program was launched, hotel executives estimate having generated more than $750,000 in new convention business due to clients' desire to support this environmentally conscious establishment.*

with program implementation. These employees could notify program coordinators or monitors when recycling containers are full or oversee waste reduction measures such as double-sided copying in their department to ensure that everyone understands and complies with the policy.

## Monitoring and Evaluating the Program

Waste reduction is a dynamic process. Once the program is underway, the team will need to evaluate its effectiveness to see if preliminary goals are being met. In addition, once the potential for reducing waste in the company becomes better understood, consider establishing long-term goals for the program. It is important to evaluate the program periodically to:

- Keep track of program success and to build on that success (e.g., waste reduced, recycling rates achieved, money saved).
- Identify new ideas for waste reduction.
- Identify areas needing improvement,
- Document compliance with state or local regulations,
- Determine the effect of any new additions to the program.
- Keep employees informed and motivated.

The best way to assess and monitor program operations is through continued documentation. Use Worksheet G to help analyze and record the effectiveness of your waste reduction program over time. Perform your first evaluation after the program has been in place long enough to have an effect on your company's waste generation rate, usually about one year. In addition, it might be worthwhile to conduct additional periodic waste assessments to determine further changes in your company's waste. If an assessment already has been performed, subsequent ones will be much easier to conduct. Consider reviewing as well your company's waste removal receipts and purchasing records (look back at your target items), or preparing a summary of recycling receipts and waste assessment worksheets.

## Waste Reduction in Your Workplace and Beyond

Many companies are finding that waste reduction makes economic and environmental sense. By working with other employees in your company as a team, you can devise and implement a successful waste reduction program. Not only can such a program look good on the bottom line, but it also can reflect well on your company!

Waste reduction isn't something you have to leave at the job, either. Spread the message to "reduce, reuse, and recycle" at home and in your community, too!

*Appendix A*

# Waste Reduction Ideas

**Below are some ideas that businesses have used to reduce waste, You might be able to adapt some of these to your business after considering your particular needs and local conditions.**

## Writing/Printing Paper

- **Establish a company-wide double-sided copying policy, and be sure future copiers purchased by your company have double-sided capability.**
- **Reuse envelopes or use two-way ("send-'n-return") envelopes.**
- **Keep mailing lists current to avoid duplication,**
- **Make scratch pads from used paper,**
- **Circulate (rather than copy) memos, documents, periodicals, and reports.**
- **Reduce the amount of advertising mail you receive by writing to the Direct Marketing Association Mail Preference Service, P.O. Box 9008, Farmingdale, NY 11735-9008, and ask that your business be eliminated from mail lists.**
- **Use outdated letterhead for in-house memos.**
- **Put company bulletins on voice or electronic mail or post on a central bulletin board.**
- **Save documents on hard drives or floppy disks instead of making paper copies.**
- **Use central files to reduce the number of hard copies your company retains.**
- **Proof documents on the computer screen before printing.**
- **Eliminate unnecessary reports.**
- **Donate old magazines and journals to hospitals, clinics, or libraries.**

## Packaging

- **Order merchandise in bulk.**
- **Purchase products with minimal packaging and/or in concentrated form.**
- **Work with suppliers to minimize the packaging used to protect their products,**
- **Establish a system for returning cardboard boxes and foam peanuts to suppliers for reuse,**
- **Request that deliveries be shipped in returnable and/or recyclable containers.**
- **Minimize the packaging used for your products.**
- **Use reusable and/or recyclable containers for shipping your products.**
- **Repair and reuse pallets or return them to your supplier.**
- **Reuse newspaper and shredded paper for packaging.**
- **Reuse foam packing peanuts, "bubblewrap," and cardboard boxes, or donate to another organization,**

## Equipment

- Rent equipment that is used only occasionally.
- Reuse worn out tires for landscaping, swings, etc.
- Purchase remanufactured office equipment.
- Establish a regular maintenance routine to prolong the life of equipment like copiers, computers, and heavy tools.
- Use rechargeable batteries where practical.
- Install reusable furnace and air conditioner filters.
- Reclaim usable parts from old equipment,
- Recharge fax and printer cartridges or return them to the supplier for remanufacture.
- Sell or give old furniture and equipment to other businesses, local charitable organizations, or employees.

## Organic Waste

- Compost yard trimmings or ask your landscape contractor to compost them.
- If unable to compost on site, investigate participating in a municipal composting program.
- Choose a landscape design that needs low maintenance.
- Use a worm bin to convert non-fatty food wastes into potting soil (called vermicompost).
- Use a mulching lawnmower and leave grass clippings on the lawn.

## Inventory/Purchasing

- Implement an improved inventory system (such as systems based on optical scanners) to provide more precise control over supplies,
- Avoid ordering excess supplies that may never be used.
- Advertise surplus and reusable waste items through a materials exchange.
- Set up an area in your business for employees to exchange used items.
- Donate surplus produce to food banks, if still edible,
- Substitute less toxic or nontoxic products for **products such as inks, paints, and cleaning solvents.**
- **Use products that promote waste reduction (products that are more durable, of higher quality, recyclable, reusable).**
- Where appropriate, order supplies in bulk to reduce excess packaging.

## Consumer Education

- Teach your customers about the importance of reducing waste (effective tools include promotional campaigns, brochures and newsletters, banners, newspaper advertisements, product displays, store signs, and information on labels).
- Offer customers waste reducing choices, such as:

  Items in bulk or concentrate.

  Solar-powered items, such as watches, calculator, and flashlights.

  Rechargeable batteries.

  Durable, repairable merchandise.

  Returnable bottles.
- Encourage reuse of shopping bags by offering customers the choice of buying their own bag, providing a financial incentive for reuse.
- Offer customers a rebate when they reuse grocery bags, containers, mugs, or cups for refilling,

*Appendix B*

# Regional EPA and State Waste Reduction Program Contacts

## Regional EPAOffice Addresses and Phone Numbers:

*USEPA Region 1*

**90 Canal Street**
**Boston, MA 02203**
**Mail Code: HER-CAN6**
**(61 7) 573-9656**

*USEPA Region 2*

**26 Federal Plaza**
**New York, NY 10278**
**Mail Code: 2AWM**
**(21 2) 264-3384**

*USEPA Region 3*

**841 Chestnut Street**
**Philadelphia, PA 19107**
**Mail Code: 3HW53**
**(21 5) 597-7938**

*USEPA Region 4*

345 **Courtland Street, N.E.**
**Atlanta, GA 30365**
**Mail Code: 4WD-RCRA**
**(404) 347-7603**

*USEPA Region 5*

**230 South Dearborn Street**
**Chicago, IL 60604**
**Mail Code: 5HR13**
**(31 2) 886-7598**

*USEPA Region 6*

**Interstate Bank Building**
**1445 Ross Avenue**
**Dallas, TX 75202-2733**
**Mail Code: 6HHS**
**(21 4) 655-6760**

*USEPA Region 7*

726 **Minnesota Avenue**
**Kansas City, KS 66101**
**Mail Code: STPG**
**(913) 551-7523**

*USEPA Region 8*

999 18th **Street, Suite 500**
**Denver, CO 80202**
**Mail Code: 8HWM-WM**
**(303) 293-1667**

*USEPA Region 9*

75 **Hawthorne Street**
**San Francisco. CA 94105**
**Mail Code: H-3-1**
**(41 5) 744-2091**

*USEPA Region **10***

**1200 6th Avenue**
**Seattle, WA 98101**
**Mail Code: HW072**
**(206) 553-6522**

# State Environmental Agency Addresses and Phone Numbers:

## Alabama

Department of Environmental Management
Land Division
1715 Congressman William Dickinson Drive
Montgomery, AL 36130
(205) 271-7726
fax (205) 271-7950

## Alaska

Environmental Quality Division
Department of Environmental Conservation
410 Willoughby Avenue
Suite 105
Juneau, AK 99801
(907) 465-5150
fax: (907) 465-5164

## Arizona

Office of Waste Programs
Department of Environmental Quality
3033 North Central Avenue
Phoenix, AZ 85012
(602) 207-4121
fax: (602) 207-4236

Recycling Coordinator
Conservation Programs Energy Office
1700 West Washington Street
Phoenix, AZ 85007
(502) 255-3303

## Arkansas

Solid Waste Division
Department of Pollution Control and Energy
P.O. Box 8913
Little Rock, AR 72219
(501 ) 570-2859

## California

Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, CA 95826
(916) 255-2182
fax: (91 6) 255-2228

## Colorado

Office of Energy Conservation
1675 Broadway, Suite 1300
Denver, CO 80202
(303) 620-4292

## Connecticut

Waste Engineering and Enforcement Division
Department of Environmental Protection
165 Capitol Avenue
Hartford, CT 06106
(203) 566-8844
fax (203) 566-5255

## Delaware

Solid Waste Division
Department of Natural Resources and
Environmental Control
89 Kings Highway
P.O. Box 1401
Dover, DE 19903
(302) 739-3820
fax (302) 7395060

Solid Waste Authority
(302) 7395361

Waste Minimization
(302) 7395071

## District of Columbia

Office of Recycling
65 K Street, NE.
Washington, DC 20002
(202) 727-5856

## Florida

Solid Waste Section
Department of Environmental Protection
Twin Towers Office Bldg.
2600 Blair Stone Road
Tallahassee, FL 32399
(904) 922-6104
fax (904) 488-6679

