January 30, 2003

Mr. Pete Previte
Recycling Coordinator
Allegheny County
3901 Penn Avenue, Building #5
Pittsburgh, Pennsylvania 15224-1313

Subject: Establishing a Pre-Consumer Food Waste Collection and Composting Pilot Program in Allegheny County, Pennsylvania

Dear Pete:

This letter report serves to provide Allegheny County with recommendations to establish a pilot program for collecting and composting pre-consumer food waste. To assist Allegheny County achieve this objective, R. W. Beck completed the following tasks:

- Task 1: Analyze the market conditions associated with composting pre-consumer food waste generated in Allegheny County;
- Task 2: Estimate the quantity of food waste that would be generated by pilot program participants;
- Task 3: Research and summarize at least one County-wide food waste composting project; and
- Task 4: Estimate the cost of collecting, transporting and composting food waste from pilot program participants.

Task 1 – Market Conditions

Food waste is consistently one of the largest categories of waste being landfilled in most parts of the country. In California, according to the California Integrated Waste Management Board, food waste comprises approximately 16 percent of the disposed waste stream (from residential, institutional, and commercial sources). Preliminary data from R. W. Beck's 2001 PA DEP Waste Composition Study indicates that food waste comprises an estimated 7.3 percent of the materials landfilled in urban Southwestern Pennsylvania communities (Figure 1).

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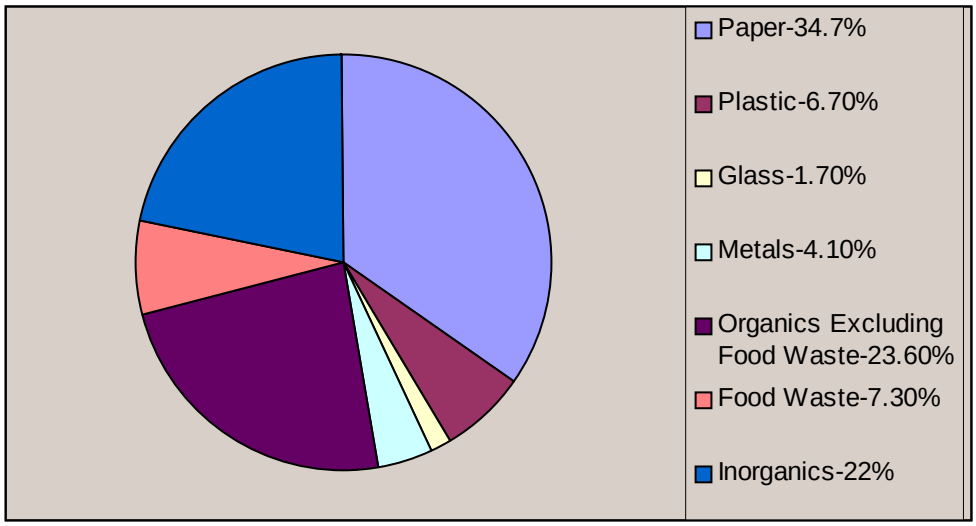
Figure 1
2001 Waste Composition for Urban, Southwestern Pennsylvania



However, because of the challenges inherent in the separation, collection and processing of food waste, effective composting or other food waste recycling programs have been slow to develop.

Food waste is often characterized in the waste industry as being either “pre-consumer” or “post-consumer”. Pre-consumer food waste is typically generated as a result of commercial/industrial food production or preparation for consumption, and in some cases may include food that is still edible for use in food bank programs. Post-consumer food waste, as the term implies, has been served to consumers and is not recoverable for human consumption, however may be acceptable for composting or animal feed operations. The primary concern with recovery of post-consumer food waste pertains to sanitation and health issues in handling these materials.

Another important consideration within the realm of food waste recovery is the presence or absence of meat in the waste stream. This concern stems from the potential for foodborne pathogens to proliferate under certain conditions during storage, transport and processing of the food waste. Proper handling effectively controls pathogen growth but the tendency of public health agencies is to err on the side of caution. Because of this, most food and food waste handling regulations, including composting regulations, are considerably more restrictive where meat is present. Due to these conditions, R. W. Beck limited the market to pre-consumer vegetative food waste.

