

# CHAPTER 6

## SOLID WASTE PROCESSING TECHNOLOGIES

This chapter describes various types of solid waste processing technologies and facilities, identifies existing facilities in Pierce County, and evaluates alternatives for meeting remaining solid waste processing needs in the County.

Since adoption of the 1989 Solid Waste Management Plan, Pierce County has completed a number of studies on solid waste processing to handle the County's municipal solid waste stream. In addition, the County has requested proposals from private firms to provide specific solid waste processing facilities and services. These reports include:

- *Report on Alternative Solid Waste Processing Technologies* (1990)
- *Compostable Waste Diversion Report* (1991)
- RFP for a waste-to-energy (WTE) facility (1989) and subsequent contract negotiations
- RFP for mixed waste composting (1991)
- RFP for waste export services
- A summary report of alternative disposal technology costs (prepared and submitted to the County Council in 1991)

The County has also completed two phases of a siting study to determine the possibility of siting a County-owned landfill in Pierce County. The *Phase I: Countywide Screening Study* identified broad, general areas with the potential for meeting the State's siting criteria

and it is discussed in more detail in Chapter 2 Background. The *Phase II: Site-Specific Screening Study* identified potential sites for a County-owned landfill. The status of this second phase is described in Chapter 8.

### 6.1 Goals and Permitting

**Goals:** Solid waste processing reduces the amount of material requiring disposal and, in some cases, also produces a useful product. Examples of solid waste processing technologies include material recovery facilities, where recyclable materials are removed and/or sorted; composting facilities where organics in solid waste undergo controlled decomposition; and waste-to-energy facilities where waste becomes energy for electricity.

Landfilling continues to be required even if solid waste processing technologies are employed because all of these technologies produce some sort of residue or handle only a portion of the waste stream. For example, landfilling is still required for ash and bypass waste (waste that can't be burned) from waste-to-energy facilities. Thus, solid waste processing technologies do not replace landfilling; rather they are a part of an integrated system that reduces the amount of material that requires landfill disposal.

Decisions to implement such technologies typically consider the costs and benefits of processing and the costs of landfilling the remaining material to be disposed. Because the success of each type of processing technology also depends in part on the nature of the feedstock or material to be processed, a decision to implement a particular processing technology needs to also consider the effects of upstream waste reduction and recycling programs.

The consideration of any large-scale solid waste processing technology should meet

existing and projected needs within the framework of the following goals:

- Goal:** To ensure the compatibility of processing technologies with the other elements of the solid waste system, and with the overall Plan goals.
  
- Goal:** To use reliable processing systems that protect human health and the environment, and reduce dependency on landfills.

These goals are intended to present a comprehensive and balanced approach to solid waste management that complements existing programs and reduces the need for disposal capacity.

**Permitting:** The state permitting regulations for recycling, composting, and other processing technologies such as incineration are found in the Minimum Functional Standards (MFS), WAC 173-304. Most solid waste handling facilities must meet the requirements of this regulation through permits issued by the Tacoma-Pierce County Health Department. Permitted facilities must meet design and operation requirements; have operation and safety plans; and be in compliance with land use comprehensive plans, zoning codes, and the Solid Waste Plan.

The Health Department regularly inspects solid waste handling sites and reviews the permit status. In general, recycling facilities, solid wastes stored in piles, and surface impoundments are the most lightly regulated. The regulations have more stringent rules for disposal facilities, such as incinerators, and other waste handling facilities, such as transfer stations.

The following sections state when facilities need or may not need a permit under the MFS. Generally, recycling facilities (or businesses)

within an enclosed building do not need a permit under the MFS, although they do need to meet the requirements of all land use codes. Specific types and sizes of waste-to-energy facilities will need a permit, as will all waste storage piles and surface impoundments.

A more detailed discussion of permitting issues is found in Chapter 10.

## 6.2 Overview of Types of Technologies

The following discussions describe various types of materials recovery, composting, and waste-to-energy facilities. It also includes a brief discussion about storage facilities.

### 6.2.1 Material Recovery Facilities

Several types of facilities are commonly referred to as “Material Recovery Facilities” or MRFs. These include:

- Waste separation and recovery facilities, often referred to as “dirty” MRFs, which process mixed municipal solid waste to recover recyclable materials.
  
- Recycling processing facilities, which complement recycling programs by providing the means to sort, process, and prepare recyclable materials for market. These are often referred to as “clean” MRFs because they do not sort mixed municipal solid waste, only mixed recyclables.
  
- Specialized MRFs, which accept a specific type of recyclable material or waste for processing, such as construction debris.

Table 6.1 summarizes the principal characteristics of the various types of Material Recovery Facilities.

**Waste separation and recovery facilities:** A waste separation and recovery facility is often called a “dirty” MRF because it accepts mixed municipal solid waste. Such a MRF can be arranged in various ways, using many methods and equipment to separate individual recyclable materials from the waste stream prior to disposal. For the purposes of land use and solid waste permits, a stand-alone facility is permitted under the requirements for a transfer station in the State’s Minimum Functional Standards (MFS), WAC 173-304. These facilities can also be added as the front-end element to an existing transfer station or other disposal facility.

Waste separation and recovery facilities are designed based on several factors, including the following:

- Type and concentration of recyclable materials remaining in the waste stream after source-separation programs are implemented.
- Material markets and specifications.
- Material prices and the cost of recovery.
- Availability of sorting equipment, labor and labor cost.

Low technology facilities, often called “dump and pick” operations, depend largely on hand sorting. Mechanical systems in such facilities may be limited to conveyors. Low technology systems are less capital cost-intensive and allow for more operational flexibility than mechanized systems because expenses can be cut by reducing staff if a material becomes uneconomical to recover. If the market for the material rebounds, costs to resume recovery of the material are generally not high.

Medium- to high-technology waste separation and recovery facilities are more capital intensive and, therefore, are more likely to be economical where waste volumes are large. At these facilities, conveyors, screens, and magnets are commonly used to separate

components of the waste. Some facilities also use air classifiers (devices that use forced air to separate the light burnable fraction from the remaining inert material) and shredders. Computerized equipment is also sometimes used to recover and segregate aluminum, paper, glass, and plastic.

Generally, residues left after recyclables are removed must be landfilled. Some may be compostable and some may be suitable for a WTE facility.

**Recycling processing facilities:** At a recycling processing facility, recyclable materials are separated by type and processed further to meet market requirements. These facilities are often called “clean” MRFs because they do not include mixed municipal solid waste in the sorting process. They can be a stand-alone facility/business, or sited along with a transfer or disposal facility. Totally enclosed stand-alone facilities do not necessarily require a permit under the MFS. Those with outside storage must meet permit requirements.

Land use permits vary depending upon the scale of the facility and type of zone the facility is being sited in. Pierce County’s land use regulations define a “buy-back recycling center” as a small-scale processing business which collects, receives, or buys recyclable materials from household, commercial, or industrial sources. The business sorts or packages the recyclables for subsequent shipment and marketing.

A “recycling processor,” as defined in the County regulations, is a large-scale business that specializes in collecting, storing and processing material (other than hazardous waste or municipal solid waste) for reuse. It may accept commingled recyclables for sorting or baling and transport off-site, or it may specialize in one category of material. A recycling processor typically uses heavy equipment to process materials.

In small communities using a recycling processing facility to process their waste stream, economics typically limit the size and complexity of the facility. For example, in a small community such a facility most often consists of covered receiving areas and storage containers without any processing equipment. For larger communities, recycling processing facilities typically contain processing equipment. Although the type and size of equipment depend on the type and volume of recyclables, collection and transport methods, and market conditions, processing at such facilities often involves:

- **Baling Newspaper.** Some additional processing to remove glossy papers, magazines, or other contaminants may be used to upgrade the quality of the newspaper. If newspaper is mixed with lower grades of paper, it may be shredded and then baled.
- **Segregating and Baling Corrugated and Office Paper.** Typically, a trommel screen is used to remove contaminants. Hand sorting may also be used to segregate grades of paper or remove contaminants.
- **Metals Separation.** Hand sorting is typically used to segregate aluminum, steel, and bi-metal cans. Magnets may be used to separate ferrous metal cans from non-ferrous (aluminum) cans. Air classifiers may be used to remove aluminum cans and plastic containers from heavier materials.
- **Glass Sorting and Processing.** Glass is often sorted by color to increase its value. Glass is typically sorted by hand to separate colors and remove contaminants. After sorting, glass is crushed into small pieces (cullet). Metal caps, rings, and labels are removed by screening the cullet.
- **Shredding and Baling Plastics.** Intact plastic containers occupy a large amount of space relative to their weight, making it

inefficient to transport these materials long distances without processing. Processing may include specialized sorting equipment and shredding, baling, perforating, and/or granulating the plastic to reduce its volume.

Residues from recycling processing facilities include contaminants that are mixed in with the recyclables, non-recoverable, or not easily marketed materials (such as broken, mixed colored glass), and materials that cannot be handled by sorting equipment. The amount of residue depends on the processing efficiency of the facility, the degree of separation by generators, and the collection method.

***Construction demolition (CD) waste MRFs:*** CD MRFs are specialized facilities or businesses designed to segregate construction, demolition, or landclearing debris into recyclable or reusable materials. For the purpose of land use permitting, a stand-alone CD MRF would be identified as a recycling processing facility.

The processing strategy employed at a CD MRF is determined primarily by the composition of the material and degree of contamination. Three general strategies are employed.

***“Dump and Pick” Operations:*** Material is dumped and hand picked for items that can be recycled or reused. Generally, the materials are dumped on a hard surface such as concrete or asphalt. Depending on the climate, the surface may be covered to protect the sorters and the material. Front-end loaders are used to distribute material for better access to recyclables by the sorter and to remove residue from the floor. The materials removed are placed in open containers or, if heavy, stockpiled on the floor. A simpler method would be to modify transfer stations by providing embayments/containers for specific materials and require generators to source-separate into the appropriate bin or container.

The sorted material is often taken to another site for additional processing or is marketed as a recyclable. Residuals are taken to appropriate disposal facilities such as a CD landfill.

*Negative sort operations:* These are where contaminants or small quantities of material are removed from the larger volume of material. These operations are used when only one or two types of CD material, such as woodwastes, concrete or asphalt are accepted. The material is then processed by size reduction, such as crushing or shredding. Contaminants may also be removed after size reduction.

*High technology strategies:* These rely on mechanized sorting. In a highly mechanized system, bulky materials are removed by presorting with front-end loaders and manual sorting. Following the presorting, materials are recovered using various types of equipment, including:

- Crushing/size reduction equipment, such as impactors, hammermills, stump grinders, and shredders to reduce the size of material;
- Screening/separating equipment, such as disc screens to split similar materials into various size fractions and segregate different materials;
- Float tanks and air classifiers to separate light and heavy material;
- Conveyors; and
- Balers used at facilities that receive large quantities of cardboard.

