July 5, 2000

Mr. Steven Tilney
Interim Recycling Coordinator
City of Philadelphia Streets Department
Recycling Office
Room 780 MSB
1401 JFK Boulevard
Philadelphia, PA 19102

Subject: Establishing a Food Waste Composting Demonstration Site for the City of Philadelphia

Dear Steve:

This letter is to provide the City of Philadelphia with the results of R.W. Beck's evaluation of food waste composting equipment and the most appropriate system for use in a demonstration facility to be established by the City. The goal is to demonstrate how food waste composting in businesses and institutions can: (1) generate a valuable product; and (2) reduce waste management costs by diverting materials from the waste stream.

This evaluation considers smaller scale enclosed systems that can be used for the composting of food waste and potential demonstration facilities. Only enclosed systems are considered because of the potential for vermin, insects and odors from an open operation in an urban setting.

ENCLOSED COMPOSTING SYSTEMS

Beck reviewed systems manufactured by the following companies:

- Ag-Bag Environmental
- Green Mountain Technologies
- Wright Environmental Management

Beck also requested information from NaturTech, but was unsuccessful in obtaining information or even a response after numerous attempts.

Each of the systems reviewed is described below.

Ag-Bag Environmental

Ag-Bag Environmental markets the "EcoPOD" (Preferred Organic Digester) system. In this system, materials are processed through a machine that breaks down the feedstock and feeds it into the EcoPOD, which is a low density polyethylene dark green film "tube." The material resides in the EcoPOD for eight to twelve weeks, at which time it can be harvested and placed into static piles for 30 to 60 days to cure.

The EcoPOD holds between 250 to 1,000 cubic yards of preground materials that are mixed with the right amount of moisture. Included with the EcoPOD is aeration piping with all fittings, seal strip sealing equipment, controllable vents, temperature probes and starter inoculant.

Some advantages to the system are that it can handle large volumes in a smaller amount of space than some other systems. Odors are controlled, as is leachate. There is no litter and low likelihood of rodents or other vectors. Cycle time (time spent composting) is less than it would be in an open system.

This system appears to have been implemented successfully in various locations throughout the country. While there are many good aspects to this system, it would generally require more space to operate than most facilities in an urban setting like Philadelphia would require. This system might work well in an application where materials from a number of smaller facilities are transported to a central location for composting, such as on a park or other public property where sufficient space is available. However, this kind of central facility requires a permit from the Pennsylvania Department of Environmental Protection (DEP) to operate, and this is a process that can be avoided by conducting composting on site. Currently, there are only two permitted composting sites in Pennsylvania, and because the process is often viewed as cumbersome, most prefer to avoid this hurdle. Unless the City is willing to manage such a site, or unless a specific facility has sufficient space for this type of operation, it is unlikely that this kind of system can be successfully implemented in Philadelphia.

Green Mountain Technologies

Green Mountain Technologies manufactures two systems small-scale in-vessel systems. The larger system is the CompTainer, and the smaller is the Earth Tub.

CompTainer. The CompTainer system can manage from one to 150 tons of material per day. Greater capacity can be achieved by incorporating more CompTainer units. In this system, materials are blended in a mixer, with scales used to measure each type of material to achieve the right blend. A "CompLoader" (mobile conveyor) is used to evenly load materials into the CompTainer at rates up to two tons per minute. This unit also has a high-energy flail at the end of the conveyor for breaking up clumps of material. The CompTainer is an airtight vessel. An aeration floor distributes pressurized air for aerobic composting, and a holding tank beneath the floor collects liquids from the compost. These units contain no moving parts. Aeration is controlled by a "CompTroller" system that monitors and interprets temperature data to determine volume and direction of airflow to maintain uniform moisture and temperature. A biofilter removes odors from the process air before release.

The CompTainer units are compatible with hook lift or cable lift roll off trucks to allow units to be moved and emptied. Finished compost is then loaded into a "CompScreener" to recover bulking agents and other contaminants.

This system can be used either indoors or outdoors, and can be operated in a smaller area than the AgBag system. However, this system would still require significantly more space than many facilities would allow in an urban setting, and provides for far more capacity than most smaller facilities need. Ideally, at least two units would be needed so that one can continue receiving new materials while the other completes the composting process. This system would probably be best in a university, hospital or prison setting where there may be more space available to operate the equipment and sufficient materials for the process.

Earth Tub. The Earth Tub is specifically designed for a low volume generator. The system consists of a tub that is 89 inches in diameter at its widest point, and stands four feet in height. The entire

unit weighs 300 pounds and holds 3.5 cubic yards in volume, accommodating approximately 100 to 200 pounds per day of material. Capacity can be increased by adding more units.

