Grant County Public Works

Feasibility Study
For an
Organic Waste Recycling Program
In
Grant County

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1. INTRODUCTION

1.1 PURPOSE

The objective of this study is to determine the feasibility of Grant County developing an organic waste recycling program for the purpose of reducing the amount of waste entering the Grant County Landfill and in turn, providing this discarded waste as a feedstock for a privately operated compost facility to be transformed into a useful product.

1.2 PROJECT DESCRIPTION

In determining the feasibility of establishing a county-wide organic waste recycling program a number of issues will be addressed.

- Regulatory requirements
- Waste stream analysis
- Material collection needs and methods
- Review of compost technologies
- Compost uses
- Public Education
- Economic analysis
- Recommendations

Grant County has chosen not to own and operate its own compost facility. Because of this decision, the overall approach of this feasibility study will be significantly different from studies of this type conducted previously. Most organic waste feasibility studies examine the costs associated with the diversion and composting of the organic portion of the waste stream at a compost facility owned and operated by the local government. Most of the effort of those studies is spent determining whether or not, the fees charged for collection of the organic wastes and the income from sale of the finished compost will be sufficient to cover all the expenses associated with the project. This study will not examine the costs associated with construction and operation of a compost facility. Instead, the focus of this study will be whether or not Grant County can provide the correct type of organic resources in sufficient quantity to a private composting facility through a program that will be acceptable to the County's citizens. This decision is based on the philosophy that a privately owned compost operation would provide a greater benefit to the County than a locally governed facility.

2. REGULATORY REQUIREMENTS

2.1 COMPOST REGULATIONS

The majority of the regulations of concern with this study relate to the Washington Department of Ecology (DOE) Composting Facility Standards found in WAC 173-350-220. With Grant County choosing to promote the private ownership of the compost facility, these regulations do not have direct application to this study. It will be the responsibility of the individual(s) building and operating the composting facility to become knowledgeable of and conform to the various regulations and requirements of these and any other regulations governing compost operations. Grant County will still have a responsibility under this WAC but as a regulator. It is important however, that Grant County has a solid understanding of the basic responsibilities compost facility owner(s)/operators will have under the WAC regulations.

The DOE has prepared a "Checklist for Review of Solid Waste Permit Application" for installation of a compost facility. This checklist, a copy of which can be found in Appendix A of this study, outlines clearly all of the regulations that must be met by compost facility owners/operators. Each regulation is linked to the WAC that must be adhered to. Among the requirements are the following:

- Obtain solid waste permit from the Grant County Health Department;
- Protect surface and ground waters through use of Best Management Practices;
- Control dust and nuisance odors;
- Manage the operation to prevent attraction of flies, rodents, and other vectors;
- Perform an annual analysis of composted materials;
- Submit an annual report to the Grant County Health Department;
- Construct a method for separating storm water from leachate and provide adequate storage for leachate;
- Facilities shall be designed to promote an aerobic composting process;
- Document pathogen reduction activities;
- Operate according to approved plan of operations submitted with permit application; and
- Have a closure plan that has been approved by the Grant County Health District.

The Grant County Health Department will have primary responsibility for permitting any composting facility within the County. Location of the specific site the composting facility will be built upon must meet the requirements of WAC 173-350-040, which calls for protection of human health and the environment, protection of surface and groundwater, conformity to the local County solid waste plan, and not allow violation of any emission standards.

If Grant County chooses to promote yard waste and/or food waste separation and collection, the requirements listed in WAC 173-350-220 (4) (e) will need to be considered because of the responsibility that will be required. The County and municipalities that choose to participate will need to work in partnership with the compost facility operator to meet the regulations under this part of the WAC. The standards addressed in this section require:

a) Listing feedstocks to be composted as well as their source,
b) Describing the acceptance criteria that will be applied to the feedstocks,
c) Procedures for ensuring only the waste described will be accepted, and
d) Outlining what procedures will be followed for handling unacceptable wastes.

According to RCW 70.95.010, the primary responsibility for solid waste management in Washington State rests with the county and city governments. Along with this responsibility comes the task of developing the most appropriate methods for local waste reduction and recycling. Each county and its municipalities are charged with the following priorities for collection, handling, and management of the solid waste generated within its jurisdiction:

(a) Waste reduction;
(b) Recycling, with source separation of recyclable materials as the preferred method;
(c) Energy recovery, incineration, or landfill of separated waste;
(d) Energy recovery, incineration, or landfill of mixed municipal solid wastes.
(e) It is the state's goal to achieve a 50 % recycling rate by 2007.
(f) It is the state's goal that programs be established to eliminate residential or commercial yard debris in landfills by 2012 in those areas where alternatives to disposal are readily available and effective.

As the compost industry in Washington State has grown through the years, the DOE has made an effort to design regulations that promote well defined quality standards. These standards will provide a more reliable product and establish guidelines that will promote more consistency in Washington State's compost industry. The DOE has defined composting in WAC 173-304-100 (14) as, *"…the controlled degradation of organic solid waste yielding a product for use as a soil conditioner."* A clear definition of exactly what compost is has also been endorsed by DOE. It says, *"Compost shall be a well-decomposed, humus like material derived from the aerobic decomposition of organic plant matter. The compost shall have an earthy odor, shall be free of viable weed seeds and other plant propagules (except airborne weed species – weed seed test sample must be taken from the center of the pile), and shall have a moisture content that has no visible free water or dust produced when handling the material."*

3. WASTE STREAM ANALYSIS

3.1 PURPOSE OF WASTE STREAM ANALYSIS

One of the key factors of a successful countywide organics recycling program in Grant County is the construction and operation of a large composting facility. Like any facility that produces goods for sale, the raw products used to manufacture these goods must be available and affordable. Municipal solid waste (MSW) is projected to be a source for much of the raw product that will be utilized by this compost operation. Since it will only be the organic portion of the MSW that can be composted, it is necessary to analyze the total waste stream to determine what portion is organic and how much raw product could potentially be available to the composting facility. The organic portion of the waste stream that is usually considered for composting is yard trimmings (lawn clippings, leaves, weeds, tree, and brush trimmings), food waste (fruits, vegetables, dairy products, grains, eggshells, and meats), and some paper waste (low-grade paper, coffee filters, unbleached paper napkins, and food soiled paper products). If the waste stream analysis shows sufficient supply of raw product, then methods of acquisition and delivery to the compost facility as well as the economics of doing so can then be examined.

3.2 NATIONAL WASTE STREAM ANALYSIS

Numerous waste streams have been investigated throughout the country to determine their makeup. The United States Environmental Protection Agency (EPA) has conducted waste characterization studies for a number of years. In 1995, an EPA study determined that out of the 209.7 million tons of MSW in the United States, organic wastes registered 141 million tons or 67 % of the total national waste stream. The major categories of this organic waste consisted of newspaper, high grade office paper, corrugated cardboard, yard trimmings, food scraps, and low grade paper. A Cornell University study showed similar results with 60 – 70 % of the waste stream made up of organic wastes.

Although any organic material could be composted, the philosophy for most recycling programs is to reclaim products to their highest and most valuable use possible. For some organic wastes this could be uses other than compost, i.e. recycled newsprint, high grade office paper, and corrugated cardboard. Diverting this portion of the organic waste stream to these higher uses typically leaves 30% or more of the waste stream suitable for composting. The 1995 EPA analysis determined the organic portion of the national waste stream that could be considered for composting consisted of 74.7 million tons, or 36% of the total waste stream. The Cornell study similarly determined over 30% of the waste stream was suitable for composting.

3.3 WASHINGTON STATE WASTE STREAM ANALYSIS

The DOE has primary responsibility to manage solid waste within the state. In their efforts to accomplish this task DOE has been involved in numerous waste characterization studies throughout Washington. These different studies have determined that about 30% of all waste disposed of in landfills in Washington is organic waste. This value may even be somewhat low when compared to the numbers published in other studies. One study of Seattle's waste stream mentioned in the monthly compost and organics recycling magazine BioCycle, in July of 2005, stated that approximately "30% of residential trash is food and soiled paper." This value did not account for yard waste which typically makes up another 12 – 15%. Another study conducted by Cascadia Consulting Group and Ross & Associates for DOE showed approximately 40% of the residential waste stream was from organics and that organics made up 30 – 40% of the commercial waste stream. This was a compilation of values from a number of different waste composition studies conducted in Seattle and 5 different Western Washington counties.

The percentage of compostable organics in Washington State's waste stream appears to be consistent with the values found in the national studies. As a general rule 30 – 40% of most MSW streams are made up of organic waste suitable for composting.

3.4 GRANT COUNTY WASTE STREAM ANALYSIS

Conducting a waste stream analysis is expensive. An alternative is estimating the volume of these organic wastes using simple calculations based on national averages and local population figures. An EPA study in 1990 determined that the national average for yard trimmings production per person was 280 pounds and the average for food waste production was 105 pounds. Applying these numbers to Grant County is shown in table 3-1.

Table 3-1 Estimated Organic Waste Production for Grant County

Organic Waste	Pounds/Person	Population[1]	Tons
Yard Trimmings	280	74,700	10,458
Food	105	74,700	3,922
		Total	14,380

[1]Source: U.S. Census Bureau, Census 2000.

Using these numbers based on national averages must be done so with caution. The amount of yard trimmings actually produced on a local basis will be affected by seasonal fluctuations, annual rainfall, temperature ranges, and regional lawn maintenance and landscaping practices. Of these factors, the climate in Grant County would have the most affect upon the overall total of organic waste production. The total tonnage calculated in Table 3-1 would probably be reduced due to the lack of need for yard care during the winter months. The low rainfall is not a factor since yards and lawns are irrigated. And, the lawn maintenance and landscaping practices would be typical of the U. S. average.

Another regional factor to consider if Table 3-1 is used to estimate the volume of organics in the waste stream is the rural nature of Grant County. Washington State's Department of Ecology projected 48% of the County's population lived in unincorporated Grant County. This is significant because of the difference in management of yard wastes by rural residents versus those living in the municipalities. This different management style could reduce the volume of yard waste ending up in the landfill. Most rural residents dispose of yard trimmings on site. They have plenty of space surrounding their yards and do not need to be as concerned about offending neighbors. The citizens in town have much smaller lots, and because of proximity to neighbors, most will place their yard waste in the MSW container to be picked up and hauled to the landfill. Because of this difference in yard waste management, the total tonnage of yard waste estimated in Table 3-1 could be reduced by as much as 48%, to 6,902 tons; yielding a total projected tonnage for yard and food waste of 10,824.

In 2002, the Grant County landfill was selected by DOE to perform a rural waste characterization. This study was conducted by Cascadia Consulting Group, Inc. in cooperation with Green Solutions, Inc. and found the local waste stream to consist of approximately the same components and percentages as has been found throughout the United States as well as elsewhere in Washington State. Table 3-2 shows the potential compostable components of the Grant County waste stream and is an adaptation of a similar table in the DOE study.

Table 3-2 Organic Waste Stream Components of Grant County Landfill in 2002

Organic Component	Mean	Cum. %	Tons
Food Waste	17.3%	17.3%	13,406
Yard, Garden & Prunings	5.2%	22.5%	4,014
Compostable Paper	4.3%	26.8%	3,307
Dimensional Lumber	5.1%	31.9%	3,956
Mixed/Low-grade Paper	4.3%	36.2%	3,358
Cardboard	3.8%	40.0%	2,979
Total	**40.0%**		**31,020**

This characterization study showed that of the 77,500 tons of waste delivered in 2002 to the Grant County landfill near Ephrata, 31,020 tons or 40% of the total waste stream could have potentially been diverted for composting.

It is the philosophy of most waste reduction and recycling programs, that the components that are recycled should be reprocessed to a form that would produce their best and highest value. Newspaper has its best value being recycled into new newsprint, cardboard back into cardboard, and high grade office paper into new office paper. With this in mind, some of the organic components listed in Table 3-2 could yield higher value if they were recycled back for their original usage rather than being composted. The table shows that if food waste, yard waste, compostable paper, and dimensional lumber were the primary organics selected for diversion to a compost facility, Grant County could potentially remove 24,683 tons of waste from the County landfill. This would be a reduction of 31.9% of the waste stream resulting in a potential extension of the life of the landfill by this same proportion. These organic wastes would then be available to supply a substantial amount of feedstock for a compost facility.