Pre-consumer food waste that is not fit for human consumption can be used as a feedstock for manufacturing compost with great success. Food waste provides a high amount of nitrogen in making compost. A number of composting technologies exist that can be used to compost food waste at a commercial scale. Whatever technology is used, the composting operation must produce a stable and consistent quality product in order to meet market requirements. Food is generally ground, then added to high-carbon ingredients, such as leaves, soiled paper and

cardboard, and/or ground wood. Vegetative food waste is most commonly utilized, however animal products can also be used if the temperatures in the compost become high enough to break down the enzymes, and where state regulations permit. Most composting operations use windrows. With this technique, the organics are mixed together, aerated, and turned regularly. Microbial action breaks down the organics, creating heat in the process, and turning the matter into compost. At the end of the process, the material is screened to remove larger pieces of material.

In addition to the centralized, commercial composting approach, there are a few programs throughout the country that have successfully matched urban food waste sources with local farmers for on-farm composting. A project in Massachusetts, for example, links commercial food waste generators, commercial waste haulers, and farm composting sites. The majority of food waste comes from supermarkets and a large wholesale grocer. Generators have reported 12-20 percent reductions in their solid waste management costs. One supermarket chain reported a 23 percent reduction in the volume of trash disposed.

Local Market Assessment

R. W. Beck surveyed local organics composters to determine their level of interest in accepting pre-consumer food waste and the requirements/costs for accepting the materials.

Agrecycle
Contact: Dan Eichelaub
Phone: 412-767-7645

Agrecycle is interested in accepting food waste, and holds a permit to do so. Agrecycle is amenable to accepting materials that meet PA DEP requirements and their own. They market their end products to high-end markets, such as golf courses, etc. Thus, they would not want contaminants in compost that would lessen the quality of their products. With respect to kitchen scraps, they could potentially accept plate scraps with permission from PA DEP to conduct a pilot project. However, the kitchen scraps could not be contaminated with materials such as cutlery, plastic containers, etc. Agrecycle estimates the tipping fee for composting food waste to be approximately $20 to $30 per ton, depending upon the quantity and quality of the feedstock.

Agrecycle would be willing to consider collecting food waste, depending on the volume and how the generators would be charged. They would be willing to collect the materials in drums, but would like participants to jointly decide upon the best container types to use. There is some uncertainty as to whether drums could work in all establishments. Also, Agrecycle tried using barrels at a grocery store, but experienced difficulties because this system required using hand carts. In Agrecycle's opinion, two-wheeled carts are in some ways better, but they get very heavy very quickly, and wheels become ruined.

Emery Tree Service
Contact: Pat Borelli
Phone: 412-963-8003

Emery Tree Service composts wood debris and yard waste. Currently, they are not permitted to accept food waste, but they are interested in going through that permitting process. They do not have any particular specifications, except that the feedstock be free of contaminants. Emery would need more information to calculate a tipping fee, such as quantity and type of food waste generated.

Emery is open to the possibility of providing collection services, and has the capability to implement collection relatively quickly. However, they would have to ensure that providing collection services is economically beneficial to them.

Iser Corporation
Contact: Mark Valentine
Phone: 814-444-9261

Iser Corporation is interested in accepting food waste. Iser has composted both pre- and post-consumer food waste. They have a five-acre facility, located in the middle of 100 acres of property, and have never had any odor problems. Iser uses a windrow technology and a front-end loader. They do no think a self-turning windrow is as efficient.

Iser estimates that the tipping fee for food waste would be $10 to $15 per ton. They are currently working with Penn State, where their composting facility handles all the pre-consumer and post-consumer food waste generated from the food service, which prepares 70,000 meals per week. Iser has a machine that pulls metal out of the feedstock, and plastics are hand-sorted. Plastic bags are not a problem, as long as the incoming materials are not heavily inundated with them, so he would not foresee the need to have generators use special biodegradable bags.