## 6.2.2 Composting Facilities

Composting is the controlled decomposition of complex organic materials by microorganisms such as fungi and bacteria. Although decomposition occurs naturally, composting facilities are designed to speed the rate of biological decomposition by managing key parameters, including moisture content, oxygen, temperature, and the ratio of carbon to nitrogen. In general, composting systems are designed to produce a stable end product quickly. The rate of decomposition depends on the type of material, local climatic conditions, system configuration, and operating procedures. Most composting operations can produce an end product in one to six months.

*Types of systems:* Composting employs oxygen as part of the decomposition process (aerobic). Composting facilities use four basic methods to introduce air.

After initial composting using one of these methods, material is cured, used on site or prepared for market, screened, stored and shipped in bulk, or packaged.

*Windrow systems:* This type of facility is where material is composted in long piles (windrows) on a flat site. Windrows are kept porous mechanically by turning the material periodically with front-end loaders or special windrow turning equipment. If piles are not turned often enough, the center of the pile may not receive enough oxygen, producing anaerobic conditions that may produce strong, unpleasant odors.

*Aerated static pile systems:* In this type, air is introduced into a large pile through air duct systems installed beneath the base of the pile. Aeration can be positive, blowing up through the pile; or negative, drawing air down through the pile. Negative aeration has the

<b>Table 6.1 Generalized Comparison of Material Recovery Facilities</b>				
<b>Type</b>	<b>Description</b>	<b>Cost Range</b>	<b>Compatibility/ System Integration Issues</b>	<b>Environmental Effects</b>
<b>Waste Separation and Recovery Facilities (“dirty” MRFs)</b>	Facility to centrally process mixed municipal solid waste for the recovery of recyclable and/or compostable materials. Processing methods range from manual “dump and pick” operations to highly mechanized systems.	\$40 - \$60/ton. Including costs for residue disposal and revenue from sale of recyclables. <sup>1</sup>	<ul style="list-style-type: none"> <li>▪ The need for such a facility is reduced by effective source-separation programs.</li> <li>▪ The value of recovered material may be reduced by contamination relative to materials recovered by a facility handling only commingled recyclables.</li> <li>▪ Significant residue (up to 50%) that requires disposal.</li> <li>▪ Stand-alone facilities are permitted under the requirements for a transfer station.</li> <li>▪ May be designed as a front-end element and sited with a transfer station, mixed-waste composting facility, or mass burn facility.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Similar to waste transfer facility and will depend on facility size and location.</li> <li>▪ Impacts most likely to require mitigation are traffic, noise, and odor.</li> <li>▪ Processing residues typically require landfilling; however, some may be compostable or suitable for a WTE facility.</li> </ul>
<b>Recycling Processing Facilities (“clean” MRFs)</b>	Facility to centrally process recyclable materials following collection in order to meet market requirements. Processing activities typically include one or more of the following: 1) baling of newspaper, corrugates, and office paper; 2) metals and glass separation; and 3) shredding and baling of plastic.	\$20 - \$25/ton minus revenue from sale of material. <sup>1</sup>	<ul style="list-style-type: none"> <li>▪ Compatible with source-separation collection programs (type of material collected) and markets (type of recycled materials needed).</li> <li>▪ Needs to be integrated with recyclables collection contracts.</li> <li>▪ Totally enclosed, stand-alone facilities do not necessarily require a permit under WAC 173-304.</li> <li>▪ Facilities with outside storage must meet permit requirements.</li> <li>▪ Land use permits vary depending on facility/business size and type of zone.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Vary depending upon size of facility, material throughput rates, and location.</li> <li>▪ General impacts would be those typically associated with commercial/light industrial project construction and operation.</li> <li>▪ Traffic impacts likely, but will depend on existing road network and traffic levels.</li> <li>▪ Noise impacts may be a problem, especially in unenclosed facilities.</li> </ul>
<b>Construction/ Demolition (CD) Waste MRF</b>	Facility which segregates CD materials into recyclable or reusable materials and processes those materials.	\$25 - \$125/ton	<ul style="list-style-type: none"> <li>▪ Generally designed to serve needs of the construction industry.</li> <li>▪ Identified as a recycling processing facility for the purposes of land use permitting.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Depends on location. Impacts most likely to require mitigation are traffic, noise, and air quality (dust).</li> <li>▪ Impacts typical of an industrial facility.</li> </ul>

<sup>1</sup> These are only estimates; heavily dependent upon the market rate for recyclables.

added capability of exhausting the processed air through odor scrubber systems when necessary. In general, aerated static pile systems have higher capital costs but lower overall operating costs than windrow systems.

*Turned-aerated pile systems:* These types of composting facilities combine both of the above technologies for more consistent process control and product quality.

*In-vessel systems:* These facilities are designed to promote rapid decomposition by continuously aerating and mixing the material in an enclosed structure. Moisture and temperature levels must be closely monitored in these systems. Although in-vessel systems can produce an end product more quickly, large-scale facilities for composting municipal solid waste are complex and costly to construct, operate, and maintain. In contrast, small-scale in-vessel composting systems use, for example, modified roll off containers to allow generators to avoid disposal costs by composting a single feedstock at the source of generation. Typical users of this type of facility include small wastewater treatment plants, hospitals, prisons, universities, and companies involved in food processing and distribution. This approach is particularly favorable in locations where composting might otherwise not seem feasible. Most of these small-scale systems also combine in-vessel composting with curing in aerated static piles and windrows. Composting time in the container varies depending on the amount of material and the degree of compost stability required. The facilities are costly on a per ton basis compared to large-scale in-vessel facilities.

*Vermicomposting:* In addition to the methods described above, there is “vermicomposting,” the use of worms to achieve controlled composting of organic wastes. It is beginning to be used in some commercial-scale facilities

in other states. Worms digest organic materials from the feedstock and produce castings. In addition to significantly reducing the quantity of waste material, the castings can be used as a soil amendment or organic fertilizer. Compared to other composts, worm castings have a finer texture, do a better job of enhancing the soil, have typically higher levels of nitrogen, potassium and phosphorous, and have more microorganisms to fight diseases in plants. Vermicomposting has been used to compost kitchen scraps, and has been demonstrated as a viable solid waste management tool used on site by businesses, institutions, and farms as well as commercial composting of source-separated resources. (Pierce County demonstrates worm composting to kids as a regular part of the school education program. The County sponsors workshops to teach residents to compost with worms at home.)

*Design Issues:* Most biodegradable organic material is suitable for composting, although meat scraps and fatty foods like dairy products and cooking oil may cause odors and attract rodents and insects. Facilities must be designed for more control of aeration and these animal vectors. In the United States, most composting programs use yardwaste, biosolids from wastewater treatment plants, a combination of the two (co-composting), or in combination with another feedstock such as compostable paper. Composting mixed municipal waste and source separated organics is relatively common in Europe, but has been used in the United States with mixed success. The potential for composting source-separated foodwaste is being evaluated by several communities in the Northwest. The Health Department permits composting facilities under the recycling regulations of the State’s Minimum Functional Standards.

Table 6.2 summarizes the principal characteristics of various types of centralized composting facilities.

***Mixed solid waste (MSW) composting:***

Paper, food scraps, woodwaste, and yardwaste make up the compostable portion of the mixed municipal solid waste stream. However, because mixed waste also includes non-biodegradable items such as plastics and metals, the quality of the compost product will depend on the degree to which non-compostable items are removed in the process. Generally, separating contaminants early in the process results in higher quality compost. Thus, a municipal solid waste composting facility would generally be co-located with a MRF.

Preprocessing of mixed municipal solid waste before composting typically involves:

- **Materials classification** - where large non-compostable and bulky items (such as white goods and tires), glass, metals, and other abrasives are removed to protect machinery, improve the quality of the final product, and increase recycling. Other non-compostable materials that are not removed in the preprocessing stage are removed during post-processing.
- **Size reduction** - by grinding or shredding to reduce particle size and facilitate handling and decomposition. Not all processes use grinding before decomposition; some processes allow non-biodegradable glass and metals in the feedstock and use these materials to grind the waste as it tumbles in an enclosed vessel (rotating drum process).
- **Mixing** - adding water and air to the mixture as it begins to decompose. The more homogenous the mixture, the less likely it will be to develop anaerobic pockets that can cause temperature differences, reduced product quality or odor problems.

Following preprocessing, mixed waste is composted in windrows, static turned-aerated piles, or vessels; cured, screened, and

marketed as a soil amendment. The product must be regularly tested for contaminants. Municipal solid waste compost that doesn't meet state standards may end up being landfilled. In that case, such a facility would only serve as a means to reduce the amount of waste to be landfilled. Controlled land application is still an option. Landfilling should rarely occur if MSW is properly processed.

***Yardwaste composting:*** Yardwaste consists of leaves, brush, tree trimmings, grass, garden waste, shrubs and materials generated by nurseries, landscapers, utility and public facility maintenance operations, and individual citizens. Generation of these wastes varies seasonally, with most yardwaste being produced in Spring and Fall. Yardwaste also includes Christmas trees.

Yardwaste usually does not require much preprocessing to remove contaminants. At operations dedicated to yardwaste, preprocessing may be limited to reducing the size of woody materials using commercial/industrial tub grinders, hammermill shredders, and/or chippers. Before the waste is ground, impurities such as plastic bags, wire or rope may be removed by hand. Reducing the size of brush and tree trimmings facilitates handling and speeds the composting process. In addition, the harder, more uniform wood also help aerate the piles, thereby enhancing decomposition. The composting process can be further enhanced if leaves are also preshredded.

Seasonal heavy grass loadings create the need for forced aeration or very porous windrows. This is because fresh-cut grass with a high moisture content begins decomposition quickly. The high density and low porosity of the material can result in anaerobic (without oxygen) decomposition, which results in offensive odors. This condition occurs frequently during wet springs when grass is

placed inside a curbside collection bin, awaiting collection before being transported to the yardwaste composting facility. Drier weather increases the need to irrigate the compost piles. The nutrient level in yardwaste is generally high and it is marketed easily. Yardwaste collection systems are described in Chapter 4 Waste Reduction and Recycling.