## Georgia

**Environmental Protection Division**
**Department of Natural Resources**
**4244 International Parkway**
**Suite 100**
**Atlanta, GA 30354**
**(404) 362-2695**
**fax: (404) 354-6612**

## Hawaii

**Solid Waste Management Coordinator**
**Department of Health**
**6 Waterfront Plaza**
**500 Ala Moana Blvd.**
**Honolulu, HI 96813**
**(808) 586-4240**
**fax: (808) 586-4370**

## Idaho

**Permits and Enforcement**
**Department of Health and Welfare**
**1410 North Hilton**
**Boise, ID 83720**
**(208) 334-5898**
**fax: (208) 3344417**

## Illinois

**Solid Waste Management Section**
**Environmental Protection Agency**
**2200 Churchill Road**
**P.O. Box 19276**
**Springfield, IL 62794**
**(217) 785-8604**
**fax (21 7) 524-4193**

## Indiana

**Office of Solid and Hazardous Waste Management**
**Department of Environmental Management**
**105 South Meridian Street**
**Indianapolis, IN 46225**
**(31 7) 232-3501**
**fax (317) 232-3403**

## Iowa

**Environmental Protection Agency**
**Department of Natural Resources**
**Wallace State Office Building**
**Des Moines, IA 50319**
**(515) 281-6284**
**fax (51 5) 281-8895**

## Kansas

**Bureau of Air and Waste Management**
**Department of Health and Environment**
**Forbes Field, Building 740**
**Topeka, KS 66620**
**(91 3) 296-1594**
**fax: (91 3) 296-1592**

## Kentucky

**Division of Waste Management**
**Department of Environmental Protection**
**Fort Boone Plaza**
**18 Reily Road**
**Frankfort, KY 40601**
**(502) 564-6716**
**fax (502) 564-4245**

## Louisiana

**Department of Environmental Quality**
**Recycling Division**
**P.O. Box 82178**
**Baton Rouge, IA 70884**
**(504) 765-0249**

## Maine

**Bureau of Hazardous Materials and Solid Waste Control**
**Department of Environmental Protection**
**State House Station 17**
**Augusta, ME 04333**
**(207) 289-2651**
**fax (207) 2897826**

## Maryland

**Waste Management Administration**
**Department of the Environment**
**2500 Broening Highway**
**Baltimore, MD 21224**
**(410) 631-3315**
**fax (410) 631-3321**

## Massachusetts

**Division of Solid Waste**
**Department of Environmental Protection**
**One Winter Street**
**4th Floor**
**Boston, MA 02108**
**(61 7) 292-5961**
**fax (61 7) 556-1049**

## Michigan

Waste Management Division
Department of Natural Resources
P.O. Box 30241
Lansing, MI 48909
(51 7) 373-9523
fax (51 7) 373-4797

Staff Specialist, Waste Reduction
(517)335-1310

Solid Waste Coordinator, Recycling
(517) 373-4735

## Minnesota

Office of Waste Management
1350 Energy Lane
St. Paul, MN 55108
(61 2) 649-5743
fax (61 2) 649-5749

## Mississippi

Non-Hazardous Waste Branch
Department of Natural Resources
P.O. Box 10385
Jackson, MS 39289
(601 ) 961-5047
fax (601 ) 354-6612

## Missouri

Solid Waste Management Program
Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
(314) 751-5401
fax (31 4) 751-7869

## Montana

Solid Waste Program
Department of Health and Environmental Sciences
Cogswell Building
Helena, MT 59620
(406) 444-1430
fax: (406) 444-1499

## Nebraska

Litter Reduction and Recycling Programs
Department of Environmental Control
P.O. Box 98922
Lincoln, NE 68509
(402) 471-2186
fax: (402) 471-2902

## Nevada

Division of Environmental Protection
Capitol Complex
123 West Nye Lane
Carson City, NV 89710
(702) 687-5872
fax (702) 885-0868

## New Hampshire

Waste Management Division
Department of Environmental Services
P.0, Box 95
Concord, NH 03301
(603) 271-3505
fax (603) 271-2456

## New Jersey

Division of Solid Waste Management
Department of Environmental Protection & Energy
840 Bear Tavern Road
(CN 414)
Trenton, NJ 08625
(609) 530-8208
fax: (609) 530-8899

## New Mexico

Environment Department
Solid Waste Bureau
P.O. Box 266110
Santa Fe, NM 87502
(505) 827-2883
fax (505) 827-2902

## New York

Division of Solid Waste
Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233
(518) 457-6603
fax (51 8) 457-1283

## North Carolina

Solid Waste Section
Department of Environmental Health and
Natural Resources
P.O. Box 27687
Raleigh, NC 27611
(91 9) 733-0692
fax (91 9) 733-4810

## North Dakota

**Solid Waste Program**
**Department of Health**
**P.O. Box 5520**
**1200 Missouri Avenue**
**Bismarck, ND 58502**
**(701) 221-5166**
**fax: (701 ) 221-5200**

## Ohio

**Solid Waste Division**
**Solid and Hazardous Waste Management**
**Ohio Environmental Protection Agency**
**1800 Watermark Drive**
**P.O. Box 1049**
**Columbus, OH 43266**
**(614) 644-3181**
**fax: (614) 644-2329**

## Oklahoma

**Solid Waste Division**
**Department of Health**
**P.O. Box 53551**
**1000 N.E. 10th Street**
**Oklahoma City, OK 73152**
**(405) 271-7159**
**fax: (405) 271-7079**

## Oregon

**Hazardous and Solid Waste Division Department of Environmental Quality**
**Executive Building**
**811 S.W. Sixth Ave.**
**Portland, OR** 97204
(503) 229-5356
**fax:** (503) 229-6124

## "Pennsylvania

**Bureau of Waste Management**
**Department of Waste Management**
**P.O. Box 2063**
**Harrisburg, PA 17120**
**(717) 787-7328**
**fax: (717) 783-1904**

## Rhode Island

**Waste Management Division**
**Department of Environmental Protection**
**9 Heyes Street**
**Providence, RI 02908**
**(401) 277-2797**
**fax (401) 277-2017**

## South Carolina

**Bureau of Solid and Hazardous Waste Management**
**Department of Health and Environmental Control**
**2600 Bull Street**
**Columbia, SC 29201**
**(803) 734-5200**
**fax (803) 734-5199**

## South Dakota

**Office of Waste Management**
**Department of Environment and Natural Resources**
**319 South Coteau**
**c/o 500 East Capitol**
**Pierre, SD 57501**
**(605) 773-4222**
**fax (605) 773-5286**

## Tennessee

**Division of Solid Waste Management**
**Department of Environment and Conservation**
**701 Broadway**
**Customs House, 4th Floor**
**Nashville, TN 37247**
**(615) 741-3424**
**fax (61 5) 741-4666**

## Texas

**Bureau of Solid Waste Management**
**Department of Health**
**1100 W. 49th Street**
**Austin, TX 78756**
**(51 2) 458-7271**
**fax: (51 2) 458-7408**

## Utah

**Division of Solid and Hazardous Waste**
**Department of Environmental Quality**
**Salt Lake City, UT 84114**
**(801 ) 538-6170**
**fax (801) 538-6116**

## Vermont

Management Division
Department of Environmental Conservation
103 South Maine Street
Waterbury, VT 05671
(802) 244-7831
fax: (802) 244-5141

## Virginia

Division of Litter Control and Recycling
Department of Waste Management
Monroe Building
11th Floor
101 N. 14th Street
Richmond, VA 23219
(804) 225-2667
fax (804) 225-3753

## Washington

Solid and Hazardous Waste Program
Department of Ecology
P.O. Box *47600*
Olympia, WA 98504
(206) 459-6316
fax (206) 438-7484

Solid Waste Reduction and Recycling
(206) 459-6302

**Litter and Recycling Information**
**(206) 459-6301**

## West Virginia

Conservation, Education, and Litter Control
Department of Natural Resources
Capitol Complex
Building 3
1900 Kanawha Blvd., East
Charleston, WV 25305
(304) 556-3370
fax (304) 558-2768

## Wisconsin

Bureau of Solid and Hazardous Waste Management
Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 266-0520
fax (608) 267-2768

Solid Waste Recycling/Waste Reduction Program
(608) 267-7566

## Wyoming

Solid Waste Program
Department of Environmental Quality
Herschler Building
4th Floor
122 W. 25th Street
Cheyenne, WY 82002
(307) 777-7752
fax (307) 777-5973

*Appendix C*

# 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,**

***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 or mulch.**

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

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

***Markets:*** **Generally, a recycling business (i.e., a buyer) 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.**

***Materials Exchange:*** **A mutually beneficial relationship whereby two or more organizations exchange materials that otherwise would be thrown away. In some areas, computer and catalog networks are available to match up companies who wish to participate in exchanging their materials.**

***Municipal Solid Waste:*** **For the purposes of this guide, municipal solid waste includes all materials typically disposed of in dumpsters by businesses and removed for offsite disposal by private or municipal haulers. Includes wastes such as durable and nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Municipal solid waste does not include wastes from other sources, such as municipal sludges, combustion ash, and industrial nonhazardous process wastes that might also be disposed of in municipal waste landfills or incinerators.**

***Pallets:*** **A wooden platform used with a forklift for moving bales or other large items, Also called a "skid."**

***Processing:*** **The operations performed on recycled materials to render them reusable or marketable. Processing can include grinding glass, crushing cans, or baling 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,**

***Rebuilding:*** **Modifying a component of municipal solid waste by repairing or replacing certain parts and reusing it again for its original purpose (e.g., refillable or rebuildable toner cartridges, wooden cable reels, or plastic wire reels). Rebuilding of solid waste components is most often done by a middleman,**

***Recyclables:*** **Materials that still have useful physical or chemical properties after serving their original purpose. Such materials can be remade into new products, (See Appendix E for a list of common recyclable.)**

**recycling:** The process by which materials are collected and used as 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 purchasing and using the goods made with reprocessed materials.