Iser would prefer not to provide collection services for generators located in Allegheny County, due to the distance involved. Iser Corporation does, however, have working relationships with different haulers in the area who could collect the material.

Based on their experience at Penn State, the hauler will need to use either fully or semi-automated collection vehicles if drums are used, since a 50-gallon drum can weigh 300-400 pounds. Iser recommends using small dumpsters (1, 2 or 5-gallons) that can be tipped into a front-end loader so that it is not necessary to lift the food. Iser also recommends not bagging food waste as the bags need to be separated from the food waste. However they will accept bagged food waste.

Iser provided additional advice to facilitate the success of the food waste collection and composting program. For example, it is important to keep containers clean. Before a program is implemented, it should be made clear who is to clean the containers after they are emptied. Iser believes that for food waste generators to be willing to participate in a food waste composting program, it has to benefit them financially. He therefore tries to keep his rates low, relative to disposal.

J.A. Rutter Company
Contact: Mr. Jim Rutter
Phone: 724-327-1101

J.A. Rutter is not interested in accepting food waste because they are not permitted to accept this material, and perceive the permitting process to be overly onerous at this time.

Task 2 – Case Studies

Hutchinson, Minnesota

Hutchinson, Minnesota operates a commercial food waste collection and composting program for commercial establishments. Hutchinson initially targeted grocery stores, since they have an 18-20 percent diversion rate for food waste; the highest rate of all types of generators. In the Hutchinson program, collection is twice weekly throughout the year, but could have decreased to once weekly during the winter months.

Hutchinson originally used 90-gallon rollout carts for the initial supermarket program, but they were not manageable, as they became too heavy due to the high moisture content of the produce waste. They then switched to 30-gallon rollout carts. However, they found that with the 30-gallon carts, in the winter contents would freeze and would not tip. Hutchinson tried putting a false cardboard bottom in, which froze, and food waste did not, allowing contents to tip. The material was originally collected with a dedicated rear loader. Hutchinson has switched haulers since the program's inception, and food waste is now collected using front-end loaders.

Large-scale cafeterias participating in the program use regular trashcans with 40- to 50-gallon bio-degradable bags, which are made of a plastic polymer that is biodegradable. Originally these bags were expensive – approximately 45 cents each, but they have come down in price considerably. The cafeteria staff treats food waste the same as regular trash, where they transfer the bags to a roll cart and then dispose of the bags in a designated dumpster.

Hutchinson officials recommend meeting with the individuals who handle the food waste, as they often have the best ideas for how to handle the waste stream. Finally, Hutchinson's experience is that fast food restaurants do not generate much in the way of quality compostables; but school cafeterias do[1].

Orange County, North Carolina

Orange County funds the entire food waste collection and composting program. In order for an entity to participate, they must meet the following criteria:

- Participate in the commercial glass, metal, and plastics recycling program;
- Generate a minimum of two tons per month because this is what Orange County has decided is more cost-efficient to collect and transport;

[1] PA DEP does not permit composting of post-consumer food waste except in approved pilot programs.

- Have adequate space for the collection containers; and
- Be serviceable by the collection vehicle (i.e., proper space for the vehicle).

The County contracts with a private company to collect and compost the food waste. Brooks, the contractor, is located 40 miles away and charges $55 per ton to collect and $20 per ton to process, for the first 800 tons (aggregate) per year. After that, Brooks waives the $20 per ton processing fee.

The County purchases the compost back from Brooks, and sells it to homeowners. Revenues from the sale of the compost are put back into the program. The budget for the program is $91,000 per year. The County is also responsible for promoting the program.