Materials are fed into the system through a loading hatch on the cover. The materials are mixed by turning on an auger and rotating the cover to mix the materials. The auger is designed to shred and mix a ton or more of compost in 10-15 minutes, and the company recommends that mixing should be done at least two times per week during active composting, which is usually three to four weeks. The system has an aeration system that draws out heated air generated by the breakdown of materials, with a blower that pushes the exhaust gases through a biofilter to remove odors. Liquids collected in a holding tank below the floor can be recycled back into the compost. The company claims that reduction in volume of the materials is usually 70 percent or higher.

Once composting is complete, compost may be removed by opening the discharge door during the mixing process. The auger pushes the compost out as it rotates past the discharge door. The compost should be cured for 20 to 40 days before use.

While one unit may be used for facilities with very small volumes of material, two is preferable. With two units, one can be filled and allowed to complete the composting process, and the other can then be filled while the first unit is "cooking." Once the product in the first unit is complete, it can be emptied and the refilled while the second unit completes the process.

Wright Environmental Management

Like the CompTainer, the Wright system uses boxes to process food wastes and other organic materials. However, the Wright unit is different in that it is designed as a stationary, stand alone, unit.

With the Wright system, materials are fed into a mixer, which then feeds the materials by conveyor into one end of the unit. A hydraulic ram at floor level forces a series of trays through a sealed entry port to create a flow through system, with incoming materials accumulating on the trays. The materials are agitated as they move through the use of specially engineered spinners that keep material moving, breaking up clumps and discouraging settling or layering. The materials are moved periodically through various zones in the system where the composting takes place. As a tray reaches the end of the system at the end of the composting process, the finished material is discharged using an auger that pushes the material onto a conveyor that delivers the product to holding bins.

Leachate is controlled by recirculation. The leachate is captured in a leachate holding area under the floor and is pumped back into the process. Odors are controlled by pumping heat, moisture and gases through a biofilter, and processed air is released as exhaust.

An advantage is that the Wright system is built to meet client specifications based on space and volume of material to be processed. It also requires less space than the CompTainer units because materials are processed through a stationary system, rather than one that requires a rolloff or hook unit to move and empty, and only one unit is required. Full composting is completed within approximately 28 days.

One Wright unit is in operation in Crawford County, PA, managing materials generated by the County prison and County home. The County reports that after a few minor problems (not equipment related) the system has been working well.

FACILITIES THAT SHOULD CONSIDER FOOD WASTE COMPOSTING

The City has reported that while two potential sites have been mentioned, it will not be able to establish food waste composting demonstration sites as part of this project. The two sites mentioned are the prison and Saul High School, an agricultural high school located in the City. The prison appears to have some interest, and had several representatives in attendance at the Philadelphia food waste composting workshop held on June 20, 2000.

Below is a discussion of the different types of facilities that could be considered for use as demonstration sites. These facilities include: (1) prisons; (2) universities/schools; (3) hospitals; (4) restaurants; (5) hotels/convention centers; (6) grocery stores; and (7) farmers markets/food distribution facilities. Ideally, it would be good to have a site for each type of facility, though time and budget considerations will probably not allow for this. Included in the discussion are considerations that must be made for each type of facility and the type of unit that might be best suited to each.

Prisons—Establishing a food waste composting operation in a prison may be easier than with most other facilities. Prisons probably have more control over the feedstock than most other facilities. Most of the food waste is generated in the kitchen area. There will be some tray scrapings, but most of the material generated is confined to one area. A decision would need to be made as to whether to compost only vegetative wastes or to also include proteins and tray scrapings. These items could probably be accommodated without major problems, with contamination kept at a minimum.

While not always the case, most prisons will have more space than most urban settings. The amount of feedstock is based on inmate population. A prison with a high inmate population would probably generate large quantities of food waste. Processing this material would probably require the CompTainer or Wright technologies. Disadvantages to using a prison as a demonstration site are that the situation is unique, and access may be problematic.

Universities/schools—Like prisons, in general, universities will have more space and the Wright or CompTainer technologies would probably be preferred. Depending on the school, however, there is less control over materials. Larger universities would generate significant amounts of food waste through their kitchen/cafeteria operation, most of which could be composted. However, many schools also have smaller food operations such as snack bars around campus, requiring that materials be transported to a central site. Plus, many rely on disposable items such as plastic utensils, single serve packets, etc. These items are likely to become contaminants if tray scrapings are used. These issues could be addressed by using smaller units such a the Earth Tub or even specially built “hot boxes” at remote locations, rather than transporting materials, and the school could elect not to use tray scrapings as a means of avoiding contamination.

