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

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**Document History**

Original Plan May, 2005
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## 1. Purpose, Need and Benefit

Since 1996 the DRC has operated a food waste composting program. 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. This is because the DRC utilizes manual waste handling and sorting techniques and uses a high compression baler to reduce the volume of waste being landfilled. Food waste is messy when it is compressed because all 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 the volume of the food waste. Finally one of the most significant attributes of aerobic food waste composting is the production of 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, the sale of finished compost and funds from the City's General Fund. Funding of the capital costs associated with the food waste composting program are through Federal, State, City and private grants.

Compost produced and sold during the past two calendar years (2018 & 2019) is approximately 10 and 20 yards during each year. Sales of each year's compost has generated $1,250 and $2,400 respectively.

The relationship between the total weight of food waste going into the composting process and the volume of compost generated by that food waste can be seen in tables 2.1 and 2.2 by comparing the total weight of the food waste of the year before a given year's distribution. For example, the food waste accepted in 2017 becomes the compost distributed in 2018.

| *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 |
| 2010 | 44,267 | 21,123 | 4,019 | 19,125 |
| 2011 | 51,770 | 24,901 | 4,410 | 22,459 |
| 2012 | 62,157 | 33,030 | 5,930 | 23,197 |
| 2013 | 57,243 | 35,815 | 4,258 | 17,170 |
| 2014 | 58,844 | 35,324 | 4,345 | 19,175 |
| 2015 | 58,406 | 33,635 | 5,802 | 18,969 |
| 2016 | 47,861 | 28,749 | 5,067 | 14,045 |
| 2017 | 37,763 | 28,840 | 3,903 | 5,020 |
| 2018 | 64,435 | 41,017 | 4,086 | 19,332 |
| 2019 | 69,992 | 42,310 | 4,480 | 23,202 |

## 2.1 Table of Pounds of Food Waste Composted by Calendar Year

*(GBNP = Glacier Bay National Park – Bartlett Cove; GB Lodge = Glacier Bay Lodge & Tours)*

*GB Lodge is separated out as it is the single largest producer of food waste.*

*GBNP is separated out because, in the early years of the composting program, it was the 2nd largest producer of food waste. However other lodges have occasionally produced more food waste.*

## 2.2 Table of Yards of Compost Distributed by Calendar Year

| Year | Yards |
|---|---|
| 2020 (*to date)* | 19 |
| 2019 | 20 |
| 2018 | 10 |
| 2017 | 16 |
| 2016 | 18 |

***Composting Yard (looking southeast towards Pleasant Island)***

## 3. Facility

The composting yard measures 110' (front to back) by 60' (left to right). This is a 6600 sq. ft. area. It is slightly raised, and partially paved with lightly sloped concrete. It is located 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 Trom screener and behind that is the Quonset shed. To the right of the entrance gate is, from front to back, sawdust storage, overs storage and curing compost. The area in the back right of the facility is materials storage or is unused.

**Fence detail:**

The fencing is chain link, 8’ high. There are four runs of high voltage (~9,000 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 20' wide 4” thick open concrete pad with 4' 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. The mixing station was placed into service in 2004. The concrete backwall has been rebuilt twice since that time.

**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 gauge 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. Placed into service in 2005.

*The wooden pony walls have deteriorated where they are in direct contact with the ground. The Quonset has been repaired with several buttresses along either side to help hold up the walls. The Quonset is in the process of being replaced with a New Composting Facility to be constructed sometime during 2020 – 2022.*

**Compost screener:**
Screen USA Trom 406 trommel screener with 3/8" mesh screen. Gasoline powered, hydraulic conveyor and screen. Placed into service in 2005.

## 4. Process Description

**Customer delivery:**
Gustavus residents and businesses self-haul their food waste to the DRC, typically in one gallon to five gallon buckets. Some customers will keep their food waste in the freezer to reduce odor and extend holding times. Food waste is weighed (for billing and data collection purposes) and placed into the daily holding container. The original daily holding container was a large, plastic tote and is currently a ½ yard 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 reduce odors. 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 additional carbon:**
The primary bulking agent and carbon source is wood chips, typically local spruce, alder or cottonwood. Overs from the screening process are also used as a bulking agent to increase porosity. Additional carbon, if needed, is provided through the addition of locally produced saw dust.

When the dumping hopper is full the food waste is mixed with the wood chips and any sawdust. This process occurs every four to six weeks in the winter (October – April) and one to three times a week during the peak summer season (May – September) depending on the volume of food waste received.

Mixing is done on the mixing station. Depending on the wetness of the food waste the Bobcat Operator either creates a bed of wood chips to dump the food waste on or empties the contents of the dumping hopper onto the mixing station's pad and then dumps wood chips on top of it. A ratio of one part food waste to one to three parts wood chips and carbon is used depending on how much carbon material is already in the dumping hopper. The materials are mixed by scooping and dropping the mixture until the operator determines it is thoroughly mixed. The bucket is also used to break-up bags or flatten large items. After mixing, the operator transports the mixture to the Quonset shed for composting.