Currently the County is collecting 800 tons per year. The County is adding several grocery stores, however, which will significantly increase tonnage. In many locations generators use 65-gallon Toter carts. Toter has a model that has a sealed body – e.g., the handle does not go through the body, so leakage is avoided and no liners are necessary. The County estimates that the weight of the compostable material is nine pounds per gallon. Brooks collects the food waste at least three times per week, except for breweries, which generate compostable waste on a less consistent basis, and therefore call when they need collection.

Orange County recommends including the health department from the conceptual stage of a food composting program. They can give advice, and it is helpful to have their buy-in. The Orange County Health Department has never issued a citation at one of their restaurants or grocery stores for food waste collection issues, while they have issued citations for refuse management.

The Pennsylvania State University

Soon after Penn State students inquired why food waste wasn't being composted in 1997, the University began a pilot project to see if they could do just that. After a successful eight-week pilot program, the University decided to make the program permanent. The program is a joint venture among the College of Agricultural Sciences, Housing and Food Services, Hospitality Services, and the Office of Physical Plant. The composting facility is located on the site of a former manure storage area. The University recovers approximately 1.6 tons of food waste per day for composting. In 2001 the total tonnage was 418 tons -- saving the University $16,000 per year in landfill tipping fees.

The compost initiative uses pre-consumer food waste from seven student dining commons, two hotels, and one daycare center. Post-consumer food waste is also used from the hotels, as staff separates this food waste. The food waste is mixed in with leaves, other organic landscape debris collected on campus, and manure from the University's dairy herd. The compost, which resembles potting soil after it is screened, is used on campus for landscaping purposes with excellent results.

The composting center provides the University with an opportunity to combine teaching, research, and educational outreach efforts. Students and faculty learn about source separation,

waste management, and commercial and backyard composting. In 2001 the program received the Governor's Award for Environmental Excellence.

Task 3 – Estimate Set-out Quantities

The Allegheny County Food Waste Composting coalition identified the following establishments as potential pilot program participants:

- Whole Foods – 5880 Center Ave., Pittsburgh 15206;
- East End Food Cooperative – 7516 Meade Street, Pittsburgh 15208;
- Mad Mex – 370 Atwood Street, Pittsburgh 15206;
- Yum Wok – 400 S. Craig Street, Pittsburgh 15213;
- University of Pittsburgh – Pittsburgh, 15260;
- Carnegie Mellon University – 5000 Forbes Ave, Pittsburgh 15213;
- Duquesne University – 6000 Forbes Ave., Pittsburgh 15282;
- Chatham College – Woodland Road, Pittsburgh, 15232;
- Pittsburgh School District Food Services – 8 South 13th Street, Pittsburgh, 15203;
- J.E. Corcoran Co. – 21 Smallman Street, Pittsburgh 15205;
- Paragon Monteverde Food Service – 55 36th Street, Pittsburgh, 15201; and
- Superior Produce Co. – 2100 Smallman Street, Pittsburgh 15222 (Indicted that they were not interested in participating).

Based on initial calls, R. W. Beck determined that these establishments could not accurately estimate the quantity of food waste they set out on a daily, weekly or monthly basis. Since this information is essential for designing a collection system, R. W. Beck categorized the Orange County and Allegheny County establishments by type of service (i.e. grocery stores). R. W. Beck then used the per-employee set out quantity data from the Orange County program and applied this data to employees from the same type of food waste category in the Allegheny program (Table 1).

Table 1
Set-Out Estimates

Type of Service	Orange County	Tons Per Year	Number of Employees	Tons per Employee	Allegheny County	Number of Employees	Tons Per Year
Grocery Store	Wellspring Whole Foods Market	205.6	300	0.69	▪ Whole Foods ▪ East End Food Coop.	▪ 220 ▪ 59	▪ 151.8 ▪ 40.71
Restaurant	Aurora Restaurant	21.03	50	0.42	▪ Mad Mex ▪ Yum Wok	▪ 36 ▪ ??? [2]	▪ 15.12 ▪ ???
University Food Service	Granville Towers	7	70	0.1	▪ Univ. of Pitts. Towers ▪ Carn. Mellon ▪ Dusquesne ▪ Chatham	▪ 100 ▪ 70 ▪ 296 ▪ 20	▪ 10 ▪ 7 ▪ 29.6 ▪ 20.1

For the large-scale food preparation services, R. W. Beck used the number of meals served instead of tons per employee to estimate generation quantities, since some of these organizations use volunteers and temporary employees, and therefore do not know how many employees/volunteers they use.