***Biosolids co-composting:*** In the past, industrial discharges to municipal sewage systems have led to high heavy metal concentrations, such as cadmium, mercury, and lead, in sewage sludge. Wastewater pretreatment programs, which began in the early 1980's, have significantly reduced the metal levels in many municipal wastewaters. Secondary treatment eliminates pathogens and the attractiveness of treated solids to animals that carry disease. The resulting biosolids now produced from these systems can often be used as a beneficial resource, particularly when fully composted. Co-composting of biosolids can increase its usefulness as a soil conditioner. As a soil amendment, composted biosolids release organic nitrogen slowly, allowing plants to use more nutrients and minimizing nitrogen losses to groundwater.

Aerated biosolids have little odor. Because biosolids are normally 15 to 25 percent solids (75 to 80 percent water) and have the consistency of toothpaste, it is difficult to keep the material aerated unless it is mixed continually, exposing new surfaces for oxygen transfer or forced aeration. Adding bulking agents such as sawdust, wood chips, ground tree trimmings, or other yardwaste can significantly reduce the need for mechanical aeration because these bulking agents aid in drying the biosolids, decreasing its density, and increasing air voids. Amendments such as wood chips can also increase the available organics in the compost mixture by improving the balance of carbon to nitrogen. (The various municipal and special sewerage district

agencies are responsible for the management of biosolids from wastewater treatment plants. Chapter 9 briefly describes Pierce County's management program.)

***Foodwaste composting:*** The nature of foodwaste as a compost feedstock varies depending on the type of waste generator. Food processors, food wholesalers/distributors, grocery stores, restaurants, schools, and hospitals tend to discard large, homogeneous quantities of materials. In contrast, the composition of household foodwaste is more varied.

As a compost feedstock, foodwaste is very dense, has a relatively high energy potential, and has a high moisture content. Because of these characteristics, decomposition can begin very quickly. However, the high density and low porosity of the material means there are few air spaces and the concentration of oxygen in the materials can be limited, resulting in anaerobic (without oxygen) decomposition. Unlike aerobic decomposition, anaerobic decomposition produces odorous sulfur gases ("rotten egg" smell). To address this concern foodwaste needs to be mixed with a bulking material such as woody yard trimmings, wastepaper, and/or woodwaste to increase the carbon/nitrogen ratio, and reduce the moisture content. Collecting non-recyclable paper with the foodwaste has been identified as an effective means of reducing moisture content at the point of collection. Wastepaper mixed with yard trimmings is also an effective bulking agent.

Foodwastes are also more likely than yardwastes to attract nuisance animals and pests, especially at the beginning of the compost process. Frequent turning of windrows early in the composting process promotes decomposition, forces aeration, and heats up windrows more quickly, which kills insect larvae and deters rodents. In addition,

<b>Table 6.2 Generalized Comparison of Composting Facilities</b>				
<b>Feedstock</b>	<b>Description</b>	<b>Cost Range</b>	<b>Compatibility/ System Integration Issues</b>	<b>Environmental Effects</b>
<b>Mixed Solid Waste (garbage)</b>	<ul style="list-style-type: none"> <li>▪ Mixed solid waste is first processed to remove bulky materials, contaminants, and recyclables; then it is ground; mixed with water; and aerated using a windrow, static pile, turned-aerated pile, or in-vessel system. Vermicomposting may also be used.</li> <li>▪ Finished compost or worm castings is cured, screened, and marketed for soil amendment, fill, landfill daily cover, or landscaping.</li> </ul>	\$45 - \$65/ton including residual disposal	<ul style="list-style-type: none"> <li>▪ Mixed waste composting may be incompatible with a system that has already established aggressive source-separated recycling and yardwaste composting because these materials comprise a large portion of the compostable elements of the mixed waste stream.</li> <li>▪ Due to the large amount of residue (up to 50%), it is often best to locate close to disposal site.</li> <li>▪ Would require siting adjacent to a MRF to remove uncompostable materials.</li> <li>▪ Need and specifications for product should be carefully examined. Markets may be limited.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Odors can be a significant problem unless facility is completely enclosed and provided with odor control.</li> <li>▪ Collection system must be efficient and effective to prevent odor problems at the source and during transit.</li> <li>▪ May require significant area for curing stock piles.</li> <li>▪ Requires leachate collection and treatment.</li> <li>▪ Other impacts similar to other centralized waste facilities (e.g., traffic).</li> <li>▪ May be difficult to site and permit due to public perception.</li> <li>▪ To use the compost as a soil amendment requires regular testing for contaminants.</li> </ul>
<b>Yardwaste</b>	<ul style="list-style-type: none"> <li>▪ Facility to centrally process and compost source separated yardwaste, including grass clippings, leaves, tree trimmings.</li> </ul>	\$30 - \$35/ton	<ul style="list-style-type: none"> <li>▪ Compatible with source-separation collection programs.</li> <li>▪ Product generally of high quality with few restrictions on use.</li> <li>▪ Seasonal fluctuations and putrescibility mean varied collection efforts.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Generally impacts will be associated with traffic and odor.</li> <li>▪ Traffic impacts will somewhat depend on collection program (curbside or self-haul).</li> <li>▪ Odor impacts for yardwaste have been found to be a problem at some locations, but not at the existing County-owned facility.</li> </ul>
<b>Foodwaste</b>	<ul style="list-style-type: none"> <li>▪ A facility to compost source-separated foodwaste to produce a compost product for use in landscaping applications.</li> <li>▪ Several processes have been utilized, including aerated static pile, aerated turned windrow, in-vessel, and vermicomposting.</li> <li>▪ Co-composting with yardwaste/paper improves porosity control.</li> </ul>	\$30 - \$40/ton (limited cost data available from operating systems)	<ul style="list-style-type: none"> <li>▪ Source-separated foodwaste from food distribution, food services, and restaurants, and food product processes required.</li> <li>▪ Collection from residential households requires weekly collection similar to refuse collection.</li> <li>▪ Can be compatible with source-separated collection programs.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Odor is the principal potential impact.</li> <li>▪ Collection system must be regular and frequent to prevent odor problems at the source and during transit.</li> <li>▪ Final product typically of high quality and low contamination (i.e., from metals or pesticides.)</li> </ul>

using an enclosed building for composting also minimizes nuisances associated with vector attraction.

Prior to implementing a foodwaste composting program, several issues should be considered. First, the frequency of collection is critical because of potential vector attraction and odor problems. Allowing foodwaste to sit for a considerable amount of time before collection can make the waste more difficult to handle without odor problems, as decomposition begins very quickly. Once a week may be the minimum collection frequency.

In addition, containers should decrease potential vector attraction and odor problems. If a range of container types (to fit the generator's foodwaste production rate and available space for storage) is allowed, collection vehicles must be able to handle all types of containers. Co-collection with yardwaste is feasible if collection is frequent.

### **6.2.3 Waste-to-Energy Facilities**

Waste-to-energy (WTE) facilities dispose solid waste or recover energy through mass burning, refuse-derived fuel incineration, pyrolysis, or any other means of using the heat of combustion. A volume reduction of 90 percent is typical for these facilities; the unburned waste fraction (ash) continues to require landfill disposal or may, in certain circumstances, be recycled into useful products such as bricks or concrete. The energy generated can be used to offset the initial capital and operating costs of a waste-to-energy facility. For the purposes of land use permitting in Pierce County's zoning regulations, a facility that handles mixed municipal solid waste (garbage) is termed a "Municipal Solid Waste (WTE) Facility.

Pierce County development regulations define a "Special WTE Facility" as a facility designed to burn more than 12 tons per day and which

specializes in disposal or energy recovery from a single type of waste *other than municipal solid waste*, such as tires or infectious waste. WTE facilities require a permit under the State's Minimum Functional Standards (MFS), WAC 173-304. Land use permits vary depending upon the type of facility, its size, and the waste stream it handles. Hospitals and industrial businesses often use small-scale WTE facilities that are considered accessory to their operation.

Waste ash from WTE facilities must undergo testing. Based on the testing results, the waste ash is characterized as state-regulated "special incinerator ash," as municipal solid waste, or as a state and federally regulated hazardous waste. WAC 173-306, Special Incinerator Ash Management Standards, sets forth specific requirements for handling, packaging, transport, disposal, and record keeping. Special incinerator ash must be disposed at a permitted landfill that meets the requirements of WAC 173-306-405 through WAC 173-306-470. If the ash tests as hazardous waste, disposal must occur in accordance with Washington State Dangerous Waste Regulations (WAC 173-303) and Federal Hazardous Waste Disposal Regulations (RCRA Subtitle C). Emissions from incinerator facilities are regulated under Washington State Solid Waste Incinerator Facilities (WAC 173-434) and Title 40, Code of Federal Regulations, Part 60.

Generally, ash from a WTE facility usually tests as "solid waste" and it can be re-used or recycled. Uses include road and soil stabilization, manufacturing of cement, and stabilization of hazardous or chemical wastes.

The three general types of waste-to-energy facilities include mass burn incinerators, refuse derived fuel facilities, and pyrolysis facilities. Table 6.3 summarizes the principal characteristics of the various types of waste-to-energy facilities. These waste-to-energy facilities are described in more detail below.

**Mass burn incinerators:** Mass burn incinerators burn mixed municipal solid waste at very high temperatures with limited preprocessing to remove large items such as stumps and appliances. In some cases, additional preprocessing is added to remove materials for recycling or other materials such as metals, that may cause ash contamination, damage equipment, or contribute to toxic air emissions. MRFs are often a front-end element of a mass burn facility.

Waste brought to a mass burn facility is either stored in a large pit or loaded directly into the furnace where it is tumbled over moving grates or through a rotating drum, advancing the waste toward the ash pit. There are two basic types of furnaces used in mass burn plants:

- **Refractory Lined Incinerators** - are lined with a 6-inch to 8-inch thick heat resistant coating (refractory). Refractory-lined furnaces experience low rates of heat loss through the furnace walls and are able to maintain steady combustion temperatures when subjected to wide variations in fuel quality. “Excess air” refractory-lined incinerators are used to keep temperatures within the combustion chamber from getting too high and producing slag, an undesirable byproduct. To control temperature, air is allowed to enter the combustion chamber at a volume and rate significantly greater than that needed for combustion (excess air). “Controlled air” refractory-lined incinerators are typically smaller (modular) mass burn units with two combustion chambers. Most controlled-air systems are used to produce steam, which is then used either for heating, industrial processes, or electricity generation.
- **Waterwall Incinerators** - a waterwall incinerator has the walls of the combustion chamber lined with boiler tubes containing water. Thus, the boiler in a waterwall

system is an integral part of the combustion chamber. Temperatures may still need to be reduced through the introduction of excess air. Overall, a waterwall incinerator provides a higher thermal efficiency than a refractory-lined incinerator. A disadvantage of waterwall furnaces is that the entire unit must come off line if the boiler becomes inoperative. This results in less frequent operation time or higher costs for redundant systems to guard against unscheduled downtime.