3.4.1 AGRICULTURE ORGANIC WASTES

Another supply of organic raw materials for a compost facility is from the agriculture industry in Grant County. The 1992 Census of Agriculture from the United States Department of Agriculture showed Grant County to have 752,487 acres of cropland with 410,552 acres being irrigated. The crops produced on these acres have the potential to yield a significant amount of organic residue highly suitable for composting.

In the waste characterization study conducted on behalf of DOE, a statewide waste generation estimate for selected rural-based industry groups was also included. Three of these rural industry groups were field crops, orchards, and vegetables. In this study the wastes generated and disposed by these industry groups were calculated from data gathered in three different areas of Washington State; Grant County being one of them. The DOE study determined the quantity of wastes generated and then categorized how they were disposed. There were three disposal categories; *landfilling*, *other disposal*, and *beneficial uses*. The data collected showed that relatively small amounts of agriculture waste are landfilled or otherwise disposed. Essentially, all ag wastes were disposed in a beneficial manner; tilling the excess crop residues back into the soil for the beneficial use that is gained from the nutrients and organic material available. The DOE has estimated that within the State of Washington field crops generate 24,000,000 tons of field wastes that are all disposed of beneficially, orchards statewide, beneficially disposed of 890,000 tons of organic wastes and that vegetable farms beneficially disposed 580,000 tons.

With over 750,000 acres of cropland in Grant County, if a portion of the leftover crop residues were made available to a composting facility, there is the potential to supply a huge volume of organic feedstocks. However, farmers recognize the value to their fields to incorporate the left over crop residues back into their soil. Disposing of ag wastes by tilling them back into the soil is not only beneficial to the farmer it is simple and easy to do. Because of that, the likelihood is probably very low that a farmer would be willing to instead harvest these residues and haul them to a compost facility where they would perhaps have to pay a tipping fee to unload them. The expense of loading crop waste on a truck and then the expense of hauling the wastes 5 to 20 miles or more and paying to unload the wastes would be prohibitive.

Due to problems that can arise in agriculture, it is still probable that some agricultural wastes would be made available to a compost facility. There are occasional circumstances that would make the option of hauling crop wastes to a nearby compost facility possible. These would be emergency need type situations; portions of a potato or onion storage becoming unmarketable and needing to be disposed of, or orchard prunings or hay bales that cannot be burned for some reason but need to be removed. These types of emergency situations could provide a substantial quantity of raw material for composting. Unfortunately, these sources of organic waste resources would be intermittent, making it difficult to estimate the quantity and timing of availability.

3.4.2 GRANT COUNTY GROWER SURVEY

As has been pointed out in the previous section, excess crop residues from the agriculture industry could potentially provide a considerable supply of organic raw material for composting. The support by agriculture for a County organic recycling and compost program would be greatly enhanced by an increased awareness by farmers of the value of compost. This increased awareness should result in a subsequent increase in the use of compost as a soil amendment. Compost application on agricultural fields has been shown to:

- Improve soil tilth
- Increase soil porosity
- Allow better root penetration
- Increase water infiltration
- Improve water holding capacity
- Reduce surface runoff
- Provide slow release of nutrients
- Suppress plant disease
- Raise soil biological activity
- Increase nutrient availability

In an attempt to determine what the level of support from the local agriculture community could be, a survey was mailed to 900 Grant County growers. Over 150 surveys were returned, approximately 17%. A copy of the survey is included in Appendix B.

The survey consisted of three sections. The first section surveyed the growers' basic knowledge of compost and what more they would like to know. Approximately 1/3 of the respondents had some knowledge of the benefits of organic soil amendments. But, 40% knew very little about compost; what it is, how it is made, and how to use it. The second section was designed to gain an understanding of the current use of organic soil amendments in the County, how farmers were utilizing organics, and how much they were paying. The primary knowledge gained from this section was many Grant County farmers are growing green manure crops to enhance their soils. Those that were practicing this had a solid understanding of the importance of building their soil's organic matter. The final section's purpose was to learn what compost specifications were the most important to them and if there would be support from the local agriculture community for a compost facility. Some of these questions were designed to answer the following: Would farmers take excess crop residues that may need to be hauled off their farms to a compost facility in the area? What would stop them from doing so and what would increase their interest in doing so? And finally, would their interest in using compost increase if they understood more about the use of compost and a compost facility producing high quality product was in the area? Of those surveys that responded to the questions dealing specifically with support for a compost facility and use of compost the following conclusions were determined:

- 72% said they would increase their use of compost if they knew more about it.
- 59% said they would be more interested in using compost if a facility was in the area.
- 57% said they would haul excess crop residues to a compost facility as long as they did not have to pay a tipping fee.
- 75% said they would haul excess crop residues to a compost facility if they received finished compost in return.

There were two very positive results from this survey. The first was the high percentage of those responding who said they would use compost if they had a better knowledge of compost. The second was the high level of interest in supporting a compost facility in the area. It would be much easier to attract a compost operator to the area if the agriculture industry in Grant County was willing to provide some of its crop wastes to a compost facility. The results of this survey indicate that kind of support is very likely.

3.4.3 CITY OF QUINCY COMPOST PROGRAM

Within Grant County there is a yard trimmings collection and compost program already operating. The numbers from Quincy's compost program could be used to determine what level of success to expect from a county-wide compost program. Many areas conduct a pilot program before instituting a full area-wide organics separation and collection program. They do this primarily for the purpose of determining public acceptance of their proposed program. Quincy's program could be regarded as a pilot project to determine how citizen's of Grant County would accept a similar program.

In 2000 the City of Quincy began a source separated yard waste recycling and compost program. This program had two purposes; 1) to reduce the volume of waste being hauled from Quincy to the County landfill, thus saving money on hauling and tipping fees, and 2) to improve the environment by turning the City's yard waste into high quality compost for landscaping and use as agriculture soil amendments.

Quincy chose to collect residents' yard waste through a source separated curbside pick-up program. Quincy mandated that no yard waste (defined as: grass and lawn cuttings, small twigs, leaves, and tree and shrub trimmings) can be placed in the MSW container. The City provided a special yard waste container at each resident's home for collection of these wastes. This mandated collection program does not rely on the motivation of a landfill ban of yard waste but instead, a "waste container ban" of yard waste.

Mandates can have a difficult time gaining public acceptance. Quincy's program does require all residents to source separate their waste but it has gained overall acceptance by allowing residents to choose what level of participation fits their lifestyle and budget best. Rather than accepting the City's yard waste container and the fee that is associated with it, they can deal with their yard waste themselves by either home composting or self-hauling their yard waste to the City's compost facility.

In a personal interview with Loren Lowry, Quincy's Public Works Director, he indicated that the City essentially had 100% acceptance of the program. Not every resident is willing to pay for a yard waste receptacle, but those who did not had assumed the responsibility of handling their organic wastes properly—either through home composting or self-hauling. Mr. Lowry also provided the following figures showing the economics of their program.

Table 3-3 City of Quincy Compost Program

Expenditures:		
Operation costs		$86,137.00
Capital costs		27,220.00
	Sub-total	$113,357.00
Income:		
Revenue from container fees		$55,560.00
Revenue from compost sales		6,000.00
	Sub-total	$61,560.00
	Net Short-fall	$51,797.00
Compost Program Savings		
Hauling fees		$48,000.00
Tipping fees		17,000.00
	Sub-total	$65,000.00
Net Savings of Program		**$13,203.00**

Even though these numbers show a shortfall of $51,797.00 it was explained that by not hauling the yard waste to the County landfill, but instead taking it to the Quincy compost facility, the City saved $65,000.00 in hauling and tipping fees. This resulted in a net savings of $13,203.00. Mr. Lowry also noted that the City has much more compost to sell and if more effort was expended to market this stockpile, additional revenues could be received.

4. MATERIAL COLLECTION NEEDS AND METHODS

4.1 ORGANIC MATERIAL COLLECTION NEEDS

Organic waste collection programs vary throughout the United States. The length of the growing season will determine the duration of the collection program and the volume of the materials produced. Some programs can operate year round while others are seasonal. An area that produces yard waste seasonally should only need a seasonal collection program.

The existing solid waste collection system in an area can sometimes be built upon to establish an organic waste collection service. Utilization of existing equipment can ease the burden of investing in new equipment to accomplish the collection of the source separated organics. Most collection programs use either a drop box system or else a curbside collection program.

The type of collection service that is established must consider not only what will be accepted by the public but also, what size of compost facility the County wants to promote. If only yard waste is selected for collection, it would be doubtful that an annual supply of just over 4,000 tons of raw product would be sufficient to attract a private firm to establish a compost facility in the area. The 13,406 tons of food waste currently going into the County landfill would provide a much greater amount of feedstock and be a more feasible volume for attracting a compost business. But, combining the two types of waste as well as any applicable paper wastes would provide an even greater incentive. It would be much more desirable for a private firm to locate a compost facility in the County knowing they could have access to 25,000 tons of organic waste resources.

Once the type of waste has been selected for collection, the level of collection service to obtain these wastes must be determined. Collection of organic wastes is a key element for the success of a county-wide organics recycling and composting program. A successful collection program must be convenient, acceptable, affordable, and effective.

4.1.1 YARDWASTE BAN

Many areas around the United States have banned yard trimmings from their local landfills. As of 1998, 24 states and the District of Columbia, representing 52 percent of the nation's population had legislated bans of yard trimmings in their landfills. These bans generated an increase of organic resources for composting and have resulted in over 3,500 operating compost programs in the United States.

The requirements for the collection services that will be offered will be determined by whether or not the County chooses to ban organic wastes from the County landfill. Banning the public from delivering their organic wastes to the landfill will not be successful without a viable alternative. If the County decided not to allow organics in the landfill, this action would need to take place in conjunction with the opening of a compost facility. If yard waste and other organics are banned from the landfill and a compost facility capable of handling the volume of organic wastes being diverted is operating in the county, the ban could be effective and successful. Other areas that have instituted this type of landfill ban have realized reductions of yard trimmings in their landfills of 80 – 95% of their pre-ban amounts.

To increase the probability of success, the County must commit itself to establishing an effective education program. The collection program that will be established as a result of the yard waste ban will require the citizens of Grant County to source separate their MSW. They will need to understand the advantages of composting these wastes rather than disposing of them in the landfill. They will also need a clear understanding of what products should be composted. Most compost programs have found that a high quality education program usually results in high quality compost. The key is effectively informing the public why they are separating their trash and what they should place in their organics bin and what they should not.

4.1.2 NO YARDWASTE BAN

Grant County could choose to promote composting of organic wastes without instituting a ban of these materials from the landfill. There have been areas that have chosen to develop their organic recycling and compost program without a landfill ban and have still been successful. Rather than a ban, these communities have established high diversion targets, and have committed a large amount of funding towards public education in an effort to commit the public to change their behavior. These type of programs focus on teaching the public the environmental and economic importance of removing these wastes from the landfill and creating a product of value in the marketplace. They do not give compost away free to their constituents. Instead, they demonstrate its worth in the marketplace through sales, education, and marketing promotions. These programs can be successful, but they take more time to realize a change in behavior and resulting decrease of organics in the landfill.

It would be advantageous politically, as a County decision maker, not to mandate a landfill ban. The great disadvantage of not doing so however, is the inability of the County to offer a private compost facility an assurance of receiving a guaranteed volume of raw product. A compost facility that could handle 25,000 tons per year of yard waste and food waste would mean an investment of $500,000 - $1,000,000. Anyone investing in this size of compost facility is probably not going to risk that amount of money without a solid commitment for obtaining the raw materials needed to produce his product. With participation in a composting program voluntary, it would be difficult to predict the volume of organic waste that residents would divert to a compost facility. It could be sufficient enough over time, as the education effort proceeded, but it would be difficult to forecast how much time it would take.

