City of Gustavus
Gustavus Disposal and Recycling Center (DRC)
Food Waste Composting
Operating Plan

Original Plan May, 2005
This revision: July 1, 2010

Paul Berry, DRC Manager/ Operator
dumpmaster@gustavus-ak.gov

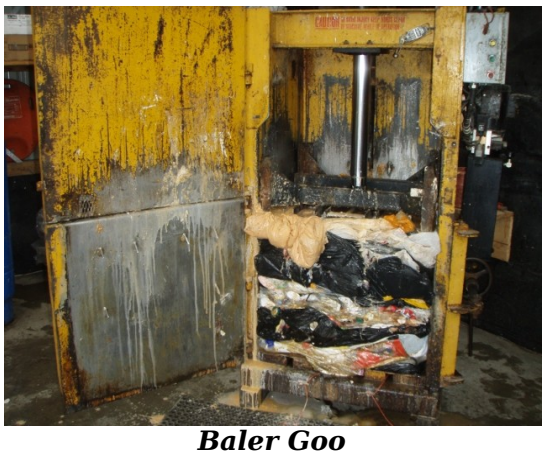
Table of Contents

Purpose and Need

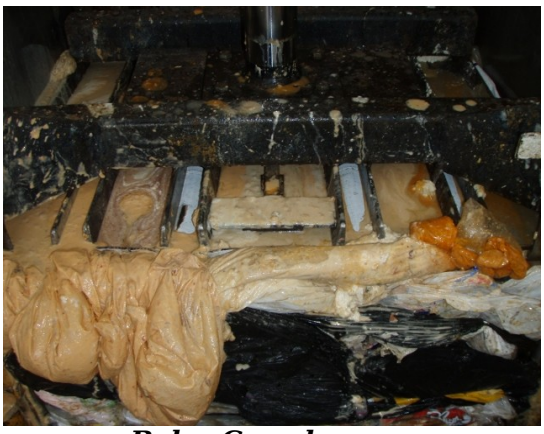
Since 1996 the DRC has operated a food waste composting program for the community's waste stream. The objective of the food waste composting program is (not prioritized):

1. Conserve limited landfill space
2. Promote recycling
3. Reduce bear and people conflicts and bird scavenging of human food waste
4. Provide a low cost soil amendment or "compost" to Gustavus residents
5. Improve the working environment for the DRC's waste baling operation

Food waste is organic and typically has a significant water content. These two facts present a challenge to waste handling facilities such as the DRC that use manual waste handling and sorting techniques and use a high compression baler to reduce the volume of waste being landfilled. Food waste cannot be easily compressed and baled like other common wastes because the water in the waste is squeezed out of the baler during compression. And really, it is more than water that comes out of the baler. "Baler goo" is a better description, and the presence of baler goo makes working with the baler very unpleasant.



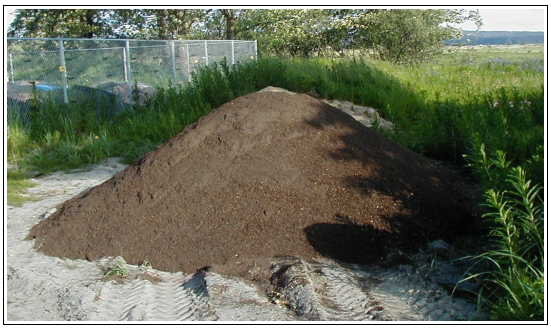
Baler Goo



Baler Goo close up

Direct burial of food waste is wasteful of limited landfill space as it requires immediate and significant earthen cover to keep away birds and flies and to trap odors. Direct burial of food waste also contributes to future methane production which is a serious greenhouse gas and buried food waste generates other gases which can contribute to nuisance odors.

A more optimum method for treating food waste is aerobic composting. Aerobic composting produces temperatures over 140 degrees Fahrenheit, which helps to sanitize the food waste. Aerobic composting is also very effective in reducing volume. Finally one of the most significant attributes of aerobic food waste composting is the production of a marketable garden compost. The sale of compost is used to help offset the program's cost.



Finished compost

The DRC's food waste composting program is not without its challenges and to operate properly it requires constant attention by the DRC staff. Funding for the operational costs associated with the food waste composting program is provided through user fees and the sale of finished compost. Funding of the capital costs associated with the food waste composting program are through Federal, State, City and private grants.

Compost produced during the past 2 years is approximately 10 -12 yards per year. Assuming a value of $70 per yard, this represents a marketable value of $700 - $900 annually.