**RDF facilities:** Refuse derived fuel (RDF) facilities process solid waste into a relatively homogeneous fuel with a uniform particle size and defined moisture content, suitable for burning in conventional boiler systems. In a typical RDF plant, mixed municipal waste is loaded onto conveyors that lead to shredders, magnetic separators, trommels, disc screens, and/or air classifiers. End products produced by a typical RDF plant include fuel, recyclable materials, and an unusable fraction that is disposed at a landfill. RDF can be prepared as shredded fluff (undensified RDF) or compressed pellets (densified RDF).

After processing, RDF is typically burned in a dedicated combustion unit directly affiliated with the processing area, and, in some instances, sold to an electric utility or an industrial customer. If RDF is sold to an electric utility or an industrial customer, it is typically fired as a supplementary fuel, contributing 10 to 20 percent of the heat input to the boiler. Two boiler technologies are used to incinerate RDF:

- **Spreader-Stoker Boiler:** In this system the RDF is fed into a boiler, and a portion is burned in suspension while the remainder burns on a traveling grate. The recovery of bottom ash and fly ash and the air pollution control equipment are similar to those for mass burn technology.

- **Fluidized Bed Boiler:** In this system, the combustion unit contains a bed of sand or comparable material that is heated to 1,500° F, while air is blown upward through the material to keep it in a state of suspension. The air movement transforms the sand into a fluid-like substance. The principal of the fluidized bed is to combust the RDF in a fluid bed of hot, inert material, such as sand or limestone. The turbulence of the sand particles acts to scrape off the burned surfaces of the RDF and continuously expose fresh surfaces. Principal advantages of fluidized bed incineration are the ability to combust a wide variety of fuels, a smaller furnace size, and the ability to reduce gas emissions with limestone in the bed material.

**Pyrolysis:** Pyrolysis is the process of decomposing materials with heat in an oxygen-deficient atmosphere. In a pyrolytic gasification facility, waste would be preprocessed to remove materials, such as metals, that cannot be decomposed. The waste would then be dried and transported to a chamber where it would be exposed to radiant heat tubes in an oxygen-free atmosphere. The heat reduces the waste into basic components: gases, (methane, ethane, hydrogen, and carbon monoxide); liquids (oil and tar); and solids (char and carbon black). The gases can be cleaned and used as a fuel for other purposes or transferred back to the chamber where it would be used to heat the radiant tubes. Solid residues are landfilled.

There is reason to believe that pyrolysis can provide more complete combustion than mass burn or RDF technologies. More complete combustion reduces the levels of some pollutants in emissions from the facility. The main uncertainty of pyrolysis for handling municipal solid waste is that economic and technical feasibility have not yet been demonstrated on a full-scale commercial basis. More development is needed to make this technology commercially viable. Several

companies are actively pursuing development of pyrolysis projects.

**Anaerobic digestion:** This is a biological process that occurs in the absence of oxygen. It uses organic wastes to produce a gas, which can be used to generate electricity, and a residue, which can be used as a soil amendment or fertilizer similar to compost. The biogas, mainly methane and carbon dioxide, is made from such organic wastes as livestock manure, food processing waste, or biosolids. The process is not suitable to be used on a large scale to handle municipal solid waste but is a common process used in wastewater treatment plants. There are many anaerobic digestion technologies commercially available.

More and more organics recycling projects are using anaerobic digestion systems, particularly large dairies and hog farms, where unprocessed wastes can cause odor and water pollution. Some communities in other parts of the country are experimenting with projects using yardwaste as one of the feedstocks.

Anaerobic processes can either occur naturally or in a controlled environment. The organic waste is put in an airtight container called a digester where decomposition begins and the biogas is captured and sold for electricity. All of the wastewater treatment plants in Pierce County have digestors to capture the gas and which help to provide electricity to run the facilities. Both the Tacoma Landfill and the closed Hidden Valley Landfill capture methane produced from the anaerobic processes that occur within the landfills. A biogas digester does not require a solid waste permit under solid waste regulations.

<b>Table 6.3 Generalized Comparison of Waste-To-Energy Facilities</b>				
<b>Type</b>	<b>Description</b>	<b>Cost Range</b>	<b>Compatibility/ System Integration Issues</b>	<b>Environmental Effects</b>
<b>Mass Burn Facilities</b>	<ul style="list-style-type: none"> <li>▪ A central facility where mixed municipal solid waste is burned to reduce volume and produce steam and electricity.</li> </ul>	\$60 - \$70/ton including ash and by-pass disposal	<ul style="list-style-type: none"> <li>▪ Requires energy to produce revenue.</li> <li>▪ Requires extensive air quality monitoring.<sup>1</sup></li> <li>▪ Usually requires a MRF as a front-end element (or sited in tandem with a MRF).</li> <li>▪ Ash residue may require disposal at an out-of-county facility.<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>▪ Similar to waste transfer facility for traffic, noise and odor.</li> <li>▪ Potential air quality impacts.</li> <li>▪ Needs large amounts of cooling water.</li> <li>▪ Typically difficult to site and permit because of public perception and concerns over air quality.</li> </ul>
<b>RDF Facilities</b>	<ul style="list-style-type: none"> <li>▪ A facility to process waste to a relatively homogeneous fuel.</li> <li>▪ RDF is burned in a dedicated boiler or used at an electric utility or industrial facility.</li> </ul>	\$60 - \$70/ton including residue disposal	<ul style="list-style-type: none"> <li>▪ Requires fuel uses.</li> <li>▪ Extensive air quality monitoring required.</li> <li>▪ Large amount of by-pass and residue requiring disposal.</li> <li>▪ Ash generally of higher quality than in mass burn facilities.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Similar to mass burn.</li> <li>▪ Some studies have indicated lower toxic air emissions and higher quality ash than mass burn facilities.</li> </ul>
<b>Pyrolysis Facilities</b>	<ul style="list-style-type: none"> <li>▪ A central facility to decompose material in an oxygen-deficient atmosphere to provide gasses and liquids, which can be used as fuel; and solids, which require disposal.</li> </ul>	Only limited cost information available	<ul style="list-style-type: none"> <li>▪ No commercially demonstrated facilities.</li> <li>▪ Requires disposal of residue.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Similar to mass burn with exception of air quality.</li> </ul>

<sup>1</sup> Incinerator Facility Emissions are regulated under Washington State Solid Waste Incinerator Facilities Regulation (WAC 173-434) and Title 40, Code of Federal Regulations, Part 60.

<sup>2</sup> Depending on ash characteristics, disposal of ash and facility residues must occur at permitted facilities in accordance with Dangerous Waste Regulations (WAC 173-303), Minimum Functional Standards for Solid Waste Handling (WAC 173-304), Criteria for Municipal Solid Waste Landfills (WAC 173-351).

## 6.2.4 Storage Facilities

Two other types of facilities that can be used for storage and treatment for recycling are required to meet the permitting standards of the State's regulations. These are solid waste surface impoundments and waste piles.

**Surface impoundments:** These are solid waste facilities designed to hold an accumulation of liquids or sludges and are most often found as an accessory facility to an industrial business. State requirements include liners, methods to avoid washout under flooding conditions, and slopes designed to maintain structural integrity under conditions of a leaking liner or erosion factors. Some facilities may be required to have groundwater monitoring or leachate detection, collection and treatment systems. To be closed, facilities must have all solid waste removed, otherwise the facility must be closed to meet the landfill standards of WAC 173-304.

There are no solid waste surface impoundments in Pierce County. However, the County's zoning regulations allow solid waste surface impoundments as an accessory use to all businesses. Such accessory uses do not require a land use permit.

**Waste piles:** Under the recycling facility standards, the regulations define waste piles as any noncontainerized waste used for storage or treatment. The regulations apply "to facilities engaged in recycling or utilization of solid waste on the land." These can include noncontainerized composting or the accumulation of waste in piles for recycling. The definition is a bit unclear. Under the MFS, permits are not required for a number of things that might be considered a waste pile such as "woodwaste or hog fuel piles to be used as fuel or raw materials stored temporarily" and being actively used, or where single family residences or family farms are engaged in composting of their own waste.

Interpretation of when to apply the regulations has been inconsistent from jurisdiction to jurisdiction around the State, so the regulations are undergoing review by the State SWAC and Ecology for the possible need for modifications.

Basically, however, facilities that the Health Department determines need a permit must show that at least fifty percent of the material has been recycled in the past three years; that material has not been on-site more than five years; that groundwater or surface water, and that air and/or land contamination has not occurred.

There are no legally permitted waste piles in Pierce County although there are some piles under review by the Health Department to determine if they need permits and if they are part of a legally permitted business. Under the Pierce County zoning regulations, waste piles that have obtained permits from the Health Department are allowed outright as an accessory use to any legally allowed principal use of the property. Such accessory uses do not require a land use permit. An illegally sited business, however, should not be able to obtain a waste pile permit since the Health Department is required under the MFS to permit only those facilities in compliance with all comprehensive land use plans and zoning

<b>Table 6.4 Storage Facilities</b>		
<b>Facility</b>	<b>Compatibility / Siting Issues</b>	<b>Environmental Effects</b>
<b>Surface Impoundments</b>	<ul style="list-style-type: none"> <li>▪ These facilities are not a necessary feature for management of municipal solid waste (garbage).</li> <li>▪ Facilities may be necessary for some industries' management of industrial sludges or liquids for treatment or recycling.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential impacts to air quality, and ground and surface water. MFS standards are designed to protect ground and surface water. PSAPCA administers air quality standards.</li> <li>▪ Closure requires complete removal or facility must be closed to meet landfill standards to prevent ground and surface water contamination.</li> <li>▪ Not difficult to permit under existing zoning regulations.</li> </ul>
<b>Waste Piles</b>	<ul style="list-style-type: none"> <li>▪ These facilities are not a necessary feature for the management of municipal solid waste (garbage).</li> <li>▪ Waste piles may be a necessary adjunct to a variety of businesses for recycling, treatment, or storage; or for composting facilities.</li> <li>▪ Requires evidence of recycling and no long-term storage on site.</li> <li>▪ MFS regulations under scrutiny by Ecology and State SWAC to clarify when regulations apply and when to apply them.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential air quality and ground or surface water impacts. MFS standards are designed to protect ground and surface water and air quality.</li> <li>▪ Potential improper storage of some materials may attract rodents, insects, or cause other vector problems.</li> <li>▪ As an accessory use to a legally permitted principal use, not difficult to site or permit under zoning regulations.</li> <li>▪ Because of environmental siting difficulties, large-scale composting operations are not permitted as waste piles, which is for regulating small-scale accessory activities to a business.</li> </ul>

### 6.3 Planning, Implementation, and Existing Facilities

**Planning:** The 1989 Plan recommended a waste-to-energy facility as a long-term option in addition to landfilling for Pierce County. The Plan also supported completion of the Fort Lewis incinerator and the renovation of Tacoma's Steam Plant No. 2 to use RDF from Tacoma's waste stream. The County negotiated a WTE contract but did not pursue its implementation. The County chose instead to complete a number of other studies called for in the 1989 Plan to evaluate all processing and landfilling alternatives.