4.2 ORGANIC MATERIAL COLLECTION METHODS

Organic waste collection is accomplished either through a curbside set-out service or a drop-off program. Methods for each can vary depending on the types of materials that are selected for collection as well as the length of the growing season. Because yard trimmings are not generated year round in Grant County a collection program would only need to operate during the growing season. Convenience and level of acceptance by the public will be the two driving forces to a successful method of collection.

Most communities that have developed successful compost programs have initiated an adaptable program. However, adaptation that requires changes in equipment can be expensive. A successful program must gain an understanding of what the public will accept before the program is implemented.

4.2.1 DROP BOXES

If an organics landfill ban is established in an area, residents may support a drop box method of collection if it means not paying any more for their MSW collection. The drop box method of organic waste collection has been found to work successfully in small communities. Residents who can conveniently haul their yard clippings and other organic wastes to a nearby drop box will participate at levels similar to curb-side collection systems. Some of the smaller communities in Grant County could probably have success with a drop box conveniently located within their community. This option offers residents the choice to save on their collection fees while at the same time obeying the landfill ban.

Table 4-1 Grant County Drop Box Sites

Site	Location	Day Operating	Hours Operating
Hartline	42 & R NE	Tues., Sat.	9 am – 12:30 pm
Coulee City	South City Limits	Tues., Fri., Sat.	1 pm – 5 pm
Hwy 28	Hwy 28 @ S NE	Mon., Sat.	9 am – 12:30 pm
Alkali	Hwy 17 & 31 NE	Mon., Wed., Sat.	9 am – 12:30 pm
Warden	U & 7.5 SE	Wed., Sat.	1 pm – 5 pm
Royal City	E & 14 SW	Mon., Wed., Sat.	1 pm – 5 pm
O'Sullivan	G & 8 SE	Mon., Wed., Sat.	9 am – 12:15 pm
Gloyd	Stratford & 9.5 NE	Tues., Thurs., Sat.	1 pm – 5 pm 9 am – 6 pm
Quincy	U & 10.5 NW	Mon., Thurs., Sat.	1 pm – 5 pm 9 am – 5 pm
George	1 & R NW	Fri., Sat.	1 pm – 5 pm
Beverly	Bev.-Burk & 16 SW	Fri., Sat.	1 pm – 5 pm
Mattawa	Hwy 243 & 26 SW	Mon., Wed., Sat.	9 am – 1 pm 9 am – 12:30 pm

Grant County already has 12 drop box sites (Table 4-1) throughout the County and implementing this type of collection service would be logistically simple and relatively inexpensive. The problem with only utilizing this method for collection would be with the larger municipalities in the County. Very few residents in Moses Lake, Quincy, or Ephrata are currently hauling their wastes to a drop box and may have a difficult time adapting to a collection program that only used drop boxes. There are additional problems with a drop box program. One is odors at the site. If the boxes sit for much time after having putrescible materials placed in them the unpleasant odors may be offensive to neighbors or discourage people from bringing their organic wastes to the drop box. There is an additional problem for the elderly or individuals with physical limitations. It could be difficult for them to participate without assistance.

4.2.2 CURBSIDE COLLECTION METHODS

There are a few different methods of curbside collection used throughout the country. Some areas choose to collect in the spring and in the fall in a campaign that may only last a few days to a week each season. Some areas experience a large amount of leaves that must be collected in the fall and incorporate, into an ongoing curbside program, a bulk collection method. Other areas collect separated organic wastes at the curbside only throughout the growing season, spring through fall, because of the lack of yard waste during the winter. In the southern parts of the country year round programs are the norm.

4.2.2.1 BULK COLLECTION

The simplest style is for residents to rake their yard clippings, leaves, and brush into piles on the edge of the curb. Trucks with vacuum equipment can then remove the piles and haul them away. If vacuum equipment is unavailable, the piles must be placed in the street so loaders or sweepers can get access to the piles to remove them. Most local governments have dump trucks and loaders and consider this option a less expensive implement a yard waste collection program.

This system would only accommodate yard waste since food wastes handled this way would create too much odor and vector attraction. Piles of yard waste in the street could cause traffic problems as well as plugging city drains. Children may also be attracted to play in the piles creating a dangerous situation. Fresh, wet yard wastes piled in this manner could also produce unpleasant odors. This method of collection could easily be implemented because it does not require anymore effort on behalf of the participants than what is normally expended taking care of their yards. But, the various negative issues introduced with this method would require careful consideration by decision makers before implementing.

4.2.2.2 BAG COLLECTION

Another method of curbside collection is the use of either paper bags or biodegradable bags. There are some communities using a bag method of collection but with limited success. Some of the problems associated with using bags have been finding biodegradable bags that are accepted by the compost facility as truly biodegradable and affordable paper bags that can hold a sufficient amount of material without tearing and coming apart. Compost facilities that accept bags require them to be strong enough to keep from breaking apart before they arrive at the compost facility. After they have been unloaded the equipment at the facility must be able to open the bags easily and break them apart so air can get to the material and the material can be blended easily with the other feedstocks. Finally, the bags both paper and plastic must biodegrade completely during the composting process. These requirements are making bag collection programs struggle to gain acceptance.

4.2.2.3 CURBSIDE COLLECTION

The most popular style of curbside collection is the use of plastic, wheeled carts, just like what is normally used for MSW collection. They are typically 90 gallon carts with lids and usually are a different color from the MSW container so they are easy to discern. The carts can be wheeled to the curb for pick up by the same type of equipment as collects the MSW carts. It is a familiar system that is convenient and practical to use. Having plastic containers with lids provides the capability of handling most food wastes; expanding the volume of organic wastes that can be separated from the MSW. Their effectiveness for yard waste collection and food waste collection has been shown in Washington State. According to a BioCycle article in December 2005, King County and the city of Seattle recently began curbside collection of food wastes using 90 gallon carts. As of late October 2005, King County had 63,000 households participating in a weekly collection service. These households were from four different communities; Bellevue (23,355 households), Issaquah (2,714 households), Kirkland (10,132 households), and Redmond (8,764 households). Depending on the city, the participation rate was from 10 to 25 percent. Seattle's bi-weekly collection program had 97,500 households participating out of 155,300 households that were eligible. This participation rate of 63% is much higher than the County program is experiencing. This may be because of the extensive advertising and education program by Seattle Public Utilities. Curbside collection programs are not only successful in large urban areas, but they are working in rural Eastern Washington also. As was discussed in Section 1.5, the City of Quincy feels they have a successful curbside collection program. Quincy has not expanded their program to include food wastes, but their yard waste collection is structured much like Seattle's and King County's. It isn't nearly as large but according to Quincy's Public Works Director, it is very successful.

Remembering that a successful collection program must be convenient, acceptable, affordable, and effective, decision makers will need to evaluate what methods of collection will satisfy these four parameters best.

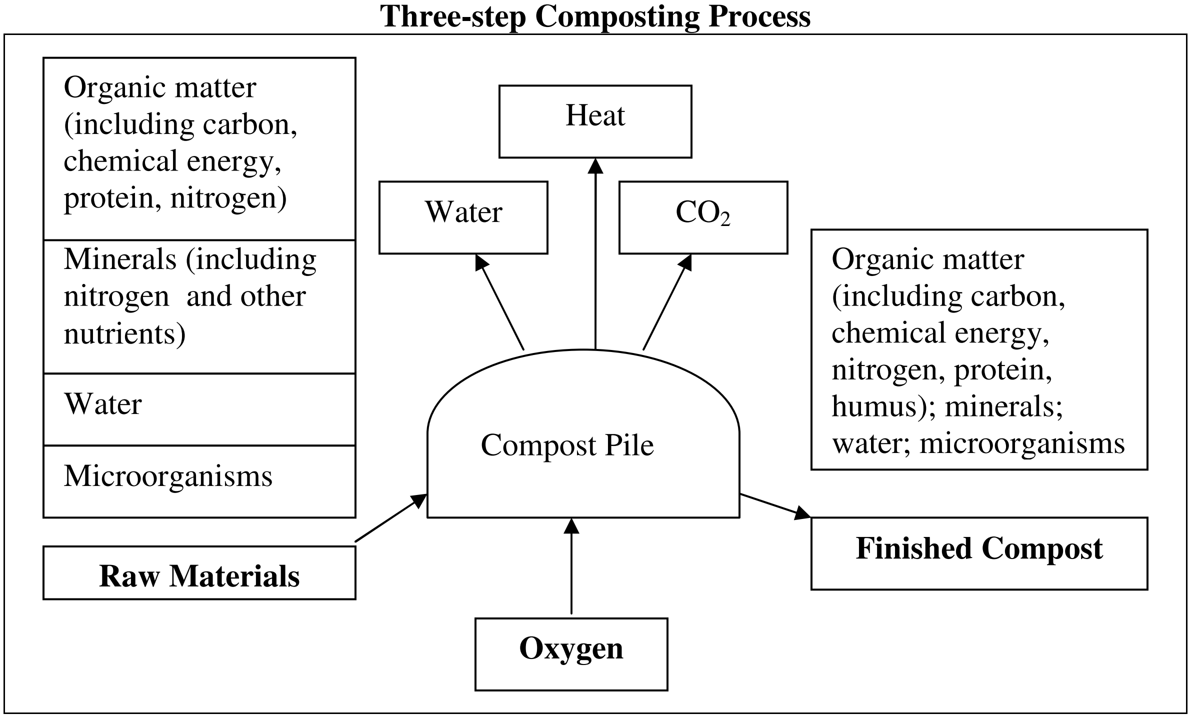
5. COMPOSTING TECHNOLOGIES

5.1 THE COMPOSTING PROCESS

Composting is the managed natural decomposition of organic materials, transforming them into a biologically-stable humus-like material that becomes very suitable for use as a soil conditioner. Any organic material can be composted; yard plant material, crop residues, tree trimmings, grass clippings, fruits, vegetables, grains, breads, dairy products, eggshells, meats, bones, animal carcasses, unbleached paper napkins, coffee filters, newspaper, used pizza boxes, paper food wrappers, and any other organic material or product. The actual process consists of 3-steps: 1) a mix of raw materials, consisting of organic material, minerals, water, and microorganisms to consume these raw materials; 2) a supply of oxygen (some process methods force air into the mix); and 3) time for the process to happen.

This process as shown in figure 3-1, diagrams how these raw materials are changed from a waste material into a valued commodity. As this process proceeds, three by-products are released as a result of the microorganisms consuming the raw materials; 1) water, 2) heat, and 3) carbon dioxide. Even though these creatures are microscopic in size, the amount of by-products generated is considerable. The water and CO_2 that is released can be as much as half the weight of the initial raw materials. The heat created can raise the temperature above 170^o F. In fact, if the conditions of the compost pile are not monitored closely for air, and moisture, the pile could become hot enough to self-combust.

Figure 5-1
Three-step Composting Process



Adapted from On-Farm Composting Handbook, NRAES – 54, 1992.

It is important to remember, even though this is a natural process, it can be managed. The better knowledge and understanding the compost manager has of the science of composting, the greater ability he will have to control the composting process. There must be constant monitoring of temperature and moisture and especially oxygen. If any of these are not at optimum levels, the process can slow down and even stop. It can change from aerobic to anaerobic, resulting in obnoxious odors. The compost manager must have an extensive knowledge and understanding of the importance of eight different factors affecting the composting process:

- Oxygen and aeration
- C:N ratio
- Moisture
- Temperature
- Porosity
- Structure, texture, and particle size
- pH
- Time

All eight of these factors are inter-related and the importance of each one must be monitored as the composting process takes place, in order to produce a high quality product. If the process is managed properly, the microorganisms will turn a material that was considered a waste into a highly valued and useful product. High quality compost has an earthy smell; it is biologically stable, dark brown to black in color, has the appearance of soil and has a soil-like texture. The composting process not only changes the original form of the raw materials into a soil like material, it can reduce the original volume of the material by 30 to 50%. The amount of humus is increased, the C:N ratio is decreased, and the pH is close to neutral.