**Reuse:** Taking a component of municipal solid waste (possibly with slight modification) and using it again for its original purpose (e.g., refillable beverage bottles, foam peanuts, or pallets).

*Solid Waste:* According to the Resource Conservation and Recovery Act (RCRA), solid waste is: garbage; refuse; sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and other discarded materials, including solid, liquid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.

*Source Separation:* Separating waste materials such as paper, metal, and glass by type at the point of discard so that they can be

*Trash:* Material often considered worthless, unnecessary, or offensive that is usually thrown away. Generally defined as dry waste material; but in common usage, it is a synonym for garbage, rubbish, or refuse.

*Waste Prevention:* The design, manufacture, purchase or use of materials or products to reduce their amount or toxicity before they enter the municipal solid waste stream. Because it is intended to reduce pollution and conserve resources, waste prevention should not increase the net amount or toxicity of wastes generated throughout the life of a product.

*Waste Reduction:* Preventing and/or decreasing the amount of waste being generated either through waste prevention, recycling, composting, or buying recycled and reduced-waste products.

**Waste Streams:** The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that are recycled, burned, or disposed in landfills, or any segment thereof such as the "residential waste stream" or the "recyclable waste stream."

## Glossary Sources

Definitions for glossary terms were derived from the following sources


Brown University Summer Internship Program, *Guide for Preparing Commenrcial Solid Waste Reduction and Recycling Plans,* prepared for Ocean State Cleanup and Recycling (OSCAR), Providence, Rhode Island, 1988.

Brown University Summer Internship Program, *Handbook for Reduction and Recycling of Commercial solid Waste,* prepared for OSCAR, Providence, Rhode Island, 1988.

Fenedick, Al Jr., Kimberly Henderson, and Jay Birgamini, Office *Recycling Handbook* Region 5, USEPA and General Services Administration, 1990.

New York State Department of Environmental Conservation, Recycling: A Planning Guide for Communities, Division of Solid Waste, January 1990.

Scheinberg, Anne and Dee Cotherman, *Business Recycling Manual,* prepared for the Westchester County Association, Inc., White Plains, New York, November 1989.

USEPA, *Characterization of Municipal Solid Waste in the United States: 1990 Update, EPA/530-SW-90-042,* June 1990.

USEPA Region 2 for World Congress of Local Governments for a Sustainable Future, *Recoverable Resource Audit Handbook,* September 1990.

World Wildlife Fund and Conservation Foundation, *Getting at the Source, Strategies for Reducing Municipal* Solid *Waste,* 1991.

*Appendix D*

# Volume-to-Weight Conversion Table

The volume-to-weight conversion table presented on the following pages is a compilation of several sources. Materials converted from volume to weight include paper (high-grade and other), glass, plastic, metals, organics, and other materials (e.g., tires and oil).

It is important to note that although the weight (density) figures presented here are useful for determining rough estimates, they will not be as useful when precise measurements are required. Differences in the way a material is handled, processed, or in the amount of moisture present can make substantial differences in the amount a particular material weighs per specified volume. Because of these differences, it will be important to actually sort and weigh materials in your program whenever precise measurements are needed (e.g., recycling contract agreements).

| **Category** | **Material** (u/c = uncompacted/ compacted & baled) | **Volume** | **Estimated Weight** (in pounds) |
|---|---|---|---|
| High-Grade Paper | *Computer Paper:* | | |
| | Uncompacted, stacked | 1 cu. yd. | 655 |
| | Compacted/baled | 1 cu. yd. | 1,310 |
| | 1 case | 2800 sheets | 42 |
| | *White Ledger:* | | |
| | (u)stacked/(c)stacked | 1 cu. yd. | 375465/755-925 |
| | (u)crumpled/(c)crumpled | 1 cu. yd. | 11 0205/325 |
| | Ream of 20# bond; 8-1/2 x 11 | 1 ream = 500 sheets | 5 |
| | Ream of 20# bond; 8-1/2 x 14 | 1 ream= 500 sheets | 6.4 |
| | White ledger pads | 1 case= 72 pads | 38 |
| | *Tab Cards:* | | |
| | Uncompacted | 1 cu. yd. | 605 |
| | Compacted/baled | 1 cu. yd. | 1,215-1,350 |

| Category | Material (u/c = uncompacted/ compacted & baled) | Volume | Estimated Weight (in pounds) |
|---|---|---|---|
| Other Paper | *Cardboard (Corrugated):* | | |
| | Uncompacted | 1 cu. yd. | 50-150 |
| | Compacted | 1 cu. yd. | 300-500 |
| | Baled | 1 cu. yd. | 7001,100 |
| | *Newspaper:* | | |
| | Uncompactad | 1 cu. yd. | 360-505 |
| | Compacted/baled | 1 cu. yd. | 7201,000 |
| | 12" stack | — | 35 |
| | *Miscellaneous Paper:* | | |
| | Yellow legal pads | 1case=72pads | 38 |
| | Colored message pads | 1 carton= 144 pads | 22 |
| | Self-carbon forms; 8-1/2 x 11 | 1 ream= 500 sheets | 50 |
| | *Mixed Ledger/Office Paper:* | | |
| | Flat (u/c) | 1 cu. yd. | 380/755 |
| | Crumpled (u/c) | 1 cu. yd. | 110205/610 |
| **G ass** | *Refillable Whole Bottles:* | | |
| | Refillable beer bottles | 1 case= *24 bottles* | *14* |
| | Refillable soft drink bottles | 1 case= 24 bottles | 22 |
| | 8 oz. glass container | 1 case= 24 bottles | 12 |
| | *Bottles:* | | |
| | Whole | 1 cu. yd | 500-700 |
| | Semi-crushed | 1 cu. yd. | 1,0001,800 |
| | Crushed (mechanically) | 1 cu. yd. | 1,800-2,700 |
| | Uncrushed to manually broken | 55gallon drum | 300 |

| Category | Material (u/c = uncompacted/ compacted & baled) | Volume | Estimated weight (in pounds) |
|---|---|---|---|
| **Plastic** | PET (Soda Bottles): | | |
| | Whole bottles, uncompacted | 1 cu. yd. | 30-40 |
| | Whole bottles, compacted | 1cu. yd. | 515 |
| | Whole bottles, uncompacted | gaylord | 40-53 |
| | Baled | 30" x 62" | 500-550 |
| | Granulated | gaylord | 700-750 |
| | 8 bottles (2-liter size) | | 1 |
| | HDPE(Dairy): | | |
| | Whole, uncompacted | 1 cu. yd. | 24 |
| | Whole, compacted | 1 cu. yd. | 270 |
| | Baled | 32" x 60" | 400-500 |
| | HDFE(Mixed): | | |
| | Baled | 32" x 60" | 900 |
| | Granulated | semi-load | 42,000 |
| | *Odd Plastic:* | | |
| | Uncompacted | 1 cu. yd. | 50 |
| | Compacted/baled | 1 cu. yd. | 400-700 |
| | *Mixed PET and HDPE (Dairy):* | | |
| | Whole, uncompacted | 1 cu. yd. | 32 |
| Metals | *Aluminum (Cans):* | | |
| | Whole | 1 cu. yd. | 50-75 |
| | Compacted (manually) | 1 cu. yd. | 250-430 |
| | Uncompacted | 1 full grocery bag<br>1 case= 24 cans | 1.5<br>0.9 |
| | *Ferrous (tin-coated steel cans):* | | |
| | Whole | 1 cu. yd. | 150 |
| | Flattened | 1 cu. yd. | 850 |
| | Whole | 1 case= 6 cans | 22 |

| Category | Material (u/o = uncompacted/ Compacted & baled) | Volume | Estimated weight (in pounds) |
|---|---|---|---|
| Organics | *Yard trmming*:* | | |
| | Leaves (uncompacted) | 1 cu. yd. | 200-250 |
| | Leaves (compacted) | 1 cu. yd. | 300-450 |
| | Leaves, vacuumed | 1 cu. yd. | 350 |
| | Grass clippings (uncompacted) | 1 cu. yd. | 350-450 |
| | Grass clippings (compacted) | 1 cu. yd. | 550-1,500 |
| | Finished compost | 1 cu. yd. | 600 |
| | Scrap wood: | | |
| | Pallets | | 30-100 (40 avg.) |
| | Wood chips | 1 cu. yd. | 500 |
| | *Food Waste:* | | |
| | Solid/liquid fats | 55-gallon drum | 400-410 |
| **Other Materials** | *Tires:* | | |
| | Car | 1 tire | 12-20 |
| | Truck | 1 tire | 60-100 |
| | *Oil (Used Motor Oil)* | 1 gallon | 7 |

*Density of yard trimmings is highly variable depending on moisture content.