Year	*Total*	*Community*	*GBNP*	*GB Lodge*
2003	73,742	38,084	4,326	31,332
2004	77,131	40,521	5,412	31,198
2005	60,677	35,319	3,683	21,675
2006	52,410	32,806	4,092	15,512
2007	58,559	30,676	3,932	23,951
2008	57,907	29,983	3,702	24,222
2009	48,216	22,958	4,178	21,080

Table 1 Pounds of food waste composted by calendar year
(GBNP = Glacier Bay National Park – Bartlett Cove)

Composting Yard (looking southeast towards Pleasant Island)

Facility

The composting yard is a raised and leveled 110' (front to back) by 60' (left to right), 6600 sq. ft. area adjacent to the original landfill (to the left). It is enclosed within an eight foot high chain link fence with access to the yard provided through the 12' wide gate directly in front, or through the landfill to the left.

Inside the composting yard on the immediate left hand side is the mixing station. Behind the mixing station towards the back of the facility is the quonset shed. Between the quonset shed and the mixing station is the wood chip storage pile and the housing for the aeration blower. To the right of the quonset shed is the outdoor static pile composting area. To the right of the entrance gate is the storage area for

sifted and curing compost. Immediately outside the fence on the right hand side is the compost screener.

Fence detail:
There are 4 runs of high voltage (~10,000 volt) electric wire fastened to the outside of the fence. The horizontal runs of this wire are spaced from eight inches to six feet above grade. When the DRC is unattended the gate is locked and fence is electrified. There are warning signs along the fence to warn the public. The original landfill enclosure is electrified as well.

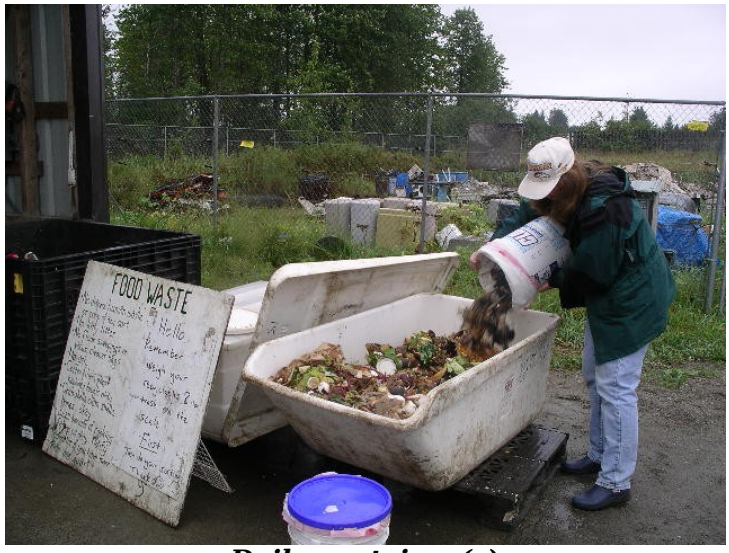
Mixing station:
The mixing station is a 16' x 16' wide 4” thick open concrete pad with 5' high back wall made of large interlocking concrete blocks. The back wall is sturdy enough to allow the Bobcat to push against it as part of the food waste mixing process.

Quonset shed:
The quonset is 48' long x 30' wide x 16' high. The base is comprised of two 4' high pony walls anchored every 8' with 6” x 6” treated spruce wood posts set four feet deep into the gravel pad. The four corner posts are set in concrete. The cover is a 10 mil woven poly fabric over a 14 guage galvanized tubular frame. The end walls are covered with widely spaced vertical or horizontal wood siding with an integral bird mesh over the entire face so as to allow maximum ventilation of the shed without providing access to ravens, crows or other corvids. Small birds are able to enter and leave the quonset, however, and this helps to reduce the fly population.

Compost screener:
Screen USA Trom 406 trommel screener with 1/2” mesh screen.

Process Description

Customer delivery:
Gustavus residents and businesses deliver their food waste to the DRC, typically in 5 gallon buckets. Food waste is weighed (for billing purposes) and placed into the daily holding container, typically a large, plastic tote or a metal dumping hopper. At the close of business the holding bin is weighed and the net weight recorded. The daily container is emptied into the Bobcat dumping hopper (model 25, 2.5 yard capacity). If the food waste is not to be processed that day, the food waste is covered with wood chips (~1/3 yard) to keep flies out and odors controlled. The dumping hopper itself is covered by a lid to keep birds, rain or snow out of the hopper. The dumping hopper resides on the pad of the mixing station.



Daily container(s)

Mixing with bulking agents and other amendments:
The primary bulking agent is wood chips, typically local spruce or alder. Amendments, when available, are grass clippings and/ or horse manure. The amendments are included to increase the amount of nitrogen available to the bacteria during composting process and improve the compost's value as a garden additive. When the dumping hopper is full the food waste is mixed with the bulking agent and other amendments. This occurs every two to four weeks in the winter (October – April) and one to three times a week during the peak summer season (May - September).