[2] Would not provide information

Table 2
Set-Out Estimates for Large Scale Food Preparations

Type of Service	Orange County	Tons Per Year	Meals Served Per Year	Tons per Meal	Allegheny County	Meals Served Per year	Tons Per Year
Large Scale food Prep.	Interfaith Community House	21.3	75,000	0.000284	Pittsburgh School District	5,261,400	1,494.23

R. W. Beck was not able to obtain set-quantity estimates for produce wholesalers. Therefore, generation quantities were not able to be estimated. However, they were included in the collection route analysis in case the data becomes available.

After the annual quantity of food waste set-outs were estimated, R. W. Beck determined the number of 30-gallon containers each establishment participating in the pilot program would set out each week, based upon a three-day collection week.

Table 3
Estimated Cart Requirements

Account Type	Estimated 30 gal Carts/Yr	Estimated Carts/Day for 3-Day Week
Grocery Store	302	2
University Food Service	219	2
University Food Service	15	1
Grocery Store	1,124	8
University Food Service	52	1
Restaurant	112	1
Other Large Food Prep	11,107	72
Total	13,005	88

Task 4 – Collection

Operations

R. W. Beck designed a collection system based on food waste being collected using 30-gallon carts, three days per week, on Monday, Wednesday, and Friday. The average weight for carts containing food waste in Orange County, North Carolina is nine pounds per gallon.

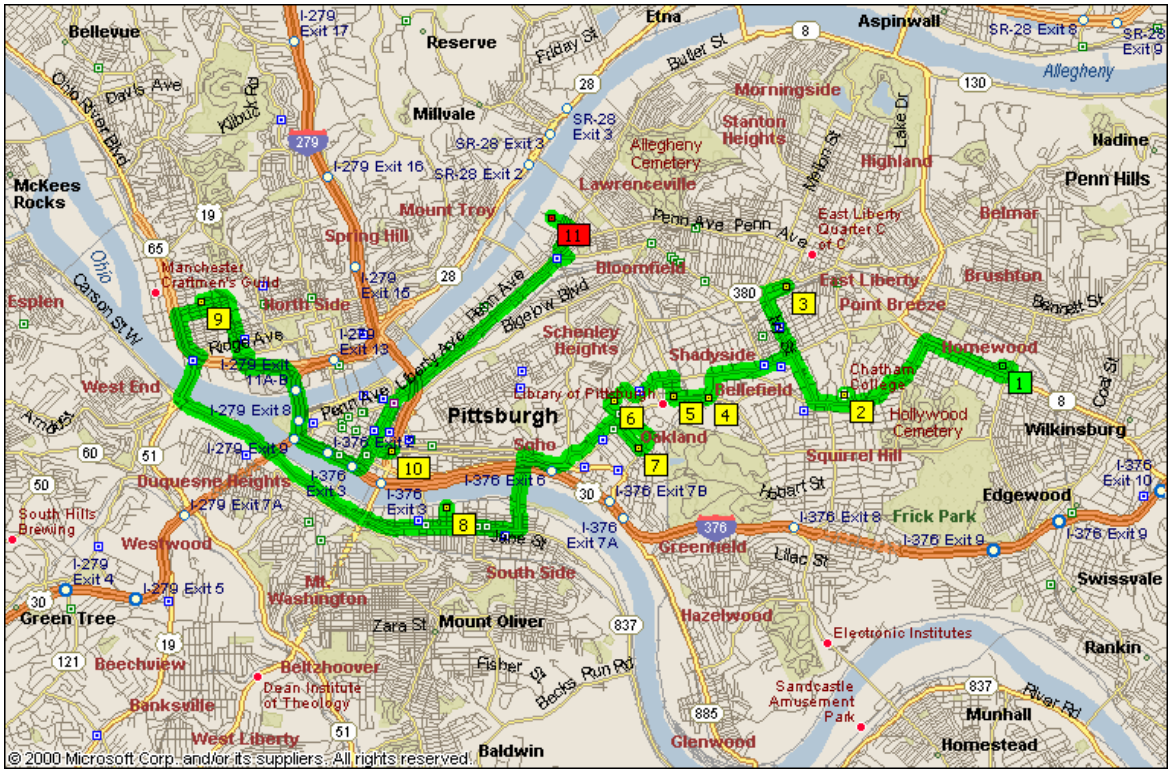
Consequently, R. W. Beck recommends using 30-gallon versus 64 -gallon carts, as the larger carts could weigh almost 600 pounds, which would limit their mobility, and exceeds cart weight ratings.