5.2 COMPOSTING METHODS

Commercial composting operations use either a windrow method or an in-vessel type of composting. A variation of windrow composting is usually preferred primarily because it is less expensive. The advantage of in-vessel systems though is the reduced time it takes to turn raw organic materials into compost. It does not matter which method is selected. The method used to compost does not determine the quality of the end product. High value compost can be produced with any method of composting as long as the process is carefully managed.

5.2.1 WINDROW METHOD

The windrow method allows for an efficient system from start to finish, for handling the composting of organic wastes. The different types of windrow composting methods are:

- Turned windrows,
- Passive Aerated Static Piles, and
- Aerated Static Piles.

All three can yield a quality product if managed properly. The choice of which is best is determined by how much material needs to be composted, how much money can be spent on equipment, how much space is available, and how much time can be taken to turn the raw materials into compost.

5.2.2 TURNED WINDROWS

A turned windrow system builds windrows with a front-end loader and then periodically turns or mixes these windrows to maintain air within the pile. The size of the windrow is determined by the type of equipment used to turn the pile. If a front-end loader is used, the pile is usually 8 – 12 feet high because the loader can easily reach to that height to mix the materials. If a specially built machine for turning windrows is used, like a scarab, the windrow is usually only 4 – 6 feet in height in order to accommodate the equipment. The width of these windrows is determined by the size of the equipment being used; usually twice the height. The length is determined by the space available for making the piles.

The aeration of the pile in this method is controlled by the nature of the materials being composted and by the equipment that is used to turn and mix the material every few days. Because no additional effort to maintain air in the pile is expended, the regular mixing of the material to maintain adequate oxygen in the pile is essential. The other parameters of moisture, C:N ratio, and heat are also closely managed. The proper C:N ratio is calculated at the beginning of the process, water is added if needed at the beginning and again along the way if too much moisture has been lost, and the temperature of the pile is constantly measured to help determine how the process is proceeding.

5.2.3 PASSIVE AERATED STATIC PILES

The passive aerated static pile method is probably the least expensive commercial method of composting. The low cost of composting is offset though, by the extended length of time it can take to complete the compost process; sometimes 18 months or more. This method relies on the pile maintaining sufficient porosity to allow air to naturally flow through the pile providing oxygen to the microorganisms that are eating the organic materials. This usually requires a highly porous base material that is sometimes combined with piping that will promote the passive flow of ambient air underneath, into, and through the pile. Because of the base material and presence of the pipes, the pile cannot be easily moved if a problem develops and the passive aeration system fails to maintain the needed level of oxygen. This system can easily become anaerobic as the materials settle and the porosity of the pile decreases. An anaerobic system will still compost. However, the primary problem associated with an anaerobic compost pile of objectionable odors is not very acceptable to the neighbors and the process can slow down even more.

This method requires some very important up-front management of the system. As with all composting methods, starting with the optimum levels of C:N ratio, moisture, and porosity are essential. If the materials that are available for feedstock do not provide adequate porosity and do not have the correct C:N ratio, the system will not function effectively no matter how much management is provided. The various feedstock materials must be mixed together in the proper amounts to attain the optimum C:N ratio of 30:1. The moisture must be 50 – 60% to be optimum. Too much moisture will tend to compact the pile, fill the pore space, and drive out the oxygen. The free air space should be around 60% to provide adequate airflow. The pile is designed to sit, undisturbed for an extended length of time. This increases the importance of having all of the parameters as optimum as possible. If any problems develop, the pile cannot be easily turned. If the process does become anaerobic, this relatively inexpensive method of composting begins to increase in cost. Disturbing the pile will mean a loss of the porous base and there is a good chance of damaging some or all of the piping.

5.2.4 AERATED STATIC PILES

The aerated static pile method of composting also requires good management before the pile is constructed. It is important to understand the raw materials that are being used in order to develop a recipe with the correct C:N ratio and moisture, and grinding or chopping the material and then blending it to obtain a porous structure that will promote adequate airflow through the pile. The pile is built on top of an aeration system with either positive airflow (pushes the air up through the pile), or negative airflow (pulls the air down through the pile). The air system itself can either be pipes with holes spaced appropriately along their length or a concrete floor with air ducts and vent holes built into the cement. Each of these systems utilizes a bio-filter to further reduce any chance of objectionable odors. With the positive airflow system, the pile is covered with 18 to 24 inches of either finished compost or clean bark. The air passing up through the pile must pass through this filter layer before it can exit the pile. The negative airflow system sucks the air down through the pile and then exhausts it out through a bio-filter consisting of a large pile of compost or bark. As the air from the compost pile passes through either type of bio-filter, the odors are literally eaten by the microorganisms within the filter.

This composting method relies on good management to avoid the need to tear the pile down and rebuild it. The cost of this method is higher than the turned windrow or passive static pile method due to the cost of the aeration equipment that is used. A compost operation can utilize vented flexible drain hose or PVC pipe for the duct system. Either type of piping is less expensive than piling the composting materials on a concrete slab that has duct work incorporated into the design of the slab. But, the added labor needed to place and remove the piping as the piles are handled can add to the cost. To further increase expenses for this method, computer controls can be incorporated to manage the airflow by remotely measuring moisture as well as oxygen and CO_2 levels with electronic sensors placed into the compost pile. Some operations using this method even enclose the piles in a large building or design a roof structure over the piles to further control odors as well as rain that could unnecessarily increase moisture levels in the pile. This system is more expensive but it has the advantage of being a much faster method of composting; usually taking only 3 to 5 weeks.

5.2.5 IN-VESSEL SYSTEMS

This system encloses the feedstocks in a chamber or some kind of enclosure that mixes, and supplies air and moisture to the material. There are a number of different companies that manufacture various proprietary in-vessel systems. Some use a digester bin or silo.

Some design a large pipe to slowly rotate and move the material along from one end to the other mixing and processing the material at optimum conditions in as little as one week. Another method uses a static aerated pile but covers it completely with a nylon fabric cover. This cover allows the compost manager to more effectively control the moisture and air and most of the odors. Sealing over the aerated windrow results in an in-vessel system. Even though all of these methods are expensive, they have the advantage of being able to compost food wastes much better than some of the other pile methods. While the potential for pathogens and odors is generally higher in food wastes, pathogen reduction, and odor control is easily attained with these in-vessel systems.

6. COMPOST USES

6.1 SCREENING & CURING

Freshly produced compost is not a finished product fit for marketing. Once the feedstocks have completed the compost process, they must be screened to remove any large pieces of uncomposted material and to obtain a uniform sized material. After screening, the compost must cure from a few weeks to six months. To accomplish this, compost is placed in a pile once again. The composting process is still going on because there is still organic material that is continuing to feed microbial activity. The purpose of curing the compost is to gradually lower the temperature, complete the microbial compost process, and arrive at a highly stable product. Stable compost has a very low level of biological activity. There may still be some organic material that is decomposing, but it is at such a low rate that there is very little respiration taking place and the amount of heat or CO_2 that is given off is extremely low. This stability allows for the compost to be marketed, even bagged, with little concern for the product heating up or changing moisture level and causing problems in shipment.

6.2 TESTING

Prior to marketing stable compost, it is sampled and tested to determine its nutrient content as well as checking for the presence of any heavy metals. A compost marketer will perform this testing to make sure he has suitable product for his intended market. To insure that compost in the State of Washington is consistent and stable, the composting standards in WAC 173-350-220 require testing. The purpose of this testing is to insure the absence of Manufactured inerts, and sharps, and check the pH level (Table 6-1). The compost must also be tested to determine the Nitrogen content, and Biological Stability as outlined in United States Composting Council Test Methods for the Examination of Composting and Compost.

Table 6-1 Other Testing Parameters

Parameter	Limit
Manufactured Inerts	< 1 per cent
Sharps	0
pH	5 – 10 (range)

Adapted from WAC 173-350-220 (4) (viii)

Besides requiring testing for the metals listed in Table 6-2, WAC 173-350-220 allows the local Health District to require testing of additional metals or other contaminants based on the past history of the facility. All of this required testing is based on the type of feedstock being composted and the volume of raw feedstocks being delivered to the facility. The required frequency of these tests is shown in Table 6-3.

Table 6-2 Metals

Metal	Limit (mg/kg dry weight)
Arsenic	< = 20 ppm
Cadmium	< = 10 ppm
Copper	< = 750 ppm
Lead	< = 150 ppm
Mercury	< = 8 ppm
Molybdenum[1]	< = 9 ppm
Nickel	< = 210 ppm
Selenium[1]	< = 18 ppm
Zinc	< = 1400 ppm

[1]Not required for composted material made from Type 1, Type 2 or a mixture of Type 1 and Type 2 feedstocks. Adapted from WAC 173-350-220 (4) (viii)

Table 6-3 Frequency of Testing Based on Feedstocks Received

Feedstock Type	< 5,000 cubic yards	= or > 5,000 cubic yards
Type 1 or Type 2	Once per year	Every 10,000 cubic yards or every six months, whichever is more frequent
Type 3	Once per quarter (four times per year)	Every 5,000 cubic yards or every other month, whichever is more frequent
Type 4	Every 1,000 cubic yards	Every 1,000 cubic yards or once per month, whichever is more frequent

Adapted from WAC 173-350-220 (4) (viii)

6.3 POTENTIAL COMPOST MARKETS

If Grant County chooses to pursue an organics recycling program and promote a privately operated compost facility, it is important for the County to understand the importance of marketing the compost. Even though finding buyers and promoting compost sales will be the responsibility of the compost facility's owner/operators, the County must adopt the right marketing attitude also. It is important to portray compost as a valued and usable product. The organics the citizens of Grant County are diverting from the waste stream are a resource and not a waste material requiring disposal. Recycling this waste not only extends the life of the landfill and is good for the environment in general; it produces a material that has great value to the agriculture industry as well as numerous other uses.

Compost has many markets for its use, many which could be considered large-scale users. The more obvious large scale users in our area would be:

- Farms
- Landscapers
- Highway department
- Sports facilities
- Golf Courses
- Nurseries
- Parks

According to a study conducted by the US Composting Council in 1992, eight existing markets for compost sales and use were identified and their potential demand nationwide was for over 1 billion cubic yards of compost. If the total compostable portion of all the nation's wastes that year had all been composted it would have only provided 48 million cubic yards of that demand. Table 6-4 lists these eight markets, how compost is utilized by them, what the potential size of the market could be, and what the constraints are that are keeping the compost industry from satisfying each market.

Table 6-4 Compost Markets, Applications, and Potential Constraints

Market Segment	Applications	Potential Market Size	Primary Constraints
Agriculture	• Soil conditioning, fertilizer amendments, and erosion control for vegetable and field crops and forage grasses. • Development of marginal lands. • Mulching after conservation seeding.	Very large, estimated at 895 million cubic yards per year. Research indicates that the demand for compost for agricultural purposes within a 50 mile radius of the 190 largest U.S. cities would exceed the supply of compost.	• Contaminant concentrations for crop production and cumulative loading limits. • Cost of transportation to end-user. • Bulk application equipment requirements and costs.
Silviculture	• Landspreading as soil conditioner for evergreen establishment. • Mulching for woodlot soil improvement and maintenance.	Very large, estimated at 104 million cubic yards per year. This segment's potential demand could exceed the available supply of compost.	• Transportation cost and distance. • Bulk application equipment requirements and costs.
Sod production	• Blending with topsoil to reduce the amount of fertilizer needed to establish sod.	Moderate, estimated at 20 million cubic yards per year. Market potential will be dictated by the rate at which sod producers deplete existing topsoil.	• Transportation cost. • Bulk application equipment requirements and costs.
Residential retail	• Soil amendment to enrich planting areas. • Top dressing for lawns.	Moderate, estimated at 8 million cubic yards per year. Much of topsoil sold in bags is currently made with compost; thus, this market has already been penetrated.	• Postprocess requirements (e.g., screening and bagging) and associated costs. • Consistent quality assurance. • Contaminant levels must be low enough to meet requirements for unrestricted.