Primary and high schools are different in that there is usually only one location—the cafeteria--where food wastes are being generated, so there is better control over what goes into the composting unit. The same potential problem of contamination would exist, however, with regard to tray scrapings because of the use of disposable serving items.

Both universities and local schools would probably make good demonstration sites, however, because there are other schools throughout the area who could learn from that experience.

Hospitals

Hospitals would in some ways be comparable to universities, though probably not as spread out. Larger hospitals generally have a central food preparation area/cafeteria that would be the major generator of food waste. Like universities, there may also be smaller coffee shops or snack bars that also generate such wastes. A couple of major differences are that (1) food is distributed throughout the building as patients are fed, and there is often significant waste from patient food, and (2) there is fear that food wastes could be contaminated by pathogens that would not be killed during the composting process.

While all food waste, including tray scrapings, could probably be composted without problems, since the temperatures generated should kill any harmful pathogens, hospitals could avoid this concern by composting only scraps from food preparation. As for tray scrapings, if they are to be included, there is the same potential for contamination that exists in the other settings described above. As with universities, use of smaller units such as Earth Tubs or hot boxes at food service locations away from the cafeteria may be helpful.

Assuming the space is available, the Wright or CompTainer systems would probably be best in a hospital setting. If not, several Earth Tubs (depending on food waste generation) should be adequate to manage this material.

Restaurants

Most restaurants in the City will have very limited space for composting. They also generate far less material than the other facilities described above.

Paul Turci of CityGreen, who spoke at the June 20 food waste composting workshop, spoke of working with clients in New York to develop hot boxes to manage materials. These are basic boxes designed to fit into a specific setting, with pipes running through them to provide aeration to promote composting. Ed Doyle, Executive Chef at the Seaport Hotel in Boston, described a simple system his hotel kitchen uses which was inexpensive to develop and is similar to what Paul Turci described. It is best to have at least two side by side, one to receive new materials, and one to complete the composting process. Once completed material is removed, new material can go into the emptied box, while the other becomes the finishing bin. Again, all food scraps can potentially be composted, though it is easier to control the process when only vegetative scraps are used.

Because of the large number of restaurants in the City, it would be useful to have one that agrees to serve as a demonstration site for others to observe.

Hotels/Convention Centers

Larger hotels and convention centers have some of the same characteristics as hospitals or universities. Many larger hotels have more than one restaurant, and convention centers may have several food service areas. Banquets serving large numbers of people are common in both. Contamination from disposables is probably a greater issue for convention centers, which often feature snack bars that sell food in disposable containers with disposable utensils.

As with other settings, a decision must be made as to whether to include tray scrapings. This should be possible for waste generated from restaurants and banquets, but should almost

certainly be avoided for food wastes generated through snack bars and other carry out type operations because of the potential for contamination.

The other decision is which units would best serve a given facility. For some facilities, it would be best to have composting as a centralized function. For larger facilities, assuming there is space, the Wright or CompTainer systems are probably the best. If space is limited, several Earth Tubs may be a better option. For smaller hotels with a single restaurant, Earth Tubs or hot boxes may be adequate. Depending on the location of food service areas and the ease in moving materials from one location to another, it may be worth considering small units such as the Earth Tub or hot boxes at each location.

Grocery Stores—The size of the grocery store and turnover of perishables will dictate the size of system needed, as well as the space available. Food waste from grocery stores could include spoiled produce, bakery items, food preparation wastes (for those that offer prepared foods), dairy products, and seafood and meat trimmings. The decision will need to be made whether to limit composting to non-protein wastes, or whether dairy, meat and seafood wastes should be included. An advantage for grocery stores is that it is much simpler to control contamination, because most would not be dealing with disposables used for food service.

If space is available and volume is high, the Wright or CompTainer systems would probably be best. However, if there is limited space or for small grocery stores, the Earth Tub would probably be the best option.

As with restaurants, it would be good to identify a grocery store that would be willing to serve as a demonstration site, since the issues they face will be similar from facility to facility.

Farmers Markets/Food Distribution Centers—The system to be used would be highly dependent on the size and setup of these facilities. These facilities generate much the same materials as grocery stores, so the decision as to what to include for composting is a similar one. Some farmers markets serve ready-made foods in disposable containers, so contamination from disposables could be an issue if the market tried to include scraps from customers. It is probably not worth the risk of contamination to try to collect this material.