The carts would be placed outside the generator's facility by a particular collection time, as requested by the collector. During the winter months the carts may need to be stored inside to prevent freezing. In this system, the generators would be responsible for cleaning out the cart.

The collection contractor would use an automated truck for collection. Fully automated collection vehicles are equipped with hydraulic crane-like arms that lift, empty, and return the waste container to the point of collection automatically. With this type of collection equipment, only one crewmember is usually needed, and will not need to leave the vehicle under normal conditions. The establishment may need to move the carts from their normal location on collection day, to prevent the driver form having to lift the carts or exit the collection vehicle. This will reduce the potential for operator injury and make collections more efficient. The automated truck would also allow collection directly from loading docks.

R. W. Beck designed the route to optimize collection efficiency, with the total estimated mileage to serve all participants being 18.7 miles and the total travel time to serve all participants being eighty minutes. This route is illustrated in Figure 2.

Figure 2
Collection Map



Stop #	Account Name	Account Type	Account Address
1	East End Food Coop	Grocery Store	7516 Meade St
2	Chatham College	University Food Service	Woodland Rd
3	Whole Food	Grocery Store	5880 Center Ave
4	Carnegie Melon University	University Food Service	5000 Forbes Ave
5	Yum Wok	Restaurant	400 S. Craig St
6	University of Pitt	University Food Service	
7	Mad Mex	Restaurant	370 Atwood St
8	Pittsburgh School Dist Food Service	Other Large Food Prep	85 S 13th St
9	J.E. Corcoran	Produce Wholesalers	2100 Smallman St
10	Duquesne University	University Food Service	600 Forbes Ave
11	Paragon Monteverde Food Service	Food Distributor	55 36th St

R. W. Beck then developed three scenarios for travel, collection and delivery time. The three scenarios were based on the assumption that the collection time from the staring point to the first

stop was thirty, forty-five or sixty minutes, with the difference attributable to traffic. The same scenarios were run for the distance from the last stop to the compost facility at the end of the day. The daily pre- and post-trip times were estimated to be 15 minutes per day. It was also assumed that it would take twenty minutes to unload the food waste at the compost facility. Table 4 presents the results of this analysis.

Table 4
Collection Time Estimates

Scenario	#1	#2	#3
Pre Trip	15	15	15
Travel to Route [1]	30	45	60
Mileage between Stops	19.5	19.5	19.5
Driving time between Stops	80	80	80
Service time for 11 Stops [2]	200	200	200
Travel to Compost Facility	30	45	60
Dump at Compost Facility	20	20	20
Travel Time to Yard [1]	0	0	0
Post Trip	15	15	15
Total Minutes per Day	390	420	450
Total Hours per Day	6.50	7.00	7.50

[1] Collection equipment is located at compost facility

[2] Avg. minutes of collection time at each stop 20

Collection Costs

The data from the collection time analysis was used to model the collection costs for two scenarios. The first scenario, Table 5, estimated cost if no grant funding was received for capital purchases. The scenario, Table 6, assumes that 90 percent of the capital costs (the vehicle and carts) would be funded through a grant.