In response to the Council's request, the County Executive prepared the *Report on Alternative Solid Waste Processing Technologies*, which described and compared

several technologies, including centralized processing, mixed waste composting, RDF production, anaerobic digestion, and pyrolysis. The County also completed the *Compostable Waste Diversion Report*.

With the information from these reports, the County conducted a series of processes called Requests for Proposals (RFPs) on varying sized facilities for mixed waste composting and short and long-term waste export. The RFP processes solicited proposals and costs. The County then compared the results with the costs of in-county landfilling combined with yardwaste composting, and with the negotiated WTE contract.

Based on proposals prepared in response to the RFPs, and on its study of alternative processing technologies, the County reached the following conclusions:

- *Waste-to-energy (mass burn):* This option, while technically feasible, proved to be the most costly option in terms of initial capital and operating costs. In addition, concerns regarding emission controls, ash disposal, siting and long-term regulatory compliance, created substantial uncertainties about this technology. Accordingly, the County decided not to proceed with development of a mass burn waste-to-energy facility.
- *Mixed waste composting:* A mixed waste composting facility was also determined to have relatively high capital and operating costs. In addition, it is not widely used in the United States at a commercial scale. Odor and end-use market problems at other facilities in the United States were being experienced and had not been resolved. Further, vendor proposals indicated a large amount of residue (approximately 50%) would have required disposal. Based on these considerations, the County decided not to further pursue development of a mixed waste composting facility.
- *Pyrolysis:* Due to the lack of a demonstrated successful operating history on a commercial scale, the County concluded that pyrolysis was not a feasible option for implementation at that time.
- *Source-separation/private processing:* The County elected to continue to pursue development of source-separated recycling collection programs as the most cost-effective alternative to meet its recycling and recovery goals.

**Implementation:** The following is a brief summary of the actions taken by the County, Tacoma, and the military bases to implement recycling and yardwaste processing, and waste-to-energy programs. Chapter 4, Waste Reduction and Recycling, provides more detail about each system's recycling programs.

*Pierce County:* The source-separation recycling collection program adopted by the County relies heavily on the processing and marketing capacities of private businesses, rather than on the development of a County-owned materials recovery facility. As a result of this approach, a number of recycling and hauling businesses expanded their facilities after 1990 to include “dump and pick” operations or sorting, shredding, and baling equipment. In addition, a number of new businesses have located in the County specializing in the processing of various recyclable materials. (Chapter 3 Waste Analysis illustrates the effects on the waste stream of the growth of the new businesses.)

Because of earlier permitting problems experienced by private developers, Pierce County elected to build a model yardwaste composting facility in 1992 to provide capacity for a portion, not all, of the yardwaste expected to be collected through the curbside pickup programs. This was done with the stated intention that the County would also encourage private development of additional composting facilities to meet needed composting capacity. The County's facility has been operating near or at capacity since inception.

As has been discussed in other chapters, this public-private partnership has worked fairly efficiently, costs have remained low to moderate when compared with other jurisdictions, and the County has seen considerable expansion of private capacity for processing recyclables and yardwaste. The growth in private composting businesses appears to be continuing, although one older facility ceased operation due to odor control problems.

*Tacoma:* The City completed expansion of Steam Plant No. 2 and the RDF facility and developed a substantial drop-off center for recyclables at its solid waste facility site, adjacent to the household hazardous waste

collection facility. The City implemented curbside source-separation programs for recyclables and yardwaste and contracted with private businesses to process some of the materials collected by City crews. Tacoma conducted an extensive analysis of its programs to identify efficiencies and needs for the future and made a number of program changes during 1998.

*Fort Lewis and McChord AFB:* Both of the military bases established recycling centers for processing recyclables collected on the bases. McChord also implemented source-separation curbside residential recycling programs and contracted with private businesses for collection. The hauling companies that collect the material use private capacity for processing and marketing for most materials and the bases market recyclables taken to their recycling centers.

The waste-to-energy facility built by Fort Lewis to handle municipal solid waste was unable to meet emission requirements and will not be reopened. Fort Lewis built a transfer station in 1999 and began operations to facilitate transfer of waste off base.

*Existing Facilities:* The facilities and private businesses described in Table 6.5 are either the municipally-owned WTE or composting facilities, or those private businesses which contract with municipal jurisdictions for composting yardwaste. All of the other private businesses that collect and process recyclables are listed in Chapter 4. Private businesses that process or dispose of a special waste that generally does not enter the municipal solid waste stream to be managed by the County or the cities are listed in Chapter 9 Special Wastes.

**Table 6.5 Existing Facilities <sup>1</sup>**

(as of May, 1999)

<p><b>Municipal Facilities</b></p>	<ul style="list-style-type: none"> <li>▪ <b>The Pierce County Yardwaste Composting Facility</b> is a County-owned facility, operated by Land Recovery, Inc. under contract with Pierce County. It accepts vegetative material including grass clippings, leaves, garden and landscaping trimmings, weeds, sod, clean wood, wood shavings and bark, aquatic weeds, hay, and straw. The facility provides for covered aeration and curing areas with mechanically turned windrows and negative forced aeration. In 1998, approximately 42,343 tons of materials were processed at the facility. Because the facility is located adjacent to the Purdy Transfer Station, it is able to take advantage of the back-haul capacity of the trucks which pickup municipal solid waste to take to the disposal facility. At present, the trucks pick up yardwaste from the landfill where it has been shredded, bring the yardwaste to the composting facility, and then leave filled with municipal solid waste. Further expansion of the composting facility is not feasible due to predicted traffic impacts on already congested local roads.</li> <li>▪ <b>Tacoma RDF and Waste-to-Energy Facilities</b> use two fluidized bed combustors to burn mixed fuels consisting of refuse derived fuel (RDF), coal, and woodwaste to produce electricity. The installation is at the existing City of Tacoma Steam Plant No. 2 which the Tacoma Solid Waste Utility leases from Tacoma City Light. In addition to coal and woodwaste, this facility can burn up to 300 tons of municipal solid waste per day, which represents about 15 percent of the fuel heating value. The fluidized bed combustors were designed and permitted to handle up to 30% RDF by weight. The RDF portion of the fuel is prepared at the Resource Recovery Plant located at the City of Tacoma Landfill. The Resource Recovery Plant was designed to process approximately 500 tons of mixed waste per day. The waste is shredded, magnetically separated, and air classified to yield ferrous metals, RDF, and a heavy fraction residue. It is estimated that approximately 20 to 25 percent of the available waste stream from the City is delivered to the RDF plant.</li> <li>▪ <b>Chambers Creek Soil Manufacturing Facility.</b> The County is designing a soil manufacturing facility to be located at the Chambers Creek Wastewater Treatment Plant to turn biosolids into a soil amendment to restore the adjacent gravel mine site.</li> </ul>
<p><b>Fort Lewis &amp; McChord AFB Facilities</b></p>	<ul style="list-style-type: none"> <li>▪ <b>Fort Lewis Recycling Center</b> currently receives commingled residential recyclables, commercial paper and other recyclables collected at drop boxes, such as cardboard, newspaper, aluminum, and glass. The recycling center also receives municipal solid waste generated at Fort Lewis and the McChord Air Force Base. This material is sorted to remove cardboard, paper, aluminum, steel, and car batteries. Certain bulky waste such as furniture and classified documents bypass the Recycling Center. The Recycling Center was expanded in 1996 by doubling the length of the sort conveyor, adding a magnetic separator, and installing a finger screen to remove small batteries.</li> </ul>
	<ul style="list-style-type: none"> <li>▪ <b>McChord Air Force Base Recycling Center</b> accepts recyclables from the on-base residential curbside collection program. The recycling center processes the recyclables and markets the materials. Recyclables accepted at the recycling center include paper, cardboard, aluminum, glass, yardwaste, tree debris, and scrap wood.</li> </ul>

<b>Table 6.5 Existing Facilities</b> <sup>1</sup>		(as of May, 1999)
<b>Private Sector Composting Facilities</b> <sup>2,3</sup>	<ul style="list-style-type: none"> <li>▪ <b>Land Recovery, Inc.</b> has an in-vessel composting facility, a yardwaste transfer facility, and a large, fully enclosed organics composting factory. The yardwaste transfer facility is located on Sales Road in Lakewood. It collects yardwaste and other land clearing debris from Tacoma and self-haulers or contractors. The material is shredded and sent to other facilities for composting or to be used as Green Mulch on farmland. Both the in-vessel compost facility and the compost factory are located at the Hidden Valley site. The in-vessel facility consists of 15 modified roll-off containers and is designed to handle 27 tons per day of such materials as food residuals from commercial/ institutional generators, waxed cardboard, and yardwaste. The compost factory is designed to compost 130 tons per day and it will compost a number of types of organics from treated biosolids, food processing waste, animal manure, yardwaste, pre- and post-consumer foodwaste, wax coated cardboard and waste wood, to mixed paper and other land clearing debris.</li> </ul>	
<b>Private Sector Composting Facilities</b> <sup>2,3</sup>	<ul style="list-style-type: none"> <li>▪ <b>University Place Refuse, Inc.</b> has a small private yardwaste composting facility. It is capable of accepting some vegetative yardwaste from curbside collection, the local school district, or landscaping contractors. The mixing and composting operations are contained on a 70-foot by 30-foot reinforced concrete slab with a leachate collection system. The collected leachate is stored in an above ground tank and utilized as a wetting agent in the composting process.</li> </ul>	

<sup>1</sup> Private businesses that process recyclables are listed in Chapter 4. Businesses processing or disposing of special wastes are listed in Chapter 9.

<sup>2</sup> A recycling processing facility and a transfer station are also located at the Hidden Valley site.

<sup>3</sup> A private facility that would co-compost chicken manure and yardwaste or other bulking material on a farm in south Pierce County may also be developed. Other composting facilities are also in the early planning stages.