# Conversion Table Sources


Brown University Summer Internship Program, *Guide for Preparing Commercial Solid Waste Reduction and Recycling Plans,* prepared for Ocean State Cleanup and Recycling (OSCAR), Providence, Rhode Island, 1988.

Draft National Recycling Coalition Measurement Standards and Reporting Guidelines presented to NRC membership, October 31, 1989.

Fenedick Al Jr., Kimberly Henderson, and Jay Birgamini, Office *Recycling Handbook,* Region 5, USEPA and General Services Administration, 1990.

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Scheinberg, Anne and Dee Cotherman, *Business Recycling Manual,* prepared for Westchester County Association, Inc., While Plains, New York, November 1989.


Conversion factors are adapted from information in: "Recycling is Everybody's Business", Morris County Municipal Utilities Authority, April 1989 and "Recycling Manual: Oneida and Herkimer Counties Solid Waste Management Project", William F. Cosulich Associates, 1988.

Appendix E

# Common Recyclable Materials

## Paper

### *High-Grade Paper*

High-grade paper is usually generated in office environments and can earn recycling revenues when present in sufficient quantity. Types of high-grade paper include:

- Computer paper (also known as Computer Print Out or CPO). Can be all white or have a white main fiber with bright green or blue bars.
- White ledger. Most white office paper, including white computer paper, copy machine paper, letterhead, white notebook paper, and white envelopes. Common contaminants include glossy paper, wax-coated paper, latex adhesive labels, envelopes with plastic windows, and carbon paper.
- Tab cards. Usually manilla-colored computer cards; may be other colors but must be separated by color to be valuable as a high-grade paper,

### *Other Papers*

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, Examples of other types of paper include:

- Colored ledger, Most non-white office paper, including carbonless paper, file folders; tablet paper, colored envelopes, and yellow legal paper,
- Corrugated Cardboard (also known as Old Corrugated Cardboard or OCC), Includes unbleached, unwaxed paper with a ruffled (corrugated) inner liner. It usually does not include linerboard or pressboard, such as cereal boxes and shoe boxes, For most businesses, cardboard is a cost-effective material to recycle.
- Newspaper (also known as Old News Print or ONP). It is most valued when separated from other paper types, but can be recycled as mixed waste paper.
- Miscellaneous waste paper. Encompasses most types of clean and dry paper which do not fall into the categories mentioned above, including glossy papers, magazines, catalogs, telephone books, cards, laser-printed white ledger, windowed envelopes, paper with adhesive labels, paper bags, wrapping paper, packing paper, sticky-backed notes, and glossy advertising paper, This mixed paper has limited value in existing markets.
- Mixed waste paper. Paper that is unsegregated by color, quantity, or grade (e.g., combination of white ledger, newsprint, colored paper, envelopes without windows, computer paper, glossy paper, etc.). Mixed paper generally sells below the price of the least valuable paper in the mix.

# Glass

## *Color-separated*

This includes all container glass that is separated into clear, green, and brown. When this glass is broken or crushed for recycling, it is called “flint,” “green,” and “amber” cullet, respectively.

## *Mixed Color*

This is the same as color-separated glass except clear, green, and brown glass are mixed together. It generally has very limited market value.

# Plastic

There are 7 types of plastic which are identified by a Society of Plastics Industry (SPI) code number ranging from 1 to 7. These numbers are usually found on the bottom of plastic containers inside a three-arrow recycling symbol. A description of each kind of plastic is presented below. Also, you may check with the Society of the Plastics Industry at 1-8002-HELP-90 for information about haulers/recyclers in your area. Some recyclers only accept a sub-category of the ones presented below. For example, a recycler may only accept HDPE milk jugs and not all HDPE products.

## *PET (SPI=1)*

Polyethylene terephthalate (PET) is the most readily recyclable material at this time. It includes 1-and 2-liter clear soda bottles, as well as some bottles containing liquor, liquid cleaners, detergents, and antacids.

## *HDPE (SPI=2)*

High-Density Polyethylene (HDPE) is currently recyclable in some areas. This class includes milk, juice, and water jugs, base cups for some plastic soda bottles, as well as bottles for laundry detergent, fabric softener, lotion, motor oil, and antifreeze.

## *Pvc [SPI=3)*

**Polyvinyl Chloride (PVC, also referred to simply as “vinyl”) includes bottles for cooking oil, salad dressing, floor polish, mouthwash, and liquor, as well as “blister packs” used for batteries and other hardware and toys.**

## *LDPE (SPI=4)*

Low-Density Polyethylene (LDPE) includes grocery bags, bread bags, trash bags, and a variety of other film products. LDPE is currently being recycled by some of the major retail chains.

## Polypropylene (SPI=5)

Polypropylene includes a wide variety of packaging such as yogurt containers, shampoo bottles, and margarine tubs. Also cereal box liners, rope and strapping, combs, and battery cases.

## *Polystyrene (SPI=6)*

Polystyrene includes Styrofoam™ coffee cups, food trays, and “clamshell” packaging, as well as some yogurt tubs, clear carry-out containers, and plastic cutlery, Foam applications are sometimes called EPS, or Expanded Polystyrene. Some recycling of polystyrene is taking place, but is limited by its low weight-to volume ratio and its value as a commodity.

## *Other (SPI=7)*

Can refer to applications which use some of the above six resins in combination or to the collection of the individual resins as mixed plastic (e.g., camera film can include several types of plastic resins). Technology exists to make useful items such as plastic ‘lumber” out of mixed plastic resins, but generally the materials are more useful and valuable if separated into the generic resin types described above.

# Metals

### *Aluminum*

Included in this category are aluminum beverage cans, as well as clean aluminum scrap and aluminum foil. Currently, aluminum is a highly valued material for recycling,

### *Tin-Coated Steel Containers*

Includes cans used for food packaging (i.e., canned foods). Some local recyclers may require cans to be cleaned and crushed with labels removed.

### *Bimetal Containers*

A typical example includes tin-plated steel cans with an aluminum "pop top" (e.g., peanut cans). These containers can be separated from aluminum cans by using a magnet. [Note: Technically, tin cans are bimetal, but we do not consider them when referring to bimetal cans.] Many recyclers accept bimetal containers with tin-coated steel cans.

### *Non-Femous Metals*

Includes most types of scrap metal which do not contain iron (such as copper and brass). This scrap can be a relatively valuable commodity, depending on quantity. It is often recycled through scrap metal dealers, although some general recyclers will handle it with other materials.

### *Ferrous Metal*

Includes iron and iron-containing metal scrap. Ferrous metal is handled in the same manner as non-ferrous metal but generally has lower market value.

# Compostables

Usually, compostable materials include food scraps and yard trimmings. Paper that cannot be recycled also can be composted.

### *Food Scraps*

Includes grease-free organic scraps from restaurants, cafeterias, motels, and other places producing food waste. It is technically possible to compost food waste in a manner similar to yard trimmings, although additional problems with rodents and other scavengers need to be addressed. Some states allow farmers to sterilize food waste and use it as animal feed.

### *Yard Trimmings*

Includes landscaping debris, grass clippings, branches, and leaves. There are largr-scale facilities which compost yard trimmings, producing a product which can be used for mulch, potting soil, landfill cover, and soil amendment, Also, composting can be performed directly on site or in backyards.

# Miscellaneous Recyclable

### *Lead-Acid Batteries*

Lead-acid batteries are used in automobiles, back-up lighting systems, lawn mowers, and computers. Lead-acid batteries contain lead, a toxic metal, and sulfuric acid. Many states prohibit disposal of lead-acid batteries in municipal solid waste, and many require either retailers, wholesalers, or distributors to take back batteries. Currently, about 90 percent of lead-acid batteries used in automobiles are recycled.

### *Household Batteries*

Household batteries come in a variety of types, including alkaline, carbon-zinc, mercuric-oxide, silver-oxide, zinc-air, and nickel-cadmium, Currently, only button batteries containing mercury and silver or nickel-cadmium batteries can be recycled, often at a net cost,

# Common Recyclable Materials Sources

The information in Appendix E was derived from the following sources:

Brown University Summer Internship Program, *Guide for Preparing Commercial Solid Waste Reduction and Recycling Plans,* prepared for Ocean State Cleanup and Recycling (OSCAR), Providence, Rhode Island, 1988.

King County Solid Waste Division, *Business Waste Reduction and Recycling Handbook,* September, 1990.