Both scenarios include interest, labor and processing costs, overhead percentage, and desired profit were also estimated in the model. The results of the model predicted the average cost per ton to collect and process the food waste. There was an insignificant difference in the per-ton cost between the sensitivities. The average cost per ton to collect and process the food waste is $80.44 for scenario one and $48.39 for scenario two.

Table 5
Estimated Collection and Processing Costs for Scenario One

Annual Operational Cost				
Equipment Cost				$ 58,287.12
	Collection Truck Purchase Price	$	165,000	
	Years of Depreciation		5	
	Monthly Depreciation	$	3,229	
	Annual Depreciation	$	38,748	
	Annual Maintenance Cost	$	18,500	
	Annual Maintenance Cost per Day	$	72.55	
	Days of Operation		3	
	Annual Maintenance Cost	$	11,317.65	
	Cart Purchase Price	$	35.00	
	Number of Carts		131	
	Years of Depreciation		10	
	Monthly Depreciation	$	685	
	Annual Depreciation	$	8,221.50	
Labor Cost				$ 21,415.68
	Hourly Rate	$	13.00	
	Hrs/Wk		24	
	Wks/Yr		52	
	Annual Wage	$	16,224.00	
	Benefits Rate		32%	
	Benefits	$	5,191.68	
Overhead Cost				$ 15,940.56
	Overhead Cost as % of Total Cost		20%	
	Total Operating Cost	$	79,702.80	
Profit				$ 9,564.34
	% of Profit		10%	
	Total Operating Cost	$	95,643.36	
Annual Processing Cost				$ 34,812.18
	Annual Tonnage		1,740.61	
	Cost per Ton	$	20.00	
Total Cost				$140,019.87
Total Tons Collected and Processed				$ 1,740.61
Estimated Cost per Ton				$ 80.44

Table 6
Estimated Collection and Processing Costs for Scenario Two

Annual Operational Cost				
Equipment Cost		**Purchase Price**	**Grand Funding @ 90%**	
	Collection Truck Purchase Price	$165,000	$ 148,000	$ 16,500
	Years of Depreciation			5
	Monthly Depreciation			$ 323
	Annual Depreciation			$ 3,875
	Annual Maintenance Cost			$ 18,500
	Annual Maintenance Cost per Day			$ 2.55
	Days of Operation			3
	Annual Maintenance Cost			$ 11,317.65
	Cart Purchase Price	$35.00	$ 31.50	
	Number of Carts			131
	Years of Depreciation			10
	Monthly Depreciation			$ 69
	Annual Depreciation			$ 822.15
Labor Cost				$ 21,415.68
	Hourly Rate		$ 13.00	
	Hrs/Wk		24	
	Wks/Yr		52	
	Annual Wage		$16,224.00	
	Benefits Rate		32%	
	Benefits		$ 5,191.68	
Overhead Cost				$ 15,940.56
	Overhead Cost as % of Total Cost		20%	
	Total Operating Cost		$79,702.80	
Profit				$ 9,564.34
	% of Profit		10%	
	Total Operating Cost		$95,643.36	
Annual Processing Cost				$ 34,812.18
	Annual Tonnage		1,740.61	
	Cost per Ton		$ 20.00	
Total Cost				$84,220.14
Total Tons Collected and Processed				$ 1,740.61
Estimated Cost per Ton				$ 48.39

It should be noted that the efficiency of the collection system would increase and the per-unit cost would decrease if additional material could be collected on each of the three days. The additional quantity of material could be collected without any additional operational collection costs other than cart costs.

R. W. Beck thanks the Allegheny Food Waste Composting Coalition for asking us to participate in this project, and hopes that this assistance facilitates the institution of a successful food waste composting program in Southwestern Pennsylvania.

Sincerely,

R. W. BECK, INC.

Karen Luken
Senior Director

cc: Carl Hursh, DEP