## 6.4 Needs and Alternatives

As discussed, a number of solid waste processing facilities have been developed in Pierce County by both the public and private sectors to provide recycling processing and waste reduction capacity. These facilities and the reliance upon, and encouragement of, private businesses to provide recycling processing and composting capacity has worked well. The County, cities, and military bases together reached a 52% recycling rate in 1996. Costs for various new recycling collection programs have remained relatively low when compared to other jurisdictions. Therefore, since the systems work well as they have developed, the approach taken in the following discussion about needs and alternatives is one of building upon the strengths of the existing systems to add capacity or increase diversion of materials from disposal.

**Pierce County/Cities and Towns:** There are still opportunities for the public and private sectors to develop processing facilities within Pierce County which build upon the County’s incremental, source-separation approach.

The 1995 Waste Characterization Study conducted by the County indicated that there may be limited need for additional processing options based on the type of material that continues to be disposed. Relevant findings regarding waste compositions include:

- Much of the hauler-collected waste consists of various types of paper that could be composted or recycled (approximately 32, 35, and 38 percent of the waste collected from single family, multi-family, and commercial generators, respectively). The Waste Characterization Study concluded that there is potential to divert greater amounts of corrugated and craft paper from the multi-family and commercial waste streams.

- Foodwaste accounts for a relatively large percentage of the hauler-collected waste stream, reflecting the County's overall success in removing recyclables and yardwaste through its source-separation programs. Foodwaste accounted for approximately 22, 15, and 17 percent of the waste from single family, multi-family, and commercial generators, respectively.
- The self-haul waste stream consists primarily of construction/demolition (CD) waste. Over 71 percent of the commercial self-haul waste stream is CD waste. The greatest percentage is wood.
- The existing County-owned yardwaste composting facility is operating beyond its designed capacity. Although the County is composting more than 33,000 tons of yardwaste, there still remains approximately 12,000 more tons being disposed annually.

common to add bulking agents to aid in moisture absorption and promote aerobic decomposition. Paper and/or yardwaste are commonly used bulking agents. It is possible that yardwaste collection programs could be modified to collect foodwaste with yard or paper waste.

Based on these findings, there appears to be some potential for additional diversion of paper, foodwaste, CD materials, and yardwaste from Pierce County's waste stream.

*CD MRF:* A recycling processing facility to recover CD debris from self-haul waste could be located at either an in-county landfill or at a central transfer station. A self-haul facility could range from a simple dump and pick/salvage operation to a more mechanized facility, or existing transfer stations could be retrofitted with storage bays to allow and encourage self-haulers to deposit already separated material. There would be few, if any, added environmental impacts. Financial risks associated with competition would be minimized because capital costs would be relatively low for a "dump and pick" or retrofit operation.

*Foodwaste composting:* Because of environmental issues associated with foodwaste composting, such as vector attraction and leachate generation, it is

With the opening of Land Recovery Inc.'s compost factory in 1999 and its capacity to compost a variety of wastes, there is substantial private capacity in Pierce County to compost commercial, and possibly residential foodwaste. Any consideration of developing a County-owned facility would have to recognize that the County would have little assurance of a secured waste stream because it could not flow-control materials, or require through contract, that foodwaste be directed to a designated facility. The County would also have virtually no control over collection.

The County may want to consider the feasibility of developing programs to collect residential foodwaste now that private capacity exists. The County would need to work with the haulers and the cities and towns to revise the curbside minimum service levels to implement this residential foodwaste collection.

*Agricultural application of compost:* To reduce the peak loading of the County's yardwaste composting facility, freshly composted yardwaste can be applied at agronomic rates on local farms. Land Recovery, Inc. (LRI), who operates the facility for the County, uses this approach with local farmers under the Environmental Excellence Program. This action increases the capacity of the existing facility because it decreases the time it takes to move yardwaste through the process. Best Management practices have been established for this "Green Mulch" in Pierce County and under the Environmental Excellence agreements with Ecology. (This is described in more detail in Chapter 9 Special Wastes.)

*Waste-to-energy:* Because Pierce County has taken aggressive steps to remove paper and yard debris from its waste stream, development of a waste-to-energy facility is not likely to be a cost-effective option for the County as long as other lower cost options, such as landfilling or long-haul, are available.

Further, development of a waste-to-energy facility by the public sector would face financial risks since the County could not easily direct materials to the facility.

Although pyrolysis has been developed to a limited scale on private sector projects, it has yet to be successfully demonstrated at a commercial scale. However, there is reason to believe that pyrolysis can provide a more complete combustion than existing implemented processing technologies which can reduce pollutants in facility emissions. Therefore, the County could continue to monitor the development of pyrolysis and, if and when any pyrolysis projects have been commercially demonstrated, verify the economic and technical feasibility of the process.

*Waste separation and recovery facility ("dirty" MRF):* If the County wants to increase the diversion of recyclables, going beyond existing programs and the source-separation of CD materials or organic wastes, such as foodwaste, then the County's long-term approach might be to develop a recycling processing facility that would sort the remaining fraction of recyclables from the waste disposal stream. If private recycling capacity does not continue to grow, the County may choose to consider siting its own facility.

Before making a decision to site its own "dirty" MRF, the County would need to carefully explore why private sector recycling capacity did not grow as expected. If, despite the efforts of the private sector, there is additional demand for local processing capacity (in terms of quantity of capacity or quality of services offered) and a long-term outlook for positive markets for recycled materials, the County may wish to site such a facility to serve demonstrated unmet demand for capacity. A similar examination of private sector capacity in the early 1990's spurred

Pierce County to site a yardwaste composting facility.

Besides demonstrating need, the County would need to look at other possible impediments, particularly those dealing with financing the siting and construction of such a facility.

Bond financing is the common method used to finance construction of new solid waste facilities by public entities. Historically, Pierce County utilized this method once, for the construction of the Purdy yardwaste composting facility. For a materials recovery facility, Pierce County could take the same approach, using the revenue generated by the facility (from tipping fees and commodity sales net of operating expenses) to repay bonds.

The County could consider meshing the recovery facility with the County-contracted waste disposal system. Much like was done with the yardwaste compost facility, the County could contract with Land Recovery Inc. to include operating charges for the facility within the County's waste tipping fees. It is not certain, however, whether Land Recovery Inc. would be amenable to this proposal.

Much study would be required to determine whether a tipping fee could be set sufficiently high to meet operating costs and bond requirements without exceeding the costs of other alternatives available to the haulers and the public (e.g., self-hauling recyclables to private facilities, hauling waste to facilities not part of the County's disposal system, or illegal dumping).

If such a facility were included with the County's system, the benefits (increased recycling, resource conservation, and reduced long-haul fees) would need to outweigh the costs (facility siting, construction, and operation costs, and the costs associated with changed collection practices).

**Tacoma:** The Tacoma Solid Waste Utility has been undergoing a number of evaluations of its recycling and yardwaste collection and its processing system. Most of the alternatives under review by Tacoma involve additions and modifications to the existing system which would increase production of RDF, increase extraction of recyclable materials from the disposed waste stream, and improve the BTU value of the RDF fuel for Steam Plant No. 2.

**Recycling collection/MRF:** Tacoma shifted its recycling collection system to a curbside commingled recycling collection system in 1998. This was done as a result of "pilot" collection programs tested in 1996 which were done at the direction of a 1995 evaluation report, *Refuse Utility Operations Performance Analysis; Analysis of Collection Practices and Recycling Incentives*. The new commingled approach required the purchase of new collection vehicles and containers and securing the services of a materials resource recovery facility (MRF) on a long-term basis. It is expected that moving from source-separation to commingled curbside collection of recyclables has resulted in an increased volume of recyclables directed to processing facilities. Tacoma contracts with nearby private operations for processing and sale of recycled material.

**RDF/Steam Plant:** The City is exploring opportunities to improve efficiency, capacity, and the fuel product (RDF) by increasing the efficiency and capacity of its existing resource recovery facility. The alternatives may include implementing waste separation and recovery operations or specialized MRF processes to the solid waste before it enters the existing resource recovery facility. The City may also alter or expand the hours of operation of the facility to increase capacity.

Modifications are also being explored at Steam Plant No. 2, which the Tacoma Solid Waste Utility leases from Tacoma City Light. The modifications being explored would

enable the Steam Plant to accept a wider range of RDF quality and potentially increase the volume of RDF that can be used for fuel. The modifications will also allow the use of alternative fuels processed from solid waste, such as roofing tear-off waste, CDL, and other wastes. If the modifications are successful, the City will obtain the necessary permits to operate the alternative fuels.

If upgrades to Tacoma's resource recovery facility are implemented, Tacoma may have excess capacity to process solid waste into fuel. If the capacity of the facility exceeds the amount of processible solid waste generated in Tacoma, the City may explore arrangements with the haulers and officials of nearby jurisdictions to increase the amount of solid waste brought to the Tacoma facility.

*Composting:* The City has also evaluated the current yardwaste composting market and existing facilities and is making changes in its collection methods. Tacoma used to contract for composting with a private business that is no longer in operation. The City is exploring siting a municipal composting facility or a public-private partnership, which will provide a stable, long-term outlet for its yardwaste. Should the siting of a composting facility be economically feasible, the Solid Waste Utility will pursue this option. The City also will consider the possibility of a partnership with other cities or Pierce County.

**Fort Lewis/McChord Air Force Base:** Fort Lewis and McChord Air Force Base both operate recycling centers to recover recyclable materials and remove contaminants from the waste stream before disposal and have implemented residential collection programs. McChord's aggressive approach to recycling has achieved substantial results. The Fort expanded the size and sorting capabilities of its recycling center in 1996. Outside of continuing improvements to the existing recycling centers, opportunities for additional waste processing are limited at this time.

**Private sector opportunities:** The private sector may wish to take advantage of opportunities to divert Pierce County waste away from disposal and into other processing or volume reduction facilities. Private sector entities, however, may want to examine more areas than the opportunities identified for composting and diversion of paper and CD material. How and when the local, regional, national, and international recycling markets stabilize will affect their decisions. Pierce County's central location on major transportation corridors and the local and regional public support for recycling collection make the County a prime area for locating regional processing and recycling facilities. For example, a company might want to ship mixed recyclables to Pierce County by truck or rail, and sort those materials before seaborne export.

**Joint Opportunities:** Private and public capacity for composting is under rapid change in Pierce County. New facilities are scheduled to be available by 1999 and this capacity will substantially change the costs, efficiencies, and alternatives for all three waste management systems. It is possible there will be no new need for composting facility capacity and that all jurisdictions can cost-effectively contract for, or design their yardwaste or other organics composting programs to suit the new public and private sector capacity. If the private sector capacity does not develop, the three management systems may want to consider the joint development of another composting facility.

In addition, changes to Tacoma's RDF system and Steam Plant may add or decrease disposal capacity for the Pierce County region. Until these issues are resolved, it is not clear what are the joint, cost-effective alternatives for increasing recycling processing capacity.