# About the Worksheets

**This guide contains seven worksheets designed to help you implement a waste reduction program:**

Worksheet A: Facility Background Information
Worksheet B: Records Review: Waste Collection and Removal
Worksheet C: Facility Walk-Through
Worksheet D: Waste Sort
Worksheet E: Identifying Potential Waste Reduction Options
Worksheet F: Economic and Operational Feasibility
Worksheet G: Monitoring and Evaluation

**These worksheets will help companies to understand the types and amounts of waste generated and carefully analyze the options for reducing this waste. Companies can invest as much time and resources into their waste reduction program as they feel is necessary, The worksheets have been designed to be flexible in order to meet the waste reduction needs of different companies. Using these worksheets, companies can opt for the most basic program, which might simply involve collecting facility information, identifying potential waste reduction options, and program evaluation. More involved programs might entail reviewing records and/or conducting a facility walk-through, identifying program options, and evaluation, The most comprehensive program would entail examining facility records, conducting a waste sort, identifying and evaluating potential options, and monitoring the program over time. Depending on the level of your waste reduction effort, you might only want to complete certain worksheets. After determining the scope of your program, use the following chart to determine which worksheets are actually needed to achieve the level of waste reductions you are seeking.**

| Level of waste reduction | Complete worksheets.. | Optional |
|---|---|---|
| **Basic program** | **A, E, and G** | **B and F** |
| **Moderate program** | **A, B, C, E, and G** | **F** |
| **Comprehensive program** | **A, B, C, D, E, F, and G** | **—** |

**Because there are a wide range of waste reduction programs, this chart is intended to offer guidance regarding the resources needed to complete the different worksheets, Your company should review the worksheets and determine which ones are needed to help you design and evaluate your waste reduction program.**

**Note: Because repeated duplication of the worksheets will diminish their clarity and make them more difficult to complete, it is recommended that you retain the original worksheets in this guide as masters. Be sure to use these originals whenever copies of the worksheets are needed.**

WORKSHEET

# A Facility Background Information

*Use this worksheet to assemble background information on your company's layout and organization.*

Data collected for this worksheet will be useful in designing implementing your waste reduction program. Company records will provide much of the information requested. Interviewing building and department contacts may also be helpful.

if your company Occupies several different building, you may want to record the requested information separately for each building, copying this worksheet **as needed.**

WORKSHEET

# A Facility Background Information

| |
|---|
| Building Name/Address: |
| Building Owner or Management Company: |
| Name of Contact: |
| Telephone Number: |

## 1 Physical Layout and Organization

| | | |
|---|---|---|
| Building Location: | | |
| Number of Employees: | Size (Area): | Number of Floors: |
| Is the Facility Equipped with ❑ Freight Elevators ❑ Loading Dock | | |
| List any Other Companies Leasing Space in the Building: | | |

| Company | Name of Contact | Telepone Number |
|---|---|---|
| | | |
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## 2 Company Departments and Functions

| |
|---|
| Department: |
| Name of Contact: |
| Telephone: |
| Location: |
| Major Functions: |
| |
| Department |
| Name of Contact: |
| Telephone: |
| Location: |
| Major Functions |

WORKSHEET

# B Records Review: Waste Collection and Removal

*Uso this worksheet to record information on how solid waste is removed from your facility and to estimate the total amount paid for waste removal services.*

Company 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 individual offices 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 for this service or are charged per pull. A flat fee is a rate charge for waste removal service that remains constant over a specific period of time (such as a year) regardless of fluctuations in the amount of waste generated. A per *pull charge is* a fee paid each time waste is hauled from *a company.*

If waste removal practices vary significantly among buildings, or if different wasts contractors are used, record the information separately for each building in your company, copying this worksheet as needed.

WORKSHEET

# B Records Review: Waste Collection and Removal

| Building: | Department: |
|---|---|
| Name of Contact: | |
| Telephone Number: | |

## 1 Onsite Waste Collection

**A** Name of Waste Collector: _____

Telephone Number: _____

Check One: ☐ Maintenance Staff ☐ Maintenance Contractor

B. Collection Schedule:

_____ times per _____ (day/week)

C. Annual Cost of Waste Collection (if maintenance contractor)

If waste collection is performed by a maintenance contractor and the fee for this service is not included in rent, use this formula to calculate the annual cost. If waste collection is performed by in-house staff, go to step l-D.

| Annual payments to maintenance contractor | + | Waste container rental fee, if any | = | $ _____ Annual Coat of Waste Collection |
|---|---|---|---|---|

D. 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:

| Number of employees | x | Hourly rate | x | Hours per week spent on waste collection | X 52 = | Annual cost |
|---|---|---|---|---|---|---|
| Number of employees | X | Hourly rate | x | Hours per week spent on waste collection | X 52 = | Annual cost |

= _____ Total annual labor cost

If applicable, add:

| Waste container(s) rental fee | per | Time period | X | Time periods per year | = | Annual waste container rental cost |
|---|---|---|---|---|---|---|

| Total annual labor cost | + | Annual waste container rental cost | = | $ _____ **Annual Cost of Waste Collection** |
|---|---|---|---|---|

WORKSHEET

# B Records Review: Waste Collection and Removal

## 2 Offsite Waste Removal

**A** Name of Waste Removal Company _____

Telephone Number: _____ Contract Expires: _____

B. **Removal Schedule**

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

Day of week: _____ **Time(s):** _____

Day of week _____ **Time(s):** _____

**C.** Waste Removal Charge ***(if charged as flat fee or part of rent)***

| Waste removal fee | + | Time periods per year (if applicable) | = | $ Annual Waste Removal Charge |
|---|---|---|---|---|
| _____ | + | _____ | = | $ _____ |

D. Waste Removal Charge by weight or Volume

| Waste removal charge | per | Unit of weight or volume | x | Units of waste removed annually | = | Annual waste removal charge |
|---|---|---|---|---|---|---|
| _____ | per | _____ | x | _____ | = | _____ |

If applicable, add:

| Hauling container(s) rental fee | per | Time period | x | Time periods per year | = | Annual waste container rental cost |
|---|---|---|---|---|---|---|
| _____ | per | _____ | x | _____ | = | _____ |

| **Annual waste removal** charge | + | Annual waste container rental cost | = | $ Annual Waste Removal Charge |
|---|---|---|---|---|
| _____ | + | _____ | = | $ _____ |

E. Waste Removal Charge ***(If charge per pull)***

| Charge per pull | x | Pulls per year | = | Annual waste pulling charge |
|---|---|---|---|---|
| _____ | x | _____ | = | _____ |

If applicable, add:

| Hauling container(s) rental fee | per | Time period' | x | Time periods per year | = | Annual waste container rental cost |
|---|---|---|---|---|---|---|
| _____ | per | _____ | x | _____ | = | _____ |

| Tipping fee | per | Unit of weight or volume | x | Units of waste removed annually | = | Annual tipping fee |
|---|---|---|---|---|---|---|
| _____ | per | _____ | x | _____ | = | _____ |

| Annual waste pulling charge | + | Annual waste container rental cost | + | Annual tipping fee | = | = **Annual Waste Removal Charge** |
|---|---|---|---|---|---|---|
| _____ | + | _____ | + | _____ | = | _____ |

WORKSHEET

# C Facility Walk-Through

***Use this worksheet to identify and record the different waste-generating activities and equipment in your facility, the types of waste produced, and any current waste reduction efforts. In addition, identify all materials that could be targeted by your waste reduction program and brainstorm ways to reduce, recycle, or compost these materials.***

**The information needed to complete this worksheet can be obtained by conducting a walk-through of targeted functional areas or of your entire facility. 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, such as shipping and receiving departments, copying areas, cafeterias, assembly lines, and offices. 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 efforts that are already in place.**

**Before the walk-through begins, contact department managers to inform them of the visit and the possibility of short interviews with department staff. (More involved interviews should be scheduled separately.) 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. Avoid scheduling it on or around holidays, company parties, or other special events that would produce wastes not representative of a normal workday.**

**During the walk-through, ask questions about variations in daily waste generation. For example, periodic deliveries may result in more discards on the delivery day. In addition, ask about any recent or upcoming changes within the department, such as new equipment or procedures, that could alter the types or amounts of waste generated.**

**Larger companies may want to record information gathered on the walk-through by department, copying this worksheet as needed.**

WORKSHEET

# C Facility Walk-Through

## 1 Waste Components *(Continued)*

| Waste-Producing Activity or Equipment | Waste Material Produced | Estimated Amount of Waste Produced per Year | Current Waste Reduction Activities (if any) |
|---|---|---|---|
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WORKSHEET

# C Facility Walk-Through

| | |
|---|---|
| Date and The of Walk-Through | Department: |
| Department Manager: | Telephone Number: |

Team Members Conducting Walk-Through:_____

Employees Interviewed:_____

## 1 Waste Components

| **Waste-Producing** Activity or **Equipment** | Waste **Material Produced** | Estimated Amount of waste Produced per Year | Current waste **Reduction Activities** (if any) |
|---|---|---|---|
| *Receiving shipments* | *Cardboard boxes* | *About 50 boxes per week/2,600 per year* | *Recycling* |
| | *Foam peanuts* | *2 waste containers (5 cubic yards each) per week/100 per year* | *None* |
| | | | |
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WORKSHEET

# C Facility Walk-Through

## 2 Target Materials for Waste Reduction

Based on the facility walk-through, list all materials that could be targeted by your waste reduction program. For each waste type, list all potential waste prevention, recycling, and/or composting methods that could be effective. Although recycling and composting are preferred ways of *managing* wastes, you may want to consider *preventing* **the waste in the first place,**

| Waste Type | Potential waste Reduction Activities |
|---|---|
| *Office paper* | *Develop company-wide double-sided copying policy* |
| *Foam peanuts* | *Return to supplier for reuse*<br>*Collect in house for reuse in our own shipments* |
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WORKSHEET