Table 6-4 Compost Markets, Applications, and Potential Constraints (Cont.)

Market Segment	Applications	Potential Market Size	Primary Constraints
Nurseries	• Potting mixes • Topsoil amendment for areas in which field grown trees are harvested on a periodic basis.	Small, estimated at 0.9 million cubic yards per year.	• Consistent pH balance, nutrient content, particle size, shrinkage, and water-holding capacity required. • Complete and continuous testing requirements to ensure high-quality product and associated costs. • Compost suppliers will need to be sensitive and responsive to specific growing requirements.
Delivered topsoil	• Blending with marginal topsoils to produce topsoils for establishing new lawns and shrubs.	Small, estimated at 3.7 million cubic yards per year.	• Consistent supplies of compost required to meet seasonal demands.
Landscapers	• Soil amendment for lawn establishment. • Top dressing. • Mulch.	Small, estimated at 2 million cubic yards per year.	• Quality assurance that compost does not contain harmful amounts of contaminants. • Physical contaminants that might be visible on lawns. • Consistent supplies of compost required to meet seasonal demands.
Landfill cover and surface mine reclamation	• Topsoil amendments for lower grade and nonuniform compost products	Small, estimated at 0.6 million cubic yards per year. There are only a limited number of landfills or mines that are undergoing reclamation at any given time.	• Transportation costs

Source:
Buhr, McClure, Silvka, and Albrecht. 1993. “Compost Supply and Demand.” *Biocycle*. January.

Beside these typical market uses for compost, there are a number of innovative markets developing. Some agriculture consultants are blending compost with various commercial fertilizer mixes to provide a "value-added" fertilizer product. Additional organic matter can be applied with the fertilizer; or composts with specific chemical characteristics can be used to help with pH or micronutrient needs. The potential use of compost to enhance the degradation of contaminated soils is having some success. Compost is being used as a biofilter to scrub industrial process air. And, wetland restoration projects are often using compost to enhance the revitalization of damaged wetlands.

6.4 MARKETCONSTRAINTS

Of the market segments listed in Table 6-4, agriculture, sod production, residential retail, nurseries, delivered topsoil, and landscapes are potential markets for compost in Grant County. According to this table, if the constraints on these markets could be met, Grant County's potential market size for selling compost would far exceed the production capability. The common constraints of these markets are transportation and application costs, and quality concerns.

6.4.1 TRANSPORTATION CONSTRAINTS

In the course of conducting the grower survey, there was an opportunity to have a few personal interviews with some of the farmers who received the survey. Each one of them was very concerned with the cost of transportation. They were interested in using compost on their fields but they were skeptical that the expense of hauling the volumes they needed would drive the total costs too high. As with many successful businesses, location will play a great role in the success of the compost facility. Choosing the location for the compost facility will be another key element for success of this program. A location that provides the shortest haul for the most agriculture customers will maximize the potential of agriculture's level of participation.

6.4.2 APPLICATION COST CONSTRAINTS

The next common constraint of application costs is currently being addressed through a USDA – NRCS cost share program through the Environmental Quality Incentives Program (EQIP). This program provides cost share money to growers participating in EQIP conservation activities. To have an opportunity to be selected for this program the grower must be implementing other conservation practices such as, wildlife habitat plots, irrigation water management, nutrient management, etc. on their land besides using compost. If through the prioritizing process of the local NRCS office, they are selected for participation, they can receive $40 per acre up to a maximum of $50,000.00 to help pay for the application of organic soil amendments (manures, and compost). This program should help to raise the level of interest in using compost in the County but it will not have widespread involvement because the total money available is limited and not every grower can qualify. Helping to solve this constraint is an opportunity for others to design methods and equipment that could reduce the cost of applying compost to the land.

6.4.3 QUALITY CONSTRAINTS

The third constraint of quality is universal to all products agriculture uses as inputs to producing crops. The State has general quality standards as outlined in the WACs, but each end-user has particular quality requirements that may be different from these general guidelines. Again, even though Grant County has chosen not to be the operator of the compost facility, the significant role the feedstocks have in the quality of the marketability of the compost produced must be addressed.

Source separated yard waste and food waste programs are generally considered to provide feedstocks free from contaminants of concern, especially heavy metals and result in high quality compost. Two past studies, one in 1990 by Roderique and Roderique, and another in 1991 by Hegberg, et al., concluded that yard trimmings compost generally have insignificant levels of detectable heavy metals or pesticides. Compost quality determines which markets to pursue. Different compost markets have different quality standards to achieve the goals they have with their use of compost.

It is important for Grant County to understand the role the County will play in the quality of compost that is produced. The type of collection program and quality of the education program that is implemented will determine what materials actually get separated from the waste stream and become available for composting. Maximizing the effort of these two programs will result in more consistent, useable feedstocks, which will result in high quality compost. As feedstock collection is altered, the qualities of the compost can be changed. The County will need to become familiar with the key elements of compost quality and how they can be affected. A typical list of the components of compost quality is:

- Particle size
- pH
- Soluble salts
- Stability
- Presence of undesirable materials such as weed seeds, heavy metals, phytotoxic compounds, and undesirable materials such as plastic and glass (EPA, 1995 and NRAES, 1992).

Because of the differing purposes compost is purchased for, the specifications attached to compost quality can be different. Some markets can successfully use lower grade compost, while others, such as the potted plant industry, must have high quality material. Table 6-5 is included in this study to illustrate how the specifications of the differing compost quality components change according to the end-use market.

Table 6-5 Compost Quality Guidelines Based on End Use

	Quality Guidelines			
	End Use of Compost			
Characteristic	Potting Grade	Potting media amendment grade[a]	Top dressing grade	Soil Amendment grade[a]
Recommended uses	As a growing medium w/o blending	For formulating growing media for potted crops with pH below 7.2	Primarily for topdressing turf	Improvement of agricultural soils, restoration of disturbed soils, establishment and maintenance of landscape plantings with pH requirements <7.2
Color	Dark brown to black	Dark brown to black	Dark brown to	Dark brown to black
Odor	Should have good earthy odor	Should have no objectionable odor	Should have no objectionable odor	Should have no objectionable odor
Particle size	Less than ½ inch (13 millimeters)	Less than ½ inch (13 millimeters)	Less than ¼ inch (7 millimeters)	Less than ½ inch (13 millimeters)
pH	5.0 – 7.6	Range should be identified	Range should be identified	Range should be identified
Soluble salt Concentration (mmhos/cm)	Less than 2.5	Less than 6	Less than 5	Less than 20
Foreign Materials	Should not contain more than 1% by dry wt. of combined glass, plastic, and other foreign particles 1/8 – 1/2 inch (3 – 13 centimeters)	Should not contain more than 1% by dry wt. of combined glass, plastic, and other foreign particles 1/8 – 1/2 inch (3 – 13 centimeters)	Should not contain more than 1% by dry wt. of combined glass, plastic, and other foreign particles 1/8 – 1/2 inch (3 – 13 centimeters)	Should not contain more than 5% by dry wt. of combined glass, plastic, and other foreign particles
Heavy Metals	Should not exceed EPA standards for unrestricted use	Should not exceed EPA standards for unrestricted use	Should not exceed EPA standards for unrestricted use	Should not exceed EPA standards for unrestricted use
Respiration rate (milligrams per Kilogram per hour)[b]	Less than 200	Less than 200	Less than 200	Less than 400

[a] For crops requiring a pH of 6.5 or greater, use lime-fortified product. Lime-fortified soil amendment grade should have a soluble salt concentration less than 30 mmhos per cm.
[b] Respiration rate is measured by the rate of oxygen consumed. It is an indication of compost stability.

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7. EDUCATION NEEDS

7.1 PUBLIC EDUCATION

A vital element to the success of any organic recycling and compost program is acceptance by the public that must participate. This is a program that will require behavior changes. Many people get comfortable with their daily routines and when circumstances arise that demands a change to that routine it is not always easy to willingly make the change. The program that is the focus of this study will demand a change in the behavior of the average citizen of Grant County. Influencing them to make that change willingly, will require a commitment to an education campaign designed to teach that what they now perceive as a waste, is really a resource for the production of a valued product. Diverting their organic wastes away from the County landfill will not only produce a product with numerous environmental benefits, but participating in this program will also extend the life of the landfill, resulting in economic benefits.

The initial efforts of explaining "why to do" the program should be followed-up with "how to do" the program. In teaching the public how to implement an organic recycling program, it will be more than a listing of steps to follow. The education plan should be simple, straightforward, and logical in its approach. Explaining the reasons for following each part of the plan cannot be overlooked. The following are some of the components of an education plan that should be considered:

- Clearly explain what waste materials must be separated from the MSW.
- Explain the method that will be used to collect the separated organic wastes and any options that exist for those who do not want to pay for curbside collection, i.e., home composting, self-haul, and drop-box sites.
- Teach how to prepare the materials for collection.
- Provide a complete list of unacceptable materials and explain the problems associated with contamination.
- Explain the fee structure.
- Teach how compost is made, what it is, and what it can be used for.
- Teach the public what the beneficial uses of compost are in their yards, gardens, and farms and how to use it.
- Continually emphasize the benefits of compost.

There are various methods that can be used to educate the public. The extent of the program will be determined by the level of funding that can be committed to the effort. Many or all of the following could be used to teach the public about the need for the program and its benefits and purposes:

- Utility or garbage bill inserts
- Special program mailers
- Instructional "how to" brochures or doorhangars
- Media coverage in local newspapers and/or radio
- Demonstration site(s) for using compost
- Special presentations in schools, clubs, service groups, etc.
- Master Gardeners

It is not always easy to evaluate the success of an education program that promotes behavioral changes in a population. For this program, the amount of organic wastes that are diverted from the County landfill to the compost facility will be the simplest tool for doing so.

7.2 HOME COMPOSTING

A home composting program would teach residents how to turn their own organic wastes into compost. They could use their own compost, they produced themselves, in their yards, gardens, flower beds, and landscaping. These programs usually consist of making written materials available explaining the process necessary to home compost. These materials teach the basic principles of composting, explain what can be composted, how to use the compost, and offer plans and blueprints for constructing compost bins. Some programs include workshops and outreach personnel to further instruct residents and help them refine their individual home composting programs. Along with outreach efforts, programs can make commercially built compost bins available to anyone desiring one, either free or at reduced rates. Most jurisdictional compost programs at least, incorporate an effort to teach their participants the methods and value of home composting, even if they do not provide outreach programs or compost bin programs.

Residential composting would remove a portion of the waste stream prior to collection resulting in savings to the County of collection costs and landfill space. It can be argued that promoting this method of source reduction would reduce the overall amount of feedstocks available for a compost facility and would be counter productive to the overall program. However, other areas that have entered into a project to encourage home composting have instead, experienced a positive impact to their overall recycling and composting program. The positive impact from residents gaining firsthand experience making their own compost, results in:

- An increased awareness of the value of compost,
- A better understanding of its uses,
- A greater knowledge of the importance of not contaminating the feedstocks,
- An increased demand for compost, and
- The home composters become part of the education force promoting the value of compost among their friends and neighbors which encourages greater participation in the program.

Not everyone will choose to backyard compost. Most will either participate in the collection program or self-haul their organic wastes because of lack of time, or interest. Unless an individual gardens, they do not have much need for the compost. Without a need for the compost, it is simply more convenient to have someone else haul it away.

If Grant County chooses to promote home composting, there are a variety of resource materials available from a number of different groups and agencies. Many of these materials are easy to access and are designed to be very user friendly with C:N ratio charts, compost recipes, plans for constructing compost bins, tips on managing the compost process, and instructions how to use the compost. These materials have already been designed and there is no need for Grant County to reinvent the wheel.