## 6.5 Evaluation Criteria

Table 6.6 outlines technical, economic, and environmental criteria to use to evaluate remaining waste processing alternatives. The weighting or emphasis on a particular criterion or group of criteria will vary depending on whether the proponent is a private sector applicant or the public sector.

All applications to build and operate a waste processing facility would have to comply with applicable zoning and environmental criteria mentioned both in this Plan and elsewhere. This is true of both public and private sector applications.

Other criteria listed in Table 6.6, however, pertain more to Pierce County's evaluation as to whether it should be involved in the siting or development and operation of a facility. These would be particularly pertinent if Pierce County should want to alter its system approach. Such a directional change could go from reliance upon a system which heavily emphasizes source-separation, private recycling processing capacity, and landfilling, to a system with less reliance upon source-separated recycling and more upon recovery through a mixed waste composting facility, or energy recovery from a waste-to-energy facility. For instance, before committing to construct a municipal solid waste MRF or a waste-to-energy facility, it would be prudent for the County to evaluate the commercial feasibility of the technology, the planned facility's compatibility to the existing and planned waste reduction and recycling programs, and the County's access to feedstock.

A private sector applicant, however, may be willing to take a risk with an as yet unproven technology, or may choose to risk competing for recyclables on the open market. With regard to private sector proposals, the criteria in Table 6.6 are meant to be descriptive rather than prescriptive.

**Flow control:** One issue that is particularly important for municipalities to consider in

deciding whether or not to add waste processing facilities to management systems is the facilities' relatively large capital cost. These costs are typically financed by municipal bonds. If revenues to cover the financed costs are generated from tipping fees, then having an assured waste stream is critical. If revenues from the sale of a processed commodity (e.g. finished compost to market or a processed recyclable commodity to a consolidator or end-user) are anticipated to repay the bonds, then having a dedicated, high-quality feedstock is important. Decisions that have been handed down by the United States Supreme Court affect a municipality's ability to control the flow of waste stream materials and recyclables as discussed below.

*Flow control as it pertains to mixed waste (garbage):* In the past, municipal governments have been able to assure that waste streams went to specific processing or disposal facilities, guaranteeing the government a way to collect fees on that waste. The U.S. Supreme Court has held this type of "flow control" to be an unconstitutional infringement on the "dormant Commerce Clause" of the U.S. Constitution. Thus far, local waste haulers in Pierce County have not challenged the ability of the County to direct the flow of waste materials. Given the Court's decisions (*C.A. Carbone vs. Town of Clarkstown, NY*), however, public financing of waste processing facilities has become riskier. Federal Appeals courts on the East Coast, however, have mitigated the *Carbone* decision somewhat. (See Chapter 5 or discussion of U.S. Second Circuit Court of Appeal decision.) The Supreme Court has declined to review subsequent appeals of those decisions.

Flow control issues could affect the County's ability to finance waste separation and recovery facilities ("dirty" MRFs), specialized MRFs, or WTE facilities, unless adding the MRF or WTE facility to the waste management system reduced overall waste

management costs and added significant value to processed recyclables.

Even without a court or congressional fix, there are things a municipality can do to maintain some control of the waste stream:

- Provide the least expensive disposal system so that markets dictate waste flow.
- Design facilities to reduce system costs and/or increase market value of recyclables.
- Enter into voluntary agreements with waste haulers, other municipalities, and large waste generators.

As explained in Chapter 5, cities and towns that contract for waste collection, or Tacoma and Ruston, which have their own collection utilities, have more control over the waste stream than the County. They could use their ability to flow control the waste to a facility, thus guaranteeing a way to collect fees and finance the cost of a facility.

*Flow control as it pertains to recyclables:* In the past, municipal governments outside of Pierce County have entered into agreements to take ownership of collected recyclable materials or have directed those materials to specific recycling centers. This assisted local government collection of revenues that were often used to offset collection charges. As was the case with waste, the U.S. Supreme Court has held this type of flow control to be an unconstitutional infringement on the “dormant Commerce Clause” of the U.S. Constitution. Decisions in court cases about the flow control of recyclables are unclear. Pierce County does not direct the flow of recyclables, but would have to consider the latest decisions, if it decided to build facilities to process recyclables, yardwaste, or foodwaste. A prohibition on recycling flow control would affect the County’s ability to finance recycling processing or composting facilities unless adding facilities to the waste management system reduced overall waste

management costs and added significant value to processed recyclables.

In addition to the Federal court prohibition on the local government flow control of recyclables, Washington State prohibits County governments from regulating the collection of recyclable materials generated by non-residential sources. Without regulatory oversight, it would be very difficult for the County to identify, let alone control, where recyclables were collected and processed.

Because Tacoma can control where waste is taken, the City has the ability to develop and finance additional facilities to separate recyclables from the waste stream. As explained in Chapter 5, cities can not flow control the collection of commercial recyclables.

Both Fort Lewis and McChord AFB have complete control over their entire waste streams, both garbage and recyclables, and their financing of facilities is not dependent on waste tipping fees or for the base to become the lowest-cost provider in order to attract waste or recyclables.

<b>Table 6.6 Evaluation Criteria – Solid Waste Processing Facilities</b>	
<b>Criteria</b>	<b>Related Questions and Issues</b>
<b>Technical Criteria</b>	
1. Commercially proven technology	<ul style="list-style-type: none"> <li>▪ Has the same technology been successfully employed in commercial operation for at least 5 years?</li> <li>▪ Has a facility of similar size been successfully operated?</li> <li>▪ What has been the record of success and failure?</li> </ul>
2. Compatibility with existing and planned waste reduction and recycling programs	<ul style="list-style-type: none"> <li>▪ Would such a facility compliment or compete with source-separated waste reduction and recycling programs?</li> <li>▪ What special provisions for collection would be required?</li> </ul>
3. Compatibility with disposal system	<ul style="list-style-type: none"> <li>▪ Could such a facility be implemented with either an in-county landfill or waste-export based disposal system?</li> <li>▪ Would there be specific implementation issues related to waste export?</li> </ul>
4. Effectiveness/Reliability	<ul style="list-style-type: none"> <li>▪ What is the diversion potential?</li> <li>▪ How frequently would the facility be off-line or operating under capacity?</li> </ul>
<b>Environmental Criteria</b>	
1. Water	<ul style="list-style-type: none"> <li>▪ What is the potential for leachate to be generated at such a facility?</li> <li>▪ How would run-off, run-on, and stormwater be handled?</li> <li>▪ How much process water is required?</li> </ul>
2. Earth	<ul style="list-style-type: none"> <li>▪ How much clearing is required?</li> </ul>
3. Air	<ul style="list-style-type: none"> <li>▪ What types of air pollutants would be generated? How effective are typical control technologies?</li> <li>▪ What is the potential for off-site odor impacts? How effective/expensive would odor controls be to implement?</li> <li>▪ How would the haul distance impact air pollution?</li> </ul>
4. Land use	<ul style="list-style-type: none"> <li>▪ How noisy would such a facility be?</li> <li>▪ What are the relevant zoning/comprehensive plan requirements?</li> <li>▪ Can aesthetic impacts be identified?</li> <li>▪ What are the transportation needs and impacts?</li> </ul>
5. Processing residue	<ul style="list-style-type: none"> <li>▪ What residues would there be? What facilities are available to handle specific residues?</li> <li>▪ What environmental issues are related to disposal/reuse of these residues?</li> </ul>
<b>Economic Criteria</b>	
1. Life-cycle Cost	<ul style="list-style-type: none"> <li>▪ What is the cost per ton and how does it compare to disposal costs per ton?</li> </ul>
2. Financial Risks	<ul style="list-style-type: none"> <li>▪ How capital-intensive would the facility be?</li> <li>▪ How likely is it that competing facilities would draw waste away from the processing facility?</li> <li>▪ How does market stability affect the facility?</li> <li>▪ For publicly procured facilities, what waste stream guarantees, if any,</li> </ul>

	can be made?
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**Table 6.7 Overview of Pierce County Processing Facility Alternatives**

Alternative	Technical Criteria	Environmental Criteria	Economic Criteria
<p><b>1A Centralized Self-haul CDL Recovery</b> - “Dump and Pick” operation.</p>	<ul style="list-style-type: none"> <li>▪ Commercially proven – yes</li> <li>▪ Compatibility with waste reduction and recycling programs – yes, but may compete with existing and future private sector facilities. A contract with private businesses to take the separated material may resolve the competition issue.</li> <li>▪ Compatibility with disposal system – would be compatible with either an in-county landfill or waste-export disposal system. Implementation should follow disposal decision.</li> <li>▪ Effectiveness/reliability - very reliable because there is little reliance on mechanical equipment that is prone to break down. Such a system could be expected to reduce self-haul disposal waste about 20%.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water – some water may be required for dust control. Low potential for leachate.</li> <li>▪ Earth – Relatively little additional area required if developed as an integrated facility with either a landfill or transfer station.</li> <li>▪ Air – dust and loader exhaust would be controllable by misting and ventilation systems.</li> <li>▪ Land use – noise similar to transfer station noise. Crushing/grinding operations could be noisier. If stand-alone facility, it is considered a Recycling Processing Facility for land use permitting purposes. Otherwise, it can be part of a transfer station.</li> <li>▪ Traffic – little, if any, incremental traffic impact expected since self-haul material would be delivered to landfill or transfer station anyway.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Life-cycle cost = \$35 - \$55 /ton</li> <li>▪ Financial risks:               <ul style="list-style-type: none"> <li>- Capital costs for covered area and loaders. Would be higher if located at a transfer station that required a fully enclosed facility.</li> <li>- For a County-owned facility, there would be some competition from private facilities. Extent of use would likely be very price sensitive.</li> </ul> </li> </ul>