# D Waste Sort

***Use this worksheet if you need a more detailed profile of the amounts and types of waste generated at your facility 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 company 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 company. This is more appropriate for larger companies.**

**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. In addition, periodic events such as holiday parties and special orders can affect your company's waste stream. If you suspect that the waste sample being sorted is not truly representative of your company'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. For smaller companies, it might be easiest to sort the sample in a large indoor room after business hours. If large quantities of waste will be sorted, a large, flat area such as a parking garage or shipping and receiving area is preferrable. 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.**

**You will need 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. Office wastebaskets might work well for small sorts. For larger companies, 30- to 50-gallon plastic containers, garbage cans, or large corrugated cardboard boxes will be needed. If there are no large scales at your facility, they often can be rented. In addition, you also will need shovels or pushbrooms, a clipboard, labels, pens, and a first aid kit.**

**A three- or four-person waste reduction team in a small- to medium-size facility can probably complete the sorting and weighing in a few hours. Waste sorts at a larger facility will take longer, depending on the size of the team and the amount of waste to be sorted.**

# D Waste Sort Instructions

## 1 Beginning the Waste Sort

**A.** 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.

B. Weigh the empty containers that the sorted wastes will be placed into and record these weights on a label on each container.

**C.** Sort the waste sample by major component (paper, plastics, glass, metal, compostable organics, other),

D. If needed, further sort each major waste component into more specific component subcategories (e.g., glass into clear, green, amber, or other),

E. Place the sorted materials into separate labeled containers.

## 2 Calculating Net Component Weights

**A.** Weigh each filled waste container and subtract the weight of the container (from I-B) 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 Step 2-C.

**B.** 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.

**C.** Add all the total waste component weight figures to determine the total sample weight and record this total on the Waste Sort Form,

## 3 Calculating Percent of Total Sample Weight

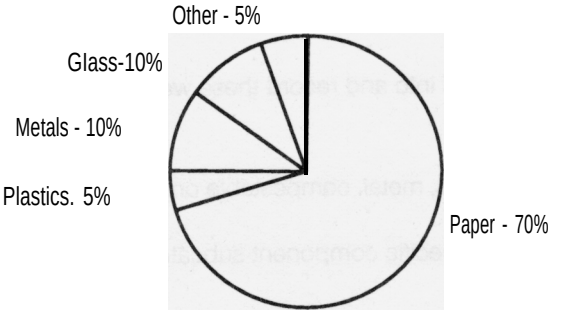
A. Use the following formula and the figures recorded in the Net Component Weight column of the Waste Sort Form to compute the percentage each waste component constitutes the total weight of the sample. Repeat the calculation for each waste component under consideration and record the results in the 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,)

| _____ | ÷ | _____ | X 1 0 0 = | % |
|---|---|---|---|---|
| Net component weight | | Total sample weight | | Percent of Total Sample Weight |

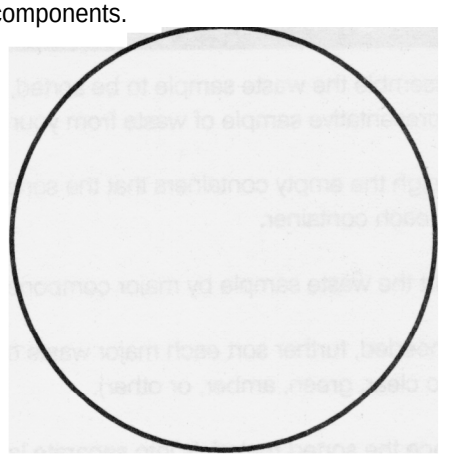
WORKSHEET

# D Waste sort Instructions

B. Use the data listed in the Percept of Total Sample Weight column on the Waste Sort Form to create a pie chart to help compare the percentages of the different waste components.




*Example*



## 4 Calculating Weight of Waste Generated Annually

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

| _____ | x | _____ | = | |
|---|---|---|---|---|
| Net component weight | | Number of working days per year | | Weight of waste Generated Annually |

B. If you sorted a representative sample, first weigh or estimate all of the waste generated by your company 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) | |

| _____ | x | _____ | x | _____ | _____ |
|---|---|---|---|---|---|
| Net component weight | | Multiplier | | Number of work days per year | |

C. Repeat the appropriate calculation for each waste component under consideration and record the figures in the Weight of Waste Generated Annually column on 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.)

WORKSHEET

# D Waste sort Form

| | |
|---|---|
| Date of waste Sorb | **Department:** |
| Source of Sample (if different from department | |
| **Sample Collected Over:** ☐ **One Day** ☐ **Two Days**<br>❑ Other Technique (specify)_____ | |
| **Sample Collected:** ☐ **All Waste at Source** ☐ **Representative Sample (specify weight)**_____ | |
| Team Members Conducting Waste Sort: _____ | |
| | |
| | |
| Factors Affecting Representativeness of Sort:_____ | |
| | |
| | |

| **Waste Component** | | **Net Component Weight** | **Percent of Total Sample Weight** (all components) | **Weight of Waste Generated Annually** |
|---|---|---|---|---|
| | **High-Grade** | | | |
| | **Low-Grade** | | | |
| | **Computer Printout** | | | |
| | **Newsprint** | | | |
| | **Corrugated Cardboard** | | | |
| | Magazines/Glossy | | | |
| | **Other** | | | |
| | Total Component Weight | | | |
| | **PET(1)** | | | |
| | **HDPE (2)** | | | |
| | **PVC (3)** | | | |
| | **LDPE (4)** | | | |
| | **Polypropylene (5)** | | | |
| | **Polystyrene (6)** | | | |
| | **Other (7)** | | | |
| | Total Component Weight | | | |

WORKSHEET

# D Waste Sort Form

| Waste Component | | Net Material weight | Percent of Total samples | Weight of waste **Generated Annually** |
|---|---|---|---|---|
| **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 | | | |
| **Compostable Organics** | Yard Trimmings | | | |
| | Food Scraps | | | |
| | Scrap Wood | | | |
| | Other | | | |
| | Other | | | |
| | Other | | | |
| | Total Component Weight | | | |
| **Other** | Textiles | | | |
| | Rubber | | | |
| | Leather | | | |
| | Inorganic (e.g., ceramics, mixed materials) | | | |
| | Copier Toner Cartridges | | | |
| | Other | | | |
| | Total Component Weight | | | |
| Totals | | | | |

WORKSHEET

# E Identifying Potential Waste Reduction Options

***Use this worksheet to list and screen the potential waste reduction options that have emerged from your waste assessment.***

**This worksheet enables to list all the potential waste prevention, recycling, composting and purchaseing options that might be feasible for your waste reduction program. Information needed to fill out this worksheet will come from your records review, facility walk-through, and waste sort, as well as from your general working knowledge about your company and its operations. At this point, the team might want to meet to discuss the results of the waste aasessment and to brainstorm potential options for the program.**

**Once you have listed the potential options, use this worksheet help you quickly identify those options that are most feasible based on economic, operational, and other criteria. This process serves to screen out those ideas that are least feasible,enabling you to concentrate on a select set of options for further analysis in Worksheet F.**

WORKSHEET E

# Identifying **Potential Waste** Reduction Options

## 1 List All Potential Options

**On the following table, list all potential waste reduction options gathered during the records review, facility walk-through, and/or waste sort. If needed, refer to Appendix A for a list of additional waste reduction options, Describe how and where the option will be used, if applicable,**

| Option | Description |
|---|---|
| *Doublesided copying* | *Equip copiers in accounting and sales offices with double-sided copying capability.* |
| *Return toner cartridges* | *Return toner cartridges from the printers in accounting and sales offices to the manufacturer for refilling.* |
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WORKSHEET

# E Identifying Potential Waste Reduction Options

## 2 Screen the Potential Options

Use the following table to screen the options listed in Step 1 according to how well they meet the criteria listed below. Add additional criteria that is important to your company in the blank spaces provided. Weigh each option against the listed criteria, using a screening system that works well for you. One option is to use a (++) when an option fully satisfies the criteria, a (+) when an option partially satisfies the criteria, or a (–) when an option does not satisfy the criteria. Check off in the last column those options that warrant further analysis.

| Criteria / Option | | | Economic | | | | Operational | | | other | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reduces Waste Volume or Weight | Reduces Waste Toxicity | Reduces Waste Disposal Costs | Reduces Purchasing Costs | Generates Revenues | Has Low Startup Costs | Improves Productivity | Improves Product or Service Quality | Is Relatively Easy to Implement | Builds Employee Morale | Improves Company Image | ncreases Use of Recycled Goods | | | Check for Further Study |
| *Double-sided copying* | + | – | + | + | – | + | | | | + | | | | | ✓ |
| *Return toner cartridges* | + | + | + | + | – | + | | | | + | | | | | ✓ |
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WORKSHEET

# F Economic and Operational Feasibility

***Use this worksheet to evaluate the economic and operational feasibility of the waste reduction options under Consideration.***