8. ECONOMIC ANALYSIS

8.1 METHODS

It is difficult to use the costs of other organic recycling and composting programs to determine the costs that Grant County could expect. Most programs incorporate the operation costs associated with a compost facility and do not differentiate between their collection costs and operations costs. If they do, the types of programs can differ dramatically. Some programs only collect and compost yard waste, and others yard waste and some paper waste, while yet others collect feedstocks of yard waste, paper waste, and food waste. The data for most of the studies researched describes yard waste collection only. There are only a few that collect and compost food waste. This is because of the need for more advanced technology to operate a compost program that adds food waste to the mix.

To compile an economic analysis of an organic recycling and composting program for Grant County it will be assumed that the compost facility will be privately operated. This eliminates the need to estimate operating costs for the composting operations segment of the program. The private owner(s) of the compost facility will have that responsibility. If the County chooses to pursue organics recycling and composting either through a landfill ban or voluntary participation, it will still be important to be aware of the costs associated with the construction and operation of the composting facility. It is also acknowledged that the majority of the organic wastes diverted from the landfill will originate with the municipalities in Grant County. The municipalities determine their own rates for waste collection; the County can only promote the concept of organics recycling. It will be up to each city and town to determine their level of participation in any proposed program and what they will charge for collection services. This study will analyze the potential cost of collection of the organic wastes. The cost that will be determined is the average cost to a household participating in an organic collection service. As each municipality must determine for itself what it will ultimately charge, specific calculation will be left to each jurisdiction.

This study's purpose is to determine the feasibility of Grant County diverting organic wastes from the County landfill and providing them as feedstocks for producing compost. It is not within the scope of this study to conduct a full cost/benefit analysis. Some basic cost and benefit questions should be kept in mind by County and municipality decision makers however:

- What is the cost of developing a new landfill?
- What are the benefits of extending the life of the current landfill by 20 – 30% through organic waste diversion?
- What are the benefits to the County landfill operations if they reduce their materials handling volume by 20 – 30%.
- What are the benefits to the municipalities in reduced tipping fees at the compost facility?

- What are the costs of the environmental impacts resulting from organics remaining in the County landfill waste stream? Impacts such as:
    - Groundwater contamination
    - Methane generation
    - Greenhouse gas production
- What are the benefits of turning perceived wastes into a valued soil conditioner?
- What are the benefits to agriculture in the County?
- What are the benefits to the soils of Grant County?
- What are the benefits of having a viable disposal alternative for excess crop residues and crop wastes to the health of Grant County?

8.2 CURRENT WASTE COLLECTION PROGRAM

To better understand the effect of a collection program the cost of the current MSW collection program should be reviewed. All residents of Grant County currently have access to MSW collection services. Those residents living in an incorporated area pay their municipality a fee for these services and those in the unincorporated portions of the County hire these services from a private hauler. All collection services are offered through Washington Utilities and Transportation Commission (WUTC) approved contracts.

The current rate for collection of MSW is shown in Table 8-1. Only 90 -100 gallon container fees are listed. A curb-side collection of organic wastes would most likely be with 90 gallon containers; making a comparison of costs between MSW collection and organic waste collection more comparable.

Table 8-1 does not contain collection rates for all of the unincorporated sections of Grant County. The majority of these areas are serviced by Consolidated Disposal and the fee is $15.90 for a 90-gallon container. There are three other firms providing collection services to unincorporated areas; Sunrise Disposal, Waste Management of Ellensburg, and Waste Management of Greater Wenatchee. The collection fees for these companies range from $12.68 - $16.40 for 3-32 gal. trash cans.

Table 8-1 Collection Service Fees in Grant County

Municipality	Population[a]	Collection Arrangement	Collection Company	Disposal Site	Collection Rate[b]
Coulee City	600	Individual	Consolidated Disposal	Ephrata	$15.90
Electric City	950	Contract	Sunrise Disposal	Delano	$20.35
Ephrata	6,930	Contract	Consolidated Disposal	Ephrata	$17.95
George	525	Individual	Waste Management of Ellensburg	Ephrata	$16.40[c]
Grand Coulee	925	Contract	Sunrise Disposal	Delano	$19.53
Hartline	135	Individual	Consolidated Disposal	Ephrata	$15.90
Marlin	60	Individual	Consolidated Disposal	Ephrata	$15.90
Mattawa	3,290	Contract	Consolidated Disposal	Ephrata	$15.30
Moses Lake	16,340	Contract	Lakeside Disposal & Recycling	Ephrata	$10.00

Quincy	5,265	Contract	Consolidated Disposal	Ephrata	$12.45
Royal City	1,870	Contract	Consolidated Disposal	Ephrata	$16.30
Soap Lake	1,735	Self	City	Ephrata	$17.50[c]
Warden	2,575	Contract	Consolidated Disposal	Ephrata	$16.89
Wilson Creek	240	Individual	Consolidated Disposal	Ephrata	$15.90
				Average Collection Rate for Grant County	**$16.16**

[a]Estimated population in 2005 from OFM, Forecasting Division
[b]Collection rate for 90 – 100 gallon capacity containers
[c]Collection rate for 3 (32 gal.) trash cans; equivalent to 96 gallon container

8.2.1 GRANT COUNTY LANDFILL TIPPING FEE

Grant County charges a tipping fee to unload waste at its landfill facilities. Currently, this amount is $25.80. It is important to understand the relationship of tipping fees to the success of a compost facility. A compost facility can generate income through two sources; tipping fees and sale of compost. To attract feedstock delivery, it is requisite the tipping fees at the compost facility be less than the tipping fees at the local landfill. In some areas this difference is as much as 75%. If they are not significantly less, there would be no incentive to divert organic wastes from the landfill.

The amount charged for unloading organic wastes will be a major component of a successful compost program. Grant County will want to work with the compost facility owner to encourage the calculation of a rate that will be appreciably less than the current landfill tipping rate. The location of the facility can also affect this value. If the compost site requires more hauling expense to get to it, and the tipping fee is not low enough to accommodate the increased hauling costs, the volume of feedstocks delivered could be less than expected.

8.3 CURBSIDE COLLECTION

8.3.1 CURBSIDE COLLECTION IN OTHER AREAS

The rate for a curbside collection service can vary dramatically depending on, climate and months of service, equipment used, efficiency of pick-up routes, extent of services provided by the local government, grant monies that may be available, participation levels, and most of all, what type of organics are targeted. A literature search found curbside collection programs had a wide range of cost. Some programs were as low as $39 per ton diverted (Fennimore, WI) and as high as $173 per ton diverted (Philadelphia, PA). A fact sheet from the Department of Environmental Quality in Oregon estimated a cost of $40 - $60 per ton for yard waste collection. One study conducted by the EPA in 1994, "Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities," determined an average cost for collection of $86.07 per ton. These 30 different programs were not all collecting only yard waste. Some included food and paper wastes. Another EPA publication, "Organic Materials Management Strategies," cited a study by Lisa Skumaz of 60 randomly selected cities with yard waste collection. This study showed an average cost of $44.37 per ton.

8.3.2 CURBSIDE COLLECTION IN GRANT COUNTY

Estimating the cost to an individual household in Grant County to participate in an organics curbside collection service is best done with as much local data as possible. Using the national averages may not result in a rate that will accurately portray the real costs for our area. To calculate the cost of a curbside collection program in Grant County the data contained in Table 8-2 and Table 8-3 will be used.

In Table 3-1 it was shown that the average rate of yard trimmings production per person in the United States was 280 pounds per year and food waste was 105 pounds per year. These national values are both quite different than Grant County's numbers shown in Table 8-2. Using US Census numbers and the weights determined by the Waste Stream Analysis conducted by DOE, the pounds of yard waste generated per person in Grant County is only 107; less than half the national average. The 359 pounds of food waste generated however, is more than three times the national food waste average. These differences emphasize the importance of gathering local data instead of applying these national average values.

In estimating the cost of collection for a household, it is important to determine how much material will be placed in the organics bin. Knowing the volume to weight conversions for some of the typical organics that could be collected is a part of this calculation. Table 8-3 shows some of those values. A 90 – 100 gallon tote holds approximately 0.5 cu. yds. of material. A typical tote can hold just over 50 pounds of mixed yard trimmings or around 400 pounds of grass clippings, and over 700 pounds of mixed produce wastes.

Table 8-2 Grant County Waste Statistics

Grant County population in 2000	74,698[a]
Persons per household in Grant County in 2000	2.92[a]
Number of households in 2000	25,582
Tons of yard waste from Table 3-2	4,014
Pounds generated per person per year	107
Pounds generated per household per year	314
Pounds generated per household per week (32 week season)	**9.8**
Tons of food waste from Table 3-2	13,406
Pounds generated per person per year	359
Pounds generated per household per year	1,048
Pounds generated per household per week (52 week season)	**20**

[a]Values from US Census Bureau, Grant County, Washington Quick Facts

Statistically, the average household in Grant County is going to generate 10 pounds of yard waste and 20 pounds of food waste. It is difficult to apply these statistics to what actually happens on the ground. The space these average weights will occupy in the tote is around ¼ of the container's volume. Because the organic tote will have plenty of volume to fill each week it may be more practical to expect more weight actually being deposited in it. For the purpose of being cautious in estimating the average weight per tote this study will double the weight and assume each week, each household will place 60 pounds of organic material in their bin.

Table 8-3 Organic Wastes Volume to Weight Conversions

Product	Volume	Weight (lbs)	Data Source
Yard Trimmings, mixed	1 Cubic Yard	108	EPA[a]
Grass	1 Cubic Yard	350 - 450	EPA
Grass & Leaves	1 Cubic Yard	108	EPA
Leaves	1 Cubic Yard	200 - 250	EPA
Prunings, dry	1 Cubic Yard	36.9	Tellus[b]
Prunings, wet	1 Cubic Yard	46.7	Tellus
Produce waste, mixed, loose	1 Cubic Yard	1,443	Tellus
Bread, bulk	1 Cubic Foot	18	FEECO[c]
Meat, ground	1 Cubic Foot	50 - 55	FEECO

[a]U. S. EPA http://www.epa.gov/epaoswer/non-hw/muncpl/pubs/red2.pdf
[b]Tellus Institute http://www.tellus.org
[c]FEECO International http://www.feeco.com

The assumed weight of 60 pounds for each tote picked up will be applied to a spreadsheet (Table 8-4) with other inputs to estimate the cost per household for organics collection service. The other components of this calculation consist of average distance traveled on the pick-up route and to and from the compost facility, the fuel used, the amount of weight the collection truck can haul, an assumed tipping fee of $15.00/ton for unloading at the compost facility, labor expenses for the driver, various license, permit, and equipment expenses, administration costs for the governing body, and profit margin for the hauler.

Using these various assumptions, the average estimated cost per household for organics collection in Grant County would be $4.81 per month. For a typical 8 month growing season it would cost $38.50. If the collection service was continued year round to capture the food waste all 12 months, the cost would be $57.72. It must be remembered that a number of assumptions have been made to calculate this figure. The distance traveled is dependant on the location of the compost facility relative to the various communities in the County. Choosing an arbitrary central location along interstate-90 would result in approximately 50 miles of travel per load. The actual location chosen could be entirely different, which may change these average distance numbers. The fuel economy of the truck, the weight that can be hauled, the labor costs, and the miscellaneous expenses were all reviewed with a local waste hauler to determine if the amounts selected were reasonable. The administration costs and hauler's fee (profit) were both calculated as 20% of the total of the cost of diesel per load, tipping fees per load, labor per load, and miscellaneous expenses per load.