***Food waste mixing process***

**Composting method:**
Currently, the DRC is using the passively aerated static pile method for composting. In this method the food waste mixture is not actively aerated once the material is placed. Inside the Quonset shed, along each of the 48' long wooden pony walls, is space for three static piles, documented as static piles 1, 2 and 3 (a potential fourth space is used as covered storage). The static piles are 7' – 9' wide at the base, 20' long and 3' – 5' high when complete. After the placement of the food waste mixture, the static pile is capped with ~2" of wood chips to help insulate the pile, 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. Typically while one static pile is being built one of the other, older piles is ready for screening. Beneath the base of each static pile there are three or more runs of aeration pipe, running the long way, to help with passive aeration. The pipe is 4” diameter HDPE SDR 11 pipe with 1/2” holes every 4” - 6”. The pipes are set into the base so that they remain in place between uses of the pile. However, the pipes are easily caught by the loader bucket when removing material. A compost thermometer is inserted into the pile to insure composting temperatures over 131F. Composting temperatures at the DRC typically reach 160F which is higher than desired but without active aeration there is no practical way to bring this temperature down.

Pile turning is minimal, typically two times during the life of the pile. This is less than ideal and is due to the current layout of the static piles and the delicate condition of the Quonset’s deteriorated wooden pony walls. The DRC Manager is in the process of redesigning the Quonset structure to provide for a more rigorous and thorough turning process.

***Static pile 1 (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.

**Screening:**
Once the primary phase of the composting process is over (at times because of a lack of moisture) the compost is screened. This is achieved by scooping the static pile with the Bobcat and dumping the material into the TROM screener. After sifting, the compost is placed in the cure area inside the composting yard. After screening the separated wood chips (and bones, silverware and other large items) are called “overs” and are placed into the overs storage pile. It is not known exactly how much of the wood chips are dissipated each season by the composting, screening and moving process each year, but it is necessary to continually obtain additional wood chips from local brushing and clearing projects.

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

**Curing:**
Curing is done in simple piles. If the compost is too dry it is remoistened with a garden hose or left uncovered to absorb rain (preferred method). The material is allowed to cure over the course of the winter, roughly six to nine months prior to distribution.

**Compost testing:**
Compost maturity testing is provided on-site with the Solvita® Compost Maturity test kit. When the test demonstrates a Maturity Index of at least 6 the compost is considered mature enough for distribution.
To the greatest degree  practical, the DRC’s Food Waste Composting program is voluntarily following Washington State’s WAC 173-350-220 Composting Facilities regulations. As part of these regulations the DRC is electing to annually send away a sample prior to the annual sale of compost. The testing of the compost is based on these regulations. In April of 2020 the DRC sent a compost sample to Soiltest Farm Consultants in Moses Lake WA. They performed their C-2 test package: pH, EC Moisture, OM%, Ash%, Total agronomic minerals, TN, Bioassy germination, $CO_2$ evolution, Sieve analysis, Inerts, Salmonella and Trace metals (503 regulated). The DRC posts recent test on the City’s website.

## 5. Operator Training

As the DRC's composting program has matured, the need for good operator training and exposure to other municipal or commercial composting facilities has become apparent. The DRC Manager has taken Washington Organic Resource Council's (WORC) Compost Facility Operator Training (October 2018). Professional training provides better procedural references and a more professional approach to the overall process. Also, it has been observed that when the various DRC Assistant Operators manage the composting operation in the Manager/ Operator's absence, each operator does it differently and with varied results. So training is also important in the development of a written standard operation procedure for the DRC's composting program.

## 6. 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.

**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 the snow 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, because 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 and 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.

**Particle size of the feedstock (food waste):**

Large items: a loaf of bread, pineapple tops, un-burst bio-bags of food waste 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 the loader bucket, a square tipped shovel or a boot

to flatten or chop larger objects.

**Non-compostable plastic or other waste in the feedstock:**
Non-compostable 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 contaminants from the food waste and compost during the entire process.

**Invasive plant seeds:**
Invasive plant seeds can be transported to new locations in a community 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.

**PFAS/ PFOA:**
PFAS are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water. This includes many brands of compostable take-out containers that are used in the food service industry. These same containers often end up being composted with the food waste. PFAS/ PFOA chemicals are a concern because they do not break down in the environment, can move through soils and contaminate drinking water sources, and they build up (bioaccumulate) in people. The DRC does allow the inclusion of most compostable containers with the food waste. The DRC is just beginning to get an understanding of this issue and has not yet developed a policy of which compostable take-out containers can be composted and which ones should not.

**Compostable plastic bags:**
The DRC allows for the inclusion of compostable bio-bags in the feed-stock. This is done for the convenience of the customer. Many customers will line their food waste bins with a bio-bag and then dump the bag in the DRC’s food waste collection container. The lack of a grinding process before the mixing process means there is no assurance that these bags will be burst open and that the food waste inside of any bio-bags is not always properly mixed during the mixing process. The Operator can burst these bags by hand, foot or with the loader bucket during the mixing process but that is time consuming for the Operator and some bags will always get by.

**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 any Gustavus residents that have come forward with concerns 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, telephone or by e-mail. The report needs to be in a timely manner, 24 or at most 48 hours from when it occurred. If the Manager receives more than one complaint from more than one individual within a five day period, the Manager will contact the City Administrator and/ or the Mayor and will contact the local ADEC Solid Waste Program Environmental Program Specialist for a recommendation on how to proceed. All complaints are recorded and kept on file at the DRC.

# 7. Site Diagram


*Drone-view, May 2020 Photo Courtesy Sean Neilson*