**Table 6.7 Overview of Pierce County Processing Facility Alternatives**

Alternative	Technical Criteria	Environmental Criteria	Economic Criteria
<p><b>1B Centralized Self-Haul CDL Recovery – Mechanized Operation</b></p>	<ul style="list-style-type: none"> <li>▪ Commercially proven – yes</li> <li>▪ Compatibility with waste reduction and recycling programs – yes, but may compete with existing and future private sector facilities.</li> <li>▪ Compatibility with disposal system - either an in-county landfill or out-of-county disposal system. Implementation should follow disposal decision.</li> <li>▪ Effectiveness/reliability – reliable, but mechanical equipment can break down. Such a system could be expected to reduce the self-haul disposal waste stream by 25 – 40 percent.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water – some water may be required for dust control. Low potential for leachate.</li> <li>▪ Earth – Approximately 2 to 5 acres required if developed as an integrated facility with either a landfill or central transfer station.</li> <li>▪ Air – dust and loader exhaust, controllable by misting and ventilation.</li> <li>▪ Land use – noise similar to transfer station noise. Crushing/grinding operations could be noisier. If stand-alone facility, it is considered a Recycling Processing Facility for land use permitting purposes. Otherwise, it can be part of a transfer station.</li> <li>▪ Traffic – little, if any, incremental traffic impact expected since self-haul material would be delivered to landfill or transfer station anyway.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Life-cycle costs = \$80 - \$150/ton</li> <li>▪ Financial risks:               <ul style="list-style-type: none"> <li>- Capital costs for enclosed facility and equipment higher than Alternative 1A.</li> <li>- For a County-owned facility, there would be some competition from private facilities. Extent of use would likely be very price sensitive.</li> </ul> </li> </ul>
<p><b>1C Retrofit transfer stations with storage bays or drop-off containers for source-separation of CD materials by self-haulers.</b></p>	<ul style="list-style-type: none"> <li>▪ Simple, established process.</li> <li>▪ Compatible with waste reduction and recycling programs and source-separation approach.</li> <li>▪ Compatible with any disposal system- either an in-county landfill or out-of-county disposal.</li> <li>▪ Effectiveness depends upon willingness of self-haulers to separate materials. No mechanical equipment to break down.</li> </ul>	<ul style="list-style-type: none"> <li>▪ No processing would occur on site, thus no effects on water, air, or noise.</li> <li>▪ Traffic – little, if any incremental traffic impact expected since self-haul material would be delivered to landfill or transfer station anyway.</li> <li>▪ Minimal land use space needed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Can be funded within existing operation costs.</li> <li>▪ Value of materials for re-use may increase over time.</li> <li>▪ Capital investment minimal.</li> </ul>

<b>Table 6.7 Overview of Pierce County Processing Facility Alternatives</b>			
<b>Alternative</b>	<b>Technical Criteria</b>	<b>Environmental Criteria</b>	<b>Economic Criteria</b>
<b>2A Foodwaste Composting</b> (commercial scale)	<ul style="list-style-type: none"> <li>▪ Commercially proven – moderate operating expense, not widely used.</li> <li>▪ Compatibility with waste reduction and recycling programs - would compliment programs since they do not target foodwaste.</li> <li>▪ Compatibility with disposal system - compatible with either a landfill or waste export based system; would reduce some problems (i.e., odor, liquids) associated with long-haul transportation.</li> <li>▪ Effectiveness/reliability – unknown.</li> <li>▪ Private capacity already available in Pierce County.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water – for a new facility, some water may be required for processing. Leachate control required.</li> <li>▪ Earth – approximately 9 to 30 acres required (for a facility with a capacity of 75,000 tons per year).</li> <li>▪ Air – dust and equipment exhaust, controllable by ventilation. Odor impacts could be substantial and could require an enclosed facility.</li> <li>▪ Land use – potential for off-site odors would be primary facility siting issue. Odor and leakage from collection vehicles could be an issue en route to the facility.</li> <li>▪ Traffic – additional collection traffic if separate vehicles/pickup schedules required.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Life-cycle costs = \$25 to \$67/ton</li> <li>▪ Capital investment required for covered and/or enclosed facility and additional collection fleet.</li> <li>▪ Financial risks: <ul style="list-style-type: none"> <li>- County could not guarantee waste stream (commercial stream) to privatized facility.</li> </ul> </li> </ul>
<b>2B Small-Scale In-Vessel Composting</b> (as accessory to feedstock generator such as an industrial business or institution)	<ul style="list-style-type: none"> <li>▪ Commercially proven – mostly limited to pilot programs.</li> <li>▪ Compatibility with waste reduction and recycling programs – would compliment existing programs and could serve institutions and others in the private sector at the point of generation.</li> <li>▪ Compatibility with disposal system - would reduce some problems (i.e., odor, collection) and would divert compostable waste from the disposal stream, especially in locations without large-scale composting facilities.</li> <li>▪ Effectiveness/reliability – unknown.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water – potential for leachate production depending on feedstock.</li> <li>▪ Earth – relatively little area require, completely contained on site of feedstock source.</li> <li>▪ Air – minimal equipment exhaust or dust.</li> <li>▪ Land use – noise and odor significantly less than large-scale facilities.</li> <li>▪ Traffic – none expected.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Life cycle cost = unknown. On a per ton cost it will likely be more costly than a large-scale facility. But cost would be born directly be generator.</li> <li>▪ Financial risks: <ul style="list-style-type: none"> <li>- Limited and isolated to the individual user.</li> <li>- Waste stream would be guaranteed since composting occurs at the point of generation.</li> </ul> </li> </ul>

<b>Table 6.7 Overview of Pierce County Processing Facility Alternatives</b>			
<b>Alternative</b>	<b>Technical Criteria</b>	<b>Environmental Criteria</b>	<b>Economic Criteria</b>
<b>3 County-owned Waste Separation and Recovery Facility (“dirty” MRF) to sort remaining fraction of recyclables from disposed waste stream.</b>	<ul style="list-style-type: none"> <li>▪ Proven technology.</li> <li>▪ Would have to be sited with a transfer station or landfill.</li> <li>▪ Compatible with existing source-separation WRR programs if designed to sort remaining fraction of recyclables from waste disposal stream.</li> <li>▪ Flexible to adapt to changed market conditions.</li> <li>▪ Technically compatible with any disposal choice.</li> <li>▪ Capacity only limited to size, hours, and equipment.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water – Low potential for leachate within enclosed facility.</li> <li>▪ Earth – Approximately 2-5 acres required if developed with as an integrated facility with a landfill or transfer station.</li> <li>▪ Air – Dust and loader exhaust, controllable by misting and ventilation.</li> <li>▪ Land Use – Noise similar to transfer station noise.</li> <li>▪ Traffic – Little, if any incremental traffic impact expected if sited at existing transfer facilities.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Life cycle costs = \$40 to \$60 per ton.</li> <li>▪ Financial risks: <ul style="list-style-type: none"> <li>- Capital and operating costs for enclosed facility would need to be funded by tipping fee which might exceed the cost of other private alternatives</li> </ul> </li> </ul>

## 6.6 Recommendations

### *Reduce disposal*

- #6-1 Reduce the amount of solid waste for disposal using solid waste processing technologies that are protective of human health and the environment.

### *Processing facilities for paper, yardwaste, CD, foodwaste, and plastics*

- #6-2 Encourage safe and effective in-county recycling processing systems and new materials processing technologies for recyclable waste components that are found in significant quantities in the waste stream, such as paper, yardwaste, CD, foodwaste, and plastics.

### *Reserve processing capacity*

- #6-3 Pierce County encourages private recycling, composting, and processing facility operators located within Pierce County to reserve processing capacity for materials generated within Pierce County.

### *Alternative technologies*

- #6-4 Pierce County should maintain its understanding of the characteristics and limitations of existing and new technologies and all available alternatives to in-county landfills for consideration in the implementation of the County's solid waste management system. The County should pursue those technologies and alternatives that can be effective in enhancing the existing waste reduction and recycling programs.
- #6-5 Only those technologies with demonstrated reliability should be implemented as primary processing alternatives of the solid waste management system. However, governments and the private sector may wish to conduct pilot programs and explore new and innovative ideas. The appropriate regulatory agencies shall determine whether or not any potential technology meets the requirements of this Plan.
- #6-6 Only processing technologies that are protective of human health and the environment (for example those that create no adverse odor impacts to neighboring properties) should be deemed to be in compliance with the Solid Waste Management Plan. As new processing technologies emerge, the environmental and health impacts should be carefully considered.
- #6-7 Encourage processing technologies that make fiscal and environmental sense.

### *Financial assurances*

- #6-8 With any alternative technology project, the operating vendor must provide sufficient financial assurances to minimize financial risk to the public for environmental and technical performance. Each city, town, and the County Council will independently determine the level of financial and environmental assurances that will be required for projects under their own jurisdiction.
- #6-9 The Tacoma-Pierce County Health Department should evaluate the need for requiring financial assurance for some permitted solid waste recycling facilities.

*Regulatory consistency and standards*

**#6-10** Work with other regulatory agencies to strive for consistency.

**#6-11** The Tacoma-Pierce County Health Department, in conjunction with Pierce County and municipalities, should encourage and participate in the process to revise Chapter 173-304 WAC, the Minimum Functional Standards for Solid Waste Handling. Should the revisions not adequately address local public health and safety issues, the need to adopt more stringent local regulations should be considered. These issues include, but are not limited to, odor, air, and water impacts, and by-product quality.

The planning process identified the following examples of regulations that may be considered:

- In order to minimize air impacts, composting of organic wastes should be accomplished through controlled aerobic decomposition methods.
- Odorous organic waste feedstocks or feedstock mixtures should be processed and/or composted with effective enclosure and odor controls. Permit conditions should include progressive odor management plans – which require significant and prompt changes in feedstocks, and improvement in management and facilities – to remediate odorous conditions to result in no adverse impacts on the environment and neighboring properties.
- Composting of organic waste should require control and treatment of liquid wastes so as to avoid any surface or ground water impacts.
- Prior to their use by the public, the Tacoma-Pierce County Health Department should review (and approve as appropriate) the probable health impacts of products and by-products generated by a permitted solid waste handling facility.

*Notification of landowners*

**#6-12** When an applicant applies for a Solid Waste Permit, the Tacoma-Pierce County Health Department shall notify the property owner(s) and verify that the owners understand they will be responsible for clean-up of any waste left by any solid waste facility or activity on their property.

**Tacoma Recommendations**

*Composting*

**#6-13** Tacoma may continue its evaluation of organic waste processing or composting needs. Should a new facility become feasible with Tacoma's evaluation, Tacoma may choose to proceed with the development of the new facility in accordance with applicable regulations and policies.

*Steam Plant*

**#6-14** Tacoma Steam Plant No. 2 may continue to operate under the existing solid waste permit. Tacoma Power or any other entity that owns or leases the facility shall continue to operate the facility in accordance with all applicable regulations and permits. The owners or operators of the facility may investigate and implement the use of alternative fuels and/ or other improvements that would increase the efficiency and viability of the operation.

*Resource Recovery Facility*

**#6-15** Tacoma's existing Resource Recovery Facility may continue operation at the Tacoma site. To continue operations, the owners or operators of the Tacoma Resource Recovery Facility

may need to expand or improve the facility to increase capacity and take advantage of alternative fuels. Should the Steam Plant facility close, Tacoma could explore the use of the Resource Recovery operation to extract other recyclable or usable materials.