Table 8-4

Collection Costs for Organic Wastes

Average distance traveled per load*	50	miles
Fuel economy of truck	3	mpg
Gallons of diesel used	$ 16.67	gallons
Cost of diesel	2.65	per gallon
Cost of diesel per load	**$ 44.17**	per load
Tons hauled	8	tons per load
Avg. tote weight	60	pounds
Total pick-ups	267	totes per load
Tipping fee at compost facility	$15.00	per ton
Tipping fee per load	**$120.00**	per load
Labor for driver (incl. taxes & benefits)	$20.00	per hour
Avg. time per load	6	hours per load
Labor per load	**$120.00**	per load
Equip. capital, taxes, licenses, etc.	**$ 20.00**	per load
Administration costs	**$ 60.83**	per load
Hauler fee	**$ 60.83**	per load
Total	**$ 320.83**	per load
Cost per 90 gallon tote per month		**$ 4.81**
Cost per 90 gallon tote per season (8 months)		**$ 38.50**
Cost per 90 gallon tote for 12 moths		**$ 57.72**

*This is for a weekly pick-up

Any of these assumptions could be argued but this study has attempted to validate each of them through research of national numbers, actual local waste stream calculations, interviews with waste haulers, and a cautious estimation of weight per tote. Changing any of these key inputs will change the bottom line either up or down. The primary input that will have the most effect on the final cost is the actual volume and weight of the organics going into the bin. As has been discussed, this number can only be estimated at this point. What that number will actually be can only be calculated accurately through implementation of the program.

8.4 ORGANICS COLLECTION EFFECT ON MSW FEES

Another economic effect that should be considered is the behavioral changes by residents. Other organics recycling programs have found that when the compostable portion of the waste stream is sorted out of the normal MSW, the resulting volume of MSW no longer requires as large a container. Many participants will reduce their MSW container size they use; reducing their total fees paid for waste collection. Whether or not this would happen in Grant County is difficult to predict, especially since few residents in the County have participated in a waste separation program before. Quincy's program experienced some residents sizing down on their MSW container but there was no data to track how many.

Not all residents in Grant County currently have a choice of container size. Some of the municipalities in Grant County that do offer different size MSW containers to choose from and the associated rates are listed in Table 8-5. The difference in rates for the two different size containers range from a low of $2.10 to a high of $4.70, with the average overall being $3.09.

Table 8-5 MSW Container Rates in Grant County

Municipality	Collection Rates
Coulee City	$13.80 for 60 gallon cart $15.90 for 90 gallon cart
Ephrata	$13.85 for 65 gallon cart $17.95 for 95 gallon cart
Electric City	$16.05 for 65 gallon cart $20.35 for 95 gallon cart
Grand Coulee	$14.90 for 65 gallon cart $19.35 for 95 gallon cart
Hartline, Marlin, & Wilson Creek	$13.80 for 60 gallon cart $15.90 for 90 gallon cart
Quincy	$7.75 for 60 gallon cart $12.45 for 100 gallon cart $11.70 for 100 gallon cart for yard waste
Average difference in cost for all 7 municipalities	$3.09 less for the smaller MSW bin

If the average resident of Grant County was paying for an organic waste bin at $4.81 and reduced the amount of MSW waste generated to only require a 60 or 65 gallon bin, the effective cost of the organic bin is actually only $1.72 per month or $13.76 per year during the 8 month yard waste production season. If the organics collection program was continued year round to capture the food wastes all 12 months, then the effective cost would be $20.64 for the entire year.

Based on the assumptions made to calculate the cost of organics collection, the cost of a program as outlined to the average Grant County resident would range from $20.64 -

$57.72. This would be for a weekly pick-up for 12 months and depend on what size collection bins were used.

9. CONCLUSION

9.1 RECOMMENDATION

It is feasible for Grant County to establish an organic recycling program to divert these wastes from the County landfill and provide them as feedstocks for a privately operated compost facility. Similar types of waste reduction and composting programs have been successfully implemented throughout the country as well as here in Washington State. Taking into account the years of life added to the County landfill, the projected average cost to the individual County resident would be very reasonable. The technology that is required is available. Programs to use as a pattern to get started are numerous. And, educational materials are easily obtained. The following recommendations should be considered as County decision makers contemplate this program:

9.1.1 COLLECTION

- Establish a landfill ban of compostable organics.
- Provide options of Home Composting and self-hauling patterned after Quincy's program.
- A curbside collection service would work best in the larger communities in the County while drop boxes may be equally successful in the small towns.
- Provide clear education materials explaining exactly what should be placed in the organic bins.
- Consider food waste collection as well as yard waste to make the program more cost effective.
- Encourage residents to conduct their own home waste characterization to determine if they can utilize smaller MSW containers.
- Provide incentives to separate by allowing free drop off of organics at the County landfill and other drop box locations.

9.1.2 COMPOST FACILITY

- County decision makers must visit some large scale compost operations to better understand the process and the technology.
- A landfill ban of organics will more easily attract a viable compost company to the County. Without a landfill ban it will be difficult to encourage a compost company to invest in the area.
- Work closely with compost owner(s)/operators to maintain compost quality through properly sorted organic wastes.
- Offer input on site location for optimizing convenience of waste haulers and serving the most County residents efficiently.
- Promote use of compost by the agriculture industry in the County.
- Encourage the compost facility to allow free dumping by County residents of small loads of organics.

- As farmers have need to dispose of large amounts of crop residue, cull potatoes, cull onions, or other crop waste, encourage the compost facility to waive the tipping fee and offer finished compost in exchange for the waste material.
- Promote capturing organic wastes from neighboring counties to increase the overall volume of feedstocks and efficiency of the compost facility.

9.1.3 EDUCATION

- Initiate an education program before a compost facility is built.
- Educate all stakeholders about the need of extending the life of the landfill, and the environmental benefits that come from diverting organic wastes for compost.
- Explain the economic benefits of extending the life of the landfill.
- Promote the concept that recycling organic wastes is the right thing to do socially, economically, and environmentally.
- Develop a "pool" of experts to form a speakers bureau for visiting groups and teaching them what compost is, how to make it, how it can benefit yards, gardens, and farms, and how to use it.
- Set up a Home Composting program.
- Consider providing compost bins to residents, either free of charge or at reduced rates.
- Utilize the numerous educational print materials available through DOE, Seattle Public Works, Washington Organic Recycling Council, and others. Don't waste time reinventing the wheel.
- Distribute informational handouts through mailers, inserts, and/or flyers to help residents become familiar with how the program will function. Provide answers to questions such as: Why source separate? What can go in the organics bin? What are the costs of the program? How can I reduce my costs through a Home Waste Characterization Analysis? How can I make my own compost? What can compost do for me? How do I use compost?
- Utilize newspapers and radio stations to promote the program.
- Develop display boards for use at the County Fair or community events.
- Work with schools and/or Conservation Districts to seek environmental education grants for teaching school children the whys and hows of composting. Promoting recycling and composting with the youth will get the message into the homes.

The decision makers of our area have the difficult challenge of designing a program that will require a change in the behavior patterns of almost every resident in Grant County. Changing the behavior of society is not easy. Ultimately, each individual asked to participate in this program must have that desire to change in their own mind. For the most part, the desire for change is rooted in the recognition of an increased value in adopting the new behavior over continuing with the old. That is the question in implementing an organic recycling and composting program in Grant County. Will the citizens of Grant County recognize sufficient value in separating their compostable waste from their other solid waste and make it available as a valued resource? This feasibility study has shown it is possible. It is now left to the will of the decision makers and residents of Grant County to decide whether or not to do so.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

APPENDIX – A

COMPOSTING FACILITY

Checklist for Review of Solid Waste Permit Application
per WAC 173-350-220

Name of Applicant:	Name of Facility:
Permit # assigned by Health Department:	Date Received:
Lead Agency Reviewer Name: Phone: Signature:	Determination of Compliance with: The Site or Facility: ☐ meets all solid waste, air and other applicable laws and regulations ☐ conforms with the approved comprehensive solid waste handling plan ☐ complies with zoning requirements (JHD only)

☐ **Location requirements** ***WAC 173-350-220(2)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
There are no specific location standards for composting facilities subject to this chapter; however, composting facilities must meet the requirements provided under WAC 173-350-040(5).		☐	☐	
Agency Comments:				

☐ **Design Standards** ***WAC 173-350-220(3)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
Scale drawings of the facility including the location and size of feedstock and finished product storage areas, compost processing areas, fixed equipment, buildings, leachate collection devices, access roads and other appurtenant facilities provided.				
Design specifications for compost pads, storm water run-on prevention system, and leachate collection and conveyance systems provided.				
Public access roads designed to prevent traffic congestion, traffic hazards, dust and noise pollution (3)(a)		☐	☐	

Storm water run-on prevention systems designed to divert storm water from areas of feedstock preparation, active composting and curing per (3)(b)		☐	☐	
Leachate holding ponds and tanks meet the requirements of (3)(c) including:		☐	☐	
• Leachate conveyed to leachate holding pond, tank or other containment structure.		☐	☐	
• Leachate holding structure adequate capacity to collect the amount of leachate generated		☐	☐	
• Volume calculations based on facility design, monthly water balance and precipitation data		☐	☐	
• For **registered dairies**, design and installation meet Natural Resources Conservation Service standards in place at the time of construction of the pond. **NA** ☐		☐	☐	
• **Leachate holding ponds other than registered dairies**:				
Liner consists of a minimum 30-mil thickness geomembrane overlying a structurally stable foundation to support the liners and the contents of the impoundment, **or** a high density polyethylene geomembranes at least 60-mil thick to allow for proper welding **or** an alternative design approved by the JHD during the permitting process		☐	☐	
Dikes and slopes designed to maintain their structural integrity under conditions of a leaking liner and capable of withstanding erosion from wave action, overfilling, or precipitation		☐	☐	
Freeboard equal to or greater than eighteen inches to avoid overtopping from wave action, overfilling, or precipitation, or other engineering controls approved by JHD during the permitting process		☐	☐	
Review and approval by Dam Safety Section of the department for ponds designed to impound more than 10 acre feet **NA** ☐		☐	☐	
• Tanks used to store leachate meet design standards in WAC 173-350-330 (3)(b) **NA** ☐		☐	☐	
Facility designed with process parameters and management procedures that promote aerobic composting taking into account porosity, nutrient balance, pile oxygen, pile moisture, pile temperature, and retention time of composting (3)(d)		☐	☐	
Compost pads for incoming feedstocks, active composting and curing meet the requirements of (3)(e) including:		☐	☐	

• Pad curbed or graded in a manner to prevent ponding, run-on and runoff, and direct all leachate to collection devices. Design calculations based upon the volume of water resulting from a twenty-five-year storm event as defined in WAC 173-350-100		☐	☐	
• Pad constructed over soils that are competent to support the weight of the pad and the proposed composting materials		☐	☐	
• Entire surface area of the compost pad designed to maintain its integrity under any machinery used for composting activities at the facility		☐	☐	
• Pad constructed of materials such as concrete (with sealed joints), asphaltic concrete, or soil cement to prevent subsurface soil and ground water contamination		☐	☐	
• JHD approved other materials for compost pad construction **NA ☐**		☐	☐	
Agency Comments:				

☐ **Plan of operations** ***WAC 173-350-220(4)(e)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
List of feedstocks to be composted, including a general description of the source of feedstocks (4)(e)(i)		☐	☐	
A description of how wastes are to be handled on-site during the facility's active life including: (4)(e)(ii)		☐	☐	
• Acceptance criteria that will be applied to the feedstocks		☐	☐	
• Procedures for ensuring that only the waste described will be accepted		☐	☐	
• Procedures for handling unacceptable wastes		☐	☐	
• Mass balance calculations for feedstocks and amendments to determine an acceptable mix of materials for efficient decomposition		☐	☐	
• Material flow plan describing general procedures to manage all materials on-site from incoming feedstock to finished product		☐	☐	
• A description of equipment, including equipment to add water to compost as necessary		☐	☐	
• Process monitoring plan, including temperature, moisture, and porosity		☐	☐	
• Pathogen reduction plan for facilities that accept Type 2, Type 3, and Type 4 feedstocks		☐	☐	
• Sampling and analysis plan for the final product		☐	☐	

• Odor management plan (air quality control plan)		☐	☐	
• Leachate management plan, including monthly water balance		☐	☐	
• Storm water management plan		☐	☐	
A description of how equipment, structures and other systems are to be inspected and maintained, including the frequency of inspections and inspection logs (4)(e)(iii)		☐	☐	
A neighbor relations plan describing how the owner or operator will manage complaints (4)(e)(iv)		☐	☐	
Safety, fire and emergency plans (4)(e)(v)		☐	☐	
Forms for recordkeeping of daily weights or volumes of incoming feedstocks by type and finished compost product, and process monitoring results (4)(e)(vi)		☐	☐	
Other details to demonstrate that the facility will be operated in accordance with subsection (4) and as required by the JHD		☐	☐	
Agency Comments:				

☐ **Ground Water Monitoring Requirements *WAC 173-350-220(5)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
There are no specific ground water monitoring requirements for composting facilities subject to this chapter; however, composting facilities must meet the requirements provided under WAC 173-350-040(5)		☐	☐	
Agency Comments:				

☐ **Closure plan *WAC 173-350-220(6)(b)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
Methods of removing raw or partially composted feedstocks		☐	☐	
Steps taken for decontamination		☐	☐	
Agency Comments:				

☐ **Financial Assurance Requirements WAC 173-350-*220(7)***	**Location of material**	**Complete**	**Meets Requirements**	**Date & Initials of Reviewer)**
There are no specific financial assurance requirements for composting facilities subject to this chapter; however, composting facilities must meet the requirements provided under WAC 173-350-040(5)		☐	☐	

APPENDIX – B

Organic Soil Amendment Survey

Instructions: Your responses are an important element to the success of a county-wide compost program. You do not need to provide your name and contact information but if you choose to do so, this information will be kept confidential.