For large farmers markets and major food distribution centers, the Wright or CompTainer systems are probably the preferred options. For small farmers markets, the Earth Tub is probably the best option.

SELECTING DEMONSTRATION SITES

Ideally, the City should have one demonstration site for each category described above. Since composting arrangements are usually unique to a given site, it would be difficult for one facility to serve as an adequate example for all types of facilities. This is even true for facilities within the same category, though a program that serves a similar facility would probably serve as a better example than one that serves a completely different operation.

Unfortunately, establishing demonstration sites in each of these categories is not likely to be possible. Therefore, the focus should be on identifying a site or sites that will be readily accessible to other interested businesses and institutions, and one that is committed to proper operations, including ensuring the proper mix of materials, monitoring the process, safeguarding against contaminants, and use of the finished product. If possible, more than one technology should be

included so that potential composters can get a better idea of what may be best for their own facilities.

Selecting the best equipment for a given site will require conducting a waste audit/study to determine the amount and types of materials generated, areas of generation, and whether there are seasonal or other variations in generation. Knowing the amounts and composition of the waste to be considered for composting will help to determine the size of unit required for composting, what other materials may be needed to ensure the proper mix of material to facilitate composting, and efforts that may be required to avoid problems of contamination.

Once sites are identified and the proper equipment is selected, the City can apply for a Section 902 Recycling Program Grant to purchase the equipment. However, it is strongly suggested that the grant also include an evaluation component that can help to look at the effectiveness of the equipment and identify specific problems that arise in the course of implementation and operation. Information obtained from this type of evaluation could then be shared with other potential composters to help them avoid some of the pitfalls that operators of the demonstration sites may have encountered.

The City might also want to consider its own effort to conduct food waste composting on City property. It may be worth considering development of a collection route for Central City, for example, to collect materials to be delivered to such a site. The City could operate a program using some of the larger units such as the Wright system or the CompTainer. The drawback is that operating this type of system would require a permit from the Department of Environmental Protection (DEP), while on-site composting does not. It may be worthwhile, however, to explore any options for DEP to view such a demonstration effort differently and apply a less stringent requirement to determine how such a system would work. It may be an opportunity to demonstrate that this kind of system can operate without significant problems, and may promote more food waste composting by including businesses that cannot compost due to space limitations or that prefer not operate their own program.

PUBLIC EDUCATION

If the City decides that it wishes to promote food waste composting, it can use the demonstration sites as a platform to generate positive publicity, assuming that these sites are operating properly. Ed Doyle of the Seaport Hotel spoke about the positive publicity his facility has received as a result of its activities. Focus could be placed on the environmental aspects of composting food waste and using the finished product, diversion of waste from disposal, or the savings that are achieved, particularly for public facilities. Evaluation information can be disseminated not only to potential composters, but also to the media. Obviously, there is a need to avoid negative publicity, however, which is why ensuring that facilities operating demonstration sites are committed to the process is so important.

The City could also work through appropriate networks and associations to promote composting in businesses and institutions. This could include everything from the Chamber of Commerce to tourist and convention organizations, restaurant associations, area/neighborhood business groups, hospital networks, and the intermediate unit for schools.

CONCLUSIONS

- There are food waste composting systems and options available for any type of business or institution in the City of Philadelphia.
- Food waste composting efforts could contribute significantly to the City's recycling rate.
- Food waste composting demonstration sites would give the City an opportunity to show that food waste composting is a viable option for managing such wastes, and give interested businesses and institutions an opportunity to observe how the process works.
- Public education and promotion will be necessary to help spread the food waste composting message and encourage businesses and institutions to compost.

RECOMMENDATIONS

- The City of Philadelphia should select appropriate demonstration sites to showcase food waste composting.
- The City should work with these facilities to audit their waste streams and survey their facilities to determine the most appropriate equipment.
- The City should apply for Section 902 grant funding to purchase equipment for the demonstration sites, and this application should include funding for program evaluation.
- The City should actively promote the demonstration sites, and should disseminate information from the evaluations in order to raise interest and promote food waste composting.

As noted in the previous report, diverting at least a portion of the estimated 8.6 percent of Philadelphia's waste stream that is thought to be food waste could contribute significantly to boosting the City's recycling rate and helping to achieve the state's 35 percent goal.

Sincerely,
R.W. BECK, INC.

Sandra L. Strauss
Environmental Analyst

cc: Kathleen Kilbane, SWANA
Carl Hursh, DEP
Debbie Miller, R.W. Beck