Mixing is done on the mixing station. The Bobcat operator dumps the contents of the dumping hopper onto the mixing station. A ratio of one part food waste to two parts wood chips and amendments is used. The food waste, wood chips and any amendments are mixed by scooping and dropping the mixture until the operator determines it is thoroughly mixed. After mixing, the operator transports the mixture to the quonset shed for composting.

Food waste mixing process

Composting method:
The DRC is using the static pile method for composting. This means the food waste mixture is not turned once it is placed. Inside the quonset shed is space for two static piles, documented as static piles 1 and 2. The static piles are 10' – 15' wide at the base, 20' long and 3' – 5' high. After the placement of the food waste mixture the static pile is capped with ~2” of wood chips to control odor and flies. The static piles are then covered with Compostex® covers to help retain moisture. Depending on the season each static pile can hold from three months to three weeks of material (approximately 10-12 yards). Typically while one static pile is being built the other older pile is ready for secondary processing. There are two runs of aeration pipe (4” SDR 11 HDPE pipe with 1/2” holes every 4” - 6”) under each static pile. Most of the time the static piles are passively ventilated. If there are odor concerns the static piles can be actively ventilated using a Green Mt Technologies Modular Aeration Control System (MACS 100S-P). Using this aeration process the static piles have negative aeration where air is drawn into the static pile through 4” diameter HDPE pipes buried beneath the static piles. From these pipes the air flows into the MACS blower assembly and exhausted through a bio-filter. The aeration blower has a temperature probe placed in the static pile. The blower is programmable. Typically the blower turns on once the static pile exceeds 140 degrees Fahrenheit and/ or run for a minimum on/ off amount of time such as on for 3 minutes of every 20 minutes. The Bio-filter assembly consists of a 20' long x 5' wide pile of wood chips, finished compost and lime. Two 20' sections of 4” perforated HDPE pipe similar to the static pile are embedded in the base of the pile.

Static pile (left) and the empty static pile 2 (right)

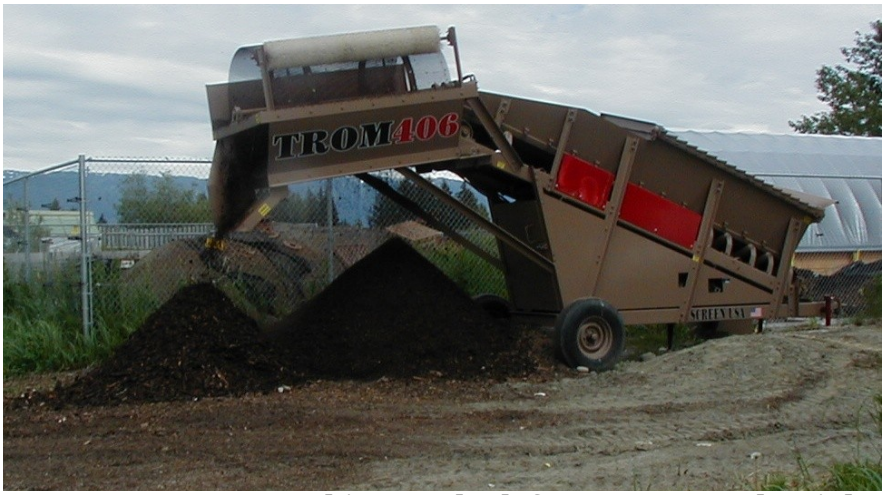
Outdoor static pile composting method:
If more food waste is delivered than can be composted within the quonset shed, outdoor static piles are utilized. These are approximately 20' long and 8' wide at the base and 4' – 4 ½' tall. Each static pile is built upon a 2” - 4” thick base of wood chips. One or two lengths of 20' perforated pipe 4” diameter SDR 11 HPDE pipe are set on top of the base for passive aeration. Once all the food waste and wood chip mixture is placed on the static pile, the static pile is capped with 2” - 4” of wood chips to control odor and flies. Then the static pile is covered with Compostex covers,

which allow carbon dioxide to escape and oxygen to enter, and which shed rain and assure the static pile will remain aerobic. Finally a bird barrier made up of chain link fencing and plastic bread trays are placed around the base and atop the static pile to keep ravens, crows and other birds from scavenging and disturbing the static pile. Because of bird prevention measures the outdoor static piles are labor intensive and are avoided whenever possible.

Secondary static pile and curing process:
During the first week of the composting process a lot of heat is generated by the process and moisture escapes from the core area of the static pile. Consequently the core becomes desiccated and stops composting. To address this problem the following technique has been developed: when the static pile is “closed” (can hold no more material) and the core temperature has dropped to ambient levels, the contents of the pile is transported, using the Bobcat, to the outdoor composting area. The mixture is re-moistened with water from a garden hose throughout the moving process and the now moistened mixture is allowed to finish the composting process. This secondary process static pile is ready for screening in approximately 2 weeks.