In this survey, the word "compost" describes the end-product of the controlled biological decomposition of organic material by micro-organisms. There is space at the end of the survey for any additional comments you may have.

If you have any questions about the survey, please contact Ron Hull at Grant Conservation District, 2145 Basin Street S. W., Suite C, Ephrata, WA 98823; 509-754-2463 X5. Please return the completed survey in the addressed, stamped envelope.

Farm/Company: ____

Name: ____

Address: ____

Telephone: ______________________________________

Crops Grown: (circle crops you grow) Apples Alfalfa Dry Corn Sweet Corn Dry Beans Green Peas Lima Beans Onions Potatoes Vegetable Seed Wheat Other ____

Total Acres: Owned______ Farmed______ Irrigated______ Dryland______ Range______

Basic Compost Knowledge

1. Check all that apply,

- I am not familiar with what compost is. ☐
- I am familiar with compost but do not know how to use it. ☐
- I have considered using compost as a soil amendment for my farm. ☐
- I have had a consultant recommend the use of compost on my farm. ☐
- I currently apply compost regularly on my farm. ☐

2. Compost will do the following. (Check all that apply)

Improve soil tilth	☐	Improve water holding capacity	☐
Reduce surface run-off	☐	Suppress weeds	☐
Improve water infiltration	☐	Raise soil biological activity	☐
Provide slow release of nutrients	☐	Increase soil organic matter	☐

Suppress plant disease ☐

3. I would like to learn the following about compost? (Check all that apply)

What is compost?	☐	How is compost made?	☐
What can compost be used for?	☐	How is it applied?	☐
What will compost do for my soil?	☐	What won't compost do for my soil?	☐
How can compost supplement my commercial fertilizer program?	☐	Is compost cheaper than commercial fertilizer?	☐
How much should I use?	☐	Can I make my own compost?	☐

<u>Background Information</u>

1. Do you currently add organic material, such as manures, green manures, mulches and/or compost to your soil?

Yes ☐ No ☐

<u>If you marked No, please skip to Question #14 on page 4.</u>

2. What kind of organic material do you add to your soil?

a. crop residue ☐
b. cattle manure ☐
c. chicken manure ☐
d. other animal manures ☐
e. mulches (straw/wood chips) ☐
f. agriculture compost (manure/straw) ☐
g. yard waste compost ☐
h. other (specify)_________________ ☐

3. What is the cost per cubic yard (cy) or ton for the organic material you use? Please circle the measurement for each material.

	Free	$1 - $10	$10 - $20	$20+
a. crop residue – cy/ton	_____	_____	_____	_____
b. cattle manure – cy/ton	_____	_____	_____	_____
c. chicken manure – cy/ton	_____	_____	_____	_____
d. other manures – cy/ton	_____	_____	_____	_____
e. mulches – cy/ton	_____	_____	_____	_____
f. agriculture compost – cy/ton	_____	_____	_____	_____
g. yard waste compost– cy/ton	_____	_____	_____	_____
h. other (specify) – cy/ton	_____	_____	_____	_____

4. Where do you purchase these products?

a. other farms ☐
b. local wholesale ☐
c. local retail ☐
d. other (specify) ☐

5. How do the materials get to your farm?

a. delivered ☐ b. self haul ☐

6. When do you apply organic material? (Check all that apply)

a. Fall ☐ b. Winter ☐ c. Spring ☐ d. Summer ☐

7. For each major crop type please indicate organic material uses and rate of application per acre. Indicate whether the rates are in tons or cubic yards per acre.

Crop	Organic Material	1 - 5	6 - 10	11 - 15	15+
e.g. potatoes	***agriculture compost***		***tons***		
a.					
b.					
c.					
d.					
e.					

8. Do you contract the application of the material?

Yes ☐ No ☐

9. How is the material applied?

Broadcast Spinner ☐ Manure Spreader ☐ Other (specify) _______________

10. How is the material incorporated?

a. disked into soil ☐
b. surface applied ☐
c. side dressing ☐
d. Other (specify) ________________________

11. Please estimate the cost per acre to <u>apply</u> the material (labor & equipment). Do not include the cost of the material.

a. $1 - $10 per acre ☐
b. $10 - $20 per acre ☐
c. greater than $20 per acre ☐
d. other (specify) ________________________

12. Do you add fertilizer to the organic material?

Yes ☐ No ☐

13. Do you premix fertilizer with the organic material or do you apply it separately?

a. premix ☐
b. separate application ☐

<u>14</u>. If you understood how to use organic soil amendments better, would you expand your use of organic materials in your soil management efforts?

Yes ☐ No ☐

15. What benefits would you expect from the application of organic materials? (Check all that apply)

a. Improved soil tilth ☐
b. Water savings ☐
c. Fertilizer savings ☐
d. Energy savings ☐
e. Disease suppression ☐
f. Increased crop yield ☐
g. Erosion control ☐
h. Improved water penetration ☐
i. Other (specify) ________________________

16. What problems, if any, do you have or foresee with the application of organic materials?

a. Availability ☐
b. Cost of purchase ☐
c. Cost of application ☐
d. Field accessibility ☐
e. Quality concerns ☐
f. Unpredictability of results ☐
g. Inconsistency of material ☐
h. Other (specify) ________________________

Compost Specifications

1. Please check the importance of each compost specification category listed below.

		Not Important	Important	Very Important
a.	Material grade/size	☐	☐	☐
b.	Moisture content	☐	☐	☐
c.	Color	☐	☐	☐
d.	Odor	☐	☐	☐
e.	Consistency	☐	☐	☐
f.	Nutrient content	☐	☐	☐
g.	pH	☐	☐	☐
h.	Salinity	☐	☐	☐
i.	Other (specify) ______________	☐	☐	☐

2. What potential contaminants would concern you? Please check the importance of the following contaminants.

		Not Important	Important	Very Important
a.	Heavy metals	☐	☐	☐
b.	Inert contaminants (plastic, glass)	☐	☐	☐
c.	Pollutants (pesticides, herbicides)	☐	☐	☐
d.	Weed seeds	☐	☐	☐
e.	Pathogens	☐	☐	☐
f.	Other (specify) _______________	☐	☐	☐

3. What quantity of compost could you potentially apply per acre?

		Cubic Yards	Tons
a.	0		
b.	1 – 15		
c.	6 – 10		
d.	11 – 15		
e.	16 – 20		
f.	more than 20		

4. Would you want compost delivered or would you self-haul?

Delivered ☐ Self-haul ☐

5. What is the highest price you would be willing to pay for the material?

	Cubic yard	Ton
a. $1 - $5		
b. $6 - $10		
c. $11 - $20		
d. $21 - $30		

6. If there was a compost production facility in Grant County, would you be more interested in using compost on your fields?

Yes ☐ No ☐ Undecided ☐

7. If there was a compost production facility in Grant County and you had excess crop residues (old hay bales, cull produce, prunings, etc.) you needed to haul off your farm, would you take them to the compost facility,

if there was a tipping fee? Yes ☐ No ☐

What if there was no tipping fee? Yes ☐ No ☐

(A **tipping fee** is a monetary charge for dumping material.)

8. Would you be willing to haul excess crop residues to a compost production facility in Grant county if you received finished compost in return?

Yes ☐ No ☐

Thank you for your participation. Please return your completed survey by December 23rd.

Please include any additional comments you may have below or on a separate sheet of paper:

RESOURCE MATERIALS

City of Moses Lake. 1993. *Compost Facility Feasibility Study,* prepared by Parametrix, Inc., Kirkland, WA.

Clark County Solid Waste Management Plan. 2000. Chapter 13.

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Epstein, Eliot. 1997. The Science of Composting. CRC Press LLC, 2000 N.W. Corporate Blvd., Boca Raton, FL.

Fickes, Michael. 2002. Banned in Boston (and a few thousand other places). Waste Age, Primedia, Inc.

Goldstein, Nora. 2005. Source Separated MSW Composting in the U. S. Biocyle. December Vol. 46, No. 12. 20-26.

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Natural Resource, Agriculture, and Engineering Service. 1992. *On-Farm Composting Handbook,* Robert Rynk, editor. NRAES-54, Ithaca, N.Y.

Richard, Tom L. 1993. *Municipal Solid Waste Composting: Physical Processing,* MSW Composting Fact Sheet Series #1, Cornell Waste Management Institute, Ithaca, N.Y.

Richard, Tom L. 1993. *Municipal Solid Waste Composting: Biological Processing,* MSW Composting Fact Sheet Series #2, Cornell Waste Management Institute, Ithaca, N.Y.

Seattle Public Utilities. 2002. *Composting at Home,* The Natural Lawn & Garden, Healthy Landscapes for a Healthy Environment, #76168, Seattle, WA.

Sherman-Huntoon, Rhonda. 2000. *Community Backyard Composting Programs,* North Carolina Cooperative Extension, AG-599.

State of Oregon Department of Environmental Quality. 2000. *Fact Sheet: Oregon Food and Yard Debris,* Office of Communications and Outreach, Portland, OR

The National Audubon Society. 1996. *Source Separated Composting, a how to guide for implementing pilot programs,* 700 Broadway, New York, NY.

U. S. Environmental Protection Agency. 1994. *Composting Yard Trimmings and Municipal Solid Waste,* EPA530-R-94-003.

U. S. Environmental Protection Agency. 1994. *WastePrevention, Recycling, and Composting Options: Lessons from 30 Communities,* EPA530-R-92-015.

U. S. Environmental Protection Agency. 1995. *Decision Maker's Guide To Solid Waste Management, Second Edition,* EPA530-R-5-023.

U. S. Environmental Protection Agency. 1999. *Organic Materials Management Strategies,* EPA530-R-99-016.

Washington Organic Recycling Council. 2005. *Compost Facility Operator Training,* Washington State University Puyallup Research and Extension Station.

Washington State Department of Ecology. 2003. *Rural Waste Characterization Report,* Prepared by Cascadia Consulting Group, Inc. in cooperation with Green Solutions, Inc.

ADDITIONAL INFORMATIONAL LINKS:

Compost Education and Resources for Western Agriculture:
http://www2.aste.usu.edu/compost/

Cornell Composting: http://www.cfe.cornell.edu/compost/Composting_homepage.html

US Composting Council: http://compostingcouncil.org/ndex.cfm

US Environmental Protection Agency: http://www.epa.gov/compost/

Washington Organic Recycling Council: http://www.compostwashington.org/

Washington State University Compost Connection: http://csanr.wsu.edu/compost/