**This table in this worksheet will enable you to examine more closely the potential Waste reductions options that passed your initial screening in worksheet E. Much of the information requested on this worksheet involves business judgement concerning such factors as the effect each option is likely to have on productivity and the ease of implementation. You may want to consult with department managers on some issues. Certain questions may not be applicable to all waste reduction option**

**For the economic evaluation sections of this worksheet, refer to purchasing records, disposal records, waste sort or facility walk-through data, and interviews with company employees, as well as information recorded on earlier worksheet Consult company purchasing officals, financial advisor, or department managers as necessary.**

**Fill out a separate workksheet for each waste reduction option to be evaluated copying the forms as needed. Use the last page of this worksheet to summarize the economic, operational, and intangible factors associated with waste reduction options under evaluation**

WORKSHEET

# F Economic and **Operational** Feasibility

Waste Reduction Option_____

## 1 Operational Factors

**A. Could this option improve or reduce product or service quality? How?**

_____

_____

_____

_____

_____

_____

_____

**B. Could this option improve or reduce productivity? How?**

_____

_____

_____

_____

_____

_____

_____

**C. Will additional staff or time be required to implement, operate, or maintain this option? How many'? What would additional staff be required to do?**

_____

_____

_____

_____

_____

_____

_____

WORKSHEET

# F Economic and Operational Feasibility

D. Can the option be Implemented within the existing facility setup, or are adjustments needed (such as additional space or a change in layout) to accommodate the option? If so, what

E. WiIl any new equipment be needed? If so, what?

F. Are there companes willing to purchase collected recyclable materials? List area buyers or haulers willing to collect material.

G. Can reusable materials be donated to a local community group or listed with a materials exchange?

WORKSHEET F

# Economic and Operational Feasibility

## 2 Economic Factors

**A.** Capital Costs for This Option

Equipment Purchased (e.g., baler, containers)

_____ $ _____

_____ $ _____

_____ $ _____

Facility/Storage Preparation (e.g., grading a site for composting) $ _____

Installation/Utility Connection (for equipment such as compactors) $ _____

Initial Staff Training $ _____

Initial Promotional and Educational Materials $ _____

Other (specify) _____ $ _____

_____ $ _____

_____ $ _____

$ _____

**Total Capital Costs**

B. Annual Operating Costs for This Option

Materials and Supplies $ _____/year

Operation & Maintenance $ _____/year
(e.g., labor, equipment, storage space, service contracts, utility charges)

Transportation $ _____/year

Ongoing Staff Training $ _____/year

Ongoing Promotion and Education $ _____/year

Other (specify) _____ $ _____/year

_____ $ _____/year

_____ $ _____/year

$ _____

**Total Annual Operating Costs**

WORKSHEET

# F Economic and Operational Feasibility

C. Avoided Waste Removal Costs for this Option

Use the table below to calculate the annual avoided removal costs for this waste reduction option. Using data from the waste sort, purchasing records, and interviews with personnel as a starting point, estimate the annual amount of waste this option will reduce. If necessary, use the conversion factors listed in Appendix D to convert the amount of waste material being reduced (Column 3 below) to the same unit of measure (e.g., cubic yards or tons) as your waste removal cost.

| Waste Reduction Activity | Waste Material Being Reduced | Amount of Waste Reduced per Time Period | Annual Amount of Waste Reduced | Waste Removal Cost | Annual Avoided Removal Cost |
|---|---|---|---|---|---|
| | | X Annual Multiplier = | | x | = |
| *Replace single-use plates with dishes in cafeteria* | *Single-use plates* | *5 cubic yards per week* | *260 cubic yards per year* | *$3 per cubic yard* | *$780* |
| | | | | | |

D. Avoided Purchase Costs for this Option

If the waste reduction option under consideration will result in the opportunity to purchase fewer supplies or materials, use the formula below to calculate the annual avoided purchase costs for this option.

Type of Material _____

_____ x _____ $ _____

Annual reduction in purchasing *[In same unit of measure as the unit price]* — Unit price — **Annual Avoided Purchase Costs**

E. Annual Revenues for this Option

Use the formula below to estimate annual revenues for this option (if any).

_____ + _____ + _____ = $ _____

Sale of recyclable materials — Sale of items in a materials exchange — Sale of compost — **Total Annual Revenues**

WORKSHEET

# F Economic and Operational Feasibility

## F. Net Savings for This Option

**Use the formula below to calculate the total annual savings for this option,**

| _____ | + | _____ | + | _____ | = | $ _____ |
|---|---|---|---|---|---|---|
| **Annual avoided removal costs** *[from Step 2-C]* | | **Annual avoided purchase costs** *[from Step 2-D]* | | **Annual revenues** *[from Step 2-E]* | | Total Annual Savings |

## G. Net Annual Cost or Savings for This Option

**Subtract the total annual operating costs from the total annual savings to arrive at the net annual cost or savings resulting from this waste reduction option (exclusive of capital costs),**

| _____ | _____ | $ _____ |
|---|---|---|
| **Total annual savings** *[from Step 2-E]* | **Total annual operating costs** *[from Step 2-B]* | **Annual Net Costs or Savings** |

## H. Interpreting Net Costs

**If the figure arrived at in 2-F is positive, proceed to 2-1,**

**If the figure arrived at in 2-F is negative, this option will cost more to implement than it will save, First, review the numbers to ensure you have accounted for all potential costs and savings. If the result is the same, you will need to determine whether this option belongs in your waste reduction program. If this option has other intangible benefits (such as improved public relations and employee morale), you might consider including it. In addition, be sure to consider the program as a whole. This option might make sense if the other components of your program will result in large enough savings to offset the costs of this option, resulting in overall program savings.**

**If you decide it should not be included in your waste reduction program at this time, you might want to make a note to revisit this option if conditions change. For example, if the market for a recyclable material improves significantly or equipment costs decline due to technological advances, this option might become cost-effective.**

WORKSHEET

# F Economic and Operational Feasibility

1. Payback Period for This Option

Payback period is one of many ways of measuring the economic feasibility of the options under consideration. The payback period measures the amount of time needed for the cumulative revenues or savings resulting from the waste reduction program to equal the initial investment. (This calculation is only relevant when annual savings or revenues exceed annual costs.) If your company uses other measures of investment worthiness (internal rate of return, net present value, etc.) you may wish to use one of these methods instead of calculating the payback period.

Calculate the payback period using the formula below.

| _____ | ÷ | _____ | = | _____ |
|---|---|---|---|---|
| Total capital costs *[from Step 2-A]* | | Annual net savings *[from Step 2-F]* | | **Payback Period (Years)** |

Note: If the payback period is longer than the useful life of any of the equipment purchases listed in 2-A, add the costs of replacing this equipment to 2-A and recalculate the payback period.

## 3 Other Factors

Aspects of the options that cannot easily be expressed using the Economic and Operational Feasibility tables and formulas may be explained below. (These intangible factors include improved working environment, corporate image, employee and customer satisfaction, community relations, and recognition.) List the intangible advantages and drawbacks associated with implementing this option.

_____

_____

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WORKSHEET F

# Economic and Operational Feasibility

## 4 Summary of Waste Reduction Options

Use this table to summarize the economic and operational feasibility of your waste reduction options.

| Option | Projected Amount of waste reduced | Annual Net Cost or savings | Payback Period | Operational and Intangible Advantages and Drawback |
|---|---|---|---|---|
| *Recycling office paper* | *200 reams of paper* | *$2,000 savings* | *Less than 1 year* | *Strong local paper recycling market, easy to implement, good for employee involvement* |
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WORKSHEET

# G Monitoring and Evaluation

***Use this worksheet to analyze your waste reduction program once it has been fully implemented and in place long enough to be evaluated.***

**Program monitoring and evaluation is a critical element of any waste reduction program. This worksheet will help you gauge the effectiveness of your waste reduction program by estimating 1) how much waste your company is reducing, 2) avoided waste removal costs, 3) avoided purchasing costs, and 4) revenues.**

**Be aware, however, that this worksheet does not calculate *net* costs or savings of the program. To do this, you would need to consider any capital and operating expenses incurred as a result of the program, as listed in Worksheet F. Now might be a good time to revisit that worksheet.**

**Also, factors other than your program could be affecting the amount of waste your company is generating, its waste removal and purchase costs, and any savings being realized. Consider if any extenuating factors (such as a reduction in your workforce) are contributing to these measures of success.**

**Finally, keep in mind that costs are not the sole indicator of a program's success. Be sure to consider the intangible benefits of waste reduction, such as improved corporate image and employee morale, when ascertaining the success of your program.**

WORKSHEET

# G Monitoring and Evaluation

| | |
|---|---|
| Name of Reviewer: | Date of Review: |
| Building: | Department: |
| Name of Contract: | Telephone Number: |

## 1 Amount of Waste Reduced

**Use the following tables to quantify the annual amount of waste that is being reduced as a result of your company's waste reduction efforts. When recording the amount of waste prevented, use whatever time period (e.g., weeks or months) is easiest for you to measure. Multiply these figures by the appropriate annual multiplier to come up with an estimate of the amount of waste reduced per year. Then, in the last column of each table, convert this amount to either weight or volume. (if you are charged for waste removal based on weight, convert the amount of waste reduced to tons. If you are charged for waste removal by volume or per pull, convert this amount to cubic yards).**

### A Waste Prevention

| Activity | Type of Waste Prevented | Amount of Waste Prevented (units/time period) | Annual Amount of Waste Prevented X Annual Multiplier = | Conversion to Tons or Cubic Yards* |
|---|---|---|---|---|
| *Double-sided copying* | *White office paper* | *12 reams per week* | *624 reams per year* | *21 cubic yards per year* |
| *Donate wooden pallets* | *Pallets* | *10 pallets per week* | *520 pallets per year* | *10.4 tons per year* |
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| | | | | |
| | | | Total | |

• See Appendix D for conversion tables.