Re-moistening material in secondary process static pile

Screening:
The process is achieved by scooping the static pile load by load, with the Bobcat and the 1 yard bucket. After sifting the finished compost is transported to a holding area inside the composting yard, is thoroughly moistened with garden hose or left uncovered to absorb rain. The material is allowed to cure over the course of the winter and is distributed to the public during the next spring. Wood chips from the sifting process are hauled back to the storage pile beside the mixing station for reuse. Approximately 3 yards (best guess) of wood chips are “lost” each year during the entire process and have to be replaced with new chips from local brushing projects.



Compost screener - chips on the left, compost to the right

Composting Challenges and Solutions

Birds:
Birds are naturally attracted to food waste. Presently the mixing activity is the only activity where food waste is exposed and birds can scavenge. The solution has been to minimize the exposure time and get the mixture into the quonset shed and covered as soon as possible. A bird mesh is used over the secondary process static pile. To further address the problem of birds scavenging during the mixing process a second person, the "scarecrow", works with the operator to make sure birds stay away from the mixing process.

Rain and snow:
Excess moisture contributes to anaerobic conditions and resulting odor problems. Since the composting process takes place under a cover this is not a problem. Snow is a problem with exposed compost covers as it has to be removed before the cover can be pulled back. Again, composting in the quonset shed eliminates this problem.

Freezing temperatures:
Extended periods of freezing temperatures make the food waste mixing process impossible, the food waste becomes a frozen block. Because significantly less food waste is processed during the winter months compared to the summer this has not been a problem. Food waste is simply stored in the dumping hopper until a period of above freezing temperatures occur. When temperatures are below freezing, there is less of an odor problem with the food waste and does not need to be covered with wood chips. This further extends the storage capacity of the dumping hopper.

Bears:
Bears were historically attracted to the smells associated with the landfill and composting at this site. However, since the installation of an electrified chain link fence in 2001, bear intrusion has not been a problem. The DRC operator checks the electrification system during each day of operation and periodically cuts vegetation around the wires to ensure the proper operation of the electric fence at all times.

Size of the feedstock (food waste):
Large items: a loaf of bread, fish carcases, apples, heads of lettuce etc. do not readily compost like small items. Ideally all feedstock would would be ground or shredded to size of approximately 1" in diameter or less before the mixing process. This would

improve the mixing process and significantly improve the composting process. However this process requires equipment that the DRC does not have at this point in time. In the absence of a shredder the Operator uses a square tipped shovel or a boot to flatten or chop larger objects.

Plastic or other waste in the feedstock:
Plastic bags, plastic food wrapping, straws, foil butter pat wrappers and the like - "contaminants", are common in food waste coming from commercial kitchens. Commercial users are educated by the Manager/ Operator which helps to reduce the incidence of contaminates in the food waste. The use of a grinder or shredder on the feedstock could add to the plastic contamination problem by making the contaminate pieces small and hard to remove. There is a constant process of removing plastic and other containments from the food waste and compost during the entire process.

Invasive plant seeds:
Invasive plant seeds can be transported to new locations through the distribution of compost unless controls are in place. At the DRC these controls are:

1. Not accepting invasive plants as a feedstock. When customers bring invasive plants for disposal to the DRC these plants not composted but are baled or otherwise safely disposed of.
2. Managing the static pile to achieve high temperatures to kill seeds. This is difficult with a static pile as temperatures are not uniform in the static pile and seeds on the periphery of the pile are likely to survive.
3. Keeping the piles of finished compost covered to prevent windblown seeds from getting into the compost.

Odor:
Aerobic composting typically has a mild odor that is effectively dissipated by natural ventilation. Nuisance odors are generated if anaerobic conditions develop within the static piles or if a large quantity of food waste has just been mixed and placed into a static pile. Eliminating excess water, careful construction and adequate ventilation of the static piles are essential to keeping the static pile aerobic and nuisance odor free.

To monitor any composting odors, the DRC has established a numerical odor index. This information is recorded in the DRC's daily log and electronic database: 0 = background levels to 4 = serious problems. Normal operation is in the range of 1 to 2. The DRC operator performs a nasal appraisal of the compost operation during each day of operation to detect any anaerobic activity. The DRC has asked Gustavus residents to notify the DRC manager or operator whenever nuisance odors become apparent. Immediate reporting is essential to identifying and correcting odor problems. Complaints of odors submitted weeks or months after their occurrence are of little use in identifying their source.

For nuisance odor complaints the DRC has established the following procedure:
The complaint should be made to the DRC Manager, in person or by telephone, in a timely manner - 24 or at most 48 hours from when it occurred. If the Manager receives more than one complaint within a five day period the Manager will ask for a member of the City Council to come to the facility with the complainant and give an objective assessment of the level of the problem. All complaints are recorded and kept on file at the DRC.

Site Diagram