WORKSHEET

# G Monitoring and Evaluation

B. Recycling

| Material | Amount of Waste Collected (units/time period) | X Annual Multiplier = | Annual Amount of Waste Collected | Conversion to Tons or Cubic Yards* |
|---|---|---|---|---|
| *HDPE plastic* | *40 pounds per week* | | *2,080 pounds per year* | *1.04 tons* |
| | | | | |
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| | | | | |
| | | | **Total** | |

C. Composting

| Material | Location of Composting | Estimated Amount of Waste Reduced | X Annual Multiplier = | Annual Amount of Waste Reduced | Conversion to Tons or Cubic Yards |
|---|---|---|---|---|---|
| *Cafeteria food scraps* | *On site* | *250 pounds per week* | | *13,000 pounds per year* | *6.5 tons* |
| | | | | | |
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| | | | | **Total** | |

D. Total Amount of Waste Reduced

Use the formula below to calculate the total annual amount of waste reduced (in tons or cubic yards).

| _____ + | _____ + | _____ = | _____ |
|---|---|---|---|
| Total annual amount of waste prevented *[from Step 1-A]* | Total annual amount of waste recycled *[from Step I-B]* | Total annual amount of waste composted *[from Step 1-C]* | **Total Annual Amount of Waste Reduced** |

• See Appendix D for conversion tables.

WORKSHEET

# G Monitoring and Evaluation

## 2 Avoided Waste Removal Costs

**Avoided waste removal costs will be calculated differently, depending on how your company is charged for waste hauling. Companies may be charged by weight (2-A), volume (2-B), container pull (2C), or a combination (2-D) of these. Complete as many of the following tables as appropriate for your company's waste hauler billing system(s).**

**A.** Avoided Waste Removal Costs ***(if charged by weight)***

| **Activity** | **Total Annual Amount of Waste Reduced** (in tons) *[from Worksheet G-1]* | x | **Waste Removal Cost** (per ton) *[from Worksheet B-2]* | = | **Annual Avoided Removal Costs** |
|---|---|---|---|---|---|
| **Waste Prevention** | | | | | |
| **Recycling** | | | | | |
| **composting** | | | | | |
| | | | | **Total** | |

B. **Avoided Waste Removal Costs** ***(If charge by volume)***

| **Activity** | **Total Annual Amount of Waste Reduced** (in cubic yards) *[from Worksheet G-1]* | x | **Waste Removal Cost** (per cubic yard) *[from Worksheet B-2]* | = | **Annual Avoided Removal Costs** |
|---|---|---|---|---|---|
| **Waste Prevention** | | | | | |
| **Recycling** | | | | | |
| **composting** | | | | | |
| | | | | Total | |

C. Avoided Waste Removal Cost ***(if charge by container pull)***

If your facility is charged by container pull, use the following table to show how many fewer pulls could have resulted from your waste reduction activities.

| **Activity** | **Total Annual Amount of Waste Reduced** (in cubic yards) [from *Worksheet* G-1] ÷ | **Volume of Hauling Container** = | **Container Pull Avoided** x | **Cost per Pull** (in dollars) [from *Worksheet B-2]* = | Annual **Avoided Waste Removal Costs** |
|---|---|---|---|---|---|
| Waste Prevention | | | | | |
| Recycling | | | | | |
| Composting | | | | | |
| | | | | Total | |

D. Total Avoided Waste Removal Costs

If your company is charged in a combination of ways for waste removal services, and you have filled out two or more of the above tables, use the following formula to calculate your total avoided removal costs.

_____ + _____ + _____ = $ _____

**Total Annual Avoided Waste Removal Costs**

*[from* 2-C]

WORKSHEET

# G Monitoring and Evaluation

## 3 Revenues and Avoided Purchase Costs

### A. Revenues

Use the following table to calculate the revenues received from collected recyclable or exchanged materials,

| Activity | Amount Collected per Time Period | Annual Amount Collected | Unit Price | Estimated Annual Revenue |
|---|---|---|---|---|
| | x Annual Multiplier= | x | | = |
| *Glass recycling* | *55 pounds per week* | *2,880 pounds per year* | *$0.08 per pound* | *$229* |
| | | | | |
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| | | | | |
| | | | Total | |

If your company receives additional revenues from other measures such as materials exchanges or the sale of compost, use the formula below to calculate total annual revenues from your waste reduction program.

_____ + _____ = $ _____

Revenues from recycling + Revenues from materials exchanges, compost sales, etc. = Total Annual Revenues

B. **Avoided Purchase Costs**

**Use the following table to calculate the annual savings from avoided purchase costs resulting from all waste reduction activities (waste prevention, composting, recycling, materials exchange).**

| Activity | Material | Amount of Material Not Purchased per Time Period | x | Unit Price | = | Total Avoided Purchase Cost | X Annual Multiplier = | Annual Avoided Purchase Cost |
|---|---|---|---|---|---|---|---|---|
| *Double-sided copying* | *White office paper* | *12 reams per week* | | *$3 per ream* | | *$36 per week* | | *$1,872* |
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| | | | | | | | Total | |

**C. Total Revenues and Avoided Purchase Costs**

**Calculate the total annual revenues and avoided purchase costs using the following formula:**

| _____ | + | _____ | = | $ _____ |
|---|---|---|---|---|
| **Total annual revenues** *[from 3-A]* | | **Total annual avoided purchase costs** *[from 3-B]* | | Total Annual Revenues and Avoided Purchase **Costs** |

## 4 Gross Annual Waste Reduction Savings

**Use the following formula to calculate the gross annual savings resulting from your waste reduction program, If 'an estimate of your program's net savings is desired, use Step 2-B in Worksheet F to estimate operating costs for each of your waste reduction measures. Then, subtract these costs from the gross savings calculated below.**

| _____ | + | _____ | = | $ _____ |
|---|---|---|---|---|
| **Total annual avoided waste removal costs** *[from Step 2-D]* | | **Total annual revenues and avoided purchase costs** *[from Step 3C]* | | **Gross** Annual Waste Reduction Savings |

## 5 Purchases of Recycled Products

**Use the following table to track your purchase of products with recycled content.**

| **Recycled Content Product** | **Annual Quantity Purchased** | **Unit Price** | **Annual Purchase Cost** |
|---|---|---|---|
| *Recycled corrugated cardboard boxes* | *2,000 units* | *$.10 per unit* | *$200* |
| | | | |
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WORKSHEET

# G Monitoring and Evaluation

## 6 Other Factors

Consider other significant factors that may have influenced any changes in cost or savings. For example, did your number of employees increase or decrease?

## 7 Summary

Summarize the success of your waste reduction program and describe any drawbacks. Indicate ways to address these drawbacks.

# Evaluation

The U.S. Environmental Protection Agency is interested in feedback from you regarding your use of *A Business Guide for Reducing Solid Waste.* Please take a few minutes to answer the following questions. When you have finished, return the form by simply folding it, stapling the bottom, and dropping in any mailbox.

1. Please rank the overall usefulness of this guide from 1 to 5.

   5 = *excellent,* 4 = *good,* 3 = *fair, 2 = POOR, 1 = unsatisfactory*

2. Please rank each of the worksheets from 1 to 5 for completeness (did the worksheet ask for the right date?), applicability (did the worksheet apply to your business?), and ease of use (was the worksheet easy to follow and fill in?).

   5 = *excellent,* 4 = *good,* 3 = *fair* 2 = *poor, 1 = unsatisfactory*

| worksheet | Completeness | Applicability | Ease of Use |
|---|---|---|---|
| *Worksheet A :* **Facility Background Information** | | | |
| *Worksheet B:* **Records Review: Waste Removal and Collection** | | | |
| *Worksheet C:* **Facility Walk-Through** | | | |
| *Worksheet D:* **Waste Sort** | | | |
| *Worksheet E:* **Identifying Potential Waste Reduction Options** | | | |
| *Worksheet F:* **Economic and Operational Feasibility** | | | |
| *Worksheet G:* **Monitoring and Evaluation** | | | |

3. Whet was your primary use of the guide? (Check all that apply.)

   ❑ **Resource only** ❑ **To conduct a waste assessment** ❑ **To setup a waste reduction program**

   ❑ **To get waste reduction ideas** ❑ **Other (specify):** _____

   How useful was the guide in meeting these needs?

4. Please share your own waste reduction successes. (Attach an additional sheet of paper if needed.)

5. The following information is optional.

   **Name:** _____

   **Type of Business:** _____

   **Number of Employees:** _____

   **Location (city, state):** _____

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Fold

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